# LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS

# ADMINISTRATIVE RECORD

# CHRONOLOGICAL INDEX

**Volume 1 of 13**

**2009**

**Bate Stamp Numbers**

**00070988 - 00071931**

**Prepared for**

**Department of the Army**
**Longhorn Army Ammunition Plant**

**1976 – 2009**

***LONGHORN ARMY AMMUNITION PLANT***
***KARNACK, TEXAS***
***ADMINISTRATIVE RECORD – CHRONOLOGICAL INDEX***

VOLUME 1 of 13

2009

A Title: Report–Final Decision Document for LHAAP-08 (Former Sewage Treatment Plant), LHAAP-48 (Y-Area), LHAAP 35C(53) (Static Test Area), and LHAAP-002 R (Static Test Area), LHAAP, Karnack, TX
Author(s): Shaw Environmental, Inc., Houston, Texas
Recipient: All Stakeholders
Date: January 7, 2009
Bate Stamp: 00070988 - 00071033

B. Title: Minutes–Monthly Managers Meeting
Author(s): Shaw Environmental, Inc., Houston, Texas
Recipient: All Stakeholders
Date: January 13, 2009
Bate Stamp: 00071034 - 00071050

C. Title: Report–Final Site Investigation Report LHAAP-02, Vacuum Truck Overnight Parking Lot, LHAAP, Karnack, TX
Author(s): Shaw Environmental, Inc., Houston, Texas
Recipient: All Stakeholders
Date: January 30, 2009
Bate Stamp: 00071051 - 00071182

D. Title: Minutes–Monthly Managers Meeting
Author(s): Shaw Environmental, Inc., Houston, Texas
Recipient: All Stakeholders
Date: February 18, 2009
Bate Stamp: 00071183 - 00071193

E. Title: Report–Final Engineering Evaluation/Cost Analysis, Former Pistol Range, LHAAP, Karnack, TX
Author(s): Shaw Environmental, Inc., Houston, Texas
Recipient: All Stakeholder
Date: February 25, 2009
Bate Stamp: 00071194 - 00071931

**DEPARTMENT OF ARMY**
LONGHORN ARMY AMMUNITION PLANT
POST OFFICE BOX 220
RATCLIFF, AR72951

00070988

January 7, 2009

DAIM-ODB-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
TCEQ Environmental Cleanup Section I MC-136
12100 Park 35 Circle
Austin, TX 78753

Re: Final Decision Document for LHAAP-08, LHAAP-48, LHAAP-35C (53), and LHAAP-002-R Sites
Longhorn Army Ammunition Plant, Karnack, Texas, November 2008

SUP 126

Dear Ms. Duke,

The above-referenced document is being transmitted to you for your records. The Decision Document has been signed by Thomas E. Lederle, Industrial Branch Chief, BRAC Division, ACSIM. TCEQ's letter of concurrence is appended to the document.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at rose.zeiler@us.army.mil.

Sincerely,

Rose M. Zeiler

Rose M. Zeiler, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
S. Tzhone, USEPA Region 6, Dallas, TX
P. Bruckwicki, Caddo Lake NWR, TX
A. Williams, COE – Tulsa District, OK
D. Birnbaum, COE – Tulsa District, OK
P. Srivastav, Shaw – Houston, TX (for project files)

00070989

*FINAL*

# DECISION DOCUMENT
# LHAAP-08 (FORMER SEWAGE TREATMENT PLANT), LHAAP-48 (Y-AREA), LHAAP-35C (53) (STATIC TEST AREA), AND LHAAP-002-R (STATIC TEST AREA)
# LONGHORN ARMY AMMUNITION PLANT
# KARNACK, TEXAS

**Prepared for**

**U.S. Army Corps of Engineers**
**Tulsa District**
**1645 South 101st Avenue**
**Tulsa, Oklahoma**

**Prepared by**

**Shaw Environmental, Inc.**
**3010 Briarpark, Suite 400**
**Houston, Texas 77042**

**TERC No. DACA56-94-D-0020, Task Order No. 0109**
**Shaw Project No. 845714**

**November 2008**

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## *Glossary of Terms*

Located at the end of this Decision Document

## *Acronyms and Abbreviations*

| | |
|---|---|
| µg/L | microgram per liter |
| AM | Action Memorandum |
| BERA | Baseline ecological risk assessment |
| Bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| COPC | chemical of potential concern |
| DNT | Dinitrotoluene |
| EE/CA | Engineering Evaluation/Cost Analysis |
| FFA | Federal Facility Agreement |
| HHRA | human health risk assessment |
| HI | hazard index |
| INF | intermediate range nuclear forces |
| IRP | Installation Restoration Program |
| Jacobs | Jacobs Engineering Group, Inc. |
| LHAAP | Longhorn Army Ammunition Plant |
| MC | munitions constituents |
| MCL | maximum contaminant level |
| MEC | munitions and explosives of concern |
| MMRP | Military Munitions Response Program |
| MOA | Memorandum of agreement |
| MRS | munitions response site |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| ng/L | nanograms per liter |
| NPL | National Priorities List |
| PCBs | polychlorinated biphenyls |
| pg/L | picograms per liter |
| PVC | polyvinyl chloride |
| RAB | Restoration Advisory Board |
| RCRA | Resource Conservation and Recovery Act |
| RFA | RCRA Facility Assessment |
| RI | Remedial investigation |
| SARA | Superfund Amendments and Reauthorization Act |
| Shaw | Shaw Environmental, Inc. |
| SI | Site Inspection |
| SVOC | semivolatile organic compound |
| TCDD | 2,3,7,8- tetrachlorodibenzo-*p*-dioxin |
| TCE | Trichloroethene |

## *Acronyms and Abbreviations (continued)*

| | |
|---|---|
| TCEQ | Texas Commission on Environmental Quality |
| TEF | toxicity equivalence factor |
| TEQ | toxicity equivalence quotient |
| TNT | Trinitrotoluene |
| TRRR | Texas Risk Reduction Rules |
| USAEHA | U.S. Army Environmental Hygiene Agency |
| USATHAMA | U.S. Army Toxic and Hazardous Material |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| VOC | volatile organic compound |

# 1.0 Declaration

## 1.1 Site Name and Location

Installation Restoration Program (IRP) Sites LHAAP-08, Former Sewage Treatment Plant; LHAAP-48, Y-Area; LHAAP-35C (53), Static Test Area; and Military Munitions Response Program (MMRP) Site LHAAP-002-R, Static Test Area

Longhorn Army Ammunition Plant
Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System, U.S. Environmental Protection Agency (USEPA) Identification Number: TX6213820529.

## 1.2 Statement of Basis and Purpose

This document presents the no action decisions for Sites LHAAP-08, LHAAP-48, LHAAP-35C (53), and LHAAP-002-R located at the former Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas. The decisions were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300.

The decisions were based on the Administrative Record file for these sites, including the remedial investigation (RI) and baseline risk assessment reports (Jacobs Engineering Group, Inc. [Jacobs] 2002a, 2002b, 2003), the Final Site Evaluation Report (Shaw Environmental, Inc.[Shaw], 2007b), the Final Site Inspection (SI) Report ($e^2$M, 2005), the Final Engineering Evaluation/Cost Analysis (EE/CA) (Cape, 2007) and Action Memorandum (AM) (U.S. Army, 2007), the installation-wide baseline ecological risk assessment (BERA) report (Shaw, 2007c), the Proposed Plans (U.S. Army, 2008a, 2008b), and other related documents contained in the Administrative Record for sites LHAAP-08, LHAAP-48, LHAAP-35C (53) and LHAAP-002-R.

This document is issued by the U.S. Army, the lead agency for this installation. USEPA Region 6 and the Texas Commission on Environmental Quality (TCEQ) are the regulatory agencies providing technical support, project review and comment, and oversight of the U.S. Army cleanup program. The USEPA and TCEQ concur with the selected no action decision.

## 1.3 Description of the Selected Remedy

The lead agency has determined that no CERCLA action is necessary to protect public health or welfare or the environment at these sites. The recommendations for no action are consistent with the criteria required under CERCLA.

Risk evaluations conducted for LHAAP-48 and LHAAP-35C (53) determined that the sites were suitable for unrestricted use.

LHAAP-08 was not evaluated for unrestricted use. The risk evaluation, which was based on the reasonably anticipated future industrial use as a wildlife refuge, did not address unrestricted use. Limited monitoring in the form of Letters of Certification to the State of Texas every five years will be conducted to verify that the use of LHAAP-08 remains industrial. In accordance with Texas Administrative Code §335.566, a notification will be recorded in Harrison County records stating that only the industrial use scenario was evaluated.

The lead agency has also determined that no CERCLA action is necessary to protect public health and safety related to munitions constituents (MC) or munitions and explosives of concern (MEC) at LHAAP-002-R, the Static Test Area. No MEC was found during the EE/CA investigation, and environmental sampling results at the site indicated that there is no risk to human health and safety from MC. The finding of No DoD Action Indicated by the Department of Defense Explosives Safety Board on April 3, 2008 supports the no action decision of the AM. Site LHAAP-002-R is suitable for unrestricted reuse.

## 1.4 Statutory Determinations

None of the CERCLA §121 statutory determinations are necessary in these actions since no remedies are being selected. No remedial actions are necessary to ensure protection of human health and the environment.

There is no cost associated with the decisions for these sites beyond the cost for limited monitoring at LHAAP-08. The LHAAP-08 risk evaluation, which was based on the reasonably anticipated future use as a wildlife refuge, does not address unrestricted use. Limited monitoring in the form of Letters of Certification to the State of Texas every five years will be conducted to certify proper land use. In addition, in accordance with Texas Administrative Code §335.566, a notification will be recorded in Harrison County records stating that only the industrial use scenario was evaluated. The undersigned is the appropriate approval authority for this decision.

## 1.5 Authorizing Signature

Thomas E. Lederle 24 Nov 2008
(Name) (Date)

Thomas E. Lederle
Industrial Branch Chief
BRAC Division, ACSIM
United States Army

# 2.0 Decision Summary

## 2.1 Site Name, Location, and Description

LHAAP-08, Former Sewage Treatment Plant; LHAAP-48, Y-Area; LHAAP-35C (53), Static Test Area; and LHAAP-002-R, Static Test Area

Longhorn Army Ammunition Plant, Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System USEPA Identification Number: TX6213820529

Lead Agency: U.S. Army, Department of Defense

Source of Cleanup Money: U.S. Army, Department of Defense, IRP and MMRP

The former LHAAP is an inactive, government-owned, formerly contractor-operated and -maintained Department of Defense facility located in central east Texas in the northeast corner of Harrison County. As shown on **Figure 2-1,** LHAAP is approximately 14 miles northeast of Marshall, Texas. The facility is approximately 40 miles west of Shreveport, Louisiana. The former U.S. Army installation occupied 8,416 acres between State Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake and is accessed by State Highways 43 and 134.

LHAAP was placed on the Superfund National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination began in 1990. After its listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA Section 120 Federal Facility Agreement (FFA) for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

The sites addressed in this Decision Document are LHAAP-08, LHAAP-48, LHAAP-35C (53), and LHAAP-002-R shown in **Figure 2-2** and discussed below.

LHAAP-08 is located in the central portion of LHAAP and covers an area of approximately 1 acre. LHAAP-08 was the sewage treatment plant that operated from 1942 to 1997. The plant was modified over time to handle hydraulic capacity of 0.5 million gallons per day.

LHAAP-48 is the former igniter production area, otherwise known as the “Y-Area” located at the intersection of Yoakum Drive and Starr Ranch Road. LHAAP-48 covers an area of approximately 16 acres. It was built during the construction of Plant 3, from 1953 through 1955. The Y-Area was used for the production of igniters and illumination devices and was active until about 1997 (Jacobs, 2003).

LHAAP-35C (53) covers an area of approximately 40.3 acres in the east-central portion of LHAAP. Known as the former Static Test Area, LHAAP-35C (53) was used for testing of illumination devices and static test firing of rocket motors. Structures for this site included a test tunnel and a data acquisition system for flares, rocket motor test stands of earth and concrete, and conditioning facilities for reproducing arctic and tropical temperatures. The site was active through 1998.

LHAAP-002-R is in the Static Test Area as described above and is a MMRP site. It is co-located with LHAAP-35C (53), but is a smaller area, approximately 27 acres.

These sites are surrounded by an area (approximately 7,000 acres) that was transferred by the U.S. Army to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge. The U.S. Army, the lead agency for environmental response actions at LHAAP, is acting in partnership with USEPA Region 6 and TCEQ in planning and implementing remedial actions at LHAAP-08, LHAAP-48, LHAAP-35C (53), and LHAAP-002-R.

## 2.2 Site History and Enforcement Activities

### 2.2.1 Site History

LHAAP was established in December 1941 with the primary mission of manufacturing trinitrotoluene (TNT). Production of TNT began at Plant 1 in October 1942 and continued through World War II until August 1945, when the facility was placed on standby status until February 1952. In 1952, the facility was reactivated and production of pyrotechnic ammunition, such as photoflash bombs, simulators, hand signals, and tracers for 40 mm ammunition continued at Plant 2 through 1956.

In December 1954, a third facility, Plant 3, began production of solid-fuel rocket motors for tactical missiles. Rocket motor production at Plant 3 continued to be the primary operation at LHAAP until 1965 when Plant 2 was reactivated for the production of pyrotechnic and illuminating ammunition. In the years following the Vietnam conflict, LHAAP continued to produce flares and other basic pyrotechnic or illuminating items for the U.S. Department of Defense inventory. From September 1988 to May 1991, LHAAP was also used for the static firing and elimination of Pershing I and II rocket motors in compliance with the Intermediate-Range Nuclear Forces Treaty in effect between the United States and the former Union of Soviet Socialist Republics.

***LHAAP-08:*** The sewage treatment plant received domestic wastewater through 6-inch and 15-inch pipelines. The plant also received storm water, boiler blow down, laundry waste, vehicle wash rack waste, and effluent from film development at the X-ray facility. The sewage treatment plant was not used to treat water from TNT manufacturing facilities. The plant discharged treated effluent into Goose Prairie Creek and Caddo Lake (Jacobs, 2002b).

The sewage treatment plant included stabilization ponds, Dunbar filters, sludge drying beds, and an Imhoff tank. The stabilization ponds received brine consisting of saltwater backwash from softeners and filters used to condition the water before it was sent to boilers. Dunbar filters were originally used in treatment of domestic sewage mixed with wastewater from the X-ray film development laboratory. Sludge drying beds received sludge generated in a grit chamber and aerobic digester. An Imhoff tank, considered the primary treatment of wastewater, consisted of two chambers that allowed suspended solids to drop out and pass through a slot from the upper chamber into the lower chamber. Anaerobic digestion occurred in the lower chamber.

***LHAAP-48:*** The former igniter production area was used for the production of igniters and illumination devices. There were nine waste process sumps and three waste rack sumps associated with this area that are being addressed under LHAAP-35/36.

***LHAAP-35C (53):*** The former static test area was used for testing of illumination devices and static test firing of rocket motors. There were four waste process sumps associated with this area (Jacobs, 2002a). The sumps are being addressed under LHAAP-35/36. The site contains several buildings that have been nominated for the National Register of Historic Places because of their use during the Intermediate Range Nuclear Forces (INF) Treaty actions at LHAAP.

***LHAAP-002-R:*** The former static test area was designated a munitions response site (MRS) because of the rocket motor static test firing and red phosphorus smoke wedge and illuminating candle testing conducted at the site.

### *2.2.2 Enforcement Activities*

Due to the release of hazardous substances, pollutants, and contaminants from operation and maintenance activities at the facility, the USEPA placed LHAAP on the Superfund NPL on August 9, 1990. Activities to remediate contamination associated with the listing of LHAAP as a Superfund site began in 1990. After the listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA Section 120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991. Sites LHAAP-08, LHAAP-48, LHAAP-35C (53), and LHAAP-002-R were not listed as NPL sites. TCEQ is the lead regulatory agency for these sites.

## 2.3 Community Participation

The U.S. Army, USEPA, TCEQ and the Restoration Advisory Board (RAB) have provided public outreach to the surrounding community concerning LHAAP-08, LHAAP-48, LHAAP-35C (53), LHAAP-002-R, and other environmental sites at LHAAP, consistent with the Community Relations Plan for this installation. The outreach program has included fact sheets, media interviews, site visits, invitations to attend quarterly RAB and regulatory review meetings, and public meetings consistent with its public participation responsibilities under Sections 113 (k)(2)(B), 117(a), and 121(f)(1)(G) of CERCLA.

The Proposed Plans (U.S. Army, 2008a, 2008b) for the decision of No Action Necessary for LHAAP-08, LHAAP-48, and LHAAP-35C (53) were released to the Administrative Record file and made available to the public for review and comment on January 10, 2008. A notice of availability of the Proposed Plans and other related documents in the Administrative Record file was published in *The Shreveport Times* and the *Marshall News Messenger* on January 13, 2008. A 30-day public comment period for the Proposed Plans began on January 13, 2008. The public meeting was held on January 29, 2008. No written comments were received from the USEPA, the TCEQ, or the general public.

The EE/CA for LHAAP-002-R with a recommendation of No Action was released to the Administrative Record file and made available to the public for review and comment beginning August 6, 2007 for a 30-day public comment period. A notice of availability of the EE/CA and other related documents in the Administrative Record file was published in *The Shreveport Times* and the *Marshall News Messenger* on August 5, 2007. No public comments were received during this period. The public meeting was held in conjunction with a RAB meeting on June 12, 2007. Public comments were considered and no impacts to the final recommendations were encountered.

Previously, copies of Administrative Record documents were made available to the public at several information repository locations, including LHAAP, USEPA Region 6 Library, TCEQ, and Marshall Public Library. Currently, the Administrative Record may be found at the information repositories maintained at the following locations:

**Public Library**

| | |
|---|---|
| Location: | Marshall Public Library<br>300 S. Alamo<br>Marshall, Texas 75670 |
| Business Hours: | Monday – Thursday 10:00 a.m. – 8:00 p.m.<br>Friday – Saturday 10:00 a.m. – 5:00 p.m. |

**Longhorn Army Ammunition Plant**

Location: U.S. Army Office Trailer
Longhorn Army Ammunition Plant,
Karnack, Texas 75670

## 2.4 Scope and Role of Operable Unit or Response Action

The land on which these sites are located is excess to the Army's needs and is intended for transfer to the USFWS for incorporation into the Caddo Lake National Wildlife Refuge. Future anticipated use is consistent with an industrial/recreational level of exposure. These four sites can be addressed independent of any response action at other environmental sites at LHAAP.

## 2.5 Site Characteristics

This section of the Decision Document presents an overview of LHAAP-08, LHAAP-48, LHAAP-35C (53), and LHAAP-002-R site characteristics with respect to physical site features, known or suspected sources of contamination, types of contamination, and affected media. Known or potential routes of contaminant migration are also discussed.

### 2.5.1 Physical Characteristics

#### 2.5.1.1 LHAAP-08

LHAAP-08 is located in the northern area of LHAAP (**Figure 2-2**). The site is located in the Goose Prairie Creek drainage system, which drains approximately 30 percent of the installation. Historical information on physical site characteristics at LHAAP-08 is limited to information derived from *Final Remedial Investigation Report Addendum for the Group 4 Sites Remedial Investigation Report, Sites 04, 08, 67 and Hydrocarbon Study at the Longhorn Army Ammunition Plant, Karnack, Texas* (Jacobs, 2002b). Well boring logs indicate that the surface soil consists of interbedded silty fine-grained sand and clay to a depth of 20 feet below ground surface (bgs). Groundwater flows east to northeast across the site toward Harrison Bayou (Jacobs, 2002b) (**Figure 2-3**).

#### 2.5.1.2 LHAAP-48

LHAAP-48 is located in the east-central portion of LHAAP (**Figure 2-2**). The surface features at LHAAP-48 include asphalt-paved roads and parking areas around the buildings. The perimeter of LHAAP-48 is a mixture of heavily wooded areas and grasslands. The topography slopes gently to the southeast and surface runoff from the northern part of the site enters a drainage ditch leading to Central Creek to the south. Runoff from the southern portion of LHAAP-48 eventually enters Central Creek to the southeast, which drains to Caddo Lake. Groundwater flow at the site has a general south and southeast flow direction (**Figure 2-4**).

Boring logs indicate silty clay at the surface is underlain by clay at three of five well locations (LHSMW62, LHSMW63, and LHSMW66) to approximately 7 to 8 feet bgs. Below several feet of clay is silty clay with some silty sand to clayey sand layers that make up the shallow groundwater zone. The sand layers across the site appear to be discontinuous.

Five monitoring wells have been installed in the shallow subsurface at LHAAP-48. These range from 18 to 28 feet bgs. There are no wells completed in the intermediate or deep groundwater-bearing zones. Groundwater flow at the site is generally south and southeast flow direction toward Central Creek. A rising head slug test performed in well LHSMW65 indicated a hydraulic conductivity of 3.8E-05 cm/sec (Jacobs, 2002a).

In 2004, a survey to collect creek elevation data was conducted by Shaw. The survey data indicate that the shallow groundwater may potentially discharge into Central Creek (Shaw, 2007d).

#### *2.5.1.3 LHAAP-35C (53)*

LHAAP-35C (53) is located in the east-central portion of LHAAP (**Figure 2-2**). The surface features at LHAAP-35C (53) include a mixture of asphalt-paved roads and parking areas around the former structures in the area. Central Creek borders the site to the northwest and Harrison Bayou borders the site to the southeast. Surface drainage flows predominantly to the southeast. Groundwater flow at the site has a general northeast direction (**Figure 2-4**).

Well boring logs indicate that surface soils at the site consists of clays and silty clays to an approximate depth of 12 feet bgs. A 2- to 3-foot-thick continuous sand layer underlies the silty clay. The sand layer is the top of the shallow groundwater zone. Seven monitoring wells have been installed at LHAAP-35C (53); one intermediate well and 6 shallow wells. The boring log for the intermediate well indicates that the silty clay confining layer below the shallow saturated zone is not present at this location. Silty sand and clayey sand were present in this boring from below the surficial clay layer at 11 feet bgs and continues the full boring depth of 51 feet bgs.

Based on rising head slug tests performed in wells LHSMW68 and LHSMW71, hydraulic conductivity values ranged from 2.8E-04 cm/sec and 1.1E-03 cm/sec, respectively. Based on the LHAAP facility wide potentiometric surface map depicted in the RI report, groundwater flow within the shallow zone beneath the site is to the north (Jacobs, 2002a).

A survey was conducted by Shaw in 2004 to collect creek elevation data. The survey data indicated that the shallow groundwater will not discharge to Central Creek but may potentially discharge to Harrison Bayou (Shaw, 2007d).

#### 2.5.1.4 LHAAP-002-R)

LHAAP-002-R is co-located with LHAAP-35C (53) in the Static Test Area (**Figure 2-2**). The site characteristics are the same as that described in Section 2.5.1.3.

### 2.5.2 Nature and Extent of Contamination

As part of the Installation Restoration Program, the U.S. Army began an environmental investigation in 1976 at LHAAP followed by installation wide assessments/investigations that included the following:

- Record Search – In 1980, U.S. Army Toxic and Hazardous Material (USATHAMA, 1980) conducted a record search to assess the impact of the LHAAP installation activities including usage, storage, treatment, and disposal of toxic and hazardous materials on the environment, and define conditions that may have adversely affected human health and the environment.
- Contamination Survey – In 1982 as part of the LHAAP contamination survey, Environmental Protection Systems collected six groundwater samples for laboratory analyses. Subsequently in 1987, as part of the Resource Conservation and Recovery Act (RCRA) permit application process, and as a continuation of the contamination survey, U.S. Army Environmental Hygiene Agency (USAEHA) identified, described, and evaluated all solid waste management units at LHAAP (USAEHA, 1987). Units requiring further sampling, investigation, and corrective action were delineated.
- RCRA Facility Assessment (RFA) – In 1988, a preliminary RFA was conducted by the U.S. Army (Maley, 1988). Waste at the various sites was characterized but no samples were collected.

In addition to the installation-wide investigations, site-specific investigations were conducted to establish the nature and extent of contamination at LHAAP-08, LHAAP-48, LHAAP-35C (53), and LHAAP-002-R.

The waste sumps at LHAAP-48 and LHAAP-35C (53), including any potential release to groundwater, are being addressed through Site 35/36 in the *Final Site 35/36 Data Evaluation Report* (Shaw, 2008) and the supplemental memorandum to Site 35/36 Data Evaluation Report currently under preparation. Closure certificates for the waste process sumps were issued in April 1997, approved by the TCEQ, and can be found in the *Closure Report, Removal and Closure of Wastewater Sumps* (OHM Remediation Services Corp., 1997). Field investigation activities were conducted by Shaw in 2006 culminating in the *Final Addendum 7 Additional Investigation at LHAAP-35/36, Sumps and Waste Rack Sumps to Final Installation-Wide Work Plan* (Shaw, 2006b).

### 2.5.2.1 LHAAP-08

In December 2000, soil and groundwater samples were collected from LHAAP-08. Two groundwater monitoring wells were installed at 18 and 19 feet bgs. Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), explosive compounds, metals, perchlorate, dioxin/furan compounds, pesticides, and polychlorinated biphenyls (PCBs).

***Soil.*** No measurable concentrations of SVOCs, explosive compounds, pesticides, or PCBs were detected in any soil sample. One VOC, methylene chloride, was detected in one soil sample at a low concentration near its detection limit. Lead, mercury, and silver were detected with concentrations evenly distributed among the samples in soil, with the exception of one elevated silver concentration measured in soil located near the Dunbar filters, which processed waste from the X-ray film development laboratory. This concentration was confined to within 3 to 5 feet of the sampling location. Two dioxin compounds (octachlorodibenzo-p-dioxin and hexachlorodibenzo-p-dioxin) were detected at low concentrations in seven of the eight soil samples analyzed (Jacobs, 2002b).

Four soil samples were collected in June 2000 for perchlorate analysis only. One of the samples taken from the 1 to 2 foot interval contained detectable perchlorate at a concentration of 32 micrograms per kilogram (Jacobs, 2002b).

***Groundwater.*** No detectable concentrations of SVOCs, explosive compounds, pesticides, or PCBs were detected in the groundwater samples. Acetone, a common laboratory contaminant, was the only VOC with a detectable groundwater concentration. Fourteen metals were detected in groundwater samples at low concentrations. Eight dibenzodioxin or dibenzofuran compounds were detected at low levels, with octachlorodibenzo-p-dioxin the most widespread at a maximum concentration of 100 picograms per liter (pg/L) (Jacobs, 2002b).

During a January/February 2001 sampling event, two groundwater monitoring wells were sampled for perchlorate. Perchlorate was detected at a concentration of 10 μg/L in monitoring well 08WW02 (STEP, 2005a).

In 2005, additional groundwater sampling was conducted. Four dibenzodioxins and perchlorate were detected in groundwater at low levels. Metals were not detected during the 2005 sampling event.

### 2.5.2.2 LHAAP-48

Previous investigations were conducted by Jacobs and others from 1982 through 2000 (Jacobs, 2002a) culminating in the Final Baseline Human Health and Screening Ecological Risk

Assessment (Jacobs, 2003). Between 1991 and 2005, soil and groundwater were sampled using a phased approach to determine the nature and extent of contamination.

***Soil.*** Soil samples were analyzed for some or all of the following chemicals during various phases of investigation: VOCs, SVOCs, metals, explosive compounds, pesticides, PCBs, dioxins/furans, and perchlorate.

Soil samples were collected at several locations and depths including the areas surrounding the sumps. Detected compounds in soil included VOCs, SVOCs, metals, PCBs, pesticides, and dioxins/furans. A human health risk assessment (HHRA) conducted in 2003 indicated no unacceptable cancer risk or non-cancer hazard to a future maintenance worker or trespasser from the detected compounds in the soil (Jacobs, 2003).

***Groundwater.*** Six monitoring wells were installed at the site for the purposes of collecting groundwater data. Five wells with stainless steel screens were installed in 1994 in the shallow groundwater-bearing zone. One well was installed in 2004 in the intermediate zone with a polyvinyl chloride (PVC) screen. Groundwater samples were collected from 1994 to 2005 and analyzed for some or all of the following parameters during the various sampling events: VOCs, SVOCs, metals, explosive compounds, pesticides, PCBs, dioxins/furans, and perchlorate.

Thallium and dioxins were detected in the early sampling rounds. Other metals, including arsenic, antimony, chromium, and lead were also detected in groundwater in the initial sampling round above their associated maximum contaminant level (MCL) (Jacobs, 2003).

Prior to 2003, groundwater samples were collected using sampling methods that could agitate the water and cause particulates (solids) to be suspended in the water. If a water sample contained particulates (high turbidity), then the result would reflect the total concentration of the compound from both the water and the particulate matter. Turbid samples can indicate an elevated concentration of a compound that is not representative of the actual concentration in the groundwater. To get a more accurate representation of a compound’s concentration in groundwater, turbid samples may be filtered to reduce the suspended particulates.

In 2004, as part of a data gaps investigation, additional groundwater samples were collected using a low-flow sampling method to reduce the turbidity in samples (Shaw, 2007a). Samples were collected from two shallow zone wells and one intermediate zone well and analyzed for thallium, dioxin/furans, and perchlorate. In 2005, additional groundwater samples were collected and analyzed for VOCs, metals, dioxins/furans, and perchlorate (Shaw, 2007b).

Metals detected above their MCL prior to 2004 were not detected or were detected at levels below their associated MCL in subsequent sampling events in both filtered and unfiltered samples collected with the low-flow sampling method, with the exception of chromium (Shaw, 2007a, 2007b).

In 2004, chromium was detected in two shallow zone wells (LHSMW62 and LHSMW63) in unfiltered samples at concentrations that exceeded the MCL of 100 micrograms per liter (µg/L) (Shaw, 2007b). Corrosion of the stainless steel well screens and particulates in the water were suspected to have caused these readings to be elevated. In May 2005, an additional sampling event was conducted to collect and analyze filtered and unfiltered samples to determine the influence of particulates (turbidity) on the sample results. After the samples were filtered, the chromium levels were reduced (e.g., from 2,510 µg/L to 60.7 µg/L in LHSMW63 and from 715 µg/L to 379 µg/L in LHSMW62) (Shaw, 2007b). The detection of chromium exceeding the MCL in only one shallow well (LHSMW62) for the filtered samples was thought to be related to very fine suspended sediments with the origin of chromium being from corrosion of stainless steel well screens.

In September 2006, a new PVC-screened well (48WW02) was installed near LHSMW62 to confirm that elevated chromium detections were related to stainless steel coatings and not to a CERCLA- release. Chromium concentrations in the groundwater from the new PVC well were below the MCL, which indicates that corroded stainless steel well screen materials were the source of the elevated chromium results (Shaw, 2007b). The wells with corroded well screens will be properly plugged and abandoned in accordance with 16 Texas Administrative Code Chapter 76 and Texas Occupations Code 1901.255.

SVOCs, explosive compounds, pesticides, or PCBs were not detected or were detected at low levels in the groundwater samples in all sampling rounds.

The only detected VOC to exceed the MCL was trichloroethene (TCE) in a 1996 sampling round with a concentration of 9 µg/L, which exceeds the MCL for TCE of 5 µg/L. However, TCE has not been detected since 1998.

Dioxin/furan compounds were detected in all the sampling rounds. Dioxin/furans are a family of compounds comprising individual compounds called congeners. To evaluate dioxins, a 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) toxicity equivalence quotient (TEQ) concentration was calculated using toxicity equivalence factors (TEFs) for the individual congeners (Van den Berg, et al., 1998). (See Glossary of Terms for further explanation.) The 2,3,7,8-TCDD TEQ was compared to the MCL for 2,3,7,8-TCDD of 30 pg/L. The calculated 2,3,7,8-TCDD TEQ based on all sampling data was below the MCL (Shaw, 2007b).

#### *2.5.2.3 LHAAP-35C (53)*

Previous investigations were conducted by Jacobs and others from 1982 through 2000 (Jacobs, 2002a, 2002b) culminating in the Final Baseline Human Health and Screening Ecological Risk Assessment (Jacobs, 2003). A series of investigations between 1991 and 2005 were performed at the site to determine the nature and extent of soil and groundwater contamination. Soil and groundwater were sampled in a phased manner between 1982 and 2005 to determine the nature and extent of contamination.

***Soil.*** Soil samples were analyzed for some or all of the following during the various phases of investigation: VOCs, SVOCs, metals, explosive compounds, pesticides, PCBs, and dioxins/furans. Detected compounds in soil included VOCs, SVOCs, metals, pesticides, and dioxins/furans. An HHRA conducted in 2003 indicated no unacceptable cancer risk or non-cancer hazard to a future maintenance worker from the detected compounds in the soil (Jacobs, 2003).

***Groundwater.*** Six monitoring wells were installed at the site to collect groundwater data. One well was installed in 1982 in the shallow groundwater bearing zone. In 1994, five wells were installed with one in the intermediate zone and four in the shallow zone (Jacobs, 2002a). The wells were completed with stainless steel screens. Seven temporary wells constructed of PVC materials were installed in 2003 in the shallow zone (Plexus, 2005b). Groundwater samples were collected from 1982 to 2005 and analyzed for some or all of the following during the various sampling events: VOCs, SVOCs, metals, explosive compounds, pesticides, PCBs, dioxins/furans, total petroleum hydrocarbons, cyanide, and perchlorate.

Detected compounds in the water included metals, VOCs, SVOCs, dioxins/furans, and explosives. Several metals including thallium, silver, nickel, aluminum, arsenic, lead, antimony, and chromium were detected above their associated MCL.

Sampling methods used prior to 2003 could cause turbid samples. In 2003/2004, temporary PVC wells were installed to determine if there was a potential source of chromium contamination at the site (Plexus, 2005b). Because many of the groundwater samples had high turbidity readings, they were filtered prior to analysis. Chromium was not detected in these samples (Plexus, 2005b).

In 2004 and 2005, additional groundwater samples were collected using a low-flow sampling method that reduces the turbidity in samples (Shaw, 2007a, 2007b). These samples were collected from five shallow wells and one intermediate well and analyzed for VOCs, metals, dioxin/furans, and perchlorate. Groundwater samples were also collected in 2005 from three of the temporary wells and were analyzed for VOCs and metals to determine if chromium and VOCs were pervasive at the site (Shaw, 2007b).

The 2004/2005 sampling using low-flow methods did not detect thallium above its MCL in filtered or unfiltered samples (Shaw, 2007a, 2007b; Plexus, 2005b). Chromium was only detected once in an unfiltered sample at a concentration of 171 µg/L. After filtering the sample, chromium had an estimated (J qualified) concentration of 3.37J µg/L, which is well below the MCL of 100 µg/L (Shaw, 2007b). This indicates that the elevated chromium concentration in the unfiltered sample was due to the turbidity of the sample. The suspended solids in the water were likely to have originated from the corrosion of stainless steel well materials indicated by the elevated concentrations of other metals associated with stainless steel, such as nickel (Shaw, 2007b). Additional evidence that chromium is not a site-related chemical at the site was provided by Jacobs (2002a) and Plexus (2005b). These studies indicate that a source of chromium is not present in the site soils.

Detection of metals in groundwater samples appears to be sporadic or marginally exceeding MCLs due to high turbidity concentrations in groundwater samples. It is not representative of the groundwater in the surrounding soil. Metals in the groundwater do not pose a current threat to human health (Shaw, 2007b).

SVOCs, explosive compounds, pesticides, perchlorate, or PCBs were not detected or were detected at low levels in the groundwater samples in all sampling rounds.

VOCs, including TCE,1,2-dichloroethane, and bis(2-ethylhexyl)phthalate were detected in groundwater in the early sampling rounds prior to 1998 at concentrations above their MCLs. A few VOCs were detected at low concentrations below MCLs in the temporary wells installed and sampled in 2003/2004 (Plexus, 2005b). Thus sampling to verify the presence of contaminants above MCLs did not confirm earlier detections (Plexus, 2005b). In later sampling rounds, VOCs were not detected or were detected at levels below their MCLs (Shaw, 2007a, 2007b) with the exception of TCE in one temporary well where TCE was detected at 5.01 µg/L, marginally above the MCL of 5 µg/L (Shaw, 2007b).

Dioxin/furan compounds were detected in all the sampling rounds. The calculated 2,3,7,8-TCDD TEQ based on all sampling data was below the MCL of 30 pg/L (Shaw, 2007b).

#### *2.5.2.4 LHAAP-002-R*

Previous investigations related to the MMRP were conducted from 2002 through 2007. As a result of the records review for the U.S. Army Closed, Transferring, and Transferred (CTT) Range/Site Inventory in 2002, the Static Test Area was identified as an MRS and designated LHAAP-002-R. An SI Report ($e^2$M, 2005) recommended additional investigation for MEC items based on the presence of an expended flare casing in the vicinity of Building 35-T noted during the site visit **(Figure 2-5)**. In addition, the analysis of aerial photographs revealed scarred and stained areas near Buildings 35-T, 36-T, and 39-T that indicated the possibility of burial or burn areas in the vicinity of the buildings which had been used for ordnance manufacturing and storage. It was also noted that although sampling for explosives, metals, and perchlorate in soil and groundwater had taken place throughout the Static Test Area as part of the IRP investigations, the scarred and stained areas had not been sampled for the MC including white phosphorus (WP).

In 2006, an EE/CA (Cape, 2007) was initiated to address the findings of the SI. Four stained and scarred areas were gridded into lanes 1.5 meters wide and investigated geophysically for the presence of MEC. Magnetometers and EM61s were used to achieve 100 percent coverage of the four areas.

To assess risk to human health as a result of the presence of MC, soil samples were collected from a depth of 0 to 6 inches below ground surface within Suspect Area #1 and Scarred Area #1 (**Figure 2-5**). The samples were analyzed for explosives and WP.

## *2.6 Current and Potential Future Site and Resource Uses*

### *2.6.1 Current and Future Land Uses*

LHAAP is located near the unincorporated community of Karnack, Texas. Karnack is a rural community with a population of 775 people. The incorporated community of Uncertain, Texas, population 205, is located to the northeast of LHAAP on the edge of Caddo Lake and is a resort area and an access point to Caddo Lake. The industries in the surrounding area consist of agriculture, timber, oil and natural gas production, and recreation.

LHAAP has been an industrial facility since 1942. Production activities and associated waste management activities continued until the facility was determined to be in excess of the Army's needs in 1997. The plant area has been relatively dormant since that time. LHAAP is surrounded by a fence (except on the border with Caddo Lake), and current security measures at LHAAP preclude unlimited public access to the areas within the fence. The fence now represents the Refuge boundary. Approved access for hunters is very limited.

The reasonably anticipated future use of LHAAP-08, LHAAP-48, LHAAP-35C (53), and LHAAP-002-R is as a national wildlife refuge. This anticipated future use is based on a Memorandum of Agreement (MOA) (U.S. Army, 2004) between the USFWS and the U.S. Army. That MOA documents the transfer process of the LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the 8,416-acre former installation. A change in use from a wildlife refuge requires an act of Congress.

### *2.6.2 Current and Future Surface Water Uses*

Streams on LHAAP currently support wildlife and aquatic life. While humans may have limited access to some streams during annual hunts, there is no routine human use of streams on LHAAP. The streams do not carry adequate numbers and size of fish to support either sport or subsistence fishing. During the summer months, the streams cease flowing and/or dry up. The streams discharge into Caddo Lake. Caddo Lake is a large recreational area that covers 51 square miles and has a mean depth of 6 feet. The watershed of the lake encompasses approximately 2,700 square miles. It is used extensively for fishing and boating. Caddo Lake is a drinking water supply for multiple cities in Louisiana including Vivian, Oil City, Mooringsport, South Shore, Blanchard, Shreveport, and Bossier City.

The anticipated future uses of the streams and lake are the same as the current uses.

### *2.6.3 Current and Future Groundwater Uses*

Groundwater in the deep aquifer (250-430 feet bgs) near LHAAP is currently used as a drinking water source. There are currently five active water supply wells near LHAAP. One well is located in and owned by Caddo Lake State Park. The well is completed to a depth of 315 feet and has been in use since 1935. A second well owned by the Karnack Water Supply Corporation services the town of Karnack and is located approximately 2 miles southeast of town. This well is approximately 430 feet deep and has been in use since 1942. The Caddo Lake Water Supply Corporation has three wells located both north and northwest of LHAAP. These wells are identified as Caddo Lake Water Supply Corporation Wells 1, 2, and 3 and are all hydraulically upgradient of LHAAP. Because of the large distance between these wells and LHAAP, water removal from these wells is not expected to affect groundwater flow at the site. In addition, there are several livestock and domestic wells located in the vicinity of LHAAP with depths averaging approximately 250 feet.

Three water supply wells are located within the boundary of LHAAP itself. One well is located at the Fire Station/Security Office approximately 0.8 miles northwest of LHAAP-08, 1.45 miles west of LHAAP-48, and 1.6 miles northwest of LHAAP-35C (53) and LHAAP-002-R. The second well is located approximately 0.35 miles southwest of the Fire Station/Security Office and 0.96 miles west of LHAAP-08, 1.7 miles west of LHAAP-48, and 1.8 miles west of LHAAP-35C (53) and LHAAP-002-R. The third well is located north of the administration building, near the entrance to LHAAP approximately 1.8 miles west-southwest of LHAAP-08, and 2.5 miles west-southwest of LHAAP-48 and LHAAP-35C (53). Two additional wells previously supplied water to the installation, but these have been plugged and abandoned. Although all three provide water at the tap, none are used for drinking water. None of the water supply wells is associated with the four sites addressed by this Decision Document.

Based on the anticipated future use of the facility (i.e., a wildlife refuge), the groundwater at the four sites will not be used in the future as a drinking water source. Although groundwater will not be used in the future as a drinking water source based on the anticipated future land use, the State of Texas views all groundwater as potential sources of drinking water. In accordance, the groundwater was conservatively evaluated against the criteria set forth for human ingestion in an industrial land use scenario.

## *2.7 Summary of Site Risks*

This section contains the results of the baseline human health and ecological risk assessments conducted for LHAAP-08, LHAAP-48 and LHAAP-35C (53). This section also contains the results of the risk evaluation for LHAAP-002-R addressing MC and MEC risk to human health and safety.

### *2.7.1 Summary of Site Risk for LHAAP-08, LHAAP-48 and LHAAP-35C (53)*

Baseline human health and ecological risk assessments were conducted for LHAAP-08, LHAAP-48 and LHAAP-35C (53) (Jacobs, 2003; Shaw, 2007c). The risk assessments consist of an HHRA and a screening ecological risk assessment performed by (Jacobs, 2003) as well as an installation-wide BERA performed by Shaw (Shaw, 2007c). Risks were assessed for human receptors according to residential land use assumptions. This risk assessment addresses what risks the site presents if no action is taken (Jacobs, 2003; Shaw, 2007b).

The NCP, 40 Code of Federal Regulations Part 300, established a range of acceptable levels of cancer risk for Superfund sites. These values range between a higher risk of one in 10,000 and a lower risk of one in 1 million additional cancer cases if cleanup action is not taken at a site. Expressed in scientific notation, this translates to an acceptable risk range of $1 \times 10^{-4}$ to $1 \times 10^{-6}$ over a defined period of exposure to site-related contaminants.

In addition to a cancer risk, chemical contaminants that are ingested, inhaled, or dermally absorbed may present non-cancer hazards to different organs of the human body. The non-cancer hazard or toxic effect is expressed as a hazard index (HI). USEPA considers an HI exceeding 1.0 to be an unacceptable non-cancer hazard. The risks estimated in the Jacobs (2003) and Shaw (2007b) assessments reflect the total cumulative exposure to chemicals of concern.

The screening ecological risk assessments for LHAAP are provided in the Final Baseline Human Health and Screening Ecological Risk Assessment (Jacobs, 2003).

The ecological risk for sites LHAAP-08, LHAAP-48 and LHAAP-35C (53) was addressed in the installation-wide BERA (Shaw, 2007c) and is noted in the subsections below. The BERA concluded that no unacceptable risk was present in the Industrial Sub-Area (Shaw, 2007c), the area in which all four sites are located. Therefore, no action is needed at LHAAP-08, LHAAP-48 and LHAAP-35C (53) for the protection of ecological receptors.

#### *2.7.1.1 LHAAP-08*

##### *2.7.1.1.1 Human Health Risks*

The baseline HHRA was conducted for LHAAP-08 to determine current and future effects of contaminants on human health and to support technical review and risk management decisions (Jacobs, 2003). During the risk assessment, cancer risk and the non-cancer HI were calculated for a current trespasser scenario and a future industrial maintenance worker scenario. In these scenarios, exposure to the site environmental media was evaluated (e.g., soil and groundwater) (Jacobs, 2003). The baseline HHRA calculated the HI for exposure to soil to be 0.005 for the current trespasser, and 0.24 for the future maintenance worker. The cancer risk for soil was $1.4 \times 10^{-8}$ and $1.7 \times 10^{-7}$ for the trespasser and maintenance worker, respectively. Both the HI and cancer risk are acceptable for exposure to chemicals in soil by current trespassers and future maintenance workers.

Both the non-cancer HI and cancer risk were acceptable for groundwater. The HI estimated for future maintenance worker exposure to groundwater by drinking or showering was 0.21 and the cancer risk was $7.3 \times 10^{-5}$. All risk above $1 \times 10^{-6}$ is due to dioxin and furan congeners, which are reported as an equivalent (TCDD) concentration (Jacobs, 2003). Although risk is within the acceptable $1 \times 10^{-6}$ to $1 \times 10^{-4}$ range, the estimate was considered elevated due to the use of undetected dioxin congener concentrations in the calculations. All congeners analyzed were reported either as not detected or as estimated values having concentrations above their detection limit but below the reporting limit (J-qualified) values.

Risk assessment calculations for dioxin/furan congeners involve the TEFs provided in TCEQ guidance, which are used to convert the detected congeners to a relative 2,3,7,8-TCDD concentration, termed the 2,3,7,8-TCDD TEQ concentration.

The calculations used in the Jacobs (2003) risk assessment were repeated using only the J-qualified congener concentrations (Shaw, 2006a). The resulting 2,3,7,8-TCDD TEQ concentration was 0.01 nanograms per liter (ng/L), which is below the MCL for 2,3,7,8-TCDD TEQ of 0.03 ng/L.

The assessment of risk to current trespassers and future industrial maintenance workers from exposure to chemicals in soil and groundwater at LHAAP-08 indicated that potential human health risks are within the acceptable range established by the USEPA. Therefore, no action is necessary at LHAAP-08.

Limited monitoring in the form of Letters of Certification is required for LHAAP-08 because the risk evaluation, which was based on the reasonably anticipated future use as a wildlife refuge, does not address unrestricted use. The Letters of Certification will serve to document that the use of the site continues to be consistent with the industrial/recreational exposure scenario evaluated in the risk assessment. Also, in accordance with Texas Administrative Code §335.566, a notification will be recorded in Harrison County records stating that only the industrial use scenario was evaluated.

##### *2.7.1.1.2 Ecological Risks*

The ecological risk for site LHAAP-08 was addressed in the installation-wide BERA (Shaw, 2007c). For the BERA, the entire Installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historical use, habitat type, and spatial proximity to each other. The conclusions regarding the potential for chemicals detected at individual sites to adversely affect the environment must be made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-08 lies within the Industrial Sub-Area.

The BERA concluded that no unacceptable risk was present in the Industrial Sub-Area (Shaw, 2007c) and therefore, no action is needed at LHAAP-08 for the protection of ecological receptors.

#### *2.7.1.2 LHAAP-48 and LHAAP-35C (53)*

##### *2.7.1.2.1 Human Health Risks*

An HHRA is based on a conservative estimate of the potential cancer risk or non-cancer hazard from potential exposure. The following three factors were considered in the evaluation:

- Nature and extent of contamination at LHAAP-48 and LHAAP-35C (53)
- Exposure pathways through which human receptors are or may be exposed to those contaminants at the site
- Potential toxic effects of those contaminants

The assessment of potential risks to current trespassers and future maintenance workers at LHAAP-48 and LHAAP-35C (53) and ecological receptors have been previously reported (Jacobs, 2003). During the risk assessment conducted by Jacobs, the cancer risk and the non-cancer HI were calculated for a future industrial worker scenario. For LHAAP-48, the baseline HHRA for a future industrial worker indicated acceptable cancer risk and non-cancer hazard from the soil within 0-2 feet bgs. The calculated risk was within the acceptable range at $1.4 \times 10^{-5}$ and the HI of 0.088 was less than 1 (Jacobs, 2003). For LHAAP-35C (53), the baseline HHRA for a future industrial worker indicated acceptable cancer risk and non-cancer hazard from soil. The calculated risk for an industrial worker was within the acceptable range at $1.2 \times 10^{-5}$ and the non-cancer HI was 0.053 (Jacobs, 2003).Shaw conducted the baseline HHRA for residential uses of LHAAP-48 and LHAAP-35C (53) using recently collected groundwater sampling data (Shaw, 2007b) to supplement the information presented in the industrial baseline HHRA (Jacobs, 2003) and provide risk managers information about whether the site can be released for unrestricted use. The residential baseline HHRA largely used the same methods employed for the industrial baseline HHRA so that the two risk assessments are consistent. Some adjustments in the methods used for the industrial baseline HHRA were made, as appropriate, to present a residential assessment that is consistent with other risk assessments being conducted for LHAAP sites and with current regulatory guidance. The assessment of potential risks to residents at LHAAP-48 and LHAAP-35C (53) was based on TCEQ Risk Reduction Rules (TCEQ, 1998 and 2004b) and USEPA guidance (1989).

The elements of the residential baseline HHRA summarized below included data evaluation in which chemicals of potential concern (COPCs) were identified by comparison of results to LHAAP background concentrations and risk-based screening criteria; exposure assessment, which describes land use assumptions, plausible human exposure scenarios and receptors, and quantitative estimates of their potential exposure; toxicity evaluation, that briefly describes the adverse health effects associated with each COPC and provides references for further details; risk characterization, that qualitatively describes cancer risk and non-cancer hazard to human receptors; and uncertainty analysis, which describes the uncertainties associated with the components of the risk assessment and their impact on the conclusions and future decisions regarding the site. A detailed account of the residential baseline HHRA process for LHAAP-49 and LHAAP-35C (53) is included in Appendix C and Appendix D, respectively, of the *Final Site Evaluation Report, LHAAP-48 (Former Igniter Production Area) and LHAAP-35C (53) (Former Static Test Area), Longhorn Army Ammunition Plant, Karnack, Texas* (Shaw, 2007b).

The baseline residential risk assessments for LHAAP-48 and LHAAP-35C (53) (Appendix C and D of Shaw, 2007b, respectively) indicate that cancer risk and non-cancer hazard posed by the soil to a hypothetical resident are within the acceptable range established by the USEPA (1994), and no action is necessary for soil at LHAAP-48 and LHAAP-35C (53).

The industrial risk assessment (Jacobs, 2003) for a future maintenance worker however, showed unacceptable risk and hazard at LHAAP-48 due to elevated concentrations of thallium and dioxins in the groundwater. Additional groundwater sampling conducted at LHAAP-48 in May 2005 indicated that elevated concentrations of dioxins/furans and metals were due to the high turbidity of the groundwater samples. For example, the maximum chromium concentration of 2,510 µg/L was observed in the unfiltered groundwater sample collected from LHSMW63 but was not detected in the filtered sample. Although the chromium concentration observed in

LHSMW62 had a concentration of 715 µg/L in the unfiltered sample, the filtered sample indicated an almost two-fold reduction in concentration (379 µg/L), indicative of turbidity and the possible attachment of chromium to particulates within the sample. The chromium detected in groundwater at these wells was shown to be associated with stainless steel construction material, and was likely the result of corrosion of the stainless steel screen. VOCs such as tetrachloroethene and TCE that were detected at very low levels (Jacobs, 2003) either were not detected or were detected at very low concentrations below MCLs. Perchlorate was not detected in any of the samples.

At LHAAP-35C (53), unacceptable non-cancer hazard was caused by thallium. During the 2005 sampling performed by Shaw, thallium was detected at concentrations below the MCL. Other metals such as arsenic, lead, and chromium were detected above MCLs in the unfiltered sample; however, in most cases the concentrations were below the detection limits or MCLs in the filtered samples, or marginally exceeded the MCLs, indicating association of these metals with particulates. Perchlorate was not detected in any of the samples, and VOCs that were detected at low concentrations in previous sampling rounds either were not detected or were detected at very low levels below the MCLs (Shaw, 2007b). Because thallium and dioxin/furans in all of the samples were below MCL, an evaluation of risk was not conducted.

##### *2.7.1.2.2 Ecological Risks*

The ecological risks for site LHAAP-48 and LHAAP-35C (53) were addressed in the installation-wide BERA (Shaw, 2007c). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historical use, habitat type, and spatial proximity to each other. The conclusions regarding the potential for chemicals detected at individual sites to adversely affect the environment must be made in the context of the overall conclusions of the sub-area in which the site falls. Sites LHAAP-48 and -35C (53) lie within the Industrial Sub-Area.

The BERA concluded that no unacceptable risk was present in the Industrial Sub-Area (Shaw, 2007c). Therefore, no action is needed at LHAAP-48 and LHAAP-35C (53) for the protection of ecological receptors.

### *2.7.2 Summary of Site Risk for LHAAP-002-R*

The risk evaluation for LHAAP-002-R addressed risks to human health related to the presence of MC at levels that might present an unacceptable exposure risk. The evaluation also addressed risks to human safety related to the presence of MEC that might present an explosive hazard.

Four areas of concern identified on aerial photographs were investigated by geophysical methods to detect the presence of MEC. Additionally, two surface soil samples representative of the areas of concern were collected and analyzed for MC.

#### *2.7.2.1 MEC Risk to Human Safety*

The basic risk factors associated with MEC items at a site are categorized into three classes: MEC factors, site characteristics factors, and human factors. MEC factors are related to the type of MEC, the sensitivity, the quantity (density), and the depth. Site characteristic factors include the accessibility and stability of areas where MEC items are located. Human factors are related to the population density and population activities.

No MEC items were identified or recovered in the four areas of concern at LHAAP-002-R during the EE/CA investigation. Accordingly, the MEC density, ordnance-type hazard, and sensitivity factors are all assigned a value of 0. Therefore, there is no MEC risk identified for the site.

#### *2.7.2.2 MC Risk to Human Health*

The MC risk to human health at LHAAP-002-R refers to the risk to human health from exposure to WP and explosives in soil and groundwater. The analytical results were screened against State of Texas Risk Reduction Rule (TRRR) standards, the lower of Groundwater Protection-Residential and Soil Absorption Inhalation-Residential numbers. No WP was identified at detectable concentrations in either of the two samples collected. All MC, except 2,4-DNT and 2,6-DNT, were identified at concentration levels below the TRRR standards in both samples. Although neither of the two explosives, 2-4-DNT and 2,6-DNT, were detected in the samples, it is noted that the method detection limit was above the screening value.

## *2.8 Documentation of Significant Changes*

The Proposed Plans for LHAAP-08, LHAAP-48 and LHAAP-35C (53) were released for public comment in January 2008 and the EE/CA for LHAAP-002-R was released for public review in August 2007. The Proposed Plans and the EE/CA document the decisions of No Action Necessary for each site. No significant changes have been made to the Proposed Plans and EE/CA for the sites. No written or verbal comments were received during the public comment period. It was determined that no significant changes to the decisions, as originally identified in the Proposed Plans and EE/CA, were necessary or appropriate.

# 3.0 Responsiveness Summary

No comments were received from the regulatory agencies or the general public during the public comment period and Proposed Plan meeting in January 2008 for LHAAP-08, LHAAP-48 and LHAAP-35C (53). The Proposed Plans were finalized without revision. No comments were received from the regulatory agencies or the general public during the public comment period for the LHAAP-002-R EE/CA in August and September 2007. **Appendix A** contains the public announcement for the Proposed Plan meeting and public comment period and the public announcement for the EE/CA public comment period.

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# Glossary of Terms

**Administrative Record File –** The body of reports, official correspondence, and other documents that establish the official record of the analysis, clean up, and final closure of a site.

**ARARs –** Applicable or relevant and appropriate requirements. Refers to the federal and state requirements that a selected remedy (a no action decision) will attain.

**Background Levels –** Naturally-occurring concentrations of inorganic elements (metals) that are present in the environment and have not been altered by human activity.

**Characterization –** The compilation of all available data about the waste unit to determine the rate and extent of contaminant migration resulting from the waste site, and the concentration of any contaminants that may be present.

**Chemicals of Concern (COC) –** Those chemicals that significantly contribute to a pathway in an exposure model of a hypothetical receptor (e.g., a child that resides on a site). They exceed either the calculated numerical limit for cumulative site cancer risk (1 in 10,000 exposed individuals) or the calculated numerical limit of 1 for non-cancer effects, a value proposed by the USEPA.

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) –** CERCLA was enacted by Congress in 1980 and was amended by the Superfund Amendments and Reauthorization Act in 1986. CERCLA provides federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites and established the Superfund Trust Fund.

**Exposure –** Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut) and available for absorption.

**Federal Facility Agreement –** A legal binding agreement among USEPA, TCEQ, and U.S. Army that sets the standards and schedules for the comprehensive remediation of Longhorn Army Ammunition Plant.

**Groundwater –** Underground water that fills pores in soil or openings in rocks to the point of saturation.

**Human Health Risk Assessment –** A study conducted as part of a remedial investigation to determine the risk posed to human health by site-related chemicals.

**Munitions and Explosives of Concern -** This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: (A) Unexploded Ordnance (UXO), as defined in 10 U.S.C. 2710 (e) (9); (B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710 (e) (2); or (C) Explosive munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.

**Munitions Constituents -** Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

**National Priorities List (NPL) –** The USEPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. USEPA is required to update the NPL at least once a year. A site must be on the NPL to receive money from the Trust Fund for remedial action.

**Organic Compounds –** Carbon compounds such as solvents, oils, and pesticides. Most are not readily dissolved in water.

**Remedial Investigation –** A study designed to gather data needed to determine the nature and extent of contamination at a Superfund site.

**Resource Conservation and Recovery Act (RCRA) –** Gives USEPA the authority to control the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA focuses only on active and future facilities and does not address abandoned or historical sites.

**Responsiveness Summary –** A summary of oral and/or written comments received during the proposed plan comment period and includes responses to these comments. The responsiveness summary is a key part of a decision document highlighting community concerns.

**Screening-Level Ecological Risk Assessment –** The initial phase of a baseline ecological risk assessment in which conservative concentrations of site chemicals are quantitatively compared to chemical- and media-specific generic effect levels. Those chemicals selected as chemicals of potential ecological concern are further refined through quantitative comparison to chemical- and species-specific effect doses, as well as qualitative examination. Those chemicals identified as chemicals of concern may be investigated further, remediated, or left in place per the decision of the risk managers.

**Proposed Plan –** A plan for a site cleanup that proposes a recommended or preferred remedial alternative. The Proposed Plan is available to the public for review and comment and the preferred alternative may change based on public and other stakeholder input.

**Superfund Amendments and Reauthorization Act (SARA) –** Amended CERCLA in 1986. SARA resulted in more emphasis on permanent remedies for cleaning up hazardous waste sites, increased the focus on human health problems posed by hazardous waste sites, and encouraged greater citizen participation in making decisions on how sites should be cleaned up.

**Surface Media –** The soil (surface or subsurface), surface water, and sediment present at a site as applicable. The source material in the surface media could contribute to groundwater contamination.

**Superfund –** The common name used for CERCLA; also referred to as the Trust Fund. The Superfund Program was established to help fund cleanup of hazardous waste sites. It also allows legal action to force those responsible for sites to clean them up.

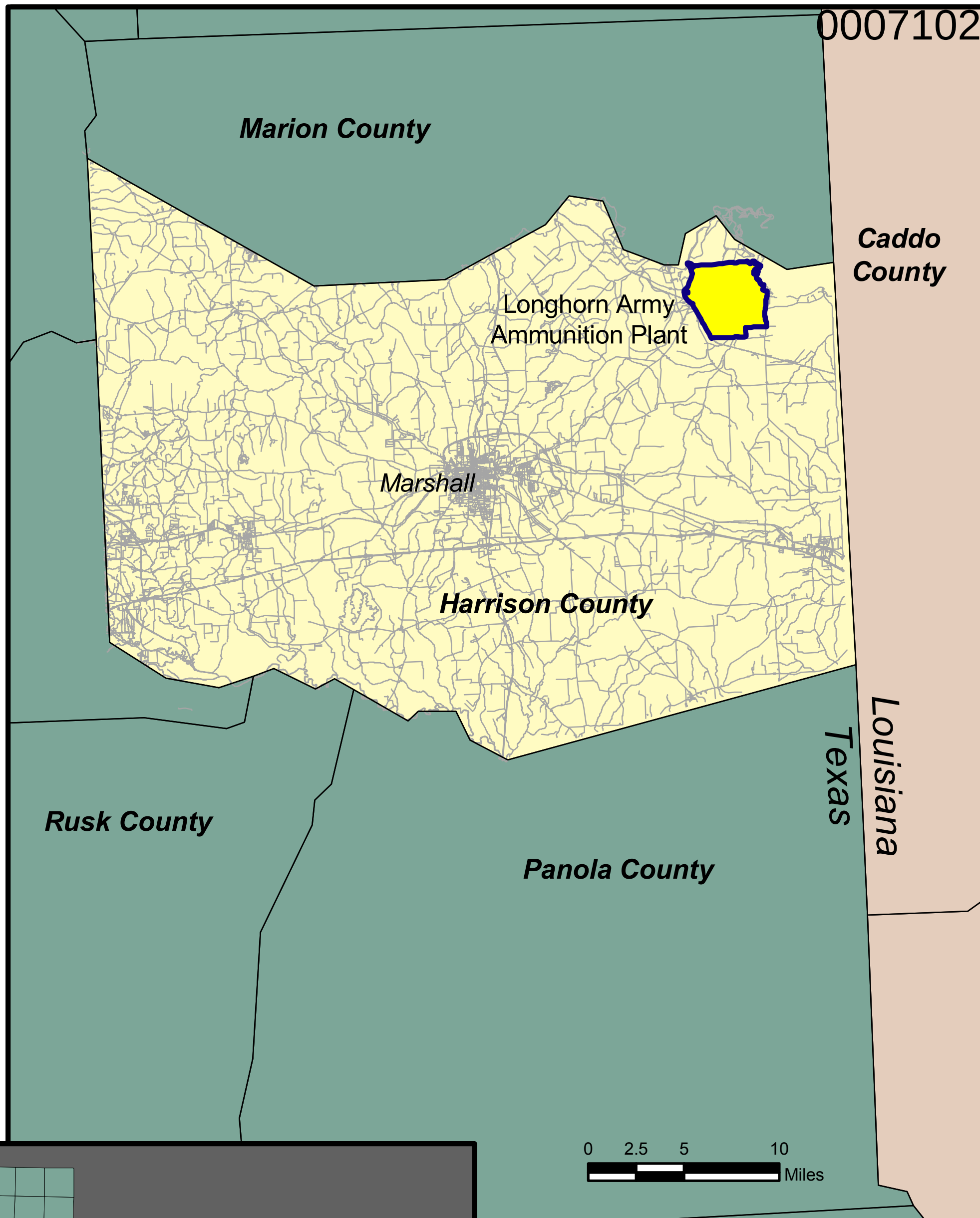
**Toxicity Equivalent Factor (TEF) –** The toxicity equivalent factor is the factor used with the individual dioxin family members that represents its toxicity potency, with the most potent having a factor of 1 and the least toxic members have the lowest factors (Van den Berg et al., 1998). The TEFs are used along with the concentrations of the individual dioxin family members to calculate the TEQ.

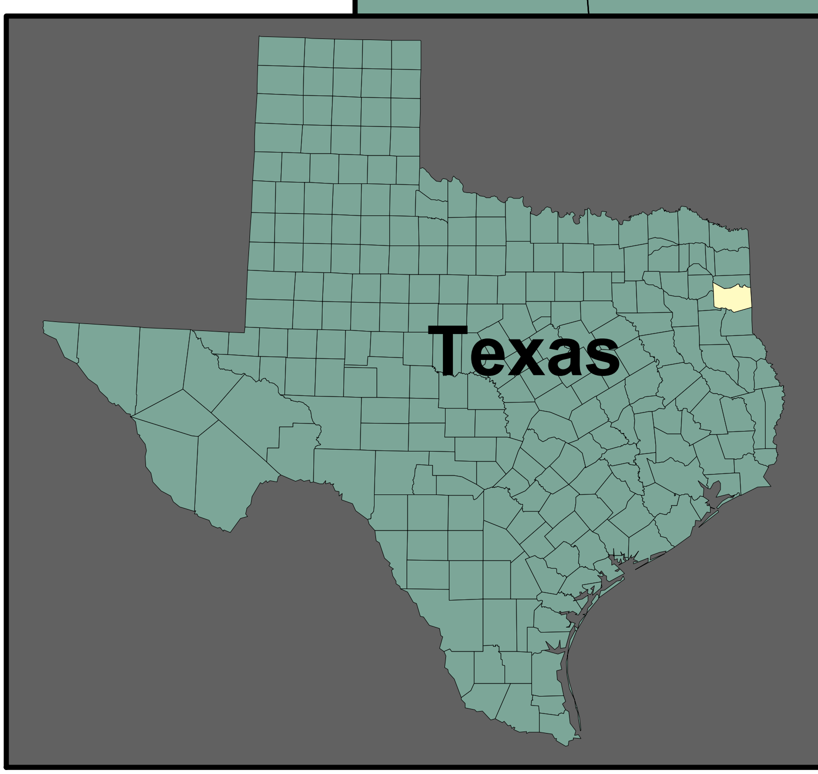
**Toxicity Equivalent Quotient (TEQ) –** A value that is the sum of the products of the individual family (e.g., furans) member compound concentrations multiplied by their TEFs. The product's sum represents the toxicity of an equivalent concentration of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)**.**

**Trichloroethene (TCE) –** TCE is a colorless or blue liquid with an odor similar to ether. It is man made and does not occur naturally in the environment. TCE was once commonly used to remove oils and grease from metal parts and is used in the dry cleaning industry.

# *Figures*

00071024

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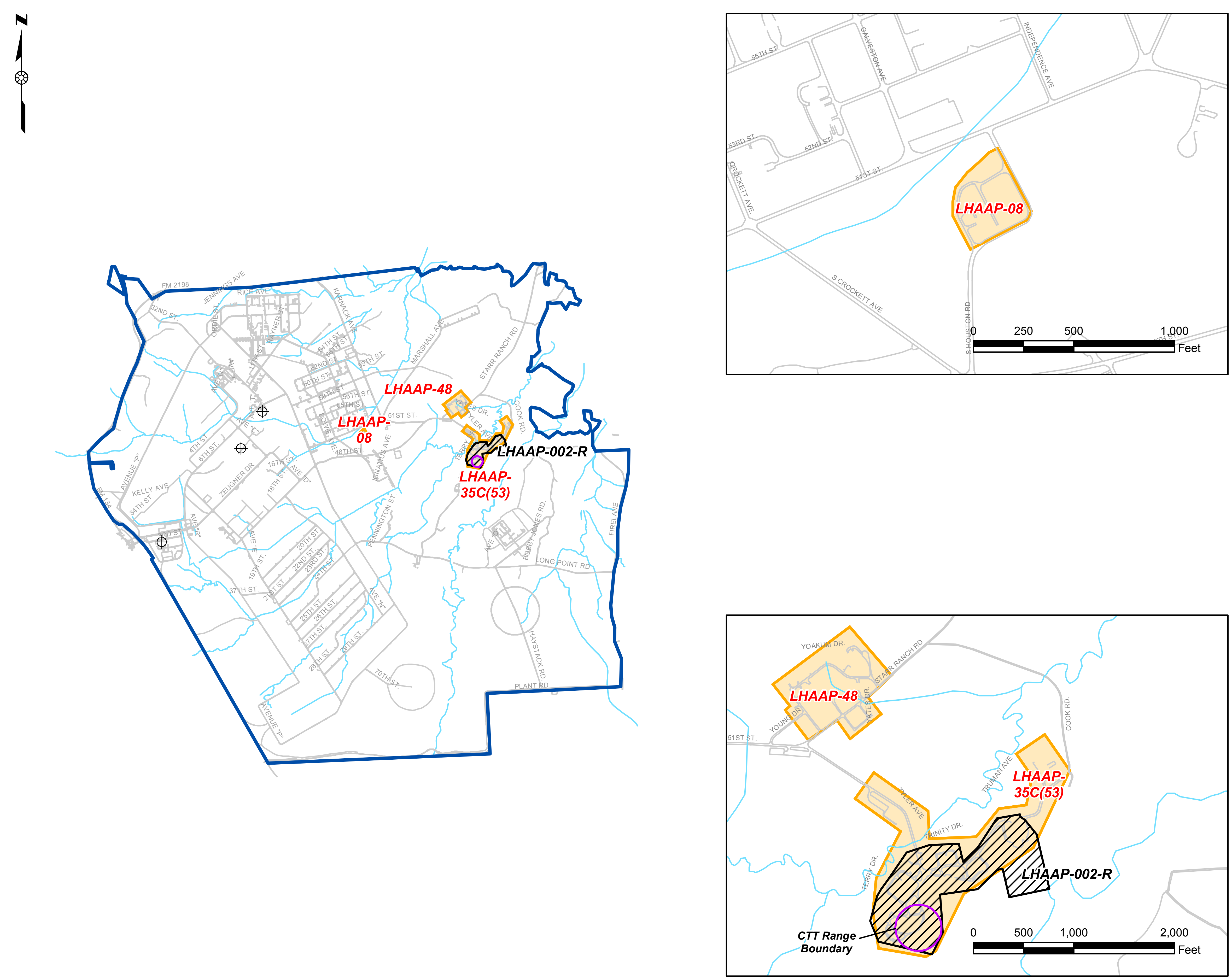
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2-1

LOCATION OF LONGHORN ARMY AMMUNITION PLANT, HARRISON COUNTY, TEXAS

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

00071025




**LEGEND**

- LHAAP Water Supply Well
- Military Munitions Response Program (MMRP) Site
- Closed, Transferred, and Transferring (CTT) Range Boundary
- Approximate LHAAP Boundary
- Road
- Stream
- Site

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TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2-2

SITE LOCATION MAP
LHAAP-08, LHAAP-48, LHAAP-35C (53)
AND LHAAP-002-R

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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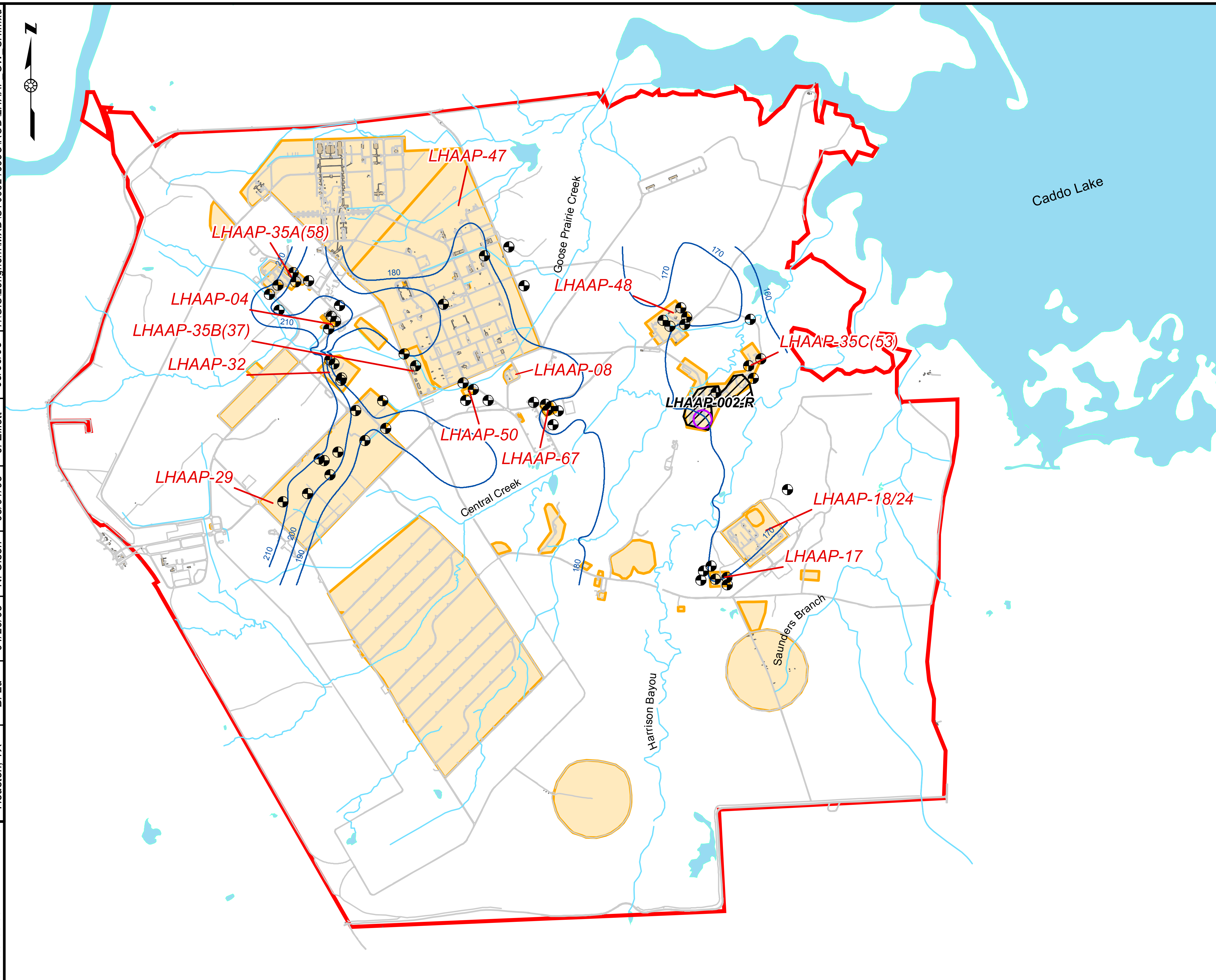
Plot Date: 05/08

00071026




## Legend

- Shallow Groundwater Monitoring Well
- 180 Approximate Groundwater Elevation Contour
- Stream
- Road
- Building, Known to Exist
- Site
- Lake
- Longhorn Base Boundary
- Military Munitions Response Program (MMRP) Site
- Closed, Transferred, and Transferring (CTT) Range Boundary

Notes:
1. All contours were generated using ArcGIS 8.3 (Spline as interpolation algorithm).
2. Groundwater contour elevations reported in feet.
3. Groundwater elevation data collected during data gaps investigation in August -- September, 2004.

0 1,250 2,500 5,000 Feet

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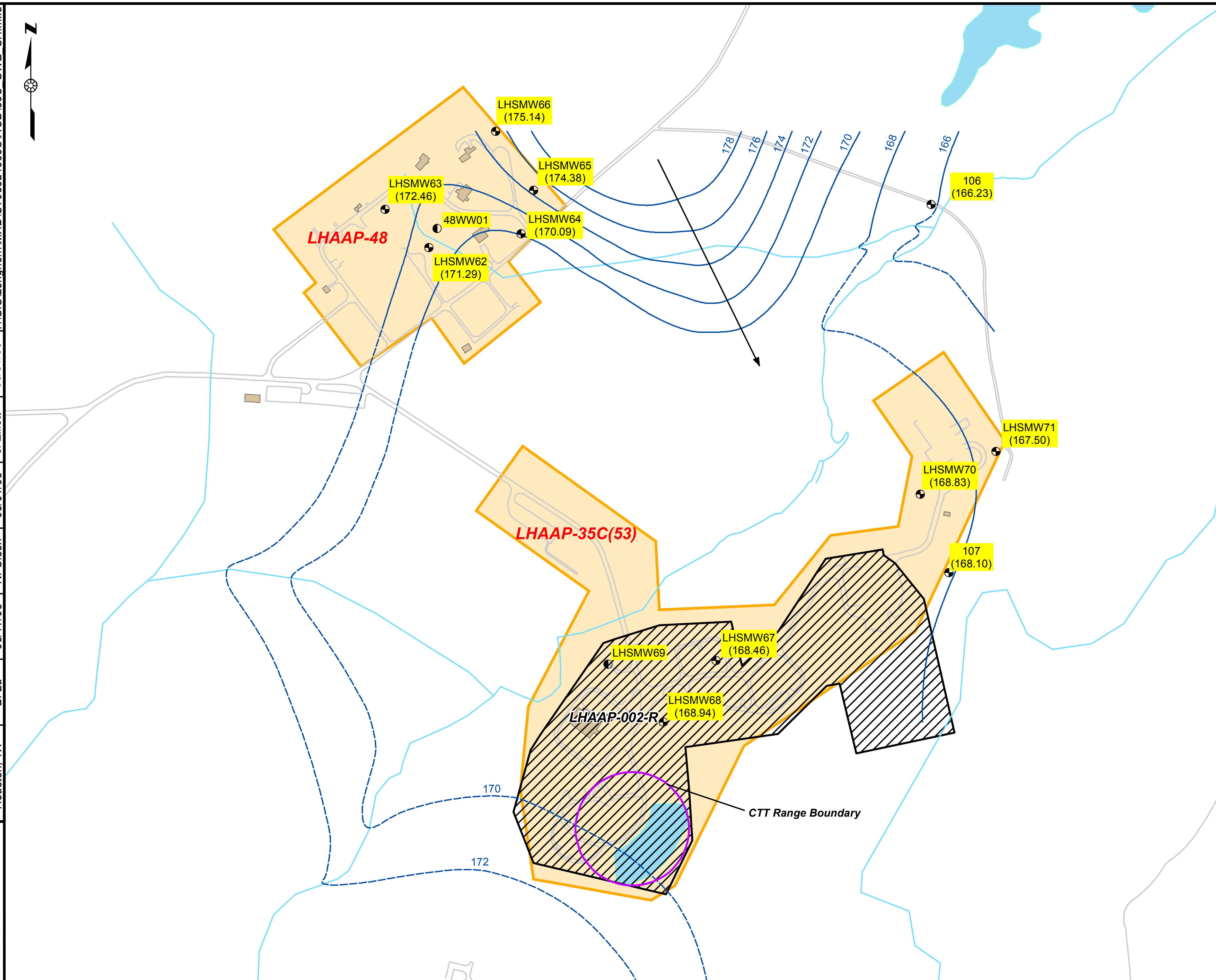
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2-3

INSTALLATION-WIDE
GROUNDWATER ELEVATION MAP
(SHALLOW ZONE)

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

00071027




## Legend

Groundwater Monitoring Well

- Shallow
- Intermediate
- Groundwater Elevation Contour
- Estimated Groundwater Elevation Contour
- Stream
- Road
- Building, Known to Exist
- Site
- Lake
- (166.23) Groundwater Elevation in Feet
- Inferred Groundwater Flow Direction
- Military Munitions Response Program (MMRP) Site
- Closed, Transferred, and Transferring (CTT) Range Boundary

Notes:
1. All contours were generated using ArcGIS 8.3 (Spline as interpolation algorithm).
2. Groundwater contour elevations reported in feet.
3. Yellow highlighted groundwater monitoring wells were sampled during data gaps investigation in August - September, 2004.
4. 170-foot groundwater elevation contour was inferred based on Figure 3-13 Installation-Wide Groundwater Elevation Map (Shallow Zone).

0 200 400 800 Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2-4

LHAAP-48, LHAAP-35C (53), AND LHAAP-002-R
GROUNDWATER ELEVATION MAP
(SHALLOW ZONE)

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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Plot Date: 05/08

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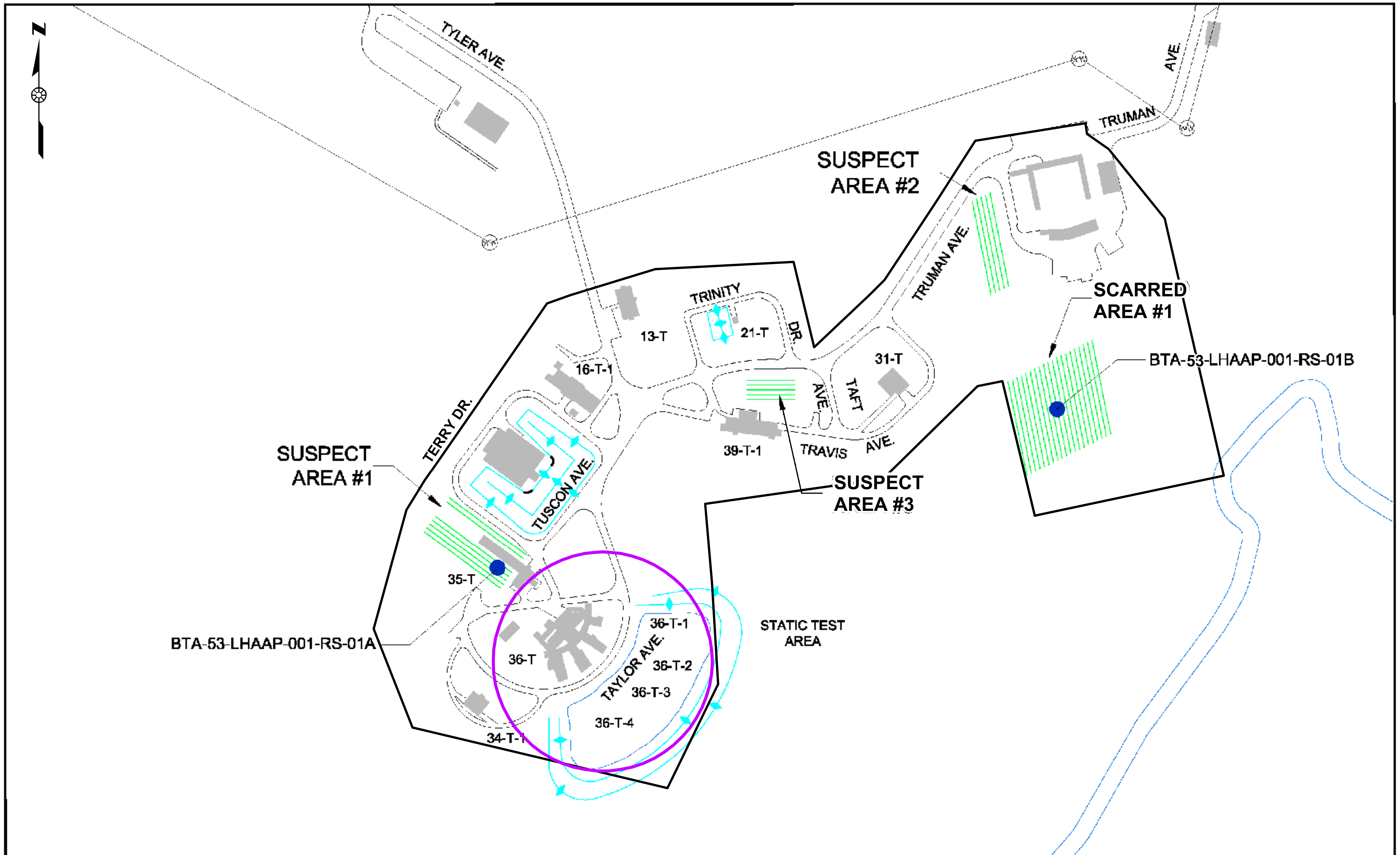


NOTE:
THE CHARACTERIZATION SAMPLE LOCATIONS ARE APPROXIMATE IN THAT THEY ARE BASED ON THE FIELD TECHNICIAN'S OBSERVATIONS. A GPS UNIT WAS USED TO SURVEY THE SAMPLE LOCATIONS. HOWEVER, DUE TO AN EQUIPMENT MALFUNCTION, CAPE HAS BEEN UNABLE TO EXTRACT THE COORDINATES TO DATE.

**LEGEND**

- Closed, Transferred, and Transferring (CTT) Range Boundary
- LHAAP-002-R Boundary
- Geophysical Transects
- Soil Sample Location

**MAP SOURCE:**

CAPE, 2007, *Static Test Area, Site 53, LHAAP-002-R*, San Antonio, TX, May.

0 120 240 480 Feet

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

Shaw

FIGURE 2-5

LHAAP-002-R
AREAS OF INVESTIGATION

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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# *Appendix A*

# *Public Announcements*

**PUBLIC NOTICE**
**OPEN HOUSE ON TUESDAY, JANUARY 29, 2008**
**THE UNITED STATES ARMY INVITES PUBLIC COMMENT**
**ON THE PROPOSED PLANS FOR ENVIRONMENTAL SITES LHAAP-08, -32, -48, and -35C (53),**
**LONGHORN ARMY AMMUNITION PLANT, TEXAS**

The U.S. Army, as lead agency for environmental response actions at Longhorn Army Ammunition Plant (LHAAP), in partnership with Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency Region 6, has developed Proposed Plans for the following sites: LHAAP-08, -32, -48, and -35C (53). An open house forum for the public to view information and ask questions will be held on Tuesday, January 29, 2008 from 6:30 to 8:30 p.m. at the Karnack Community Center, Highway 134 and Spur 449, Karnack, Texas. The meeting will be an open house format with no set or formal presentations.

LHAAP-08, a former sewage treatment plant, is located in the central portion of LHAAP and covers an area of approximately 1 acre. LHAAP-08 operated from 1942 to 1997. The plant was modified over time to handle hydraulic capacity of 0.5 million gallons per day. The plant received domestic wastewater through 6-inch and 15-inch pipelines.

LHAAP-32, a former TNT waste disposal plant, is a 9-acre site located in the west-central portion of LHAAP. The TNT waste disposal plant operated from 1942 to 1945. The plant also treated wastewater generated at the nearby TNT production area.

LHAAP-48 is the former igniter production area, otherwise known as the “Y-Area” located in the east-central portion of LHAAP. LHAAP-48 covers an area of approximately 16 acres. The “Y-Area” was used for the production of igniters and illumination devices and was active until about 1997.

LHAAP-35C (53) covers an area of approximately 40.3 acres in the east-central portion of LHAAP. Known as the former static test area, LHAAP-35C (53) was used for testing of illumination devices and static test firing of rocket motors. Structures for this site included a test tunnel and a data acquisition system for flares, rocket motor test stands of earth and concrete, and conditioning facilities for reproducing arctic and tropical temperatures. The site was active through 1998.

The Proposed Plans identify the recommendation of No Action Necessary for LHAAP-08, -32, -48, and -35C (53) which is based on the existing data and determination of no unacceptable risk to human health and the environment.

The U.S. Army is soliciting public review and comment on the recommendation of No Action Necessary for LHAAP-08, -32, -48, and -35C (53). Copies of the Proposed Plans and supporting documentation are available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670.

The U.S. Army encourages the public to participate in the decision-making process by offering comments on the Proposed Plans. Public comment period begins January 13, 2008 and concludes February 14, 2008. The public information forum will be held on Tuesday, January 29, 2008 from 6:30 – 8:30 p.m. at the Karnack Community Center, Highway 134 and Spur 449, Karnack, Texas 75661. Interested parties are invited to attend. For further information, contact: Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951; phone number 903-679-3192 or e-mail rose.zeiler@us.army.mil.

**NOTICE OF PUBLIC AVAILABILITY**

**THE UNITED STATES ARMY ANNOUNCES THE AVAILABILITY OF THE ENGINEERING EVALUATION/COST ANALYSIS REPORT AT LONGHORN ARMY AMMUNITION PLANT, KARNACK, TEXAS**

The U.S. Amy at the former Longhorn Army Ammunition Plant announces the availability for public review and comment for the Engineering Evaluation/Cost Analysis Report for the South Test Area/Bomb Test Area, the Static Test Area, and the Ground Signal Test Area. The Engineering Evaluation/Cost Analysis evaluates several alternatives for each of the three sites based on risk to human health and human safety and recommends a removal action.

The results of the Engineering Evaluation/Cost Analysis for these sites were presented at a Restoration Advisory Board and Public Meeting at the J.T. Taylor Community Center in Karnack, Texas, at 6:30 PM on 12 June 2007. The document explains the Army's investigation of the three areas and evaluation of the risk from the presence of military ordnance and the Army's proposed actions. The Army is proposing the following actions: surface removal at the 79-acre South Test Area/Bomb Test Area and partial subsurface removal to depth at the 11-acre Open Burn/Open Detonation sector, along with selected land use controls for the entire site; no action at the Static Test Area; and surface removal with selected land use controls at the 80-acre Ground Signal Test Area. Selected land use controls include posting UXO warning signs around the site perimeters, UXO education programs for workers and visitors, and dig restrictions are proposed.

The public is encouraged to be involved and to review the Engineering Evaluation/Cost Analysis. The Administrative Record File includes documents which form the basis for the selection of a removal action at this site. Copies of the *Final Engineering Evaluation/Cost Analysis for Longhorn Army Ammunition Plant, Karnack, Texas*, and the Administrative Record File are available for review at: Marshall Public Library, 300 South Alamo, Marshall, Texas 75670.

Public comments on the proposed action will be accepted for thirty (30) days beginning 6 August 2007 and ending 5 September 2007. Written comments on the Engineering Evaluation/Cost Analysis Report should be sent to: Ms. Rose M. Zeiler, Ph.D., Site Manager, Longhorn Army Ammunition Plant, Department of the Army, P.O. Box 220, Ratcliff, AR 72591. Ms. Zeiler may be contacted by telephone at (479) 635-0110 and (903) 679-3192.

***Correspondence of Regulatory Concurrence***

00071033

# TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

December 11, 2008

Mr. Thomas E. Lederle, Branch Chief
United States Army, BRAC
2530 Crystal Drive, Room 5000
Taylor Bldg / NC3
Arlington, VA 22202

Re: LHAAP-08 (Former Sewage Treatment Plant), LHAAP-48 (Y-Area), LHAAP-35C (53) and MMRP Site- LHAAP-002R (Static Test Area)
Longhorn Army Ammunition Plant Superfund Site TX6213820529
Karnack, Harrison County, Texas

Dear Mr. Lederle:

The Texas Commission on Environmental Quality (TCEQ) received the final Army Decision Document for the LHAAP-08 (Former Sewage Treatment Plant), LHAAP-48 (Y-Area), LHAAP-35C (53) (Static Test Area) and the Military Munitions Response Program site LHAAP-002R (Static Test Area) at the Longhorn Army Ammunition Plant Superfund Site in Karnack Texas on November 26, 2008. The TCEQ has completed the review of the above referenced document and concurs that the response action for the LHAAP-08 (Former Sewage Treatment Plant), LHAAP-48 (Y-Area), LHAAP-35C (53) (Static Test Area) and the MMRP site - LHAAP-002R (Static Test Area) described in the Decision Document is the appropriate remedy for these units at this site.

Sincerely,

fn Brent Wade, Director,
Remediation Division

BW/FD

cc: Ms. Rosen Zeiler, Army / BRAC Site Manager, Ratcliff, AR
Mr. Stephen L. Tzhone, U. S. Environmental Protection Agency Region 6, Dallas, TX
Mr. Paul Bruckwicki, U.S. Fish and Wildlife Service, Karnack, TX

# LONGHORN ARMY AMMUNITION PLANT,

00071034

## Karnack, Texas

## *MONTHLY MANAGERS' MEETING*

## AGENDA

| | |
|---|---|
| **DATE:** | Tuesday, 13 January, 2009 |
| **TIME:** | 1:30 p.m. |
| **PLACE:** | **Teleconference** |
| | **Dial in number:** 866-797-9304, code - 4155734 |

**Welcome** **RMZ**

**Action Items:**

**Army**

- Provide documentation on transferred sites with RC notation.
- Coordinate with Shaw on listing all LHAAP-18/24 sub-sites separately or together on the schedule.
- Update master spreadsheet schedule and provide to EPA on or before December 17.
- Provide information to EPA regarding Longhorn as a perchlorate site and make correction to the DOD website

**EPA**

- Provide comments to Army on site schedule.

**Shaw**

- Provide field summary table of what field work was completed during this last mobilization. Completed.
- Provide time table for recommended actions from 5-year review report. Provided to Army.

**Defense Environmental Restoration Program (DERP) PBC Update** **PS**

- Document Status/Environmental Sites (Table)
- roundwater Treatment Plant Update
- LHAAP-03 Data and Path Forward

**DERP Total Environmental Restoration Contract Update** **RMZ**

- Decision document status for LHAAP-48, 53, 08
- ROD and RD Sites 37/67

**BRAC-Funded Environmental Restoration**

- LHAAP-19 – Demolition Landfill Progress **DB**

**MMRP** **JRL/DB**

- Update

**Transfer Update** **RMZ**

- Lease to USFWS
- Transfer of LHAAP-12 Parcel

**Other Issues** **RMZ**

- 2009 IAP Schedule

- Natural Resources Damages
- New Perchlorate DWEL

00071035

**Adjourn**

Shaw® Shaw Environmental, Inc.

---

**Subject:** **Draft Final Minutes, Monthly Managers Meeting, Longhorn Army Ammunition Plant (LHAAP)**

**Location of Meeting: Teleconference**

**Date of Meeting: January 13, 2008; 1:30 PM – 2:45 PM**

---

**Meeting Participants:**

| | |
|---|---|
| **BRAC:** | Rose M. Zeiler |
| **USACE-Tulsa:** | Dan Birnbaum, Aaron Williams |
| **USAEC:** | Jeff Armstrong |
| **Shaw**: | Praveen Srivastav, Greg Jones, Kay Everett, Susan Watson |
| **USEPA Region 6:** | Steve Tzhone |
| **TCEQ**: | Fay Duke, Dale Vodak |
| **USFWS:** | Paul Bruckwicki, Barry Forsythe |

---

**Previous Action Items**

**Army**

- Provide documentation on transferred sites with RC notation. **Pending.**
- Coordinate with Shaw on listing all sub-sites at LHAAP-18/24 separately or together on schedule. *Rose provided copies of DERPMIS/RMIS document showing that sub-sites were either included in LHAAP-18 or 24. There was a question on how building 43-X will be addressed.*
- Update master spreadsheet schedule and provide to EPA on or before December 17. *Jeff Armstrong said that funding for many of the tasks under PBC will expire by the end of FY2011 (Sept 2011). Therefore, the Army would like to target RIP for FY2010. Shaw will revise schedule to show how RIP at LHAAP-18/24 and 47 can be achieved in FY2010.*
- Provide information to EPA regarding Longhorn as a perchlorate site and make correction to the DOD website. *Jeff stated that he did not know why Longhorn is not listed as a perchlorate site. It was decided that Rose will work with Steve to correct the information on the website.*

**Shaw**

- Provide field summary table of what field work was completed during this last mobilization. **Completed.**
- Provide time table for recommended actions from 5-year review report. **Provided to Army**

Rose provided a handout listing the sub-sites. Steve Tzhone asked about the site schedule. A schedule had been provided but the dates have changed since it was distributed. Praveen said that Don Williams indicated the schedule should be brought back to September 2010. If the dates are changed then, in order to stick with the schedule, that would entail shorter review times.

Steve said that we can backdate from this and make a concerted effort to keep to the schedule. Praveen will get a draft schedule to see if LHAAP-18/24 and LHAAP-47 RIP can be achieved in FY2010. Rose asked if a separate meeting for resolving Feasibility Study (FS) comments is necessary. Praveen indicated that at this time he did not think so.

Rose indicated that the IAP is in the data gathering phase. The deadline is March 17 for data gathering and April 21 for data validation.

**<u>Defense Environmental Restoration Program (DERP) PBC Update</u>** **Praveen Srivastav**

**Document Status/Environmental Sites PBC**

Praveen briefly went over the document status/environmental sites table. Shaw is addressing comments from the EPA and TCEQ. LHAAP-03 was discussed at the last monthly meeting. Deeper soil sampling and groundwater sampling were conducted and provided to the TCEQ. A question was posed to the TCEQ about removing the soil at the hot spot at LHAAP-03, which is within the boundaries of site LHAAP-35A(58). Fay conferred with management and obtained consensus that the removal of the affected soil can be conducted without going through the CERCLA process. A completion report to be followed by a decision document with confirmation sampling would be the appropriate documentation. Praveen asked if "Removal Action" or "Soil Removal" is appropriate terminology to use. Fay said she was okay with either term. Praveen mentioned that he hoped to excavate at the Pistol Range at the same time, if possible. Praveen said that Shaw is still awaiting EPA comments on LHAAP-04. The RTCs to LHAAP-16 have been sent to the Army just today. The Draft FS for LHAAP-17 is in progress; the projected date of submittal is January 2009. The FS for LHAAP-18/24 is in progress and projected to be submitted by the end of the month. The RTCs for LHAAP-29 are in preparation. They will be issued to the Army this week. Another set of responses to comments for LHAAP-46 were submitted last week and will probably go to the regulators by the end of the month. FS for LHAAP-47 is in Army review. RTCs for LHAAP-49 are in preparation. The completion report on soil removal is being prepared. The FS for LHAAP-50 is in regulatory review. Comments from EPA were received before the meeting; currently waiting for TCEQ comments. Surveying LHAAP-60 and completing the county notification is being planned. The Pistol Range is in comment resolution. After finalization of the EE/CA, the Action Memo initiates the steps to removing the soil, which would be within the next couple months. The draft addendum to LHAAP-35/36 will be provided to regulators by the end of the week. The comments to LHAAP-12 RAO Report are in preparation.

**Groundwater Treatment Plant Update**
Normal operations continued. Van was at the site that day. Some well control panels were not communicating with the plant. ICT-12 and -13 are not pumping properly but ICT-14 and -8 are operating normally. Repairs are underway. Regarding personnel, one is on medical leave and one is on light duty. A couple of substitute operators have been brought in to help out.

**DERP Total Environmental Restoration Contract (TERC) Update** **Rose Zeiler**

**Decision Document Status for LHAAP-48, -53, and -08**
The decision document has been signed.

**ROD and RD LHAAP-37/67**
ELD comments are in the process of being resolved. No significant progress has been made since the last meeting. Dan said that he is preparing to close out the TERC task order.

**BRAC-Funded Environmental Restoration** **Dan Birnbaum**

**Demolition of Powerhouse and closure of C&D Landfill, Site 19— Progress**
Dan mentioned that Sonny Sebastian with ECC is preparing the Powerhouse Building Demolition/Debris Removal final work plan which may be delivered today. They anticipate that they will be substantially complete by June 2009. As an action item, the current site schedule will be sent via email to the Longhorn team.

**MMRP** **Dan Birnbaum**

**Update**
The Draft Completion Report will be submitted this week for Army review.

Rose said that she had seen the MEC educational video and that it had been reviewed all over BRAC. They were impressed with the video and expect to use it for training on the UXO website.

**Transfer Update** **Rose Zeiler**
**Lease to USFWS**
Rose asked the status of the transfer/lease for the electric easement. Paul said it was signed at the regional office and has been sent to the Refuge for a representative to sign. Paul said she should be getting it in the mail in few days.

**Transfer of LHAAP-12 Parcel**
Rose said that she had not heard anything from FWS on the LHAAP-12 transfer and asked for a status from FWS. Paul has not heard anything regarding that transfer.

**<u>Other Issues</u>** **Rose Zeiler**

**2009 IAP Schedule**
Stakeholders should be receiving the 2009 IAP schedule about the 7th of April. The next monthly managers' meeting is tentatively scheduled for February 10, 2009 at 1:30pm.

**Natural Resources Damages**
Rose received an email from Jeff asking whether Army had made a Natural Resources Damages notification to the trustees – that it would probably have been made in the 1990s. She stated that she had searched the Administrative Record, and found several documents indicating the topic had been discussed by the Longhorn team and the trustees, but was unable to find a notification letter from the Army to the trustees, including information referring to a meeting of the Army and the Trustees that included the TPWD that mentions the Natural Resources Trustee Responsibilities and indicated a participant from the TNRCC-NRTC. Rose asks that if anyone has a copy of an Army letter from about the same time period, acknowledging the potential for natural resource damages, to please let her know. Jeff said that he was certain David Tolbert took care of this a long time ago. Fay said she will check with Richard Seiler at TCEQ to see if he has a copy of the letter.

**New Perchlorate DWEL**
EPA has submitted a new Interim Drinking Water Standard of 15 micrograms per liter. Praveen asked which standard to use at Longhorn. Fay indicated that the most stringent should be used, which would be this DWEL, although it is an interim value and not legally enforceable.

***Meeting Adjourned***

**Action Items:**

**Army**
- Update site status spreadsheet/schedule and provide to EPA before next meeting.
- Provide schedule on progress of Powerhouse Demolition and C&D Landfill Closure, Site 19.

**EPA**
- Provide comments to Army on site schedule.

**Shaw**
- Provide a revised site status spreadsheet/schedule.

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# LONGHORN ARMY AMMUNITION PLANT
# MONTHLY MANAGERS' MEETING

| | | | |
|---|---|---|---|
| **Location** | telephone | | |
| **Date** | 13-Jan-2009 | **Time** | 1:30 PM |

| Name (printed) | Present | Organization | Phone | E-mail |
|---|---|---|---|---|
| **Longhorn Team Members** | | | | |
| Rose M. Zeiler | ✓ | BRAC | (479) 635-0110 | rose.zeiler@us.army.mil |
| Jeff Armstrong | ✓ | USAEC | (410) 436-1510 | jeffrey.armstrong@us.army.mil |
| Aaron Williams | ✓ | USACE, Tulsa | (918) 669-4915 | aaron.k.williams@usace.army.mil |
| John Lambert | | USACE, Tulsa | (918) 669-4992 | john.r.lambert@SWT03.usace.army.mil |
| Dan Birnbaum | ✓ | USACE, Tulsa | (918) 669-4304 | daniel.birnbaum@usace.army.mil |
| Stephen Tzhone | ✓ | USEPA, Dallas | (214) 665-8409 | tzhone.stephen@epa.gov |
| Raji Josiam | | USEPA, Dallas | (214) 665-8529 | josiam.raji@epa.gov |
| Fay Duke | ✓ | TCEQ, Austin | (512) 239-2443 | fduke@tceq.state.tx.us |
| Dale Vodak | | TCEQ, Tyler | (903) 535-5142 | dvodak@tceq.state.tx.us |
| Barry Forsythe | ✓ | USFSW, Dallas | (214) 665-8467 | forsythe.barry@epa.gov |
| Paul Bruckwicki | ✓ | USFSW, Karnack | (903) 679-4536 | paul_bruckwicki@fws.gov |
| Mark Williams | | USFSW, Karnack | (903) 679-9144 | mark_williams@fws.gov |
| Praveen Srivastav | [signature] | SHAW, Houston | (713) 996-4588 | praveen.srivastav@shawgrp.com |
| Kay Everett | [signature] | SHAW, Houston | (713) 996-4421 | kay.everett@shawgrp.com |
| Greg Jones | [signature] | SHAW, Houston | (713) 996-4472 | greg.n.jones@shawgrp.com |
| Susan Watson | [signature] | SHAW, Houston | (713) 996-4407 | susan.watson@shawgrp.com |
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**Status of Sites and Technical Documents**
**Longhorn Army Ammunition Plant – PBC Contract**
**January 13, 2009**

| No. | Document in Progress | Submittal Date | Army | Regulator | Next Submittal | Expected Date | Army | Regulator | Comment Resolution | Status | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Draft Final SI Report, LHAAP-02 | 12/21/07 | x | x | Final Report | 02/15/09 | x | x | Complete | Submitted RTC to regulators on 10/14/08<br>Additional TCEQ comments rec'd 11/3/08 | Potential GW impact to be addressed by including metals in the monitoring program for LHAAP-58 for wells near LHAAP-02 |
| 2 | Draft Final SI Report for LHAAP-03, Rev 01 | 12/30/07 | | x | | | | | In progress | Soil and groundwater data submitted to TCEQ. Currently trying to determine path forward. | SI report to be submitted after groundwater data is available |
| 3 | Draft Final EE/CA, LHAAP-04 | 6/10/08 | | x | Final EE/CA | 01/30/09 | x | x | In progress | Responses to regulatory comments submitted on 10/14/08. Additional TCEQ comments rec'd on 11/12/08. Waiting for EPA comments | EPA review comments pending |
| 4 | Final Decision Document, LHAAP-06, 07, 51, 55, 64, 66, 68 | 12/18/08 | x | | NA | | | | NA | Final copies were distributed on 12/18/08. | Scheduling survey, followed by County notification. |
| 5 | Draft Final Feasibility Study Addendum, Rev 01, LHAAP-16 | 7/3/08 | | x | RTC | 01/12/09 | x | | | EPA and TCEQ comments rec'd<br><br>RTC prep in progress | FS delayed because of additional field work |
| 6 | Draft Feasibility Study, LHAAP-17 | Jan 2008 | x | | | | | | | GW investigation completed, preparing Draft FS | |
| 7 | Draft Feasibility Study, LHAAP-18/24 | Jan 2009 | x | | | | | | | In preparation | Pilot study continuing, one additional extraction well installed in hot spot, collected geological information. Collecting data from each ICT |
| 8 | Draft Feasibility Study, LHAAP-29 | 10/30/08 | x | | RTC | 1/16/09 | x | | Army comments received.<br>RTC prep in progress. | | Sampling for metals is complete. Draft FS will be revised to include data. |

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**Status of Sites and Technical Documents**
**Longhorn Army Ammunition Plant – PBC Contract**
**January 13, 2009**

| No. | Document in Progress | Submittal Date | Army | Regulator | Next Submittal | Expected Date | Army | Regulator | Comment Resolution | Status | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Draft Final Focused Feasibility Study, LHAAP-46 | Jan 2009 | x | x | | | | | In progress | Additional comments received from Army. Submitted responses on 1/8/09 | |
| 10 | Draft Focused Feasibility Study, LHAAP-47 | 12/23/08 | x | | | | | | | In Army review | |
| 11 | Draft Final Site Evaluation Report for LHAAP-49 | 3/3/08 | x | x | RTC | 01/15/09 | x | | In progress | GW data available. RTC in prepration | Soil removal for mercury has been completed. Installed and sampled 5 wells. Currently addressing groundwater issues. |
| 12 | Draft Final Feasibility Study, LHAAP-50 | 11/20/08 | x | x | | | | | Complete | DF FS has been submitted on 11/20/08. In regulatory review. | |
| 13 | Draft Final Feasibility Study, LHAAP-58 | 9/20/07 | x | x | RTC | 1/16/09 | | x | In progress | RTC submitted to Army on 12/26/08 | Installed wells and collected groundwater data. FS delay caused by additional field work. |
| 14 | Final Decision Document, LHAAP-60 | 12/18/08 | x | | | | | | NA | Final copies were distributed on 12/18/08. | Scheduling survey, followed by County notification. |
| 15 | Draft Final EE/CA, Pistol Range | 7/15/08 | | x | Final EE/CA | Jan 2009 | x | x | In progress | Regulatory comments rec'd. RTC submitted for regulatory review on 12/16/08 | |
| 16 | Draft Addendum, LHAAP-35/36 | 11/06/08 | x | | Draft Final Addendum | Jan 2009 | x | x | | Army's comments rec'd. Submitted RTCs to Army on 1/08/09 | |
| 17 | LHAAP-12 Annual RAO Report | 9/3/08 | x | | RTC | 01/30/09 | x | | In progress | Army comments rec'd | |

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

015554

SEP 06 1995

CERTIFIED MAIL: RETURN RECEIPT REQUESTED

David Tolbert, Project Manager
Longhorn Army Ammunition Plant
Attn: SMCLO-EN
Marshall, Texas 75671-1059

Re: DERPMIS/RMIS Resolution Document
Longhorn Army Ammunition Plant

Dear David:

In accordance with the Federal Facility Agreement for the Longhorn Army Ammunition Plant and in response to your requested made during the August 1995 Project Coordinators meeting, EPA is submitting comments on the latest version of the DERPMIS/RMIS Resolution Document dated June 1995.

EPA's comments are as follows:

#1 I have enclosed copies of EPA's comment letters (May 17, 1994 and June 14, 1994) regarding the previous version of the DERPMIS/RMIS Resolution Document, a copy of the Army's annotated comment responses (dated January 30, 1995) to EPA's comments, and a DERPMIS/RMIS Cross Reference table (dated February 2, 1995). Although the response to comments states that the Army concurred with all but one of EPA's comments, the DERPMIS/RMIS Resolution Document was NOT revised to address EPA's comments and the Army's concurrence with those comments. Please revise the document to address EPA's comments.

#2 Although EPA requested that the Waste Characterization Study be removed from the DERPMIS/RMIS Resolution Document, EPA agreed with a subsequent request from the Army to keep this document in the final version of the DERPMIS/RMIS Resolution Document. Therefore, disregard EPA's comment #3 in the May 17, 1994 letter and comment #3 in the June 14. 1994 letter.

#3 Include in the final version of the DERPMIS/RMIS Resolution Document the *Installation Assessment of Longhorn Army Ammunition Plant Report No. 150*, February 1980. This document is very informative and EPA <u>never</u> requested that it be removed.

#4 Include in the final version of the DERPMIS/RMIS Resolution Document the April 1988 RFA.

If you have any questions about this or any other matter, please contact me at (214) 665-6744.

Sincerely,

Lisa Marie Price
Remedial Project Manager
Superfund Division

Enclosure

cc: Captain Darrell W. Chinn
Executive Officer, U.S. Army
Longhorn Army Ammunition Plant
Marshall, Texas 75671-1059

Tulsa District Corps of Engineers
P.O. Box 61
Attn: Ms. Jonna Polk
CESWT-PP-E
Tulsa, OK 74121-0061

Mike Moore, Superfund
Texas Natural Resource Conservation Commission
P.O. Box 13087
Section MC143
Austin, TX 78711-3087

015556

Tulsa District

US Army Corps of Engineers

Building Today for a Better Tomorrow

**PROGRAMS AND PROJECT MANAGEMENT DIVISION**

PHONE: 918-669-~~7230~~ 7480 FAX: 918-669-7235

DATE 6 Feb 95

**TO** Lisa Marie Price

**Office Symbol** EPA Superfund

**No. of pages (including cover sheet)** 4

**FROM** CPT(P) Nguyen

**COMMENTS:** Good Morning!!! I hope that you're feeling better... Attached are:

* The Army responses to your comments on the DERPMIS/RMIS Resolution
* The latest DERPMIS/RMIS cross reference.

We'll talk tomorrow but if you have any serious questions before the please, call me & David.

See you tomorrow —

CPT(P) N.

**DERPMIS/RMIS COMMENTS RESPONSE**
(as of 30 January 1995)

| EPA COMMENTS DATED 17 MAY 94 AND 14 JUN 94 | ARMY RESPONSES |
|---|---|
| 1. The final version of this document must contain the cross-reference for the DERPMIS and the RMIS lists. | **CONCUR** - The Final DERPMIS/RMIS Resolution Document will include a cross reference of DERPMIS/RMIS sites. |
| 2. It is inappropriate to state in this document that the TNRCC made a "no contamination" determination with the reference to the states of many sites. | **CONCUR** - The Final Resolution Document will etate "...the TNRCC determined that there was no threat of release at this site." as the reference to the status of these RFA sites. |
| 3. The purpose of the Waste Characterization Study is unclear. Please remove the document from the final version of this document. | **CONCUR** - The Waste Characterization Study will be removed from the Final Resolution Document. To replace this study, the Final document will state "...Findings of the Army's Preliminary Assessment in 1990 concluded that no further action is necessary at this site." |
| 4. A map should be included that identifies the location of each of the sites on the DERPMIS/RMIS lists. | **CONCUR** - The Final Resolution Document will include a map identifying all the site locations with reference to the cross reference of sites. |

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| | |
|---|---|
| 5. a. *Are* the sumps associated with LHAAP 36 and 39 also included in the sum investigation?<br>b. Revise the text of the document as well as the Site Summary Chart to reflect that LHAAP 50 is under investigation, that LHAAP 56, 59, and 65 are under investigation (not deleted).<br>c. Confirm that all waste pmcess and rack sumps (145 total) are accounted for when investigating the sites identified. | a. CONCUR - The sumps of LHAAP 36 and 39 are being investigated under LHAAP 35.<br><br>b. CONCUR - LHAAP 50 is in Group #5 Site Investigation. The sumps of LHAAP 56, 59, and 65 are being investigated under LHAAP 35. We will correct the Site Summary Chart to reflect these changes.<br>c. CONCUR - All waste process and rack sumps will be accounted for. |
| 6. According to the February 1980 Installation Assesssment, it appears that allowing waste, wastewaters (including explosives), to discharge to, flow into and/or mix with the surface water of Goose Prairie (North) Bayou was customary. Therefore, it is imperative that a thorough site risk assessment be conducted. | CONCUR - A thorough Risk Assessment is being conducted at this site as a part of the Sumps Risk Assessment Report. |
| 7. Was there an investigation into the reported dumping of TCE and methylene chloride east of the Old Landfill? EPA requests a Preliminary Assessment be conducted to be more accurately describe the location of this dumping and to determine the potential *impact of such a release.* | EXCEPTION - There is no investigation into the reported dumping of TCE and methylene chloride east of the Old Landfill. We conducted a site inspection but did not find any suspicious area east of the Old Landfill. We firmly believe that the current RI/FS and the Remedial Action (Landfill Cap) are more than adequate to reduce any threat to human health and/or the environment at this site. |
| 8. A list of requested action for site 3, 4, 5, 6, 7, 8, 18, 36, 38, 39, 44, 50, 52, 53, 55, 57, 60, 61, 62, 63, 64, 66, 69, 70, 71. | CONCUR - The Final Resolution Document will incorporate changes based on the latest Longhorn's Preliminary Assessment on your requested sites. |

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## DERPMIS/RMIS CROSS REFERENCE
(as of 2 Feb 95)

| SITE DESCRIPTION | DERPMIS LHAAP# | RMIS LHAAP# | STATUS |
|---|---|---|---|
| Inert Burning Ground | 001 | 1 | RI/FS |
| Vacuum Truck Overnight Parking Lot | 002 | 2 | NFA |
| Building 722 - Paint Shop | 003 | 3 | NFA |
| Pilot Waste Water Treatment Plant | 004 | 4 | NFA |
| Power House Boiler Pond | 005 | 5 | NFA |
| Building 54F Solvent | 006 | 6 | NFA |
| Building 50G Drum Processing | 007 | 7 | NFA |
| Sewage Treatment Plant | 008 | 8 | NFA |
| Building 31-W Drum Storage | 009 | 9 | NFA |
| Suspected TNT Burial Site at P&Q Avenue | 010 | 11 | RI/FS |
| Active Landfill | 011 | 12 | RI/FS |
| Suspected TNT Burial Between Active and Old Landfill | 012 | 13 | RI/FS |
| Area 54W Burial Site | 013 | 14 | RI/FS |
| Area 49W Drum Storage | 014 | 15 | NFA |
| Old Landfill | 015 | 16 | RI/FS |
| No. 2 Flashing Area Burning Ground | 016 | 17 | RI/FS |
| Burning Ground/Rocket Motor Washout Pond | 017 | 18 | RI/FS |
| Construction Materials Landfill | 018 | 19 | NFA |
| South Test Area/Bomb Test Area | 019 | 27 | RI/FS |
| Former TNT Production Area | 021 | 29 | RI/FS |
| TNT Red Water Pipeline | 022 | 29 | RI/FS |
| Building 707-Storage Area PCBs | 023 | 23 | NFA |
| Former TNT Waste Disposal Plant | 024 | 32 | RI/FS |
| Building 701 PCB Storage | 034 | 34 | NFA |
| Sumps Various | 035 | 35 | RI/FS |

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| | | | |
|---|---|---|---|
| Explosive Waste Pads | 036 | 36 | NFA |
| Quality Assurance Laboratory Building 29-A | 037 | 37 | NFA |
| 24X Holding Area | 038 | 18 | RI/FS |
| 25X Washout Pad | 039 | 18 | RI/FS |
| Air Curtain Destructor | 040 | 18 | RI/FS |
| Open Burning Cage | 041 | 18 | RI/FS |
| Open Burning Pan | 042 | 18 | RI/FS |
| Former Unlined Evaporation Pond | 043 | 24 | RI/FS |
| Building 41-X | 044 | 18 | RI/FS |
| Magazine Area | 045 | 45 | NFA |
| Plant 2/Pyrotechnic Operation | 046 | 46 | NFA |
| Plant 3/Produces Hand Signal Assemblies | 047 | 47 | NFA |
| Y Area/Produces Hand Signal Assemblies | 048 | 48 | NFA |
| Former Acid Plant | 049 | 29 | RI/FS |
| Former Waste Disposal Facility | 050 | 50 | SI |
| Photographic Laboratory Building 60B | 051 | 51 | NFA |
| Magazine Area | 052 | 52 | SI |
| Static Test Area | 053 | 53 | NFA |
| Ground Signal Test Area | 054 | 54 | RI/FS |
| Septic Tank | 055 | 55 | NFA |
| Vehicle Wash Rack & Oil/Water Seperator | 056 | 56 | NFA |
| Rubble Burial Site | 057 | 57 | NFA |
| Maintenance Complex | 058 | 58 | NFA |
| Storage Building #725 | 059 | 59 | NFA |
| Former Storage Building #411 and #714 | 060 | 60 | SI |
| Water Treatment Plant | 061 | 61 | NFA |
| Building #43X | 062 | 62 | NFA |

| | | | |
|---|---|---|---|
| Burial Pits | 063 | 63 | SI |
| Transformer Storage | 064 | 64 | NFA |
| Building #209 | 065 | 65 | NFA |
| Transformers | 066 | 66 | NFA |
| Above Ground Storage Tank | 067 | 67 | NFA |
| Mobile Storage Tank | 068 | 68 | NFA |
| Underground Storage Tank | 069 | 69 | NFA |

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Shaw® Shaw Environmental, Inc.

***Date:*** ***January 30, 2009***

***Project No.:*** ***117591***

## ***TRANSMITTAL LETTER:***

***To:*** Mr. Aaron Williams

***Address***: US Army Corps of Engineers - Tulsa

CESWT-PP-M
1645 South 101st East Ave
Tulsa, Oklahoma 74128

***Re:*** Final Site Investigation Report LHAAP-02, Vacuum Truck Overnight Parking Lot

Contract No. W912QR-04-D-0027/DS02

For: Review ____ As Requested ____ Approval ____ Corrections ____ Submittal x ____ Other ____

| ***Item No:*** | ***No. of Copies*** | ***Date:*** | ***Document Title*** |
|---|---|---|---|
| 1 | 2 | January 2009 | **Final Site Investigation Report LHAAP-02, Vacuum Truck Overnight Parking Lot** |
| | | | |
| | | | |

Enclosed are copies of Shaw's final of the above-named report for your files.

Copies have also been distributed as indicated below.

***Sincerely:***

Praveen Srivastav
Project Manager

***3010 Briarpark Drive, Suite 4N, Houston, Texas 77042*** ***Phone: (713) 996-4522/Fax: (713) 996-4436***

***CC:*** **Distribution List:**

Mr. D. Birnbaum – USACE, Tulsa (copy sent to A. Williams for distribution)
Mr. J. Armstrong – AEC
Ms. Rose Zeiler – BRAC-LHAAP
Mr. S. Tzhone – EPA Region 6 (2)
Ms. F. Duke– TCEQ, Austin (2)
Mr. D. Vodak– TCEQ, Tyler
Mr. P. Bruckwicki– USFWS

**DEPARTMENT OF THE ARMY**
**LONGHORN ARMY AMMUNITION PLANT**
**POST OFFICE BOX 220**
**RATCLIFF, AR 72951**

00071052

January 30, 2009

DAIM-ODB-LO

Mr. Stephen Tzhone
US Environmental Protection Agency
Superfund Division (6SF-AT)
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Final Site Investigation Report LHAAP-02, Vacuum Truck Overnight Parking Lot, Longhorn Army Ammunition Plant, Karnack, Texas, January 2009

Dear Mr. Tzhone,

The above-referenced document is being transmitted to you for your records. The document has been prepared by Shaw Environmental, Inc. (Shaw) on behalf of the Army as part of Shaw's performance based contract for the facility. The document has also been posted on Shaw's LHAAP Project Portal.

The point of contact for this action is the undersigned. I ask that Praveen Srivastav, Shaw's Project Manager, be copied on any communications related to the project. I may be contacted at 479-635-0110, or by email at rose.zeiler@us.army.mil.

Sincerely,

Rose M. Zeiler

Rose M. Zeiler, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
S. Tzhone, USEPA Region 6 – Dallas, TX
D. Vodak, TCEQ – Tyler, TX
P. Bruckwicki, USFWS – Caddo Lake NWR, TX
A. Williams, USACE – Tulsa District, OK
D. Birnbaum, USACE – Tulsa District, OK
J. Armstrong, USAEC – MD
P. Srivastav, Shaw – Houston, TX (for project files)

**DEPARTMENT OF THE ARMY**
**LONGHORN ARMY AMMUNITION PLANT**
**POST OFFICE BOX 220**
**RATCLIFF, AR 72951**

00071053

January 30, 2009

DAIM-ODB-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
TCEQ Environmental Cleanup Section I, Team 2 MC-136
12100 Park 35 Circle
Austin, TX 78753

Re: Final Site Investigation Report LHAAP-02, Vacuum Truck Overnight Parking Lot, Longhorn Army Ammunition Plant, Karnack, Texas, January 2009

SUP 126

Dear Ms. Duke,

The above-referenced document is being transmitted to you for your records. The document has been prepared by Shaw Environmental, Inc. (Shaw) on behalf of the Army as part of Shaw's performance based contract for the facility. The document has also been posted on Shaw's LHAAP Project Portal.

The point of contact for this action is the undersigned. I ask that Praveen Srivastav, Shaw's Project Manager be copied on any communications related to the project. I may be contacted at 479-635-0110, or by email at rose.zeiler@us.army.mil.

Sincerely,

Rose M. Zeiler

Rose M. Zeiler, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
S. Tzhone, USEPA Region 6 – Dallas, TX
D. Vodak, TCEQ – Tyler, TX
P. Bruckwicki, USFWS – Caddo Lake NWR, TX
A. Williams, USACE – Tulsa District, OK
D. Birnbaum, USACE – Tulsa District, OK
J. Armstrong, USAEC – MD
P. Srivastav, Shaw – Houston, TX (for project files)

**Response to Comments**
**Draft Final Site Investigation Report, LHAAP-02, Vacuum Truck Overnight Parking Lot, Revision 01**
**Longhorn Army Ammunition Plant, Karnack, Texas**

**Submitted: December 2007**
**EPA Comments Received: June 26, 2008**

**Reviewers:** Steve Tzhone, EPA, Region 6
**Respondents:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commenter Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Comment | C, D, E or X[1] | Response | A or D[2] |
|---|---|---|---|---|
| 1 | Please provide additional information on the groundwater (characteristics, depths) at this site. | C | The shallow well 35AWW03 installed at LHAAP-35A(58), which is closest to LHAAP-02, was screened at the first saturated zone at 19 feet below ground surface (bgs). Borings drilled during the Remedial Investigation indicate relatively thin, discontinuous layers of varying thickness at different depth intervals with occasional thin sand lenses encountered. The shallow sand lens in the boring for 35AWW03 is underlain by clay to silty clay soil that extends to a thicker saturated sand zone encountered at approximately 15 feet bgs in borings 35AWW03 located near the southeast corner of LHAAP-02. (Jacobs, RI, Group IV Sites, Figures 5-1 and 5-2). | |
| 2 | Are there monitoring wells close to this site?<br><br>What are the levels of arsenic, copper, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd) pyrene in the monitoring wells? | C | Yes, shallow well 35AWW03 is closest to the site in a downgradient direction.<br><br>Concentrations of arsenic, copper, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd) pyrene were below laboratory detection limits in samples collected 11/8/98 from 35AWW03. | |
| 3 | How many acres are the Parking Lot area and the surrounding area? | C | Acreage for the Parking Lot area LHAAP-02 is approximately 0.87 acres. Acreage for LHAAP-35A(58) is approximately 11.033 acres. | |
| 4 | Table 3-1: Are the samples with “A” suffix surface samples and those with “B” suffix subsurface? Please clarify in the report and tables which soil samples are from the surface (0-6 inches) and which are subsurface (12-18 inches). | C | Yes, “A” suffix denoted samples are surface samples and “B” denoted samples are subsurface. A footnote will be added to Table 3-1 to clarify this. The text will be modified by revising the second sentence in Section 1.2, “Ten surface soil samples with sample numbers ending in “A” (0-6 inches below ground surface [bgs]) and eight subsurface samples with sample numbers ending in “B” (12-18 inches bgs) were collected at each location.” | |
| 5 | Text under Copper on page 4-2 refers to the LAP-021A location while Table 3-1, page 3 of 13 refers to LAP-27A. Please correct. | C | The text will be revised to show “LAP-027A” location. | |
| 6 | High copper in the LAP-27A location appears to be | D | The hotspot is a random detection of copper and removal is not | |

00071055

**Submitted: December 2007**
**EPA Comments Received: June 26, 2008**

**Reviewers:** Steve Tzhone, EPA, Region 6
**Respondents:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commenter Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Comment | C, D, E or X[1] | Response | A or D[2] |
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| | on the surface level and at a localized hotspot area. Please provide clarification on why a hotspot removal is or is not being considered. | | considered a necessary activity. Page 4-2 indicated that the sample "might have included a piece of copper wire from demolition activities at the area." | |
| 7 | On page 4-1 in the 5th paragraph, please clarify why the soil organic chemicals are compared to the groundwater-protective human health criteria. | D | Comparison to groundwater-protective human health criteria is required by TCEQ regulations. *(TCEQ, 1998, Interoffice Memorandum from Ronald R. Pedde to Remediation Division Staff regarding implementation of the existing risk reduction rules (a.k.a. TNRCC Consistency Memorandum), July, as updated in April 2005.)* | |

**Review Comments to Draft Final Site Investigation Report dated March 2006**
**LHAAP-02, Vacuum Truck Overnight Parking Lot**
**Longhorn Army Ammunition Plant, Karnack, Texas**

00071056

**December 2007**

**Reviewer:** TCEQ
**Respondent:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), or Takes Exception (E)
2. Commenter Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
|---|---|---|---|---|---|---|
| **Reviewer – Fay Duke, Project Manager/TCEQ, August 29, 2006** | | | | | | |
| 1 | | General | Given the decisions to conduct a site wide Ecological Risk Assessment, the TCEQ will not comment or concur on the risk assessment or management decisions made in this report until the completion of the site wide ecological risk assessment. | C | The conclusions drawn from the Final Baseline Ecological Risk Assessment have shown that there is no ecological impact in the Industrial Area, which includes site LHAAP-02, and that no further action is needed at LHAAP-02 for the protection of ecological receptors. This conclusion is described in Section 2.3 of the revised document. In addition, the ecological benchmark values have been deleted from Table 3-1 because screening of data against these values is redundant now that BERA has been finalized. | |
| 2 | | Section 1.2, Sources of Analytical Data | There are discrepancies with the analytical data reported in this report versus analytical data reported in *Hazardous and Medical Waste Study No:37-EF-5506-00, Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant* (USACHAPPM, 2000). In this report, the SVOCs are reported as mostly non-detect with the exception of two COCs at one location. However, in the original report (USACHAPPM, 2000) most of the SVOCs were reported with concentrations that are "J" flagged rather than non-detect. Many of the PAH samples were given the "J" qualifier because the concentrations were below the reporting limit. Please clarify or revise. | C | Further review revealed a discrepancy between the electronic database provided to Shaw and the data in the laboratory analytical certificates included in the USACHPPM (2000) document. The data used in the previous version of the LHAAP-02 data evaluation report was based on the electronic database. Shaw could not find a basis for the different qualifiers. Table 3-1 and the rest of the document has been revised to reflect the data in the laboratory certificates included in the USACHPPM report. | |
| 3 | | Section 3.1.2, Comparison to Risk-Based Screening Levels | There are two conflicting statements regarding selenium. It states on Page 3-1 that selenium has one or more measured concentration(s) above the human health screening level. On Page 3-5, it states that the maximum concentration of selenium is below the human health RBSV value. In Table 3-2, selenium is screened out as a COPC based on the maximum concentration being below or equal to risk-based screening levels. Please clarify.<br><br>Please note that in Table 3-2, under the "range of values" column, the maximum detected concentration for selenium is reported to be 1.2 mg/kg. In Table C-3, the selenium concentration for LAP-029B is reported to be 1.37 mg/kg. | C | The maximum selenium concentration is below human health screening levels. The erroneous statement on Page 3-1 of the draft that selenium has one or more measured concentrations above human health screening levels is in error and has been corrected.<br><br>There are no location coordinates for sample LAP-029B, with selenium concentration of 1.37 mg/kg, in the data base that could locate it in LHAAP-02, and thus it was excluded from the evaluation. Because a maximum selenium concentration of 1.37 mg/kg is below the human health screening value (130 mg/kg) and the 95% upper prediction limit (95% UPL) of the | |

1. Respondent Concurs (C), Does Not Concur (D), or Takes Exception (E)
2. Commenter Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | | | background concentration (5.61 mg/kg) shown in Table 3-2, the exclusion of the LAP-029B value from the evaluation does not change its conclusion.<br><br>This explanation has been added to the revised document as paragraph 3 of Section 3.1.1. | |
| 4 | | Section 3.1.2, Comparison to LHAAP-specific Background Concentrations (Distribution tests) and Table 3-2 | Please verify that a test for outliers in the background data set was performed before calculating the UPL. | C | The data set for soil was subjected to distribution testing and examined for outliers using methods provided in the USEPA data analysis program ProUCL 4.0. However, potential outliers identified by these methods were not excluded from the background data set before calculating UPL values.<br><br>The methods used in ProUCL to identify potential outliers assume that the data represent a single population. Statistical evaluations of soil from background locations were reported in *Final Background Soil Study Report, Longhorn Army Ammunition Plant, Karnack, Texas*, July 2004 (Shaw, 2004). The Shaw (2004) report described the background samples as originating from two locations with somewhat different soil types. Statistical analysis of the soil properties most related to sorption of chemicals (cation exchange capacity (CEC), total organic carbon (TOC) and pH) showed that the CEC, TOC, and pH properties of surface soil from the two locations were not different with respect to sampling location and that TOC and pH properties of subsurface soil samples were not different. The CEC data subsurface samples from the two locations were different with 95 percent confidence. The variability in these soil properties was attributed to different soil types and it was concluded that the soil types in the background sampling areas are consistent with soil across the LHAAP property.<br><br>As suggested by the soil background report (Shaw, | |

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| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | | | (2004), concentrations of most chemicals in background samples do not represent a single population. Because of this data characteristic, the statistical methods used in ProUCL 4.0 to identify outliers are limited in their ability to identify true outliers. Likewise, the ASTM International (ASTM) method E178-75 test for outliers described in USEPA guidance (*Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Interim Final Guidance,* EPA/530-SW-89-026, Office of Solid Waste Management Division, 1989) is limited by the assumption that values except the potential outlier are from a normal distribution. Because concentrations of naturally-occurring metals are known to be highly skewed (H. T. Shacklette, J. G. Boerngen, *Elemental concentrations in Soils and Other Surficial Materials of the Conterminous United States*, U. S. Geological Survey Professional Paper 1270, U. S. Government Printing Office, Washington, D. C., 1984.), a statistical outlier test alone is not a reliable indicator of whether a metal is naturally occurring.<br><br>In spite of the limitations of statistical tests, we concur that it is necessary to ensure that high concentrations in the background data set do not indicate contamination from site operations. Please note that the background study areas were located outside the boundary of LHAAP, at the request of regulators, to minimize impact from site operations. As a cautionary measure, the samples from the off-LHAAP locations were further analyzed for LHAAP process chemicals including explosives, chlorinated hydrocarbons and other volatile organic compounds (VOCs) and perchlorate. Section 3.2 of the soil background report (Shaw, 2004) describes the results of these analyses to determine whether LHAAP process chemicals might affect any of the locations. The report concludes that soil samples from off-LHAAP sampling | |

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| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | Please revise the title to Table 3-2 to reflect that selection of COPCs are based on comparisons to human health screening values only or revise the table to include selection of COPC based on human health and ecological screening values. | C | locations were not affected by LHAAP process chemicals.<br><br>As pointed out in Section 2.3, there is no ecological risk at LHAAP-02. The term COPC, as a norm, refers to human health-based selection of chemicals that pose risk, as opposed to “COPEC”, which refers to chemicals of potential ecological concern. The basis for selection of COPCs is reflected in the column headings, which do not include ecological screening values. The title of Table 3-2 has been revised to indicate selection of COPCs for human health. | |
| 5 | | Geochemical Evaluation | As stated previously, the TCEQ is concerned about geochemical evaluations being used to eliminate COPCs. The comparisons of background and affected property data based on ratios of selected constituents are subjective and the TCEQ questions the validity of conclusions based on these comparison. Therefore, the TCEQ does not find this methodology acceptable. Please provide examples of this method being used on other Superfund or similar sites. | C | Please note that the LHAAP-02 soil geochemical evaluation (Appendix A of the revised document) confirmed that two elements (arsenic and copper) should be retained as COPCs, as suggested by the risk-based screening process and statistical analysis.<br><br>Please also note that the geochemical evaluations are not subjective. An objective and reproducible decision rule is provided by comparison of calculated site versus background ratios of specific metal pairs (as discussed in Section A.2.0 of the revised document). Site samples with elemental ratios that exceed the maximum background ratio appear in the ratio plot to the right of the background sample with the maximum background ratio, as occurs for arsenic in Figure A-3 and copper in Figure A-5. These metals are objectively identified as representing potential contamination in this approach because all ratios are calculated in Excel and conditional formatting is used to automatically highlight the samples with anomalously high ratios. This reproducible procedure can be independently verified using the site and background data.<br>Geochemical evaluations of soil and groundwater media have been approved by regulatory agencies at | |

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| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | | | the following sites:<br><br>**Redstone Arsenal, Alabama** – Multiple RCRA Release Assessment reports and RCRA Facility Investigation (RFI) reports to delineate metals contamination at oil-water separators, plating shops, open burn/open detonation sites, and UST sites were approved by the Alabama Department of Environmental Management.<br><br>**Fort McClellan, Alabama** – EPA Region 4 and the Alabama Department of Environmental Management have approved the use of geochemical evaluations at multiple CERCLA sites as one line of evidence to support determinations of whether detected metals concentrations reflect site-related contamination or are naturally occurring in soil, sediment, groundwater, and surface water media. Sites include firing ranges and other munitions sites.<br><br>**Fort Chaffee, Arkansas** – CERCLA site with Arkansas Department of Environmental Quality as lead regulatory agency. A geochemical evaluation demonstrated that elevated metals concentrations were related to high turbidity and were naturally occurring. The evaluation resulted in the granting of a No Further Action decision by the State of Arkansas for the groundwater.<br><br>**Wright Patterson AFB, Ohio –** Site managed under CERCLA, under a Federal Facility Agreement (also known as Interagency Agreement) with U.S. EPA Region 5, and the Ohio Consent Order (OCO) with the Ohio EPA (OEPA).<br><br>A long term monitoring program (LTM) acquired | |

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| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | | | analyses of 218 groundwater samples from 21 monitor wells over a ten-year period. Geochemical evaluations were performed on the analytical results to determine if detected concentrations of metals in unfiltered samples are the result of actual groundwater contamination or are representative of natural conditions. Concentrations of the 19 evaluated elements were determined to be mostly due to natural processes. The findings of the evaluation led to an agreement with the State of Ohio to remove of the applicable wells from continued sampling under the LTM program and to consider these wells as candidates for abandonment.<br><br>**Kirtland AFB, Albuquerque, New Mexico** – RCRA site under New Mexico Environment Department lead authority. Geochemical evaluations were used to evaluate metals concentrations in soil at six investigation sites. The methodology, results and conclusions were used to prepare No Further Action petitions at these sites that which were approved by the New Mexico Environment Department.<br><br>**Former Walker AFB, Roswell New Mexico** – Formally Utilized Defense (FUD) Sites that were managed under CERCLA. Geochemical evaluations were used to determine if elevated metals concentrations in groundwater and soil at a landfill site, a disposal trench, and four Atlas missile silos were due to contamination. Results of the investigations were approved by the New Mexico Environment Department. As a result of the evaluation, the sites all received “No Department of Defense Action Indicated” designation from the New Mexico Environment Department, which removes them from the list of FUD sites. The New Mexico Environment Department has primacy and issued the regulatory decision with consultation by the EPA | |

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| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | | | Region 4 representatives.<br><br>**Myrtle Beach Air Force Base, South Carolina** – EPA Region 4 and the South Carolina Department of Health and Environmental Control have approved the use of geochemical evaluations to support determinations of whether detected metals concentrations reflect site-related contamination or are naturally occurring. Groundwater is the primary medium evaluated to date, at RCRA landfill and dump sites.<br><br>Geochemical evaluation methods and case studies have been described in the following peer-reviewed journal articles:<br><br>Myers, J. and K. Thorbjornsen, 2004, "Identifying Metals Contamination in Soil: A Geochemical Approach," ***Soil & Sediment Contamination***, Vol. 13, No. 1, pp. 1-16.<br><br>Thorbjornsen, K. and J. Myers, 2007, "Identifying Metals Contamination in Groundwater Using Geochemical Correlation Evaluation," ***Environmental Forensics***, Vol. 8, No. 1, pp. 25-35.<br><br>Thorbjornsen, K. and J. Myers, 2007, "Identification of Metals Contamination in Firing-Range Soil Using Geochemical Correlation Evaluation," ***Soil & Sediment Contamination***, Vol. 16, No. 4, pp. 337-349. | |
| 6 | | Section 3.2, Chemical Reported as Not Detected in Any Sample | It states that "TCEQ guidance provides that …the PQL exceeds the cleanup level for the chemical, the PQL shall be used as the cleanup level (30TAC335.554 and 335.555). Therefore, these chemicals are of no concerns at LHAAP-02." Please provide the rationale for reaching this | C | To clarify this conclusion, the first paragraph of Section 3.2 was revised to read, "The majority of organic chemicals were reported with undetected concentrations in all samples (**Table 3-4**); these chemicals are of no concern at LHAAP-02. Among | |

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| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | conclusion. | | these undetected chemicals, some SVOCs were reported as having detection limits above a screening criterion: 4-bromophenyl phenyl ether, 4-chlorophenyl phenyl ether, bis(2-chloroethoxy)methane, bis(2-chloroethoxy)ether, hexachlorobenzene, hexachlorocyclopentadiene, N-nitrosodimethylamine, N-nitroso-di-n-propylamine, pentachlorophenol, and dibenzo(a,h)anthracene, a polycyclic aromatic hydrocarbon (PAH). These chemicals were analyzed using USEPA SW-846 Method 8270C (USACHPPM, 2000). TCEQ guidance (1998) provides that when the Practical Quantitation Limit (PQL) achieved by the most sensitive standard analytical method available exceeds the cleanup level for the chemical, the PQL value shall be used as the cleanup level (30TAC§335.554 and §335.555). Because these chemicals were not detected above their PQL values, they are below the cleanup level and are of no concern at LHAAP-02.” | |
| | | | It states that further interpretation of thallium data cannot be made because the reporting limit for thallium is above both RBSV and ecological benchmark values. What does this mean? Please explain whether additional data is necessary or provide other justifications to assess the risk thallium poses at this site. | C | To clarify this conclusion, the third paragraph of Section 3.2 was revised to read, “Although thallium was not detected in any sample, all reporting limits are above RBSV values (**Table 3-1**). The reporting limits, ~20 mg/kg, exceed the thallium reporting limit measured in the LHAAP background soil study (1 to 5 mg/kg) (Shaw, 2004). Therefore it is difficult to say whether or not thallium values would be below the RBSV value if lower reporting limits are achieved. However, thallium is not listed as a component of devices produced at LHAAP (Table 4-3 of Plexus, 2005). Measurements of thallium in soil at the Igniter Area sites (Section 1009), or the HMX Production Area (Section 1010), were either not confirmed by subsequent analysis or are described as inconsistent (Plexus, 2005). Because thallium was not detected consistently at known production areas, and was not a component of LHAAP processes, it is unlikely that | |

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | | | vacuum trucks that collected sump wastes would contain high levels of thallium to the exclusion of most other metals. Therefore, thallium is judged to be of no further concern at LHAAP-02." | |
| 7 | | Section 4.0, Summary and Conclusions | The TCEQ generally concurs that based on the statistical comparison to background values or the direct comparison to the RBSV and/or Medium Specific Concentrations, the following contaminants are likely not to pose an unacceptable risk to human health: Aluminum, antimony, barium, calcium, magnesium, manganese, nickel, potassium, silver, strontium, VOCs and explosives.<br><br>Please note, as stated in Comment No. 1, the TCEQ cannot at this time, concur with the evaluation regarding site risk to the ecological receptor until the completion of the site wide ecological risk assessment. | C<br><br>C | Noted.<br><br>Please see response to Comment 1. | |
| **Reviewer – Steve Tzhone, EPA Region 6, May 12, 2006** | | | | | | |
| 1 | | General | I've completed the review of the "Draft Final Background Surface Water and Sediment Report, October 2004" and "Draft Final Evaluation of LHAAP-02 Surface Soil Analytical Data, March 30, 2006". Both documents appear satisfactory and I only have one comment for both documents: Consider integration of EPA's OSWER Guidance on UCLs: "Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites," OSWER 9285.6-10, December 2002 and the EPA ProUCL software. | C | Although calculation of exposure point concentrations was not the purpose of this document, the EPA guidance document cited in the comment, and the EPA (2002) document cited in the draft report, are used in all LHAAP documents as needed. The ProUCL software is based on EPA guidance documents and is used as needed. | |
| **Other changes to the document - Shaw** | | | | | | |
| | | | The title of the document has been changed to Site Investigation Report, LHAAP-02, Vacuum Truck Overnight Parking Lot | | | |

**Review Comments to Draft Final Site Investigation Report, Rev. 1, dated December 2007**
**LHAAP-02, Vacuum Truck Overnight Parking Lot**
**Longhorn Army Ammunition Plant, Karnack, Texas**

00071065

**January 2008**

**Reviewer:** Fay Duke, TCEQ
**Respondent:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), or Takes Exception (E)
2. Commenter Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| **Reviewer – Fay Duke, Project Manager/TCEQ, January 11, 2008 email** | | | | | | |
| 1 | | General | I recently received the final SI Report for LHAAP 02. Took me awhile to figure out that I provided comments to the draft final back in Oct. 06. Since that time, we have had various discussions regarding the different evaluation requirements for closure under the Texas RRR Std 2 and RRR Std 3. Which standard are we using for LHAAP02? It appears this site should be evaluated under Std 2 since no site specific risk assessment was done. Therefore, this report needs to be re-evaluated under Std 2 MSC. | | Longhorn AAP sites can be evaluated according to Risk Standard 3 as provided in TCEQ correspondence dated April 2, 2000. The LHAAP-02 site is evaluated in this report according to Risk Standard 3 using the approach provided in Section III of the Consistency Memorandum (*Implementation of the Existing Risk Reduction Rule,* TCEQ memorandum, July 1998). The Consistency Memorandum provides for the use of Risk-Based Screening Values (RBSVs) to identify contaminants which do not need to be included in the baseline risk assessment required under Standard 3.<br><br>Section 3 of the referenced report includes an evaluation of data that compares soil concentrations to RBSVs and to LHAAP background levels. This evaluation represents the initial Data Evaluation step of a baseline risk assessment, and shows that all chemicals except arsenic, copper, and four polycyclic aromatic hydrocarbons would be excluded from a risk assessment. The remaining chemicals are discussed in more detail in Section 4.1.<br><br>This discussion notes that one of 18 samples contained arsenic or copper concentrations above RBSV levels, and that the four polycyclic aromatic hydrocarbons were detected infrequently and at low concentrations. The polycyclic aromatic hydrocarbons are expected to reflect runoff from asphalt paving at the parking lot to the ditches sampled. As such they are judged to be of little concern for human health at LHAAP-02.<br><br>Because the data evaluation eliminated most of the detected chemicals, and the remaining chemicals were measured in only a few samples at isolated locations, calculation of exposure point concentrations | |

**Review Comments to Draft Final Site Investigation Report, Rev. 1, dated December 2007**
**LHAAP-02, Vacuum Truck Overnight Parking Lot**
**Longhorn Army Ammunition Plant, Karnack, Texas**

00071066

**January 2008**

**Reviewer:** Fay Duke, TCEQ
**Respondent:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), or Takes Exception (E)
2. Commenter Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], or E | Response | A or D[2] |
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| | | | | | from the 18 measured levels is expected to be low and to result in low risk estimates so that they are of little concern for human health risk at LHAAP-02. Therefore, no baseline risk assessment or other further action is recommended for the site. | |

**Response to Comments**
**Draft Final Site Investigation Report, Revision 1**
**LHAAP-02, Vacuum Truck Overnight Parking Lot**
**Longhorn Army Ammunition Plant, Karnack, Texas**

**Submitted:** December 2007
**Additional Comments Received:** November 3, 2008

**Reviewer:** Fay Duke, TCEQ
**Respondent:** Shaw Environmental, Inc.

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TCEQ comment (Received November 3, 2008):

We have completed our review of the responses to the agency comments. Based on the additional data and your responses, we continue to have reservations regarding the "no further action" decision for site LHAAP-02.

Response to EPA's Comment No. 2 indicates that well 35AWW03 is the nearest well and samples collected in 1998 indicate no unacceptable concentrations of metals. However, we noted that based on the most recent interpretation of groundwater flow direction, well 35AWW03 is not located down gradient of the suspected impacted areas. We also noted that data collected to date suggest groundwater in the vicinity of LHSMW05 and 35AWW02 may be impacted with metals.

Due to these circumstances, we cannot concur with the no further action decision at this time. It is possible that with additional data, the TCEQ can concur to close the LHAAP-02 soil with no further action and defer the groundwater to be managed under LHAAP-35A(58). We recommend the following:

1. Collect more recent groundwater samples for metals.
2. Evaluate the data to see whether the contamination is stable or worsening.
3. If the metal concentrations in groundwater are stable or exhibit a decreasing trend, than, we would concur with the recommendation of no further action for the soil at site LHAAP-02.

Response: In December 2008, Shaw tried to sample well 35AWW03, located downgradient of LHAAP-03, for metals. The well was dry. Please note that 1998 data from this well showed non-detect or very low levels for the metals of concern. As discussed during the monthly managers' meeting on January 13, 2009, the soil-to-groundwater impact may be addressed by monitoring groundwater in well(s) in the vicinity of site LHAAP-02 concurrent with VOC monitoring under site LHAAP-58.

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**Response to Comments**
**Draft Final Site Investigation Report, Rev. 1**
**LHAAP-02, Vacuum Truck Overnight Parking Lot**
**Longhorn Army Ammunition Plant, Karnack, Texas**

**Submitted:** December 2007
**Comments Received:** April 29, 2008

**Reviewer:** Fay Duke, TCEQ
**Respondent:** Shaw Environmental, Inc.

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***TCEQ Comment***

*We have reviewed the response to our comments that the site evaluation should be conducted under RRR Std 2 for closure since no risk assessment was conducted. The response indicated that all COPCs except As, Cu, and 4 PAHs were screened out of the BLRA, that these COPCs were detected infrequently at isolated locations and at low concentrations, that the PAHs are likely from asphalt paving runoff, and that an evaluation would be expected to result in low risk so no BLRA is recommended. As and Cu just had one detect above the RBSV, and based on the data we concur that it is unlikely that it would represent a health concern for a future C/I worker. Additionally, although the 4 PAHs were not screened out, the concentrations of these PAHs will most likely be within an acceptable risk range under the BLRA. Therefore, we concur no additional evaluation will be necessary to address the direct contact pathway.*

*However, our request to have the site evaluated under RRR Std 2 because we felt that the evaluation would answer two questions: Is the residual concentration of chemical in soil pose unacceptable risk to human health via direct contact pathway and leach to groundwater in acceptable limits. The response to comment addresses only the direct contact pathway. Therefore, there is still a potential issue regarding cross-media transfer. Please evaluate and resubmit.*

**Shaw Response**

The issue of cross-media transfer for chemicals in soil at LHAAP-02 was evaluated using Medium Specific Concentrations (MSCs) developed according to the Texas Commission on Environmental Quality [TCEQ] Texas Risk Reduction Rules, Title 30 Texas Administrative Code (TAC) Chapter 335 (30 TAC §335.563(i)(2) and updates).

The development of the Applicable Standard 3 MSCs developed to consider cross-media transfer from soil to groundwater is described in the attached memorandum dated August 29, 2008. The memorandum summarizes the LHAAP-02 data described in the subject report and re-evaluates the selection of COPCs taking groundwater protection criteria into account, such that antimony, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, strontium, thallium, zinc, bis(2-ethylhexyl)phthalate, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, methylene chloride, p-isopropyltoluene were identified for cross-media transfer concerns.

Concentrations of the selected chemicals are compared to the Applicable Standard 3 MSC values in the attached memorandum. The comparison showed that soil concentrations of all organic

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chemicals identified as COPCs at LHAAP-02 are below those values and are of no further concern for cross-media transfer at LHAAP-02.

Arsenic, cadmium, copper, lead, and mercury, were detected in at least one sample above their Applicable Standard 3 MSC values (represented by calculated cross-media MSCs or background concentrations). Thallium was not detected in any sample analyzed, although the detection limits for all samples were above the Standard 3 MSC.

Comparisons of soil concentrations with Applicable Standard 3 MSC described in the attached memorandum and the discussion in the subject document support similar conclusions for LHAAP-02.

*Arsenic*
The attached memorandum indicates that three of the 18 samples have arsenic concentrations above the Applicable Standard 3 MSC (5.9 ppm) and the remaining 15 concentrations are below that value. None of the 18 samples have arsenic concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (200 ppm).

The geochemical analysis in the subject document describes the maximum arsenic concentration (22.1 ppm) as being correlated with high iron content in the sample, indicating that it is likely naturally occurring, but that the next highest concentration (18.7 ppm) was anomalously high, indicating possible contamination. Both the subject document and the attached memorandum indicate that the isolated arsenic concentrations are low and near background levels, and suggest that elevated arsenic concentrations are not widespread at LHAAP-02, and are of little concern for human health at LHAAP-02.

*Cadmium*
Only two cadmium samples from LHAAP-02 exceed the Applicable Standard 3 MSC for cadmium (1.7 ppm) by 0.45 ppm to 1.1 ppm. The remaining 16 values are below the Standard 3 MSC value and are comparable to, or below, the 95% UPL of the cadmium background level (1.4 ppm). None of the 18 samples have cadmium concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (1,500 ppm). These comparisons indicate that the isolated cadmium concentrations are low and near background levels, and suggest that elevated cadmium concentrations are not widespread at LHAAP-02. Therefore, cadmium is judged to be of little concern for human or environmental health at LHAAP-02.

*Copper*
One copper sample from LHAAP-02 reflects an extreme value of 1,460 ppm that exceeds the Applicable Standard 3 MSC (520 ppm) as developed in the attached memorandum. The next highest concentration (28 ppm) and all concentrations in the remaining 17 of 18 samples from LHAAP-02 are well below the Applicable Standard 3 MSC and are protective of groundwater. None of the 18 samples have copper concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (74,000 ppm). As discussed in the subject document, the single extreme value suggests that the sample might have included piece of copper wire from demolition activities at the area. Copper concentrations in 9 of the 18 samples were below 8.37 ppm, which is the 95% UPL of the copper background level. Both the subject document and the attached memorandum indicate that elevated copper concentrations are not widespread at LHAAP-02. Therefore, copper is judged to be of little concern for human or environmental health at LHAAP-02.

*Lead*
As described in he attached memorandum, five of the 18 samples exceeded the Applicable Standard 3 MSC for lead (280 ppm) by 5 ppm to 88 ppm. None of the 18 samples have lead concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (1,000 ppm). These results suggest that the lead concentrations are low and isolated and that elevated lead concentrations are not widespread at LHAAP-02, and are of little concern for human or environmental health at LHAAP-02.

*Mercury*
As described in he attached memorandum, two of 18 samples slightly exceed the Applicable Standard 3 MSC (0.11 ppm) by 0.012 to 0.033 ppm. Sixteen samples had reported concentrations below the Standard 3 MSC, although five detection limits exceeded the Standard 3 MSC by up to 0.013 ppm. None of the 18 samples have mercury concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (0.15 ppm).

The geochemical analysis in the subject document described associations of mercury and aluminum concentrations that suggest a natural source for mercury detected in the two samples. Although both the attached memorandum and the geochemical analysis in the subject document describe uncertainties associated with concentrations that are estimated (J-qualified) and are near the detection limit for mercury, both descriptions indicate low mercury concentrations that that are detected above the MSC in only 2 of 18 samples. These results suggest that the mercury concentrations are low and isolated and that elevated mercury concentrations are not widespread at LHAAP-02, and are of little concern for human or environmental health at LHAAP-02.

A few metals detected at LHAAP-02 (i.e., arsenic, cadmium, copper, lead, and mercury) exceed Applicable Standard 3 MSC values in at least one sample. However, such deviations reflect low concentrations that occurred in only a few samples at isolated locations and are of little concern at LHAAP-02. No further action is recommended for the LHAAP-02 site.

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# Memorandum

**Date:** **August 29, 2008**

**To:** **Praveen Srivastav**

**CC:** **Dave Cobb**

**From:** **Arthur F. Eidson, Ph.D.**

**RE:** **Development of TCEQ Risk Reduction Rules Standard 3 Medium Specific Concentrations for Soil at the LHAAP-02 Site at the Longhorn Army Ammunition Plant, Karnack, Texas**

This memorandum describes development of Standard 3 Medium Specific Concentrations (MSCs) for chemicals in soil that are protective of groundwater at the Vacuum Truck Overnight Parking Lot (LHAAP-02) located at the former Longhorn Army Ammunition Plant (LHAAP) near Karnack, Texas. The MSC values were developed according to the Texas Commission on Environmental Quality [TCEQ] Texas Risk Reduction Rules, Title 30 Texas Administrative Code (TAC) Chapter 335 (30 TAC §335 and updates).

Site LHAAP-02 was a parking lot for trucks used to pump out various sumps around LHAAP. Evaluation of chemicals in soil was based on data from analysis of ten surface soil samples (0-6 inches below ground surface [bgs]) and eight subsurface samples (12-18 inches bgs). The surface soil samples were analyzed for metals, semi-volatile organic chemicals (SVOCs), explosives, and perchlorate. Subsurface soil samples were analyzed for metals, SVOCs, explosives, perchlorate, and volatile organic compounds (VOCs), and the analytical results were reported in the USACHPPM (2000) document.

In the draft final document (Shaw, 2007a), the analytical data were evaluated by comparison of chemical concentrations to TCEQ risk-based soil screening values (RBSVs) developed to be protective of human health by the direct contact exposure pathways (ingestion, inhalation, and dermal contact). The evaluation showed that aluminum, arsenic, copper, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene, have one or more measured concentrations above these direct contacts.

That evaluation showed that antimony, barium, cadmium, chromium, lead, manganese, nickel, selenium, silver, strontium, zinc, acenaphthylene, anthracene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, pyrene, bis(2-ethylhexyl)phthalate, methylene chloride, and p-isopropyltoluene have concentrations below the direct contact human health screening levels. However, TCEQ comments have indicated that the concentrations of these chemicals can not be removed from consideration based on only these direct contact exposure pathways, but must also be protective of groundwater resources from potential leaching from soil and transport to underlying groundwater-bearing zones.

Selected chemicals were further compared to LHAAP-specific background concentrations statistically or by geochemical evaluations. Aluminum was excluded from further consideration at LHAAP-02, because the maximum detected concentration (MDC) for aluminum is below the 95% UPL value for background (Shaw, 2007a). Statistical comparisons of other metal concentrations to LHAAP background concentrations showed that arsenic and copper concentrations are above background concentrations with 95 percent confidence. Because less than 60 percent of the samples analyzed for mercury, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene concentrations were detected, the above statistical tests could not be applied, and these chemicals were considered here.

Therefore, groundwater-protective Risk Reduction Standard 3 MSCs were calculated to evaluate potential migration of chemicals from soil to groundwater as provided in TCEQ guidance [30 TAC §335.563(i)(2)]. Groundwater-protective Standard 3 MSCs were calculated for the following chemicals:

antimony
arsenic
barium
cadmium
chromium
copper
lead
manganese
mercury
nickel
selenium
silver
strontium
thallium
zinc
bis(2-ethylhexyl)phthalate
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
fluoranthene
indeno(1,2,3-cd)pyrene
phenanthrene
pyrene
methylene chloride
p-isopropyltoluene

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The SAM model was selected to predict impacts of soil contamination on groundwater quality. The SAM model is an extension of the Soil Screening Level calculations EPA (1996) guidance and is based on calculating total mass (liquid phase, solid phase, and gas phase) in the soil column:

$$M_T = V(\rho_b C_s + \theta_w C_w + \theta_a C_g) \qquad \text{Eq. 1}$$

Where

$M_T$ = total mass of chemical
$V$ = volume of the soil column
$\rho_b$ = bulk density
$C_s$ = concentration in soil (dry weight basis)
$\theta_w$ = water filled porosity
$C_w$ = concentration in pore water
$\theta_a$ = air filled porosity
$C_g$ = gas phase concentration.

Total mass is then redistributed using equilibrium conditions based on the adsorption coefficient and Henry's Law constant. The equilibrium equations are:

$$C_s = K_d C_w \qquad \text{Eq. 2}$$

$$C_g = K_H C_w \qquad \text{Eq. 3}$$

Where Kd is the distribution coefficient or adsorption coefficient, and $K_H$ is dimensionless Henry's Law constant.

The SAM model enhancement over EPA's Soil Screening Levels is that the SAM model assumes a zone of contaminated soils overlying a zone of clean soil (zero contaminant concentration). The SAM simulates mixing of contamination through the contaminated and clean soil zones based on equilibrium conditions, and predicts leachate concentration at the bottom of the soil column. The SAM model calculates the leachate concentration according to the equation:

$$C_w = C_s \left( \frac{\rho_b}{K_d\ \rho_b + \theta_w + \theta_a K_H} \right) \left( \frac{L_1}{L_2} \right) \qquad \text{Eq. 4}$$

The concentration in the contaminated soil zone that will produce a given leachate concentration can be calculated as:

$$C_s = C_w \left( \frac{K_d\ \rho_b + \theta_w + \theta_a K_H}{\rho_b} \right) \left( \frac{L_2}{L_1} \right) \qquad \text{Eq. 5}$$

Where $L_1$ is the thickness of the total soil column and $L_2$ is the thickness of the contaminated zone. The factor ($L_2/L_1$) is an enhancement in the SAM model over the Soil Screening Level Model by EPA. A further dilution factor for leachate mixing with groundwater can be incorporated by using leachate dilution factor:

$$LDF = 1 + \frac{Kid}{IL} \qquad \text{Eq. 6}$$

Where

K = aquifer hydraulic conductivity
i = hydraulic gradient in aquifer
d = groundwater mixing zone depth
I = infiltration rate
L = source length parallel to groundwater flow.

The groundwater protective Standard 3 MSC is the soil concentration ($C_s$) described by Eq. 7 where the groundwater concentration ($C_w$) is limited by the TCEQ risk-based drinking water concentration (GW-Ind) modified by the LDF as follows:

$$\text{Standard 3 } MSC = C_w \left( \frac{K_d\ \rho_b + \theta_w + \theta_a K_H}{\rho_b} \right) \left( \frac{L_2}{L_1} \right) x\ LDF \qquad \text{Eq. 7}$$

The model further calculates the soil saturation concentration ($C_{sat}$), which corresponds to the contaminant concentration in soil at which the absorptive capacity of soil particles, the solubility limits of soil pore water, and saturation of soil pore air have been reached. Concentrations above $C_{sat}$ are assumed to be in free phase. The $C_{sat}$ concentration is calculated in the SAM model according to Eq. 8.

$$C_{sat} = S \left( \frac{K_d\ \rho_b + \theta_w + \theta_a K_H}{\rho_b} \right) \qquad \text{Eq. 8}$$

Input parameters to the SAM model that are either specific to LHAAP-02 or are default TCEQ values are shown in **Table 1**. Physical properties of chemicals addressed in the SAM model and are shown in **Table 2**. Calculation of $C_{sat}$ concentrations of each chemical is shown in **Table 3**. Calculated Standard 3 MSC values that are based on the TCEQ MSC for groundwater (GW-Ind) are shown in **Table 4**. The Standard 3 MSC is equated to the $C_{sat}$ concentration for chemicals having a calculated MSC greater than the soil saturation concentration, which includes p-isopropyl toluene and all polycyclic aromatic compounds except benzo(a)anthracene (**Table 4**).

The Applicable Standard 3 MSC was developed as the larger of the Standard 3 MSC value and the background concentration (**Table 5**). The background concentration represents the Applicable MSC for arsenic, mercury, selenium, and thallium.

Concentrations of the selected chemicals are compared to the Applicable Standard 3 MSC values in **Table 6**.

*Arsenic*

Of the six samples detected above the Standard 3 MSC for arsenic, three samples, LAP-0211, LAP-021A, and LAP-027A exceed the Standard 3 MSC of 5.9 ppm by 0.09 to 1.0 ppm. Reported concentrations in two other samples, LAP-0210 and LAP-028B exceed the Standard 3 MSC by up to 16.2 ppm. Arsenic concentrations in 12 of the 18 samples were below 5.86ppm, which is the background concentration and serves as the Applicable MSC (**Table 5**).

*Cadmium*

Only two samples, LAP-026A and LAP027A, exceed the Standard 3 MSC for cadmium, 1.7 ppm. The concentration of cadmium in LAP-0027A exceeds the Standard 3 MSC by 1.1 ppm, and the other sample (LAP-026A) only exceeds the Standard 3 MSC by 0.45 ppm. Cadmium concentrations in 15 of the 18 samples were below 1.4 ppm, the 95% UPL of the cadmium background level.

*Copper*

Sample LAP-027A is reported at 1,460 ppm, which is well over twice the Standard 3 MSC for copper (520 ppm). This is the only sample that exceeded the Standard 3 MSC. Copper concentrations in 9 of the 18 samples were below 8.37 ppm, which is the 95% UPL of the copper background level.

*Lead*

Five of the 18 samples exceeded the Standard 3 MSC for lead (280 ppm). These samples include LAP-0210, LAP-0211, LAP-024A, LAP-025A, and LAP-026A. The concentrations of the samples that exceed the Standard 3 MSC range from 285 ppm to 368 ppm, which means that lead concentrations exceed the Standard 3 MSC by 5 ppm to 88 ppm. Lead concentrations also exceed the 95% UPL of the lead background level of 17.8 ppm.

*Mercury*

The Applicable Standard 3 MSC for mercury is the 95% UPL concentration of 0.11 ppm (**Table 5**). Two of 18 samples, LAP-0210 and LAP-0211, slightly exceed the Standard 3 MSC by 0.012 to 0.033 ppm. The highest mercury concentration was detected in sample LAP-0211 at 0.143 ppm. Sixteen samples had reported concentrations below the Standard 3 MSC, although five detection limits exceeded the Standard 3 MSC by up to 0.013 ppm.

*Thallium*

Thallium was not detected in any of the 18 samples analyzed, although the detection limits for all 18 samples were above the Standard 3 MSC of 7.2 ppm (**Table 2**).

To summarize, arsenic, cadmium, copper, lead, and mercury concentrations exceeded Applicable Standard 3 MSCs in one or more samples. No other chemicals analyzed exceed their respective Applicable MSC values in any of the samples (**Table 6**).

## References

Jacobs Engineering Group, Inc., 2002, *Final Remedial Investigation Report, Group 4 Sites, Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60,67, Goose Prairie Creek, Volumes 1 and 2: Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Oak Ridge, Tennessee, April.

Shaw Environmental, Inc., 2008a, *LHAAP-49 Site Evaluation Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Appendix E, May.

Shaw, 2008b, *LHAAP-58 Feasibility Study Report, Longhorn Army Ammunition Plant, Karnack, Texas*,.

Shaw, 2007a, *Draft Final Site Investigation Report, LHAAP-02, Vacuum Truck Overnight Parking Lot, Longhorn Army Ammunition Plant, Karnack, Texas*, November

Shaw, 2007b, *Draft Final Focused Feasibility Study, LHAAP-35A(58)*, September.

Shaw, 2004, *Final Background Soil Study Report, Longhorn Army Ammunition Plant, Karnack*, Texas, July.

U.S. Environmental Protection Agency (EPA), 1996, *Soil Screening Guidance: User's Guide*, Second Edition.

U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), 2000, *Hazardous and Medical Waste Study NO: 37-EF-5506-00, Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant, Karnack, Texas*, Vols. I and II, July.

**Table 1**
**Input Values for Parameters Used to Calculate Risk Reduction Standard 3 Groundwater-Protective MSCs for Soil**
**LHAAP-02 Vacuum Truck Overnight Parking Lot**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Parameter | | Value | Units | Comment | Reference |
|---|---|---|---|---|---|
| Soil Dry Bulk Density | $r_b$ | 1.6 | g/cm$^3$ | Dry bulk density was assumed to be 100 pounds per cubic feet and is a typical value for silty clayey sands. | Shaw,2008a |
| Particle Density | $r_{particle}$ | 2.65 | g/cm$^3$ | TCEQ default value | 30 TAC §350.75 (c) and (d) |
| Total Porosity | n | 0.4 | unitless | n = 1-(rb/rparticle) = 1-(1.6 g/cc/2.65 g/cc) | EPA, 1996, pg. 38. |
| Volumetric Water Content of Soil | $q_{ws}$ | 0.1 | unitless | Assumed 25% | Shaw, 2008a |
| Soil Fraction Organic Carbon | $f_{oc}$ | 0.02 | unitless | TCEQ default value | 30 TAC §335.567. Appendix I. (p. 26) |
| Net Infiltration Rate through soil | I | 38.1 | cm/yr | 15 inches/yr estimated for LHAAP | Shaw, 2008a |
| Groundwater mixing zone | $d_a$ | 153 | cm | Well 35AWW03 screened 5' in sand layer | Jacobs, 2002, Fig. 5-2, and pg 5-3 |
| Thickness of affected soil | $L_1$ | 45.7 | cm | Samples taken 1-0.5 ft and 1.0 to 1.5 ft bgs. 1.5 ft assumed all chemicals | CHPPM, 2000, Vol I, pg 5. |
| Distance from top of affected soils to top of water bearing unit. | $L_2$ | 457 | cm | Clay to silty clay zone at Well 35AWW03 with 5 foot sand layer. Groundwater at ~ 15 ft bgs. | Jacobs, 2002, Fig. 5-1 and pg.5-3. |
| Groundwater Darcy Velocity | $V_{gw}$ | 8.0325 | cm/yr | = K*i*31500000 sec/yr | EPA, 1996, pg. 42. |
| Hydraulic conductivity in groundwater bearing unit | K | 1.50E-05 | cm/sec | Range of values 1.5E-05 to 3.5E-05. | Shaw, 2007b, pg. 1-3. |
| Hydraulic gradient in groundwater bearing unit | i | 0.017 | unitless | Value calculated from potentiometric map scale: 10ft elevation/600ft horizontal | Shaw, 2007b, Fig. 1 |
| Width of soil source area parallel to groundwater flow direction | W | 1.37E+04 | cm | Maximum site dimension, 450 ft | Shaw, 2008a, Fig. 1-2. |
| Groundwater mixing zone (20') | $d_{gw}$ | 305 | cm | 35AWW03 screened 5' in sand layer | Jacobs, 2002, Fig. 5-2 |
| Soil Air Filled Porosity ($q_{as}$) | $q_{as}$ | 0.3 | unitless | n - qws | EPA, 1996, pg. 38. |
| Henry's Law Constant | H' | Chemical specific property | unitless | See Table 3 | TCEQ, 2008 |
| Organic Carbon Partition Coefficient | $K_{oc}$ | Chemical specific property | unitless | See Table 3 | TCEQ, 2008 |
| Soil Water Partition Coefficient | $K_d$ | Chemical specific property | unitless | See Table 3 | TCEQ, 2008 |

$$\text{LDF} = 1 + \frac{V_{gw} \times \delta_{gw}}{I \times W}$$

**LDF = 1.005E+00**

CHPPM, 2000: U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Hazardous and Medical Waste Study NO: 37-EF-5506-00, *Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant, Karnack, Texas*, Vol I, pg 5, July

EPA, 1996. *Soil Screening Guidance: Technical Background Document*, EPA/540/R-95/128018, U. S. Environmental Protection Agency, Office of Emergency and Remedial Response, July.

Jacobs Engineering Group, Inc., 2002: *Final Remedial Investigation Report, Group 4 Sites, Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60,67, Goose Prairie Creek, Volumes 1 and 2: Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Oak Ridge, Tennessee, April, Figure 5-2.

Shaw, 2007b, *Draft Final Focused Feasibility Study, LHAAP-35A(58)*, September.

Shaw, 2008a *LHAAP-49 Site Evaluation Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Appendix E, May.

Texas Commission on Environmental Quality (TCEQ), *Risk Reduction Rules*, 30 TAC §335.567. Appendix I.

TCEQ, 2008: Texas Risk Reduction Program Physical Chemical Properties Tables, April, accessed at http://www.tceq.state.tx.us/remediation/trrp/trrppcls.html

**Table 2**
**Physical Chemical Properties of Chemicals of Concern a**
**LHAAP-02 Vacuum Truck Overnight Parking Lot**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Chemical of Concern | Henry's Law Constant (H') (unitless) | Organic Carbon Partition Coefficient (Koc, unitless) | Soil Water Partition Coefficient (Kd, unitless) | pH Dependent Partition Coefficient at pH 5.8 Soil Kd | Solubility in Water (S, mg/L) |
|---|---|---|---|---|---|
| Antimony | 0.00E+00 | NA | b | 6.20E+01 | 0.00E+00 |
| Arsenic | 0.00E+00 | NA | b | 2.70E+01 | 0.00E+00 |
| Barium | 0.00E+00 | NA | b | 2.60E+01 | 0.00E+00 |
| Cadmium | 0.00E+00 | NA | b | 3.30E+01 | 0.00E+00 |
| Chromium | 0.00E+00 | NA | b | 8.70E+04 | 0.00E+00 |
| Copper | 0.00E+00 | NA | 3.98E+01 | d | 0.00E+00 |
| Lead | 0.00E+00 | NA | c | 1.83E+03 | 0.00E+00 |
| Manganese | 0.00E+00 | NA | 5.01E+01 | d | 0.00E+00 |
| Mercury | 4.74E-01 | NA | b | 1.60E+00 | 3.00E-02 |
| Nickel | 0.00E+00 | NA | b | 3.40E+01 | 0.00E+00 |
| Selenium | 0.00E+00 | NA | b | 9.80E+00 | 0.00E+00 |
| Silver | 0.00E+00 | NA | b | 8.40E-01 | 0.00E+00 |
| Strontium | 0.00E+00 | NA | 2.00E+00 | d | 0.00E+00 |
| Thallium | 0.00E+00 | NA | b | 5.50E+01 | 2.90E+03 |
| Zinc | 0.00E+00 | NA | b | 3.20E+01 | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | 4.57E-04 | 6.81E+05 | 1.36E+04 | e | 3.00E-01 |
| Acenaphthylene | 4.74E-03 | 6.92E+03 | 1.38E+02 | e | 3.94E+00 |
| Anthracene | 4.61E-03 | 2.34E+04 | 4.69E+02 | e | 4.34E-02 |
| Benzo(a)anthracene | 1.39E-04 | 3.55E+05 | 7.10E+03 | e | 1.00E-02 |
| Benzo(a)pyrene | 4.70E-05 | 9.55E+05 | 1.91E+04 | e | 1.62E-03 |
| Benzo(b)flouranthene | 4.99E-04 | 1.20E+06 | 2.40E+04 | e | 1.50E-03 |
| Benzo(k)fluoranthene | 4.45E-07 | 1.23E+06 | 2.46E+04 | e | 5.50E-04 |
| Benzo(ghi)perylene | 5.82E-06 | 1.58E+06 | 3.17E+04 | e | 2.60E-04 |
| Chrysene | 5.03E-05 | 3.09E+05 | 6.18E+03 | e | 2.00E-03 |
| Fluoranthene | 3.88E-04 | 4.90E+04 | 9.80E+02 | e | 2.60E-01 |
| Indeno(1,2,3-cd)pyrene | 2.85E-06 | 3.47E+06 | 6.93E+04 | e | 3.75E-03 |
| Phenanthrene | 5.40E-03 | 1.41E+04 | 2.83E+02 | e | 9.94E-01 |
| Pyrene | 4.57E-04 | 3.80E+04 | 7.60E+02 | e | 1.35E-01 |
| Methylene Chloride | 9.10E-02 | 1.17E+01 | 2.35E-01 | e | 1.54E+04 |
| p-Isopropyltoluene | 4.66E-01 | 2.29E+03 | 4.58E+01 | e | 1.71E+01 |

Notes:
[a] Annual TCEQ update of chemical/physical properties table [(Figure: 30 TAC §350.73(e)], April 2008.
[b] pH-dependent Kd value obtained from Figure 30TAC§350.73(e)(1)(C), April 2008.
[c] pH-dependent Kd value obtained from Figure 30TAC§350.73(e)(1)(A), April 2008.
[d] value calculated from log (Kd) value from chemphys TRRP table, April 2008.
[e] value calculated by Koc * foc
pH data provided in the LHAAP-58 Feasibility Study, Shaw, 2008b. Well LHSMW-04 is screened from 18.2 to 28.2 ft bgs and is located approximately 450 ft southesast of well 35AWW03, which is screened from 9 to 19 ft bgs, and is located within LHAAP-02. pH was measured on LHSMW-04 sample taken on Feb 20, 2007. Well locations and screening data are shown in the Jacobs (2002) document, Figures 5-1, 5-2, and Table 5-1.

# Table 3
## Calculation of Soil Saturation Concentration (Csat) Values for Chemicals in Soil
## LHAAP-02 Vacuum Truck Overnight Storage Parking lot
## LonghormnArmy Ammunition Plant
## Karnack, Texas

$$K_{sw} = \frac{\rho_b}{\theta_{ws}+K_d\rho_b+H'\theta_{as}} \qquad C_{sat} = S\,\frac{(\theta_{ws}+K_d\rho_b+H'\theta_{as})}{\rho_b}$$

| Chemical of Concern (COC) | $r_b$ | $q_{ws}$ | $F_{oc}$ | $K_{oc}$ | $K_d$ | H' | $q_{as}$ | S | $K_{sw}$ | $C_{sat}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 1.60 | 0.10 | 0.020 | NA | 6.2E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 1.6E-02 | NA |
| Arsenic | 1.60 | 0.10 | 0.020 | NA | 2.7E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 3.7E-02 | NA |
| Barium | 1.60 | 0.10 | 0.020 | NA | 2.6E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 3.8E-02 | NA |
| Cadmium | 1.60 | 0.10 | 0.020 | NA | 3.3E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 3.0E-02 | NA |
| Chromium | 1.60 | 0.10 | 0.020 | NA | 8.7E+04 | 0.0E+00 | 0.30 | 0.0E+00 | 1.1E-05 | NA |
| Copper | 1.60 | 0.10 | 0.020 | NA | 4.0E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 2.5E-02 | NA |
| Lead | 1.60 | 0.10 | 0.020 | NA | 1.8E+03 | 0.0E+00 | 0.30 | 0.0E+00 | 5.5E-04 | NA |
| Manganese | 1.60 | 0.10 | 0.020 | NA | 5.0E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 2.0E-02 | NA |
| Mercury | 1.60 | 0.10 | 0.020 | NA | 1.6E+00 | 4.7E-01 | 0.30 | 3.0E-02 | 5.7E-01 | 5.3E-02 |
| Nickel | 1.60 | 0.10 | 0.020 | NA | 3.4E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 2.9E-02 | NA |
| Selenium | 1.60 | 0.10 | 0.020 | NA | 9.8E+00 | 0.0E+00 | 0.30 | 0.0E+00 | 1.0E-01 | NA |
| Silver | 1.60 | 0.10 | 0.020 | NA | 8.4E-01 | 0.0E+00 | 0.30 | 0.0E+00 | 1.1E+00 | NA |
| Strontium | 1.60 | 0.10 | 0.020 | NA | 2.0E+00 | 0.0E+00 | 0.30 | 0.0E+00 | 4.8E-01 | NA |
| Thallium | 1.60 | 0.10 | 0.020 | NA | 5.5E+01 | 0.0E+00 | 0.30 | 2.9E+03 | 1.8E-02 | 1.6E+05 |
| Zinc | 1.60 | 0.10 | 0.020 | NA | 3.2E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 3.1E-02 | NA |
| Bis(2-ethylhexyl)phthalate | 1.60 | 0.10 | 0.020 | 6.8E+05 | 1.4E+04 | 4.6E-04 | 0.30 | 3.0E-01 | 7.3E-05 | 4.1E+03 |
| Acenaphthylene | 1.60 | 0.10 | 0.020 | 6.9E+03 | 1.4E+02 | 4.7E-03 | 0.30 | 3.9E+00 | 7.2E-03 | 5.4E+02 |
| Anthracene | 1.60 | 0.10 | 0.020 | 2.3E+04 | 4.7E+02 | 4.6E-03 | 0.30 | 4.3E-02 | 2.1E-03 | 2.0E+01 |
| Benzo(a)anthracene | 1.60 | 0.10 | 0.020 | 3.5E+05 | 7.1E+03 | 1.4E-04 | 0.30 | 1.0E-02 | 1.4E-04 | 7.1E+01 |
| Benzo(a)pyrene | 1.60 | 0.10 | 0.020 | 9.5E+05 | 1.9E+04 | 4.7E-05 | 0.30 | 1.6E-03 | 5.2E-05 | 3.1E+01 |
| Benzo(b)flouranthene | 1.60 | 0.10 | 0.020 | 1.2E+06 | 2.4E+04 | 5.0E-04 | 0.30 | 1.5E-03 | 4.2E-05 | 3.6E+01 |
| Benzo(k)fluoranthene | 1.60 | 0.10 | 0.020 | 1.2E+06 | 2.5E+04 | 4.4E-07 | 0.30 | 5.5E-04 | 4.1E-05 | 1.4E+01 |
| Benzo(ghi)perylene | 1.60 | 0.10 | 0.020 | 1.6E+06 | 3.2E+04 | 5.8E-06 | 0.30 | 2.6E-04 | 3.2E-05 | 8.2E+00 |
| Chrysene | 1.60 | 0.10 | 0.020 | 3.1E+05 | 6.2E+03 | 5.0E-05 | 0.30 | 2.0E-03 | 1.6E-04 | 1.2E+01 |
| Flouranthene | 1.60 | 0.10 | 0.020 | 4.9E+04 | 9.8E+02 | 3.9E-04 | 0.30 | 2.6E-01 | 1.0E-03 | 2.5E+02 |
| Indeno(1,2,3-cd)pyrene | 1.60 | 0.10 | 0.020 | 3.5E+06 | 6.9E+04 | 2.9E-06 | 0.30 | 3.8E-03 | 1.4E-05 | 2.6E+02 |
| Phenanthrene | 1.60 | 0.10 | 0.020 | 1.4E+04 | 2.8E+02 | 5.4E-03 | 0.30 | 9.9E-01 | 3.5E-03 | 2.8E+02 |
| Pyrene | 1.60 | 0.10 | 0.020 | 3.8E+04 | 7.6E+02 | 4.6E-04 | 0.30 | 1.4E-01 | 1.3E-03 | 1.0E+02 |
| Methylene Chloride | 1.60 | 0.10 | 0.020 | 1.2E+01 | 2.3E-01 | 9.1E-02 | 0.30 | 1.5E+04 | 3.2E+00 | 4.8E+03 |
| p-Isopropyltoluene | 1.60 | 0.10 | 0.020 | 2.3E+03 | 4.6E+01 | 4.7E-01 | 0.30 | 1.7E+01 | 2.2E-02 | 7.9E+02 |

Notes:

NA: Not Applicable

## Table 4
## Calculation of Standard 3 Commercial/Industrial Medium Specific Concentration (MSC) for Chemicals in Soil
## LHAAP-02 Vacuum Truck Overnight Storage Parking lot
## LonghormnArmy Ammunition Plant
## Karnack, Texas

$$\text{Standard 3 Soil MSC} = \frac{\text{GW-Ind x LDF x }(L_2/L_1)}{\text{Ksw}}$$

| Chemical of Concern (COC) | GW-Ind MSC[a] (mg/L) | LDF | $K_{sw}$ | $L_2$ | $L_1$ | Standard 3 Commercial/Industrial Soil MSC (mg/kg) Calculated | Corrected [b] |
|---|---|---|---|---|---|---|---|
| Antimony | 6.0E-03 | 1.00E+00 | 0.016 | 457.00 | 45.70 | 3.7E+00 | |
| Arsenic | 1.0E-02 | 1.00E+00 | 0.037 | 457.00 | 45.70 | 2.7E+00 | |
| Barium | 2.0E+00 | 1.00E+00 | 0.038 | 457.00 | 45.70 | 5.2E+02 | |
| Cadmium | 5.0E-03 | 1.00E+00 | 0.030 | 457.00 | 45.70 | 1.7E+00 | |
| Chromium | 1.0E-01 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 8.7E+04 | |
| Copper | 1.3E+00 | 1.00E+00 | 0.025 | 457.00 | 45.70 | 5.2E+02 | |
| Lead | 1.5E-02 | 1.00E+00 | 0.001 | 457.00 | 45.70 | 2.8E+02 | |
| Manganese | 1.4E+01 | 1.00E+00 | 0.020 | 457.00 | 45.70 | 7.1E+03 | |
| Mercury | 2.0E-03 | 1.00E+00 | 0.571 | 457.00 | 45.70 | 3.5E-02 | |
| Nickel | 2.0E+00 | 1.00E+00 | 0.029 | 457.00 | 45.70 | 6.8E+02 | |
| Selenium | 5.0E-02 | 1.00E+00 | 0.101 | 457.00 | 45.70 | 5.0E+00 | |
| Silver | 5.1E-01 | 1.00E+00 | 1.108 | 457.00 | 45.70 | 4.6E+00 | |
| Strontium | 6.1E+01 | 1.00E+00 | 0.485 | 457.00 | 45.70 | 1.3E+03 | |
| Thallium | 2.0E-03 | 1.00E+00 | 0.018 | 457.00 | 45.70 | 1.1E+00 | |
| Zinc | 3.1E+01 | 1.00E+00 | 0.031 | 457.00 | 45.70 | 1.0E+04 | |
| Bis(2-ethylhexyl)phthalate | 6.0E-03 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 8.2E+02 | |
| Acenaphthylene | 6.1E+00 | 1.00E+00 | 0.007 | 457.00 | 45.70 | 8.5E+03 | 5.4E+02 |
| Anthracene | 3.1E+01 | 1.00E+00 | 0.002 | 457.00 | 45.70 | 1.4E+05 | 2.0E+01 |
| Benzo(a)anthracene | 3.9E-04 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 2.8E+01 | |
| Benzo(a)pyrene | 2.0E-04 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 3.8E+01 | 3.1E+01 |
| Benzo(b)flouranthene | 3.9E-04 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 9.4E+01 | 3.6E+01 |
| Benzo(k)fluoranthene | 3.9E-03 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 9.7E+02 | 1.4E+01 |
| Benzo(ghi)perylene | 3.1E+00 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 9.8E+05 | 8.2E+00 |
| Chrysene | 3.9E-02 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 2.4E+03 | 1.2E+01 |
| Flouranthene | 4.1E+00 | 1.00E+00 | 0.001 | 457.00 | 45.70 | 4.0E+04 | 2.5E+02 |
| Indeno(1,2,3-cd)pyrene | 3.9E-04 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 2.7E+02 | 2.6E+02 |
| Phenanthrene | 3.1E+00 | 1.00E+00 | 0.004 | 457.00 | 45.70 | 8.7E+03 | 2.8E+02 |
| Pyrene | 3.1E+00 | 1.00E+00 | 0.001 | 457.00 | 45.70 | 2.3E+04 | 1.0E+02 |
| Methylene Chloride | 5.0E-03 | 1.00E+00 | 3.179 | 457.00 | 45.70 | 1.6E-02 | |
| p-Isopropyltoluene | 1.0E+01 | 1.00E+00 | 0.022 | 457.00 | 45.70 | 4.6E+03 | 7.9E+02 |

Notes:

[a] GW-Ind MSC value from TCEQ 2006 MSC table.

[b] Corrected MSC = $C_{sat}$ concentration shown on Table 3

# Table 5
## Applicable Standard 3 Commercial/Industrial Medium Specific Concentration (MSC) for Chemicals in Soil at the LHAAP-02 Vacuum Truck Overnight Storage Parking lot LonghormnArmy Ammunition Plant Karnack, Texas

| Chemical of Concern (COC) | Calculated Standard 3 Commercial/ Industrial Soil MSC [a] (mg/kg) | Background Concentration [b] | Applicable Commercial/ Industrial Soil MSC [c] (mg/kg) |
|---|---|---|---|
| Antimony | 3.7E+00 | 1.6E+00 | 3.7E+00 |
| Arsenic | 2.7E+00 | 5.9E+00 | 5.9E+00 |
| Barium | 5.2E+02 | 1.2E+02 | 5.2E+02 |
| Cadmium | 1.7E+00 | 1.4E+00 | 1.7E+00 |
| Chromium | 8.7E+04 | 2.9E+01 | 8.7E+04 |
| Copper | 5.2E+02 | 8.4E+00 | 5.2E+02 |
| Lead | 2.8E+02 | 1.8E+01 | 2.8E+02 |
| Manganese | 7.1E+03 | 1.3E+03 | 7.1E+03 |
| Mercury | 3.5E-02 | 1.1E-01 | 1.1E-01 |
| Nickel | 6.8E+02 | 9.4E+00 | 6.8E+02 |
| Selenium | 5.0E+00 | 5.6E+00 | 5.6E+00 |
| Silver | 4.6E+00 | 3.7E-01 | 4.6E+00 |
| Strontium | 1.3E+03 | 2.5E+01 | 1.3E+03 |
| Thallium | 1.1E+00 | 7.2E+00 | 7.2E+00 |
| Zinc | 1.0E+04 | 2.5E+01 | 1.0E+04 |
| Bis(2-ethylhexyl)phthalate | 8.2E+02 | NA | 8.2E+02 |
| Acenaphthylene | 5.4E+02 | NA | 5.4E+02 |
| Anthracene | 2.0E+01 | NA | 2.0E+01 |
| Benzo(a)anthracene | 2.8E+01 | 1.5E-02 | 2.8E+01 |
| Benzo(a)pyrene | 3.1E+01 | 1.5E-02 | 3.1E+01 |
| Benzo(b)flouranthene | 3.6E+01 | 1.5E-02 | 3.6E+01 |
| Benzo(k)fluoranthene | 1.4E+01 | 1.3E-02 | 1.4E+01 |
| Benzo(ghi)perylene | 8.2E+00 | 1.2E-02 | 8.2E+00 |
| Chrysene | 1.2E+01 | 1.5E-02 | 1.2E+01 |
| Flouranthene | 2.5E+02 | 2.3E-02 | 2.5E+02 |
| Indeno(1,2,3-cd)pyrene | 2.6E+02 | 1.4E-02 | 2.6E+02 |
| Phenanthrene | 2.8E+02 | NA | 2.8E+02 |
| Pyrene | 1.0E+02 | 1.9E-02 | 1.0E+02 |
| Methylene Chloride | 1.6E-02 | NA | 1.6E-02 |
| p-Isopropyltoluene | 7.9E+02 | NA | 7.9E+02 |

Notes:

[a] Value equals the lower of the calculated MSC or $C_{sat}$ values (Table 4).

[b] Background oncentration calculated as the 95% UPL of soil background concentrations (*Final Background Soil Study Report, Longhorn Army Ammunition Plant, Karnack, Texas* , July ( Shaw, 2004).

[c] Applicable Commercial/Industrial Soil MSC equals largest of Standard 3 MSC, background and GWP-Ind values.

NA: Not Applicable

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Antimony | 0.75 | | Yes |
| LAP-0211 | Antimony | 0.622 | | Yes |
| LAP-021A | Antimony | 0.429 | | Yes |
| LAP-021B | Antimony | 0.1415 | 0.283 | No |
| LAP-022A | Antimony | 0.407 | | Yes |
| LAP-022B | Antimony | 0.284 | | Yes |
| LAP-023A | Antimony | 0.461 | | Yes |
| LAP-023B | Antimony | 0.1395 | 0.279 | No |
| LAP-024A | Antimony | 0.489 | | Yes |
| LAP-024B | Antimony | 0.1395 | 0.279 | No |
| LAP-025A | Antimony | 0.498 | | Yes |
| LAP-025B | Antimony | 0.284 | | Yes |
| LAP-026A | Antimony | 0.87 | | Yes |
| LAP-026B | Antimony | 0.145 | 0.29 | No |
| LAP-027A | Antimony | 0.417 | | Yes |
| LAP-027B | Antimony | 0.354 | | Yes |
| LAP-028A | Antimony | 0.259 | | Yes |
| LAP-028B | Antimony | 0.431 | | Yes |
| Maximum Value | | 0.87 | 0.29 | |
| Minimum Value | | 0.1395 | 0.279 | |
| Frequency of Detection (%) | | 78 | | |
| Statistical Distribution Type | | Normal | | |
| Applicable MSC (Std 3 or Background) | | 3.7E+00 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Arsenic | ***18.7*** | | Yes |
| LAP-0211 | Arsenic | ***6.9*** | | Yes |
| LAP-021A | Arsenic | ***5.99*** | | Yes |
| LAP-021B | Arsenic | 1.28 | | Yes |
| LAP-022A | Arsenic | 3.44 | | Yes |
| LAP-022B | Arsenic | 1.86 | | Yes |
| LAP-023A | Arsenic | 5.04 | | Yes |
| LAP-023B | Arsenic | 1.25 | | Yes |
| LAP-024A | Arsenic | 4.72 | | Yes |
| LAP-024B | Arsenic | 4.04 | | Yes |
| LAP-025A | Arsenic | 4.21 | | Yes |
| LAP-025B | Arsenic | 2.07 | | Yes |
| LAP-026A | Arsenic | ***9.01*** | | Yes |
| LAP-026B | Arsenic | 2.75 | | Yes |
| LAP-027A | Arsenic | ***6.08*** | | Yes |
| LAP-027B | Arsenic | 4.04 | | Yes |
| LAP-028A | Arsenic | 5.25 | | Yes |
| LAP-028B | Arsenic | ***22.1*** | | Yes |
| Maximum Value | | ***22.1*** | | |
| Minimum Value | | 1.25 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | 5.9E+00 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Barium | 60.2 | | Yes |
| LAP-0211 | Barium | 52.5 | | Yes |
| LAP-021A | Barium | 34.3 | | Yes |
| LAP-021B | Barium | 81.3 | | Yes |
| LAP-022A | Barium | 46.4 | | Yes |
| LAP-022B | Barium | 49.5 | | Yes |
| LAP-023A | Barium | 32.9 | | Yes |
| LAP-023B | Barium | 48.5 | | Yes |
| LAP-024A | Barium | 36.2 | | Yes |
| LAP-024B | Barium | 53 | | Yes |
| LAP-025A | Barium | 42.1 | | Yes |
| LAP-025B | Barium | 44.7 | | Yes |
| LAP-026A | Barium | 43.4 | | Yes |
| LAP-026B | Barium | 67.9 | | Yes |
| LAP-027A | Barium | 78.5 | | Yes |
| LAP-027B | Barium | 115 | | Yes |
| LAP-028A | Barium | 80.6 | | Yes |
| LAP-028B | Barium | 27.9 | | Yes |
| Maximum Value | | 115 | | |
| Minimum Value | | 27.9 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | 5.2E+02 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Cadmium | 1.34 | | Yes |
| LAP-0211 | Cadmium | 0.995 | | Yes |
| LAP-021A | Cadmium | 0.269 | | Yes |
| LAP-021B | Cadmium | 0.1415 | 0.283 | No |
| LAP-022A | Cadmium | 0.51 | | Yes |
| LAP-022B | Cadmium | 0.142 | 0.284 | No |
| LAP-023A | Cadmium | 0.461 | | Yes |
| LAP-023B | Cadmium | 0.1395 | 0.279 | No |
| LAP-024A | Cadmium | 1.41 | | Yes |
| LAP-024B | Cadmium | 0.279 | | Yes |
| LAP-025A | Cadmium | 1.33 | | Yes |
| LAP-025B | Cadmium | 0.142 | 0.284 | No |
| LAP-026A | Cadmium | ***2.15*** | | Yes |
| LAP-026B | Cadmium | 0.145 | 0.29 | No |
| LAP-027A | Cadmium | ***3.8*** | | Yes |
| LAP-027B | Cadmium | 0.1475 | 0.295 | No |
| LAP-028A | Cadmium | 0.724 | | Yes |
| LAP-028B | Cadmium | 0.828 | | Yes |
| Maximum Value | | ***3.8*** | 0.295 | |
| Minimum Value | | 0.1395 | 0.279 | |
| Frequency of Detection (%) | | 67 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | 1.7E+00 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Calcium | 17600 | | Yes |
| LAP-0211 | Calcium | 14800 | | Yes |
| LAP-021A | Calcium | 49000 | | Yes |
| LAP-021B | Calcium | 790 | | Yes |
| LAP-022A | Calcium | 67000 | | Yes |
| LAP-022B | Calcium | 821 | | Yes |
| LAP-023A | Calcium | 58400 | | Yes |
| LAP-023B | Calcium | 1160 | | Yes |
| LAP-024A | Calcium | 60300 | | Yes |
| LAP-024B | Calcium | 2800 | | Yes |
| LAP-025A | Calcium | 64200 | | Yes |
| LAP-025B | Calcium | 662 | | Yes |
| LAP-026A | Calcium | 42900 | | Yes |
| LAP-026B | Calcium | 1030 | | Yes |
| LAP-027A | Calcium | 20700 | | Yes |
| LAP-027B | Calcium | 2460 | | Yes |
| LAP-028A | Calcium | 2760 | | Yes |
| LAP-028B | Calcium | 14900 | | Yes |
| Maximum Value | | 67000 | | |
| Minimum Value | | 662 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | NA | | |

| Sample Number | Analyte | Concentration (ppm) a in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Chromium | 28.8 | | Yes |
| LAP-0211 | Chromium | 19.1 | | Yes |
| LAP-021A | Chromium | 15.6 | | Yes |
| LAP-021B | Chromium | 8.3 | | Yes |
| LAP-022A | Chromium | 19.3 | | Yes |
| LAP-022B | Chromium | 8.8 | | Yes |
| LAP-023A | Chromium | 32.4 | | Yes |
| LAP-023B | Chromium | 8.75 | | Yes |
| LAP-024A | Chromium | 19.5 | | Yes |
| LAP-024B | Chromium | 23.7 | | Yes |
| LAP-025A | Chromium | 20.2 | | Yes |
| LAP-025B | Chromium | 10.4 | | Yes |
| LAP-026A | Chromium | 35.4 | | Yes |
| LAP-026B | Chromium | 8.52 | | Yes |
| LAP-027A | Chromium | 27.1 | | Yes |
| LAP-027B | Chromium | 12.8 | | Yes |
| LAP-028A | Chromium | 16.2 | | Yes |
| LAP-028B | Chromium | 37.7 | | Yes |
| Maximum Value | | 37.7 | | |
| Minimum Value | | 8.3 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | 8.7E+04 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Copper | 19.1 | | Yes | LAP-0210 | Iron | 18200 | | Yes | LAP-0210 | Lead | ***330*** | | Yes |
| LAP-0211 | Copper | 10.9 | | Yes | LAP-0211 | Iron | 13200 | | Yes | LAP-0211 | Lead | ***335*** | | Yes |
| LAP-021A | Copper | 4.12 | | Yes | LAP-021A | Iron | 20600 | | Yes | LAP-021A | Lead | 104 | | Yes |
| LAP-021B | Copper | 1.135 | 2.27 | No | LAP-021B | Iron | 5800 | | Yes | LAP-021B | Lead | 8.92 | | Yes |
| LAP-022A | Copper | 5.84 | | Yes | LAP-022A | Iron | 12700 | | Yes | LAP-022A | Lead | 158 | | Yes |
| LAP-022B | Copper | 10.7 | | Yes | LAP-022B | Iron | 7060 | | Yes | LAP-022B | Lead | 9.7 | | Yes |
| LAP-023A | Copper | 6.94 | | Yes | LAP-023A | Iron | 17500 | | Yes | LAP-023A | Lead | 259 | | Yes |
| LAP-023B | Copper | 1.115 | 2.23 | No | LAP-023B | Iron | 6370 | | Yes | LAP-023B | Lead | 9.92 | | Yes |
| LAP-024A | Copper | 13.2 | | Yes | LAP-024A | Iron | 16500 | | Yes | LAP-024A | Lead | ***285*** | | Yes |
| LAP-024B | Copper | 4.37 | | Yes | LAP-024B | Iron | 27900 | | Yes | LAP-024B | Lead | 72.3 | | Yes |
| LAP-025A | Copper | 9.08 | | Yes | LAP-025A | Iron | 10900 | | Yes | LAP-025A | Lead | ***347*** | | Yes |
| LAP-025B | Copper | 1.14 | 2.28 | No | LAP-025B | Iron | 6450 | | Yes | LAP-025B | Lead | 12.7 | | Yes |
| LAP-026A | Copper | 28 | | Yes | LAP-026A | Iron | 15100 | | Yes | LAP-026A | Lead | ***368*** | | Yes |
| LAP-026B | Copper | 1.16 | 2.32 | No | LAP-026B | Iron | 5850 | | Yes | LAP-026B | Lead | 15.3 | | Yes |
| LAP-027A | Copper | ***1460*** | | Yes | LAP-027A | Iron | 15400 | | Yes | LAP-027A | Lead | 236 | | Yes |
| LAP-027B | Copper | 6.12 | | Yes | LAP-027B | Iron | 12200 | | Yes | LAP-027B | Lead | 30 | | Yes |
| LAP-028A | Copper | 10.5 | | Yes | LAP-028A | Iron | 16100 | | Yes | LAP-028A | Lead | 41.5 | | Yes |
| LAP-028B | Copper | 5.49 | | Yes | LAP-028B | Iron | 38400 | | Yes | LAP-028B | Lead | 87.5 | | Yes |
| Maximum Value | | ***1460*** | 2.32 | | Maximum Value | | 38400 | | | Maximum Value | | ***368*** | | |
| Minimum Value | | 1.115 | 2.23 | | Minimum Value | | 5800 | | | Minimum Value | | 8.92 | | |
| Frequency of Detection (%) | | 78 | | | Frequency of Detection (%) | | 100 | | | Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Lognormal | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 5.2E+02 | | | Applicable MSC (Std 3 or Background) | | NA | | | Applicable MSC (Std 3 or Background) | | 2.8E+02 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Magnesium | 562 | | Yes | LAP-0210 | Manganese | 260 | | Yes | LAP-0210 | Mercury | ***0.122*** | 0.106 | Yes |
| LAP-0211 | Magnesium | 665 | | Yes | LAP-0211 | Manganese | 305 | | Yes | LAP-0211 | Mercury | ***0.143*** | ***0.123*** | Yes |
| LAP-021A | Magnesium | 515 | | Yes | LAP-021A | Manganese | 203 | | Yes | LAP-021A | Mercury | 0.0535 | 0.107 | No |
| LAP-021B | Magnesium | 141 | | Yes | LAP-021B | Manganese | 232 | | Yes | LAP-021B | Mercury | 0.0565 | ***0.113*** | No |
| LAP-022A | Magnesium | 732 | | Yes | LAP-022A | Manganese | 231 | | Yes | LAP-022A | Mercury | 0.04875 | 0.0975 | No |
| LAP-022B | Magnesium | 127 | | Yes | LAP-022B | Manganese | 205 | | Yes | LAP-022B | Mercury | 0.0545 | 0.109 | No |
| LAP-023A | Magnesium | 727 | | Yes | LAP-023A | Manganese | 227 | | Yes | LAP-023A | Mercury | 0.0505 | 0.101 | No |
| LAP-023B | Magnesium | 149 | | Yes | LAP-023B | Manganese | 125 | | Yes | LAP-023B | Mercury | 0.0535 | 0.107 | No |
| LAP-024A | Magnesium | 857 | | Yes | LAP-024A | Manganese | 392 | | Yes | LAP-024A | Mercury | 0.0535 | 0.107 | No |
| LAP-024B | Magnesium | 343 | | Yes | LAP-024B | Manganese | 173 | | Yes | LAP-024B | Mercury | 0.053 | 0.106 | No |
| LAP-025A | Magnesium | 821 | | Yes | LAP-025A | Manganese | 278 | | Yes | LAP-025A | Mercury | 0.0535 | 0.107 | No |
| LAP-025B | Magnesium | 210 | | Yes | LAP-025B | Manganese | 58 | | Yes | LAP-025B | Mercury | 0.057 | ***0.114*** | No |
| LAP-026A | Magnesium | 612 | | Yes | LAP-026A | Manganese | 206 | | Yes | LAP-026A | Mercury | 0.0505 | 0.101 | No |
| LAP-026B | Magnesium | 211 | | Yes | LAP-026B | Manganese | 168 | | Yes | LAP-026B | Mercury | 0.055 | ***0.11*** | No |
| LAP-027A | Magnesium | 491 | | Yes | LAP-027A | Manganese | 268 | | Yes | LAP-027A | Mercury | 0.0515 | 0.103 | No |
| LAP-027B | Magnesium | 495 | | Yes | LAP-027B | Manganese | 19.7 | | Yes | LAP-027B | Mercury | 0.0585 | ***0.117*** | No |
| LAP-028A | Magnesium | 404 | | Yes | LAP-028A | Manganese | 413 | | Yes | LAP-028A | Mercury | 0.051 | 0.102 | No |
| LAP-028B | Magnesium | 235 | | Yes | LAP-028B | Manganese | 173 | | Yes | LAP-028B | Mercury | 0.0525 | 0.105 | No |
| Maximum Value | | 857 | | | Maximum Value | | 413 | | | Maximum Value | | ***0.143*** | ***0.123*** | |
| Minimum Value | | 127 | | | Minimum Value | | 19.7 | | | Minimum Value | | 0.04875 | 0.0975 | |
| Frequency of Detection (%) | | 100 | | | Frequency of Detection (%) | | 100 | | | Frequency of Detection (%) | | 11 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Normal | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | NA | | | Applicable MSC (Std 3 or Background) | | 7.1E+03 | | | Applicable MSC (Std 3 or Background) | | 1.1E-01 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Nickel | 2.68 | 5.36 | No |
| LAP-0211 | Nickel | 3.115 | 6.23 | No |
| LAP-021A | Nickel | 2.685 | 5.37 | No |
| LAP-021B | Nickel | 0.2835 | 0.567 | No |
| LAP-022A | Nickel | 2.56 | 5.12 | No |
| LAP-022B | Nickel | 2.84 | 5.68 | No |
| LAP-023A | Nickel | 2.565 | 5.13 | No |
| LAP-023B | Nickel | 2.795 | 5.59 | No |
| LAP-024A | Nickel | 16.8 | | Yes |
| LAP-024B | Nickel | 2.795 | 5.59 | No |
| LAP-025A | Nickel | 7.2 | | Yes |
| LAP-025B | Nickel | 2.845 | 5.69 | No |
| LAP-026A | Nickel | 5.47 | | Yes |
| LAP-026B | Nickel | 2.895 | 5.79 | No |
| LAP-027A | Nickel | 7.36 | | Yes |
| LAP-027B | Nickel | 2.95 | 5.9 | No |
| LAP-028A | Nickel | 2.59 | 5.18 | No |
| LAP-028B | Nickel | 2.77 | 5.54 | No |
| Maximum Value | | 16.8 | 6.23 | |
| Minimum Value | | 0.2835 | 0.567 | |
| Frequency of Detection (%) | | 22 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 6.8E+02 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Potassium | 303 | | Yes |
| LAP-0211 | Potassium | 392 | | Yes |
| LAP-021A | Potassium | 201 | | Yes |
| LAP-021B | Potassium | 138 | | Yes |
| LAP-022A | Potassium | 337 | | Yes |
| LAP-022B | Potassium | 151 | | Yes |
| LAP-023A | Potassium | 243 | | Yes |
| LAP-023B | Potassium | 183 | | Yes |
| LAP-024A | Potassium | 447 | 5.43 | Yes |
| LAP-024B | Potassium | 264 | | Yes |
| LAP-025A | Potassium | 362 | | Yes |
| LAP-025B | Potassium | 291 | | Yes |
| LAP-026A | Potassium | 241 | | Yes |
| LAP-026B | Potassium | 221 | | Yes |
| LAP-027A | Potassium | 252 | | Yes |
| LAP-027B | Potassium | 372 | | Yes |
| LAP-028A | Potassium | 400 | | Yes |
| LAP-028B | Potassium | 104 | | Yes |
| Maximum Value | | 447 | 5.43 | |
| Minimum Value | | 104 | 5.43 | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Normal | | |
| Applicable MSC (Std 3 or Background) | | NA | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Selenium | 0.856 | | Yes |
| LAP-0211 | Selenium | 0.685 | | Yes |
| LAP-021A | Selenium | 0.912 | | Yes |
| LAP-021B | Selenium | 0.283 | 0.566 | No |
| LAP-022A | Selenium | 0.866 | | Yes |
| LAP-022B | Selenium | 0.283 | 0.566 | No |
| LAP-023A | Selenium | 0.921 | | Yes |
| LAP-023B | Selenium | 0.2795 | 0.559 | No |
| LAP-024A | Selenium | 1.2 | | Yes |
| LAP-024B | Selenium | 0.893 | | Yes |
| LAP-025A | Selenium | 1.11 | | Yes |
| LAP-025B | Selenium | 0.284 | 0.568 | No |
| LAP-026A | Selenium | 0.87 | | Yes |
| LAP-026B | Selenium | 0.695 | | Yes |
| LAP-027A | Selenium | 0.99 | | Yes |
| LAP-027B | Selenium | 0.945 | | Yes |
| LAP-028A | Selenium | 0.775 | | Yes |
| LAP-028B | Selenium | 0.993 | | Yes |
| Maximum Value | | 1.2 | 0.568 | |
| Minimum Value | | 0.2795 | 0.559 | |
| Frequency of Detection (%) | | 78 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 5.6E+00 | | |

*Footnotes are provided on the last page of this table*

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**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Silver | 0.535 | | Yes |
| LAP-0211 | Silver | 0.155 | 0.31 | No |
| LAP-021A | Silver | 0.1345 | 0.269 | No |
| LAP-021B | Silver | 0.1415 | 0.283 | No |
| LAP-022A | Silver | 0.1275 | 0.255 | No |
| LAP-022B | Silver | 0.142 | 0.284 | No |
| LAP-023A | Silver | 0.128 | 0.256 | No |
| LAP-023B | Silver | 0.1395 | 0.279 | No |
| LAP-024A | Silver | 0.136 | 0.272 | No |
| LAP-024B | Silver | 0.1395 | 0.279 | No |
| LAP-025A | Silver | 0.1385 | 0.277 | No |
| LAP-025B | Silver | 0.142 | 0.284 | No |
| LAP-026A | Silver | 0.256 | | Yes |
| LAP-026B | Silver | 0.145 | 0.29 | No |
| LAP-027A | Silver | 0.13 | 0.26 | No |
| LAP-027B | Silver | 0.1475 | 0.295 | No |
| LAP-028A | Silver | 0.1295 | 0.259 | No |
| LAP-028B | Silver | 0.138 | 0.276 | No |
| Maximum Value | | 0.535 | 0.31 | |
| Minimum Value | | 0.1275 | 0.255 | |
| Frequency of Detection (%) | | 11 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 4.6E+00 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Strontium | 61.4 | | Yes |
| LAP-0211 | Strontium | 32.2 | | Yes |
| LAP-021A | Strontium | 117 | | Yes |
| LAP-021B | Strontium | 4 | | Yes |
| LAP-022A | Strontium | 184 | | Yes |
| LAP-022B | Strontium | 3.5 | | Yes |
| LAP-023A | Strontium | 147 | | Yes |
| LAP-023B | Strontium | 4.49 | | Yes |
| LAP-024A | Strontium | 138 | | Yes |
| LAP-024B | Strontium | 10.3 | | Yes |
| LAP-025A | Strontium | 178 | | Yes |
| LAP-025B | Strontium | 3.2 | | Yes |
| LAP-026A | Strontium | 103 | | Yes |
| LAP-026B | Strontium | 4.29 | | Yes |
| LAP-027A | Strontium | 56.4 | | Yes |
| LAP-027B | Strontium | 14.6 | | Yes |
| LAP-028A | Strontium | 10.9 | | Yes |
| LAP-028B | Strontium | 31.6 | | Yes |
| Maximum Value | | 184 | | |
| Minimum Value | | 3.2 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 1.3E+03 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Thallium | ***10.75*** | ***21.5*** | No |
| LAP-0211 | Thallium | ***12.45*** | ***24.9*** | No |
| LAP-021A | Thallium | ***10.75*** | ***21.5*** | No |
| LAP-021B | Thallium | ***11.35*** | ***22.7*** | No |
| LAP-022A | Thallium | ***10.25*** | ***20.5*** | No |
| LAP-022B | Thallium | ***11.35*** | ***22.7*** | No |
| LAP-023A | Thallium | ***10.25*** | ***20.5*** | No |
| LAP-023B | Thallium | ***11.15*** | ***22.3*** | No |
| LAP-024A | Thallium | ***10.85*** | ***21.7*** | No |
| LAP-024B | Thallium | ***11.15*** | ***22.3*** | No |
| LAP-025A | Thallium | ***11.05*** | ***22.1*** | No |
| LAP-025B | Thallium | ***11.4*** | ***22.8*** | No |
| LAP-026A | Thallium | ***10.25*** | ***20.5*** | No |
| LAP-026B | Thallium | ***11.6*** | ***23.2*** | No |
| LAP-027A | Thallium | ***10.4*** | ***20.8*** | No |
| LAP-027B | Thallium | ***11.8*** | ***23.6*** | No |
| LAP-028A | Thallium | ***10.35*** | ***20.7*** | No |
| LAP-028B | Thallium | ***11.1*** | ***22.2*** | No |
| Maximum Value | | ***12.45*** | ***24.9*** | |
| Minimum Value | | ***10.25*** | ***20.5*** | |
| Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 7.2E+00 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Zinc | 191 | | Yes | LAP-0210 | Bis(2-ethylhexyl)phthalate | 1.8 | 1.8 | No |
| LAP-0211 | Zinc | 147 | | Yes | LAP-0211 | Bis(2-ethylhexyl)phthalate | 0.17 | 0.4 | Yes |
| LAP-021A | Zinc | 46.5 | | Yes | LAP-021A | Bis(2-ethylhexyl)phthalate | 0.35 | 0.35 | No |
| LAP-021B | Zinc | 7.87 | | Yes | LAP-021B | Bis(2-ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-022A | Zinc | 72.6 | | Yes | LAP-022A | Bis(2-ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-022B | Zinc | 14.5 | | Yes | LAP-022B | Bis(2-ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-023A | Zinc | 65.5 | | Yes | LAP-023A | Bis(2-ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-023B | Zinc | 9.07 | | Yes | LAP-023B | Bis(2-ethylhexyl)phthalate | 0.6 | 0.6 | No |
| LAP-024A | Zinc | 186 | | Yes | LAP-024A | Bis(2-ethylhexyl)phthalate | 0.43 | 1.8 | Yes |
| LAP-024B | Zinc | 49.1 | | Yes | LAP-024B | Bis(2-ethylhexyl)phthalate | 0.079 | 0.37 | Yes |
| LAP-025A | Zinc | 136 | | Yes | LAP-025A | Bis(2-ethylhexyl)phthalate | 0.13 | 0.37 | Yes |
| LAP-025B | Zinc | 10.4 | | Yes | LAP-025B | Bis(2-ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-026A | Zinc | 122 | | Yes | LAP-026A | Bis(2-ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-026B | Zinc | 10.3 | | Yes | LAP-026B | Bis(2-ethylhexyl)phthalate | 0.08 | 0.38 | Yes |
| LAP-027A | Zinc | 826 | | Yes | LAP-027A | Bis(2-ethylhexyl)phthalate | 3.5 | 3.5 | No |
| LAP-027B | Zinc | 20.1 | | Yes | LAP-027B | Bis(2-ethylhexyl)phthalate | 0.39 | 0.39 | No |
| LAP-028A | Zinc | 133 | | Yes | LAP-028A | Bis(2-ethylhexyl)phthalate | 1.8 | 1.8 | No |
| LAP-028B | Zinc | 50 | | Yes | LAP-028B | Bis(2-ethylhexyl)phthalate | 1.9 | 1.9 | No |
| Maximum Value | | 826 | | | Maximum Value | | 3.5 | 3.5 | |
| Minimum Value | | 7.87 | | | Minimum Value | | 0.079 | 0.35 | |
| Frequency of Detection (%) | | 100 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 1.0E+04 | | | Applicable MSC (Std 3 or Background) | | 8.2E+02 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Acenaphthylene | 1.8 | 1.8 | No | LAP-0210 | Anthracene | 1.8 | 1.8 | No |
| LAP-0211 | Acenaphthylene | 0.4 | 0.4 | No | LAP-0211 | Anthracene | 0.4 | 0.4 | No |
| LAP-021A | Acenaphthylene | 0.35 | 0.35 | No | LAP-021A | Anthracene | 0.35 | 0.35 | No |
| LAP-021B | Acenaphthylene | 0.38 | 0.38 | No | LAP-021B | Anthracene | 0.38 | 0.38 | No |
| LAP-022A | Acenaphthylene | 1.7 | 1.7 | No | LAP-022A | Anthracene | 1.7 | 1.7 | No |
| LAP-022B | Acenaphthylene | 0.38 | 0.38 | No | LAP-022B | Anthracene | 0.38 | 0.38 | No |
| LAP-023A | Acenaphthylene | 1.7 | 1.7 | No | LAP-023A | Anthracene | 1.7 | 1.7 | No |
| LAP-023B | Acenaphthylene | 0.6 | 0.6 | No | LAP-023B | Anthracene | 0.6 | 0.6 | No |
| LAP-024A | Acenaphthylene | 1.8 | 1.8 | No | LAP-024A | Anthracene | 1.8 | 1.8 | No |
| LAP-024B | Acenaphthylene | 0.37 | 0.37 | No | LAP-024B | Anthracene | 0.37 | 0.37 | No |
| LAP-025A | Acenaphthylene | 0.37 | 0.37 | No | LAP-025A | Anthracene | 0.37 | 0.37 | No |
| LAP-025B | Acenaphthylene | 0.38 | 0.38 | No | LAP-025B | Anthracene | 0.38 | 0.38 | No |
| LAP-026A | Acenaphthylene | 1.7 | 1.7 | No | LAP-026A | Anthracene | 1.7 | 1.7 | No |
| LAP-026B | Acenaphthylene | 0.38 | 0.38 | No | LAP-026B | Anthracene | 0.38 | 0.38 | No |
| LAP-027A | Acenaphthylene | 0.64 | 3.5 | Yes | LAP-027A | Anthracene | 0.69 | 3.5 | Yes |
| LAP-027B | Acenaphthylene | 0.39 | 0.39 | No | LAP-027B | Anthracene | 0.39 | 0.39 | No |
| LAP-028A | Acenaphthylene | 1.8 | 1.8 | No | LAP-028A | Anthracene | 1.8 | 1.8 | No |
| LAP-028B | Acenaphthylene | 1.9 | 1.9 | No | LAP-028B | Anthracene | 1.9 | 1.9 | No |
| Maximum Value | | 1.9 | 3.5 | | Maximum Value | | 1.9 | 3.5 | |
| Minimum Value | | 0.35 | 0.35 | | Minimum Value | | 0.35 | 0.35 | |
| Frequency of Detection (%) | | 0 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 5.4E+02 | | | Applicable MSC (Std 3 or Background) | | 2.0E+01 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Benzo(a)anthracene | 0.52 | 1.8 | Yes | LAP-0210 | Benzo(a)pyrene | 0.54 | 1.8 | Yes |
| LAP-0211 | Benzo(a)anthracene | 0.4 | 0.4 | No | LAP-0211 | Benzo(a)pyrene | 0.4 | 0.4 | No |
| LAP-021A | Benzo(a)anthracene | 0.093 | 0.35 | Yes | LAP-021A | Benzo(a)pyrene | 0.11 | 0.35 | Yes |
| LAP-021B | Benzo(a)anthracene | 0.38 | 0.38 | No | LAP-021B | Benzo(a)pyrene | 0.38 | 0.38 | No |
| LAP-022A | Benzo(a)anthracene | 1.7 | 1.7 | No | LAP-022A | Benzo(a)pyrene | 1.7 | 1.7 | No |
| LAP-022B | Benzo(a)anthracene | 0.38 | 0.38 | No | LAP-022B | Benzo(a)pyrene | 0.38 | 0.38 | No |
| LAP-023A | Benzo(a)anthracene | 1.7 | 1.7 | No | LAP-023A | Benzo(a)pyrene | 1.7 | 1.7 | No |
| LAP-023B | Benzo(a)anthracene | 0.6 | 0.6 | No | LAP-023B | Benzo(a)pyrene | 0.6 | 0.6 | No |
| LAP-024A | Benzo(a)anthracene | 1.8 | 1.8 | No | LAP-024A | Benzo(a)pyrene | 1.8 | 1.8 | No |
| LAP-024B | Benzo(a)anthracene | 0.057 | 0.37 | Yes | LAP-024B | Benzo(a)pyrene | 0.077 | 0.37 | Yes |
| LAP-025A | Benzo(a)anthracene | 0.078 | 0.37 | Yes | LAP-025A | Benzo(a)pyrene | 0.11 | 0.37 | Yes |
| LAP-025B | Benzo(a)anthracene | 0.38 | 0.38 | No | LAP-025B | Benzo(a)pyrene | 0.38 | 0.38 | No |
| LAP-026A | Benzo(a)anthracene | 0.17 | 1.7 | Yes | LAP-026A | Benzo(a)pyrene | 0.19 | 1.7 | Yes |
| LAP-026B | Benzo(a)anthracene | 0.38 | 0.38 | No | LAP-026B | Benzo(a)pyrene | 0.38 | 0.38 | No |
| LAP-027A | Benzo(a)anthracene | 2 | 3.5 | Yes | LAP-027A | Benzo(a)pyrene | 2 | 3.5 | Yes |
| LAP-027B | Benzo(a)anthracene | 0.048 | 0.39 | Yes | LAP-027B | Benzo(a)pyrene | 0.047 | 0.39 | Yes |
| LAP-028A | Benzo(a)anthracene | 0.18 | 1.8 | Yes | LAP-028A | Benzo(a)pyrene | 0.19 | 1.8 | Yes |
| LAP-028B | Benzo(a)anthracene | 1.9 | 1.9 | No | LAP-028B | Benzo(a)pyrene | 1.9 | 1.9 | No |
| Maximum Value | | 2 | | | Maximum Value | | 2 | | |
| Minimum Value | | 0.048 | | | Minimum Value | | 0.047 | | |
| Frequency of Detection (%) | | 0 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 2.8E+01 | | | Applicable MSC (Std 3 or Background) | | 3.1E+01 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Benzo(b)fluoranthene | 0.9 | 1.8 | No | LAP-0210 | Benzo(k)fluoranthene | 0.37 | 1.8 | Yes |
| LAP-0211 | Benzo(b)fluoranthene | 0.2 | 0.4 | No | LAP-0211 | Benzo(k)fluoranthene | 0.4 | 0.4 | No |
| LAP-021A | Benzo(b)fluoranthene | 0.175 | 0.35 | No | LAP-021A | Benzo(k)fluoranthene | 0.071 | 0.35 | Yes |
| LAP-021B | Benzo(b)fluoranthene | 0.19 | 0.38 | No | LAP-021B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-022A | Benzo(b)fluoranthene | 0.85 | 1.7 | No | LAP-022A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-022B | Benzo(b)fluoranthene | 0.19 | 0.38 | No | LAP-022B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-023A | Benzo(b)fluoranthene | 0.85 | 1.7 | No | LAP-023A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-023B | Benzo(b)fluoranthene | 0.3 | 0.6 | No | LAP-023B | Benzo(k)fluoranthene | 0.6 | 0.6 | No |
| LAP-024A | Benzo(b)fluoranthene | 0.9 | 1.8 | No | LAP-024A | Benzo(k)fluoranthene | 1.8 | 1.8 | No |
| LAP-024B | Benzo(b)fluoranthene | 0.185 | 0.37 | No | LAP-024B | Benzo(k)fluoranthene | 0.087 | 0.37 | Yes |
| LAP-025A | Benzo(b)fluoranthene | 0.185 | 0.37 | No | LAP-025A | Benzo(k)fluoranthene | 0.085 | 0.37 | Yes |
| LAP-025B | Benzo(b)fluoranthene | 0.19 | 0.38 | No | LAP-025B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-026A | Benzo(b)fluoranthene | 0.85 | 1.7 | No | LAP-026A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-026B | Benzo(b)fluoranthene | 0.19 | 0.38 | No | LAP-026B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-027A | Benzo(b)fluoranthene | 4.7 | 3.5 | Yes | LAP-027A | Benzo(k)fluoranthene | 2 | 3.5 | Yes |
| LAP-027B | Benzo(b)fluoranthene | 0.195 | 0.39 | No | LAP-027B | Benzo(k)fluoranthene | 0.39 | 0.39 | No |
| LAP-028A | Benzo(b)fluoranthene | 0.9 | 1.8 | No | LAP-028A | Benzo(k)fluoranthene | 1.8 | 1.8 | No |
| LAP-028B | Benzo(b)fluoranthene | 0.95 | 1.9 | No | LAP-028B | Benzo(k)fluoranthene | 1.9 | 1.9 | No |
| Maximum Value | | 4.7 | 3.5 | | Maximum Value | | 2 | 3.5 | |
| Minimum Value | | 0.175 | 0.35 | | Minimum Value | | 0.071 | 0.35 | |
| Frequency of Detection (%) | | 6 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 3.6E+01 | | | Applicable MSC (Std 3 or Background) | | 1.4E+01 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Benzo(ghi)perylene | 0.83 | 1.8 | Yes | LAP-0210 | Chrysene | 0.67 | 1.8 | Yes |
| LAP-0211 | Benzo(ghi)perylene | 0.4 | 0.4 | No | LAP-0211 | Chrysene | 0.051 | 0.4 | Yes |
| LAP-021A | Benzo(ghi)perylene | 0.05 | 0.35 | Yes | LAP-021A | Chrysene | 0.13 | 0.35 | Yes |
| LAP-021B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-021B | Chrysene | 0.38 | 0.38 | No |
| LAP-022A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-022A | Chrysene | 1.7 | 1.7 | No |
| LAP-022B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-022B | Chrysene | 0.38 | 0.38 | No |
| LAP-023A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-023A | Chrysene | 0.26 | 1.7 | Yes |
| LAP-023B | Benzo(ghi)perylene | 0.6 | 0.6 | No | LAP-023B | Chrysene | 0.6 | 0.6 | No |
| LAP-024A | Benzo(ghi)perylene | 1.8 | 1.8 | No | LAP-024A | Chrysene | 0.19 | 1.8 | Yes |
| LAP-024B | Benzo(ghi)perylene | 0.37 | 0.37 | No | LAP-024B | Chrysene | 0.11 | 0.37 | Yes |
| LAP-025A | Benzo(ghi)perylene | 0.078 | 0.37 | Yes | LAP-025A | Chrysene | 0.12 | 0.37 | Yes |
| LAP-025B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-025B | Chrysene | 0.38 | 0.38 | No |
| LAP-026A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-026A | Chrysene | 0.22 | 1.7 | Yes |
| LAP-026B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-026B | Chrysene | 0.38 | 0.38 | No |
| LAP-027A | Benzo(ghi)perylene | 0.81 | 3.5 | Yes | LAP-027A | Chrysene | 2.7 | 3.5 | Yes |
| LAP-027B | Benzo(ghi)perylene | 0.042 | 0.39 | Yes | LAP-027B | Chrysene | 0.05 | 0.39 | Yes |
| LAP-028A | Benzo(ghi)perylene | 1.8 | 1.8 | No | LAP-028A | Chrysene | 0.34 | 1.8 | Yes |
| LAP-028B | Benzo(ghi)perylene | 1.9 | 1.9 | No | LAP-028B | Chrysene | 1.9 | 1.9 | No |
| Maximum Value | | 1.9 | 3.5 | | Maximum Value | | 2.7 | 3.5 | |
| Minimum Value | | 0.042 | 0.35 | | Minimum Value | | 0.05 | 0.35 | |
| Frequency of Detection (%) | | 0 | | | Frequency of Detection (%) | | 1 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 8.2E+00 | | | Applicable MSC (Std 3 or Background) | | 1.2E+01 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Fluoranthene | 0.9 | 1.8 | No | LAP-0210 | Indeno(1,2,3-cd)pyrene | 0.49 | 1.8 | Yes |
| LAP-0211 | Fluoranthene | 0.2 | 0.4 | No | LAP-0211 | Indeno(1,2,3-cd)pyrene | 0.4 | 0.4 | No |
| LAP-021A | Fluoranthene | 0.175 | 0.35 | No | LAP-021A | Indeno(1,2,3-cd)pyrene | 0.053 | 0.35 | Yes |
| LAP-021B | Fluoranthene | 0.19 | 0.38 | No | LAP-021B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-022A | Fluoranthene | 0.85 | 1.7 | No | LAP-022A | Indeno(1,2,3-cd)pyrene | 1.7 | 1.7 | No |
| LAP-022B | Fluoranthene | 0.19 | 0.38 | No | LAP-022B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-023A | Fluoranthene | 0.85 | 1.7 | No | LAP-023A | Indeno(1,2,3-cd)pyrene | 1.7 | 1.7 | No |
| LAP-023B | Fluoranthene | 0.3 | 0.6 | No | LAP-023B | Indeno(1,2,3-cd)pyrene | 0.6 | 0.6 | No |
| LAP-024A | Fluoranthene | 0.9 | 1.8 | No | LAP-024A | Indeno(1,2,3-cd)pyrene | 1.8 | 1.8 | No |
| LAP-024B | Fluoranthene | 0.185 | 0.37 | No | LAP-024B | Indeno(1,2,3-cd)pyrene | 0.37 | 0.37 | No |
| LAP-025A | Fluoranthene | 0.185 | 0.37 | No | LAP-025A | Indeno(1,2,3-cd)pyrene | 0.091 | 0.37 | Yes |
| LAP-025B | Fluoranthene | 0.19 | 0.38 | No | LAP-025B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-026A | Fluoranthene | 0.85 | 1.7 | No | LAP-026A | Indeno(1,2,3-cd)pyrene | 1.7 | 1.7 | No |
| LAP-026B | Fluoranthene | 0.19 | 0.38 | No | LAP-026B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-027A | Fluoranthene | 3.9 | 3.5 | Yes | LAP-027A | Indeno(1,2,3-cd)pyrene | 1 | 3.5 | Yes |
| LAP-027B | Fluoranthene | 0.195 | 0.39 | No | LAP-027B | Indeno(1,2,3-cd)pyrene | 0.049 | 0.39 | Yes |
| LAP-028A | Fluoranthene | 0.9 | 1.8 | No | LAP-028A | Indeno(1,2,3-cd)pyrene | 1.8 | 1.8 | No |
| LAP-028B | Fluoranthene | 0.95 | 1.9 | No | LAP-028B | Indeno(1,2,3-cd)pyrene | 1.9 | 1.9 | No |
| Maximum Value | | 3.9 | 3.5 | | Maximum Value | | 1.9 | 3.5 | |
| Minimum Value | | 0.175 | 0.35 | | Minimum Value | | 0.049 | 0.35 | |
| Frequency of Detection (%) | | 6 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 2.5E+02 | | | Applicable MSC (Std 3 or Background) | | 2.6E+02 | | |

*Footnotes are provided on the last page of this table*

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**Table 6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Phenanthrene | 0.46 | 1.8 | Yes | LAP-0210 | Pyrene | 1 | 1.8 | Yes |
| LAP-0211 | Phenanthrene | 0.4 | 0.4 | No | LAP-0211 | Pyrene | 0.048 | 0.4 | Yes |
| LAP-021A | Phenanthrene | 0.071 | 0.35 | Yes | LAP-021A | Pyrene | 0.15 | 0.35 | Yes |
| LAP-021B | Phenanthrene | 0.38 | 0.38 | No | LAP-021B | Pyrene | 0.38 | 0.38 | No |
| LAP-022A | Phenanthrene | 1.7 | 1.7 | No | LAP-022A | Pyrene | 1.7 | 1.7 | No |
| LAP-022B | Phenanthrene | 0.38 | 0.38 | No | LAP-022B | Pyrene | 0.38 | 0.38 | No |
| LAP-023A | Phenanthrene | 1.7 | 1.7 | No | LAP-023A | Pyrene | 0.22 | 1.7 | Yes |
| LAP-023B | Phenanthrene | 0.6 | 0.6 | No | LAP-023B | Pyrene | 0.6 | 0.6 | No |
| LAP-024A | Phenanthrene | 1.8 | 1.8 | No | LAP-024A | Pyrene | 1.8 | 1.8 | No |
| LAP-024B | Phenanthrene | 0.37 | 0.37 | No | LAP-024B | Pyrene | 0.079 | 0.37 | Yes |
| LAP-025A | Phenanthrene | 0.37 | 0.37 | No | LAP-025A | Pyrene | 0.13 | 0.37 | Yes |
| LAP-025B | Phenanthrene | 0.38 | 0.38 | No | LAP-025B | Pyrene | 0.38 | 0.38 | No |
| LAP-026A | Phenanthrene | 1.7 | 1.7 | No | LAP-026A | Pyrene | 0.29 | 1.7 | Yes |
| LAP-026B | Phenanthrene | 0.38 | 0.38 | No | LAP-026B | Pyrene | 0.38 | 0.38 | No |
| LAP-027A | Phenanthrene | 3.5 | 3.5 | No | LAP-027A | Pyrene | 3.3 | 3.5 | Yes |
| LAP-027B | Phenanthrene | 0.39 | 0.39 | No | LAP-027B | Pyrene | 0.089 | 0.39 | Yes |
| LAP-028A | Phenanthrene | 1.8 | 1.8 | No | LAP-028A | Pyrene | 0.29 | 1.8 | Yes |
| LAP-028B | Phenanthrene | 1.9 | 1.9 | No | LAP-028B | Pyrene | 1.9 | 1.9 | No |
| Maximum Value | | 3.5 | 3.5 | | Maximum Value | | 3.3 | 3.5 | |
| Minimum Value | | 0.071 | 0.35 | | Minimum Value | | 0.048 | 0.35 | |
| Frequency of Detection (%) | | 0 | | | Frequency of Detection (%) | | 1 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 2.8E+02 | | | Applicable MSC (Std 3 or Background) | | 1.0E+02 | | |

*Footnotes are provided on the last page of this table*

**Table 6**
**Comparison of Soil Concenetrations to Aplicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**
**Longhorn Army Ammunition Plant**
**Karnack, Texas**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-021B | Methylene chloride | 0.0025 | 0.005 | No | LAP-021B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-022B | Methylene chloride | 0.006 | 0.005 | Yes | LAP-022B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-023B | Methylene chloride | 0.0025 | 0.005 | No | LAP-023B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-024B | Methylene chloride | 0.0025 | 0.005 | No | LAP-024B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-025B | Methylene chloride | 0.0025 | 0.005 | No | LAP-025B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-026B | Methylene chloride | 0.0025 | 0.005 | No | LAP-026B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-027B | Methylene chloride | 0.0025 | 0.005 | No | LAP-027B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-028B | Methylene chloride | 0.0025 | 0.005 | No | LAP-028B | p-Isopropyltoluene | 0.006 | 0.005 | Yes |
| Maximum Value | | 0.006 | 0.005 | | Maximum Value | | 0.006 | 0.005 | |
| Minimum Value | | 0.0025 | 0.005 | | Minimum Value | | 0.0025 | 0.005 | |
| Frequency of Detection (%) | | 13 | | | Frequency of Detection (%) | | 13 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 1.6E-02 | | | Applicable MSC (Std 3 or Background) | | 7.9E+02 | | |

Footnotes and Abbreviations:

***Boldface italics enclosed in a box indicates value exceeding the Applicable MSC (the larger of the Standard 3 MSC or background values).***

[a] Concentrations reported were corrected for soil moisture content.

[b] Value equals 1/2 the detection limit if the concentration was reported as not detected.

[c] Blank entry indicates no value reported for the sample.

LAP: Prefix indicates sample reported in *Hazardous and Medical Waste Study No: 37-EF-5506-00, Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant, Karnack, Texas*, Volumes I and II, U. S. Army Center for Health Promotion and Preventative Medicine, July 2000

LHAAP: Longhorn Army Ammunition Plant

Nutrient: Chemical is an essential nutrient; no screening value available or required

RBSV: risk-based screening value soil specified in the Texas Risk Reduction Rules, Title 30 Texas Administrative Code Chapter 335 (30TAC§335) as updated through 2005

00071097

*FINAL*
**SITE INVESTIGATION REPORT**
**LHAAP-02, VACUUM TRUCK OVERNIGHT PARKING LOT**
**LONGHORN ARMY AMMUNITION PLANT**
**KARNACK, TEXAS**

**Prepared for**

**U.S. Army Corps of Engineers**
**Tulsa District**
**1645 South 101st Avenue**
**Tulsa, Oklahoma**

**Prepared by**

**Shaw Environmental, Inc.**
**3010 Briarpark, Suite 400**
**Houston, Texas 77042**

**Contract No. W912QR-04-D-0027, Task Order No. DS02**
**Shaw Project No. 117591**

**January 2009**

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## Acronyms and Abbreviations

| | |
|---|---|
| 95% UPL | 95 percent upper prediction limit |
| BERA | baseline ecological risk assessment |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| COPC | chemical of potential concern |
| EPRI | Electric Power Research Institute |
| FFA | Federal Facilities Agreement |
| GWP-Ind | Soil MSC protective of groundwater assuming industrial land use |
| LHAAP | Longhorn Army Ammunition Plant |
| MARC | Multiple Award Remediation Contract |
| MDC | maximum detected concentration |
| mg/kg | milligrams per kilogram |
| MSC | medium-specific concentration |
| NPL | National Priorities List |
| PAH | polycyclic aromatic hydrocarbon |
| PQL | practical quantitation limit |
| RBSV | risk based screening value |
| Shaw | Shaw Environmental, Inc. |
| SVOC | semivolatile organic compound |
| TAC | Texas Administrative Code |
| TCEQ | Texas Commission on Environmental Quality |
| TNT | trinitrotoluene |
| USACE | U.S. Army Corps of Engineers |
| USACHPPM | U.S. Army Center for Health Promotion and Preventive Medicine |
| USEPA | U.S. Environmental Protection Agency |
| UTL | upper tolerance limit |

# 1.0 Introduction

This report, prepared by Shaw Environmental, Inc. (Shaw) for the U.S. Army Corps of Engineers (USACE), Tulsa District, under Task Order DS02 of the Louisville District's Multiple Award Remediation Contract (MARC) No. W912QR-04-D-0027, presents an evaluation of chemical concentrations in surface soil at LHAAP-02 (Vacuum Truck Overnight Parking Lot) located at the former Longhorn Army Ammunition Plant (LHAAP) near Karnack, Texas (**Figure 1-1**). Environmental sampling and analysis efforts were conducted by the U. S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) as part of the Hazardous and Medical Waste Study No. 37-EF-5506-00 (USACHPPM, 2000).

## 1.1 Site History and Description

The LHAAP operated intermittently from 1942 through 1997 and is now inactive. The LHAAP produced trinitrotoluene (TNT) and other explosives, pyrotechnic devices, photoflash bombs, simulators, hand signals, tracer ammunition, and solid-fuel rocket motors and propellant. Due to releases of chemicals from operation and maintenance activities at the facility, LHAAP was placed on the Superfund National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination associated with the listing of LHAAP as a Superfund site began in 1990. After being listed on the NPL, the U.S. Army, the U.S. Environmental Protection Agency (USEPA), and the Texas Water Commission (currently known as the Texas Commission on Environmental Quality [TCEQ]) entered into a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120 Federal Facility Agreement (FFA) for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property. Remediation activities incorporate the Texas Risk Reduction Rules, Title 30 Texas Administrative Code (TAC) Chapter 335 (30TAC§335 and updates) under the FFA.

Site LHAAP-02 was a parking lot for trucks used to pump out various sumps around LHAAP (**Figure 1-2**).

## 1.2 Sources of Analytical Data

The evaluation includes analytical data from samples collected at LHAAP-02 by the USACHPPM in July 2000. Because any spills from the trucks were expected to run to the soil at the perimeter of the lot (USACHPPM, 2000), sampling locations were selected as shown in **Figure 1-2**. Ten surface soil samples (0-6 inches below ground surface [bgs]) and eight subsurface samples (12-18 inches bgs) were collected at each location. The surface soil samples were analyzed for metals, semivolatile organic chemicals (SVOCs), explosives, and perchlorate.

Subsurface soil samples were analyzed for metals, SVOCs, explosives, perchlorate, and volatile organic compounds. All analyses were conducted according to standard EPA SW-846 methods (USACHPPM, 2000).

For this evaluation, concentrations of a chemical reported as undetected were substituted with the reporting limit as a proxy concentration. Concentrations of chemicals in the samples were compared to risk-based soil screening levels developed to be protective of human health by the TCEQ and the USEPA. If all concentrations of a chemical were below both TCEQ and USEPA risk-based screening levels, no further comparisons were made. If at least one sample exceeded screening levels, the data were compared to LHAAP-specific background concentrations (Shaw, 2004).

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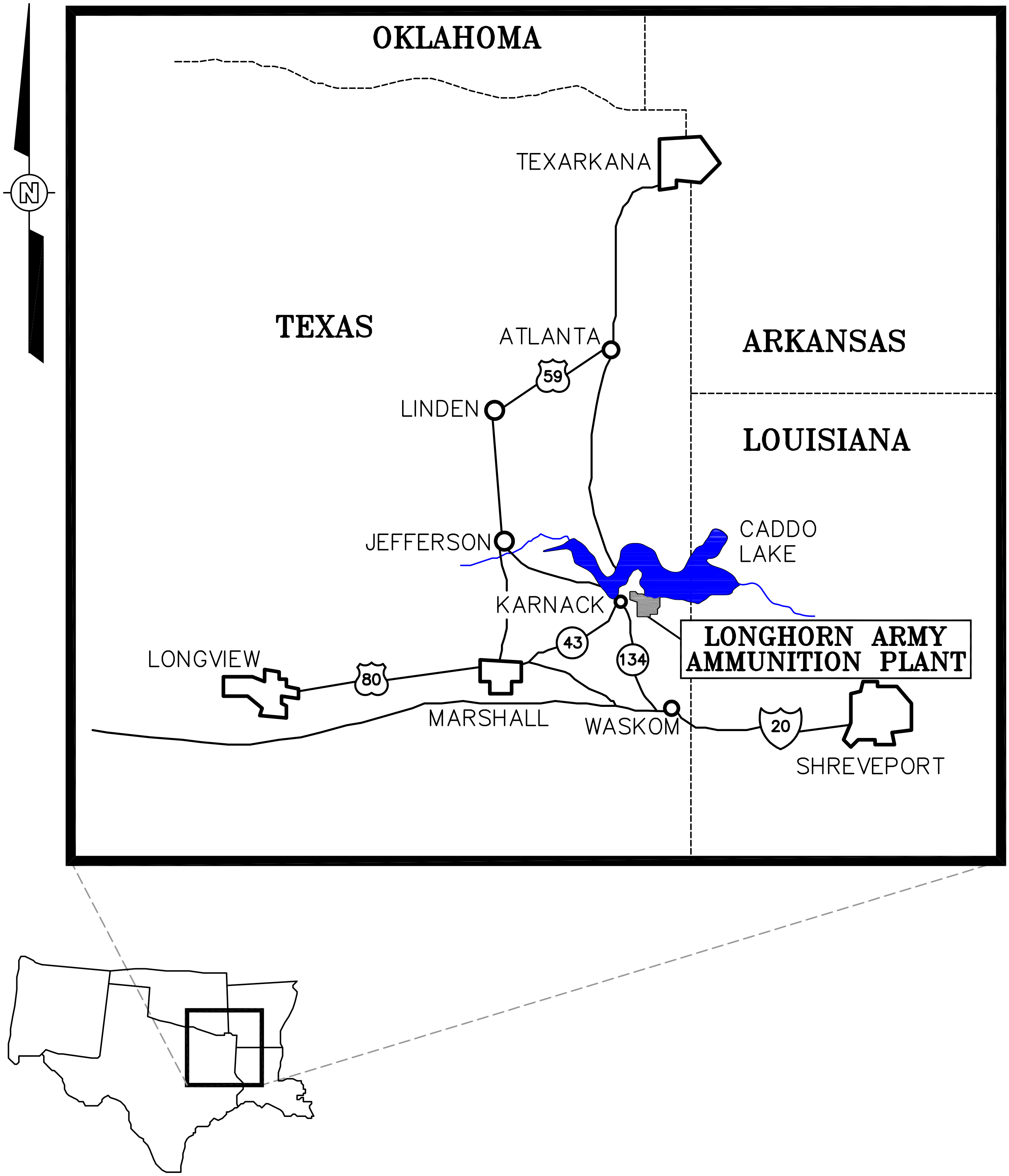



"DRAWING NOT TO SCALE"

Shaw

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1-1

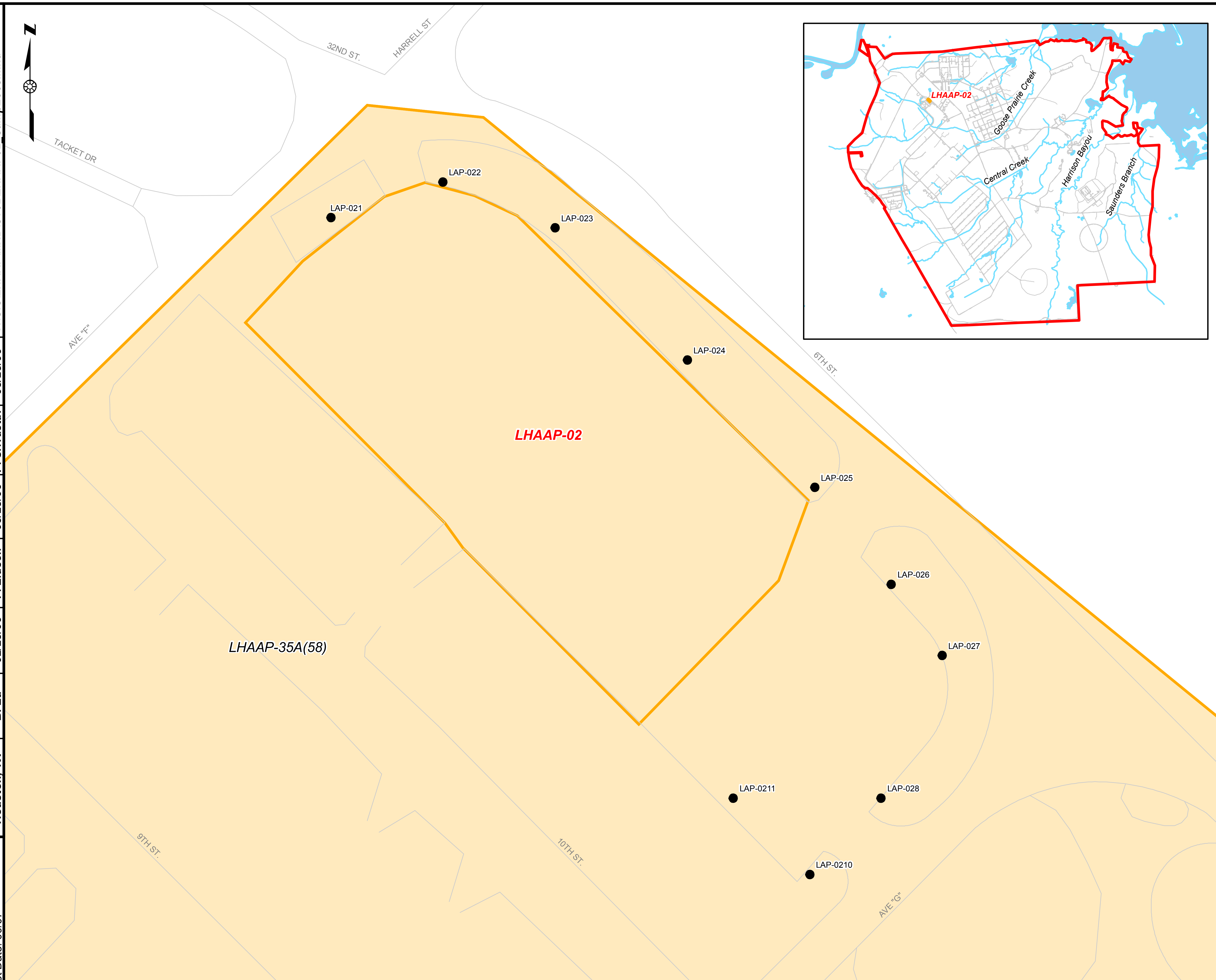
LHAAP LOCATION MAP

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

| DRAWING NUMBER | APPROVED BY | CHECKED BY | DRAWN BY | OFFICE | X-REF | IMAGE |
|---|---|---|---|---|---|---|
| 845714-A4 | P. SRIVASTAV 04/08/05 | G. JONES 04/08/05 | J. RDZ 12/17/03 | Houston, Texas | --- | --- |

PLOT DATE: 04/08/05
FORMAT REVISION 3/25/99

00071104




**Legend**

- Soil Sample Location
- Road
- Site
- Approximate LHAAP Boundary

0 25 50 100 Feet

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1-2

SOIL SAMPLE LOCATION MAP
LHAAP-02

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

| OFFICE | DRAWN BY | | CHECKED BY | APPROVED BY | FILE PATH |
|---|---|---|---|---|---|
| Houston, TX | B. Lu | 02/23/06 | F. Eidson 03/28/06 | P. Srivastav 03/28/06 | T:\GIS\LHAAP\MXD\ST02\LHAAP02_SampLocs.mxd |

Plot Date: 09/07

# 2.0 Background Concentrations and Risk-Based Soil Screening Levels

## 2.1 Background Concentrations

Background concentrations of metals in soil were reported in the Background Soil Study Report (Shaw, 2004).

## 2.2 Risk-Based Soil Screening Levels

Soil concentrations of chemicals developed by regulatory agencies to protect human health were used in this evaluation. Risk-based screening values (RBSVs) specified in the Texas Risk Reduction Rules, (30TAC§335 and updates) were used.

## 2.3 Ecological Risk Assessment

The ecological evaluation of analytical data for this site is based on the conclusions presented in the *Final Installation-Wide Baseline Ecological Risk Assessment* (Shaw, 2007). The only medium of concern for ecological risk assessment at LHAAP-02 is soil. An important difference between the human health and ecological risk assessment conducted at LHAAP is that the baseline ecological risk assessment (BERA) was conducted on a broader spatial organization than the human health risk assessment, which was conducted on a site-by-site basis. For the BERA, the entire Installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation, and four watersheds (i.e., Goose Prairie Creek, Central Creek, Harrison Bayou, and Saunders Branch) for the aquatic evaluation. The individual sites at LHAAP were grouped into one of the sub-areas, which were delineated based on commonalities of historical use, habitat type, and spatial proximity to each other. This type of spatial analysis was determined to be more appropriate for the evaluation of ecological effects because it more closely reflects the size of areas that ecological receptors would be expected to use. Conclusions regarding analytical data from samples from an individual site that could adversely affect the environment must be made in the context of the overall conclusions of the sub-area that the site falls within, and the contribution of the ecological hazard from that site in relation to other sites in the sub-area.

LHAAP-02 is a small site located within LHAAP-35A(58) and within the Industrial Sub-Area (**Figure 1-2**). The BERA concluded that no unacceptable ecological risk was present in the Industrial Sub-Area (Shaw, 2007) and therefore, no further action is needed at LHAAP-02 for the protection of ecological receptors.

# 3.0 Evaluation

Concentrations of chemicals in individual samples were compared to the risk-based soil screening levels discussed in **Section 2.2**. Those individual concentrations that exceeded one or more of the soil screening levels are identified in the data tables. Two comparisons were made for metals; the comparison of individual values to screening values and the comparison to background surface soil concentrations (Shaw, 2004).

## 3.1 Metals and Organic Compounds

Concentrations of metals were compared to risk-based soil screening levels developed to be protective of human health in the guidance provided by the TCEQ. If concentrations of a chemical were below human health screening levels, no further comparisons were made. If at least one sample exceeded the risk-based screening level, the data were compared to LHAAP-specific background concentrations (Shaw, 2004) according to USEPA (2002) guidance and also subjected to geochemical analysis.

### 3.1.1 Comparison to Risk-Based Screening Levels

Comparisons of concentrations of metals in soil to risk-based screening levels are shown in **Table 3-1**. Calcium, iron, magnesium, and potassium are considered to be essential nutrients in USEPA (1989) guidance and TCEQ (2001) guidance. Therefore, these metals are not of concern for human health at LHAAP-02 and are not evaluated in this report.

Antimony, barium, cadmium, chromium, lead, manganese, nickel, selenium, silver, strontium, zinc, acenaphthylene, anthracene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, pyrene, bis(2-ethylhexyl)phthalate, methylene chloride, and p-isopropyltoluene have concentrations below human health screening levels and, therefore, are of no concern at LHAAP-02.

The maximum selenium soil concentration (1.2 milligrams per kilogram [mg/kg]) was measured in sample LAP-024A, which is below the RBSV value of 130 mg/kg (**Table 3-1**). The USACHPPM (2000) document reports a maximum selenium concentration of 1.37 mg/kg measured in sample LAP-029B. There are no location coordinates for sample LAP-029B in the data base that could locate it in LHAAP-02, and it was excluded from the evaluation. Because a maximum selenium concentration of 1.37 mg/kg is below the human health screening value and the 95 percent upper prediction limit (95% UPL) of the background concentration (5.61 mg/kg) shown in **Table 3-2**, the exclusion of the LAP-029B value from the evaluation does not change the conclusion that all selenium concentrations are below the RBSV.

Aluminum, arsenic, copper, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene, have one or more measured concentrations above human health screening levels.

Mercury and benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene have one or more detection limits above human health screening levels.

All thallium detection limits are above human health screening levels.

Mercury has detection limits above the human health screening value in all 18 samples **(Table 3-1).** Mercury was evaluated by direct comparison with background screening values as described in **Section 3.1.2** because of the uncertainty posed by high detection limits.

Based on the above comparisons to human health screening levels, the following chemicals are of no concern at LHAAP-02 and are not considered further in this evaluation: antimony, barium, cadmium, calcium, chromium, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, strontium, zinc, acenaphthylene, anthracene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, pyrene, bis(2-ethylhexyl)phthalate, methylene chloride, and p-isopropyltoluene. Chemicals having at least one concentration that exceeds the RBSV include: aluminum, arsenic, copper, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene.

### *3.1.2 Comparison to LHAAP-Specific Background Concentrations*

Concentrations of aluminum, arsenic, copper, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene had at least one value that exceeded human health screening values. These chemicals were compared with LHAAP-specific background concentrations, where applicable, to determine whether detected chemicals were related to LHAAP operations.

The LHAAP-specific background concentrations were developed using data that represent background concentrations for soil (Shaw, 2004). Statistical comparisons were made according to statistical methods described in USEPA (2002) guidance. **Table 3-2** summarizes the results of comparisons of chemical concentrations to human health RBSV and LHAAP-specific background screening values and population distributions. The background comparison process is described below.

<u>Distribution Tests</u>

The Shapiro-Wilk test was performed according to USEPA (2002) guidance to determine the type of statistical distribution of LHAAP-02 data (**Table 3-2**) and to ensure that the assumptions inherent in later statistical calculations are valid. The Shapiro-Wilk test was also used to determine the distribution type of background data (Shaw, 2004). These distribution tests were made to determine whether the normal or lognormal distribution, or a nonparametric distribution, could be used in comparisons with background data.

The Shapiro-Wilk test calculates the statistic W to test the null hypothesis $H_o$: that the population has a normal distribution versus the alternate hypothesis $H_A$: that the population does not have a normal distribution. When applied to the logarithms of data values, the lognormality of the distribution is tested.

Two indicators of background concentration were used for screening purposes, the 95 percent upper tolerance limit (UTL) with 95 percent confidence (95%/95% UTL) and the 95% UPL. Both the 95%/95% UTL and the 95% UPL can be used to screen the upper tail of the background concentration. The 95%/95% UTL value represents the background concentration below which 95 per cent of the concentrations can be said to fall with 95 percent confidence. The 95% UPL value represents the concentration that will be above the next single measurement with 95 percent confidence. Both screening values were used in this screening evaluation and result in the same identification of chemicals of potential concern (COPCs) (**Table 3-2**).

The 95%/95% UTL concentration of each metal in soil was described previously (Shaw, 2004). The 95% UPL of the background concentration (**Table 3-2**) was calculated as follows. If the background data have either the normal or lognormal distribution, the 95% UPL was calculated according to the equation (USEPA, 1992):

$$UPL_{0.95} = X + t_{n-1,0.95} \text{ x } S \text{ x } (1+1/n)^{1/2} \qquad \textbf{Equation 1}$$

where:

| | | |
|---|---|---|
| $UPL_{0.95}$ | = | the 95% UPL |
| X | = | mean background concentration |
| $t_{n-1,0.95}$ | = | Student's t value for n-1 degrees of freedom and 95 percent confidence |
| S | = | standard deviation of the mean |
| n | = | number of samples |

If the data were shown to be both normally and lognormally distributed, the distribution having the higher p value above 0.05 was used for the 95% UPL calculation. If the data were lognormally distributed, the 95% UPL value shown in **Table 3-2** is the antilogarithm of the value calculated by **Equation 1**.

Nonparametric methods were used if the data do not have either the normal or lognormal distribution. The 95% UPL concentration was determined by ranking the data from highest to lowest and calculating the 95th percentile rank according to the equation:

$$UPL_{0.95} = 95^{th} \text{ percentile} = 0.95(n+1) \qquad \textbf{Equation 2}$$

where:

| | | |
|---|---|---|
| $UPL_{0.95}$ | = | concentration occupying the 95$^{th}$ percentile rank |
| 95$^{th}$ percentile | = | the 95$^{th}$ percentile rank of the of the data set |
| n | = | number of samples |

This 95$^{th}$ percentile is the same as the 95 percent UPL according to the assumptions made in **Equation 1**.

Comparison of maximum detected concentrations (MDC) to RBSV values and to background screening concentrations represented by the 95%/95% UTL and 95% UPL values indicates that arsenic, copper, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene concentrations may represent a risk to human health and may exceed background levels (**Table 3-2**) and, therefore, require direct statistical comparison to background data (USEPA, 2002). Aluminum was not identified as a COPC, because the MDC for aluminum is below the 95% UPL value for background (**Table 3-2**).

<u>Statistical Comparisons to Background</u>

Comparisons of LHAAP-02 data and background data sets were based on the Wilcoxon Rank Sum test (USEPA, 2002), which tests for differences in median concentrations. All statistical inferences were made at the 95 percent confidence level using the Statistica© software package (StatSoft, 2004). Statistical comparisons of arsenic and copper concentrations with their respective background concentrations (**Table 3-3**) indicate that these metals occur above background levels at LHAAP-02.

Because less than 60 percent of the samples reported mercury, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene concentrations as detected **(Table 3-2)**, the above statistical tests could not be applied. Benzo(a)anthracene and benzo(a)pyrene were detected in 8 of 18 samples (44 percent). Benzo(b)fluoranthene was detected in 11 of 18 samples (61 percent). Indeno(1,2,3-cd)pyrene was detected in 8 of 18 samples (28 percent) (**Tables 3-1** and **3-2**). There were two samples with detected mercury concentrations, but all non-detected values, and all detection limits, were above the screening value (**Table 3-1**). Certain data sets, (arsenic, copper, and mercury) contain a high proportion of undetected concentrations or have other limitations. These data sets were further evaluated using geochemical analysis or other approaches as discussed individually below.

Geochemical Evaluations

Because natural background concentrations are inherently variable and span a wide range of concentrations, statistical evaluations alone (especially those based on univariate statistics) sometimes lead to misleading and high background concentrations. Therefore, a geochemical evaluation of data was used as an independent check of statistical conclusions regarding arsenic, copper, and mercury.

Such geochemical evaluations examine ratios of concentrations of selected metals to confirm that the samples have the expected geochemical relationships. Anomalous samples that may represent contamination can be readily distinguished from uncontaminated samples. When properly evaluated, geochemistry can provide mechanistic explanations for the observed variability in yet naturally occurring metal concentrations and provide an independent check on purely statistical evaluations.

Geochemical evaluation results (**Appendix A**) show that one arsenic concentration (18.7 mg/kg in LAP-0210) and seven copper concentrations represent anomalous levels that may indicate contamination. Both detected concentrations of mercury in the site data set are naturally occurring.

## *3.2 Chemicals Reported as Not Detected in Any Sample*

The majority of organic chemicals were reported with undetected concentrations in all samples (**Table 3-4**); these chemicals are of no concern at LHAAP-02. Among these undetected chemicals, some SVOCs were reported as having detection limits above a screening criterion: 4-bromophenyl phenyl ether, 4-chlorophenyl phenyl ether, bis(2-chloroethoxy)methane, bis(2-chloroethoxy)ether, hexachlorobenzene, hexachlorocyclopentadiene, N-nitrosodimethylamine, N-nitroso-di-n-propylamine, pentachlorophenol, and dibenzo(a,h)anthracene, a polycyclic aromatic hydrocarbon (PAH). These chemicals were analyzed using USEPA SW-846 Method 8270C (USACHPPM, 2000). TCEQ guidance (1998) provides that when the practical quantitation limit (PQL) achieved by the most sensitive standard analytical method available exceeds the cleanup level for the chemical, the PQL value shall be used as the cleanup level (30TAC§335.554 and §335.555). Because these chemicals were not detected above their PQL values, they are below the cleanup level and are of no concern at LHAAP-02.

The explosives 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2,4,6-tinitrotoluene, 2,4-dinitrotoluene, 2.6-dinitrotoluene, 2-amino-4,6-dintirotoluene, 4-amino-2,6-dintirotoluene, 2.6-dinitrotoluene, HMX, m-nitrotoluene, nitrobenzene, o-nitrotoluene, p-nitrotoluene, cyclonite, and tetryl were not detected in any of the samples analyzed (**Table 3-4**). None of the LHAAP-02 samples contained detected perchlorate concentrations, although the perchlorate detection limit is not reported in the UASCHPPM study. Because the maximum perchlorate concentration reported in the

UASCHPPM study is 0.280 mg/kg at another location (LHAAP-45), it follows that the undetected concentrations reported for LHAAP-02 are all below the TCEQ RBSV value of 14 mg/kg. Therefore, explosives and perchlorate are not of concern at LHAAP-02.

Although thallium was not detected in any sample, all reporting limits are above RBSV values (**Table 3-1**). The reporting limits, ~20 mg/kg, exceed the thallium reporting limit measured in the LHAAP background soil study (1 to 5 mg/kg) (Shaw, 2004). Therefore, it is difficult to say whether or not thallium values would be below the RBSV value if lower reporting limits are achieved. However, thallium is not listed as a component of devices produced at LHAAP (Table 4-3 of Plexus, 2005). Measurements of thallium in soil at the Igniter Area sites (Section 1009), or the HMX Production Area (Section 1010), were either not confirmed by subsequent analysis or are described as inconsistent (Plexus, 2005). Because thallium was not detected consistently at known production areas, and was not a component of LHAAP processes, it is unlikely that vacuum trucks that collected sump wastes would contain high levels of thallium to the exclusion of most other metals. Therefore, thallium is judged to be of no further concern at LHAAP-02.

# 4.0 Summary and Conclusions

## 4.1 Risk-Based Soil Screening Concentration and Geochemical Evaluation Summary

Analysis of 18 LHAAP-02 soil samples from the USACHPPM (2000) study shows that chemicals were detected at low concentrations, often consistent with LHAAP background levels. Individual measured concentrations were compared with risk-based soil screening concentrations developed by the TCEQ to be protective of human health.

Among the metals, calcium, iron, magnesium, and potassium are considered essential nutrients and are not of concern at LHAAP-02. Antimony, barium, cadmium, chromium, lead, manganese, nickel, selenium, silver, strontium, zinc, fluoranthene, methylene chloride, and p-isopropyltoluene have concentrations below human health screening levels and, therefore, are of no concern.

Chemicals exceeding human health RBSVs were subjected to statistical and geochemical comparisons to background. Statistical comparison of LHAAP-02 metal concentrations to LHAAP background concentrations showed that arsenic and copper concentrations are different from LHAAP background concentrations with 95 percent confidence.

Geochemical evaluation results indicate that 1 of 18 arsenic samples and 7 of 18 copper samples may not be related to LHAAP background. Geochemical evaluation of mercury concentrations indicate that mercury is naturally occurring. Thallium was not detected in any LHAAP-02 sample, although analytical reporting limits exceed screening criteria. However, thallium was not a component of LHAAP processes, and previous detections were not confirmed or were described as inconsistent. Because it is unlikely that thallium would be present at high concentrations at LHAAP-02 to the exclusion of most other metals, thallium is judged to be of no further concern at LHAAP-02.

Concentrations of most organic chemicals are either below human health screening criteria or were not detected in the samples and are of no concern at LHAAP-02. Benzo(a)anthracene and benzo(a)pyrene were detected in 8 of 18 samples (44 percent). Benzo(b)fluoranthene was detected in 11 of 18 samples (61 percent). Indeno(1,2,3-cd)pyrene was detected in 8 of 18 samples (28 percent). The detected concentrations of these compounds, and all 18 of the reported detection limits, exceed RBSVs and groundwater-protective human health criteria.

Arsenic, copper, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene require further discussion because these chemicals exceeded human health criteria or were shown by statistical analysis or geochemical considerations to be different from background. Because LHAAP-02 was a parking lot for vacuum trucks used to pump waste from sumps around the LHAAP facility, it is possible that any of these chemicals could be related to LHAAP operations even though they were not used in the TNT manufacturing process at LHAAP.

Arsenic

One of the 18 samples contained an arsenic concentration (22.1 mg/kg) in soil from sample LAP-028B at the LAP-028 location that is above the human health RBSV concentration (20 mg/kg) (**Table 3-1**). Geochemical analysis indicated that the 18.7 mg/kg concentration reported for the sample from the LAP-210 location was anomalously high, but the maximum concentration of arsenic correlated with a high iron content in the sample, indicating that it is likely naturally occurring. All other arsenic concentrations were below screening levels. The isolated arsenic concentrations that are low and near background, suggest that elevated arsenic concentrations are not widespread at LHAAP-02. These two samples contained concentrations near the human health criteria, which reflect conservative assumptions of almost daily exposure to the soil over a 25 to 33 year period. Therefore, arsenic is judged to be of little concern for human health effects at LHAAP-02.

Copper

Statistical evaluation of copper showed that the LHAAP-02 data are different from background. Geochemical evaluation indicated that seven copper concentrations may reflect contamination in soil. Only one of these concentrations (in sample LAP-027A at the LAP-027 location) exceeded the RBSV concentration (1,000 mg/kg). The maximum copper concentration (1,460 mg/kg) exceeded all other measured concentrations by at least a factor of 100, as reflected in the statistical difference between LHAAP-02 samples and background. This single extreme value suggests that the sample might have included a piece of copper wire from demolition activities at the area. The remaining six concentrations are below human health criteria and are not of concern, regardless of their possible association with soil contamination inferred from geochemical evaluations. The isolated single copper concentration suggests that elevated copper concentrations are not widespread at LHAAP-02. Therefore, copper is judged to be of little concern for human or environmental health at LHAAP-02.

Semivolatile Organic Compounds

Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were detected in some samples and all of the reported detection limits exceed the human health screening criterion (**Table 3-1**). The presence of these PAHs is expected as a result of runoff from the paving at the vacuum truck parking lot to the ditches sampled. Because these PAHs were detected infrequently and at low concentrations, they are judged to be of little concern for human environmental health at LHAAP-02.

The concentrations of most organic and inorganic chemicals detected at LHAAP-02 are either below the regulatory human health criteria or are within the range of LHAAP soil background concentrations. A few chemicals detected at LHAAP-02 (i.e., arsenic, copper, and four PAH compounds) exceeded the screening criteria and differed from the LHAAP background data set. However, such deviations occurred in only a few samples at isolated locations and are of little concern at LHAAP-02. Therefore, it is concluded that the soil at LHAAP-02 does not pose an unacceptable human health risk.

## *4.2 Groundwater Protection Summary*

The issue of cross-media transfer for chemicals in soil at LHAAP-02 was evaluated using Medium Specific Concentrations (MSCs) developed according to the TCEQ Texas Risk Reduction Rules, Title 30 TAC Chapter 335 (30 TAC §335.563(i)(2) and updates).

The development of the Applicable Standard 3 MSCs developed to consider cross-media transfer from soil to groundwater is described in **Appendix B**. The appendix summarizes the LHAAP-02 data reference and re-evaluates the selection of COPCs, taking groundwater protection criteria into account. Antimony, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, strontium, thallium, zinc, bis(2-ethylhexyl)phthalate, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, methylene chloride, p-isopropyltoluene were identified for cross-media transfer concerns. Concentrations of aluminum were within the range of background levels at LHAAP.

Concentrations of the selected chemicals are compared to the Applicable Standard 3 MSC values in **Appendix B**. The comparison showed that soil concentrations of all organic chemicals identified as COPCs at LHAAP-02 are below those values and are of no further concern for cross-media transfer at LHAAP-02.

Arsenic, cadmium, copper, lead, and mercury, were detected in at least one sample above their Applicable Standard 3 MSC values (represented by calculated cross-media MSCs or background concentrations). Thallium was not detected in any sample analyzed, although the detection limits for all samples were above the Standard 3 MSC.

Comparisons of soil concentrations with Applicable Standard 3 MSC described in **Appendix B** and the discussion in this document support similar conclusions for LHAAP-02.

Arsenic

**Appendix B** indicates that three of the 18 samples have arsenic concentrations above the Applicable Standard 3 MSC (5.9 ppm) and the remaining 15 concentrations are below that value. None of the 18 samples have arsenic concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (200 ppm).

The geochemical analysis discussed in **Section 3.1** and **Appendix A** describes the maximum arsenic concentration (22.1 ppm) as being correlated with high iron content in the sample, indicating that it is likely naturally occurring, but that the next highest concentration (18.7 ppm) was anomalously high, indicating possible contamination. Isolated arsenic concentrations are low and near background levels, and suggest that elevated arsenic concentrations are not widespread at LHAAP-02, and are of little concern for human health at LHAAP-02.

Cadmium

Only two cadmium samples from LHAAP-02 exceed the Applicable Standard 3 MSC for cadmium (1.7 ppm) by 0.45 ppm to 1.1 ppm. The remaining 16 values are below the Standard 3 MSC value and are comparable to, or below, the 95% UPL of the cadmium background level (1.4 ppm). None of the 18 samples have cadmium concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (1,500 ppm). These comparisons indicate that the isolated cadmium concentrations are low and near background levels, and suggest that elevated cadmium concentrations are not widespread at LHAAP-02. Therefore, cadmium is judged to be of little concern for human or environmental health at LHAAP-02.

Copper

One copper sample from LHAAP-02 reflects an extreme value of 1,460 ppm that exceeds the Applicable Standard 3 MSC (520 ppm) as developed in **Appendix B**. The next highest concentration (28 ppm) and all concentrations in the remaining 17 of 18 samples from LHAAP-02 are well below the Applicable Standard 3 MSC and are protective of groundwater. None of the 18 samples have copper concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (74,000 ppm). As discussed in **Section 3.0**, the single extreme value suggests that the sample might have included a piece of copper wire from demolition activities at the area. Copper concentrations in 9 of the 18 samples were below 8.37 ppm, which is the 95% UPL of the copper background level. Data presented indicate that elevated copper concentrations are not widespread at LHAAP-02. Therefore, copper is judged to be of little concern for human or environmental health at LHAAP-02.

Lead

As described in **Appendix B**, five of the 18 samples exceeded the Applicable Standard 3 MSC for lead (280 ppm) by 5 ppm to 88 ppm. None of the 18 samples have lead concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (1,000 ppm). These results suggest that the lead concentrations are low and isolated and that elevated lead concentrations are not widespread at LHAAP-02, and are of little concern for human or environmental health at LHAAP-02.

Mercury

As described in **Appendix B**, two of 18 samples slightly exceed the Applicable Standard 3 MSC (0.11 ppm) by 0.012 to 0.033 ppm. Sixteen samples had reported concentrations below the Standard 3 MSC, although five detection limits exceeded the Standard 3 MSC by up to 0.013 ppm. None of the 18 samples have mercury concentrations above the SAI-Ind Standard 3 MSC concentration that is protective of direct contact exposures to an industrial worker by incidental ingestion, inhalation, or dermal contact pathways (0.15 ppm).

The geochemical analysis described associations of mercury and aluminum concentrations that suggest a natural source for mercury detected in the two samples. Although uncertainties associated with concentrations that are estimated (J-qualified) and are near the detection limit for mercury, both descriptions indicate low mercury concentrations detected above the MSC in only 2 of 18 samples. These results suggest that the mercury concentrations are low and isolated and that elevated mercury concentrations are not widespread at LHAAP-02, and are of little concern for human or environmental health at LHAAP-02.

## *4.3 Conclusions*

To summarize, a few metals detected at LHAAP-02 (i.e., arsenic, cadmium, copper, lead, and mercury) exceed Applicable Standard 3 MSC (soil to groundwater pathway) values in at least one sample. However, such deviations reflect low concentrations at a few isolated sample locations and are of little concern at LHAAP-02.

None of the chemicals in the soil pose a human health risk to a receptor via direct exposure, and thus no action is recommended for this pathway.

# 5.0 References

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# *Tables*

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**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Aluminum | 5460 | | Yes | LAP-0210 | Antimony | 0.75 | | Yes | LAP-0210 | Arsenic | 18.7 | | Yes |
| LAP-0211 | Aluminum | 6570 | | Yes | LAP-0211 | Antimony | 0.622 | | Yes | LAP-0211 | Arsenic | 6.9 | | Yes |
| LAP-021A | Aluminum | 3950 | | Yes | LAP-021A | Antimony | 0.429 | | Yes | LAP-021A | Arsenic | 5.99 | | Yes |
| LAP-021B | Aluminum | 3650 | | Yes | LAP-021B | Antimony | 0.1415 | 0.283 | No | LAP-021B | Arsenic | 1.28 | | Yes |
| LAP-022A | Aluminum | 3300 | | Yes | LAP-022A | Antimony | 0.407 | | Yes | LAP-022A | Arsenic | 3.44 | | Yes |
| LAP-022B | Aluminum | 3520 | | Yes | LAP-022B | Antimony | 0.284 | | Yes | LAP-022B | Arsenic | 1.86 | | Yes |
| LAP-023A | Aluminum | 3960 | | Yes | LAP-023A | Antimony | 0.461 | | Yes | LAP-023A | Arsenic | 5.04 | | Yes |
| LAP-023B | Aluminum | 3820 | | Yes | LAP-023B | Antimony | 0.1395 | 0.279 | No | LAP-023B | Arsenic | 1.25 | | Yes |
| LAP-024A | Aluminum | 6180 | | Yes | LAP-024A | Antimony | 0.489 | | Yes | LAP-024A | Arsenic | 4.72 | | Yes |
| LAP-024B | Aluminum | 8170 | | Yes | LAP-024B | Antimony | 0.1395 | 0.279 | No | LAP-024B | Arsenic | 4.04 | | Yes |
| LAP-025A | Aluminum | 4890 | | Yes | LAP-025A | Antimony | 0.498 | | Yes | LAP-025A | Arsenic | 4.21 | | Yes |
| LAP-025B | Aluminum | 5520 | | Yes | LAP-025B | Antimony | 0.284 | | Yes | LAP-025B | Arsenic | 2.07 | | Yes |
| LAP-026A | Aluminum | 3740 | | Yes | LAP-026A | Antimony | 0.87 | | Yes | LAP-026A | Arsenic | 9.01 | | Yes |
| LAP-026B | Aluminum | 5330 | | Yes | LAP-026B | Antimony | 0.145 | 0.29 | No | LAP-026B | Arsenic | 2.75 | | Yes |
| LAP-027A | Aluminum | 4880 | | Yes | LAP-027A | Antimony | 0.417 | | Yes | LAP-027A | Arsenic | 6.08 | | Yes |
| LAP-027B | Aluminum | ***18100*** | | Yes | LAP-027B | Antimony | 0.354 | | Yes | LAP-027B | Arsenic | 4.04 | | Yes |
| LAP-028A | Aluminum | 6090 | | Yes | LAP-028A | Antimony | 0.259 | | Yes | LAP-028A | Arsenic | 5.25 | | Yes |
| LAP-028B | Aluminum | 4300 | | Yes | LAP-028B | Antimony | 0.431 | | Yes | LAP-028B | Arsenic | ***22.1*** | | Yes |
| Maximum Value | | ***18100*** | | | Maximum Value | | 0.87 | 0.29 | | Maximum Value | | ***22.1*** | | |
| Minimum Value | | 3300 | | | Minimum Value | | 0.1395 | 0.279 | | Minimum Value | | 1.25 | | |
| Frequency of Detection | | 100% | | | Frequency of Detection | | 78% | | | Frequency of Detection | | 100% | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Normal | | | Statistical Distribution Type | | Lognormal | | |
| RBSV | | 1.5E+04 | | | RBSV | | 7.2E+00 | | | RBSV | | 2.0E+01 | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Barium | 60.2 | | Yes | LAP-0210 | Cadmium | 1.34 | | Yes | LAP-0210 | Calcium | 17600 | | Yes |
| LAP-0211 | Barium | 52.5 | | Yes | LAP-0211 | Cadmium | 0.995 | | Yes | LAP-0211 | Calcium | 14800 | | Yes |
| LAP-021A | Barium | 34.3 | | Yes | LAP-021A | Cadmium | 0.269 | | Yes | LAP-021A | Calcium | 49000 | | Yes |
| LAP-021B | Barium | 81.3 | | Yes | LAP-021B | Cadmium | 0.1415 | 0.283 | No | LAP-021B | Calcium | 790 | | Yes |
| LAP-022A | Barium | 46.4 | | Yes | LAP-022A | Cadmium | 0.51 | | Yes | LAP-022A | Calcium | 67000 | | Yes |
| LAP-022B | Barium | 49.5 | | Yes | LAP-022B | Cadmium | 0.142 | 0.284 | No | LAP-022B | Calcium | 821 | | Yes |
| LAP-023A | Barium | 32.9 | | Yes | LAP-023A | Cadmium | 0.461 | | Yes | LAP-023A | Calcium | 58400 | | Yes |
| LAP-023B | Barium | 48.5 | | Yes | LAP-023B | Cadmium | 0.1395 | 0.279 | No | LAP-023B | Calcium | 1160 | | Yes |
| LAP-024A | Barium | 36.2 | | Yes | LAP-024A | Cadmium | 1.41 | | Yes | LAP-024A | Calcium | 60300 | | Yes |
| LAP-024B | Barium | 53 | | Yes | LAP-024B | Cadmium | 0.279 | | Yes | LAP-024B | Calcium | 2800 | | Yes |
| LAP-025A | Barium | 42.1 | | Yes | LAP-025A | Cadmium | 1.33 | | Yes | LAP-025A | Calcium | 64200 | | Yes |
| LAP-025B | Barium | 44.7 | | Yes | LAP-025B | Cadmium | 0.142 | 0.284 | No | LAP-025B | Calcium | 662 | | Yes |
| LAP-026A | Barium | 43.4 | | Yes | LAP-026A | Cadmium | 2.15 | | Yes | LAP-026A | Calcium | 42900 | | Yes |
| LAP-026B | Barium | 67.9 | | Yes | LAP-026B | Cadmium | 0.145 | 0.29 | No | LAP-026B | Calcium | 1030 | | Yes |
| LAP-027A | Barium | 78.5 | | Yes | LAP-027A | Cadmium | 3.8 | | Yes | LAP-027A | Calcium | 20700 | | Yes |
| LAP-027B | Barium | 115 | | Yes | LAP-027B | Cadmium | 0.1475 | 0.295 | No | LAP-027B | Calcium | 2460 | | Yes |
| LAP-028A | Barium | 80.6 | | Yes | LAP-028A | Cadmium | 0.724 | | Yes | LAP-028A | Calcium | 2760 | | Yes |
| LAP-028B | Barium | 27.9 | | Yes | LAP-028B | Cadmium | 0.828 | | Yes | LAP-028B | Calcium | 14900 | | Yes |
| Maximum Value | | 115 | | | Maximum Value | | 3.8 | 0.295 | | Maximum Value | | 67000 | | |
| Minimum Value | | 27.9 | | | Minimum Value | | 0.1395 | 0.279 | | Minimum Value | | 662 | | |
| Frequency of Detection | | 100% | | | Frequency of Detection | | 67% | | | Frequency of Detection | | 100% | | |
| Statistical Distribution Type | | Lognormal | | | Statistical Distribution Type | | Lognormal | | | Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 9.1E+02 | | | RBSV | | 5.2E+00 | | | RBSV | | Nutrient | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) a in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Chromium | 28.8 | | Yes |
| LAP-0211 | Chromium | 19.1 | | Yes |
| LAP-021A | Chromium | 15.6 | | Yes |
| LAP-021B | Chromium | 8.3 | | Yes |
| LAP-022A | Chromium | 19.3 | | Yes |
| LAP-022B | Chromium | 8.8 | | Yes |
| LAP-023A | Chromium | 32.4 | | Yes |
| LAP-023B | Chromium | 8.75 | | Yes |
| LAP-024A | Chromium | 19.5 | | Yes |
| LAP-024B | Chromium | 23.7 | | Yes |
| LAP-025A | Chromium | 20.2 | | Yes |
| LAP-025B | Chromium | 10.4 | | Yes |
| LAP-026A | Chromium | 35.4 | | Yes |
| LAP-026B | Chromium | 8.52 | | Yes |
| LAP-027A | Chromium | 27.1 | | Yes |
| LAP-027B | Chromium | 12.8 | | Yes |
| LAP-028A | Chromium | 16.2 | | Yes |
| LAP-028B | Chromium | 37.7 | | Yes |
| Maximum Value | | 37.7 | | |
| Minimum Value | | 8.3 | | |
| Frequency of Detection | | 100% | | |
| Statistical Distribution Type | | Lognormal | | |
| RBSV | | 5.9E+03 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Copper | 19.1 | | Yes |
| LAP-0211 | Copper | 10.9 | | Yes |
| LAP-021A | Copper | 4.12 | | Yes |
| LAP-021B | Copper | 1.135 | 2.27 | No |
| LAP-022A | Copper | 5.84 | | Yes |
| LAP-022B | Copper | 10.7 | | Yes |
| LAP-023A | Copper | 6.94 | | Yes |
| LAP-023B | Copper | 1.115 | 2.23 | No |
| LAP-024A | Copper | 13.2 | | Yes |
| LAP-024B | Copper | 4.37 | | Yes |
| LAP-025A | Copper | 9.08 | | Yes |
| LAP-025B | Copper | 1.14 | 2.28 | No |
| LAP-026A | Copper | 28 | | Yes |
| LAP-026B | Copper | 1.16 | 2.32 | No |
| LAP-027A | Copper | ***1460*** | | Yes |
| LAP-027B | Copper | 6.12 | | Yes |
| LAP-028A | Copper | 10.5 | | Yes |
| LAP-028B | Copper | 5.49 | | Yes |
| Maximum Value | | ***1460*** | 2.32 | |
| Minimum Value | | 1.115 | 2.23 | |
| Frequency of Detection | | 78% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 1.0E+03 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Iron | 18200 | | Yes |
| LAP-0211 | Iron | 13200 | | Yes |
| LAP-021A | Iron | 20600 | | Yes |
| LAP-021B | Iron | 5800 | | Yes |
| LAP-022A | Iron | 12700 | | Yes |
| LAP-022B | Iron | 7060 | | Yes |
| LAP-023A | Iron | 17500 | | Yes |
| LAP-023B | Iron | 6370 | | Yes |
| LAP-024A | Iron | 16500 | | Yes |
| LAP-024B | Iron | 27900 | | Yes |
| LAP-025A | Iron | 10900 | | Yes |
| LAP-025B | Iron | 6450 | | Yes |
| LAP-026A | Iron | 15100 | | Yes |
| LAP-026B | Iron | 5850 | | Yes |
| LAP-027A | Iron | 15400 | | Yes |
| LAP-027B | Iron | 12200 | | Yes |
| LAP-028A | Iron | 16100 | | Yes |
| LAP-028B | Iron | 38400 | | Yes |
| Maximum Value | | 38400 | | |
| Minimum Value | | 5800 | | |
| Frequency of Detection | | 100% | | |
| Statistical Distribution Type | | Lognormal | | |
| RBSV | | Nutrient | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Lead | 330 | | Yes | LAP-0210 | Magnesium | 562 | | Yes | LAP-0210 | Manganese | 260 | | Yes |
| LAP-0211 | Lead | 335 | | Yes | LAP-0211 | Magnesium | 665 | | Yes | LAP-0211 | Manganese | 305 | | Yes |
| LAP-021A | Lead | 104 | | Yes | LAP-021A | Magnesium | 515 | | Yes | LAP-021A | Manganese | 203 | | Yes |
| LAP-021B | Lead | 8.92 | | Yes | LAP-021B | Magnesium | 141 | | Yes | LAP-021B | Manganese | 232 | | Yes |
| LAP-022A | Lead | 158 | | Yes | LAP-022A | Magnesium | 732 | | Yes | LAP-022A | Manganese | 231 | | Yes |
| LAP-022B | Lead | 9.7 | | Yes | LAP-022B | Magnesium | 127 | | Yes | LAP-022B | Manganese | 205 | | Yes |
| LAP-023A | Lead | 259 | | Yes | LAP-023A | Magnesium | 727 | | Yes | LAP-023A | Manganese | 227 | | Yes |
| LAP-023B | Lead | 9.92 | | Yes | LAP-023B | Magnesium | 149 | | Yes | LAP-023B | Manganese | 125 | | Yes |
| LAP-024A | Lead | 285 | | Yes | LAP-024A | Magnesium | 857 | | Yes | LAP-024A | Manganese | 392 | | Yes |
| LAP-024B | Lead | 72.3 | | Yes | LAP-024B | Magnesium | 343 | | Yes | LAP-024B | Manganese | 173 | | Yes |
| LAP-025A | Lead | 347 | | Yes | LAP-025A | Magnesium | 821 | | Yes | LAP-025A | Manganese | 278 | | Yes |
| LAP-025B | Lead | 12.7 | | Yes | LAP-025B | Magnesium | 210 | | Yes | LAP-025B | Manganese | 58 | | Yes |
| LAP-026A | Lead | 368 | | Yes | LAP-026A | Magnesium | 612 | | Yes | LAP-026A | Manganese | 206 | | Yes |
| LAP-026B | Lead | 15.3 | | Yes | LAP-026B | Magnesium | 211 | | Yes | LAP-026B | Manganese | 168 | | Yes |
| LAP-027A | Lead | 236 | | Yes | LAP-027A | Magnesium | 491 | | Yes | LAP-027A | Manganese | 268 | | Yes |
| LAP-027B | Lead | 30 | | Yes | LAP-027B | Magnesium | 495 | | Yes | LAP-027B | Manganese | 19.7 | | Yes |
| LAP-028A | Lead | 41.5 | | Yes | LAP-028A | Magnesium | 404 | | Yes | LAP-028A | Manganese | 413 | | Yes |
| LAP-028B | Lead | 87.5 | | Yes | LAP-028B | Magnesium | 235 | | Yes | LAP-028B | Manganese | 173 | | Yes |
| Maximum Value | | 368 | | | Maximum Value | | 857 | | | Maximum Value | | 413 | | |
| Minimum Value | | 8.92 | | | Minimum Value | | 127 | | | Minimum Value | | 19.7 | | |
| Frequency of Detection | | 100% | | | Frequency of Detection | | 100% | | | Frequency of Detection | | 100% | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Normal | | |
| RBSV | | 5.0E+02 | | | RBSV | | Nutrient | | | RBSV | | 1.7E+03 | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Mercury | ***0.122*** | ***0.106*** | Yes | LAP-0210 | Nickel | 2.68 | 5.36 | No | LAP-0210 | Potassium | 303 | | Yes |
| LAP-0211 | Mercury | ***0.143*** | ***0.123*** | Yes | LAP-0211 | Nickel | 3.115 | 6.23 | No | LAP-0211 | Potassium | 392 | | Yes |
| LAP-021A | Mercury | ***0.0535*** | ***0.107*** | No | LAP-021A | Nickel | 2.685 | 5.37 | No | LAP-021A | Potassium | 201 | | Yes |
| LAP-021B | Mercury | ***0.0565*** | ***0.113*** | No | LAP-021B | Nickel | 0.2835 | 0.567 | No | LAP-021B | Potassium | 138 | | Yes |
| LAP-022A | Mercury | ***0.04875*** | ***0.0975*** | No | LAP-022A | Nickel | 2.56 | 5.12 | No | LAP-022A | Potassium | 337 | | Yes |
| LAP-022B | Mercury | ***0.0545*** | ***0.109*** | No | LAP-022B | Nickel | 2.84 | 5.68 | No | LAP-022B | Potassium | 151 | | Yes |
| LAP-023A | Mercury | ***0.0505*** | ***0.101*** | No | LAP-023A | Nickel | 2.565 | 5.13 | No | LAP-023A | Potassium | 243 | | Yes |
| LAP-023B | Mercury | ***0.0535*** | ***0.107*** | No | LAP-023B | Nickel | 2.795 | 5.59 | No | LAP-023B | Potassium | 183 | | Yes |
| LAP-024A | Mercury | ***0.0535*** | ***0.107*** | No | LAP-024A | Nickel | 16.8 | | Yes | LAP-024A | Potassium | 447 | 5.43 | Yes |
| LAP-024B | Mercury | ***0.053*** | ***0.106*** | No | LAP-024B | Nickel | 2.795 | 5.59 | No | LAP-024B | Potassium | 264 | | Yes |
| LAP-025A | Mercury | ***0.0535*** | ***0.107*** | No | LAP-025A | Nickel | 7.2 | | Yes | LAP-025A | Potassium | 362 | | Yes |
| LAP-025B | Mercury | ***0.057*** | ***0.114*** | No | LAP-025B | Nickel | 2.845 | 5.69 | No | LAP-025B | Potassium | 291 | | Yes |
| LAP-026A | Mercury | ***0.0505*** | ***0.101*** | No | LAP-026A | Nickel | 5.47 | | Yes | LAP-026A | Potassium | 241 | | Yes |
| LAP-026B | Mercury | ***0.055*** | ***0.11*** | No | LAP-026B | Nickel | 2.895 | 5.79 | No | LAP-026B | Potassium | 221 | | Yes |
| LAP-027A | Mercury | ***0.0515*** | ***0.103*** | No | LAP-027A | Nickel | 7.36 | | Yes | LAP-027A | Potassium | 252 | | Yes |
| LAP-027B | Mercury | ***0.0585*** | ***0.117*** | No | LAP-027B | Nickel | 2.95 | 5.9 | No | LAP-027B | Potassium | 372 | | Yes |
| LAP-028A | Mercury | ***0.051*** | ***0.102*** | No | LAP-028A | Nickel | 2.59 | 5.18 | No | LAP-028A | Potassium | 400 | | Yes |
| LAP-028B | Mercury | ***0.0525*** | ***0.105*** | No | LAP-028B | Nickel | 2.77 | 5.54 | No | LAP-028B | Potassium | 104 | | Yes |
| Maximum Value | | ***0.143*** | ***0.123*** | | Maximum Value | | 16.8 | 6.23 | | Maximum Value | | 447 | 5.43 | |
| Minimum Value | | ***0.04875*** | ***0.0975*** | | Minimum Value | | 0.2835 | 0.567 | | Minimum Value | | 104 | 5.43 | |
| Frequency of Detection | | 11% | | | Frequency of Detection | | 22% | | | Frequency of Detection | | 100 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Normal | | |
| RBSV | | 1.1E-02 | | | RBSV | | 1.9E+02 | | | RBSV | | Nutrient | | |

*Footnotes are provided on the last page of this table*

00071124

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Selenium | 0.856 | | Yes | LAP-0210 | Silver | 0.535 | | Yes | LAP-0210 | Strontium | 61.4 | | Yes |
| LAP-0211 | Selenium | 0.685 | | Yes | LAP-0211 | Silver | 0.155 | 0.31 | No | LAP-0211 | Strontium | 32.2 | | Yes |
| LAP-021A | Selenium | 0.912 | | Yes | LAP-021A | Silver | 0.1345 | 0.269 | No | LAP-021A | Strontium | 117 | | Yes |
| LAP-021B | Selenium | 0.283 | 0.566 | No | LAP-021B | Silver | 0.1415 | 0.283 | No | LAP-021B | Strontium | 4 | | Yes |
| LAP-022A | Selenium | 0.866 | | Yes | LAP-022A | Silver | 0.1275 | 0.255 | No | LAP-022A | Strontium | 184 | | Yes |
| LAP-022B | Selenium | 0.283 | 0.566 | No | LAP-022B | Silver | 0.142 | 0.284 | No | LAP-022B | Strontium | 3.5 | | Yes |
| LAP-023A | Selenium | 0.921 | | Yes | LAP-023A | Silver | 0.128 | 0.256 | No | LAP-023A | Strontium | 147 | | Yes |
| LAP-023B | Selenium | 0.2795 | 0.559 | No | LAP-023B | Silver | 0.1395 | 0.279 | No | LAP-023B | Strontium | 4.49 | | Yes |
| LAP-024A | Selenium | 1.2 | | Yes | LAP-024A | Silver | 0.136 | 0.272 | No | LAP-024A | Strontium | 138 | | Yes |
| LAP-024B | Selenium | 0.893 | | Yes | LAP-024B | Silver | 0.1395 | 0.279 | No | LAP-024B | Strontium | 10.3 | | Yes |
| LAP-025A | Selenium | 1.11 | | Yes | LAP-025A | Silver | 0.1385 | 0.277 | No | LAP-025A | Strontium | 178 | | Yes |
| LAP-025B | Selenium | 0.284 | 0.568 | No | LAP-025B | Silver | 0.142 | 0.284 | No | LAP-025B | Strontium | 3.2 | | Yes |
| LAP-026A | Selenium | 0.87 | | Yes | LAP-026A | Silver | 0.256 | | Yes | LAP-026A | Strontium | 103 | | Yes |
| LAP-026B | Selenium | 0.695 | | Yes | LAP-026B | Silver | 0.145 | 0.29 | No | LAP-026B | Strontium | 4.29 | | Yes |
| LAP-027A | Selenium | 0.99 | | Yes | LAP-027A | Silver | 0.13 | 0.26 | No | LAP-027A | Strontium | 56.4 | | Yes |
| LAP-027B | Selenium | 0.945 | | Yes | LAP-027B | Silver | 0.1475 | 0.295 | No | LAP-027B | Strontium | 14.6 | | Yes |
| LAP-028A | Selenium | 0.775 | | Yes | LAP-028A | Silver | 0.1295 | 0.259 | No | LAP-028A | Strontium | 10.9 | | Yes |
| LAP-028B | Selenium | 0.993 | | Yes | LAP-028B | Silver | 0.138 | 0.276 | No | LAP-028B | Strontium | 31.6 | | Yes |
| Maximum Value | | 1.2 | 0.568 | | Maximum Value | | 0.535 | 0.31 | | Maximum Value | | 184 | | |
| Minimum Value | | 0.2795 | 0.559 | | Minimum Value | | 0.1275 | 0.255 | | Minimum Value | | 3.2 | | |
| Frequency of Detection | | 78% | | | Frequency of Detection | | 11% | | | Frequency of Detection | | 100% | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 1.3E+02 | | | RBSV | | 4.7E+01 | | | RBSV | | 1.2E+04 | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Thallium | ***10.75*** | ***21.5*** | No |
| LAP-0211 | Thallium | ***12.45*** | ***24.9*** | No |
| LAP-021A | Thallium | ***10.75*** | ***21.5*** | No |
| LAP-021B | Thallium | ***11.35*** | ***22.7*** | No |
| LAP-022A | Thallium | ***10.25*** | ***20.5*** | No |
| LAP-022B | Thallium | ***11.35*** | ***22.7*** | No |
| LAP-023A | Thallium | ***10.25*** | ***20.5*** | No |
| LAP-023B | Thallium | ***11.15*** | ***22.3*** | No |
| LAP-024A | Thallium | ***10.85*** | ***21.7*** | No |
| LAP-024B | Thallium | ***11.15*** | ***22.3*** | No |
| LAP-025A | Thallium | ***11.05*** | ***22.1*** | No |
| LAP-025B | Thallium | ***11.4*** | ***22.8*** | No |
| LAP-026A | Thallium | ***10.25*** | ***20.5*** | No |
| LAP-026B | Thallium | ***11.6*** | ***23.2*** | No |
| LAP-027A | Thallium | ***10.4*** | ***20.8*** | No |
| LAP-027B | Thallium | ***11.8*** | ***23.6*** | No |
| LAP-028A | Thallium | ***10.35*** | ***20.7*** | No |
| LAP-028B | Thallium | ***11.1*** | ***22.2*** | No |
| Maximum Value | | ***12.45*** | ***24.9*** | |
| Minimum Value | | ***10.25*** | ***20.5*** | |
| Frequency of Detection | | 0% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 2.0E+00 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Zinc | 191 | | Yes |
| LAP-0211 | Zinc | 147 | | Yes |
| LAP-021A | Zinc | 46.5 | | Yes |
| LAP-021B | Zinc | 7.87 | | Yes |
| LAP-022A | Zinc | 72.6 | | Yes |
| LAP-022B | Zinc | 14.5 | | Yes |
| LAP-023A | Zinc | 65.5 | | Yes |
| LAP-023B | Zinc | 9.07 | | Yes |
| LAP-024A | Zinc | 186 | | Yes |
| LAP-024B | Zinc | 49.1 | | Yes |
| LAP-025A | Zinc | 136 | | Yes |
| LAP-025B | Zinc | 10.4 | | Yes |
| LAP-026A | Zinc | 122 | | Yes |
| LAP-026B | Zinc | 10.3 | | Yes |
| LAP-027A | Zinc | 826 | | Yes |
| LAP-027B | Zinc | 20.1 | | Yes |
| LAP-028A | Zinc | 133 | | Yes |
| LAP-028B | Zinc | 50 | | Yes |
| Maximum Value | | 826 | | |
| Minimum Value | | 7.87 | | |
| Frequency of Detection | | 100% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 5.9E+03 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Acenaphthylene | 1.8 | 1.8 | No |
| LAP-0211 | Acenaphthylene | 0.4 | 0.4 | No |
| LAP-021A | Acenaphthylene | 0.35 | 0.35 | No |
| LAP-021B | Acenaphthylene | 0.38 | 0.38 | No |
| LAP-022A | Acenaphthylene | 1.7 | 1.7 | No |
| LAP-022B | Acenaphthylene | 0.38 | 0.38 | No |
| LAP-023A | Acenaphthylene | 1.7 | 1.7 | No |
| LAP-023B | Acenaphthylene | 0.6 | 0.6 | No |
| LAP-024A | Acenaphthylene | 1.8 | 1.8 | No |
| LAP-024B | Acenaphthylene | 0.37 | 0.37 | No |
| LAP-025A | Acenaphthylene | 0.37 | 0.37 | No |
| LAP-025B | Acenaphthylene | 0.38 | 0.38 | No |
| LAP-026A | Acenaphthylene | 1.7 | 1.7 | No |
| LAP-026B | Acenaphthylene | 0.38 | 0.38 | No |
| LAP-027A | Acenaphthylene | 0.64 | 3.5 | Yes |
| LAP-027B | Acenaphthylene | 0.39 | 0.39 | No |
| LAP-028A | Acenaphthylene | 1.8 | 1.8 | No |
| LAP-028B | Acenaphthylene | 1.9 | 1.9 | No |
| Maximum Value | | 1.9 | 3.5 | |
| Minimum Value | | 0.35 | 0.35 | |
| Frequency of Detection | | 6% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 8.2E+02 | | |

*Footnotes are provided on the last page of this table*

00071126

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Anthracene | 1.8 | 1.8 | No |
| LAP-0211 | Anthracene | 0.4 | 0.4 | No |
| LAP-021A | Anthracene | 0.35 | 0.35 | No |
| LAP-021B | Anthracene | 0.38 | 0.38 | No |
| LAP-022A | Anthracene | 1.7 | 1.7 | No |
| LAP-022B | Anthracene | 0.38 | 0.38 | No |
| LAP-023A | Anthracene | 1.7 | 1.7 | No |
| LAP-023B | Anthracene | 0.6 | 0.6 | No |
| LAP-024A | Anthracene | 1.8 | 1.8 | No |
| LAP-024B | Anthracene | 0.37 | 0.37 | No |
| LAP-025A | Anthracene | 0.37 | 0.37 | No |
| LAP-025B | Anthracene | 0.38 | 0.38 | No |
| LAP-026A | Anthracene | 1.7 | 1.7 | No |
| LAP-026B | Anthracene | 0.38 | 0.38 | No |
| LAP-027A | Anthracene | 0.69 | 3.5 | Yes |
| LAP-027B | Anthracene | 0.39 | 0.39 | No |
| LAP-028A | Anthracene | 1.8 | 1.8 | No |
| LAP-028B | Anthracene | 1.9 | 1.9 | No |
| Maximum Value | | 1.9 | 3.5 | |
| Minimum Value | | 0.35 | 0.35 | |
| Frequency of Detection | | 6% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 4.1E+03 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Benzo(a)anthracene | 0.52 | ***1.8*** | Yes |
| LAP-0211 | Benzo(a)anthracene | 0.4 | 0.4 | No |
| LAP-021A | Benzo(a)anthracene | 0.093 | 0.35 | Yes |
| LAP-021B | Benzo(a)anthracene | 0.38 | 0.38 | No |
| LAP-022A | Benzo(a)anthracene | ***1.7*** | ***1.7*** | No |
| LAP-022B | Benzo(a)anthracene | 0.38 | 0.38 | No |
| LAP-023A | Benzo(a)anthracene | ***1.7*** | ***1.7*** | No |
| LAP-023B | Benzo(a)anthracene | 0.6 | 0.6 | No |
| LAP-024A | Benzo(a)anthracene | ***1.8*** | ***1.8*** | No |
| LAP-024B | Benzo(a)anthracene | 0.057 | 0.37 | Yes |
| LAP-025A | Benzo(a)anthracene | 0.078 | 0.37 | Yes |
| LAP-025B | Benzo(a)anthracene | 0.38 | 0.38 | No |
| LAP-026A | Benzo(a)anthracene | 0.17 | ***1.7*** | Yes |
| LAP-026B | Benzo(a)anthracene | 0.38 | 0.38 | No |
| LAP-027A | Benzo(a)anthracene | ***2*** | ***3.5*** | Yes |
| LAP-027B | Benzo(a)anthracene | 0.048 | 0.39 | Yes |
| LAP-028A | Benzo(a)anthracene | 0.18 | ***1.8*** | Yes |
| LAP-028B | Benzo(a)anthracene | ***1.9*** | ***1.9*** | No |
| Maximum Value | | ***2*** | | |
| Minimum Value | | 0.048 | | |
| Frequency of Detection | | 44% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 6.3E-01 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Benzo(a)pyrene | ***0.54*** | ***1.8*** | Yes |
| LAP-0211 | Benzo(a)pyrene | ***0.4*** | ***0.4*** | No |
| LAP-021A | Benzo(a)pyrene | ***0.11*** | ***0.35*** | Yes |
| LAP-021B | Benzo(a)pyrene | ***0.38*** | ***0.38*** | No |
| LAP-022A | Benzo(a)pyrene | ***1.7*** | ***1.7*** | No |
| LAP-022B | Benzo(a)pyrene | ***0.38*** | ***0.38*** | No |
| LAP-023A | Benzo(a)pyrene | ***1.7*** | ***1.7*** | No |
| LAP-023B | Benzo(a)pyrene | ***0.6*** | ***0.6*** | No |
| LAP-024A | Benzo(a)pyrene | ***1.8*** | ***1.8*** | No |
| LAP-024B | Benzo(a)pyrene | ***0.077*** | ***0.37*** | Yes |
| LAP-025A | Benzo(a)pyrene | ***0.11*** | ***0.37*** | Yes |
| LAP-025B | Benzo(a)pyrene | ***0.38*** | ***0.38*** | No |
| LAP-026A | Benzo(a)pyrene | ***0.19*** | ***1.7*** | Yes |
| LAP-026B | Benzo(a)pyrene | ***0.38*** | ***0.38*** | No |
| LAP-027A | Benzo(a)pyrene | ***2*** | ***3.5*** | Yes |
| LAP-027B | Benzo(a)pyrene | 0.047 | ***0.39*** | Yes |
| LAP-028A | Benzo(a)pyrene | ***0.19*** | ***1.8*** | Yes |
| LAP-028B | Benzo(a)pyrene | ***1.9*** | ***1.9*** | No |
| Maximum Value | | ***2*** | | |
| Minimum Value | | 0.047 | | |
| Frequency of Detection | | 44% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 6.3E-02 | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Benzo(b)fluoranthene | ***1*** | ***1.8*** | Yes | LAP-0210 | Benzo(ghi)perylene | 0.83 | 1.8 | Yes | LAP-0210 | Benzo(k)fluoranthene | 0.37 | 1.8 | Yes |
| LAP-0211 | Benzo(b)fluoranthene | 0.063 | 0.4 | Yes | LAP-0211 | Benzo(ghi)perylene | 0.4 | 0.4 | No | LAP-0211 | Benzo(k)fluoranthene | 0.4 | 0.4 | No |
| LAP-021A | Benzo(b)fluoranthene | 0.24 | 0.35 | Yes | LAP-021A | Benzo(ghi)perylene | 0.05 | 0.35 | Yes | LAP-021A | Benzo(k)fluoranthene | 0.071 | 0.35 | Yes |
| LAP-021B | Benzo(b)fluoranthene | 0.38 | 0.38 | No | LAP-021B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-021B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-022A | Benzo(b)fluoranthene | ***1.7*** | ***1.7*** | No | LAP-022A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-022A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-022B | Benzo(b)fluoranthene | 0.38 | 0.38 | No | LAP-022B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-022B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-023A | Benzo(b)fluoranthene | 0.4 | ***1.7*** | Yes | LAP-023A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-023A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-023B | Benzo(b)fluoranthene | 0.6 | 0.6 | No | LAP-023B | Benzo(ghi)perylene | 0.6 | 0.6 | No | LAP-023B | Benzo(k)fluoranthene | 0.6 | 0.6 | No |
| LAP-024A | Benzo(b)fluoranthene | 0.23 | ***1.8*** | Yes | LAP-024A | Benzo(ghi)perylene | 1.8 | 1.8 | No | LAP-024A | Benzo(k)fluoranthene | 1.8 | 1.8 | No |
| LAP-024B | Benzo(b)fluoranthene | 0.2 | 0.37 | Yes | LAP-024B | Benzo(ghi)perylene | 0.37 | 0.37 | No | LAP-024B | Benzo(k)fluoranthene | 0.087 | 0.37 | Yes |
| LAP-025A | Benzo(b)fluoranthene | 0.23 | 0.37 | Yes | LAP-025A | Benzo(ghi)perylene | 0.078 | 0.37 | Yes | LAP-025A | Benzo(k)fluoranthene | 0.085 | 0.37 | Yes |
| LAP-025B | Benzo(b)fluoranthene | 0.38 | 0.38 | No | LAP-025B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-025B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-026A | Benzo(b)fluoranthene | 0.32 | ***1.7*** | Yes | LAP-026A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-026A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-026B | Benzo(b)fluoranthene | 0.38 | 0.38 | No | LAP-026B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-026B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-027A | Benzo(b)fluoranthene | ***4.7*** | ***3.5*** | Yes | LAP-027A | Benzo(ghi)perylene | 0.81 | 3.5 | Yes | LAP-027A | Benzo(k)fluoranthene | 2 | 3.5 | Yes |
| LAP-027B | Benzo(b)fluoranthene | 0.096 | 0.39 | Yes | LAP-027B | Benzo(ghi)perylene | 0.042 | 0.39 | Yes | LAP-027B | Benzo(k)fluoranthene | 0.39 | 0.39 | No |
| LAP-028A | Benzo(b)fluoranthene | 0.45 | ***1.8*** | Yes | LAP-028A | Benzo(ghi)perylene | 1.8 | 1.8 | No | LAP-028A | Benzo(k)fluoranthene | 1.8 | 1.8 | No |
| LAP-028B | Benzo(b)fluoranthene | ***1.9*** | ***1.9*** | No | LAP-028B | Benzo(ghi)perylene | 1.9 | 1.9 | No | LAP-028B | Benzo(k)fluoranthene | 1.9 | 1.9 | No |
| Maximum Value | | ***4.7*** | ***3.5*** | | Maximum Value | | 1.9 | 3.5 | | Maximum Value | | 2 | 3.5 | |
| Minimum Value | | 0.063 | 0.35 | | Minimum Value | | 0.042 | 0.35 | | Minimum Value | | 0.071 | 0.35 | |
| Frequency of Detection | | 61% | | | Frequency of Detection | | 28% | | | Frequency of Detection | | 28% | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 6.3E-01 | | | RBSV | | 4.1E+02 | | | RBSV | | 6.3E+00 | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Chrysene | 0.67 | 1.8 | Yes |
| LAP-0211 | Chrysene | 0.051 | 0.4 | Yes |
| LAP-021A | Chrysene | 0.13 | 0.35 | Yes |
| LAP-021B | Chrysene | 0.38 | 0.38 | No |
| LAP-022A | Chrysene | 1.7 | 1.7 | No |
| LAP-022B | Chrysene | 0.38 | 0.38 | No |
| LAP-023A | Chrysene | 0.26 | 1.7 | Yes |
| LAP-023B | Chrysene | 0.6 | 0.6 | No |
| LAP-024A | Chrysene | 0.19 | 1.8 | Yes |
| LAP-024B | Chrysene | 0.11 | 0.37 | Yes |
| LAP-025A | Chrysene | 0.12 | 0.37 | Yes |
| LAP-025B | Chrysene | 0.38 | 0.38 | No |
| LAP-026A | Chrysene | 0.22 | 1.7 | Yes |
| LAP-026B | Chrysene | 0.38 | 0.38 | No |
| LAP-027A | Chrysene | 2.7 | 3.5 | Yes |
| LAP-027B | Chrysene | 0.05 | 0.39 | Yes |
| LAP-028A | Chrysene | 0.34 | 1.8 | Yes |
| LAP-028B | Chrysene | 1.9 | 1.9 | No |
| Maximum Value | | 2.7 | 3.5 | |
| Minimum Value | | 0.05 | 0.35 | |
| Frequency of Detection | | 61% | | |
| Statistical Distribution Typ | | Nonparametric | | |
| RBSV | | 6.3E+01 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Fluoranthene | 1.2 | 1.8 | Yes |
| LAP-0211 | Fluoranthene | 0.062 | 0.4 | Yes |
| LAP-021A | Fluoranthene | 0.2 | 0.35 | Yes |
| LAP-021B | Fluoranthene | 0.38 | 0.38 | No |
| LAP-022A | Fluoranthene | 1.7 | 1.7 | No |
| LAP-022B | Fluoranthene | 0.38 | 0.38 | No |
| LAP-023A | Fluoranthene | 0.32 | 1.7 | Yes |
| LAP-023B | Fluoranthene | 0.6 | 0.6 | No |
| LAP-024A | Fluoranthene | 0.24 | 1.8 | Yes |
| LAP-024B | Fluoranthene | 0.11 | 0.37 | Yes |
| LAP-025A | Fluoranthene | 0.13 | 0.37 | Yes |
| LAP-025B | Fluoranthene | 0.38 | 0.38 | No |
| LAP-026A | Fluoranthene | 0.4 | 1.7 | Yes |
| LAP-026B | Fluoranthene | 0.38 | 0.38 | No |
| LAP-027A | Fluoranthene | 3.9 | 3.5 | Yes |
| LAP-027B | Fluoranthene | 0.097 | 0.39 | Yes |
| LAP-028A | Fluoranthene | 0.39 | 1.8 | Yes |
| LAP-028B | Fluoranthene | 1.9 | 1.9 | No |
| Maximum Value | | 3.9 | 3.5 | |
| Minimum Value | | 0.062 | 0.35 | |
| Frequency of Detection | | 61% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 5.5E+02 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Indeno(1,2,3-cd)pyrene | 0.49 | ***1.8*** | Yes |
| LAP-0211 | Indeno(1,2,3-cd)pyrene | 0.4 | 0.4 | No |
| LAP-021A | Indeno(1,2,3-cd)pyrene | 0.053 | 0.35 | Yes |
| LAP-021B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-022A | Indeno(1,2,3-cd)pyrene | ***1.7*** | ***1.7*** | No |
| LAP-022B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-023A | Indeno(1,2,3-cd)pyrene | ***1.7*** | ***1.7*** | No |
| LAP-023B | Indeno(1,2,3-cd)pyrene | 0.6 | 0.6 | No |
| LAP-024A | Indeno(1,2,3-cd)pyrene | ***1.8*** | ***1.8*** | No |
| LAP-024B | Indeno(1,2,3-cd)pyrene | 0.37 | 0.37 | No |
| LAP-025A | Indeno(1,2,3-cd)pyrene | 0.091 | 0.37 | Yes |
| LAP-025B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-026A | Indeno(1,2,3-cd)pyrene | ***1.7*** | ***1.7*** | No |
| LAP-026B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-027A | Indeno(1,2,3-cd)pyrene | ***1*** | ***3.5*** | Yes |
| LAP-027B | Indeno(1,2,3-cd)pyrene | 0.049 | 0.39 | Yes |
| LAP-028A | Indeno(1,2,3-cd)pyrene | ***1.8*** | ***1.8*** | No |
| LAP-028B | Indeno(1,2,3-cd)pyrene | ***1.9*** | ***1.9*** | No |
| Maximum Value | | ***1.9*** | ***3.5*** | |
| Minimum Value | | 0.049 | 0.35 | |
| Frequency of Detection | | 28% | | |
| Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 6.3E-01 | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Phenanthrene | 0.46 | 1.8 | Yes | LAP-0210 | Pyrene | 1 | 1.8 | Yes | LAP-0210 | bis(2-Ethylhexyl)phthalate | 1.8 | 1.8 | No |
| LAP-0211 | Phenanthrene | 0.4 | 0.4 | No | LAP-0211 | Pyrene | 0.048 | 0.4 | Yes | LAP-0211 | bis(2-Ethylhexyl)phthalate | 0.17 | 0.4 | Yes |
| LAP-021A | Phenanthrene | 0.071 | 0.35 | Yes | LAP-021A | Pyrene | 0.15 | 0.35 | Yes | LAP-021A | bis(2-Ethylhexyl)phthalate | 0.35 | 0.35 | No |
| LAP-021B | Phenanthrene | 0.38 | 0.38 | No | LAP-021B | Pyrene | 0.38 | 0.38 | No | LAP-021B | bis(2-Ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-022A | Phenanthrene | 1.7 | 1.7 | No | LAP-022A | Pyrene | 1.7 | 1.7 | No | LAP-022A | bis(2-Ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-022B | Phenanthrene | 0.38 | 0.38 | No | LAP-022B | Pyrene | 0.38 | 0.38 | No | LAP-022B | bis(2-Ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-023A | Phenanthrene | 1.7 | 1.7 | No | LAP-023A | Pyrene | 0.22 | 1.7 | Yes | LAP-023A | bis(2-Ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-023B | Phenanthrene | 0.6 | 0.6 | No | LAP-023B | Pyrene | 0.6 | 0.6 | No | LAP-023B | bis(2-Ethylhexyl)phthalate | 0.6 | 0.6 | No |
| LAP-024A | Phenanthrene | 1.8 | 1.8 | No | LAP-024A | Pyrene | 1.8 | 1.8 | No | LAP-024A | bis(2-Ethylhexyl)phthalate | 0.43 | 1.8 | Yes |
| LAP-024B | Phenanthrene | 0.37 | 0.37 | No | LAP-024B | Pyrene | 0.079 | 0.37 | Yes | LAP-024B | bis(2-Ethylhexyl)phthalate | 0.079 | 0.37 | Yes |
| LAP-025A | Phenanthrene | 0.37 | 0.37 | No | LAP-025A | Pyrene | 0.13 | 0.37 | Yes | LAP-025A | bis(2-Ethylhexyl)phthalate | 0.13 | 0.37 | Yes |
| LAP-025B | Phenanthrene | 0.38 | 0.38 | No | LAP-025B | Pyrene | 0.38 | 0.38 | No | LAP-025B | bis(2-Ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-026A | Phenanthrene | 1.7 | 1.7 | No | LAP-026A | Pyrene | 0.29 | 1.7 | Yes | LAP-026A | bis(2-Ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-026B | Phenanthrene | 0.38 | 0.38 | No | LAP-026B | Pyrene | 0.38 | 0.38 | No | LAP-026B | bis(2-Ethylhexyl)phthalate | 0.08 | 0.38 | Yes |
| LAP-027A | Phenanthrene | 3.5 | 3.5 | No | LAP-027A | Pyrene | 3.3 | 3.5 | Yes | LAP-027A | bis(2-Ethylhexyl)phthalate | 3.5 | 3.5 | No |
| LAP-027B | Phenanthrene | 0.39 | 0.39 | No | LAP-027B | Pyrene | 0.089 | 0.39 | Yes | LAP-027B | bis(2-Ethylhexyl)phthalate | 0.39 | 0.39 | No |
| LAP-028A | Phenanthrene | 1.8 | 1.8 | No | LAP-028A | Pyrene | 0.29 | 1.8 | Yes | LAP-028A | bis(2-Ethylhexyl)phthalate | 1.8 | 1.8 | No |
| LAP-028B | Phenanthrene | 1.9 | 1.9 | No | LAP-028B | Pyrene | 1.9 | 1.9 | No | LAP-028B | bis(2-Ethylhexyl)phthalate | 1.9 | 1.9 | No |
| Maximum Value | | 3.5 | 3.5 | | Maximum Value | | 3.3 | 3.5 | | Maximum Value | | 3.5 | 3.5 | |
| Minimum Value | | 0.071 | 0.35 | | Minimum Value | | 0.048 | 0.35 | | Minimum Value | | 0.079 | 0.35 | |
| Frequency of Detection | | 11% | | | Frequency of Detection | | 56% | | | Frequency of Detection | | 28% | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 4.1E+02 | | | RBSV | | 4.1E+02 | | | RBSV | | 1.7E+01 | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-021B | Methylene chloride | 0.0025 | 0.005 | No | LAP-021B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-022B | Methylene chloride | 0.006 | 0.005 | Yes | LAP-022B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-023B | Methylene chloride | 0.0025 | 0.005 | No | LAP-023B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-024B | Methylene chloride | 0.0025 | 0.005 | No | LAP-024B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-025B | Methylene chloride | 0.0025 | 0.005 | No | LAP-025B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-026B | Methylene chloride | 0.0025 | 0.005 | No | LAP-026B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-027B | Methylene chloride | 0.0025 | 0.005 | No | LAP-027B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-028B | Methylene chloride | 0.0025 | 0.005 | No | LAP-028B | p-Isopropyltoluene | 0.006 | 0.005 | Yes |
| Maximum Value | | 0.006 | 0.005 | | Maximum Value | | 0.006 | 0.005 | |
| Minimum Value | | 0.0025 | 0.005 | | Minimum Value | | 0.0025 | 0.005 | |
| Frequency of Detection | | 13% | | | Frequency of Detection | | 13% | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| RBSV | | 8.7E+00 | | | RBSV | | 4.2E+02 | | |

*Footnotes are provided on the last page of this table*

**Table 3-1**
**Comparison of Concentrations of Metals in Soil at LHAAP-02 to Risk-Based Screening Levels**

Footnotes and Abbreviations:

***Boldface italics enclosed in a box indicates value exceeding one or more of the RBSV or ecological benchmark values.***
[a] Concentrations reported were corrected for soil moisture content.
[b] Value equals 1/2 the detection limit if the concentration was reported as not detected.
[c] Blank entry indicates no value reported for the sample.
[d] See Table A-1 in Appendix A - Ecological Benchmarks for Soil.
LAP: Prefix indicates sample reported in *Hazardous and Medical Waste Study No: 37-EF-5506-00, Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant, Karnack, Texas*, Volumes I and II, U. S. Army Center for Health Promotion and Preventative Medicine, July 2000.
LHAAP: Longhorn Army Ammunition Plant
NE: Not established
Nutrient: Chemical is an essential nutrient; no screening value available or required
RBSV: risk-based screening value soil specified in the Texas Risk Reduction Rules, Title 30 Texas Administrative Code Chapter 335 (30TAC§335) as updated through 2005.

Note:

Sample numbers ending in "A" indicate the sample was collected at 0 to 6 inches below ground surfrace (bgs).
Sample numbers ending in "B" indicate the sample was collected at 12 to 18 inches bgs.

**Table 3-2**
**Selection of Chemicals of Potential Concern (COPC) for Human Health in LHAAP-02 Soil [a]**

| Chemical | Detection Frequency | Percent Detection | Range of Values, mg/kg: Detected Concentrations Minimum - Maximum | Range of Values, mg/kg: Reporting Limits Minimum - Maximum | Statistical Distribution [b] | Mean mg/kg | 95% UCL [c] mg/kg | Background Screening Concentration [d] mg/kg | Texas RBSV [e] mg/kg | Background UPL mg/kg | COPC? [f,g] | Source-Term Concentration [h] mg/kg | COPC using UPL [f,g] | Location of MDC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | | | | | |
| Aluminum | 18 / 18 | 100 | 3300 - 18100 | NA - NA | NP | 5.64E+03 | | 2.38E+04 | 1.5E+04 | 1.89E+04 | N (c) | --- | N (c) | LAP-027 |
| Antimony | 14 / 18 | 78 | 0.259 - 0.87 | 0.279 - 0.29 | N | 3.96E-01 | | 1.60E+00 | 7.2E+00 | 1.60E+00 | N (a) | --- | N (a) | LAP-026 |
| Arsenic | 18 / 18 | 100 | 1.25 - 22.1 | NA - NA | L | 6.04E+00 | 8.09E+00 | 6.89E+00 | 2.0E+01 | 5.86E+00 | Y | 8.09E+00 | Y | LAP-028 |
| Barium | 18 / 18 | 100 | 27.9 - 115 | NA - NA | L | 5.53E+01 | | 1.36E+02 | 9.1E+02 | 1.16E+02 | N (a) | --- | N (a) | LAP-027 |
| Cadmium | 12 / 18 | 67 | 0.269 - 3.8 | 0.279 - 0.295 | L | 8.31E-01 | | 1.40E+00 | 5.2E+00 | 1.40E+00 | N (a) | --- | N (a) | LAP-027 |
| Calcium | 18 / 18 | 100 | 662 - 67000 | NA - NA | NP | 2.35E+04 | | 3.84E+03 | Not Required | 2.52E+03 | N (b) | --- | N (b) | LAP-022 |
| Chromium | 18 / 18 | 100 | 8.3 - 37.7 | NA - NA | L | 1.96E+01 | | 3.55E+01 | 5.9E+03 | 2.90E+01 | N (a) | --- | N (a) | LAP-028 |
| Copper | 14 / 18 | 78 | 4.12 - 1460 | 2.23 - 2.32 | NP | 8.88E+01 | 1.72E+02 | 1.04E+01 | 1.0E+03 | 8.37E+00 | Y | 1.72E+02 | Y | LAP-027 |
| Iron | 18 / 18 | 100 | 5800 - 38400 | NA - NA | L | 1.48E+04 | | 3.49E+04 | Not Required | 2.79E+04 | N (b) | --- | N (b) | LAP-028 |
| Lead | 18 / 18 | 100 | 8.92 - 368 | NA - NA | NP | 1.51E+02 | | 2.03E+01 | 5.0E+02 | 1.78E+01 | N (a) | --- | N (a) | LAP-026 |
| Magnesium | 18 / 18 | 100 | 127 - 857 | NA - NA | N | 4.61E+02 | | 1.59E+03 | Not Required | 1.24E+03 | N (b) | --- | N (b) | LAP-024 |
| Manganese | 18 / 18 | 100 | 19.7 - 413 | NA - NA | N | 2.19E+02 | | 2.24E+03 | 1.7E+03 | 1.34E+03 | N (a) | --- | N (a) | LAP-028 |
| Mercury | 2 / 18 | 11 | 0.122 - 0.143 | 0.0975 - 0.123 | NP | 6.21E-02 | 6.81E-02 | 1.34E-01 | 1.1E-02 | 1.10E-01 | Y | 6.81E-02 | Y | LAP-0211 |
| Nickel | 4 / 18 | 22 | 5.47 - 16.8 | 0.567 - 6.23 | NP | 4.07E+00 | | 1.13E+01 | 1.9E+02 | 9.40E+00 | N (a) | --- | N (a) | LAP-024 |
| Potassium | 18 / 18 | 100 | 104 - 447 | 5.43 - 5.43 | N | 2.72E+02 | | 5.46E+02 | Not Required | 4.61E+02 | N (b) | --- | N (b) | LAP-024 |
| Selenium | 14 / 18 | 78 | 0.685 - 1.2 | 0.559 - 0.568 | NP | 7.69E-01 | | 6.96E+00 | 1.3E+02 | 5.61E+00 | N (a) | --- | N (a) | LAP-024 |
| Silver | 2 / 18 | 11 | 0.256 - 0.535 | 0.255 - 0.31 | NP | 1.67E-01 | | 3.70E-01 | 4.7E+01 | 3.70E-01 | N (a) | --- | N (a) | LAP-0210 |
| Strontium | 18 / 18 | 100 | 3.2 - 184 | NA - NA | NP | 6.13E+01 | | 3.17E+01 | 1.2E+04 | 2.48E+01 | N (a) | --- | N (a) | LAP-022 |
| Thallium | 0 / 18 | 0 | NA - NA | 20.5 24.9 | NA | NA | | 7.20E+00 | 2.0E+00 | 7.20E+00 | Y | NA | Y | NA |
| Zinc | 18 / 18 | 100 | 7.87 - 826 | NA - NA | L | 1.16E+02 | | 2.94E+01 | 5.9E+03 | 2.45E+01 | N (a) | --- | N (a) | LAP-027 |
| **Semivolatile Organics** | | | | | | | | | | | | | | |
| Acenaphthylene | 1 / 18 | 6 | 0.64 - 0.64 | 0.35 - 3.5 | NP | 5.53E-01 | | | 8.2E+02 | | N (a) | --- | N (a) | LAP-027 |
| Anthracene | 1 / 18 | 6 | 0.69 - 0.69 | 0.35 - 3.5 | NP | 5.53E-01 | | | 3.5E+00 | | N (a) | --- | N (a) | LAP-027 |
| Benzo(a)anthracene | 8 / 18 | 44 | 0.048 - 2 | 0.35 - 3.5 | NP | 5.53E-01 | 6.78E-01 | 1.53E-02 | 6.3E-01 | 1.53E-02 | Y | 6.78E-01 | Y | LAP-027 |
| Benzo(a)pyrene | 8 / 18 | 44 | 0.047 - 2 | 0.35 - 3.5 | NP | 5.53E-01 | 6.53E-01 | 1.54E-02 | 6.3E-02 | 1.54E-02 | Y | 6.53E-01 | Y | LAP-027 |
| Benzo(b)fluoranthene | 11 / 18 | 61 | 0.063 - 4.7 | 0.35 - 3.5 | NP | 7.17E-01 | 9.98E-01 | 1.53E-02 | 6.3E-01 | 1.53E-02 | Y | 9.98E-01 | Y | LAP-027 |
| Benzo(ghi)perylene | 5 / 18 | 28 | 0.042 - 0.83 | 0.35 - 3.5 | NP | 5.53E-01 | | 1.23E-02 | 4.1E+02 | 1.23E-02 | N (a) | --- | N (a) | LAP-0210 |
| Benzo(k)fluoranthene | 5 / 18 | 28 | 0.071 - 2 | 0.35 - 3.5 | NP | 5.53E-01 | | 1.30E-02 | 6.3E+00 | 1.30E-02 | N (a) | --- | N (a) | LAP-027 |
| bis(2-Ethylhexyl)phthalate | 5 / 18 | 28 | 0.079 - 0.43 | 0.35 - 3.5 | NP | 5.53E-01 | | | 1.7E+01 | | N (a) | --- | N (a) | LAP-024 |
| Chrysene | 11 / 18 | 61 | 0.05 - 2.7 | 0.35 - 3.5 | NP | 5.53E-01 | | 1.51E-02 | 6.3E+01 | 1.51E-02 | N (a) | --- | N (a) | LAP-027 |
| Fluoranthene | 11 / 18 | 61 | 0.062 - 3.9 | 0.35 - 3.5 | NP | 6.72E-01 | | 2.29E-02 | 5.5E+02 | 2.29E-02 | N (a) | --- | N (a) | LAP-027 |
| Indeno(1,2,3-cd)pyrene | 5 / 18 | 28 | 0.049 - 1 | 0.35 - 3.5 | NP | 5.53E-01 | 6.62E-01 | 1.43E-02 | 6.3E-01 | 1.43E-02 | Y | 6.62E-01 | Y | LAP-027 |
| Phenanthrene | 1 / 18 | 6 | 0.46 - 0.46 | 0.35 - 3.5 | NP | 5.53E-01 | | | 2.5E+00 | | N (a) | --- | N (a) | LAP-0210 |
| Pyrene | 10 / 18 | 56 | 0.048 - 3.3 | 0.35 - 3.5 | NP | 5.53E-01 | | 1.94E-02 | 1.5E+01 | 1.94E-02 | N (a) | --- | N (a) | LAP-027 |
| **Volatile Organics** | | | | | | | | | | | | | | |
| 1,2,3-Trichlorobenzene | 1 / 8 | 13 | 0.001 - 0.001 | 0.005 - 0.005 | NP | 2.50E-03 | | | 4.2E+01 | | N (a) | --- | N (a) | LAP-023 |
| Methylene chloride | 7 / 8 | 88 | 0.003 - 0.006 | 0.005 - 0.005 | NP | 2.94E-03 | | | 8.7E+00 | | N (a) | --- | N (a) | LAP-022 |
| Naphthalene | 1 / 8 | 13 | 0.004 - 0.004 | 0.005 - 0.005 | NP | 2.50E-03 | | | 1.8E+01 | | N (a) | --- | N (a) | LAP-023 |
| p-Isopropyltoluene | 1 / 8 | 13 | 0.006 - 0.006 | 0.005 - 0.005 | NP | 2.94E-03 | | | 4.2E+02 | | N (a) | --- | N (a) | LAP-028 |

[a] Ten surface soil and eight subsurface soil samples were collected from the vacuum truck overnight parking lot at LHAAP-02.
[b] Statistical Distribution: U = Distribution not determined if chemical is not selected as a COPC; L = Lognormal distribution; NP = nonparametric distribution.
[c] 95% Upper confidence limit (UCL) calculated for COPC using bootstrapping (2000 replications).
[d] Background screening concentrations are based on the 95% upper tolerance limit (UTL) of the total soil background data set, which used the combined depth intervals (i.e., 0-0.5 feet and 1.5-2.5 feet) from Shaw, 2004, Final Background Soil Study Report, Longhorn Army Ammunition Plant, July.
[e] Based on Texas Risk-Based Screening Values (RBSV) for soil, April 12, 2005 update. Values are based on a cancer risk of 1E-6 and a hazard index of 0.1
[f] N = Chemical is not chosen as a COPC; Y = Chemical is chosen as a COPC.
[g] Rationale for exclusion of chemical as a COPC:
(a) = maximum detected concentration is below or equal to risk-based screening concentration
(b) = essential nutrient; no screening value available/required
(c) = chemical concentration is below or equal to background screening concentration.
(d) = chemical is detected infrequently (i.e., < 5% frequency of detection).
[h] Concentration used in risk assessment equal to 95% UCL or maximum detected concentration, whichever is lower.
NA = Not available
UPL = Upper prediction limit of the Shaw total soil background dataset.
mg/kg = milligram per kilogram

**Table 3-3**

**Comparison of Metal Concentrations in LHAAP-02 Soil Samples to Background Concentrations**

| Metal | Basis for Background Comparison | p value | Are LHAAP-02 Concentrations Different from Background? [c] | Comment |
|---|---|---|---|---|
| Arsenic | WRS Test [a], Geochem [b] | 0.003395 | Yes | (1) |
| Copper | WRS Test [a], Geochem [b] | 0.002603 | Yes | (2) |

Notes:

[a] Wilcoxon Rank Sum statistical test

[b] Geochem: Comparison to background based on geochemical relationships (Appendix B).

[c] Difference is considered significant with 95% confidence if $p<0.05$.

Comments:

(1) Sample population exceeds background based on statistical test and one sample represents anomalous geochemical relationships (Attachment A, Table A-1).

(2) Sample population exceeds background based on statistical test and seven samples represent anomalous geochemical relationships (Appendix A, Table A-1).

**Table 3-4**
**Summary of Nondetected Chemicals in Soil at LHAAP-02**

| Chemical | Range of Values, mg/kg Reporting Limits Minimum - Maximum | Background Screening Concentration mg/kg [a] | Texas RBSV [b] mg/kg | Exceeds Screening Criteria [c] | Frequency of Affected Samples |
|---|---|---|---|---|---|
| **Inorganics** | | | | | |
| Cobalt | 5.12 - 6.23 | 8.34E+00 | 1.5E+03 | N (a,b) | 0 / 18 |
| Thallium | 20.5 - 24.9 | 4.70E-01 | 2.0E+00 | Y | 18 / 18 |
| **Perchlorate** | | | | | |
| Perchlorate | NR - NR | | 1.4E+01 | N (a) | 0 / 18 |
| **Explosives** | | | | | |
| 1,3,5-Trinitrobenzene | 0.19 - 0.22 | | 4.6E+02 | N (a) | 0 / 16 |
| 1,3-Dinitrobenzene | 0.19 - 0.22 | | 1.5E+00 | N (a) | 0 / 16 |
| 2,4,6-Trinitrotoluene | 0.19 - 0.22 | | 7.7E+00 | N (a) | 0 / 16 |
| 2,4-Dinitrotoluene | 0.19 - 0.22 | | 7.2E-01 | N (a) | 0 / 16 |
| 2,6-Dinitrotoluene | 0.19 - 0.22 | | 7.2E-01 | N (a) | 0 / 16 |
| 2-Amino-4,6-dinitrotoluene | 0.19 - 0.22 | | 2.6E+00 | N (a) | 0 / 16 |
| 4-Amino-2,6-dinitrotoluene | 0.19 - 0.22 | | 2.6E+00 | N (a) | 0 / 16 |
| HMX | 0.19 - 0.22 | | 2.2E+02 | N (a) | 0 / 16 |
| m-Nitrotoluene | 0.19 - 0.22 | | 4.4E+01 | N (a) | 0 / 16 |
| Nitrobenzene | 0.19 - 0.22 | | 6.5E+00 | N (a) | 0 / 16 |
| o-Nitrotoluene | 0.19 - 0.22 | | 4.7E+01 | N (a) | 0 / 16 |
| p-Nitrotoluene | 0.19 - 0.22 | | 4.4E+01 | N (a) | 0 / 16 |
| RDX | 0.19 - 0.22 | | 3.6E+00 | N (a) | 0 / 16 |
| Tetryl | 0.19 - 0.22 | | 1.5E+02 | N (a) | 0 / 16 |
| **Semivolatile Organics** | | | | | |
| 1,2,4-Trichlorobenzene | 0.35 - 3.5 | | 1.4E+02 | N (a) | 0 / 18 |
| 1,2-Dichlorobenzene | 0.35 - 3.5 | | 5.6E+01 | N (a) | 0 / 18 |
| 1,3-Dichlorobenzene | 0.35 - 3.5 | | 5.1E+00 | N (a) | 0 / 18 |
| 1,4-Dichlorobenzene | 0.35 - 3.5 | | 2.7E+01 | N (a) | 0 / 18 |
| 2,4,5-Trichlorophenol | 0.35 - 3.5 | | 1.5E+03 | N (a) | 0 / 18 |
| 2,4,6-Trichlorophenol | 0.35 - 3.5 | | 4.4E+01 | N (a) | 0 / 18 |
| 2,4-Dichlorophenol | 0.35 - 3.5 | | 4.6E+01 | N (a) | 0 / 18 |
| 2,4-Dimethylphenol | 0.35 - 3.5 | | 3.1E+02 | N (a) | 0 / 18 |
| 2,4-Dinitrophenol | 2.1 - 21 | | 3.1E+01 | N (a) | 0 / 18 |
| 2-Chloronaphthalene | 0.35 - 3.5 | | 1.1E+03 | N (a) | 0 / 18 |
| 2-Chlorophenol | 0.35 - 3.5 | | 1.1E+02 | N (a) | 0 / 18 |
| 2-Methylnaphthalene | 0.35 - 3.5 | | 5.0E+01 | N (a) | 0 / 18 |
| 2-Methylphenol | 0.35 - 3.5 | | 7.7E+02 | N (a) | 0 / 18 |
| 2-Nitroaniline | 0.35 - 3.5 | | 4.6E+00 | N (a) | 0 / 18 |
| 2-Nitrophenol | 0.35 - 3.5 | | 3.1E+01 | N (a) | 0 / 18 |
| 3-Nitroaniline | 0.35 - 3.5 | | 4.6E+00 | N (a) | 0 / 18 |
| 4,6-Dinitro-2-methylphenol | 0.88 - 8.7 | | 3.1E+01 | N (a) | 0 / 18 |
| 4-Bromophenyl phenyl ether | 0.35 - 3.5 | | 3.1E-02 | N (c) | 18 / 18 |
| 4-Chloro-3-methylphenol | 0.35 - 3.5 | | 7.7E+01 | N (a) | 0 / 18 |
| 4-Chloroaniline | 0.35 - 3.5 | | 6.2E+01 | N (a) | 0 / 18 |
| 4-Chlorophenyl phenyl ether | 0.35 - 3.5 | | 2.8E-02 | N (c) | 18 / 18 |
| 4-Methylphenol | 0.35 - 3.5 | | 7.7E+01 | N (a) | 0 / 18 |
| 4-Nitroaniline | 0.35 - 3.5 | | 1.3E+01 | N (a) | 0 / 18 |
| 4-Nitrophenol | 0.88 - 8.7 | | 3.1E+01 | N (a) | 0 / 18 |
| Acenaphthene | 0.35 - 3.5 | | 2.2E+00 | N (a) | 0 / 18 |
| Benzyl Alcohol | 0.88 - 8.7 | | 4.6E+03 | N (a) | 0 / 18 |
| bis(2-Chloroethoxy)methane | 0.35 - 3.5 | | 2.9E-01 | N (c) | 18 / 18 |
| bis(2-Chloroethoxy)ether | 0.35 - 3.5 | | 1.5E-01 | N (c) | 18 / 18 |
| Butyl benzyl phthalate | 0.35 - 3.5 | | 3.1E+03 | N (a) | 0 / 18 |
| Dibenzo(a,h)anthracene | 0.35 - 3.5 | | 6.3E-02 | N (c) | 18 / 18 |
| Dibenzofuran | 0.35 - 3.5 | | 2.0E+01 | N (a) | 0 / 18 |
| Diethyl phthalate | 0.35 - 3.5 | | 1.2E+04 | N (a) | 0 / 18 |
| Dimethyl phthalate | 0.35 - 3.5 | | 1.2E+04 | N (a) | 0 / 18 |
| di-n-Butyl phthalate | 0.35 - 3.5 | | 1.5E+03 | N (a) | 0 / 18 |
| di-n-Octyl phthalate | 0.35 - 3.5 | | 3.1E+02 | N (a) | 0 / 18 |
| Fluorene | 0.35 - 3.5 | | 4.6E+01 | N (a) | 0 / 18 |
| Hexachlorobenzene | 0.35 - 3.5 | | 2.5E-01 | N (c) | 18 / 18 |
| Hexachlorobutadiene | 0.005 - 0.005 | | 1.6E+00 | N (a) | 0 / 8 |
| Hexachlorocyclopentadiene | 0.71 - 7.1 | | 1.0E+00 | N (c) | 8 / 18 |
| Hexachloroethane | 0.35 - 3.5 | | 1.5E+01 | N (a) | 0 / 18 |
| Isophorone | 0.35 - 3.5 | | 5.2E+02 | N (a) | 0 / 18 |

**Table 3-4**
**Summary of Nondetected Chemicals in Soil at LHAAP-02**

| Chemical | Range of Values, mg/kg Reporting Limits Minimum - Maximum | Background Screening Concentration mg/kg [a] | Texas RBSV [b] mg/kg | Exceeds Screening Criteria [c] | Frequency of Affected Samples |
|---|---|---|---|---|---|
| Naphthalene | 0.35 - 3.5 | | 1.8E+01 | N (a) | 0 / 18 |
| Nitrobenzene | 0.35 - 3.5 | | 6.5E+00 | N (a) | 0 / 18 |
| n-Nitrosodimethylamine | 0.35 - 3.5 | | 1.3E-02 | N (c) | 18 / 18 |
| n-Nitroso-di-n-propylamine | 0.35 - 3.5 | | 4.1E-02 | N (c) | 18 / 18 |
| n-Nitrosodiphenylamine | 0.35 - 3.5 | | 5.9E+01 | N (a) | 0 / 18 |
| Pentachlorophenol | 0.88 - 8.7 | | 3.0E+00 | N (c) | 8 / 18 |
| Phenol | 0.35 - 3.5 | | 4.6E+03 | N (a) | 0 / 18 |
| **Volatile Organics** | | | | | |
| 1,1,1,2-Tetrachloroethane | 0.005 - 0.005 | | 5.2E+00 | N (a) | 0 / 8 |
| 1,1,1-Trichloroethane | 0.005 - 0.005 | | 2.3E+02 | N (a) | 0 / 8 |
| 1,1,2,2-Tetrachloroethane | 0.005 - 0.005 | | 5.1E-01 | N (a) | 0 / 8 |
| 1,1,2-Trichloroethane | 0.005 - 0.005 | | 9.7E-01 | N (a) | 0 / 8 |
| 1,1-Dichloroethane | 0.005 - 0.005 | | 8.9E+01 | N (a) | 0 / 8 |
| 1,1-Dichloroethene | 0.005 - 0.005 | | 2.7E+01 | N (a) | 0 / 8 |
| 1,1-Dichloropropene | 0.005 - 0.005 | | 9.9E-01 | N (a) | 0 / 8 |
| 1,2,3-Trichlorobenzene | 0.005 - 0.005 | | 4.2E+01 | N (a) | 0 / 8 |
| 1,2,3-Trichloropropane | 0.005 - 0.005 | | 9.1E-02 | N (a) | 0 / 8 |
| 1,2,4-Trichlorobenzene | 0.005 - 0.005 | | 1.4E+02 | N (a) | 0 / 8 |
| 1,2,4-Trimethylbenzene | 0.005 - 0.005 | | 9.6E+00 | N (a) | 0 / 8 |
| 1,2-Dibromo-3-chloropropane | 0.005 - 0.005 | | 3.5E-01 | N (a) | 0 / 8 |
| 1,2-Dibromoethane | 0.005 - 0.005 | | 7.2E-03 | N (a) | 0 / 8 |
| 1,2-Dichlorobenzene | 0.005 - 0.005 | | 5.6E+01 | N (a) | 0 / 8 |
| 1,2-Dichloroethane | 0.005 - 0.005 | | 2.7E-01 | N (a) | 0 / 8 |
| 1,2-Dichloropropane | 0.005 - 0.005 | | 1.8E+00 | N (a) | 0 / 8 |
| 1,2-Dimethylbenzene (o-Xylene) | 0.005 - 0.005 | | 3.3E+03 | N (a) | 0 / 8 |
| 1,3,5-Trimethylbenzene | 0.005 - 0.005 | | 8.3E+00 | N (a) | 0 / 8 |
| 1,3-Dichlorobenzene | 0.005 - 0.005 | | 5.1E+00 | N (a) | 0 / 8 |
| 1,3-Dichloropropane | 0.005 - 0.005 | | 3.0E+00 | N (a) | 0 / 8 |
| 1,4-Dichlorobenzene | 0.005 - 0.005 | | 2.7E+01 | N (a) | 0 / 8 |
| 2,2-Dichloropropane | 0.005 - 0.005 | | 1.7E+00 | N (a) | 0 / 8 |
| 2-Chlorotoluene | 0.005 - 0.005 | | 1.5E+02 | N (a) | 0 / 8 |
| 4-Chlorotoluene | 0.005 - 0.005 | | 3.4E-01 | N (a) | 0 / 8 |
| Benzene | 0.005 - 0.005 | | 8.8E-01 | N (a) | 0 / 8 |
| Bromobenzene | 0.005 - 0.005 | | 1.1E+01 | N (a) | 0 / 8 |
| Bromochloromethane | 0.005 - 0.005 | | 2.4E+01 | N (a) | 0 / 8 |
| Bromodichloromethane | 0.005 - 0.005 | | 1.0E+01 | N (a) | 0 / 8 |
| Bromoform | 0.005 - 0.005 | | 3.4E+01 | N (a) | 0 / 8 |
| Bromomethane | 0.005 - 0.005 | | 3.5E-01 | N (a) | 0 / 8 |
| Carbon tetrachloride | 0.005 - 0.005 | | 3.5E-01 | N (a) | 0 / 8 |
| Chlorobenzene | 0.005 - 0.005 | | 4.0E+01 | N (a) | 0 / 8 |
| Chloroethane | 0.005 - 0.005 | | 1.1E+03 | N (a) | 0 / 8 |
| Chloroform | 0.005 - 0.005 | | 3.1E-01 | N (a) | 0 / 8 |
| Chloromethane | 0.005 - 0.005 | | 2.3E-01 | N (a) | 0 / 8 |
| cis-1,2-Dichloroethene | 0.005 - 0.005 | | 1.2E+02 | N (a) | 0 / 8 |
| Dibromochloromethane | 0.005 - 0.005 | | 7.6E+00 | N (a) | 0 / 8 |
| Dibromomethane | 0.005 - 0.005 | | 1.9E+01 | N (a) | 0 / 8 |
| Dichlorodifluoromethane | 0.005 - 0.005 | | 2.2E+02 | N (a) | 0 / 8 |
| Ethylbenzene | 0.005 - 0.005 | | 4.3E+02 | N (a) | 0 / 8 |
| Isopropylbenzene | 0.005 - 0.005 | | 5.4E+02 | N (a) | 0 / 8 |
| Naphthalene | 0.005 - 0.005 | | 1.8E+01 | N (a) | 0 / 8 |
| n-Butylbenzene | 0.005 - 0.005 | | 2.7E+02 | N (a) | 0 / 8 |
| n-Propylbenzene | 0.005 - 0.005 | | 3.2E+02 | N (a) | 0 / 8 |
| sec-Butylbenzene | 0.005 - 0.005 | | 3.0E+02 | N (a) | 0 / 8 |
| Styrene | 0.005 - 0.005 | | 1.3E+03 | N (a) | 0 / 8 |
| tert-Butylbenzene | 0.005 - 0.005 | | 2.6E+02 | N (a) | 0 / 8 |
| Tetrachloroethene | 0.005 - 0.005 | | 6.0E+00 | N (a) | 0 / 8 |
| Toluene | 0.005 - 0.005 | | 1.7E+02 | N (a) | 0 / 8 |
| trans-1,2-Dichloroethene | 0.005 - 0.005 | | 1.4E+02 | N (a) | 0 / 8 |
| Trichloroethene | 0.005 - 0.005 | | 3.7E+00 | N (a) | 0 / 8 |
| Trichlorofluoromethane | 0.005 - 0.005 | | 2.6E+02 | N (a) | 0 / 8 |
| Vinyl chloride | 0.005 - 0.005 | | 3.6E-02 | N (a) | 0 / 8 |

**Table 3-4**
**Summary of Nondetected Chemicals in Soil at LHAAP-02**

| Chemical | Range of Values, mg/kg Reporting Limits Minimum - Maximum | Background Screening Concentration mg/kg [a] | Texas RBSV [b] mg/kg | Exceeds Screening Criteria [c] | Frequency of Affected Samples |
|---|---|---|---|---|---|

Notes:

[a] Background screening concentrations are based on the 95% upper tolerance limit (UTL) of the total soil background data set, which used the combined depth intervals (i.e., 0-0.5 feet and 1.5-2.5 feet) from Shaw, 2004, Final Background Soil Study Report, Longhorn Army Ammunition Plant, July.

[b] Based on Texas Medium Risk-Based Screening Values (RBSV) for soil, March 2006 update. Values are based on a cancer risk of 1E-6 and a hazard index of 0.1

[c] N = No; Y = Yes Comments:

(a) = maximum detected concentration is below or equal to risk-based screening concentration

(b) = chemical concentration is below or equal to background screening concentration.

(c) = Reporting Limits are above RBSV concentration and meet TCEQ requirements (30TAC335.554 and 335.555).

NR = Not reported

mg/kg = milligram per kilogram

# *Appendix A*

# *Geochemical Evaluation of Multiple Elements in Soil Samples from LHAAP-02*

# Appendix A

## Geochemical Evaluation of Multiple Elements in Soil Samples from LHAAP-02 Longhorn Army Ammunition Plant

## *A.1.0 Introduction*

This report provides the results of a geochemical evaluation of inorganic constituents in soil samples from the LHAAP-02 site at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. Arsenic, copper, and mercury in the site data set failed statistical comparison to background and comparisons to human health screening criteria, and a geochemical evaluation was performed to determine if the elevated concentrations are naturally occurring or if they contain a component of contamination.

Site samples included in the evaluation consist of 18 soil samples collected in July 2000. The samples were obtained from depths of 0 to 0.5 foot below ground surface (bgs) and 1 to 1.5 feet bgs. These samples were analyzed for several elements including aluminum, iron, and manganese. Installation-wide background data for target analyte list metals in soil are provided in the background study report (Shaw Environmental, Inc., 2004) and are used in the following evaluation.

## *A.2.0 Geochemical Evaluation Methodology*

Statistical site-to-background comparisons for trace elements in soil commonly have high false-positive error rates (erroneous declarations of contamination). A large number of background samples is required to adequately characterize the upper tails of most trace element distributions, which are typically right-skewed and span a wide range of concentrations, but such a large background data set is not always feasible. Higher false-positive error rates are expected if the site sample size is greater than the background sample size. The presence of estimated concentrations and nondetects with differing reporting limits can also cause statistical comparison tests to fail.

Statistical tests consider only the absolute concentrations of individual elements, and they disregard the interdependence of element concentrations and the geochemical mechanisms controlling element behavior. However, it is well established that trace elements are naturally associated with specific soil-forming minerals, and the preferential enrichment of a sample with these minerals will result in elevated trace element concentrations. It is thus important to be able to identify these naturally high concentrations and distinguish them from potential contamination.

Recent publications indicate that geochemical evaluations are assuming a larger role in environmental investigations (e.g., U.S. Environmental Protection Agency, 1995; Barclift, *et al.*, 2000; U.S. Navy, 2002 and 2003; Myers and Thorbjornsen, 2004). A properly executed geochemical evaluation can distinguish between naturally high element concentrations versus contamination, and it can identify the specific samples that may contain some component of site-related contamination. This section describes the geochemical evaluation techniques that were employed in the LHAAP-02 soil investigation.

It should be noted that the geochemical evaluations rely in part on professional judgment. Samples that plot off the linear trend on a correlation plot are certainly suspect, but because all uncertainty cannot be eliminated from the evaluation, such plots cannot be construed as definitive proof of contamination. However, anomalous samples should be flagged as suspect, and their results should be used as a basis for further investigation, risk assessment, or remediation, as appropriate.

Geochemical evaluation of inorganic data is not a new concept, and it is based in part on the well-understood processes of trace element adsorption that are described in the literature (e.g., Gulledge and O'Connor, 1973; McKenzie, 1980; Electric Power Research Institute [EPRI], 1984; Hem, 1985; EPRI, 1986; Belzile and Tessier, 1990; Bowell, 1994; Manceau, 1995; Stumm and Morgan, 1996; Sullivan and Aller, 1996; Drever, 1997; Belzile *et al.*, 2000; Nickson *et al.*, 2000; Kabata-Pendias, 2001; Lai and Chen, 2001; Emmanuel and Erel, 2002; Munk *et al.*, 2002; Roddick-Lanzilotta *et al.*, 2002; Smedley and Kinniburgh, 2002; Cornell and Schwertmann, 2003; Welch and Stollenwerk, 2003). These papers, texts, and monographs provide the technical basis for the geochemical evaluations performed for the LHAAP project. This fundamental research has been applied in numerous peer-reviewed papers that employ correlation plots of trace elements versus specific major elements. The aims of these applied-science papers are to determine the likely mechanisms controlling element concentrations and identify potentially contaminated samples (e.g., Windom *et al.*, 1989; Hanson *et al.*, 1993; Daskalakis and O'Connor, 1995; Schiff and Weisberg, 1997; Barclift *et al.*, 2000; Kuss *et al.*, 2001; Chen *et al.*, 2002; El Bilali *et al.*, 2002; Mostafa *et al.*, 2004). In many cases, these papers use the same types of analytical data that are obtained during the LHAAP investigations and typical environmental investigations at other sites.

***Trace Elements in Soil.*** Trace elements naturally associate with specific soil-forming minerals, and geochemical evaluations are predicated on these known associations. For example, in most uncontaminated oxic soils, arsenic exhibits an almost exclusive association with iron oxide minerals (Bowell, 1994; Schiff and Weisberg, 1997). Arsenic exists in oxic soil pore fluid as oxyanions such as $HAsO_4^{2-}$ and $H_2AsO_4^{-}$ (Brookins, 1988), and these negatively charged species have a strong affinity to adsorb on iron oxides, which tend to maintain a net positive surface charge (EPRI, 1986). (In this report, the term "iron oxide" encompasses oxides, hydroxides, oxyhydroxides, and hydrous oxides of iron.) This association is expressed as a positive correlation between arsenic concentrations and iron concentrations for uncontaminated samples: soil samples with a low percentage of iron oxides will contain proportionally lower arsenic concentrations, and soil samples that are enriched in iron oxides will contain proportionally higher arsenic concentrations. Although there is variability in the absolute concentrations of arsenic and iron in soil at a site, the As/Fe ratios of the samples will be relatively constant if no contamination is present (Daskalakis and O'Connor, 1995). Samples that contain excess arsenic from a contaminant source (e.g., an arsenic-bearing herbicide) will exhibit anomalously high As/Fe ratios compared to the uncontaminated samples.

To perform the geochemical evaluation, correlation plots are constructed to explore the elemental associations and identify potentially contaminated samples. The detected concentrations of the trace element of interest (dependent variable) are plotted against the detected concentrations of the reference element (independent variable), which represents the mineral to which the trace element may be adsorbed. In the case of arsenic, the arsenic concentrations for a given set of samples would be plotted on the y-axis and the corresponding iron concentrations would be plotted on the x-axis. If no contamination is present, then the samples will exhibit a generally linear trend, and the samples with the highest arsenic concentrations will lie on this trend. This indicates that the elevated arsenic is due to the preferential enrichment of iron oxides in those samples and that the arsenic has a natural source. If, however, the samples with high arsenic concentrations have low or moderate iron concentrations (anomalously high As/Fe ratios), then they will lie above the linear trend established by the other samples. This would indicate that the anomalous samples contain excess arsenic beyond that which can be explained by the natural iron oxide content, and such samples may contain a component of contamination.

The reference elements against which trace elements are evaluated reflect the affinity that the trace elements have for specific minerals. The concentrations of iron, aluminum, and manganese serve as qualitative indicators of the amounts of iron oxide, clay, and manganese oxide minerals in the soil samples. Along with arsenic, selenium and vanadium are present in oxic soil pore fluid as anions and have an affinity to adsorb on iron oxides, which tend to maintain a net positive surface charge. Concentrations of arsenic, selenium, or vanadium in a set of samples can be evaluated through comparison to the corresponding iron concentrations. Barium, cadmium, lead, and zinc are typically present in soil as divalent cations and have an affinity to adsorb on clay minerals, which tend to maintain a net negative surface charge. Concentrations of barium, cadmium, lead, or zinc can be evaluated through comparison to the corresponding aluminum concentrations. Manganese oxides have a strong affinity to adsorb barium, cobalt, and lead (Kabata-Pendias, 2001), so concentrations of these elements can be compared to the corresponding manganese concentrations, as long as there is enough manganese present in the soil to form discrete manganese oxides.

It is important to note that some trace elements have very strong affinities for a particular type of mineral, whereas other elements will partition themselves between several minerals. For instance, vanadium has a particularly strong affinity for iron oxides, so correlation coefficients for vanadium versus iron in uncontaminated samples are usually very high, and this is expressed on a correlation plot as a highly linear trend. In contrast, chromium forms several coexisting aqueous species with different charges [$Cr(OH)_2^+$, $Cr(OH)_3^0$, and $Cr(OH)_4^-$] that will adsorb on several different types of minerals including clays and iron oxides. This behavior will yield lower correlation coefficients for chromium versus iron or chromium versus aluminum relative to the coefficients observed for vanadium versus iron, and more scatter may be observed on the correlation plots. Some elements are more selective than others with respect to adsorption on specific mineral surfaces, and this selectivity is dependent on site-specific conditions, including soil pH, redox conditions, and concentrations of competing elements.

***Ratio Plots.*** Site samples with a trace element present as a contaminant will exhibit anomalously high trace-versus-major element ratios compared to background trace-versus-major element ratios. These elevated ratios may not always be apparent in log-log correlation plots, especially at the upper range of concentrations. Therefore, ratio plots, which depict trace element concentrations on the y-axis and trace/major element ratios on the x-axis, are employed in conjunction with correlation plots in those cases where it is not immediately apparent which site samples have anomalously high elemental ratios on the correlation plots. The ratio plots permit easy identification of samples with anomalously high elemental ratios relative to background, and they have high resolution over the entire concentration range. The presence of an anomalously high elemental ratio is not definitive proof of site-related contamination; however, such samples are discussed in the text and, unless otherwise noted, are flagged as representing potential site-related contamination. This is a conservative approach.

It is important to note that there is natural variability, as well as analytical uncertainty, in the elemental ratios of uncontaminated soil samples. Trace/major element ratios are calculated from two uncertain analytical results, so the resulting uncertainties in the ratios can produce some scatter in the points on a ratio plot. This is especially true when estimated (“J”-qualified) analytical results are used. This can be seen on many of the plots that show more scatter of the points at the lower end of the concentration range, where analytical uncertainties are higher and analytical results are reported with fewer significant figures.

On ratio plots, vertical trends should be expected only in those cases where the trace element adsorption is a linear process, where the trace element concentrations are controlled exclusively by adsorption on a given mineral type, and where the variances of the reference and trace element concentrations are similar. Nonvertical trends are much more common in ratio plots, however, because adsorption processes often are not linear, trace elements often have affinities for more than one type of sorptive surface, and the reference and trace element concentrations usually possess different variances. Nonlinear adsorption of a trace element on mineral surfaces will manifest itself as a curve rather than a straight line on a correlation plot and as a nonvertical trend on a ratio plot. In addition, the presence of competing ions in soil and differences in pH and redox conditions among the sample locations can add to the natural variability of elemental ratios.

Ratio plots may also be prepared for the major elements (e.g., aluminum versus Al/Fe ratios). However, adsorption is not the dominant process controlling major element concentrations. For example, aluminum and iron concentrations covary largely because they are controlled by the abundance of fine-grained minerals in the samples. The plots thus reflect physical effects rather than chemical effects such as adsorption. Linearity is often not observed in major-versus-major element correlation plots and associated ratio plots.

## *A.3.0 Results of the Geochemical Evaluation of Multiple Elements in Soil*

This section presents the results of the geochemical evaluation of arsenic and copper in soil samples from LHAAP-02. Correlation plots and ratio plots are provided in Figures A-1 through A-7. Table A-1 lists the samples identified as containing anomalously high element concentrations.

### Arsenic

Arsenic is typically present in oxic soil pore fluid as oxyanions ($H_2AsO_4^-$, $HAsO_4^{2-}$) and has a strong affinity to adsorb on iron oxides, which tend to maintain a net positive surface charge. A positive correlation between arsenic and iron concentrations is expected for uncontaminated samples under those conditions. Iron is the second most abundant element analyzed in the LHAAP-02 soil samples, with a mean concentration of 14,800 mg/kg (1.5 weight percent), and aluminum is the third most abundant element analyzed in the site samples, with a mean concentration of 5,640 mg/kg (0.6 weight percent). The iron in the samples is dominantly present as iron oxides, which are common soil-forming minerals and occur as discrete mineral grains or as coatings on silicate minerals (Cornell and Schwertmann, 2003). Aluminum is a primary component of minerals such as clays, feldspars, and micas; it also substitutes for ferric iron in iron oxide minerals, and can adsorb on iron oxide surfaces (Cornell and Schwertmann, 2003). Clays and iron oxides tend to exist as very fine particles, so both aluminum and iron are enriched in samples with finer grain sizes.

A plot of aluminum versus iron concentrations can be used as a qualitative indicator of the relative abundance of clay and iron oxide minerals in site soil (Figure A-1). As noted previously, covariance of aluminum and iron concentrations generally reflects grain-size effects rather than chemical effects such as adsorption. Thus, although positive correlations between aluminum and iron are often observed in uncontaminated samples, some natural variability in Al/Fe ratios is expected. Most of the site and background samples form a common, generally linear trend with a positive slope in Figure A-1. The site samples have higher iron concentrations than many of the background samples and slightly lower aluminum concentrations, which suggests that the site soils are characterized by a lower proportion of clays and aluminum-bearing minerals relative to the background soils. However, the site samples generally have Al/Fe ratios that are similar to those of the background samples, which suggests a natural source for their aluminum and iron concentrations.

A plot of arsenic versus iron reveals a common linear trend with a positive slope for the background samples and most of the site samples (Figure A-2). This correlation is expected, based on arsenic's affinity for adsorption on iron oxides. Another perspective on the data sets is provided in Figure A-3, which displays the arsenic concentrations of the site and background samples (y-axis) versus their corresponding As/Fe ratios (x-axis). If a site sample contains excess arsenic from a contaminant source, then it will exhibit an anomalously high As/Fe ratio relative to background and will lie to the right of the background samples in Figure A-3. Most of the LHAAP-02 samples exhibit As/Fe ratios that are within the background range, which suggests a natural source for their arsenic concentrations. However, sample LAP-0210 has an As/Fe ratio (1.03E-03) that exceeds the maximum background As/Fe ratio of 6.54E-04. Elevated arsenic in this sample should be considered suspect (Table A-1).

## Copper

Cations such as copper ($Cu^{2+}$) and nickel ($Ni^{2+}$) have an affinity to adsorb on the surfaces of iron oxides under the pH range of typical soils (5 to 8 standard units), with adsorption increasing as pH approaches neutrality (Cornell and Schwertmann, 2003). The cations bind to surface hydroxyl groups ($OH^{-}$), giving rise to metal-surface complexes. Because of this affinity for cation adsorption, positive correlations are commonly observed for copper versus iron concentrations in uncontaminated soil samples. Samples that contain a high proportion of iron oxides are therefore expected to contain naturally high concentrations of cations such as copper.

Figure A-4 provides a plot of copper versus iron for the LHAAP-02 and background samples. The background samples and several site samples form a common linear trend with a positive slope. Several site samples have Cu/Fe ratios that are within the background range, as seen in Figure A-5. Copper detected in these samples is most likely natural. Seven LHAAP-02 samples, however, have high copper concentrations but moderate iron; they lie above the linear background trend in Figure A-4 and to the right of the background samples in Figure A-5. The anomalously high Cu/Fe ratios indicate that these samples may contain a component of contamination (Table A-1).

**Mercury**

Mercury can adsorb on the surfaces of iron oxide and clay minerals, but its concentrations are commonly controlled through organic complex formation (Kabata-Pendias, 2001). As a result, poor correlations for mercury versus iron or mercury versus aluminum are often observed, even in uncontaminated soil samples. In addition, mercury concentrations are often estimated detections near or below the reporting limit, and the uncertainty associated with such values contributes to the weak correlations. A plot of mercury versus aluminum is provided in Figure A-6. The background samples form a weak trend with a positive slope. All but one of the background mercury detections are estimated (J-qualified) concentrations, which likely explains why a stronger correlation is not observed. Both site samples with detectable mercury lie on the background trend.

Figure A-7 displays the mercury concentrations of the site and background samples (y-axis) versus their corresponding Hg/Al ratios (x-axis). If a site sample contained excess mercury from a contaminant source, it would exhibit an anomalously high Hg/Al ratio relative to background and would plot to the right of the background samples in Figure A-7. However, all of the site samples exhibit Hg/Al ratios that are within the background range. This suggests a natural source for the mercury detected in the site samples.

## *A.4.0 Summary*

Arsenic, copper, and mercury in the LHAAP-02 soil data set failed statistical comparison to background and exceeded human health screening criteria. A geochemical evaluation was performed to determine if the elevated site concentrations could be explained as the result of natural processes. This evaluation indicated that anomalously high concentrations of arsenic and copper are present in one to seven samples each (Table A-1). Both detected concentrations of mercury in the site data set are naturally occurring.

## *A.5.0 References*

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# *Appendix A Tables*

# Table A-1
## Samples with Anomalous Concentrations

| Location | Sample | Date | Depth | Element(s) |
|---|---|---|---|---|
| LAP-0210 | LAP-0210 | 11-Jul-00 | 0 - 0.5 | Arsenic, Copper |
| LAP-0211 | LAP-0211 | 11-Jul-00 | 0 - 0.5 | Copper |
| LAP-022 | LAP-022B | 11-Jul-00 | 1 - 1.5 | Copper |
| LAP-024 | LAP-024A | 11-Jul-00 | 0 - 0.5 | Copper |
| LAP-025 | LAP-025A | 11-Jul-00 | 0 - 0.5 | Copper |
| LAP-026 | LAP-026A | 11-Jul-00 | 0 - 0.5 | Copper |
| LAP-027 | LAP-027A | 11-Jul-00 | 0 - 0.5 | Copper |

Note: Depths represent feet below ground surface.

# *Appendix A Figures*

# Figures
## Correlation and Ratio Plots

**Figure A-1. Aluminum vs. Iron in LHAAP-02 Soil**

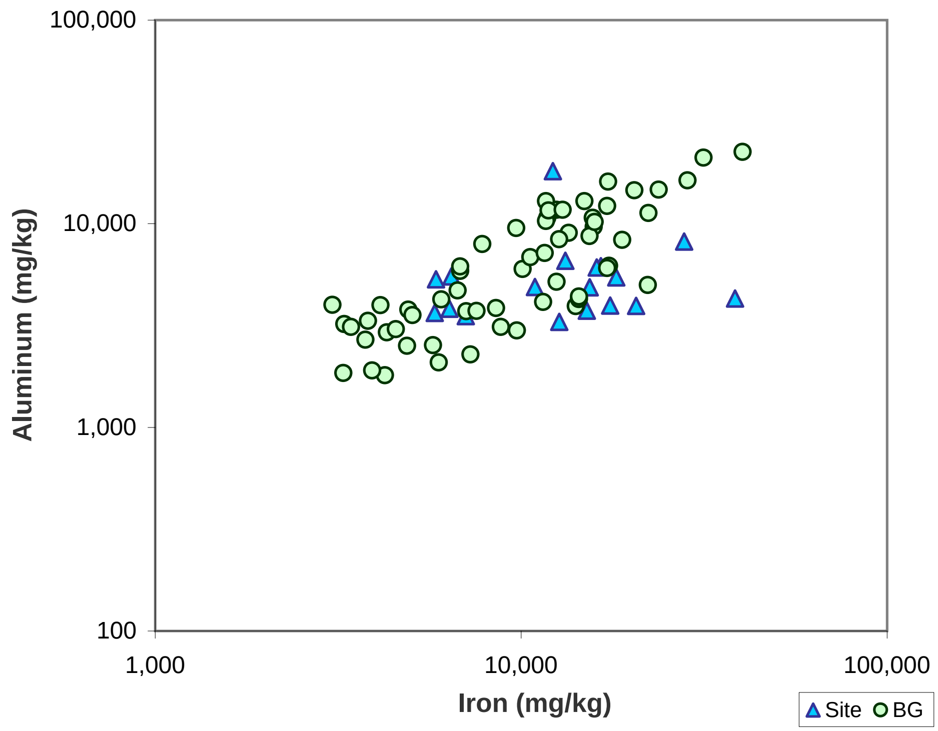
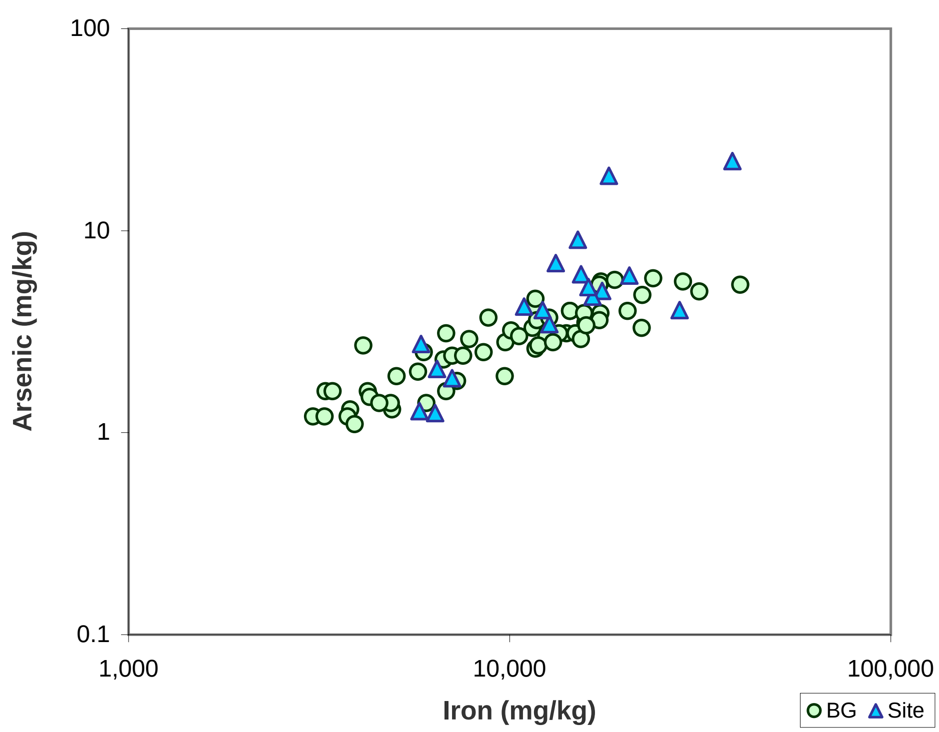
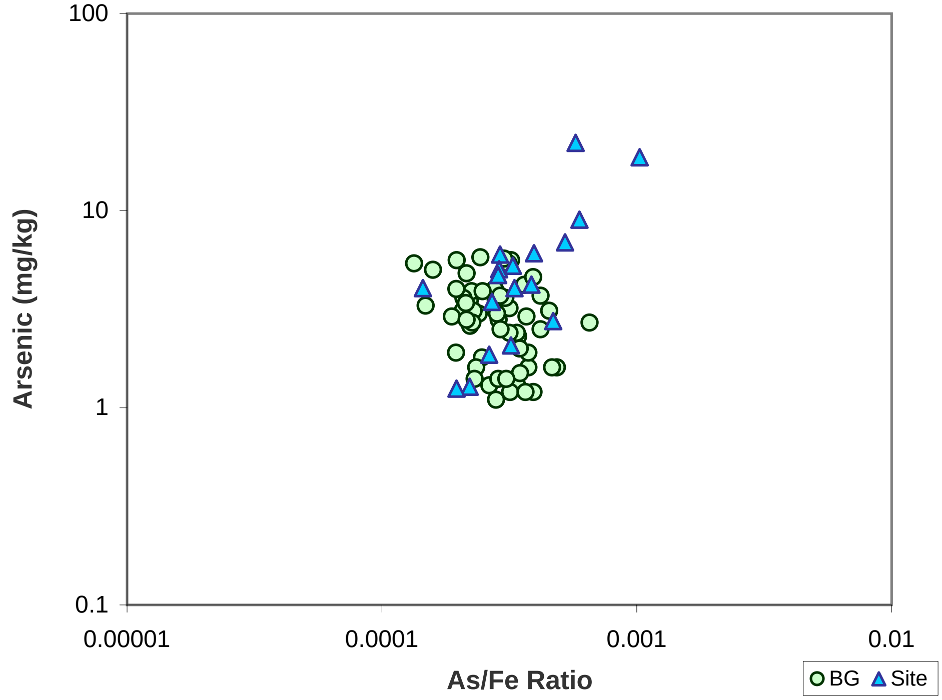



**Figure A-2. Arsenic vs. Iron in LHAAP-02 Soil**

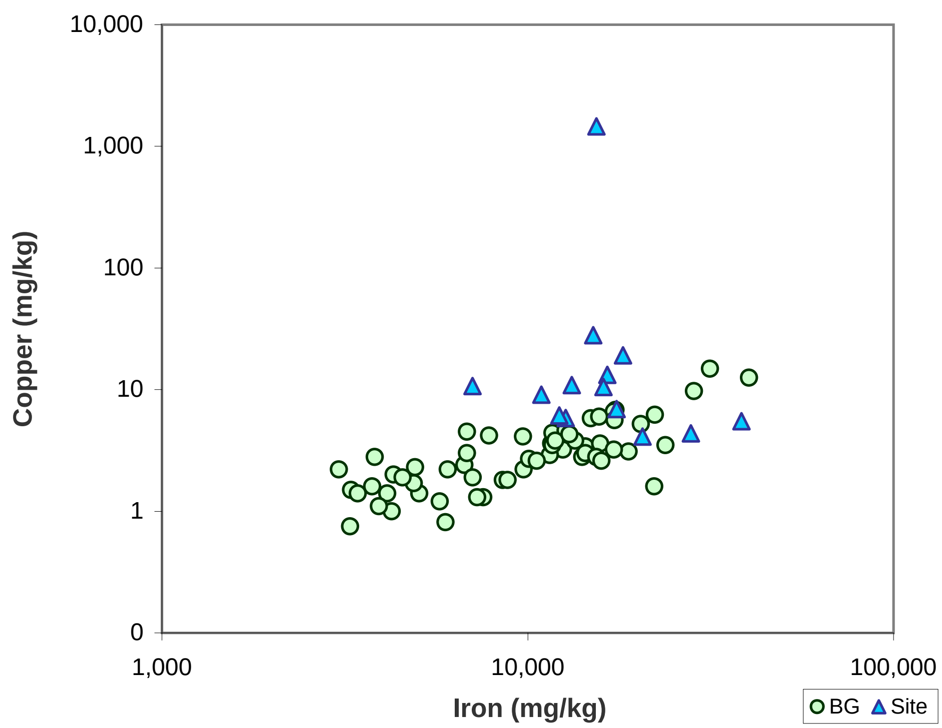


# Figures
## Correlation and Ratio Plots

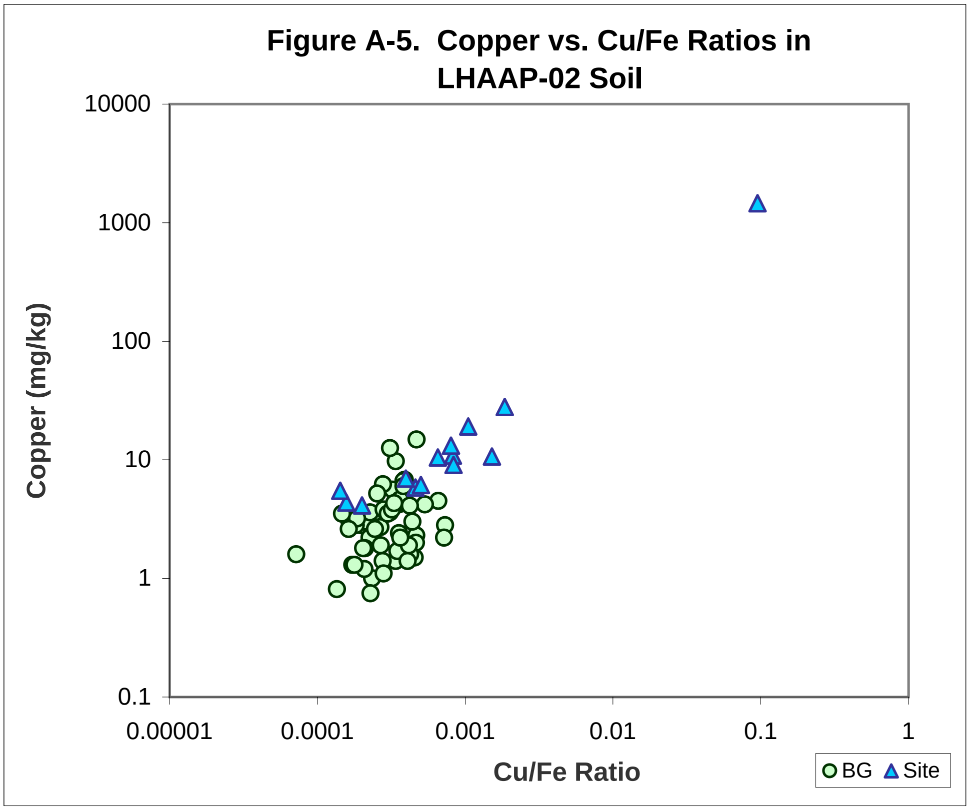
### Figure A-3. Arsenic vs. As/Fe Ratios in LHAAP-02 Soil

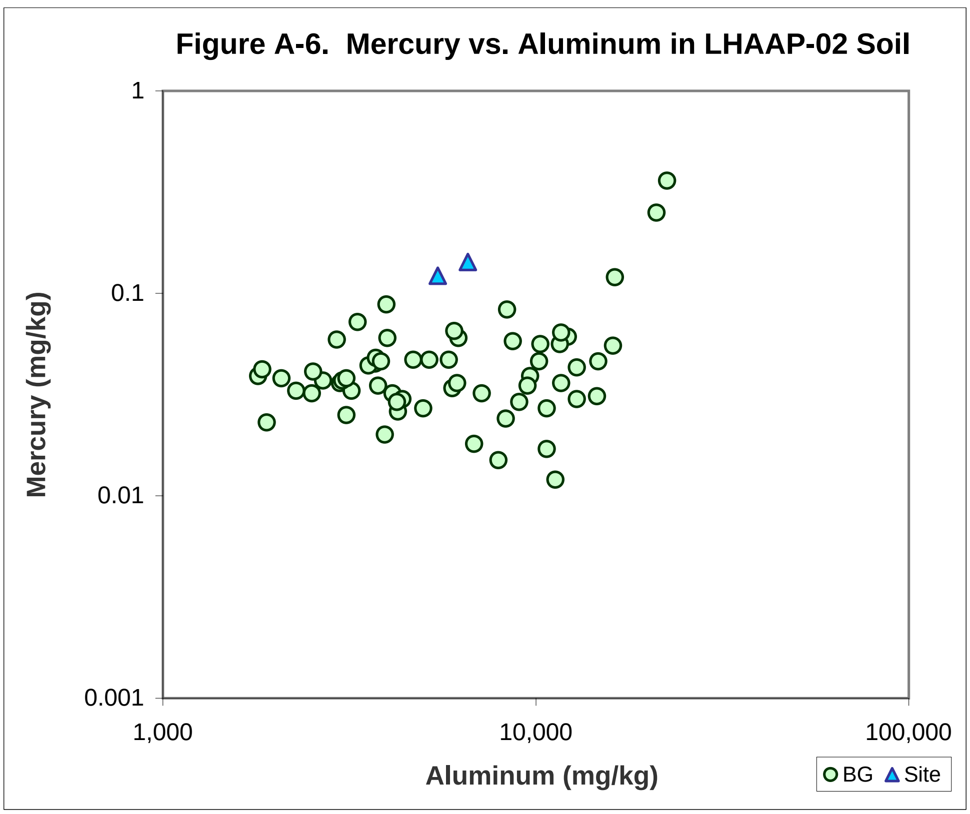



### Figure A-4. Copper vs. Iron in LHAAP-02 Soil

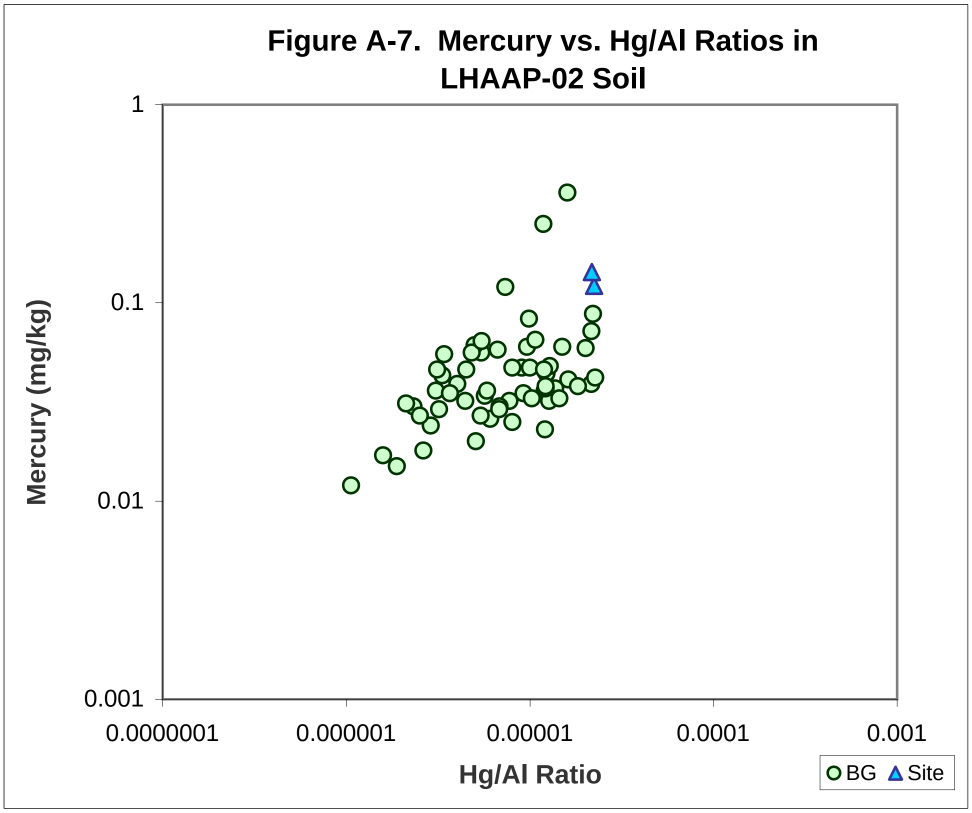


## Figures
## Correlation and Ratio Plots



# Figures
# Correlation and Ratio Plots



# *Appendix B*

## *Development of TCEQ Risk Reduction Rules Standard 3 Medium-Specific Concentrations for Soil at LHAAP-02*

# Appendix B
# Development of TCEQ Risk Reduction Rules Standard 3 Medium-Specific Concentrations for Soil at LHAAP-02

This appendix describes the development of Standard 3 Medium Specific Concentrations (MSCs) for chemicals in soil that are protective of groundwater at the Vacuum Truck Overnight Parking Lot (LHAAP-02) located at the former Longhorn Army Ammunition Plant (LHAAP) near Karnack, Texas. The MSC values were developed according to the Texas Commission on Environmental Quality [TCEQ] Texas Risk Reduction Rules, Title 30 Texas Administrative Code (TAC) Chapter 335 (30 TAC §335 and updates).

Site LHAAP-02 was a parking lot for trucks used to pump out various sumps around LHAAP. Evaluation of chemicals in soil was based on data from analysis of ten surface soil samples (0-6 inches below ground surface [bgs]) and eight subsurface samples (12-18 inches bgs). The surface soil samples were analyzed for metals, semi-volatile organic chemicals (SVOCs), explosives, and perchlorate. Subsurface soil samples were analyzed for metals, SVOCs, explosives, perchlorate, and volatile organic compounds (VOCs), and the analytical results were reported in the USACHPPM (2000) document.

In Section 3.0 of the main body of this report, the analytical data were evaluated by comparison of chemical concentrations to TCEQ risk-based soil screening values (RBSVs) developed to be protective of human health by the direct contact exposure pathways (ingestion, inhalation, and dermal contact). The evaluation showed that aluminum, arsenic, copper, mercury, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene, have one or more measured concentrations above these direct contacts.

That evaluation showed that antimony, barium, cadmium, chromium, lead, manganese, nickel, selenium, silver, strontium, zinc, acenaphthylene, anthracene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, pyrene, bis(2-ethylhexyl)phthalate, methylene chloride, and p-isopropyltoluene have concentrations below the direct contact human health screening levels. However, according to TCEQ Risk Reduction Rules (RRR), the concentrations of these chemicals can not be removed from consideration based on only these direct contact exposure pathways, but must also be protective of groundwater resources from potential leaching from soil and transport to underlying groundwater-bearing zones.

Selected chemicals were further compared to LHAAP-specific background concentrations statistically or by geochemical evaluations. Aluminum was excluded from further consideration at LHAAP-02, because the maximum detected concentration (MDC) for aluminum is below the 95% UPL value for background (Table 3-2 in the main body of this report). Statistical comparisons of other metal concentrations to LHAAP background concentrations showed that arsenic and copper concentrations are above background concentrations with 95 percent confidence. Because less than 60 percent of the samples analyzed for mercury, benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene concentrations were detected, the above statistical tests could not be applied, and these chemicals were considered here.

Therefore, groundwater-protective Risk Reduction Standard 3 MSCs were calculated to evaluate potential migration of chemicals from soil to groundwater as provided in TCEQ guidance [30 TAC §335.563(i)(2)]. Groundwater-protective Standard 3 MSCs were calculated for the following chemicals:

- antimony
- arsenic
- barium
- cadmium
- chromium
- copper
- lead
- manganese
- mercury
- nickel
- selenium
- silver
- strontium
- thallium
- zinc
- bis(2-ethylhexyl)phthalate
- acenaphthylene
- anthracene
- benzo(a)anthracene
- benzo(a)pyrene
- benzo(b)fluoranthene
- benzo(k)fluoranthene
- benzo(ghi)perylene
- chrysene
- fluoranthene
- indeno(1,2,3-cd)pyrene
- phenanthrene
- pyrene
- methylene chloride
- p-isopropyltoluene

Soil Attenuation

The SAM model was selected to predict impacts of soil contamination on groundwater quality. The SAM model is an extension of the Soil Screening Level calculations EPA (1996) guidance and is based on calculating total mass (liquid phase, solid phase, and gas phase) in the soil column:

$$M_T = V(\rho_b C_s + \theta_w C_w + \theta_a C_g) \qquad \text{Eq. 1}$$

Where

$M_T$ = total mass of chemical
$V$ = volume of the soil column
$\rho_b$ = bulk density
$C_s$ = concentration in soil (dry weight basis)
$\theta_w$ = water filled porosity
$C_w$ = concentration in pore water
$\theta_a$ = air filled porosity
$C_g$ = gas phase concentration.

Total mass is then redistributed using equilibrium conditions based on the adsorption coefficient and Henry's Law constant. The equilibrium equations are:

$$C_s = K_d C_w \qquad \text{Eq. 2}$$

$$C_g = K_H C_w \qquad \text{Eq. 3}$$

Where Kd is the distribution coefficient or adsorption coefficient, and $K_H$ is dimensionless Henry's Law constant.

The SAM model enhancement over EPA's Soil Screening Levels is that the SAM model assumes a zone of contaminated soils overlying a zone of clean soil (zero contaminant concentration). The SAM simulates mixing of contamination through the contaminated and clean soil zones based on equilibrium conditions, and predicts leachate concentration at the bottom of the soil column. The SAM model calculates the leachate concentration according to the equation:

$$C_w = C_s \left( \frac{\rho_b}{K_d\ \rho_b + \theta_w + \theta_a K_H} \right) \left( \frac{L_1}{L_2} \right) \qquad \text{Eq. 4}$$

The concentration in the contaminated soil zone that will produce a given leachate concentration can be calculated as:

$$C_s = C_w \left( \frac{K_d \ \rho_b + \theta_w + \theta_a K_H}{\rho_b} \right) \left( \frac{L_2}{L_1} \right) \qquad \text{Eq. 5}$$

Where $L_1$ is the thickness of the total soil column and $L_2$ is the thickness of the contaminated zone. The factor ($L_2/L_1$) is an enhancement in the SAM model over the Soil Screening Level Model by EPA. A further dilution factor for leachate mixing with groundwater can be incorporated by using leachate dilution factor:

$$LDF = 1 + \frac{Kid}{IL} \qquad \text{Eq. 6}$$

Where

K = aquifer hydraulic conductivity
i = hydraulic gradient in aquifer
d = groundwater mixing zone depth
I = infiltration rate
L = source length parallel to groundwater flow.

The groundwater protective Standard 3 MSC is the soil concentration ($C_s$) described by Eq. 7 where the groundwater concentration ($C_w$) is limited by the TCEQ risk-based drinking water concentration (GW-Ind) modified by the LDF as follows:

$$\text{Standard 3 } MSC = C_w \left( \frac{K_d \ \rho_b + \theta_w + \theta_a K_H}{\rho_b} \right) \left( \frac{L_2}{L_1} \right) x \ LDF \qquad \text{Eq. 7}$$

The model further calculates the soil saturation concentration ($C_{sat}$), which corresponds to the contaminant concentration in soil at which the absorptive capacity of soil particles, the solubility limits of soil pore water, and saturation of soil pore air have been reached. Concentrations above $C_{sat}$ are assumed to be in free phase. The $C_{sat}$ concentration is calculated in the SAM model according to Eq. 8.

$$C_{sat} = S \left( \frac{K_d \ \rho_b + \theta_w + \theta_a K_H}{\rho_b} \right) \qquad \text{Eq. 8}$$

Input parameters to the SAM model that are either specific to LHAAP-02 or are default TCEQ values are shown in **Table B-1**. Physical properties of chemicals addressed in the SAM model and are shown in **Table B-2**. Calculation of $C_{sat}$ concentrations of each chemical is shown in **Table B-3**. Calculated Standard 3 MSC values that are based on the TCEQ MSC for groundwater (GW-Ind) are shown in **Table B-4**. The Standard 3 MSC is equated to the $C_{sat}$ concentration for chemicals having a calculated MSC greater than the soil saturation concentration, which includes p-isopropyl toluene and all polycyclic aromatic compounds except benzo(a)anthracene (**Table B-4**).

The Applicable Standard 3 MSC was developed as the larger of the Standard 3 MSC value and the background concentration (**Table B-5**). The background concentration represents the Applicable MSC for arsenic, mercury, selenium, and thallium.

Concentrations of the selected chemicals are compared to the Applicable Standard 3 MSC values in **Table B- 6**.

*Arsenic*

Of the six samples detected above the Standard 3 MSC for arsenic, three samples, LAP-0211, LAP-021A, and LAP-027A exceed the Standard 3 MSC of 5.9 ppm by 0.09 to 1.0 ppm. Reported concentrations in two other samples, LAP-0210 and LAP-028B exceed the Standard 3 MSC by up to 16.2 ppm. Arsenic concentrations in 12 of the 18 samples were below 5.86 ppm, which is the background concentration and serves as the Applicable MSC (**Table B-5**).

*Cadmium*

Only two samples, LAP-026A and LAP027A, exceed the Standard 3 MSC for cadmium, 1.7 ppm. The concentration of cadmium in LAP-0027A exceeds the Standard 3 MSC by 1.1 ppm, and the other sample (LAP-026A) only exceeds the Standard 3 MSC by 0.45 ppm. Cadmium concentrations in 15 of the 18 samples were below 1.4 ppm, the 95% UPL of the cadmium background level.

*Copper*

Sample LAP-027A is reported at 1,460 ppm, which is well over twice the Standard 3 MSC for copper (520 ppm). This is the only sample that exceeded the Standard 3 MSC. Copper concentrations in 9 of the 18 samples were below 8.37 ppm, which is the 95% UPL of the copper background level.

*Lead*

Five of the 18 samples exceeded the Standard 3 MSC for lead (280 ppm). These samples include LAP-0210, LAP-0211, LAP-024A, LAP-025A, and LAP-026A. The concentrations of the samples that exceed the Standard 3 MSC range from 285 ppm to 368 ppm, which means that lead concentrations exceed the Standard 3 MSC by 5 ppm to 88 ppm. Lead concentrations also exceed the 95% UPL of the lead background level of 17.8 ppm.

*Mercury*

The Applicable Standard 3 MSC for mercury is the 95% UPL concentration of 0.11 ppm (**Table B-5**). Two of 18 samples, LAP-0210 and LAP-0211, slightly exceed the Standard 3 MSC by 0.012 to 0.033 ppm. The highest mercury concentration was detected in sample LAP-0211 at 0.143 ppm. Sixteen samples had reported concentrations below the Standard 3 MSC, although five detection limits exceeded the Standard 3 MSC by up to 0.013 ppm.

*Thallium*

Thallium was not detected in any of the 18 samples analyzed, although the detection limits for all 18 samples were above the Standard 3 MSC of 7.2 ppm (**Table B-2**).

To summarize, arsenic, cadmium, copper, lead, and mercury concentrations exceeded Applicable Standard 3 MSCs in one or more samples. No other chemicals analyzed exceed their respective Applicable MSC values in any of the samples (**Table B-6**).

**References**

Jacobs Engineering Group, Inc. (Jacobs), 2002, *Final Remedial Investigation Report, Group 4 Sites, Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60,67, Goose Prairie Creek, Volumes 1 and 2: Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Oak Ridge, Tennessee, April.

Shaw Environmental, Inc. (Shaw), 2008a, *LHAAP-49 Site Evaluation Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Appendix E, May.

Shaw, 2008b, *LHAAP-58 Feasibility Study Report, Longhorn Army Ammunition Plant, Karnack, Texas*.

Shaw, 2007, *Draft Final Focused Feasibility Study, LHAAP-35A(58)*, September.

Shaw, 2004, *Final Background Soil Study Report, Longhorn Army Ammunition Plant, Karnack*, Texas, July.

U.S. Environmental Protection Agency (EPA), 1996, *Soil Screening Guidance: User's Guide*, Second Edition.

U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), 2000, *Hazardous and Medical Waste Study NO: 37-EF-5506-00, Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant, Karnack, Texas*, Vols. I and II, July.

# *Appendix B Tables*

**Table B-1**
**Input Values for Parameters Used to Calculate Risk Reduction Standard 3 Groundwater-Protective MSCs for Soil**
**LHAAP-02 Vacuum Truck Overnight Parking Lot**

| Parameter | | Value | Units | Comment | Reference |
|---|---|---|---|---|---|
| Soil Dry Bulk Density | $r_b$ | 1.6 | g/cm$^3$ | Dry bulk density was assumed to be 100 pounds per cubic feet and is a typical value for silty clayey sands. | Shaw,2008a |
| Particle Density | $r_{particle}$ | 2.65 | g/cm$^3$ | TCEQ default value | 30 TAC §350.75 (c) and (d) |
| Total Porosity | n | 0.4 | unitless | n = 1-(rb/rparticle) = 1-(1.6 g/cc/2.65 g/cc) | EPA, 1996, pg. 38. |
| Volumetric Water Content of Soil | $q_{ws}$ | 0.1 | unitless | Assumed 25% | Shaw, 2008a |
| Soil Fraction Organic Carbon | $f_{oc}$ | 0.02 | unitless | TCEQ default value | 30 TAC §335.567. Appendix I. (p. 26) |
| Net Infiltration Rate through soil | I | 38.1 | cm/yr | 15 inches/yr estimated for LHAAP | Shaw, 2008a |
| Groundwater mixing zone | $d_a$ | 153 | cm | Well 35AWW03 screened 5' in sand layer | Jacobs, 2002, Fig. 5-2, and pg 5-3 |
| Thickness of affected soil | $L_1$ | 45.7 | cm | Samples taken 1-0.5 ft and 1.0 to 1.5 ft bgs. 1.5 ft assumed all chemicals | CHPPM, 2000, Vol I, pg 5. |
| Distance from top of affected soils to top of water bearing unit. | $L_2$ | 457 | cm | Clay to silty clay zone at Well 35AWW03 with 5 foot sand layer. Groundwater at ~ 15 ft bgs. | Jacobs, 2002, Fig. 5-1 and pg.5-3. |
| Groundwater Darcy Velocity | $V_{gw}$ | 8.0325 | cm/yr | = K*i*31500000 sec/yr | EPA, 1996, pg. 42. |
| Hydraulic conductivity in groundwater bearing unit | K | 1.50E-05 | cm/sec | Range of values 1.5E-05 to 3.5E-05. | Shaw, 2007b, pg. 1-3. |
| Hydraulic gradient in groundwater bearing unit | i | 0.017 | unitless | Value calculated from potentiometric map scale: 10ft elevation/600ft horizontal | Shaw, 2007b, Fig. 1 |
| Width of soil source area parallel to groundwater flow direction | W | 1.37E+04 | cm | Maximum site dimension, 450 ft | Shaw, 2008a, Fig. 1-2. |
| Groundwater mixing zone (20') | $d_{gw}$ | 305 | cm | 35AWW03 screened 5' in sand layer | Jacobs, 2002, Fig. 5-2 |
| Soil Air Filled Porosity ($q_{as}$) | $q_{as}$ | 0.3 | unitless | n - qws | EPA, 1996, pg. 38. |
| Henry's Law Constant | H' | Chemical specific property | unitless | See Table B-3 | TCEQ, 2008 |
| Organic Carbon Partition Coefficient | $K_{oc}$ | Chemical specific property | unitless | See Table B-3 | TCEQ, 2008 |
| Soil Water Partition Coefficient | $K_d$ | Chemical specific property | unitless | See Table B-3 | TCEQ, 2008 |

$$\mathbf{LDF = 1 + \frac{V_{gw} \times \delta_{gw}}{I \times W}} \qquad \mathbf{LDF = 1.005E+00}$$

Notes:

CHPPM, 2000: U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Hazardous and Medical Waste Study NO: 37-EF-5506-00, *Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant, Karnack, Texas*, Vol I, pg 5, July

EPA, 1996. *Soil Screening Guidance: Technical Background Document*, EPA/540/R-95/128018, U. S. Environmental Protection Agency, Office of Emergency and Remedial Response, July.

Jacobs Engineering Group, Inc., 2002: *Final Remedial Investigation Report, Group 4 Sites, Sites 04, 08, 35A, 35B, 35C, 46, 47, 48, 50, 60,67, Goose Prairie Creek, Volumes 1 and 2: Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Oak Ridge, Tennessee, April, Figure 5-2.

Shaw, 2007b, *Draft Final Focused Feasibility Study, LHAAP-35A(58)*, September.

Shaw, 2008a *LHAAP-49 Site Evaluation Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Appendix E, May.

Texas Commission on Environmental Quality (TCEQ), *Risk Reduction Rules*, 30 TAC §335.567. Appendix I.

TCEQ, 2008: Texas Risk Reduction Program Physical Chemical Properties Tables, April, accessed at http://www.tceq.state.tx.us/remediation/trrp/trrppcls.html

## Table B-2
## Physical Chemical Properties of Chemicals of Concern a
## LHAAP-02 Vacuum Truck Overnight Parking Lot

| Chemical of Concern | Henry's Law Constant (H') (unitless) | Organic Carbon Partition Coefficient (Koc, unitless) | Soil Water Partition Coefficient (Kd, unitless) | pH Dependent Partition Coefficient at pH 5.8 Soil Kd | Solubility in Water (S, mg/L) |
|---|---|---|---|---|---|
| Antimony | 0.00E+00 | NA | b | 6.20E+01 | 0.00E+00 |
| Arsenic | 0.00E+00 | NA | b | 2.70E+01 | 0.00E+00 |
| Barium | 0.00E+00 | NA | b | 2.60E+01 | 0.00E+00 |
| Cadmium | 0.00E+00 | NA | b | 3.30E+01 | 0.00E+00 |
| Chromium | 0.00E+00 | NA | b | 8.70E+04 | 0.00E+00 |
| Copper | 0.00E+00 | NA | 3.98E+01 | d | 0.00E+00 |
| Lead | 0.00E+00 | NA | c | 1.83E+03 | 0.00E+00 |
| Manganese | 0.00E+00 | NA | 5.01E+01 | d | 0.00E+00 |
| Mercury | 4.74E-01 | NA | b | 1.60E+00 | 3.00E-02 |
| Nickel | 0.00E+00 | NA | b | 3.40E+01 | 0.00E+00 |
| Selenium | 0.00E+00 | NA | b | 9.80E+00 | 0.00E+00 |
| Silver | 0.00E+00 | NA | b | 8.40E-01 | 0.00E+00 |
| Strontium | 0.00E+00 | NA | 2.00E+00 | d | 0.00E+00 |
| Thallium | 0.00E+00 | NA | b | 5.50E+01 | 2.90E+03 |
| Zinc | 0.00E+00 | NA | b | 3.20E+01 | 0.00E+00 |
| Bis(2-ethylhexyl)phthalate | 4.57E-04 | 6.81E+05 | 1.36E+04 | e | 3.00E-01 |
| Acenaphthylene | 4.74E-03 | 6.92E+03 | 1.38E+02 | e | 3.94E+00 |
| Anthracene | 4.61E-03 | 2.34E+04 | 4.69E+02 | e | 4.34E-02 |
| Benzo(a)anthracene | 1.39E-04 | 3.55E+05 | 7.10E+03 | e | 1.00E-02 |
| Benzo(a)pyrene | 4.70E-05 | 9.55E+05 | 1.91E+04 | e | 1.62E-03 |
| Benzo(b)flouranthene | 4.99E-04 | 1.20E+06 | 2.40E+04 | e | 1.50E-03 |
| Benzo(k)fluoranthene | 4.45E-07 | 1.23E+06 | 2.46E+04 | e | 5.50E-04 |
| Benzo(ghi)perylene | 5.82E-06 | 1.58E+06 | 3.17E+04 | e | 2.60E-04 |
| Chrysene | 5.03E-05 | 3.09E+05 | 6.18E+03 | e | 2.00E-03 |
| Fluoranthene | 3.88E-04 | 4.90E+04 | 9.80E+02 | e | 2.60E-01 |
| Indeno(1,2,3-cd)pyrene | 2.85E-06 | 3.47E+06 | 6.93E+04 | e | 3.75E-03 |
| Phenanthrene | 5.40E-03 | 1.41E+04 | 2.83E+02 | e | 9.94E-01 |
| Pyrene | 4.57E-04 | 3.80E+04 | 7.60E+02 | e | 1.35E-01 |
| Methylene Chloride | 9.10E-02 | 1.17E+01 | 2.35E-01 | e | 1.54E+04 |
| p-Isopropyltoluene | 4.66E-01 | 2.29E+03 | 4.58E+01 | e | 1.71E+01 |

Notes:

[a] Annual TCEQ update of chemical/physical properties table [(Figure: 30 TAC §350.73(e)], April 2008.

[b] pH-dependent Kd value obtained from Figure 30TAC§350.73(e)(1)(C), April 2008.

[c] pH-dependent Kd value obtained from Figure 30TAC§350.73(e)(1)(A), April 2008.

[d] value calculated from log (Kd) value from chemphys TRRP table, April 2008.

[e] value calculated by Koc * foc

pH data provided in the LHAAP-58 Feasibility Study, Shaw, 2008b. Well LHSMW-04 is screened from 18.2 to 28.2 ft bgs and is located approximately 450 ft southesast of well 35AWW03, which is screened from 9 to 19 ft bgs, and is located within LHAAP-02. pH was measured on LHSMW-04 sample taken on Feb 20, 2007. Well locations and screening data are shown in the Jacobs (2002) document, Figures 5-1, 5-2, and Table 5-1.

## Table B-3
## Calculation of Soil Saturation Concentration (Csat) Values for Chemicals in Soil
## LHAAP-02 Vacuum Truck Overnight Storage Parking lot

$$K_{sw} = \frac{r_b}{q_{ws}+K_d r_b+H'q_{as}}$$

$$C_{sat} = S\,\frac{(q_{ws}+K_d r_b+H'q_{as})}{r_b}$$

| Chemical of Concern (COC) | $r_b$ | $q_{ws}$ | $F_{oc}$ | $K_{oc}$ | $K_d$ | H' | $q_{as}$ | S | $K_{sw}$ | $C_{sat}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 1.60 | 0.10 | 0.020 | NA | 6.2E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 1.6E-02 | NA |
| Arsenic | 1.60 | 0.10 | 0.020 | NA | 2.7E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 3.7E-02 | NA |
| Barium | 1.60 | 0.10 | 0.020 | NA | 2.6E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 3.8E-02 | NA |
| Cadmium | 1.60 | 0.10 | 0.020 | NA | 3.3E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 3.0E-02 | NA |
| Chromium | 1.60 | 0.10 | 0.020 | NA | 8.7E+04 | 0.0E+00 | 0.30 | 0.0E+00 | 1.1E-05 | NA |
| Copper | 1.60 | 0.10 | 0.020 | NA | 4.0E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 2.5E-02 | NA |
| Lead | 1.60 | 0.10 | 0.020 | NA | 1.8E+03 | 0.0E+00 | 0.30 | 0.0E+00 | 5.5E-04 | NA |
| Manganese | 1.60 | 0.10 | 0.020 | NA | 5.0E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 2.0E-02 | NA |
| Mercury | 1.60 | 0.10 | 0.020 | NA | 1.6E+00 | 4.7E-01 | 0.30 | 3.0E-02 | 5.7E-01 | 5.3E-02 |
| Nickel | 1.60 | 0.10 | 0.020 | NA | 3.4E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 2.9E-02 | NA |
| Selenium | 1.60 | 0.10 | 0.020 | NA | 9.8E+00 | 0.0E+00 | 0.30 | 0.0E+00 | 1.0E-01 | NA |
| Silver | 1.60 | 0.10 | 0.020 | NA | 8.4E-01 | 0.0E+00 | 0.30 | 0.0E+00 | 1.1E+00 | NA |
| Strontium | 1.60 | 0.10 | 0.020 | NA | 2.0E+00 | 0.0E+00 | 0.30 | 0.0E+00 | 4.8E-01 | NA |
| Thallium | 1.60 | 0.10 | 0.020 | NA | 5.5E+01 | 0.0E+00 | 0.30 | 2.9E+03 | 1.8E-02 | 1.6E+05 |
| Zinc | 1.60 | 0.10 | 0.020 | NA | 3.2E+01 | 0.0E+00 | 0.30 | 0.0E+00 | 3.1E-02 | NA |
| Bis(2-ethylhexyl)phthalate | 1.60 | 0.10 | 0.020 | 6.8E+05 | 1.4E+04 | 4.6E-04 | 0.30 | 3.0E-01 | 7.3E-05 | 4.1E+03 |
| Acenaphthylene | 1.60 | 0.10 | 0.020 | 6.9E+03 | 1.4E+02 | 4.7E-03 | 0.30 | 3.9E+00 | 7.2E-03 | 5.4E+02 |
| Anthracene | 1.60 | 0.10 | 0.020 | 2.3E+04 | 4.7E+02 | 4.6E-03 | 0.30 | 4.3E-02 | 2.1E-03 | 2.0E+01 |
| Benzo(a)anthracene | 1.60 | 0.10 | 0.020 | 3.5E+05 | 7.1E+03 | 1.4E-04 | 0.30 | 1.0E-02 | 1.4E-04 | 7.1E+01 |
| Benzo(a)pyrene | 1.60 | 0.10 | 0.020 | 9.5E+05 | 1.9E+04 | 4.7E-05 | 0.30 | 1.6E-03 | 5.2E-05 | 3.1E+01 |
| Benzo(b)flouranthene | 1.60 | 0.10 | 0.020 | 1.2E+06 | 2.4E+04 | 5.0E-04 | 0.30 | 1.5E-03 | 4.2E-05 | 3.6E+01 |
| Benzo(k)fluoranthene | 1.60 | 0.10 | 0.020 | 1.2E+06 | 2.5E+04 | 4.4E-07 | 0.30 | 5.5E-04 | 4.1E-05 | 1.4E+01 |
| Benzo(ghi)perylene | 1.60 | 0.10 | 0.020 | 1.6E+06 | 3.2E+04 | 5.8E-06 | 0.30 | 2.6E-04 | 3.2E-05 | 8.2E+00 |
| Chrysene | 1.60 | 0.10 | 0.020 | 3.1E+05 | 6.2E+03 | 5.0E-05 | 0.30 | 2.0E-03 | 1.6E-04 | 1.2E+01 |
| Flouranthene | 1.60 | 0.10 | 0.020 | 4.9E+04 | 9.8E+02 | 3.9E-04 | 0.30 | 2.6E-01 | 1.0E-03 | 2.5E+02 |
| Indeno(1,2,3-cd)pyrene | 1.60 | 0.10 | 0.020 | 3.5E+06 | 6.9E+04 | 2.9E-06 | 0.30 | 3.8E-03 | 1.4E-05 | 2.6E+02 |
| Phenanthrene | 1.60 | 0.10 | 0.020 | 1.4E+04 | 2.8E+02 | 5.4E-03 | 0.30 | 9.9E-01 | 3.5E-03 | 2.8E+02 |
| Pyrene | 1.60 | 0.10 | 0.020 | 3.8E+04 | 7.6E+02 | 4.6E-04 | 0.30 | 1.4E-01 | 1.3E-03 | 1.0E+02 |
| Methylene Chloride | 1.60 | 0.10 | 0.020 | 1.2E+01 | 2.3E-01 | 9.1E-02 | 0.30 | 1.5E+04 | 3.2E+00 | 4.8E+03 |
| p-Isopropyltoluene | 1.60 | 0.10 | 0.020 | 2.3E+03 | 4.6E+01 | 4.7E-01 | 0.30 | 1.7E+01 | 2.2E-02 | 7.9E+02 |

Notes:
NA - not applicable
See Table B-1

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**Table B-4**
**Calculation of Standard 3 Commercial/Industrial Medium Specific Concentration (MSC) for Chemicals in Soil**
**LHAAP-02 Vacuum Truck Overnight Storage Parking lot**

$$\text{Standard 3 Soil MSC} = \frac{\text{GW-Ind} \times \text{LDF} \times (L_2/L_1)}{\text{Ksw}}$$

| Chemical of Concern (COC) | GW-Ind MSC[a] (mg/L) | LDF | $K_{sw}$ | $L_2$ | $L_1$ | Standard 3 Commercial/Industrial Soil MSC (mg/kg) Calculated | Corrected [b] |
|---|---|---|---|---|---|---|---|
| Antimony | 6.0E-03 | 1.00E+00 | 0.016 | 457.00 | 45.70 | 3.7E+00 | |
| Arsenic | 1.0E-02 | 1.00E+00 | 0.037 | 457.00 | 45.70 | 2.7E+00 | |
| Barium | 2.0E+00 | 1.00E+00 | 0.038 | 457.00 | 45.70 | 5.2E+02 | |
| Cadmium | 5.0E-03 | 1.00E+00 | 0.030 | 457.00 | 45.70 | 1.7E+00 | |
| Chromium | 1.0E-01 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 8.7E+04 | |
| Copper | 1.3E+00 | 1.00E+00 | 0.025 | 457.00 | 45.70 | 5.2E+02 | |
| Lead | 1.5E-02 | 1.00E+00 | 0.001 | 457.00 | 45.70 | 2.8E+02 | |
| Manganese | 1.4E+01 | 1.00E+00 | 0.020 | 457.00 | 45.70 | 7.1E+03 | |
| Mercury | 2.0E-03 | 1.00E+00 | 0.571 | 457.00 | 45.70 | 3.5E-02 | |
| Nickel | 2.0E+00 | 1.00E+00 | 0.029 | 457.00 | 45.70 | 6.8E+02 | |
| Selenium | 5.0E-02 | 1.00E+00 | 0.101 | 457.00 | 45.70 | 5.0E+00 | |
| Silver | 5.1E-01 | 1.00E+00 | 1.108 | 457.00 | 45.70 | 4.6E+00 | |
| Strontium | 6.1E+01 | 1.00E+00 | 0.485 | 457.00 | 45.70 | 1.3E+03 | |
| Thallium | 2.0E-03 | 1.00E+00 | 0.018 | 457.00 | 45.70 | 1.1E+00 | |
| Zinc | 3.1E+01 | 1.00E+00 | 0.031 | 457.00 | 45.70 | 1.0E+04 | |
| Bis(2-ethylhexyl)phthalate | 6.0E-03 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 8.2E+02 | |
| Acenaphthylene | 6.1E+00 | 1.00E+00 | 0.007 | 457.00 | 45.70 | 8.5E+03 | 5.4E+02 |
| Anthracene | 3.1E+01 | 1.00E+00 | 0.002 | 457.00 | 45.70 | 1.4E+05 | 2.0E+01 |
| Benzo(a)anthracene | 3.9E-04 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 2.8E+01 | |
| Benzo(a)pyrene | 2.0E-04 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 3.8E+01 | 3.1E+01 |
| Benzo(b)flouranthene | 3.9E-04 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 9.4E+01 | 3.6E+01 |
| Benzo(k)fluoranthene | 3.9E-03 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 9.7E+02 | 1.4E+01 |
| Benzo(ghi)perylene | 3.1E+00 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 9.8E+05 | 8.2E+00 |
| Chrysene | 3.9E-02 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 2.4E+03 | 1.2E+01 |
| Flouranthene | 4.1E+00 | 1.00E+00 | 0.001 | 457.00 | 45.70 | 4.0E+04 | 2.5E+02 |
| Indeno(1,2,3-cd)pyrene | 3.9E-04 | 1.00E+00 | 0.000 | 457.00 | 45.70 | 2.7E+02 | 2.6E+02 |
| Phenanthrene | 3.1E+00 | 1.00E+00 | 0.004 | 457.00 | 45.70 | 8.7E+03 | 2.8E+02 |
| Pyrene | 3.1E+00 | 1.00E+00 | 0.001 | 457.00 | 45.70 | 2.3E+04 | 1.0E+02 |
| Methylene Chloride | 5.0E-03 | 1.00E+00 | 3.179 | 457.00 | 45.70 | 1.6E-02 | |
| p-Isopropyltoluene | 1.0E+01 | 1.00E+00 | 0.022 | 457.00 | 45.70 | 4.6E+03 | 7.9E+02 |

Notes:

[a] GW-Ind MSC value from TCEQ 2006 MSC table.

[b] Corrected MSC = $C_{sat}$ concentration shown on Table 3

## Table B-5
## Applicable Standard 3 Commercial/Industrial Medium Specific Concentration (MSC) for Chemicals in Soil at the LHAAP-02 Vacuum Truck Overnight Storage Parking lot

| Chemical of Concern (COC) | Calculated Standard 3 Commercial/ Industrial Soil MSC [a] (mg/kg) | Background Concentration [b] | Applicable Commercial/ Industrial Soil MSC [c] (mg/kg) |
|---|---|---|---|
| Antimony | 3.7E+00 | 1.6E+00 | 3.7E+00 |
| Arsenic | 2.7E+00 | 5.9E+00 | 5.9E+00 |
| Barium | 5.2E+02 | 1.2E+02 | 5.2E+02 |
| Cadmium | 1.7E+00 | 1.4E+00 | 1.7E+00 |
| Chromium | 8.7E+04 | 2.9E+01 | 8.7E+04 |
| Copper | 5.2E+02 | 8.4E+00 | 5.2E+02 |
| Lead | 2.8E+02 | 1.8E+01 | 2.8E+02 |
| Manganese | 7.1E+03 | 1.3E+03 | 7.1E+03 |
| Mercury | 3.5E-02 | 1.1E-01 | 1.1E-01 |
| Nickel | 6.8E+02 | 9.4E+00 | 6.8E+02 |
| Selenium | 5.0E+00 | 5.6E+00 | 5.6E+00 |
| Silver | 4.6E+00 | 3.7E-01 | 4.6E+00 |
| Strontium | 1.3E+03 | 2.5E+01 | 1.3E+03 |
| Thallium | 1.1E+00 | 7.2E+00 | 7.2E+00 |
| Zinc | 1.0E+04 | 2.5E+01 | 1.0E+04 |
| Bis(2-ethylhexyl)phthalate | 8.2E+02 | NA | 8.2E+02 |
| Acenaphthylene | 5.4E+02 | NA | 5.4E+02 |
| Anthracene | 2.0E+01 | NA | 2.0E+01 |
| Benzo(a)anthracene | 2.8E+01 | 1.5E-02 | 2.8E+01 |
| Benzo(a)pyrene | 3.1E+01 | 1.5E-02 | 3.1E+01 |
| Benzo(b)flouranthene | 3.6E+01 | 1.5E-02 | 3.6E+01 |
| Benzo(k)fluoranthene | 1.4E+01 | 1.3E-02 | 1.4E+01 |
| Benzo(ghi)perylene | 8.2E+00 | 1.2E-02 | 8.2E+00 |
| Chrysene | 1.2E+01 | 1.5E-02 | 1.2E+01 |
| Flouranthene | 2.5E+02 | 2.3E-02 | 2.5E+02 |
| Indeno(1,2,3-cd)pyrene | 2.6E+02 | 1.4E-02 | 2.6E+02 |
| Phenanthrene | 2.8E+02 | NA | 2.8E+02 |
| Pyrene | 1.0E+02 | 1.9E-02 | 1.0E+02 |
| Methylene Chloride | 1.6E-02 | NA | 1.6E-02 |
| p-Isopropyltoluene | 7.9E+02 | NA | 7.9E+02 |

Notes:

[a] Value equals the lower of the calculated MSC or $C_{sat}$ values (Table B-4).

[b] Background oncentration calculated as the 95% UPL of soil background concentrations (*Final Background Soil Study Report, Longhorn Army Ammunition Plant, Karnack, Texas* , July ( Shaw, 2004).

[c] Applicable Commercial/Industrial Soil MSC equals largest of Standard 3 MSC, background and GWP-Ind values.

NA - not applicable

# Table B-6
## Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels
## LHAAP-02

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Antimony | 0.75 | | Yes |
| LAP-0211 | Antimony | 0.622 | | Yes |
| LAP-021A | Antimony | 0.429 | | Yes |
| LAP-021B | Antimony | 0.1415 | 0.283 | No |
| LAP-022A | Antimony | 0.407 | | Yes |
| LAP-022B | Antimony | 0.284 | | Yes |
| LAP-023A | Antimony | 0.461 | | Yes |
| LAP-023B | Antimony | 0.1395 | 0.279 | No |
| LAP-024A | Antimony | 0.489 | | Yes |
| LAP-024B | Antimony | 0.1395 | 0.279 | No |
| LAP-025A | Antimony | 0.498 | | Yes |
| LAP-025B | Antimony | 0.284 | | Yes |
| LAP-026A | Antimony | 0.87 | | Yes |
| LAP-026B | Antimony | 0.145 | 0.29 | No |
| LAP-027A | Antimony | 0.417 | | Yes |
| LAP-027B | Antimony | 0.354 | | Yes |
| LAP-028A | Antimony | 0.259 | | Yes |
| LAP-028B | Antimony | 0.431 | | Yes |
| Maximum Value | | 0.87 | 0.29 | |
| Minimum Value | | 0.1395 | 0.279 | |
| Frequency of Detection (%) | | 78 | | |
| Statistical Distribution Type | | Normal | | |
| Applicable MSC (Std 3 or Background) | | 3.7E+00 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Arsenic | *18.7* | | Yes |
| LAP-0211 | Arsenic | *6.9* | | Yes |
| LAP-021A | Arsenic | *5.99* | | Yes |
| LAP-021B | Arsenic | 1.28 | | Yes |
| LAP-022A | Arsenic | 3.44 | | Yes |
| LAP-022B | Arsenic | 1.86 | | Yes |
| LAP-023A | Arsenic | 5.04 | | Yes |
| LAP-023B | Arsenic | 1.25 | | Yes |
| LAP-024A | Arsenic | 4.72 | | Yes |
| LAP-024B | Arsenic | 4.04 | | Yes |
| LAP-025A | Arsenic | 4.21 | | Yes |
| LAP-025B | Arsenic | 2.07 | | Yes |
| LAP-026A | Arsenic | *9.01* | | Yes |
| LAP-026B | Arsenic | 2.75 | | Yes |
| LAP-027A | Arsenic | *6.08* | | Yes |
| LAP-027B | Arsenic | 4.04 | | Yes |
| LAP-028A | Arsenic | 5.25 | | Yes |
| LAP-028B | Arsenic | *22.1* | | Yes |
| Maximum Value | | *22.1* | | |
| Minimum Value | | 1.25 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | 5.9E+00 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Barium | 60.2 | | Yes |
| LAP-0211 | Barium | 52.5 | | Yes |
| LAP-021A | Barium | 34.3 | | Yes |
| LAP-021B | Barium | 81.3 | | Yes |
| LAP-022A | Barium | 46.4 | | Yes |
| LAP-022B | Barium | 49.5 | | Yes |
| LAP-023A | Barium | 32.9 | | Yes |
| LAP-023B | Barium | 48.5 | | Yes |
| LAP-024A | Barium | 36.2 | | Yes |
| LAP-024B | Barium | 53 | | Yes |
| LAP-025A | Barium | 42.1 | | Yes |
| LAP-025B | Barium | 44.7 | | Yes |
| LAP-026A | Barium | 43.4 | | Yes |
| LAP-026B | Barium | 67.9 | | Yes |
| LAP-027A | Barium | 78.5 | | Yes |
| LAP-027B | Barium | 115 | | Yes |
| LAP-028A | Barium | 80.6 | | Yes |
| LAP-028B | Barium | 27.9 | | Yes |
| Maximum Value | | 115 | | |
| Minimum Value | | 27.9 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | 5.2E+02 | | |

*Footnotes are provided on the last page of this table*

## Table B-6
## Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels
## LHAAP-02

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Cadmium | 1.34 | | Yes |
| LAP-0211 | Cadmium | 0.995 | | Yes |
| LAP-021A | Cadmium | 0.269 | | Yes |
| LAP-021B | Cadmium | 0.1415 | 0.283 | No |
| LAP-022A | Cadmium | 0.51 | | Yes |
| LAP-022B | Cadmium | 0.142 | 0.284 | No |
| LAP-023A | Cadmium | 0.461 | | Yes |
| LAP-023B | Cadmium | 0.1395 | 0.279 | No |
| LAP-024A | Cadmium | 1.41 | | Yes |
| LAP-024B | Cadmium | 0.279 | | Yes |
| LAP-025A | Cadmium | 1.33 | | Yes |
| LAP-025B | Cadmium | 0.142 | 0.284 | No |
| LAP-026A | Cadmium | *2.15* | | Yes |
| LAP-026B | Cadmium | 0.145 | 0.29 | No |
| LAP-027A | Cadmium | *3.8* | | Yes |
| LAP-027B | Cadmium | 0.1475 | 0.295 | No |
| LAP-028A | Cadmium | 0.724 | | Yes |
| LAP-028B | Cadmium | 0.828 | | Yes |
| Maximum Value | | *3.8* | 0.295 | |
| Minimum Value | | 0.1395 | 0.279 | |
| Frequency of Detection (%) | | 67 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | 1.7E+00 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Calcium | 17600 | | Yes |
| LAP-0211 | Calcium | 14800 | | Yes |
| LAP-021A | Calcium | 49000 | | Yes |
| LAP-021B | Calcium | 790 | | Yes |
| LAP-022A | Calcium | 67000 | | Yes |
| LAP-022B | Calcium | 821 | | Yes |
| LAP-023A | Calcium | 58400 | | Yes |
| LAP-023B | Calcium | 1160 | | Yes |
| LAP-024A | Calcium | 60300 | | Yes |
| LAP-024B | Calcium | 2800 | | Yes |
| LAP-025A | Calcium | 64200 | | Yes |
| LAP-025B | Calcium | 662 | | Yes |
| LAP-026A | Calcium | 42900 | | Yes |
| LAP-026B | Calcium | 1030 | | Yes |
| LAP-027A | Calcium | 20700 | | Yes |
| LAP-027B | Calcium | 2460 | | Yes |
| LAP-028A | Calcium | 2760 | | Yes |
| LAP-028B | Calcium | 14900 | | Yes |
| Maximum Value | | 67000 | | |
| Minimum Value | | 662 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | NA | | |

| Sample Number | Analyte | Concentration (ppm) a in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Chromium | 28.8 | | Yes |
| LAP-0211 | Chromium | 19.1 | | Yes |
| LAP-021A | Chromium | 15.6 | | Yes |
| LAP-021B | Chromium | 8.3 | | Yes |
| LAP-022A | Chromium | 19.3 | | Yes |
| LAP-022B | Chromium | 8.8 | | Yes |
| LAP-023A | Chromium | 32.4 | | Yes |
| LAP-023B | Chromium | 8.75 | | Yes |
| LAP-024A | Chromium | 19.5 | | Yes |
| LAP-024B | Chromium | 23.7 | | Yes |
| LAP-025A | Chromium | 20.2 | | Yes |
| LAP-025B | Chromium | 10.4 | | Yes |
| LAP-026A | Chromium | 35.4 | | Yes |
| LAP-026B | Chromium | 8.52 | | Yes |
| LAP-027A | Chromium | 27.1 | | Yes |
| LAP-027B | Chromium | 12.8 | | Yes |
| LAP-028A | Chromium | 16.2 | | Yes |
| LAP-028B | Chromium | 37.7 | | Yes |
| Maximum Value | | 37.7 | | |
| Minimum Value | | 8.3 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | 8.7E+04 | | |

*Footnotes are provided on the last page of this table*

# Table B-6
## Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels
## LHAAP-02

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Copper | 19.1 | | Yes |
| LAP-0211 | Copper | 10.9 | | Yes |
| LAP-021A | Copper | 4.12 | | Yes |
| LAP-021B | Copper | 1.135 | 2.27 | No |
| LAP-022A | Copper | 5.84 | | Yes |
| LAP-022B | Copper | 10.7 | | Yes |
| LAP-023A | Copper | 6.94 | | Yes |
| LAP-023B | Copper | 1.115 | 2.23 | No |
| LAP-024A | Copper | 13.2 | | Yes |
| LAP-024B | Copper | 4.37 | | Yes |
| LAP-025A | Copper | 9.08 | | Yes |
| LAP-025B | Copper | 1.14 | 2.28 | No |
| LAP-026A | Copper | 28 | | Yes |
| LAP-026B | Copper | 1.16 | 2.32 | No |
| LAP-027A | Copper | *1460* | | Yes |
| LAP-027B | Copper | 6.12 | | Yes |
| LAP-028A | Copper | 10.5 | | Yes |
| LAP-028B | Copper | 5.49 | | Yes |
| Maximum Value | | *1460* | 2.32 | |
| Minimum Value | | 1.115 | 2.23 | |
| Frequency of Detection (%) | | 78 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 5.2E+02 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Iron | 18200 | | Yes |
| LAP-0211 | Iron | 13200 | | Yes |
| LAP-021A | Iron | 20600 | | Yes |
| LAP-021B | Iron | 5800 | | Yes |
| LAP-022A | Iron | 12700 | | Yes |
| LAP-022B | Iron | 7060 | | Yes |
| LAP-023A | Iron | 17500 | | Yes |
| LAP-023B | Iron | 6370 | | Yes |
| LAP-024A | Iron | 16500 | | Yes |
| LAP-024B | Iron | 27900 | | Yes |
| LAP-025A | Iron | 10900 | | Yes |
| LAP-025B | Iron | 6450 | | Yes |
| LAP-026A | Iron | 15100 | | Yes |
| LAP-026B | Iron | 5850 | | Yes |
| LAP-027A | Iron | 15400 | | Yes |
| LAP-027B | Iron | 12200 | | Yes |
| LAP-028A | Iron | 16100 | | Yes |
| LAP-028B | Iron | 38400 | | Yes |
| Maximum Value | | 38400 | | |
| Minimum Value | | 5800 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Lognormal | | |
| Applicable MSC (Std 3 or Background) | | NA | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Lead | *330* | | Yes |
| LAP-0211 | Lead | *335* | | Yes |
| LAP-021A | Lead | 104 | | Yes |
| LAP-021B | Lead | 8.92 | | Yes |
| LAP-022A | Lead | 158 | | Yes |
| LAP-022B | Lead | 9.7 | | Yes |
| LAP-023A | Lead | 259 | | Yes |
| LAP-023B | Lead | 9.92 | | Yes |
| LAP-024A | Lead | *285* | | Yes |
| LAP-024B | Lead | 72.3 | | Yes |
| LAP-025A | Lead | *347* | | Yes |
| LAP-025B | Lead | 12.7 | | Yes |
| LAP-026A | Lead | *368* | | Yes |
| LAP-026B | Lead | 15.3 | | Yes |
| LAP-027A | Lead | 236 | | Yes |
| LAP-027B | Lead | 30 | | Yes |
| LAP-028A | Lead | 41.5 | | Yes |
| LAP-028B | Lead | 87.5 | | Yes |
| Maximum Value | | *368* | | |
| Minimum Value | | 8.92 | | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 2.8E+02 | | |

*Footnotes are provided on the last page of this table*

## Table B-6
## Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels
## LHAAP-02

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Magnesium | 562 | | Yes | LAP-0210 | Manganese | 260 | | Yes | LAP-0210 | Mercury | *0.122* | 0.106 | Yes |
| LAP-0211 | Magnesium | 665 | | Yes | LAP-0211 | Manganese | 305 | | Yes | LAP-0211 | Mercury | *0.143* | *0.123* | Yes |
| LAP-021A | Magnesium | 515 | | Yes | LAP-021A | Manganese | 203 | | Yes | LAP-021A | Mercury | 0.0535 | 0.107 | No |
| LAP-021B | Magnesium | 141 | | Yes | LAP-021B | Manganese | 232 | | Yes | LAP-021B | Mercury | 0.0565 | *0.113* | No |
| LAP-022A | Magnesium | 732 | | Yes | LAP-022A | Manganese | 231 | | Yes | LAP-022A | Mercury | 0.04875 | 0.0975 | No |
| LAP-022B | Magnesium | 127 | | Yes | LAP-022B | Manganese | 205 | | Yes | LAP-022B | Mercury | 0.0545 | 0.109 | No |
| LAP-023A | Magnesium | 727 | | Yes | LAP-023A | Manganese | 227 | | Yes | LAP-023A | Mercury | 0.0505 | 0.101 | No |
| LAP-023B | Magnesium | 149 | | Yes | LAP-023B | Manganese | 125 | | Yes | LAP-023B | Mercury | 0.0535 | 0.107 | No |
| LAP-024A | Magnesium | 857 | | Yes | LAP-024A | Manganese | 392 | | Yes | LAP-024A | Mercury | 0.0535 | 0.107 | No |
| LAP-024B | Magnesium | 343 | | Yes | LAP-024B | Manganese | 173 | | Yes | LAP-024B | Mercury | 0.053 | 0.106 | No |
| LAP-025A | Magnesium | 821 | | Yes | LAP-025A | Manganese | 278 | | Yes | LAP-025A | Mercury | 0.0535 | 0.107 | No |
| LAP-025B | Magnesium | 210 | | Yes | LAP-025B | Manganese | 58 | | Yes | LAP-025B | Mercury | 0.057 | *0.114* | No |
| LAP-026A | Magnesium | 612 | | Yes | LAP-026A | Manganese | 206 | | Yes | LAP-026A | Mercury | 0.0505 | 0.101 | No |
| LAP-026B | Magnesium | 211 | | Yes | LAP-026B | Manganese | 168 | | Yes | LAP-026B | Mercury | 0.055 | *0.11* | No |
| LAP-027A | Magnesium | 491 | | Yes | LAP-027A | Manganese | 268 | | Yes | LAP-027A | Mercury | 0.0515 | 0.103 | No |
| LAP-027B | Magnesium | 495 | | Yes | LAP-027B | Manganese | 19.7 | | Yes | LAP-027B | Mercury | 0.0585 | *0.117* | No |
| LAP-028A | Magnesium | 404 | | Yes | LAP-028A | Manganese | 413 | | Yes | LAP-028A | Mercury | 0.051 | 0.102 | No |
| LAP-028B | Magnesium | 235 | | Yes | LAP-028B | Manganese | 173 | | Yes | LAP-028B | Mercury | 0.0525 | 0.105 | No |
| Maximum Value | | 857 | | | Maximum Value | | 413 | | | Maximum Value | | *0.143* | *0.123* | |
| Minimum Value | | 127 | | | Minimum Value | | 19.7 | | | Minimum Value | | 0.04875 | 0.0975 | |
| Frequency of Detection (%) | | 100 | | | Frequency of Detection (%) | | 100 | | | Frequency of Detection (%) | | 11 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Normal | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | NA | | | Applicable MSC (Std 3 or Background) | | 7.1E+03 | | | Applicable MSC (Std 3 or Background) | | 1.1E-01 | | |

*Footnotes are provided on the last page of this table*

# Table B-6
## Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels
## LHAAP-02

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Nickel | 2.68 | 5.36 | No |
| LAP-0211 | Nickel | 3.115 | 6.23 | No |
| LAP-021A | Nickel | 2.685 | 5.37 | No |
| LAP-021B | Nickel | 0.2835 | 0.567 | No |
| LAP-022A | Nickel | 2.56 | 5.12 | No |
| LAP-022B | Nickel | 2.84 | 5.68 | No |
| LAP-023A | Nickel | 2.565 | 5.13 | No |
| LAP-023B | Nickel | 2.795 | 5.59 | No |
| LAP-024A | Nickel | 16.8 | | Yes |
| LAP-024B | Nickel | 2.795 | 5.59 | No |
| LAP-025A | Nickel | 7.2 | | Yes |
| LAP-025B | Nickel | 2.845 | 5.69 | No |
| LAP-026A | Nickel | 5.47 | | Yes |
| LAP-026B | Nickel | 2.895 | 5.79 | No |
| LAP-027A | Nickel | 7.36 | | Yes |
| LAP-027B | Nickel | 2.95 | 5.9 | No |
| LAP-028A | Nickel | 2.59 | 5.18 | No |
| LAP-028B | Nickel | 2.77 | 5.54 | No |
| Maximum Value | | 16.8 | 6.23 | |
| Minimum Value | | 0.2835 | 0.567 | |
| Frequency of Detection (%) | | 22 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 6.8E+02 | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Potassium | 303 | | Yes |
| LAP-0211 | Potassium | 392 | | Yes |
| LAP-021A | Potassium | 201 | | Yes |
| LAP-021B | Potassium | 138 | | Yes |
| LAP-022A | Potassium | 337 | | Yes |
| LAP-022B | Potassium | 151 | | Yes |
| LAP-023A | Potassium | 243 | | Yes |
| LAP-023B | Potassium | 183 | | Yes |
| LAP-024A | Potassium | 447 | 5.43 | Yes |
| LAP-024B | Potassium | 264 | | Yes |
| LAP-025A | Potassium | 362 | | Yes |
| LAP-025B | Potassium | 291 | | Yes |
| LAP-026A | Potassium | 241 | | Yes |
| LAP-026B | Potassium | 221 | | Yes |
| LAP-027A | Potassium | 252 | | Yes |
| LAP-027B | Potassium | 372 | | Yes |
| LAP-028A | Potassium | 400 | | Yes |
| LAP-028B | Potassium | 104 | | Yes |
| Maximum Value | | 447 | 5.43 | |
| Minimum Value | | 104 | 5.43 | |
| Frequency of Detection (%) | | 100 | | |
| Statistical Distribution Type | | Normal | | |
| Applicable MSC (Std 3 or Background) | | NA | | |

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|
| LAP-0210 | Selenium | 0.856 | | Yes |
| LAP-0211 | Selenium | 0.685 | | Yes |
| LAP-021A | Selenium | 0.912 | | Yes |
| LAP-021B | Selenium | 0.283 | 0.566 | No |
| LAP-022A | Selenium | 0.866 | | Yes |
| LAP-022B | Selenium | 0.283 | 0.566 | No |
| LAP-023A | Selenium | 0.921 | | Yes |
| LAP-023B | Selenium | 0.2795 | 0.559 | No |
| LAP-024A | Selenium | 1.2 | | Yes |
| LAP-024B | Selenium | 0.893 | | Yes |
| LAP-025A | Selenium | 1.11 | | Yes |
| LAP-025B | Selenium | 0.284 | 0.568 | No |
| LAP-026A | Selenium | 0.87 | | Yes |
| LAP-026B | Selenium | 0.695 | | Yes |
| LAP-027A | Selenium | 0.99 | | Yes |
| LAP-027B | Selenium | 0.945 | | Yes |
| LAP-028A | Selenium | 0.775 | | Yes |
| LAP-028B | Selenium | 0.993 | | Yes |
| Maximum Value | | 1.2 | 0.568 | |
| Minimum Value | | 0.2795 | 0.559 | |
| Frequency of Detection (%) | | 78 | | |
| Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 5.6E+00 | | |

*Footnotes are provided on the last page of this table*

**Table B-6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Silver | 0.535 | | Yes | LAP-0210 | Strontium | 61.4 | | Yes | LAP-0210 | Thallium | *10.75* | *21.5* | No |
| LAP-0211 | Silver | 0.155 | 0.31 | No | LAP-0211 | Strontium | 32.2 | | Yes | LAP-0211 | Thallium | *12.45* | *24.9* | No |
| LAP-021A | Silver | 0.1345 | 0.269 | No | LAP-021A | Strontium | 117 | | Yes | LAP-021A | Thallium | *10.75* | *21.5* | No |
| LAP-021B | Silver | 0.1415 | 0.283 | No | LAP-021B | Strontium | 4 | | Yes | LAP-021B | Thallium | *11.35* | *22.7* | No |
| LAP-022A | Silver | 0.1275 | 0.255 | No | LAP-022A | Strontium | 184 | | Yes | LAP-022A | Thallium | *10.25* | *20.5* | No |
| LAP-022B | Silver | 0.142 | 0.284 | No | LAP-022B | Strontium | 3.5 | | Yes | LAP-022B | Thallium | *11.35* | *22.7* | No |
| LAP-023A | Silver | 0.128 | 0.256 | No | LAP-023A | Strontium | 147 | | Yes | LAP-023A | Thallium | *10.25* | *20.5* | No |
| LAP-023B | Silver | 0.1395 | 0.279 | No | LAP-023B | Strontium | 4.49 | | Yes | LAP-023B | Thallium | *11.15* | *22.3* | No |
| LAP-024A | Silver | 0.136 | 0.272 | No | LAP-024A | Strontium | 138 | | Yes | LAP-024A | Thallium | *10.85* | *21.7* | No |
| LAP-024B | Silver | 0.1395 | 0.279 | No | LAP-024B | Strontium | 10.3 | | Yes | LAP-024B | Thallium | *11.15* | *22.3* | No |
| LAP-025A | Silver | 0.1385 | 0.277 | No | LAP-025A | Strontium | 178 | | Yes | LAP-025A | Thallium | *11.05* | *22.1* | No |
| LAP-025B | Silver | 0.142 | 0.284 | No | LAP-025B | Strontium | 3.2 | | Yes | LAP-025B | Thallium | *11.4* | *22.8* | No |
| LAP-026A | Silver | 0.256 | | Yes | LAP-026A | Strontium | 103 | | Yes | LAP-026A | Thallium | *10.25* | *20.5* | No |
| LAP-026B | Silver | 0.145 | 0.29 | No | LAP-026B | Strontium | 4.29 | | Yes | LAP-026B | Thallium | *11.6* | *23.2* | No |
| LAP-027A | Silver | 0.13 | 0.26 | No | LAP-027A | Strontium | 56.4 | | Yes | LAP-027A | Thallium | *10.4* | *20.8* | No |
| LAP-027B | Silver | 0.1475 | 0.295 | No | LAP-027B | Strontium | 14.6 | | Yes | LAP-027B | Thallium | *11.8* | *23.6* | No |
| LAP-028A | Silver | 0.1295 | 0.259 | No | LAP-028A | Strontium | 10.9 | | Yes | LAP-028A | Thallium | *10.35* | *20.7* | No |
| LAP-028B | Silver | 0.138 | 0.276 | No | LAP-028B | Strontium | 31.6 | | Yes | LAP-028B | Thallium | *11.1* | *22.2* | No |
| Maximum Value | | 0.535 | 0.31 | | Maximum Value | | 184 | | | Maximum Value | | *12.45* | *24.9* | |
| Minimum Value | | 0.1275 | 0.255 | | Minimum Value | | 3.2 | | | Minimum Value | | *10.25* | *20.5* | |
| Frequency of Detection (%) | | 11 | | | Frequency of Detection (%) | | 100 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 4.6E+00 | | | Applicable MSC (Std 3 or Background) | | 1.3E+03 | | | Applicable MSC (Std 3 or Background) | | 7.2E+00 | | |

*Footnotes are provided on the last page of this table*

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**Table B-6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Zinc | 191 | | Yes | LAP-0210 | Bis(2-ethylhexyl)phthalate | 1.8 | 1.8 | No |
| LAP-0211 | Zinc | 147 | | Yes | LAP-0211 | Bis(2-ethylhexyl)phthalate | 0.17 | 0.4 | Yes |
| LAP-021A | Zinc | 46.5 | | Yes | LAP-021A | Bis(2-ethylhexyl)phthalate | 0.35 | 0.35 | No |
| LAP-021B | Zinc | 7.87 | | Yes | LAP-021B | Bis(2-ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-022A | Zinc | 72.6 | | Yes | LAP-022A | Bis(2-ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-022B | Zinc | 14.5 | | Yes | LAP-022B | Bis(2-ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-023A | Zinc | 65.5 | | Yes | LAP-023A | Bis(2-ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-023B | Zinc | 9.07 | | Yes | LAP-023B | Bis(2-ethylhexyl)phthalate | 0.6 | 0.6 | No |
| LAP-024A | Zinc | 186 | | Yes | LAP-024A | Bis(2-ethylhexyl)phthalate | 0.43 | 1.8 | Yes |
| LAP-024B | Zinc | 49.1 | | Yes | LAP-024B | Bis(2-ethylhexyl)phthalate | 0.079 | 0.37 | Yes |
| LAP-025A | Zinc | 136 | | Yes | LAP-025A | Bis(2-ethylhexyl)phthalate | 0.13 | 0.37 | Yes |
| LAP-025B | Zinc | 10.4 | | Yes | LAP-025B | Bis(2-ethylhexyl)phthalate | 0.38 | 0.38 | No |
| LAP-026A | Zinc | 122 | | Yes | LAP-026A | Bis(2-ethylhexyl)phthalate | 1.7 | 1.7 | No |
| LAP-026B | Zinc | 10.3 | | Yes | LAP-026B | Bis(2-ethylhexyl)phthalate | 0.08 | 0.38 | Yes |
| LAP-027A | Zinc | 826 | | Yes | LAP-027A | Bis(2-ethylhexyl)phthalate | 3.5 | 3.5 | No |
| LAP-027B | Zinc | 20.1 | | Yes | LAP-027B | Bis(2-ethylhexyl)phthalate | 0.39 | 0.39 | No |
| LAP-028A | Zinc | 133 | | Yes | LAP-028A | Bis(2-ethylhexyl)phthalate | 1.8 | 1.8 | No |
| LAP-028B | Zinc | 50 | | Yes | LAP-028B | Bis(2-ethylhexyl)phthalate | 1.9 | 1.9 | No |
| Maximum Value | | 826 | | | Maximum Value | | 3.5 | 3.5 | |
| Minimum Value | | 7.87 | | | Minimum Value | | 0.079 | 0.35 | |
| Frequency of Detection (%) | | 100 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 1.0E+04 | | | Applicable MSC (Std 3 or Background) | | 8.2E+02 | | |

*Footnotes are provided on the last page of this table*

**Table B-6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Acenaphthylene | 1.8 | 1.8 | No | LAP-0210 | Anthracene | 1.8 | 1.8 | No |
| LAP-0211 | Acenaphthylene | 0.4 | 0.4 | No | LAP-0211 | Anthracene | 0.4 | 0.4 | No |
| LAP-021A | Acenaphthylene | 0.35 | 0.35 | No | LAP-021A | Anthracene | 0.35 | 0.35 | No |
| LAP-021B | Acenaphthylene | 0.38 | 0.38 | No | LAP-021B | Anthracene | 0.38 | 0.38 | No |
| LAP-022A | Acenaphthylene | 1.7 | 1.7 | No | LAP-022A | Anthracene | 1.7 | 1.7 | No |
| LAP-022B | Acenaphthylene | 0.38 | 0.38 | No | LAP-022B | Anthracene | 0.38 | 0.38 | No |
| LAP-023A | Acenaphthylene | 1.7 | 1.7 | No | LAP-023A | Anthracene | 1.7 | 1.7 | No |
| LAP-023B | Acenaphthylene | 0.6 | 0.6 | No | LAP-023B | Anthracene | 0.6 | 0.6 | No |
| LAP-024A | Acenaphthylene | 1.8 | 1.8 | No | LAP-024A | Anthracene | 1.8 | 1.8 | No |
| LAP-024B | Acenaphthylene | 0.37 | 0.37 | No | LAP-024B | Anthracene | 0.37 | 0.37 | No |
| LAP-025A | Acenaphthylene | 0.37 | 0.37 | No | LAP-025A | Anthracene | 0.37 | 0.37 | No |
| LAP-025B | Acenaphthylene | 0.38 | 0.38 | No | LAP-025B | Anthracene | 0.38 | 0.38 | No |
| LAP-026A | Acenaphthylene | 1.7 | 1.7 | No | LAP-026A | Anthracene | 1.7 | 1.7 | No |
| LAP-026B | Acenaphthylene | 0.38 | 0.38 | No | LAP-026B | Anthracene | 0.38 | 0.38 | No |
| LAP-027A | Acenaphthylene | 0.64 | 3.5 | Yes | LAP-027A | Anthracene | 0.69 | 3.5 | Yes |
| LAP-027B | Acenaphthylene | 0.39 | 0.39 | No | LAP-027B | Anthracene | 0.39 | 0.39 | No |
| LAP-028A | Acenaphthylene | 1.8 | 1.8 | No | LAP-028A | Anthracene | 1.8 | 1.8 | No |
| LAP-028B | Acenaphthylene | 1.9 | 1.9 | No | LAP-028B | Anthracene | 1.9 | 1.9 | No |
| Maximum Value | | 1.9 | 3.5 | | Maximum Value | | 1.9 | 3.5 | |
| Minimum Value | | 0.35 | 0.35 | | Minimum Value | | 0.35 | 0.35 | |
| Frequency of Detection (%) | | 0 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 5.4E+02 | | | Applicable MSC (Std 3 or Background) | | 2.0E+01 | | |

*Footnotes are provided on the last page of this table*

**Table B-6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Benzo(a)anthracene | 0.52 | 1.8 | Yes | LAP-0210 | Benzo(a)pyrene | 0.54 | 1.8 | Yes |
| LAP-0211 | Benzo(a)anthracene | 0.4 | 0.4 | No | LAP-0211 | Benzo(a)pyrene | 0.4 | 0.4 | No |
| LAP-021A | Benzo(a)anthracene | 0.093 | 0.35 | Yes | LAP-021A | Benzo(a)pyrene | 0.11 | 0.35 | Yes |
| LAP-021B | Benzo(a)anthracene | 0.38 | 0.38 | No | LAP-021B | Benzo(a)pyrene | 0.38 | 0.38 | No |
| LAP-022A | Benzo(a)anthracene | 1.7 | 1.7 | No | LAP-022A | Benzo(a)pyrene | 1.7 | 1.7 | No |
| LAP-022B | Benzo(a)anthracene | 0.38 | 0.38 | No | LAP-022B | Benzo(a)pyrene | 0.38 | 0.38 | No |
| LAP-023A | Benzo(a)anthracene | 1.7 | 1.7 | No | LAP-023A | Benzo(a)pyrene | 1.7 | 1.7 | No |
| LAP-023B | Benzo(a)anthracene | 0.6 | 0.6 | No | LAP-023B | Benzo(a)pyrene | 0.6 | 0.6 | No |
| LAP-024A | Benzo(a)anthracene | 1.8 | 1.8 | No | LAP-024A | Benzo(a)pyrene | 1.8 | 1.8 | No |
| LAP-024B | Benzo(a)anthracene | 0.057 | 0.37 | Yes | LAP-024B | Benzo(a)pyrene | 0.077 | 0.37 | Yes |
| LAP-025A | Benzo(a)anthracene | 0.078 | 0.37 | Yes | LAP-025A | Benzo(a)pyrene | 0.11 | 0.37 | Yes |
| LAP-025B | Benzo(a)anthracene | 0.38 | 0.38 | No | LAP-025B | Benzo(a)pyrene | 0.38 | 0.38 | No |
| LAP-026A | Benzo(a)anthracene | 0.17 | 1.7 | Yes | LAP-026A | Benzo(a)pyrene | 0.19 | 1.7 | Yes |
| LAP-026B | Benzo(a)anthracene | 0.38 | 0.38 | No | LAP-026B | Benzo(a)pyrene | 0.38 | 0.38 | No |
| LAP-027A | Benzo(a)anthracene | 2 | 3.5 | Yes | LAP-027A | Benzo(a)pyrene | 2 | 3.5 | Yes |
| LAP-027B | Benzo(a)anthracene | 0.048 | 0.39 | Yes | LAP-027B | Benzo(a)pyrene | 0.047 | 0.39 | Yes |
| LAP-028A | Benzo(a)anthracene | 0.18 | 1.8 | Yes | LAP-028A | Benzo(a)pyrene | 0.19 | 1.8 | Yes |
| LAP-028B | Benzo(a)anthracene | 1.9 | 1.9 | No | LAP-028B | Benzo(a)pyrene | 1.9 | 1.9 | No |
| Maximum Value | | 2 | | | Maximum Value | | 2 | | |
| Minimum Value | | 0.048 | | | Minimum Value | | 0.047 | | |
| Frequency of Detection (%) | | 0 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 2.8E+01 | | | Applicable MSC (Std 3 or Background) | | 3.1E+01 | | |

*Footnotes are provided on the last page of this table*

**Table B-6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Benzo(b)fluoranthene | 0.9 | 1.8 | No | LAP-0210 | Benzo(k)fluoranthene | 0.37 | 1.8 | Yes |
| LAP-0211 | Benzo(b)fluoranthene | 0.2 | 0.4 | No | LAP-0211 | Benzo(k)fluoranthene | 0.4 | 0.4 | No |
| LAP-021A | Benzo(b)fluoranthene | 0.175 | 0.35 | No | LAP-021A | Benzo(k)fluoranthene | 0.071 | 0.35 | Yes |
| LAP-021B | Benzo(b)fluoranthene | 0.19 | 0.38 | No | LAP-021B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-022A | Benzo(b)fluoranthene | 0.85 | 1.7 | No | LAP-022A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-022B | Benzo(b)fluoranthene | 0.19 | 0.38 | No | LAP-022B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-023A | Benzo(b)fluoranthene | 0.85 | 1.7 | No | LAP-023A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-023B | Benzo(b)fluoranthene | 0.3 | 0.6 | No | LAP-023B | Benzo(k)fluoranthene | 0.6 | 0.6 | No |
| LAP-024A | Benzo(b)fluoranthene | 0.9 | 1.8 | No | LAP-024A | Benzo(k)fluoranthene | 1.8 | 1.8 | No |
| LAP-024B | Benzo(b)fluoranthene | 0.185 | 0.37 | No | LAP-024B | Benzo(k)fluoranthene | 0.087 | 0.37 | Yes |
| LAP-025A | Benzo(b)fluoranthene | 0.185 | 0.37 | No | LAP-025A | Benzo(k)fluoranthene | 0.085 | 0.37 | Yes |
| LAP-025B | Benzo(b)fluoranthene | 0.19 | 0.38 | No | LAP-025B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-026A | Benzo(b)fluoranthene | 0.85 | 1.7 | No | LAP-026A | Benzo(k)fluoranthene | 1.7 | 1.7 | No |
| LAP-026B | Benzo(b)fluoranthene | 0.19 | 0.38 | No | LAP-026B | Benzo(k)fluoranthene | 0.38 | 0.38 | No |
| LAP-027A | Benzo(b)fluoranthene | 4.7 | 3.5 | Yes | LAP-027A | Benzo(k)fluoranthene | 2 | 3.5 | Yes |
| LAP-027B | Benzo(b)fluoranthene | 0.195 | 0.39 | No | LAP-027B | Benzo(k)fluoranthene | 0.39 | 0.39 | No |
| LAP-028A | Benzo(b)fluoranthene | 0.9 | 1.8 | No | LAP-028A | Benzo(k)fluoranthene | 1.8 | 1.8 | No |
| LAP-028B | Benzo(b)fluoranthene | 0.95 | 1.9 | No | LAP-028B | Benzo(k)fluoranthene | 1.9 | 1.9 | No |
| Maximum Value | | 4.7 | 3.5 | | Maximum Value | | 2 | 3.5 | |
| Minimum Value | | 0.175 | 0.35 | | Minimum Value | | 0.071 | 0.35 | |
| Frequency of Detection (%) | | 6 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 3.6E+01 | | | Applicable MSC (Std 3 or Background) | | 1.4E+01 | | |

*Footnotes are provided on the last page of this table*

**Table B-6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Benzo(ghi)perylene | 0.83 | 1.8 | Yes | LAP-0210 | Chrysene | 0.67 | 1.8 | Yes |
| LAP-0211 | Benzo(ghi)perylene | 0.4 | 0.4 | No | LAP-0211 | Chrysene | 0.051 | 0.4 | Yes |
| LAP-021A | Benzo(ghi)perylene | 0.05 | 0.35 | Yes | LAP-021A | Chrysene | 0.13 | 0.35 | Yes |
| LAP-021B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-021B | Chrysene | 0.38 | 0.38 | No |
| LAP-022A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-022A | Chrysene | 1.7 | 1.7 | No |
| LAP-022B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-022B | Chrysene | 0.38 | 0.38 | No |
| LAP-023A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-023A | Chrysene | 0.26 | 1.7 | Yes |
| LAP-023B | Benzo(ghi)perylene | 0.6 | 0.6 | No | LAP-023B | Chrysene | 0.6 | 0.6 | No |
| LAP-024A | Benzo(ghi)perylene | 1.8 | 1.8 | No | LAP-024A | Chrysene | 0.19 | 1.8 | Yes |
| LAP-024B | Benzo(ghi)perylene | 0.37 | 0.37 | No | LAP-024B | Chrysene | 0.11 | 0.37 | Yes |
| LAP-025A | Benzo(ghi)perylene | 0.078 | 0.37 | Yes | LAP-025A | Chrysene | 0.12 | 0.37 | Yes |
| LAP-025B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-025B | Chrysene | 0.38 | 0.38 | No |
| LAP-026A | Benzo(ghi)perylene | 1.7 | 1.7 | No | LAP-026A | Chrysene | 0.22 | 1.7 | Yes |
| LAP-026B | Benzo(ghi)perylene | 0.38 | 0.38 | No | LAP-026B | Chrysene | 0.38 | 0.38 | No |
| LAP-027A | Benzo(ghi)perylene | 0.81 | 3.5 | Yes | LAP-027A | Chrysene | 2.7 | 3.5 | Yes |
| LAP-027B | Benzo(ghi)perylene | 0.042 | 0.39 | Yes | LAP-027B | Chrysene | 0.05 | 0.39 | Yes |
| LAP-028A | Benzo(ghi)perylene | 1.8 | 1.8 | No | LAP-028A | Chrysene | 0.34 | 1.8 | Yes |
| LAP-028B | Benzo(ghi)perylene | 1.9 | 1.9 | No | LAP-028B | Chrysene | 1.9 | 1.9 | No |
| Maximum Value | | 1.9 | 3.5 | | Maximum Value | | 2.7 | 3.5 | |
| Minimum Value | | 0.042 | 0.35 | | Minimum Value | | 0.05 | 0.35 | |
| Frequency of Detection (%) | | 0 | | | Frequency of Detection (%) | | 1 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 8.2E+00 | | | Applicable MSC (Std 3 or Background) | | 1.2E+01 | | |

*Footnotes are provided on the last page of this table*

**Table B-6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Fluoranthene | 0.9 | 1.8 | No | LAP-0210 | Indeno(1,2,3-cd)pyrene | 0.49 | 1.8 | Yes |
| LAP-0211 | Fluoranthene | 0.2 | 0.4 | No | LAP-0211 | Indeno(1,2,3-cd)pyrene | 0.4 | 0.4 | No |
| LAP-021A | Fluoranthene | 0.175 | 0.35 | No | LAP-021A | Indeno(1,2,3-cd)pyrene | 0.053 | 0.35 | Yes |
| LAP-021B | Fluoranthene | 0.19 | 0.38 | No | LAP-021B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-022A | Fluoranthene | 0.85 | 1.7 | No | LAP-022A | Indeno(1,2,3-cd)pyrene | 1.7 | 1.7 | No |
| LAP-022B | Fluoranthene | 0.19 | 0.38 | No | LAP-022B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-023A | Fluoranthene | 0.85 | 1.7 | No | LAP-023A | Indeno(1,2,3-cd)pyrene | 1.7 | 1.7 | No |
| LAP-023B | Fluoranthene | 0.3 | 0.6 | No | LAP-023B | Indeno(1,2,3-cd)pyrene | 0.6 | 0.6 | No |
| LAP-024A | Fluoranthene | 0.9 | 1.8 | No | LAP-024A | Indeno(1,2,3-cd)pyrene | 1.8 | 1.8 | No |
| LAP-024B | Fluoranthene | 0.185 | 0.37 | No | LAP-024B | Indeno(1,2,3-cd)pyrene | 0.37 | 0.37 | No |
| LAP-025A | Fluoranthene | 0.185 | 0.37 | No | LAP-025A | Indeno(1,2,3-cd)pyrene | 0.091 | 0.37 | Yes |
| LAP-025B | Fluoranthene | 0.19 | 0.38 | No | LAP-025B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-026A | Fluoranthene | 0.85 | 1.7 | No | LAP-026A | Indeno(1,2,3-cd)pyrene | 1.7 | 1.7 | No |
| LAP-026B | Fluoranthene | 0.19 | 0.38 | No | LAP-026B | Indeno(1,2,3-cd)pyrene | 0.38 | 0.38 | No |
| LAP-027A | Fluoranthene | 3.9 | 3.5 | Yes | LAP-027A | Indeno(1,2,3-cd)pyrene | 1 | 3.5 | Yes |
| LAP-027B | Fluoranthene | 0.195 | 0.39 | No | LAP-027B | Indeno(1,2,3-cd)pyrene | 0.049 | 0.39 | Yes |
| LAP-028A | Fluoranthene | 0.9 | 1.8 | No | LAP-028A | Indeno(1,2,3-cd)pyrene | 1.8 | 1.8 | No |
| LAP-028B | Fluoranthene | 0.95 | 1.9 | No | LAP-028B | Indeno(1,2,3-cd)pyrene | 1.9 | 1.9 | No |
| Maximum Value | | 3.9 | 3.5 | | Maximum Value | | 1.9 | 3.5 | |
| Minimum Value | | 0.175 | 0.35 | | Minimum Value | | 0.049 | 0.35 | |
| Frequency of Detection (%) | | 6 | | | Frequency of Detection (%) | | 0 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 2.5E+02 | | | Applicable MSC (Std 3 or Background) | | 2.6E+02 | | |

*Footnotes are provided on the last page of this table*

**Table B-6**
**Comparison of Soil Concentrations to Applicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm)[a] in Soil[b] | Det. Limit[c] | Detection? | Sample Number | Analyte | Concentration (ppm)[a] in Soil[b] | Det. Limit[c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-0210 | Phenanthrene | 0.46 | 1.8 | Yes | LAP-0210 | Pyrene | 1 | 1.8 | Yes |
| LAP-0211 | Phenanthrene | 0.4 | 0.4 | No | LAP-0211 | Pyrene | 0.048 | 0.4 | Yes |
| LAP-021A | Phenanthrene | 0.071 | 0.35 | Yes | LAP-021A | Pyrene | 0.15 | 0.35 | Yes |
| LAP-021B | Phenanthrene | 0.38 | 0.38 | No | LAP-021B | Pyrene | 0.38 | 0.38 | No |
| LAP-022A | Phenanthrene | 1.7 | 1.7 | No | LAP-022A | Pyrene | 1.7 | 1.7 | No |
| LAP-022B | Phenanthrene | 0.38 | 0.38 | No | LAP-022B | Pyrene | 0.38 | 0.38 | No |
| LAP-023A | Phenanthrene | 1.7 | 1.7 | No | LAP-023A | Pyrene | 0.22 | 1.7 | Yes |
| LAP-023B | Phenanthrene | 0.6 | 0.6 | No | LAP-023B | Pyrene | 0.6 | 0.6 | No |
| LAP-024A | Phenanthrene | 1.8 | 1.8 | No | LAP-024A | Pyrene | 1.8 | 1.8 | No |
| LAP-024B | Phenanthrene | 0.37 | 0.37 | No | LAP-024B | Pyrene | 0.079 | 0.37 | Yes |
| LAP-025A | Phenanthrene | 0.37 | 0.37 | No | LAP-025A | Pyrene | 0.13 | 0.37 | Yes |
| LAP-025B | Phenanthrene | 0.38 | 0.38 | No | LAP-025B | Pyrene | 0.38 | 0.38 | No |
| LAP-026A | Phenanthrene | 1.7 | 1.7 | No | LAP-026A | Pyrene | 0.29 | 1.7 | Yes |
| LAP-026B | Phenanthrene | 0.38 | 0.38 | No | LAP-026B | Pyrene | 0.38 | 0.38 | No |
| LAP-027A | Phenanthrene | 3.5 | 3.5 | No | LAP-027A | Pyrene | 3.3 | 3.5 | Yes |
| LAP-027B | Phenanthrene | 0.39 | 0.39 | No | LAP-027B | Pyrene | 0.089 | 0.39 | Yes |
| LAP-028A | Phenanthrene | 1.8 | 1.8 | No | LAP-028A | Pyrene | 0.29 | 1.8 | Yes |
| LAP-028B | Phenanthrene | 1.9 | 1.9 | No | LAP-028B | Pyrene | 1.9 | 1.9 | No |
| Maximum Value | | 3.5 | 3.5 | | Maximum Value | | 3.3 | 3.5 | |
| Minimum Value | | 0.071 | 0.35 | | Minimum Value | | 0.048 | 0.35 | |
| Frequency of Detection (%) | | 0 | | | Frequency of Detection (%) | | 1 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 2.8E+02 | | | Applicable MSC (Std 3 or Background) | | 1.0E+02 | | |

*Footnotes are provided on the last page of this table*

**Table B-6**
**Comparison of Soil Concenetrations to Aplicable Standard 3 MSC Cleanup Levels**
**LHAAP-02**

| Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? | Sample Number | Analyte | Concentration (ppm) [a] in Soil [b] | Det. Limit [c] | Detection? |
|---|---|---|---|---|---|---|---|---|---|
| LAP-021B | Methylene chloride | 0.0025 | 0.005 | No | LAP-021B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-022B | Methylene chloride | 0.006 | 0.005 | Yes | LAP-022B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-023B | Methylene chloride | 0.0025 | 0.005 | No | LAP-023B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-024B | Methylene chloride | 0.0025 | 0.005 | No | LAP-024B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-025B | Methylene chloride | 0.0025 | 0.005 | No | LAP-025B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-026B | Methylene chloride | 0.0025 | 0.005 | No | LAP-026B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-027B | Methylene chloride | 0.0025 | 0.005 | No | LAP-027B | p-Isopropyltoluene | 0.0025 | 0.005 | No |
| LAP-028B | Methylene chloride | 0.0025 | 0.005 | No | LAP-028B | p-Isopropyltoluene | 0.006 | 0.005 | Yes |
| Maximum Value | | 0.006 | 0.005 | | Maximum Value | | 0.006 | 0.005 | |
| Minimum Value | | 0.0025 | 0.005 | | Minimum Value | | 0.0025 | 0.005 | |
| Frequency of Detection (%) | | 13 | | | Frequency of Detection (%) | | 13 | | |
| Statistical Distribution Type | | Nonparametric | | | Statistical Distribution Type | | Nonparametric | | |
| Applicable MSC (Std 3 or Background) | | 1.6E-02 | | | Applicable MSC (Std 3 or Background) | | 7.9E+02 | | |

Footnotes and Abbreviations:

***Boldface italics enclosed in a box indicates value exceeding the Applicable MSC (the larger of the Standard 3 MSC or background values).***

[a] Concentrations reported were corrected for soil moisture content.

[b] Value equals 1/2 the detection limit if the concentration was reported as not detected.

[c] Blank entry indicates no value reported for the sample.

LAP: Prefix indicates sample reported in *Hazardous and Medical Waste Study No: 37-EF-5506-00, Response Complete Verification and Relative Risk Site Evaluation for Longhorn Army Ammunition Plant, Karnack, Texas* , Volumes I and II, U. S. Army Center for Health Promotion and Preventative Medicine, July 2000.

LHAAP: Longhorn Army Ammunition Plant

Nutrient: Chemical is an essential nutrient; no screening value available or required

RBSV: risk-based screening value soil specified in the Texas Risk Reduction Rules, Title 30 Texas Administrative Code Chapter 335 (30TAC§335) as updated through 2005.

# LONGHORN ARMY AMMUNITION PLANT,

00071183

# Karnack, Texas

## *MONTHLY MANAGERS' MEETING*

## AGENDA

| | |
|---|---|
| **DATE:** | Wednesday, 18 February, 2009 |
| **TIME:** | 2:00 p.m. |
| **PLACE:** | **Teleconference Dial in number:** 866-797-9304, code - 4155734 |

**Welcome** **RMZ**

**Action Items:**

**Army**

- Update site status spreadsheet/schedule and provide to EPA before next meeting.
- Provide schedule on progress of Construction Landfill, Site 19.
- Provide documentation on transferred sites with RC notation.
- Evaluate how Building 43-X will be addressed.

**EPA**

- Provide comments to Army on site status spreadsheet.

**Shaw**

- Provide a revised draft site status spreadsheet to Army.
- Provide time table for recommended actions from 5-year review report. Completed.

**Defense Environmental Restoration Program (DERP) PBC Update** **PS**

- Document Status/Environmental Sites (Table)
- Pistol Range path forward
- LHAAP-03 path forward
- LHAAP-49 path forward
- Groundwater Treatment Plant Update

**DERP Total Environmental Restoration Contract Update** **RMZ**

- Status of Draft Final ROD for Sites 37/67

**MMRP** **JRL/DB**

- Update

**Transfer Update**

- Hunting Program and Opening of Refuge
- Electrical ROW Lease to USFWS
- Transfer of LHAAP-12 Parcel
- ECOP VI
- Schedule of Powerhouse Bldg/Debris Removal

**Other Issues**

- 2009 IAP Schedule
- Notification Requirement vs. Proposed Plan for MMRP Sites (Steve Tzhone)

- Land Use Recordations – Notifications and Restrictions
    - MMRP Sites
    - TERC Sites
    - PBC Site
- March meeting date change
- Status of Army's Perchlorate page for Longhorn



**Adjourn**

Shaw® Shaw Environmental, Inc.

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**Subject:** **Draft Final Minutes, Monthly Managers Meeting, Longhorn Army Ammunition Plant (LHAAP)**

**Location of Meeting:** **Teleconference**

**Date of Meeting:** **February 18, 2009; 2:00 PM – 4:00 PM**

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## Meeting Participants:

| | |
|---|---|
| **BRAC:** | Rose M. Zeiler |
| **USACE-Tulsa:** | Dan Birnbaum, Aaron Williams, John Lambert, Scottie Fiehler |
| **USAEC:** | Jeff Armstrong |
| **Shaw**: | Praveen Srivastav, Greg Jones, Kay Everett, Van Vangala, Robert Duffield |
| **USEPA Region 6:** | Steve Tzhone |
| **TCEQ**: | Fay Duke |
| **USFWS:** | Paul Bruckwicki |

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## Previous Action Items

### Army

- Update site status spreadsheet/schedule and provide to EPA before next meeting.
- Provide schedule on progress of Demolition of Powerhouse and Construction Landfill Closure. *Dan Birnbaum said that he had expected to receive a schedule from the contractor around the February10th but had not yet received one. He also indicated that a Sampling Analysis Plan needed to be included in the work plan. He mentioned that the contractor mobilized a generator to the site to maintain power to the groundwater treatment plant (GWTP) during the demolition. A cover has been constructed over the switch gear, and the asbestos work is just beginning. He indicated that the landfill cover needs repair and that cap construction at this time of year would be advantageous.*
- Provide documentation on transferred sites with RC notation.
  *BRAC and USACE hoped to have substantive information by next week.*
- Evaluate how Building 43-X will be addressed.
  *This building is located within LHAAP-18. Information presented earlier (via Lisa Price from a 1995 table from a draft DERPMIS document) did not identify 43-X as part of*

*LHAAP-18. Rose referred everyone to an April 1996 document, previously provided by Fay Duke that specifically associates 43-X with LHAAP-18.*

**EPA**

- Provide comments to Army on site status spreadsheet.
  *Pending; EPA received the spreadsheet today.*

**Shaw**

- Provide a revised draft site status spreadsheet to Army.
  *Completed.*
- Provide time table for recommended actions from 5-year review report.
  *Completed. Rose indicated that she had some questions on the 5-year review report timetable.*

**<u>Defense Environmental Restoration Program (DERP) PBC Update</u>** **Praveen Srivastav**

**Document Status/Environmental Sites (Table)**

Praveen briefly went over the document status/environmental sites table. The next document to be submitted for LHAAP-02 is the decision document. RTCs for the Draft Final SI LHAAP-03 are currently being prepared. The Draft Final Engineering Evaluation/Cost Analysis (EE/CA) for LHAAP-04 is awaiting EPA review comments. Survey work is being scheduled for sites LHAAP-06, 07, 51, 55, 64, 66, and 68 to be followed by county recordation. Praveen asked about LHAAP-55 and whether each individual septic tank and leachate field should be surveyed. It was discussed that eight of the septic tanks are within sites LHAAP-48 and LHAAP-53, which have already been screened for unrestricted use. Two other septic tanks are not affiliated with any other nearby site. Rose said that she would check on the contaminant levels for LHAAP-55 and the sumps that are located in or adjacent to other transferred areas. Rose asked if USFWS would want pieces carved out of the production areas that could actually be transferred. Paul Bruckwicki said he would check with Mark Williams on that issue. Rose indicated that the TERC sites that need to be filed with the county had been already been surveyed. There was a discussion on the groundwater-use restriction and whether the notification to the county should be based on the entire area of a site or the specific area of groundwater contamination. Praveen asked about the timeframe for filing with the county office, and Fay said that she did not think there was a problem waiting. Rose said that the powerhouse is currently under demolition and wondered if the USFWS were interested in using the slab. Paul would have to check, but mentioned it might be nice to be able to use the slab. Rose pointed out that the site will not be clear of electrical facilities, since the transformers and switch gear are located there. Praveen continued with the site status and indicated that the Feasibility Study (FS) Addendum for LHAAP-16 has been delayed because of additional field work. The Draft FSs for LHAAP-17 and LHAAP-18/24 are in preparation and expected out by the end of February. The Responses to Comments (RTCs) for the Draft FS for LHAAP-29 are in Army review. The Draft Final FS for LHAAP-46 is in regulatory review. The Draft FS for LHAAP-47 is in progress; additional data are being collected. For LHAAP-49, issues regarding the Draft Final Site Evaluation Report are still being resolved. The Draft Final FS for LHAAP-50 is in progress, and RTCs are in preparation. The RTCs for the Draft Final FS for LHAAP-58 were submitted to the TCEQ and EPA after the last meeting. At LHAAP-60, the next task will be a survey of the site. Concurrence with the RTCs was received from EPA and TCEQ. The final document is currently being prepared. The Draft Final Addendum for LHAAP-35/36 is in regulatory review. The LHAAP-12 RA(O) Report is in progress.

Fay indicated that TCEQ is in the process of reorganizing. She is now in the Office of Compliance and Enforcement. In all likelihood, she will be working under new management with this reorganization.

**Pistol Range Path Forward**
Praveen indicated that Shaw plans to be in the field in April or early May 2009 to remove the contaminated soil. The soil removal will occur in conjunction with the soil removal at LHAAP-03 and 04 (if EE/CA for LHAAP-04 is finalized in time). Praveen indicated that Shaw will prepare a draft action memorandum for Pistol Range/LHAAP-04 and submit for Army's review in March 2009. He also mentioned that a work plan will be prepared for these sites prior to mobilization for the field work. He asked if the regulators wanted to review the work plan. Fay Duke indicated that TCEQ would review the work plan.

**LHAAP-49 Path Forward**
Groundwater issues were raised, so more sampling is being conducted. In addition, Shaw is planning to plug the 49WW03 well. A replacement well was previously installed in the last quarter of 2008.

**Groundwater Treatment Plant Update**
Normal operations continued.

**DERP Total Environmental Restoration Contract (TERC) Update** **Rose Zeiler**

**Status of Draft Final ROD for Sites 37/67**
Rose said that they have asked for comments by the 26th for this document. Fay indicated that she passed it on when she received it.

**MMRP** **Dan Birnbaum/John Lambert**

**Update**
John Lambert indicated that two documents are in progress. They are the MEC (Munitions Explosives of Concern) Removal Action Completion Report, which should be submitted to Fay and Steve sometime in March. The other document is the Munitions Constituent Summary Report, which is expected to be submitted sometime in March. John said that the contractor doing this work is Shaw, but as a separate contract from the current PBC contract with Shaw.

**<u>Transfer Update</u>** **Rose Zeiler**

**Hunting Program and Opening of Refuge**
Paul said that a program has been submitted and approved at the regional office of USFWS regarding the hunting programs. The programs include youth and archery programs in conjunction with the opening of the refuge. He indicated that the archery hunt would start September 26 and go through all of October 2009. There will also be controlled hunts on the weekends of November 6, 7, and 8 and November 13, 14, and 15. He also indicated that a youth hunt would take place on the November 20, 21, and 22. He wanted everyone aware because no one other than the hunters should be in the designated tracts during these time periods, and extreme caution should be exercised during hunting programs and hunting season in general. A discussion on card access was mentioned and Paul said he would talk to Mark Williams about that. A flyer on these events has been provided to stakeholders.

Paul said that a map is available that shows approximately 500 acres with habitat units broken out. Rose said she had received markups and asked if it was okay to provide them to Shaw. Paul said that some changes need to be made to them. A discussion followed regarding Army sites that are undergoing active remedial investigation/clean up and are not open to visitors. The discussion addressed deterrents in place to prevent unauthorized personnel in environmental sites. Some of the deterrents include barbed wire fencing across access points; signage prohibiting unauthorized access; locked gates across other access points. In addition, an LUC plan and a MEC safety video are available for review for specific sites.

Paul indicated that travel trailers will be up and running soon. A visitor's center will be established.

**Electrical Right of Way (ROW) Lease to USFWS**
Rose asked the status of the transfer/lease for the electric easement. Paul said it was signed at the regional office and has been sent to the Refuge for a representative to sign. Paul said she should be receiving it by mail in a few days.

**Transfer of LHAAP-12 Parcel**
Rose said that she had not heard anything from USFWS on the LHAAP-12 transfer and asked for a status from USFWS. Paul has not heard anything regarding that transfer.

Paul also indicated that a burn program is coming soon and that a number of parcels will be in the burn, potentially including LHAAP-49. A discussion followed regarding what is involved in the burn. Since a well abandonment is planned for next week at LHAAP-49, Praveen asked that LHAAP-49 not be included in the burn at this time.

**ECOP VI**
The upcoming ECOP VI will have as many of the outlier sites in it as possible. These include sites 27, 54, 53, 48, 08, and 32 and some other areas near them. Rose suggested that there may be two more ECOPs. LHAAP-12 (Landfill 12) has its own ECOP.

**Schedule of Powerhouse Bldg/Debris Removal**
The schedule of the Powerhouse demolition was discussed briefly at the beginning of the meeting. The demolition is currently in progress.

**<u>Other Issues</u>** **Rose Zeiler**

**2009 IAP Schedule**
Rose indicated that no Installation Action Plan (IAP) meeting is scheduled for this year. She suggested that if anyone feels a meeting for the IAP is needed, a meeting could be arranged outside of the next Managers' meeting to go over the IAP.

**Notification Requirement vs. Proposed Plan for MMRP Sites** **Steve Tzhone**
John Lambert asked if there was anything further required other than a no further action ROD. Steve said that he believes the NFA ROD should follow the basic CERCLA process and that it would need a community involvement component. He would pass the question back to HQ for their input. Fay said public participation would be needed on the proposed plan. Steve thought a Proposed Plan would need to be done, but perhaps not an FS. However, an FS might be required for the perchlorate issue, and that issue might require a Remedial Investigation (RI) if too few data are available. Steve noted that some ROD sections could be omitted in an NFA ROD. Steve will follow up by checking if a formal publication to present to the public is needed.

**Land Use Recordation – Notifications and Restrictions**
**MMRP Sites**
**TERC Sites**
**PBC Site**
Rose indicated that the data on these will be sent to the EPA.

The next RAB meeting date has been changed to March 24, 2009. The monthly managers meeting will be held at 12:30 PM with the RAB following at 6:30 PM. An action item for Shaw is to notify the stakeholders of this change.

Army will let EPA know when the perchlorate page for Longhorn on the DOD website has been posted.

***Meeting Adjourned***

**Action Items:**

**Army**
- Update site status spreadsheet/schedule and provide to EPA before next meeting.
- Provide schedule on progress of Powerhouse Demolition and Site 19 Landfill Closure,
- Provide a hardcopy of the Draft Final ROD for LHAAP-37/67 to EPA.

- Provide the 5-year Review Follow-up Status Table.
- Send Shaw a copy of the hunting map.

**EPA**
- Provide comments to Army on the site schedule.
- Confirm if formal publication and public comment period are needed for NFA ROD

**Shaw**
- Notify stakeholders of RAB meeting date change.

**USFWS**
- Settlement of card access issues during hunting programs.

Shaw

# LONGHORN ARMY AMMUNITION PLANT
# MONTHLY MANAGERS' MEETING

| | | | |
|---|---|---|---|
| **Location** | teleconference | | |
| **Date** | Feb. 18, 2009 | **Time** | 2:00 PM |

## ATTENDEES

| Name (printed | Signature | Organization | Phone | E-mail |
|---|---|---|---|---|
| **Longhorn Team Members** | | | | |
| Rose M. Zeiler | ✓ | BRAC | (479) 635-0110 | rose.zeiler@us.army.mil |
| Jeff Armstrong | ✓ | USAEC | (410) 436-1510 | jeffrey.armstrong@us.army.mil |
| Aaron Williams | ✓ | USACE, Tulsa | (918) 669-4915 | aaron.k.williams@usace.army.mil |
| John Lambert | ✓ | USACE, Tulsa | (918) 669-4992 | john.r.lambert@SWT03.usace.army.mil |
| Dan Birnbaum | ✓ | USACE, Tulsa | (918) 669-4304 | daniel.birnbaum@usace.army.mil |
| Stephen Tzhone | ✓ | USEPA, Dallas | (214) 665-8409 | tzhone.stephen@epa.gov |
| Raji Josiam | | USEPA, Dallas | (214) 665-8529 | josiam.raji@epa.gov |
| Fay Duke | ✓ | TCEQ, Austin | (512) 239-2443 | fduke@tceq.state.tx.us |
| Dale Vodak | | TCEQ, Tyler | (903) 535-5142 | dvodak@tceq.state.tx.us |
| Barry Forsythe | | USFSW, Dallas | (214) 665-8467 | forsythe.barry@epa.gov |
| Paul Bruckwicki | ✓ | USFSW, Karnack | (903) 679-4536 | paul_bruckwicki@fws.gov |
| Mark Williams | | USFSW, Karnack | (903) 679-9144 | mark_williams@fws.gov |
| Praveen Srivastav | ✓ | SHAW, Houston | (713) 996-4588 | praveen.srivastav@shawgrp.com |
| Kay Everett | ✓ | SHAW, Houston | (713) 996-4421 | kay.everett@shawgrp.com |
| Greg Jones | ✓ | SHAW, Houston | (713) 996-4472 | greg.n.jones@shawgrp.com |
| Scottie Fiehler | ✓ | USACE, Tulsa | | |
| Van Vangala | ✓ | Shaw, Houston | (713) 996-4459 | Van.Vangala@Shawgrp.com |
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**Status of Sites and Technical Documents**
**Longhorn Army Ammunition Plant – PBC Contract**
**February 18, 2009**

| No. | Document in Progress | Submittal Date | Army | Regulator | Next Submittal | Expected Date | Army | Regulator | Comment Resolution | Status | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Final SI Report, LHAAP-02 | 1/30/09 | x | x | | | | | | Final report submitted. | Decision Document to be submitted |
| 2 | Draft Final SI Report for LHAAP-03, Rev 01 | 12/30/07 | | x | RTC | 2/27/09 | x | | In progress | Preparing RTCs | Final SI report to be submitted after RTCs are resolved. |
| 3 | Draft Final EE/CA, LHAAP-04 | 6/10/08 | | x | Final EE/CA | 02/27/09 | x | x | In progress | Responses to regulatory comments submitted on 10/14/08. Additional TCEQ comments rec'd on 11/12/08. Waiting for EPA concurrence | EPA review comments pending |
| 4 | Final Decision Document, LHAAP-06, 07, 51, 55, 64, 66, 68 | 12/18/08 | x | | NA | | | | NA | Final copies were distributed on 12/18/08. | Scheduling survey, followed by County notification. |
| 5 | Draft Final Feasibility Study Addendum, Rev 01, LHAAP-16 | 7/3/08 | | x | RTC | 03/15/09 | | x | In progress | EPA and TCEQ comments rec'd. RTCs reviewed by Army. RTC revision in progress | FS delayed because of additional field work |
| 6 | Draft Feasibility Study, LHAAP-17 | Feb 2008 | x | | | | | | | In preparation | |
| 7 | Draft Feasibility Study, LHAAP-18/24 | Feb 2009 | x | | | | | | | In preparation | Pilot study continuing, one additional extraction well installed in hot spot, collected geological information. Collecting data from each ICT |
| 8 | Draft Feasibility Study, LHAAP-29 | 10/30/08 | x | | RTC | 2/27/09 | | x | In progress | RTCs in Army review | Sampling for metals is complete. Draft FS will be revised to include data. |

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**Status of Sites and Technical Documents**
**Longhorn Army Ammunition Plant – PBC Contract**
**February 18, 2009**

| No. | Document in Progress | Submittal Date | Army | Regulator | Next Submittal | Expected Date | Army | Regulator | Comment Resolution | Status | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Draft Final Focused Feasibility Study, LHAAP-46 | 1/30/09 | x | x | | | | | | Document in regulatory review. Comments due 3/2/09 | |
| 10 | Draft Focused Feasibility Study, LHAAP-47 | 12/23/08 | x | | Draft Final | 3/15/09 | | | In progress | Army comments received. RTC in prep. | Collecting groundwater samples for more current data. |
| 11 | Draft Final Site Evaluation Report for LHAAP-49 | 3/3/08 | x | x | RTC | 01/15/09 | x | | In progress | GW data available. RTC in preparation | Soil removal for mercury has been completed. Installed and sampled 5 wells. Currently addressing groundwater issues. |
| 12 | Draft Final Feasibility Study, LHAAP-50 | 11/20/08 | x | x | RTC | 2/20/09 | x | | In progress | Regulatory comments received. RTC in preparation | |
| 13 | Draft Final Feasibility Study, LHAAP-58 | 9/20/07 | x | x | | | | | In progress | RTCs submitted to regulators on 1/30/09. | |
| 14 | Final Decision Document, LHAAP-60 | 12/18/08 | x | | | | | | NA | Final copies were distributed on 12/18/08. | Scheduling survey, followed by County notification. |
| 15 | Draft Final EE/CA, Pistol Range | 7/15/08 | | x | Final EE/CA | 2/24/09 | x | x | Completed | Regulators concurred with RTCs. Final EE/CA in preparation | 30 Day comment period to start 2/25/09. Planning public meeting during March 24 RAB |
| 16 | Draft Final Addendum, LHAAP-35/36 | 1/14/09 | x | | | | | | | Document in regulatory review | |
| 17 | LHAAP-12 Annual RAO Report | 9/3/08 | x | | RTC | 02/27/09 | x | | In progress | Army comments rec'd | |

00071194

Shaw® Shaw Environmental, Inc.

***Date:*** ***February 25, 2009***

***Project No.:*** ***117591***

## ***TRANSMITTAL LETTER:***

***To:*** Mr. Aaron Williams

***Address:*** US Army Corps of Engineers - Tulsa

CESWT-PP-M

1645 South 101st East Ave

Tulsa, Oklahoma 74128

***Re:*** Final Engineering Evaluation/Cost Analysis, Former Pistol Range,

Contract No. W912QR-04-D-0027/DS02

For: Review____ As Requested ____ Approval____ Corrections____ Submittal____ Other X____

| *Item No:* | *No. of Copies* | *Date:* | *Document Title* |
|---|---|---|---|
| 1 | 2 | February 2009 | **Final Engineering Evaluation/Cost Analysis,<br>Former Pistol Range,<br>Longhorn Army Ammunition Plant, Karnack, Texas** |
| | | | |

Aaron – Enclosed please find two copies of Shaw's draft final version of the above-named document.

Copies have been distributed as indicated below.

Please call with any questions or comments.

***Sincerely:***

Praveen Srivastav
Project Manager

***CC:*** **Distribution List:**

D. Birnbaum – USACE, Tulsa (sent to A. Williams for distribution)
J. Armstrong – AEC
Rose Zeiler – BRAC-LHAAP
S. Tzhone – EPA Region 6 (2)
F. Duke– TCEQ, Austin (2)
D. Vodak– TCEQ, Tyler
P. Bruckwicki– U.S. Fish and Wildlife Service

DEPARTMENT OF THE ARMY
LONGHORN ARMY AMMUNITION PLANT
POST OFFICE BOX 220
RATCLIFF, AR 72951

00071195

February 25, 2009

DAIM-ODB-LO

Mr. Stephen Tzhone
US Environmental Protection Agency
Superfund Division (6SF-AT)
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Final Engineering Evaluation/Cost Analysis Former Pistol Range
Longhorn Army Ammunition Plant, Karnack, Texas, February 2009

Dear Mr. Tzhone,

The above-referenced document is being transmitted to you for your records. The document has been prepared by Shaw Environmental, Inc. (Shaw) on behalf of the Army as part of Shaw's performance based contract for the facility.

The point of contact for this action is the undersigned. I ask that Praveen Srivastav, Shaw's Project Manager, be copied on any communications related to the project. I may be contacted at 479-635-0110, or by email at rose.zeiler@us.army.mil.

Sincerely,

Rose M. Zeiler

Rose M. Zeiler, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
F. Duke, TCEQ, Austin, TX
D. Vodak, TCEQ, Tyler, TX
A. Williams, USACE, Tulsa District, OK
D. Birnbaum, USACE, Tulsa District, OK
J. Armstrong, USAEC, MD
P. Bruckwicki, Caddo Lake NWR, TX
P. Srivastav, Shaw, Houston, TX (for project files)

00071196

**DEPARTMENT OF THE ARMY**
**LONGHORN ARMY AMMUNITION PLANT**
**POST OFFICE BOX 220**
**RATCLIFF, AR 72951**

February 25, 2009

DAIM-ODB-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
TCEQ Environmental Cleanup Section I MC-136
12100 Park 35 Circle, Bldg D
Austin, TX 78753

Re: Final Engineering Evaluation/Cost Analysis Former Pistol Range, Longhorn Army Ammunition Plant, Karnack, Texas, February, 2009
SUP 126

Dear Ms. Duke,

The above-referenced document is being transmitted to you for your records. The document has been prepared by Shaw Environmental, Inc. (Shaw) on behalf of the Army as part of Shaw's performance based contract for the facility.

The point of contact for this action is the undersigned. I ask that Praveen Srivastav, Shaw's Project Manager be copied on any communications related to the project. I may be contacted at 479-635-0110, or by email at rose.zeiler@us.army.mil.

Sincerely,

Rose M. Zeiler

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Longhorn AAP Site Manager

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D. Vodak, TCEQ, Tyler, TX
A. Williams, USACE, Tulsa District, OK
D. Birnbaum, USACE, Tulsa District, OK
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P. Bruckwicki, Caddo Lake NWR, TX
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**Comments on Draft Final EE/CA, LHAAP Former Pistol Range (published July 2008)**
**Site Closure of Multiple Sites (T.O. DS02, W912QR-04-D-2006)**
**Longhorn Army Ammunition Plant, Karnack, Texas**

00071197

**Reviewers:** TCEQ and USEPA
**Respondent:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
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| **Reviewer: Fay Duke, TCEQ** | | | | | | |
| 1 | General | General | The TCEQ has completed its review of the DF EE/CA for the Former Pistol Range. We concur that Alternative 3, Excavation and Offsite Disposal with Land Use Control most appropriately address the contaminations at this site. However we have one comment. We noted that the screening results of XRF appears to be consistently lower than the laboratory results especially at higher concentrations. Therefore, we advise caution when interpreting the XRF results that are near the action level (i.e. sample N75, E25-Lower). If soil removal does not occur in area near sample locations where XRF screening levels can be interpret to be near the action level, a confirmation soil sample should be taken.<br><br>Source: Email from F. Duke/TCEQ to R. Zeiler/U.S. Army on Wednesday, 09/24/2008 at 12:18 PM. | C | The relationship between XRF and laboratory results will be mentioned in Section 2.6 (Please see the response to Comment #52). Also, the following text will be added on after the 4th sentence of the last paragraph on Page 4-5:<br><br>"Because XRF results tended to slightly underestimate the laboratory results for soil lead concentrations (see **Section 2.6**), the work plan will address isolated sample locations near the cleanup level (e.g., N75,E25-lower, which had an XRF lead result of 750.8 mg/kg) by expanding the excavation to include them or specifying confirmation samples at such locations." | |
| **Reviewer: Stephen Tzone, USEPA** | | | | | | |
| 2 | General | General | The EPA has completed its review of the Draft Final Engineering Evaluation/Cost Analysis (EE/CA), Former Pistol Range (July 2008), with the assistance of TVA.<br><br>Please find enclosed the original comments, which represents the comments for the EPA on this draft report.<br><br>In addition, the EPA concurs that Alternative 3, Excavation and Off-site Disposal with Land Use Controls, most appropriately addresses the soil contamination at the site, but shares the same concern with TCEQ, that confirmation soil samples should be taken (if soil removal does not occur) for areas near sample locations where x-ray fluorescence (XRF) screening results are near the action level.<br>(See attached file: memo TVA to EPA Pistol Range EECA comments.pdf)<br>Source: Email from S. Tzhone/USEPA to R. Zeiler/U.S. Army on Thursday, 10/16/2008 at 2:06 PM. | C | Noted. Please see response to Comment #1. | |
| **Reviewer: Various Reviewers/TVA as documented in letter from R.A. Westmoreland/TVA to S. Tzhone, USEPA, dated 08/29/2008** | | | | | | |

**Comments on Draft Final EE/CA, LHAAP Former Pistol Range (published July 2008)**
**Site Closure of Multiple Sites (T.O. DS02, W912QR-04-D-2006)**
**Longhorn Army Ammunition Plant, Karnack, Texas**

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**Respondent:** Shaw Environmental, Inc.

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| 3 | General | General | TVA has reviewed the Draft Final report for removal action alternatives for the former Pistol Range at the former Longhorn Army Ammunition Plant. Overall, the draft report appears to be well written and appropriately addresses historical data and determination of alternatives for handling of the site. Two of our reviewers raised questions concerning the possibility of other alternatives, such as capping or hot-spot removal, which may have already been considered. TVA has provided review comments as shown below for your consideration and use as you deem appropriate. Separate tables of review comments are provided for the report and each appendix. We had no comments on Appendix D. | C | While capping and hot spot removal were not explicitly addressed, they were considered during EE/CA development. Hot spot removal is a subset of removal technology, which is the basis for the recommended alternative. However, if excavation was limited to specific hot spots, rather than the cleanup level, it would not have ensured removal of surface soil exceeding the SAI-Ind. Also, the capital cost for hot spot excavations is only a little better than the cost for a larger excavation at this particular site; therefore, hot spot excavation was not considered.<br>Capping is distinct from the other technologies. Therefore, Table 4-1 will be expanded to explain why capping was not used as the foundation for an alternative. Please see the attached revision of Table 4-1. | |
| **MAIN TEXT** | | | | | | |
| 4 | Genera l | General | Briefly mention the history of the LHAAP (i.e., TNT production, munitions loading and assembly) and indicate if there is no visual evidence or historical record of anything other than small arms being used at the pistol range. | C | The following paragraph will be added before the existing paragraph in Section 2.2:<br>"LHAAP was established in 1942 to produce TNT for use in World War II. Production of TNT was discontinued in 1945. Starting in 1952, the facility was used for production of pyrotechnic ammunition, and later for rocket motor production. In the 1990s, LHAAP was also responsible for static firing and elimination of rocket motors in compliance with the Intermediate-Range Nuclear Forces Treaty. The plant was ultimately deactivated and declared excess to the Army's needs in 1997 (U.S. Army, 2007)."<br>The following will be appended to the end of the 2nd paragraph of Section 2.2:<br>"There is no visual evidence or historical record of the Pistol Range being used as anything other than a small arms firing range." | |

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**Reviewers:** TCEQ and USEPA
**Respondent:** Shaw Environmental, Inc.

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| 5 | | Executive Summary / General | Need to explain why the EE/CA is being prepared. | C | The following text will be added between the 1st and 2nd sentences of the 1st paragraph of the Executive Summary:<br>"A removal action is appropriate at the former Pistol Range based on the concentrations of lead in the surface and near-surface soil. The lead concentrations are sufficiently high to constitute a threat to public health that should be addressed under §300.415(b)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). §300.415(b)(2)(i) refers to "Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants. A planning period of at least six months exists prior to the need to initiate on-site action. In that circumstance, the NCP requires that an EE/CA be conducted (§300.415(b)(4)). This EE/CA has been prepared to present the existing data for the site, verify the need for a removal action, evaluate possible actions, and recommend a path forward."<br>In conjunction with this change, the 4th paragraph of the Executive Summary will be deleted. | |
| 6 | | Executive Summary / General | Need to give brief regulatory history and current status of the LHAAP site, which is a NPL site. The clean-up of the range is being conducted in accordance with a 1991 Federal Facility Agreement between the State of Texas, EPA and the Department of Defense to address site-wide contamination at LHAAP. | C | The following text will be inserted after the 1st sentence of the 2nd paragraph:<br>"LHAAP was established in 1942 to produce TNT for use in World War II. Production of TNT was discontinued in 1945, but the facility was later used for production of pyrotechnic ammunition, rocket motor production, and static firing and elimination of rocket motors. The plant was deactivated and declared excess to the Army's needs in 1997. In December 1991, the State of Texas, USEPA, and the Department of Defense - U.S. Army Longhorn Army Ammunition Plant, entered into a federal facility agreement (FFA) to address the contamination at LHAAP. Proposed actions are carried out under CERCLA (as implemented through the NCP) with the U.S. Army as the lead agency, in conformity with the FFA." | |
| 7 | | Executive Summary / | Need to state that the removal action is classified as a "non- | C | The following sentence will be added to the Executive | |

**Reviewers:** TCEQ and USEPA
**Respondent:** Shaw Environmental, Inc.

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| | | General | critical" removal. | | Summary as noted in the response to Comment #5:<br>"A planning period of at least six months exists prior to the initiation of on-site action; therefore, this action will be implemented as a non-time critical removal action."<br>The same sentence will also be added to the 2nd paragraph of Section 2.10 on Page 2-9. | |
| 8 | ES-1 | 1st | Identify the proposed removal action as the "preferred alternative" or the "recommended alternative." | C | In the first paragraph,<br>"This EE/CA proposes a removal action at the former Pistol Range consisting of the following"<br>will be replaced with<br>"Based on this EE/CA, the recommended removal action alternative at the former Pistol Range comprises the following" | |
| 9 | ES-1 | 3rd | Give the timeframe that the pistol range was used. | C | Exact years are unknown, but the last sentence of the paragraph will be revised to:<br>"The Pistol Range was used intermittently for small arms qualifying tests by security personnel until 2004." | |
| 10 | ES-1 | 4th | Give the list of the potential COC and why they were investigated. | C | The text similar to the following will be inserted in the Executive Summary:<br>"The potential chemicals of concern (COCs) at the former Pistol Range are metals associated with small arms use. Work at other small arms firing ranges has shown that the most prevalent and widespread contaminant is lead. The investigations at former Pistol Range have sometimes included other metals commonly associated with firing ranges (e.g., arsenic, copper, nickel, zinc), but the investigations have focused on lead as the COC that would drive cleanup at the site." | |

**Reviewers:** TCEQ and USEPA
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| 11 | ES-1 | 5th | Indicate that the NCP implements CERCLA. | C | Please see the response to Comment #6. | |
| 12 | ES-2 | 3rd | Consider Containment (Capping) and Hot Spot Removal or a combination of the two as 4th and 5th options. | E | Please see the response to Comment #3. | |
| 13 | i | TOC | Each section in Table of Contents page needs correct page numbers listed. | C | Page number for Section 5.3.3 will be corrected. | |
| 14 | iii | TOC | List of Tables and List of Figures in TOC need correct page numbers listed. | C | Page numbers will be rechecked and corrected as needed. | |
| 15 | iv | Acronyms | Could not find the following acronyms as being used in the report: CLI, FS, GPS, HDPE, MCLs, NRHP, or USC. | C | All acronyms will be double checked. Unused acronyms will be deleted, and the acronym list will be updated. Also, each acronym will be defined at the point of first occurrence. | |
| 16 | iv | Acronyms | The following acronyms were found in the report, but were not listed on the acronym page: DNT, TSD, and BRAC. | C | Please see response to Comment #15. | |
| 17 | 1-1 | Intro | Indicate why the EE/CA is being required from a regulatory sense. | C | The first sentence of Section 1.1 will be replaced with the following: “A removal action is being considered at the former Pistol Range because of the presence of high concentrations of lead in the surface and near-surface soil at the site. A planning period of at least six months exists prior to the need to initiate on-site action. In that circumstance, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires that an EE/CA be conducted (§300.415(b)(4)). The purpose of this EE/CA is to present the existing data for the site, verify the need for a removal action, evaluate possible actions, and recommend a path forward. In doing so, this EE/CA identifies removal action objectives for the former Pistol Range and analyzes various alternatives that may be used to satisfy those objectives.” | |
| 18 | 1-1 | 1.2 | Indicate when the operations at the pistol range ceased. | C | There is not a definite year in which the site was shut down. However, the last sentence of Section 1.2 will be revised to the following: | |

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| | | | | | "The area was used as a small arms firing range by base security personnel from the 1950s until 2004." | |
| 19 | 2-1 | 2.2 | When did LHAAP production operations cease? | C | Please see the response to Comment #4. | |
| 20 | 2-1 | 2.2 | Describe products made at LHAAP. | C | Please see the response to Comment #4. | |
| 21 | 2-1 | 2.2 | Indicate when the operations at the pistol range ceased. | C | The first sentence of Section 2.2 will be revised to the following:<br><br>"The Pistol Range at LHAAP was established before 1954 and is known to have been used by LHAAP security personnel for small arms target practice and qualifying tests. The range was designated as an active/inactive (A/I) range during the Army range inventory process which culminated in the Longhorn Army Ammunition Plant Active/Inactive Range Inventory conducted in March 2001 (Army Materiel Command, 2001). The reason for the A/I classification was that the range was being used once a year by contract security for qualification/certification. The Pistol Range was used through 2003 and into 2004 for qualifying and recertification by security guards. The Pistol Range was officially closed by Army in 2005. According to the Draft Historical Records Review For Other Than Operational Ranges at LHAAP, 1 June 2004, the Pistol Range was a small arms range."<br><br>The 2004 document will be added to the references provided in Section 8.0. | |
| 22 | 2-1 | 2.3 | Describe whether target berm is a natural or artificial structure. | C | The next to last sentence of the 2nd paragraph of Section 2.3 will be revised as follows: "This natural slope constituted the target berm for the Pistol Range." | |
| 23 | 2-1 | 2.3 | Note that the entire LHAAP site lies within the 100-year floodplain. | E | The 3rd sentence of the last paragraph of Section 2.3 will be revised as follows: "The former Pistol Range is located with in the flood plain of Harrison Bayou; the site lies within a designated | |

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**Respondent:** Shaw Environmental, Inc.

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| | | | | | Special Flood Hazard Area (U.S. Department of Housing and Urban Development [HUD], 1989)." | |
| 24 | 2-3 | 2.5.1 | The acronym HUD is not defined at first use. | C | HUD will be defined at point of first use (see response to Comment #23). | |
| 25 | 2-3 | 2.5.1 | When was the facility determined to be in excess of the Army's needs? | C | Please see response to Comment #4. | |
| 26 | 2-3 | 2.5.1 | Note year that operations ceased. | C | "in 1997" will be added to the end of the 2nd sentence of the section. | |
| 27 | 2-3 | 2.5.2 | Acronym TCEQ not defined. | C | Please see response to Comment #15. | |
| 28 | 2-3 | 2.5.2 | Mention that there is groundwater contamination (i.e., TCE, methylene chloride) at the LHAAP site caused from other production activities not associated with the pistol range that are being addressed under separate remedial actions. | C | This section is on Current and Future Site Usage. Discussion of contamination associated with other sites seems out of place. So Section 2.6 was revised to address this. Please see response to Comment #32. | |
| 29 | 2-3 | 2.5.2 | Not only does the State of Texas "view all groundwater as a potential drinking water source," but the underlying aquifer is the only source available for the public water supply systems in the area that border the installation. | C | Noted. | |
| 30 | 2-4 | 2.6.1 | Acronym CES not defined. | C | Please see response to Comment #15. | |
| 31 | 2-4 | 2.6.1 | Last paragraph, first sentence of this section, suggest replacing with the following: "The RCRA concentration at which lead is considered a hazardous waste is that at which it exceeds…" | E | The 1st sentence of the last paragraph of Section 2.6.1 will be replaced with the following: "The lead concentration at which soil is considered a RCRA-defined hazardous waste is that at which it exceeds 5.0 milligrams per liter (mg/L) for lead based on toxicity characteristic." | |
| 32 | 2-4 | 2.6.2 | What contaminants have been previously discovered at LHAAP? Need to insert a summary of these along with the expected contaminants associated with a firing range and justify why these may or may not be present at the firing range. | C | The following will be inserted in Section 2.6 just after the bullet list:<br>"Production and waste disposal activities at LHAAP resulted in contamination of soil and groundwater with chlorinated solvents, metals, and explosives constituents. However, the Pistol Range was not associated with production and waste | |

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
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| | | | | | disposal activities. Small arms firing is the only activity documented to have occurred at the site, and there is no visual evidence of other activities. Therefore, the potential chemicals of concern (COCs) at the former Pistol Range are limited to metals associated with small arms use. Work at other small arms firing ranges has shown that the most prevalent and widespread contaminant at such ranges is lead. The investigations at former Pistol Range have sometimes included other metals commonly associated with firing ranges (e.g., arsenic, copper, nickel, zinc), but the investigations listed above have focused on lead as the COC that would drive cleanup at the site." | |
| 33 | 2-4 | 2.6.2 | In paragraph 7, the next-to-last sentence appears to present a lead level (11.5ppm) associated with the pistol range from "North Ditch #1". This sample was associated with the sample set from "Building 407" data and not the pistol range (see Appendix C). | C | The sentence will be replaced with "Lead was detected at 10.70 ppm in the West Ditch sample." | |
| 34 | 2-5 | General | Would be beneficial to have a table indicating background values for the COC's or add these to an existing table. | C | For clarity, the UPL provided in Table 2-2 will be relabeled as "UPL (mg/kg) for background concentration." | |
| 35 | 2-5 | 2.6.2 | Need a short summary of background soil results (perhaps a table). | C | Please see UPL provided in Table 2-2. | |
| 36 | 2-5 | 2.6.2 | Acronym for ppm not defined. | C | Please see response to Comment #15. | |
| 37 | 2-5 | 2.6.2 | Acronym for bgs not defined. | C | Please see response to Comment #15. | |
| 38 | 2-5 | 2.6.2 | The 7th sentence from the bottom of the page has left out "ppm" after 102. | C | "ppm" will be inserted at the location noted. | |
| 39 | 2-7 | 2.6.3 | 1st sentence at the top of the page, suggest the following: "… the lead concentration decreases rapidly with depth, except at the 1.5-2.5 feet depth where the concentration increased." | E | The sentence is intended to indicate the general trend. A layer by layer account is provided by the table itself. The sentence will be revised as follows:<br>"As demonstrated by the results in Table 2-5, the lead concentration generally decreases with increasing depth and is at non-detect levels by 9-10 feet bgs." | |

00071205

**Reviewers:** TCEQ and USEPA
**Respondent:** Shaw Environmental, Inc.

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| 40 | 2-7 | 2.8.1 | Indicate that there is no history or physical evidence of any other activity other than small arms fire at the pistol range. | C | The following sentence will be added to Section 2.8.1:<br>"There is no history or physical evidence of any activity other than small arms fire at the former Pistol Range." | |
| 41 | 2-7 | 2.8.2 | The statement that the GWP-Ind was determined to not be applicable needs further discussion. Section 2.8.5 does not state this. | C | The 2nd sentence of Section 2.8.2 will be revised to the following:<br>"Comparisons to the GWP-Ind values are also presented **Table 2-2**, but are discussed in **Section 2.8.5**."<br>In Section 2.8.5, the following will be added at the end of the last paragraph:<br>"Since groundwater has not been impacted by the site and is not anticipated to be impacted within the next 1,000 years, there are no soil-to-groundwater cross-media impacts that need to be addressed at the former Pistol Range." | |
| 42 | 2-8 | 2.8.3 | Sentence 2 states sediments from East, Center, and West Ditch were analyzed by XRF for arsenic, copper, lead, nickel, and zinc with "no detections (Table 2-2)." However, Table 2-2 and Table 1 in Appendix C show zinc readings for both the East and Center Ditch. | C | The sentence will be corrected by replacing with the following:<br>"All three samples were analyzed by XRF for arsenic, copper, lead, nickel, and zinc (Table 2-2). Two samples had detectable levels of zinc, while the remaining XRF results were non-detect."<br>The next to last sentence in the same paragraph will be revised to the following:<br>"That laboratory result for lead, the zinc XRF detections, and the various XRF detection limits were far below their associated SAI-Ind values." | |

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
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| 43 | 2-8 | 2.8.4 | Microscopic lead bullet fragments might have been carried to the drainage ditch, but of greater concern would be dissolution of lead oxide coating on bullet fragments at certain pH values to ionic lead -- the erosion you mention. It is not clear that sediment sampling would be able to determine that the latter has not occurred. Some mention of pH dependence of lead solubility or the presence of anions which would give insoluble lead species, etc., might strengthen your position. | C | pH data from other sites at LHAAP are neutral to slightly acidic, but pH data are not available from the former Pistol Range. Therefore, specific conclusions cannot be drawn regarding lead solubility at the site. The following text will be added to the end of Section 2.8.4:<br>"Another possible transport mechanism is dissolution of lead from the surface of bullets and bullet fragments. However, lead compounds on the corroded surface of bullets are relatively insoluble in water except at very low pH. Since the former Pistol Range was not a site of waste disposal or production activities that would have altered the natural pH, dissolution is not considered a significant mechanism." | |
| 44 | 2-8 | 2.8.5 | Acronym ITRC not defined. | C | Please see response to Comment #15. | |
| 45 | 2-9 | 2.8.5 | Need more support for statement in 2.8.2 that GWP-Ind is not applicable. | C | Please see response to Comment #41. | |
| 46 | 2-9 | 2.9 | Acronym TNT and DNT not defined. | C | Please see response to Comment #15. | |
| 47 | 2-9 | 2.9 | The word "potential" was left out of the sentence defining the acronym COPEC. | C | "potential" will be inserted. | |
| 48 | 2-9 | 2.9 | Need summary of chemicals detected in the firing range sub-area in order to evaluate the completeness of the firing range potential contaminants. | C | The following will be inserted before the last sentence of Section 2.9:<br>"During the investigation at the former Pistol Range, arsenic, copper, nickel, and zinc were detected at levels exceeding background (as identified by the UPL in **Table 2-2**). Of these, the results for arsenic, nickel, and zinc were below the ecological screening values (ESVs) presented in the BERA. Therefore, these metals are not chemicals of ecological concern within the Waste Sub-area.<br>Copper was detected in all three laboratory samples. Because two of the three detected concentrations of copper exceeded the ESV for copper, copper was re-evaluated for potential impacts on ecological receptors. The detected copper concentrations from the former Pistol Range were added to the Waste Sub-Area copper dataset, and a new 95% | |

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| | | | | | upper confidence limit on the mean (95% UCL) was calculated. It should be noted that the 95% UCL was used in the LHAAP BERA as the screening concentration for comparison to ecological benchmarks. The new 95% UCL for copper was 22.4 mg/kg, which is greater than the previous 95% UCL for copper of 11.5 mg/kg in the Waste Sub-Area that was used in the BERA. However, the new 95% UCL is still well below the ESV of 61 mg/kg (see Table 6-19 in the BERA [Shaw, 2007]). As noted in the BERA, copper is a bioaccumulative chemical, and as such, is automatically evaluated for potential food chain effects even if the screening concentration is below the ESV. Ecological effects quotients (EEQ), calculated by dividing receptor-specific intake doses by no-effect toxicity reference values (TRV), were used in the BERA to characterize potential food chain hazards. EEQs greater than 1.0 indicate that a potential for ecological risk exists, while EEQs below 1.0 indicate that the risk from food chain effects is negligible. Using the original 95% UCL for copper resulted in a maximum EEQ in the Waste Sub-Area among all terrestrial receptors of 0.115 for the Short-tailed Shrew (see Table 7-32 in the BERA). Using the new 95% UCL for copper resulted in an EEQ of 0.144 for the shrew. Because the revised EEQ is still well below the target threshold value of 1.0, no adverse impacts associated with food chain effects are expected for copper.<br><br>In summary, the inclusion of elevated concentrations of copper in the Pistol Range resulted in an increase in the 95% UCL for the Waste Sub-Area, but the 95% UCL was still well below the conservative ESV and did not affect conclusions from the food chain model. Therefore, the inclusion of the former Pistol Range copper data in the BERA dataset does not affect the BERA conclusions, and copper is not a chemical of concern for the Waste Sub-Area.” | |
| 49 | 2-10 | Table 2-1 | Sample date for sample FR-7 is not consistent with sample date on COC or laboratory report. | C | The date matches that presented in first page of **Appendix B**. However, the date on the chain-of-custody form is more likely to be accurate. Therefore, the sample date will be changed to November | |

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| | | | | | 20, 1995, in the table and footnote #1. | |
| 50 | 2-10 | Table 2-1 | Footnote 2 has no basis. This statement was only noted in the cover letter and was not specifically directed to sample FR-7 only. Lead fragments could also be contained in other samples also. The statement was not noted in either the laboratory report or the COC either. | D | The cover letter was prepared by the person identified as the sampler in the lab reports. The table defers to his description in the letter. The letter categorizes the samples in two ways:<br>1) "Samples twelve inches depth into the clay embankment or beneath the fragments" – These had results of ND up to 0.46 mg/L.<br>2) "Samples of clay mixed with the spent lead fragments" – These had results up to 1100 mg/L.<br>The footnote is applied to both FR-2 and FR-7 because these have results exceeding 0.46 mg/L and they are surface samples (and thus not 12 inches deep). | |
| 51 | 2-11 | Table 2-2 | Table contains five questionable nickel results not found on field sheets (see comments for Appendix C). | | Table 2-2 and the text in Section 2.6.2 will be revised in coordination with the changes discussed in the response to Comment #95. | |
| 52 | 2-11 | Table 2-2 | In the first mention of this table, it might be helpful in data assessment to point out that the laboratory method has a much greater sensitivity (e.g., lower detection limit) than the XRF screening method and only values well above the laboratory method's quantitation limit can be directly compared. Example: nickel on N25, E75 Low (6-12). | C | In Section 2.6.2 on Page 2-6, the following text will be inserted at the end of the next to last paragraph of the section:<br>"The laboratory results typically have a lower detection limit than the XRF method. It is also important to note that the laboratory analyses for lead generally presented higher results than the XRF. A comparison of lead results by XRF and laboratory analysis is presented in **Figure 2-7**."<br>Figure 2-7 is a new figure and is attached at the end of these comments/responses. | |
| 53 | 2-14 | Table 2-3 | The acronym "SPLP" does not appear to be mentioned in the text although it appears here. Some brief discussion of its importance or interpretation of the data would be appropriate. | C | The SPLP data were provided in Table 2-3 to ensure that all results are presented. The results provide little additional information on the potential characterization of the waste soil and therefore were not discussed in the text. However, the following note will be added to the bottom of Table 2-3 to define the test:<br>"Note: Both TCLP and SPLP are laboratory leaching tests that | |

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
|---|---|---|---|---|---|---|
| | | | | | can be used to determine if a waste should be considered hazardous. The major difference between the tests is the leaching media. TCLP uses acetic acid to simulate municipal waste landfill leachate, while SPLP uses a mixture of sulfuric acid and nitric acid to simulate acid rain. TCLP is considered more conservative and the TCLP results have been utilized within this EE/CA." | |
| 54 | 3-1 | 3.1 | Acronym USEPA and CERCLA not defined. | C | Please see response to Comment #15. | |
| 55 | 3-5 | 3.2.3 | NEPA needs to be added as location-specific ARARs. | D | NEPA defines a policy under which other requirements may be identified for federal activities. At a remediation site, CERCLA itself drives the identification of the requirements (ARARs), and, in that sense, is functionally equivalent to NEPA at such sites. Section 3.2.3 considers requirements (e.g., Protection of Threatened and Endangered Species) that would also have been identified under a NEPA assessment. | |
| 56 | 4-1 | 4.1 | Consider Containment (Capping) and Hot Spot Removal or a combination of the two as 4th and 5th options. | E | Please see response to Comment #3. | |
| 57 | 4-1 | 4.2 | 2nd paragraph, 2nd sentence refers to "This area" referencing Figure 4-1—could not determine from the figure which 2500-ft2 area it was referencing. | C | The following will be added to the end of that sentence: "as the region bounded by the 1000 mg/kg concentration contour." Also, please see the response to Comment #71. | |
| 58 | 4-1 | 4.4 | 2nd sentence, add the word "and" after screenings to make it more readable. | C | The text will be revised as requested. | |
| 59 | 4-3 | 4.5.2 | There is no Section 4.3.2.2. as referenced in this section. | C | The words "as described in Section 4.3.2.2" will be deleted. | |
| 60 | 4-4 | 4.5.3 | Reporting and Work Plans – A sampling plan will also be required. | C | "sampling and analysis plan" will be added to the first sentence under the heading. | |
| 61 | 4-4 | 4.5.3 | Acronyms LUC and BRAC are not defined. | C | Please see response to Comment #15. | |
| 62 | 4-4 | 4.5.3 | Site grading should ensure that the site is no longer suitable for | E | The berm is a natural slope that cannot be destroyed and cannot | |

00071210



| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
|---|---|---|---|---|---|---|
| | | | continued unauthorized use as a firing range by members of the general public. The target berm should be completely destroyed if allowed by the natural topography. | | reasonably be altered sufficiently to discourage unauthorized use. | |
| 63 | 4-5 | 4.5.3 | In the last paragraph on this page, it refers to collection of a composite sample. Is there a need to explain how the composite sample will be collected from the 100 tons of excavated material? | E | For an EE/CA, that level of detail is not appropriate. The compositing method will be described in the Removal Action Work Plan. | |
| 64 | 4-6 | 4.5.3 | Ensure that the treatment permit allows disposal of waste decontamination liquids from other sites at the groundwater treatment plant at LHAAP-18/24. | C | The treatment plant does not have a permit. However, disposal of decontamination liquids from other sites has been allowed in the past and is a reasonable assumption for work at the former Pistol Range. | |
| 65 | 4-6 | 4.5.3 | Is the onsite groundwater treatment plant permitted to accept potentially lead-contaminated decontamination water generated from this activity? | E | The treatment plant does not have a permit. The treatment train at the plant was designed for metals removal, and lead is one of the metals specifically identified in the discharge limits in the Interim Record of Decision that established the plant. | |
| 66 | 4-6 | 4.5.3 | At the top of the page, it refers to the decontamination liquids being disposed of at the facility treatment plant. Will this decontamination liquid need to be analyzed for lead to determine if it is hazardous before disposal? | C | The 2nd sentence on page 4-6 will be revised as follows:<br>"Decontamination liquids would be stored in a portable tank for subsequent disposal. Following waste characterization analysis, the liquid would be disposed at an off-site hazardous waste facility if found to be hazardous, or at the groundwater treatment plant at LHAAP-18/24 if determined to be non-hazardous." | |
| 67 | 4-7 | 4.6.1 | Acronym TAC is not defined. | C | Please see response to Comment #15. | |
| 68 | 4-7 | 4.6.2 | Delete second paragraph discussing RCRA treatment standards. | C | Paragraph will be deleted. | |
| 69 | 4-8 | 4.6.2 | Two typographical errors… Next to last sentence in section, the word "been" at the end of the line appears to have a line feed after the second "e". Last sentence UEPA needs to be changed to USEPA or defined if it does not refer to EPA. | C | Both errors will be corrected as noted. | |
| 70 | 4-8 | 4.6.2 | Acronym TSD is not defined. Also in the last sentence of this paragraph, the "S" was left out of the USEPA acronym. | C | Please see response to Comment #15. | |

**Comments on Draft Final EE/CA, LHAAP Former Pistol Range (published July 2008)**
**Site Closure of Multiple Sites (T.O. DS02, W912QR-04-D-2006)**
**Longhorn Army Ammunition Plant, Karnack, Texas**

00071211

**Reviewers:** TCEQ and USEPA
**Respondent:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
|---|---|---|---|---|---|---|
| 71 | 4-10 | Figure 4-1 | What is the meaning of LOD? And is the outer contour line for 100 drawn correctly? Pre-designated limits of excavation are not clearly noted in Figure 4-1. Is the removal area the Lead Concentration Contour within 1000 line? | C | LOD means level of detection. A note to this effect will be added to the figure.<br>The eastern segment of the 100 contour between N75,E25 and N25,E75) will be revised.<br>Notes will be added to the figure to indicate that (1) the lead concentrations are in milligrams per kilogram and (2) the 1000 contour is equivalent to the boundary of the anticipated area of removal. | |
| 72 | 5-2 | 5.2.1 | Acronym COC is not defined. | C | Please see response to Comment #15. | |
| 73 | 6-1 | 6.0 | Would replace 4th bullet on this page to read as follows: "If excavated, soil exceeding the SAI-Ind will also likely be a RCRA hazardous waste due to lead concentration." | C | Text will be revised as suggested. | |
| 74 | 8-1 | 8.0 | Does the acronym TNRCC need to be defined? | C | Please see response to Comment #15. | |
| 75 | 8-1 | 8.0 | Does the acronym OSWER need to be defined? | C | Please see response to Comment #15. | |
| **APPENDIX A: BORING LOG AND WELL CONSTRUCTION DIAGRAM** | | | | | | |
| 76 | 1 | | Sections 12, 13, 15, 16, and "QC" portion of 17 have been left blank. | C | Blank boxes depict data not available or data not applicable. The QC box will be initialed, and an "NA" will be added to other boxes. | |
| 77 | 1 | | "Sample" column (f) contains no information. | C | Sampling intervals will be added. | |
| 78 | 1 | | Names on page printed; that is, there are no signatures. | C | Noted. Signatures are not needed. | |
| 79 | 2 | | Section titled "Elevation Top of Hole" left blank. | C | "NA" was added to indicate not available. | |
| 80 | 2 | | Under column titled "Classification of Materials" handwritten note states "same as above". Not sure what the note refers to on page 1 since there are four different material descriptions listed. | C | The "same as above" notation refers to the description immediately above, including any qualifiers. | |
| 81 | 2 | | "Box or Sample No." column (f) left blank. | C | Please see response to Comment #77. | |
| 82 | 2 | | "Remarks" column (g) left blank. | C | Sample collection intervals will be added. | |

**Reviewers:** TCEQ and USEPA
**Respondent:** Shaw Environmental, Inc.

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2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
|---|---|---|---|---|---|---|
| 83 | 2 | | At bottom of page, "Project" and "Hole No." sections left blank. | C | Identifying data are found at the top of each page and will be added at the bottom of each page. | |
| 84 | 2 | | No signature and date on page. | C | Please see response to Comment #78, and see first page of log for date. | |
| 85 | 3 | | Section titled "Elevation Top of Hole" left blank. | C | "NA" will be added to box. Survey data were not available when well was drilled. | |
| 86 | 3 | | "Box or Sample No." column left blank. | C | Please see response to Comment #77. | |
| 87 | 3 | | At bottom of page, "Project" and "Hole No." sections left blank. | C | Please see response to Comment #83. | |
| 88 | 3 | | No signature and date on page. | C | Please see response to Comments #78 and #84. | |
| 89 | 4 | | "Discrepancies" section left blank. | C | "None" will be inserted. | |
| 90 | 4 | | Names on page printed—there are no signatures. | C | Please see response to Comment #78. | |
| **APPENDIX B: 1995 TCLP ANALYSES** | | | | | | |
| 91 | Appendix B | General | Most likely these samples were analyzed by EPA Method 6010A which may or may not have required a Laboratory Control Sample (LCS). These analyses do not have an LCS included. | - - - | Noted. | |
| 92 | Appendix B | QA sections | None of the Spike samples (Quality Assurance sections of the reports) list data in the "Results" column although they do show recoveries in the "Percent" column. | - - - | Noted. | |
| **APPENDIX C: 2006 SOIL RESULTS** | | | | | | |
| 93 | Appendix C3-2 | 3.3 | All of the RPD calculations listed in Table 5 are incorrect and are low by a factor of two. The 2nd paragraph states that the RPD for lead (comparing the XRF data and corresponding laboratory data) was less than 35 percent and that the variance between the XRF and laboratory results is not significant. Are these conclusions invalid? | C | The table will be revised. The last six sentences of the last paragraph in Section 3.3 will be replaced with the following:<br>"The RPDs calculated for lead are up to 70 percent and indicate that the XRF results for lead appear to be biased low in comparison to laboratory analytical results. Calculated RPDs for arsenic, copper, chromium, nickel, and zinc are frequently higher, as shown in **Table 5**. Several of these | |

**Reviewers:** TCEQ and USEPA
**Respondent:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D1, E or X | Response | A or D2 |
|---|---|---|---|---|---|---|
| | | | | | RPDs are indicative of very low laboratory analytical results and high XRF detection limits."<br><br>Please see the responses to Comments #1 and #52 for related information on XRF lead results. | |
| 94 | Appendix C4-1 | 4.2 | The 2nd paragraph states that zinc was the only metal detected by XRF at the surface (0-6") at location 0,W25, but Table 1 and the field sheet both show lead (18.1 ppm) and copper (58.8 ppm) at that location. This is also stated in the 5th paragraph of Section 3.1. | C | Section 4.2, paragraph two, the second sentence will be changed to read, "Zinc was detected in 60 of 88 samples and was the only metal detected by the XRF at the surface (0 to 6 inches) at location S75.0 (0-6")." The second sentence of the 5th paragraph of Section 3.1 will be changed to, "…at location S75, 0 (0-6")." | |
| 95 | App. C 4-1 | 4.2 | The 2nd paragraph states that nickel was detected in 14 of the pistol range samples, but Table 1 lists XRF nickel results for 18 samples, while the field sheets and Figure 2 show nickel results for only 13 samples. The five samples from Table 1 with nickel results not listed on the field sheets are:<br><br>N50,E25 (18-24") N25, E50 (6-12") 0,E75 (0-6")<br>0,E75 (6-12") E25,E75-Up (12-18") | C | The result from N50,E25 (18-24") will be deleted from Table 1. Values for N25,E50 (6-12"); 0, E75 (0-6"); 0,E75 (6-12"); and N25,E75 UP (12-18") [shown in comment as E25,E75-UP (12-18")] were revised to reflect less than detected quantities by adding the symbol "<" to the result on Table 1. The second paragraph of Section 4.2 will be revised to read, "Nickel was detected in 13 of 88 samples." | |
| 96 | App. C | App A | The field sheet for sample S50,0 (0-6") lists a chromium value of 169 which is not mentioned in this appendix. | C | The XRF was not calibrated to a chromium standard during the Pistol Range field screening; therefore, chromium results are not discussed. | |
| 97 | App. C | App. A | On the field sheet for sample N25,E50 (0-6") the zinc data appear to conflict with the data listed in Table 1. The table value is 40 ppm, but the field sheet appears to list the value as 212.40 | E | The notation is smudged on the field sheet, and the first entry was marked through. However, the value was transcribed by the field analyst as 40, which is the correct value. | |
| 98 | App. C | App. A | The field XRF sheets for work done at Building 407 are not included in this appendix therefore no comparison could be done with the data in Table 3. | C | The field sheets will be included. | |
| 99 | App. C | App B Pistol Range data review | On the second page of the review, the signature and date lines are not completed. | C | The signed and dated sheet will be inserted. | |
| 100 | App. C | App B | The field-to-lab COC sheets are not included with the data. | C | The COCs have been attached. | |

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
|---|---|---|---|---|---|---|
| | | Pistol Range data review | Table 1-1 has a typo on the second row of data. Sample ID is listed as PR-SS-N590-0-6, but should be PR-SS-N500-0-6. | C | The typo will be corrected. | |
| 101 | App. C | App B Pistol Range data review | On the third row of data in Table 1-1, the sample ID is listed as PR-SS-N75E75-Low-6-12, but a review of the field sheets does not list N75,E75-Low (6-12) as a sample, but does list N25,E75-Low (6-12) as a sample. At some point the sample ID was entered incorrectly. On page 15 of the Laboratory Report, it appears that a handwritten change was attempted on the errant client ID number for the last two analyses on the page. An attempt was made to change the first 7 in the ID to a 2. | C | N25,E75 Low (6-12") was entered incorrectly on the COC, which reflected the incorrect number on the laboratory result. Confirmation of the sample was made based on date and time sample was collected which is identical to the COC and field sheet entries. | |
| | | | Section 2.2 states that the matrix spike and matrix spike duplicate were outside quality control limits for copper, lead, nickel, zinc, and antimony, but that the soil used for the spikes was a non-project sample. Section 2.4 states that no QC replicate sample was submitted. | C | The actual QC criterion is based on the LCS, and its results are within control limits. Since no field duplicate sample was submitted, the lab chose to use a non-project sample. | |
| 102 | App. C | App B Bldg 407 data review | On the second page of the review, the signature and date lines are not completed. | C | The signed report has been inserted. | |
| 103 | App. C | App B Bldg 407 data review | The field-to-lab COC sheets are not included with the data. | C | The COC sheet has been attached. | |
| | | | Section 2.2 states that the matrix spike and matrix spike duplicate recoveries exceeded the upper control, but that the soil used for the spikes was a non-project sample. Section 2.4 states that no QC replicate sample was submitted. | C | The actual QC criterion is based on the LCS, and its results are within control limits. Since no field duplicate sample was submitted, the lab chose to use a non-project sample. | |
| **APPENDIX E: SOIL-TO-GROUNDWATER TRANSPORT MODELING** | | | | | | |
| 104 | E-1 | "Model Selection" | For clarity, add that K(sub)H , the Henry's law constant for lead, is set to zero. | C | After introduction of $K_H$, the following sentence will be added: "For lead, the primary contaminant at the former Pistol Range, | |

00071215

**Reviewers:** TCEQ and USEPA
**Respondent:** Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

| Comment # | Page | Section/ Paragraph | Comment | C, D[1], E or X | Response | A or D[2] |
|---|---|---|---|---|---|---|
| | | | | | the Henry's Law Constant is set to zero." | |
| **APPENDIX F: COST ESTIMATES** | | | | | | |
| 105 | App. F | Throughout | Not detailed, but generally speaking, it looks reasonable for such costs. However, the 5 - 30 year CERCLA review is costed, but no details are given as to what this includes. | - - - | Noted. The CERCLA review cost is a lump sum amount that is being used for the LHAAP cost analyses to ensure consistency and comparability. It is a conservative figure based on costs that the Army has encountered. | |
| 106 | 2 | | Page with heading "Alternative 2, Present Value": O&M cost ($201,262) in far right column is not given in the following detailed cost estimate pages, so do not know how this value was determined. But value is used in Draft Final Table ES-1 and p. 5-3 for O&M cost. Also LTM cost ($440,972) in middle column is not included in Draft Final Table ES-1and p. 5-3 – should this be included in O&M costs? | E | The costs on Table ES-1 and page 5-3 are present value amounts. However, costs in the detail tables are typically current year dollars. Amounts specifically identified as present value (e.g., the $201,262) utilize formulas within the Excel spreadsheet to convert current year dollars to present value. Therefore, the present value costs (e.g., $201,262) are presented in the main text, while current year costs (e.g., $440,972) are only used to support the ultimate calculation of the present value costs. | |
| 107 | 8 | | Page with heading "Alternative 3, Present Value": O&M cost ($98,184) in far right column is not given in the following detailed cost estimate pages, so do not know how this value was determined, but value is used in Draft Final Table ES-1 and p. 5-4 for O&M cost. Also LTM cost ($255,150) in middle column is not included in Draft Final Table ES-1 and p. 5-4; should this be included in O&M costs? | E | See response to previous comment. | |

**Table 4-1**
**Technology Screening for the Former Pistol Range**

| Category | Description | Retained | Reasoning |
|---|---|---|---|
| No Action | No Action provides a baseline for comparison. | Yes | No Action does not prevent exposure to contaminated soil. Retained to serve as a baseline for comparison. |
| Land Use Controls | Application of access controls such as land use restrictions, deed notices, and fencing or signs to protect human health through management of potential risk. Also may include physical surveillance to ensure integrity of the fencing/signage to verify compliance with RAO. | Yes | Land Use Controls can be effective in reducing potential exposure to contaminated soil. |
| Capping | Addition of an engineered cover system over the area of contaminated soil to prevent contact, minimize infiltration, and prevent erosion. Capping would be supported by land use controls and perpetual maintenance. | No | Capping can be effective in reducing potential exposure to contaminated soil. However, infiltration and erosion have not proved to be environmental issues at the Former Pistol Range. Thus capping would offer little more protectiveness than land use controls alone, while requiring LUCs (both physical and administrative) to be implemented. |
| Removal | Physical removal of contaminated materials utilizing conventional earth moving equipment. The primary removal technology is excavation. | Yes | Excavation would be effective for removal of lead contaminated soil and can easily be implemented with commercially available equipment. |
| Treatment | Stabilization, physical treatment, and biological treatment to meet waste acceptance criteria of the designated disposal facility. Process options include reagent-based stabilization, soil-washing, screening of bullet fragments/debris, and phytoremediation. | No | Due to small volume, any treatment would be performed in conjunction with disposal and does not need to be evaluated separately. Screening not likely to be effective due to limited bullet fragments/debris observed at site. |
| Disposal | Off-site disposal of excavated soil at either a RCRA Subtitle C landfill facility if the soil is classified as hazardous or a RCRA Subtitle D permitted disposal facility if the soil is non-hazardous. | Yes | RCRA Subtitle C permitted disposal facility retained since excavated soil is likely to be classified as hazardous. |

*Abbreviations:*

*GRA General Response Action*
*RAO removal action objective*
*RCRA Resource Conservation and Recovery Act*

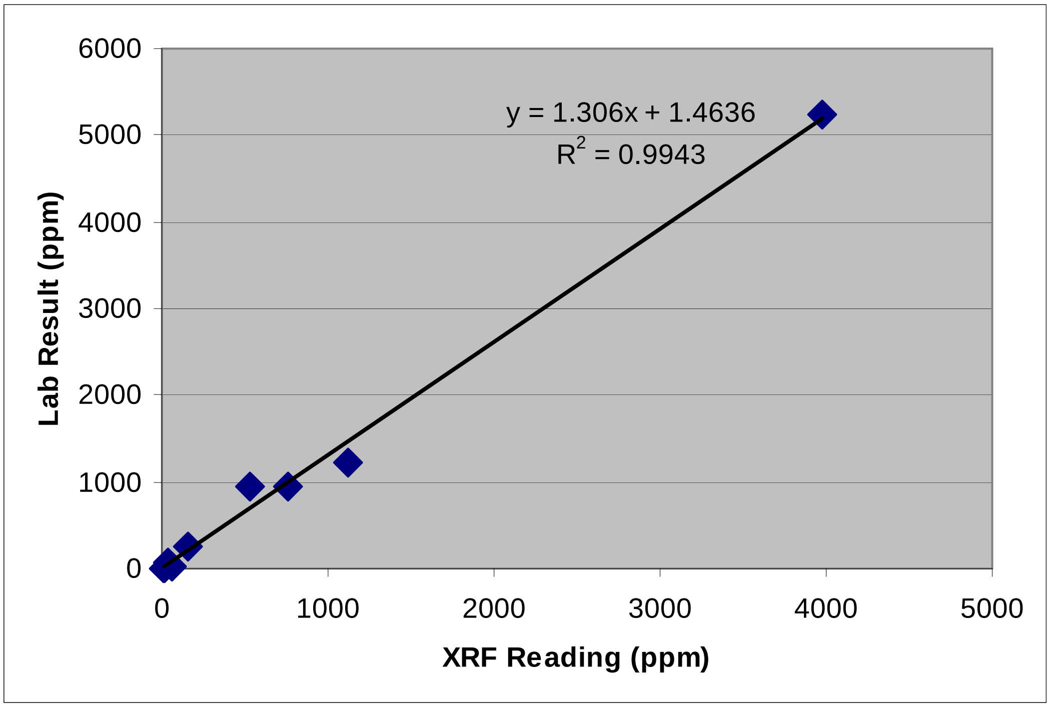


**Figure 2-7**
**Relationship between Laboratory Analytical Results and XRF Readings for Lead**

00071218

*FINAL*
# ENGINEERING EVALUATION/COST ANALYSIS FORMER PISTOL RANGE LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS

**Prepared for**

**U.S. Army Corps of Engineers**
**Tulsa District**
**1645 South 101st Avenue**
**Tulsa, Oklahoma**

**Prepared by**

**Shaw Environmental, Inc.**
**3010 Briarpark, Suite 400**
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**MARC No. W912QR-04-D-0027, Shaw Project No. 117591**
**Task Order No. DS02**

**February 2009**

00071219

# Table of Contents

## Table of Contents (continued)

## List of Tables



## List of Figures



## List of Appendices

# Acronyms and Abbreviations

| | |
|---|---|
| °F | degrees Fahrenheit |
| µg/L | micrograms per liter |
| A/I | active/inactive |
| ARAR | applicable or relevant and appropriate requirements |
| BERA | Baseline Ecological Risk Assessment |
| bgs | below ground surface |
| BRAC | Base Realignment and Closure |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| CES | Complete Environmental Services |
| CFR | Code of Federal Regulations |
| COC | chemical of concern |
| EcoPRG | ecological preliminary remediation goal |
| EE/CA | Engineering Evaluation/Cost Analysis |
| EEQ | ecological effects quotient |
| ESVs | ecological screening values |
| FFA | Federal Facility Agreement |
| FR | Federal Register |
| ft | feet |
| GRAs | general response actions |
| GW-Ind | Groundwater Medium-Specific Concentration for Industrial Use |
| GWP-Ind | Soil Medium-Specific Concentration for Industrial Use Based on Groundwater Protection |
| HUD | U.S. Department of Housing of Urban Development |
| ITRC | Interstate Technology and Regulatory Council |
| Jacobs | Jacobs Engineering Group, Inc. |
| LHAAP | Longhorn Army Ammunition Plant |
| LUC | land use controls |
| MARC | Multiple Award Remediation Contract |
| mg/kg | miligram per kilograms |
| mg/L | milligrams per liter |
| MSC | medium-specific concentration |
| msl | above mean sea level |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| ND | non-detect |
| NTU | nephelometric turbidity units |

| | |
|---|---|
| O&M | operation and maintenance |
| OSWER | Office of Solid Waste and Emergency Response |
| ppm | parts per million |
| RAOs | removal action objectives |
| RCRA | Resource Conservation and Recovery Act |
| SAI-Ind | Texas Soil Medium-Specific Concentration for Industrial Use Based on Inhalation, Ingestion, and Direct Contact |
| Shaw | Shaw Environmental, Inc. |
| SSL | soil screening level |
| TAC | Texas Administrative Code |
| TBC | to-be-considered |
| TCEQ | Texas Commission on Environmental Quality |
| TCLP | toxicity characterisitc leaching procedure |
| TNRCC | Texas Natural Resources Conservation Commission |
| TNT | 2,4,6-trinitrotoluene |
| TRV | toxicity reference value |
| UPL | upper prediction limit |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |
| XRF | x-ray fluorescence |

# Executive Summary

This Engineering Evaluation/Cost Analysis (EE/CA) was prepared by Shaw Environmental, Inc. for the U.S. Army Corps of Engineers (USACE), Tulsa District, under Contract W912QR-04-D-0027, Task Order DS02, and presents an analysis of removal action alternatives for the former Pistol Range at the former Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. A removal action is appropriate at the former Pistol Range based on the concentrations of lead in the surface and near-surface soil. The lead concentrations are sufficiently high to constitute a threat to public health that should be addressed under §300.415(b)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). §300.415(b)(2)(i) refers to "Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants." A planning period of at least six months exists prior to the need to initiate on-site action. Therefore, this action will be implemented as a non-time critical removal action, and the NCP requires that an EE/CA be conducted (§300.415(b)(4)). This EE/CA has been prepared to present the existing data for the site, verify the need for a removal action, evaluate possible actions, and recommend a path forward. Based on this EE/CA, the recommended removal action alternative at the former Pistol Range comprises the following:

- Excavate soil contaminated with lead (exceeding industrial use levels) and dispose that soil off site at an approved landfill.
- Implement land use controls since the property is being remediated to industrial use levels and would not be suitable for unrestricted use.

This removal action is consistent with the intended future use of the LHAAP as a wildlife refuge and will be a final action for the former Pistol Range.

LHAAP is an inactive, government-owned, formerly contractor-operated and maintained, Department of Defense facility located in central-east Texas. LHAAP was established in 1942 to produce 2,4,6-trinitrotoluene (TNT) for use in World War II. Production of TNT was discontinued in 1945, but the facility was later used for production of pyrotechnic ammunition, rocket motor production, and static firing and elimination of rocket motors. The plant was deactivated and declared excess to the Army's needs in 1997. In December 1991, the State of Texas, USEPA, and the Department of Defense – U.S. Army Longhorn Army Ammunition Plant, entered into a Federal Facility Agreement (FFA) to address the contamination at LHAAP. Proposed actions are carried out under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (as implemented through the NCP) with the U.S. Army as the lead agency, in conformity with the FFA. The entire installation was under the control of the U.S. Army until May 5, 2004, when approximately two-thirds of the property was transferred to the U.S. Fish and Wildlife Service (USFWS). The property transfer process is continuing as responses are completed at smaller parcels of land. The U.S. Army Environmental Center provides the funding for the environmental restoration program at LHAAP while the Base Realignment and Closure Office is responsible for implementation. The installation's groundwater, surface water, sediment, and soil have been contaminated by past operations. The former Pistol Range encompasses approximately 0.4 acres. The Pistol Range was used intermittently for small arms qualifying tests by security personnel until 2004.

The soil at the former Pistol Range was found to have concentrations of lead that exceed the Texas Soil Medium-Specific Concentration for Industrial Use Based on Inhalation, Ingestion, and Direct Contact (SAI-Ind). Results as high as 5,240 milligrams per kilogram (mg/kg) were found at sample locations at and near the target embankment at the eastern end of the pistol range. The SAI-Ind value for lead is 1,000 mg/kg.

The potential chemicals of concern (COCs) at the former Pistol Range are metals associated with small arms use. Work at other small arms firing ranges has shown that the most prevalent and widespread contaminant is lead. The investigations at the former Pistol Range have sometimes included other metals commonly associated with firing ranges (e.g., arsenic, copper, nickel, zinc), but the investigations have focused on lead as the COC that would drive cleanup at the site.

The reasonably anticipated future use of the site is as a wildlife refuge. The applicable receptor scenario for future use as a wildlife refuge is the future maintenance worker. The removal action objective (RAO) for the former Pistol Range, consistent with future use as a wildlife refuge, can be described as follows:

- Minimize the potential for human contact with soil containing lead at concentrations that could adversely affect future maintenance workers

This objective was used as the basis for formulating removal action alternatives.

The EE/CA identifies and screens removal action technologies that might be appropriate for satisfying the RAOs for the Pistol Range. After screening, the following remedial alternatives were developed from the various technologies:

- **Alternative 1 – No Action.** Leaves contaminated soil in place with no measures to prevent exposure. Serves as a baseline for comparison of other alternatives.

- **Alternative 2 – Land Use Controls**. Implements land use controls to prevent human exposure to contaminated soil. For the future maintenance worker, exposure should be limited to levels below the SAI-Ind.

- **Alternative 3 – Excavation and Off-site Disposal with Land Use Controls**. Remove soil contaminated above SAI-Ind to ensure that unacceptable exposures would not occur. Land use controls would be implemented to prevent human exposure to remaining soil that may contain lead at levels that exceed limits for unrestricted use of the property.

The alternatives were evaluated based on effectiveness, implementability, and cost. A comparison of those factors is presented in **Table ES-1**.

Alternative 3 was selected as the recommended alternative for the former Pistol Range. Based on the detailed analysis of these removal action alternatives, Alternative 3 most appropriately addresses the soil contamination at the former Pistol Range in a manner that is cost-effective and consistent with future use of LHAAP as a wildlife refuge.

**Table ES-1**
**Comparative Analysis of Alternatives**

| Comparative Analysis of Alternatives Criteria | Alternative 1<br>No Action | Alternative 2<br>Land Use Controls | Alternative 3<br>Excavation and Off-site Disposal with Land Use Controls |
|---|---|---|---|
| Effectiveness | No protection. Does not achieve RAO. No compliance with chemical-specific ARARs. No short-term impacts. | Achieves RAO, but is not fully compatible with future use as a wildlife refuge. Protection of human health provided by maintenance of land use controls. Complies with location- and action-specific ARARs. Minimal impacts to the community or workers from short-term activities. | Achieves RAO. Protection of human health provided by removal of soil contamination above the SAI-Ind level. Complies with chemical-specific ARARs for soil. Complies with location- and action-specific ARARs. Short-term impact to community from waste transportation and risks to workers from excavation and waste handling. |
| Implementability | Criterion does not apply because no removal action would be taken. | Technically and administratively implementable. Routine inspection and maintenance of land use controls required. | Technically and administratively implementable. Construction methods for soil removal and disposal are conventionally used. Equipment readily available. |
| Cost (Net Present Value)*<br>• Capital<br>• O&M<br>• Total | <br>$0<br>$0<br>$0 | <br>$84,000<br>$201,000<br>$285,000 | <br>$283,000<br>$98,000<br>$381,000 |

<u>*Notes and Abbreviations*</u>:

* *Costs have been rounded to the nearest $1,000.*

*ARAR applicable or relevant and appropriate requirement*
*O&M operation and maintenance*
*RAO removal action objective*

# 1.0 Introduction

The U.S. Army Corps of Engineers (USACE) contracted Shaw Environmental, Inc. (Shaw), under Multiple Award Remediation Contract (MARC) Number W912QR-04-D-0027, Task Order DS02, to perform remediation activities associated with Site Closure of Multiple Sites at the former Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas. As one of the activities associated with that task order, Shaw has prepared an Engineering Evaluation/Cost Analysis (EE/CA) for the former Pistol Range at LHAAP.

## 1.1 Purpose of EE/CA

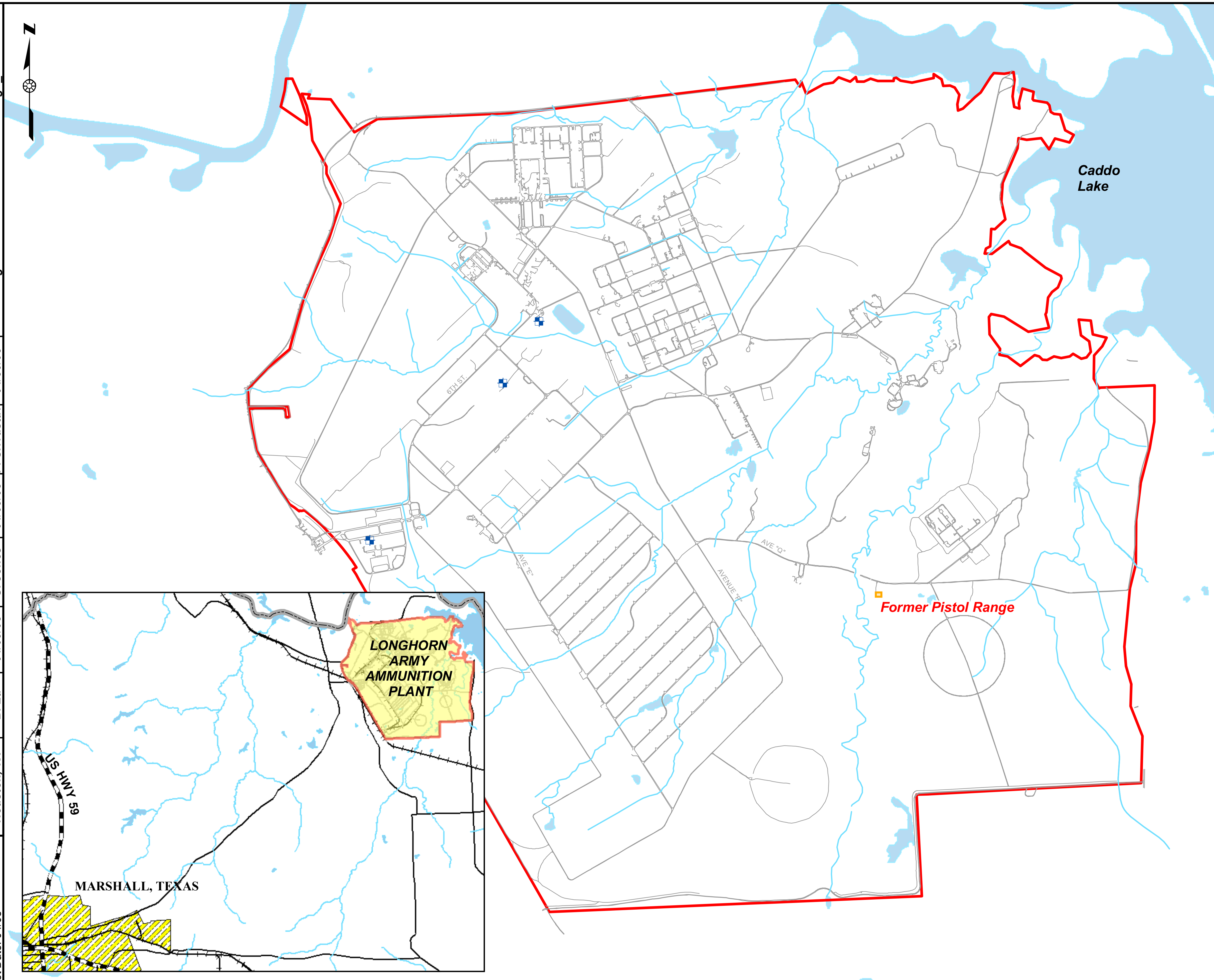
A removal action is being considered at the former Pistol Range because of the presence of high concentrations of lead in the surface and near-surface soil at the site. A planning period of at least six months exists prior to the need to initiate on-site action. In that circumstance, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires that an EE/CA be conducted (§300.415(b)(4)). The purpose of this EE/CA is to present the existing data for the site, verify the need for a removal action, evaluate possible actions, and recommend a path forward. In doing so, this EE/CA identifies removal action objectives for the former Pistol Range and analyzes various alternatives that may be used to satisfy those objectives. The alternatives are evaluated for effectiveness, implementability, and cost.

## 1.2 Site Background

LHAAP is located in central-east Texas in the northeastern corner of Harrison County, approximately 14 miles northeast of Marshall, Texas (**Figure 1-1**). The facility occupies approximately 8,416 acres between State Highway 43 in Karnack, Texas, and the western shore of Caddo Lake. Caddo Lake is a large freshwater lake that bounds LHAAP to the north and east. The eastern fence of LHAAP is 3.5 miles from the Texas-Louisiana state border.

The former Pistol Range is located in the southeastern portion of LHAAP. The approximately 0.4 acre site lies within a rectangular clearing at the end of Robert Avenue, south of Avenue Q. The area was used as a small arms firing range by base security personnel from the 1950s until 2004.

00071229




**LEGEND**

- Water Supply Well
- Stream
- Road
- Site
- Lake
- LHAAP Boundary

0 1,250 2,500 5,000
Feet

| OFFICE | DRAWN BY | CHECKED BY | APPROVED BY | FILE PATH |
| --- | --- | --- | --- | --- |
| Houston, TX | B. Lu 04/09/08 | G. Jones 04/09/08 | P. Srivastav 04/30/08 | T:\GIS\Longhorn\MXD\PR\EECA\PistolRange_SiteLoc.mxd |

Plot Date: 04/08

Shaw®

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1-1

SITE LOCATION MAP
FORMER PISTOL RANGE

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

# 2.0 Site Characterization

## 2.1 Site Description

The former Pistol Range is located in the southeastern portion of LHAAP at the end of Robert Avenue, approximately 280 feet south of Avenue Q (**Figure 2-1**). The site is the eastern portion of a rectangular field that covers approximately 0.4 acres, and is approximately 110 feet north to south by 150 feet east to west. Signs that still exist at the site indicate that the firing line was located near the middle of the clearing (**Figure 2-2**). The target area was a wooded slope adjacent to the east end of the clearing.

## 2.2 Operations History

LHAAP was established in 1942 to produce TNT for use in World War II. Production of TNT was discontinued in 1945. Starting in 1952, the facility was used for production of pyrotechnic ammunition, and later for rocket motor production. In the 1990s, LHAAP was also responsible for static firing and elimination of rocket motors in compliance with the Intermediate-Range Nuclear Forces Treaty. The plant was ultimately deactivated and declared excess to the Army's needs in 1997 (U.S. Army, 2007).

The Pistol Range at LHAAP was established before 1954 and is known to have been used by LHAAP security personnel for small arms target practice and qualifying tests. The range was designated as an active/inactive (A/I) range during the Army range inventory process which culminated in the Longhorn Army Ammunition Plant Active/Inactive Range Inventory conducted in March 2001 (Army Materiel Command, 2001). The reason for the A/I classification was that the range was being used once a year by contract security for qualification/certification. The Pistol Range was used through 2003 and into 2004 for qualifying and recertification by security guards. The Pistol Range was officially closed by Army in 2005. According to the Draft Historical Records Review for Other Than Operational Ranges at LHAAP, 1 June 2004, the Pistol Range was a small arms range. The *Final Environmental Site Assessment, Phase I and II Report, Production Areas, Longhorn Army Ammunition Plant* (Plexus, 2005) provides a summary of historical aerial photographs that notes the Pistol Range is present in photographs from 1954 and 1955. In the 2001 inventory, the size was indicated as 0.15 acres, which is an area approximately equivalent to the northeastern portion of the range from the firing line to the target embankment. There is no visual evidence or historical record of the Pistol Range being used as anything other than a small arms firing range.

## 2.3 Physical Setting

LHAAP is located in an area characterized by a mild climate with an average temperature of 63.7 degrees Fahrenheit (°F). August is the warmest month with an average high temperature of

92.5°F. January is the coolest month with an average low temperature of 33.4°F. Precipitation averages approximately 52 inches per year with June being the month with greatest rainfall (National Climatic Data Center, 2002).

Most of LHAAP consists of mixed pine-hardwood forests that cover a flat to gently rolling terrain with an average slope of 3 percent or less. The topography of the Pistol Range itself is relatively flat. Based on U.S. Geological Survey topographic maps, the western end of the site is approximately 175 feet above mean sea level (msl). The site slopes gently upward to the east until reaching approximately 180 feet msl. However, the elevation increases by approximately 10 feet at the very eastern end. This natural slope constituted the target berm for the Pistol Range. The flat portion of the former Pistol Range is covered by grass while the eastern slope (the target embankment) is forested (see **Figure 2-3** and **Figure 2-4**).

Surface water at LHAAP drains to the northeast into Caddo Lake via four drainage systems known as Goose Prairie Creek, Central Creek, Harrison Bayou, and Saunders Branch. Caddo Lake is a part of the Big Cypress Bayou. The former Pistol Range is located within the flood plain of Harrison Bayou; the site lies within a designated Special Flood Hazard Area (U.S. Department of Housing and Urban Development [HUD], 1989). Surface drainage at the former Pistol Range generally drains west toward Harrison Bayou, either directly as sheet flow or via the drainage swale along the southwestern portion of the site.

### *2.4 Geology/Hydrogeology*

The Wilcox Group, a Quaternary alluvium mantling Tertiary age formation, underlies most of the LHAAP (Jacobs, 2001). The thickness of the Wilcox Group varies from 350 feet in the northwest corner of the installation to 130 feet along the east side near Caddo Lake. The formation consists of interbedded fine to medium-grained sand, silt, and clay. Underlying these sediments are Cretaceous age formations of the Navarro and Taylor Groups. The Wilcox Group constitutes the majority of the unconsolidated sediments underlying LHAAP.

The Wilcox formation is the most important hydrogeologic formation at LHAAP. The unconsolidated sediments of the Wilcox formation are interpreted as consisting of a series of three active groundwater zones separated by silty, clayey, semi-confining layers. The first groundwater zone is within the shallow sand zone of the Wilcox formation. The second groundwater zone, or intermediate groundwater zone, occurs within the intermediate sand zone. The third groundwater zone, or deep groundwater zone, is in the deep sand zone of the Wilcox formation. Due to the fluvial nature of the Quaternary sediments, the three zones are not laterally continuous for large distances, and their depth may also vary across the installation. The clayey Midway formation is considered as the base of the active groundwater flow system at LHAAP.

Monitoring well PRWW01 was drilled in the shallow groundwater zone in the eastern portion of the former Pistol Range near the toe of the target slope. The boring revealed clay to a depth 24 feet below ground surface, with the exception of a clayey sand zone from 5 to 7 feet. Beyond 24 feet, alternating layers of sand and clay, varying from 2 to 4 feet thick, were encountered until the total boring depth of 34 feet was reached. The boring log is provided in **Appendix A**.

## 2.5 Current and Future Site Usage

LHAAP is located near the unincorporated community of Karnack, Texas. Karnack is a rural community with a population of 775 people. The incorporated community of Uncertain, Texas, population 205, is a local resort area located to the northeast of LHAAP on the edge of Caddo Lake and an access point to Caddo Lake. The industries in the surrounding area consist of agriculture, timber, oil and natural gas production, and recreation. Current and future use of resource categories at the former Pistol Range are considered below.

### 2.5.1 Land

LHAAP has been an industrial facility since 1942. Significant production activities continued until the facility was determined to be in excess of the Army's needs in 1997. The plant area is now inactive and approximately two-thirds of the former plant area is now controlled by the U.S. Fish and Wildlife Service (USFWS). LHAAP is surrounded by a fence (except on the border with Caddo Lake), and current conditions preclude unlimited public access to areas within the fence. The fence now represents the refuge boundary. Approved access for hunters is very limited. The anticipated future use of the entire facility, including the former Pistol Range, is as a wildlife refuge. There is currently no plan to develop LHAAP for residential use. The former Pistol Range is located within a Special Flood Hazard Area (HUD, 1989), which further limits its use.

### 2.5.2 Groundwater

There are three water supply wells located on LHAAP (**Figure 1-1**), and they supply water to the buildings currently in use on the installation. None of these wells is used to provide drinking water. One well is located at the Fire Station/Security Office (northwest of LHAAP-67 and north of Goose Prairie Creek) and has been in use since 1997. A second is located approximately one-half mile southwest of the Fire Station/Security Office (directly south of LHAAP-58) and has been in use since 1999. The third is located immediately adjacent to the former administration building, currently used as offices for Caddo Lake Institute and the USFWS. Two additional wells previously supplied water to the installation, but these have been plugged and abandoned. The depths of the three existing wells on LHAAP are as follows:

- Well 150 feet south-southeast of fire station: 128 feet
- Well ½ mile southwest of fire station: 195 feet
- Well at USFWS facility: 220 feet

None of the water supply wells are associated with the site. Based on the anticipated future use of the facility (i.e., a wildlife refuge), the groundwater at the former Pistol Range will not be used in the future as a drinking water source. While there is no current or planned future use of the groundwater underlying this site as a drinking water source, the State of Texas views all groundwater as a potential drinking water source. Therefore, the evaluation of groundwater sampling results in **Section 2.6.3** compares the results to the TCEQ's Groundwater Medium-Specific Concentration for Industrial Use (GW-Ind) for lead; the GW-Ind value equals the federal drinking water standard.

## *2.6 Environmental Studies at the Former Pistol Range*

The following field investigations have been conducted at the former Pistol Range:

- 1995 toxicity characteristic leaching procedure (TCLP) analyses by Thiokol Corporation
- 2006 soil sampling by Shaw for site characterization
- 2007 vertical soil delineation and groundwater sampling by Shaw

Production and waste disposal activities at LHAAP resulted in contamination of soil and groundwater with chlorinated solvents, metals, and explosives constituents. However, the Pistol Range was not associated with production and waste disposal activities. Small arms firing is the only activity documented to have occurred at the site, and there is no visual evidence of other activities. Therefore, the potential chemicals of concern (COCs) at the former Pistol Range are limited to metals associated with small arms use. Work at other small arms firing ranges has shown that the most prevalent and widespread contaminant at such ranges is lead. The investigations at former Pistol Range have sometimes included other metals commonly associated with firing ranges (e.g., arsenic, copper, nickel, zinc), but the investigations listed above have focused on lead as the COC that would drive cleanup at the site.

### *2.6.1 1995 TCLP Analyses*

Thiokol Corporation collected six samples from the target embankment and nearby area in June 1995 (Thiokol, 1995). A seventh sample was collected in November 1995 (CES, 2004). The samples were subjected to the TCLP. The leachate was analyzed for lead; the results are presented in **Table 2-1**. The laboratory reports and a rough sketch of the approximate sampling locations are provided in **Appendix B**.

A letter to the Army in 2004 summarized the results as follows (CES, 2004):

> *"…the contamination from lead at the site is limited to surface contamination where the spent lead bullets are located. Samples collected from twelve inches depth into the clay embankment beneath the fragments were ND [non-detect] or*

*had concentrations up to .46 mg/L. Samples of clay mixed with the spent lead fragments had concentrations up to 1100 mg/L for lead."*

The lead concentration at which soil is considered a RCRA-defined hazardous waste is that at which it exceeds 5.0 milligrams per liter (mg/L) for lead based on toxicity characteristic. The 1995 results indicate that soil, if excavated from the target embankment, would likely be hazardous if the soil contained lead fragments.

### *2.6.2 2006 Soil Sampling*

In February 2006, Shaw collected soil samples and performed x-ray fluorescence (XRF) analyses to delineate the extent of metals contamination at the former Pistol Range. Field activities performed included screening with an XRF unit to delineate metals contamination, and collection of analytical samples for confirmation of the XRF results. The procedures, XRF field results, and analytical laboratory report are presented in **Appendix C**.

Samples were collected at each of the grid nodes shown on **Figure 2-5**, and additional sample locations were established on and around the embankment since lead concentrations were expected to be greater at these locations due to the operational use of the site. Sample locations at the embankment included two height intervals corresponding to the approximate lower and upper half of the embankment. These sample locations included N75,E25-Lower, N75,E25-Upper, N50,E50-Lower, N50,E50-Upper, N25,E75-Lower. At each of these locations in the embankment, grab samples were collected by penetrating horizontally into the embankment to depths of 0 to 6 inches, 6 to 12 inches, 12 to 18 inches, and 18 to 24 inches. Sampling locations in the vicinity of the firing line were established to check for the presence of lead residue from firearm discharge. The grid was expanded outside the site to ensure that the extent of contamination was more fully delineated. The grid was extended 135 feet to the west to include 13 additional sampling locations. The grid was also extended to include three additional sample locations in the northeast corner and one location at the southeast when results indicated elevated concentrations of lead in those areas. Three samples were collected and screened within the ditch that runs south of the Pistol Range. A total of 52 sampling locations were screened.

Surface soil samples (0 to 6 inches) were collected at each sample location. The measured surface soil lead concentration was compared to the maximum background value of 33.8 milligrams per kilogram (mg/kg) (based on the *Final Background Soil Study Report* [Shaw, 2004]), and if the concentration was less than background, no subsurface soil samples were collected. In the case of the grid nodes located near the toe of the target embankment face, eleven soil borings were advanced to a minimum depth of 18 inches below surface with one boring reaching refusal at 12 inches.

A field portable Niton 733Q spectrometer instrument was utilized to field screen soil samples to characterize the horizontal and vertical extent of lead and other metals. For field screening, soil was analyzed in situ or in a sample container in accordance with SW-846 Method 6200 (USEPA, 1997), utilizing the XRF spectrometer. To verify accuracy of the XRF spectrometer in the field, chemical standards were used to calibrate the instrument. More information on the operation of the portable XRF spectrometer can be found in **Appendix C**.

Fifty-two locations (88 samples) were screened with the XRF for lead, copper, arsenic, zinc, and nickel. These metals were selected in the Work Plan Addendum for the Pistol Range (Shaw, 2006) to address the types of contamination expected at a small arms range - lead and arsenic for bullet fragments and copper, nickel, and zinc for jackets/casings. The XRF screening results are provided in **Table 2-2**. XRF lead results are shown on **Figure 2-6**. As expected, all five metals were detected within the soil. The maximum surface (0 to 6 inches below ground surface [bgs]) XRF result for lead, 3,978 parts per million (ppm), was detected at N50,E25. This location also yielded the highest subsurface (6 to 12 inches) concentration of lead, 1,180 ppm. Elevated lead readings were also present at this location for the 12 to 18, 18 to 24, and 24 to 30 inches intervals. Copper was detected by the XRF unit in 6 of 88 samples. The maximum surface concentration of copper, 148 ppm, was detected at N50,E25 (0 to 6 inches). The maximum subsurface concentration, 104 ppm, was observed from the sample collected from N25,E75-Low (6 to 12 inches). Arsenic was detected in 2 of 88 samples. N50,0 (0 to 6 inches), which had an arsenic concentration of 102 ppm yielded the maximum reading. Zinc was detected in 60 of 88 samples. The maximum concentration, 142 ppm, was detected at S25,0 (0 to 6 inches). The sample collected from N50,E50-Low (6 to 12 inches) yielded the highest subsurface concentration of Zinc, 65.6 ppm. The maximum nickel concentration, 145 ppm, was detected at 0,E50 (6 to 12 inches). This was also the maximum subsurface concentration. The maximum surface concentration was 142 ppm at N25,0 (0 to 6 inches).

Sample locations 0,W75; S25,W50; S50,W25; and S75,0 were associated with the approximate location of the firing line, where shells, shot, and/or bullets may have been discharged. Zinc was the only metal detected by the XRF at the surface (0 to 6 inches) at locations 0,W75 and S75,0. Low concentrations of lead and zinc were detected within the surface soil at S25,W50. No metals were detected by XRF at S50,W25.

Due to the possibility of runoff from the site, XRF readings were also taken within the ditch located south of the Pistol Range. Zinc was detected at concentrations of 29.9 ppm and 36.9 ppm in the Center Ditch and the East Ditch, respectively. Lead was detected at 10.7 ppm in the West Ditch sample. Metals were below levels of detection in all other samples associated with the ditch.

To provide a quality control check for the XRF results, nine samples collected from the former Pistol Range were submitted to the laboratory for analysis. These samples were selected in the field and based on the XRF survey results. The samples selected for laboratory confirmation were N50,E25 (0 to 6 inches), N50,0 (0 to 6 inches), N25,E75-Low (6 to 12 inches), N25,E75-Low (0 to 6 inches), N25,E75-Low (12 to 18 inches), N25,0 (0 to 6 inches), N25,E25 (0 to 6 inches), N25,E75-Up (0 to 6 inches), and West Ditch (0 to 6 inches). **Table 2-2** includes the results of these laboratory analyses along with the associated XRF results. The laboratory results typically have a lower detection limit than the XRF method. It is also important to note that the laboratory analyses for lead generally presented higher results than the XRF. A comparison of lead results by XRF and laboratory analysis is presented in **Figure 2-7**.

The three laboratory samples that exhibited the highest lead concentrations were also subject to leaching procedures. These analyses were performed as an additional check (together with the 1995 TCLP Analyses) to determine if the soil would be considered a hazardous waste if it were excavated. The results are provided in **Table 2-3**. While the leachate did not exceed the limit for arsenic, it exceeded the TCLP limit for lead in all three samples that were analyzed.

### *2.6.3 2007 Vertical Delineation*

Because of the high concentrations of lead encountered in some parts of the former Pistol Range and its potential to leach and migrate to groundwater, Shaw performed additional investigation activities in 2007. The activities included the collection of vertical delineation samples in the vicinity of the highest surface soil lead concentrations and the installation of a monitoring well.

Shaw personnel returned to location N50,E25 where lead XRF results as high as 3,978 ppm were measured in the surface soil. Laboratory analysis of the surface sample from this location had a lead result of 5,240 mg/kg. In August 2007, additional soil samples were collected by hand augering to six feet below ground surface. In September 2007, an auger drill rig was mobilized to collect soil samples from deeper intervals (from boring PRSB01) and to install a monitoring well (PRWW01). Monitoring well PRWW01 was located in close proximity to N50, E25 (see **Figure 2-5**). The results of the soil samples at N50,E25 and PRWW01 are provided in **Table 2-4**. These results are combined with the earlier XRF results (**Section 2.6.2**) and tabulated in **Table 2-5**. As demonstrated by the results in **Table 2-5**, the lead concentration generally decreases rapidly with depth and is at non-detect levels by 9-10 feet bgs.

Groundwater at monitoring well PRWW01 was sampled twice. The groundwater results are presented in **Table 2-6**. The first sample was collected on September 7, 2007, and analyzed for total and dissolved metals. Despite low flow sampling, the turbidity in the sample was relatively high (approximately 185 nephelometric turbidity units [NTU]). Nonetheless, the only metal that exceeded its GW-Ind value (15 micrograms per liter [µg/L]) was total lead at 17.2 µg/L. Dissolved lead was well below the GW-Ind. Another sample was collected on September 18, 2007, and analyzed for lead. The turbidity stabilized at a 9 NTU, indicating much lower particulate content than in the earlier sampling. The associated lead results (5.41 µg/L total lead and 0.5 U µg/L dissolved lead) were both well below the GW-Ind.

The groundwater elevation was measured prior to each sampling event and found to be 168.67 feet (ft) msl on both September 7 and September 18, 2007.

## *2.7 Other Response Actions to Date*

There is no record of previous removal or remedial action at the former Pistol Range.

## *2.8 Summary of Findings*

This section discusses the source, nature, and extent of contamination at the former Pistol Range, as well as its potential impacts on human receptors. Based on future use as a wildlife refuge, this discussion compares the findings of the investigations at the Pistol Range with Texas Risk Reduction Standard 2 Medium Specific Concentrations for Industrial Use (TCEQ, 2006).

### *2.8.1 Sources*

The original source of contamination at the former Pistol Range comprises the bullets, bullet fragments, and particulates that impacted the range floor and target embankment. There is no history or physical evidence of any activity other than small arms fire at the former Pistol Range.

### *2.8.2 Soil*

To evaluate potential human health issues, the results for arsenic, copper, lead, nickel, and zinc were compared to their respective Texas Soil Medium-Specific Concentration for Industrial Use Based on Inhalation, Ingestion, and Direct Contact (SAI-Ind) values as shown in **Table 2-2**. Comparisons to the Soil Medium-Specific Concentration for Industrial Use Based on Groundwater Protection (GWP-Ind) values are also presented in **Table 2-2**, but are discussed in **Section 2.8.5**. For arsenic, copper, nickel, and zinc, no result exceeds the SAI-Ind. However, the former Pistol Range exhibits soil contamination that exceeds the SAI-Ind for total lead (1,000 mg/kg) at three locations (N50,0; N75,0; and N50, E25). While industrial cleanup levels are applicable to a depth of 2 feet bgs (TCEQ, 1998), lead contamination did not exceed the SAI-Ind in any sample deeper than 12 inches.

### *2.8.3 Sediment*

Sediment samples were collected at three locations in the ditch that runs along the southern edge of the former Pistol Range toward Harrison Bayou – the East, Center, and West Ditch samples as shown on **Figure 2-5**. All three samples were analyzed by XRF for arsenic, copper, lead, nickel, and zinc (**Table 2-2**). Two samples had detectable levels of zinc, while the remaining XRF results were non-detect. The West Ditch sample was also analyzed for lead at an off-site laboratory with a result of 10.7 mg/kg. That laboratory result for lead, the zinc XRF detections, and the various XRF detection limits were far below their associated SAI-Ind values. Therefore, sediment is not considered to be a medium of concern.

### 2.8.4 Surface Water

Because the lead contaminated soil at the former Pistol Range is near the surface, it has the potential to be eroded and transported by rainfall through surface drainage features and to nearby surface water. However, the results for sediment samples in the ditch (see above) indicate that this has not occurred to any significant extent.

Another possible transport mechanism is dissolution of lead from the surface of bullets and bullet fragments. However, lead compounds on the corroded surface of bullets are relatively insoluble in water except at very low pH. Since the former Pistol Range was not a site of waste disposal or production activities that would have altered the natural pH, dissolution is not considered a significant mechanism.

### 2.8.5 Groundwater

To evaluate potential for impact to groundwater, the results for arsenic, copper, lead, nickel, and zinc were compared to the highest of either their respective GWP-Ind or their background value (as represented by the upper prediction limit [UPL]) as shown in **Table 2-2**. For nickel and zinc, no result exceeds the GWP-Ind. For copper, results at two locations (N50, E25 and N25, E75-Low) exceeded the GWP-Ind. For arsenic, the UPL is higher than the GWP-Ind; arsenic results exceeded the UPL at two locations (N50, 0 and S25, 0). Lead exceeded the UPL at numerous locations. Based on these comparisons, arsenic, copper, and lead appeared to have the potential to migrate downward and adversely affect the local groundwater. Because of this potential, vertical migration was evaluated further.

The 2006 investigation demonstrated that lead is much more widespread at the former Pistol Range than arsenic and copper and that the lead concentrations far exceed the concentrations of other metals analyzed. This is consistent with guidance on small arms ranges, such as *Characterization and Remediation of Soils at Closed Small Arms Firing Ranges* (ITRC, 2003), which notes that "Lead accounts for more than 85% of the weight of the projectile and constitutes the greatest environmental concern." Therefore, the evaluation of vertical migration primarily focused on lead. The three means of evaluation were:

1. Modeling of vertical transport using VLEACH (see **Appendix E**)
2. Vertical profiling concentrations beneath the location with the highest lead result in soil (**Section 2.6.3**)
3. Analysis of groundwater beneath the site (**Section 2.6.3**)

The modeling, using a simulation period of 1,000 years, demonstrated that the lead at the Pistol Range will not migrate to the water table. This is confirmed by the actual results thus far in the vertical soil profile and the lead concentration in the groundwater itself. Since groundwater has not been impacted by the site and is not anticipated to be impacted within the next 1,000 years, there are no soil-to-groundwater cross-media impacts that need to be addressed at the former Pistol Range.

## *2.9 Ecological Risk*

The ecological risk for the former Pistol Range was addressed in the installation-wide Baseline Ecological Risk Assessment (BERA) (Shaw, 2007). For the BERA, the entire Installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historical use, habitat type, and spatial proximity to each other. The conclusions regarding the potential for chemicals detected at individual sites to adversely affect the environment must be made in the context of the overall conclusions of the sub-area in which the site falls. The former Pistol Range lies within the Waste Sub-Area.

The BERA concluded that there were potential ecological concerns in the Waste Sub-Area associated with barium, 2,4-DNT, 2,6-DNT, 2,4,6-TNT, and dioxin (Shaw, 2007), but not with lead or other parameters detected in the soil at the former Pistol Range. Although lead was selected as a final chemical of potential ecological concern in the Waste Sub-Area, the calculated ecological preliminary remediation goal (EcoPRG) for lead was higher than the exposure point concentration of lead in the Waste Sub-Area; therefore, lead was determined not to be an ecological concern (Shaw, 2007). During the investigation at the former Pistol Range, arsenic, copper, nickel, and zinc were detected at levels exceeding background (as identified by the UPL in **Table 2-2**). Of these, the results for arsenic, nickel, and zinc were below the ecological screening values (ESVs) presented in the BERA. Therefore, these metals are not chemicals of potential ecological concern within the Waste Sub-area.

Copper was detected in all three laboratory samples. Because two of the three detected concentrations of copper exceeded the ESV for copper, copper was re-evaluated for potential impacts on ecological receptors. The detected copper concentrations from the former Pistol Range were added to the Waste Sub-Area copper dataset, and a new 95% upper confidence limit on the mean (95% UCL) was calculated. It should be noted that the 95% UCL was used in the LHAAP BERA as the screening concentration for comparison to ecological benchmarks. The new 95% UCL for copper was 22.4 mg/kg, which is greater than the previous 95% UCL for copper of 11.5 mg/kg in the Waste Sub-Area that was used in the BERA. However, the new 95% UCL is still well below the ESV of 61 mg/kg (see Table 6-19 in the BERA [Shaw, 2007]).

As noted in the BERA, copper is a bioaccumulative chemical, and as such, is automatically evaluated for potential food chain effects even if the screening concentration is below the ESV. Ecological effects quotients (EEQ), calculated by dividing receptor-specific intake doses by no-effect toxicity reference values, were used in the BERA to characterize potential food chain hazards. EEQs greater than 1.0 indicate that a potential for ecological risk exists, while EEQs below 1.0 indicate that the risk from food chain effects is negligible. Using the original 95% UCL for copper resulted in a maximum EEQ in the Waste Sub-Area among all terrestrial receptors of 0.115 for the Short-tailed Shrew (see Table 7-32 in the BERA). Using the new 95% UCL for copper resulted in an EEQ of 0.144 for the shrew. Because the revised EEQ is still well below the target threshold value of 1.0, no adverse impacts associated with food chain effects are expected for copper.

In summary, the inclusion of elevated concentrations of copper in the Pistol Range resulted in an increase in the 95% UCL for the Waste Sub-Area, but the 95% UCL was still well below the conservative ESV and did not affect conclusions from the food chain model. Therefore, the inclusion of the former Pistol Range copper data in the BERA dataset does not affect the BERA conclusions, and copper is not a chemical of concern for the Waste Sub-Area. No further action is needed at the former Pistol Range for the protection of ecological receptors.

## *2.10 Summary*

The former Pistol Range was used as a small arms firing range from before 1954 until the early 2000s, and will be part of a wildlife refuge in the future. Lead exceeded the SAI-Ind at a number of soil sample locations at the eastern portion of the former Pistol Range at the target embankment, and the surface/near-surface soil in that area is considered a potential exposure pathway if disturbed by future maintenance workers. Sediment, surface water, and groundwater were not found to be impacted.

A removal action is appropriate at the former Pistol Range based on the concentrations of lead in the surface and near-surface soil. Those concentrations are sufficiently high to constitute a threat to public health as defined by factor (i) under §300.415(b)(2) of the NCP: "Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants." A planning period of at least six months exists prior to the initiation of on-site action; therefore, this action will be implemented as a non-time critical removal action.

## Table 2-1
## 1995 TCLP Results

| Sample[1] | Sample Date | Location | Parameter | Result (mg/L) | Estimated Quantitation Limit (mg/L) |
|---|---|---|---|---|---|
| FR-1 | June 21, 1995 | 12 inches horizontally into embankment; 6 feet high on embankment, 18 feet behind target | TCLP-Lead | ND | 0.1 |
| FR-2[2] | June 21, 1995 | Surface of embankment 12 feet behind target | TCLP-Lead | 570 | 10 |
| FR-3 | June 21, 1995 | 12 inches deep at a location 3 feet behind target (between target and toe of embankment) | TCLP-Lead | 0.46 | 0.1 |
| FR-4 | June 21, 1995 | 12 inches deep – 12 feet south of target | TCLP-Lead | 0.16 | 0.1 |
| FR-5 | June 21, 1995 | 12 inches deep – 12 feet north of target | TCLP-Lead | ND | 0.1 |
| FR-6 | June 21, 1995 | 6 inches deep – 40 feet north and 35 feet east of target | TCLP-Lead | ND | 0.1 |
| FR-7[2] | November 20, 1995 | Surface of embankment behind target | TCLP-Lead | 1,100 | 50 |

*Notes and Abbreviations:*

*FR* *Federal Register*
*mg/L* *milligrams per liter*
*ND* *not detected above estimated quantitation limit*
*TCLP* *toxicity characteristic leaching procedure*

[1] *All samples except FR-6 are from clay; FR-6 is a sand/clay mix. Samples FR-1 to -6 were collected on June 21, 1995, and sample FR-7 was collected on November 20, 1995.*

[2] *The sample contained lead fragments.*

## Table 2-2
## XRF Screening and Laboratory Results

| Parameter | | Arsenic | | | Copper | | | Lead | | | Nickel | | | Zinc | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | XRF Result | Laboratory Result | | XRF Result | Laboratory Result | | XRF Result | Laboratory Result | | XRF Result | Laboratory Result | | XRF Result | Laboratory Result | |
| SAI - Ind (mg/kg) | | 200 | | | 74,000 | | | 1000 | | | 12,000 | | | 410,000 | | |
| GWP-Ind (mg/kg) | | 1.0 | | | 130 | | | 1.5 | | | 200 | | | 3,100 | | |
| UPL for Background Concentration (mg/kg) | | 5.86 | | | 8.37 | | | 17.8 | | | 9.4 | | | 24.5 | | |
| Maximum Detected Value (mg/kg) | | 101.5 | 14.2 | | 148.4 | 186 | | 3977.6 | 5,240 | | 144.9 | 8.71 | | 142.4 | 65.1 | |
| Number of Detected Results | | 2 | 3 | | 6 | 3 | | 47 | 9 | | 13 | 3 | | 60 | 3 | |
| Number of Samples | | 88 | 3 | | 88 | 3 | | 88 | 9 | | 88 | 3 | | 88 | 3 | |
| Sample Location | Sample Date | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes |
| N75,0 (0-6") | 2/22/2006 10:20 | <56.25 | | | <49.35 | | | 1000 | | 1,2 | 81.1 | | | 92.6 | | |
| N75,0 (6-12") | 2/22/2006 10:32 | <33.75 | | | <51.45 | | | 246.6 | | 2 | <89.85 | | | 60.3 | | |
| N75,0 (12-18") | 2/22/2006 10:48 | <19.65 | | | <54.9 | | | 25.6 | | 2 | <103.2 | | | 57.4 | | |
| N50,E25 (0-6") | 2/22/2006 11:02 | <110.55 | 2.51 | | 148.4 | 186.00 | 2 | 3977.6 | 5,240.00 | 1,2 | <79.8 | 7.51 | | 39 | 65.10 | |
| N50,E25 (6-12") | 2/22/2006 11:11 | <55.2 | | | 79.1 | | | 1180 | | 1,2 | <64.65 | | | 56.8 | | |
| N50,E25 (12-18") | 2/22/2006 11:20 | <30.6 | | | 77.8 | | | 244.8 | | 2 | <73.8 | | | 53.3 | | |
| N50,E25 (18-24") | 2/22/2006 11:32 | <46.5 | | | <52.8 | | | 624.8 | | 2 | | | | <33.15 | | |
| N50,E25 (24-30") | 2/22/2006 11:51 | <45.15 | | | <51.15 | | | 564.4 | | 2 | <77.85 | | | 51.3 | | |
| N25,E50 (0-6") | 2/22/2006 13:46 | <16.95 | | | <48.15 | | | 27.5 | | 2 | <71.85 | | | 40 | | |
| N25,E50 (6-12") | 2/22/2006 13:53 | <14.55 | | | <43.8 | | | 12.7 | | | <65.85 | | | 40.7 | | |
| 0,E75 (0-6") | 2/22/2006 14:31 | <16.65 | | | <48.75 | | | 24.5 | | 2 | <84.6 | | | 39.3 | | |
| 0,E75 (6-12") | 2/22/2006 14:45 | <15.75 | | | <46.8 | | | <12.9 | | | <85.5 | | | 45.2 | | |
| 0,E75 (12-18") | 2/22/2006 14:59 | <14.7 | | | <44.4 | | | <11.85 | | | <77.55 | | | 33.8 | | |
| 0,E50 (0-6") | 2/22/2006 15:31 | <15.9 | | | <48.45 | | | 15.3 | | | 118.6 | | | <30 | | |
| 0,E50 (6-12") | 2/22/2006 15:47 | <17.85 | | | <51.15 | | | 16.3 | | | 144.9 | | | <31.8 | | |
| 0,E50 (12-18") | 2/22/2006 15:59 | <16.35 | | | <48 | | | 15.3 | | | <85.35 | | | 52.6 | | |
| N25,E25 (0-6") | 2/22/2006 16:16 | <24.75 | NA | | <62.85 | NA | | 55.7 | 32.00 | 2 | <124.2 | NA | | <37.65 | NA | |
| N25,E25 (6-12") | 2/22/2006 16:27 | <16.35 | | | <48.75 | | | <13.2 | | | 79.4 | | | <30.15 | | |
| N25,E25 (12-18") | 2/22/2006 16:39 | <15.3 | | | <47.55 | | | <12.75 | | | <72.6 | | | 35.7 | | |
| N50,0 (0-6") | 2/23/2006 9:13 | 101.5 | 14.2 | 2 | <59.7 | 5.86 | | 1120 | 1,220.00 | 1,2 | <108.3 | 8.71 | | 66 | 46.6 | |
| N50,0 (6-12") | 2/23/2006 9:25 | <21.3 | | | <48.6 | | | 71.1 | | 2 | <84.75 | | | 33.1 | | |
| N50,0 (12-18") | 2/23/2006 9:33 | <15.75 | | | <45.45 | | | <13.05 | | | <75.15 | | | <28.5 | | |
| N50,W25 (0-6") | 2/23/2006 9:48 | <16.95 | | | <46.2 | | | 33.1 | | 2 | <74.85 | | | 43.2 | | |
| N25,0 (0-6") | 2/23/2006 9:56 | <29.1 | NA | | <85.2 | NA | | 33.1 | 68.50 | 2 | 141.6 | NA | | <52.65 | NA | |

## Table 2-2
## XRF Screening and Laboratory Results

| Sample Location | Date/Time | Arsenic | | | Copper | | | Lead | | | Nickel | | | Zinc | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes |
| 0,E25 (0-6") | 2/23/2006 10:03 | <17.4 | | | <52.8 | | | <15 | | | <92.4 | | | <32.85 | | |
| S25,E50 (0-6") | 2/23/2006 10:10 | <16.2 | | | <46.2 | | | 21.3 | | 2 | <83.7 | | | 55.1 | | |
| N25,W25 (0-6") | 2/23/2006 10:18 | <17.4 | | | <45.3 | | | 40.4 | | 2 | <70.2 | | | <28.5 | | |
| 0,0 (0-6") | 2/23/2006 10:29 | <15.6 | | | <47.85 | | | <13.65 | | | <79.2 | | | 34.1 | | |
| S25,E25 (0-6") | 2/23/2006 10:40 | <16.35 | | | <49.5 | | | <12.6 | | | 88.3 | | | <30.75 | | |
| N25,W50 (0-6") | 2/23/2006 10:47 | <15.3 | | | <45.15 | | | <13.05 | | | <75.15 | | | 41.9 | | |
| 0,W25 (0-6") | 2/23/2006 10:58 | <17.1 | | | 58.8 | | | 18.1 | | 2 | <90.45 | | | 72.7 | | |
| S25,0 (0-6") | 2/23/2006 11:08 | 18.4 | | 2 | <58.35 | | | <14.7 | | | <96.3 | | | 142.4 | | |
| S50,E25 (0-6") | 2/23/2006 11:17 | <11.85 | | | <38.85 | | | <9.9 | | | <59.25 | | | 35.1 | | |
| 0,W50 (0-6") | 2/23/2006 11:24 | <16.95 | | | <43.2 | | | 31.4 | | 2 | <70.8 | | | 46.9 | | |
| S25,W25 (0-6") | 2/23/2006 11:31 | <10.35 | | | 66.7 | | | 12.8 | | | 62 | | | 43.9 | | |
| S50,0 (0-6") | 2/23/2006 11:49 | <14.85 | | | <43.5 | | | <12 | | | <82.2 | | | <27.3 | | |
| N75,W25 (0-6") | 2/23/2006 15:09 | <15.45 | | | <47.55 | | | <12.75 | | | <77.25 | | | 31.3 | | |
| N75,W25 (6-12") | 2/23/2006 15:19 | <16.35 | | | <52.5 | | | <13.8 | | | <87.75 | | | <32.85 | | |
| N75,W25 (12-18") | 2/23/2006 15:29 | <16.8 | | | <51.9 | | | <14.1 | | | <86.85 | | | 37.7 | | |
| N100,W25 (0-6") | 2/23/2006 15:41 | <15.6 | | | <49.5 | | | <12.9 | | | <82.05 | | | 37.7 | | |
| N100,W25 (6-12") | 2/23/2006 15:53 | <17.25 | | | <51.6 | | | <14.25 | | | <88.95 | | | 39 | | |
| N100,W25 (12-18") | 2/23/2006 16:05 | <17.55 | | | <53.25 | | | <15 | | | <100.95 | | | <33.6 | | |
| N100,0 (0-6") | 2/23/2006 16:22 | <15.9 | | | <47.1 | | | <13.35 | | | <82.35 | | | 39.8 | | |
| N100,0 (6-12") | 2/23/2006 16:36 | <15.3 | | | <49.95 | | | <12.9 | | | 113 | | | <30.6 | | |
| N100,0 (12-18") | 2/23/2006 16:48 | <16.65 | | | <51.9 | | | <14.25 | | | <84 | | | 52.7 | | |
| N75,E25-Low (0-6") | 2/24/2006 10:02 | <50.1 | | | <46.5 | | | 750.8 | | 2 | <67.65 | | | <30.15 | | |
| N75,E25-Low (6-12") | 2/24/2006 10:09 | <20.55 | | | <49.95 | | | 51.8 | | 2 | <74.4 | | | <30.75 | | |
| N75,E25-Low (12-18") | 2/24/2006 10:16 | <17.85 | | | <49.2 | | | 21.4 | | 2 | <74.4 | | | <30.3 | | |
| N75,E25-Up (0-6") | 2/24/2006 10:25 | <18.9 | | | <44.1 | | | 52.4 | | 2 | <65.55 | | | <28.5 | | |
| N75,E25-Up (6-12") | 2/24/2006 10:33 | <17.25 | | | <49.2 | | | 20.8 | | 2 | <76.65 | | | 36.2 | | |
| N75,E25-Up (12-18") | 2/24/2006 10:42 | <16.35 | | | <47.7 | | | 16.2 | | | <74.1 | | | 36.4 | | |
| N50,E50-Low (0-6") | 2/24/2006 11:00 | <45.3 | | | <50.85 | | | 559.2 | | 2 | <81.75 | | | 46.1 | | |
| N50,E50-Low (6-12") | 2/24/2006 11:12 | <47.7 | | | <54.15 | | | 604.8 | | 2 | <89.55 | | | 65.6 | | |
| N50,E50-Low (12-18") | 2/24/2006 11:21 | <27.3 | | | <49.95 | | | 181.1 | | 2 | <76.95 | | | 37.2 | | |
| N50,E50-Low (18-24") | 2/24/2006 11:36 | <16.8 | | | <47.7 | | | 24.4 | | 2 | <73.8 | | | 44.7 | | |
| N50,E50-Up (0-6") | 2/24/2006 13:11 | <25.2 | | | <50.55 | | | 117.9 | | 2 | <74.85 | | | 37.1 | | |
| N50,E50-Up (6-12") | 2/24/2006 13:19 | <16.65 | | | <46.2 | | | 24.1 | | 2 | 80.6 | | | 42.2 | | |
| N50,E50-Up (12-18") | 2/24/2006 13:28 | <14.55 | | | <43.8 | | | 16.9 | | | <75.45 | | | 41.8 | | |
| N25,E75-Low (0-6") | 2/24/2006 13:42 | <40.35 | NA | | <45.15 | NA | | 527.2 | 937.00 | 2 | <67.65 | NA | | <28.2 | NA | |
| N25,E75-Low (6-12") | 2/24/2006 13:49 | <52.65 | 1.75 | | 104.1 | 148.00 | 2 | 763.2 | 952.00 | 2 | 92.9 | 8.11 | | 41.2 | 52.2 | |
| N25,E75-Low (12-18") | 2/24/2006 13:57 | <27 | NA | | <50.85 | NA | | 161.1 | 245.00 | 2 | <75.9 | NA | | <31.65 | NA | |
| N25,E75-Low (18-24") | 2/24/2006 14:05 | <14.55 | | | <40.35 | | | 29.8 | | 2 | <61.05 | | | 40.1 | | |
| N25,E75-Up (0-6") | 2/24/2006 14:19 | <15.75 | NA | | <44.85 | NA | | 14.8 | 11.00 | | <65.25 | NA | | <28.5 | NA | |
| N25,E75-Up (6-12") | 2/24/2006 14:26 | <16.65 | | | <48.45 | | | 17.5 | | | <70.2 | | | <30.15 | | |

## Table 2-2
## XRF Screening and Laboratory Results

| | | Arsenic | | | Copper | | | Lead | | | Nickel | | | Zinc | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -40.7 | Date/Time | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes | XRF Result in mg/kg | Laboratory Result in mg/kg | Notes |
| N25,E75-Up (12-18") | 2/24/2006 14:32 | <15.15 | | | <44.25 | | | <12.15 | | | <67.05 | | | 28.9 | | |
| 0,E100 (0-6") | 2/24/2006 14:44 | <15.3 | | | <47.85 | | | <12.3 | | | <77.85 | | | 60 | | |
| 0,E100 (6-12") | 2/24/2006 14:51 | <17.1 | | | <54 | | | <14.4 | | | <91.2 | | | 64.7 | | |
| 0,E100 (12-18") | 2/24/2006 14:58 | <16.65 | | | <52.35 | | | <13.95 | | | <100.5 | | | 54.6 | | |
| 0,W75 (0-6") | 2/24/2006 15:42 | <17.55 | | | <55.95 | | | <14.55 | | | <95.4 | | | 47.8 | | |
| S25,W50 (0-6") | 2/24/2006 15:47 | <17.7 | | | <52.2 | | | 16.6 | | | <87.9 | | | 40.6 | | |
| S50,W25 (0-6") | 2/24/2006 15:53 | <14.25 | | | <42.45 | | | <12.3 | | | <72.3 | | | <26.7 | | |
| S75,0 (0-6") | 2/24/2006 15:59 | <15 | | | <48.45 | | | <12.15 | | | <84.3 | | | 35.8 | | |
| S50,W100 (0-6") | 2/24/2006 16:05 | <16.8 | | | <50.4 | | | <14.1 | | | <80.85 | | | 34.5 | | |
| S75,W75 (0-6") | 2/24/2006 16:10 | <14.55 | | | <45.75 | | | <12 | | | <69.9 | | | <28.2 | | |
| S100,W50 (0-6") | 2/24/2006 16:16 | <16.05 | | | <46.2 | | | 24.2 | | 2 | 97.4 | | | <28.95 | | |
| S50,W125 (0-6") | 2/24/2006 16:22 | <17.25 | | | <49.05 | | | 26.1 | | 2 | <78.15 | | | 31.1 | | |
| S75,W100 (0-6") | 2/24/2006 16:28 | <16.2 | | | <51.3 | | | 15.5 | | | <78.6 | | | <31.5 | | |
| S100,W75 (0-6") | 2/24/2006 16:34 | <15.75 | | | <49.2 | | | <13.05 | | | <86.55 | | | 49.1 | | |
| S125,W50 (0-6") | 2/24/2006 16:40 | <14.7 | | | <45.6 | | | <12.15 | | | 77.1 | | | 41.7 | | |
| S150,W100 (0-6") | 2/24/2006 16:46 | <14.1 | | | <45.15 | | | <12.45 | | | <70.05 | | | 33.2 | | |
| S125,W125 (0-6") | 2/24/2006 16:52 | <15.15 | | | <43.35 | | | <12.6 | | | <69.9 | | | 42 | | |
| S100,W150 (0-6") | 2/24/2006 16:58 | <14.4 | | | <45 | | | <12.15 | | | <71.25 | | | 38.7 | | |
| S100,W175 (0-6") | 2/24/2006 17:04 | <15.45 | | | <47.7 | | | <13.8 | | | 85.2 | | | 45.1 | | |
| S125,W150 (0-6") | 2/24/2006 17:10 | <15.15 | | | <47.85 | | | <12.9 | | | <76.65 | | | <28.8 | | |
| S150,W125 (0-6") | 2/24/2006 17:16 | <16.05 | | | <47.55 | | | <13.5 | | | <82.5 | | | 34.6 | | |
| East Ditch (0-6") | 2/24/2006 17:22 | <13.65 | | | <43.2 | | | <11.4 | | | <67.65 | | | 36.9 | | |
| Center Ditch (0-6") | 2/24/2006 17:27 | <14.55 | | | <45 | | | <12.6 | | | <73.05 | | | 29.9 | | |
| **West Ditch (0-6")** | 2/24/2006 17:34 | <13.2 | NA | | <41.7 | NA | | <11.4 | 10.70 | | <64.5 | NA | | <24.9 | NA | |

Notes and Abbreviations:

1 detected result exceeds SAI-Ind (TCEQ, 2006)

2 detected result exceeds GWP-Ind (TCEQ, 2006) and UPL Appendix C)

Laboratory resutls were analyzed using EPA Method 6010B

**Bold** Confirmation (Laboratory) Sample Collected

GW-Ind Soil Medium-specific Concentration for Industrial Use Based on Groundwater Protection

mg/kg milligrams per kilogram

NA not available

SAI-Ind Soil Medium-specific Concentration for Industrial Use Based on Inhalation, Ingestion, and Dermal Contact under the Texas Risk Reduction Rules, Standard No. 2 (TCEQ, 200

UPL upper prediction limit for background levels as calculated for use in **Appendix C**.

XRF x-ray fluorescence

Zn zinc

## Table 2-3
## Leachate Results

| Sample Location and Depth Below Ground Surface | | N50,E25 (0-6") | N50,0 (0-6") | N25,E75-Low (6-12") |
|---|---|---|---|---|
| Date | | 2/22/2006 | 2/23/2006 | 2/24/2006 |
| As | XRF Result (mg/kg) | < 110.55 | 101.5 | < 52.65 |
| | Soil Result (mg/kg) | 2.51 | 14.2 | 1.75 |
| | TCLP (mg/L)[a] | < 0.10 | < 0.1 | < 0.1 |
| | SPLP (mg/L) | < 0.002 | 0.0164 | 0.052 |
| Cu | XRF Result (mg/kg) | 148.4 | < 59.7 | 104.1 |
| | Soil Result (mg/kg) | 186.00 | 5.86 | 148.00 |
| | TCLP (mg/L) | Not applicable | Not applicable | Not applicable |
| | SPLP (mg/L) | 0.0411 | 0.00541 | 0.215 |
| Pb | XRF Result (mg/kg) | 3,977.6 | 1,120.0 | 763.2 |
| | Soil Result (mg/kg) | 5,240 | 1,220 | 952 |
| | TCLP (mg/L)[b] | 34.00 | 11.00 | 9.21 |
| | SPLP (mg/L) | 0.656 | 0.211 | 0.957 |
| Ni | XRF Result (mg/kg) | < 79.8 | < 108.3 | 92.9 |
| | Soil Result (mg/kg) | 7.51 | 8.71 | 8.11 |
| | TCLP (mg/L) | Not applicable | Not applicable | Not applicable |
| | SPLP (mg/L) | 0.00643 | 0.00587 | 0.0167 |
| Zn | XRF Result (mg/kg) | 39 | 66 | 41.2 |
| | Soil Result (mg/kg) | 65.1 | 46.6 | 52.2 |
| | TCLP (mg/L) | Not applicable | Not applicable | Not applicable |
| | SPLP (mg/L) | 0.0441 | 0.0550 | 0.0993 |

Notes and Abbreviations:

Both TCLP and SPLP are laboratory leaching tests that can be used to determine if a waste should be considered hazardous. The major difference between the tests is the leaching media. TCLP uses acetic acid to simulate municipal waste landfill leachate, while SPLP uses a mixture of sulfuric acid and nitric acid to simulate acid rain. TCLP is considered more conservative and the TCLP results have been utilized within this EE/CA.

[a] Waste exceeding 5 mg/L arsenic is considered characteristically hazardous (USEPA hazardous waste number D004).
[b] Waste exceeding 5 mg/L lead is considered characteristically hazardous (USEPA hazardous waste number D008).

As arsenic
Cu copper
mg/kg milligrams per kilogram
mg/L milligrams per Liter
Ni nickel
Pb lead
SPLP synthetic precipitation leaching procedure
TCLP toxicity characteristic leaching procedure
USEPA U.S. Environmental Protection Agency
XRF x-ray fluorescence
Zn zinc

**Table 2-4**
**2007 Soil Results**

| | Location Code | N50,E25 | | N50,E25 | | N50,E25 | | N50,E25 | | N50,E25 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Date | 13-Aug-07 | | 13-Aug-07 | | 13-Aug-07 | | 13-Aug-07 | | 13-Aug-07 | |
| | Sample Number | N50,E25-0-6 | | N50,E25-_5-2_0 | | N50,E25-2_0-4_0 | | N50,E25-4_0-6_0 | | N50,E25-2_0-4_0-FD | |
| | Depth (feet bgs) | 0-0.5 | | 0.5-2.0 | | 2.0-4.0 | | 4.0-6.0 | | 4.0-6.0 | |
| | Sample Purpose | REG | | REG | | REG | | REG | | FD | |
| Parameter | Units | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| Arsenic | mg/kg | 2.67 | | 3.17 | | 3.63 | | 2.73 | | 3.28 | |
| Copper | mg/kg | 19.1 | | 8.09 | | 9.12 | | 10.3 | | 9.02 | |
| Lead | mg/kg | 425 | | 55.8 | | 32.4 | | 126 | | 20.3 | |
| Nickel | mg/kg | 7.1 | | 9.68 | | 13.4 | | 9.55 | | 13.9 | |
| Zinc | mg/kg | 30.2 | | 34.7 | | 39 | | 25.5 | | 39.6 | |

| | Location Code | PRSB01 | | PRSB01 | | PRSB01 | |
|---|---|---|---|---|---|---|---|
| | Sample Date | 7-Sep-07 | | 7-Sep-07 | | 7-Sep-07 | |
| | Sample Number | PRSB01 (9-10) | | PRSB01 (14-15) | | PRSB01 (19-20) | |
| | Depth (feet bgs) | 9.0-10.0 | | 14.0-15.0 | | 19.0-20.0 | |
| | Sample Purpose | REG | | REG | | REG | |
| Parameter | Units | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| Arsenic | mg/kg | NA | | NA | | NA | |
| Copper | mg/kg | NA | | NA | | NA | |
| Lead | mg/kg | 11.4 | U | 11.1 | U | 7.59 | U |
| Nickel | mg/kg | NA | | NA | | NA | |
| Zinc | mg/kg | NA | | NA | | NA | |

Notes and Abbreviations:

bgs - below ground surface

FD - field duplicate sample for quality control

mg/kg - milligrams per kilogram

NA - not analyzed

REG - regular sample

U - undetected; result is detection limit

**Table 2-5**
**Vertical Delineation of Lead in Soil Near N50, E25**

| Depth (feet bgs) Top | Depth (feet bgs) Bottom | Lead (mg/kg) | Sample Date | Remarks |
|---|---|---|---|---|
| 0 | 0.5 | 425 | 8/13/2007 | Surface sample |
| 0 | 0.5 | 5,240 | 2/22/2006 | Surface sample |
| 0 | 0.5 | 3,978 | 2/22/2006 | Surface sample; XRF analysis |
| 0.5 | 1 | 1,180 | 2/22/2006 | Hand auger; XRF analysis |
| 0.5 | 2 | 55.8 | 8/13/2007 | Hand auger |
| 1 | 1.5 | 245 | 2/22/2006 | Hand auger; XRF analysis |
| 1.5 | 2 | 625 | 2/22/2006 | Hand auger; XRF analysis |
| 2 | 2.5 | 564 | 2/22/2006 | Hand auger; XRF analysis |
| 2 | 4 | 32.4 | 8/13/2007 | Hand auger |
| 4 | 6 | 126 | 8/13/2007 | Hand auger |
| 4 | 6 | 20.3 | 8/13/2007 | Hand auger; field duplicate |
| 9 | 10 | 11.4 U | 9/7/2007 | Hollow-stem auger (PRWW01) |
| 11.62 | - - - | - - - | 9/18/2007 | Groundwater Level (PRWW01) |
| 14 | 15 | 11.1 U | 9/7/2007 | Hollow-stem auger (PRWW01) |
| 19 | 20 | 7.59 U | 9/7/2007 | Hollow-stem auger (PRWW01) |

Notes and Abbreviations:

- - - not applicable
bgs below ground surface
mg/kg milligrams per kilogram
U undetected; result is detection limit
XRF x-ray fluorescence

**Table 2-6**
**Groundwater Results**

| | | LOCATION CODE | PRWW01 | | PRWW01 | | PRWW01 | | PRWW01 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SAMPLE NO. | PRWW01-090707 | | PRWW01-090707 | | PRWW01-091807 | | PRWW01-091807 | |
| | | SAMPLE DATE | 7-Sep-07 | | 7-Sep-07 | | 18-Sep-07 | | 18-Sep-07 | |
| | | SAMPLE PURPOSE | REG | | REG | | REG | | REG | |
| | | FILTERED? | Unfiltered | | Filtered | | Unfiltered | | Filtered | |
| Parameter | Units | GW-Ind | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| Aluminum | µg/L | 100,000 | 8360 | | 86 | U | 2,680 | | 100 | U |
| Antimony[a] | µg/L | 6 | 2.8 | | 2.7 | U | NA | | NA | |
| Arsenic[a] | µg/L | 10 | 2.7 | U | 2.7 | U | NA | | NA | |
| Barium[a] | µg/L | 2,000 | 209 | | 137 | | NA | | NA | |
| Beryllium[a] | µg/L | 4 | 0.27 | | 0.26 | U | NA | | NA | |
| Cadmium[a] | µg/L | 5 | 1.8 | U | 1.8 | U | NA | | NA | |
| Calcium | µg/L | - - - | 26,500 | | 25,000 | | NA | | NA | |
| Chromium[a] | µg/L | 100 | 7.3 | | 1.5 | U | NA | | NA | |
| Cobalt | µg/L | 6,100 | 9.6 | U | 9.6 | U | NA | | NA | |
| Copper[a] | µg/L | 1,300 | 13 | | 5.9 | U | NA | | NA | |
| Iron | µg/L | - - - | 5,150 | | 25.2 | | 2,320 | | 129 | |
| Lead[a] | µg/L | 15 | 17.2[b] | | 2.8 | U | 5.41 | | 0.5 | U |
| Magnesium | µg/L | - - - | 16,900 | | 15,400 | | NA | | NA | |
| Manganese | µg/L | 14,000 | 199 | | 171 | | NA | | NA | |
| Mercury[a] | µg/L | 2 | 0.094 | U | 0.094 | U | NA | | NA | |
| Nickel | µg/L | 2,000 | 4.2 | | 2.6 | U | NA | | NA | |
| Potassium | µg/L | - - - | 4,140 | | 3,080 | | NA | | NA | |
| Selenium[a] | µg/L | 50 | 2.3 | | 2.3 | U | NA | | NA | |
| Silver | µg/L | 510 | 1.1 | U | 1.1 | U | NA | | NA | |
| Sodium | µg/L | - - - | 87,200 | | 87,000 | | NA | | NA | |
| Thallium[a] | µg/L | 2 | 1.5 | U | 1.5 | U | NA | | NA | |
| Vanadium | µg/L | 720 | 14.8 | | 0.98 | | NA | | NA | |
| Zinc | µg/L | 31,000 | 19.4 | | 7.5 | U | NA | | NA | |

Notes and Abbreviations:

[a] The GW-Ind for this parameter is based on Maximum Contaminant Level from Primary Drinking Water Standards (U.S. Environmental Protection Agency)

[b] Result exceeds GW-Ind.

- - - Compound not necessarily of concern from a human health standpoint, therefore calculation of human health-based value is not required.

µg/L - micrograms per liter

GW-Ind - Groundwater Medium Specific Concentration for Industrial Use (Texas Commission on Environmental Quality, 2006)

NA - Sample was not analyzed for this parameter.

Qualifier - Qualifier assigned by chemist evaluating laboratory results package

REG - Regular sample

U - Result was below the sample detection limit; sample detection limit reported as numeric result.

00071249


**LEGEND**

- Stream
- Road
- Approximate Firing Line Location
- Target Embankment
- Pistol Range

0 30 60 120
Feet

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TULSA, OKLAHOMA

FIGURE 2-1

SITE PLAN VIEW
FORMER PISTOL RANGE

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

| OFFICE | DRAWN BY | CHECKED BY | APPROVED BY | FILE PATH |
|---|---|---|---|---|
| Houston, TX | B. Lu 04/09/08 | N. Olson 04/09/08 | G. Jones 04/30/08 | T:\GIS\Longhorn\MXD\PR\EECA\PistolRange_PlanView.mxd |

Plot Date: 04/08

00071250


**Figure 2-2**
**Signs at Firing line**


**Figure 2-3**
**View of Former Pistol Range Looking East**


**Figure 2-4**
**Target Embankment at Eastern End of Former Pistol Range**

OFFICE Houston, TX | DRAWN BY B. Lu 04/16/08 | CHECKED BY N. Olson 04/16/08 | APPROVED BY G. Jones 04/30/08 | FILE PATH T:\GIS\Longhorn\MXD\PR\EECA\PistolRange_SampLocs.mxd

Plot Date: 04/08

00071252


## LEGEND

- Shallow Monitoring Well
- XRF Sediment Sample Location
- XRF Sample Location
- Stream
- Road
- Approximate Firing Line Location
- 25-foot Grid
- Target Embankment
- Pistol Range

0 30 60 120 Feet

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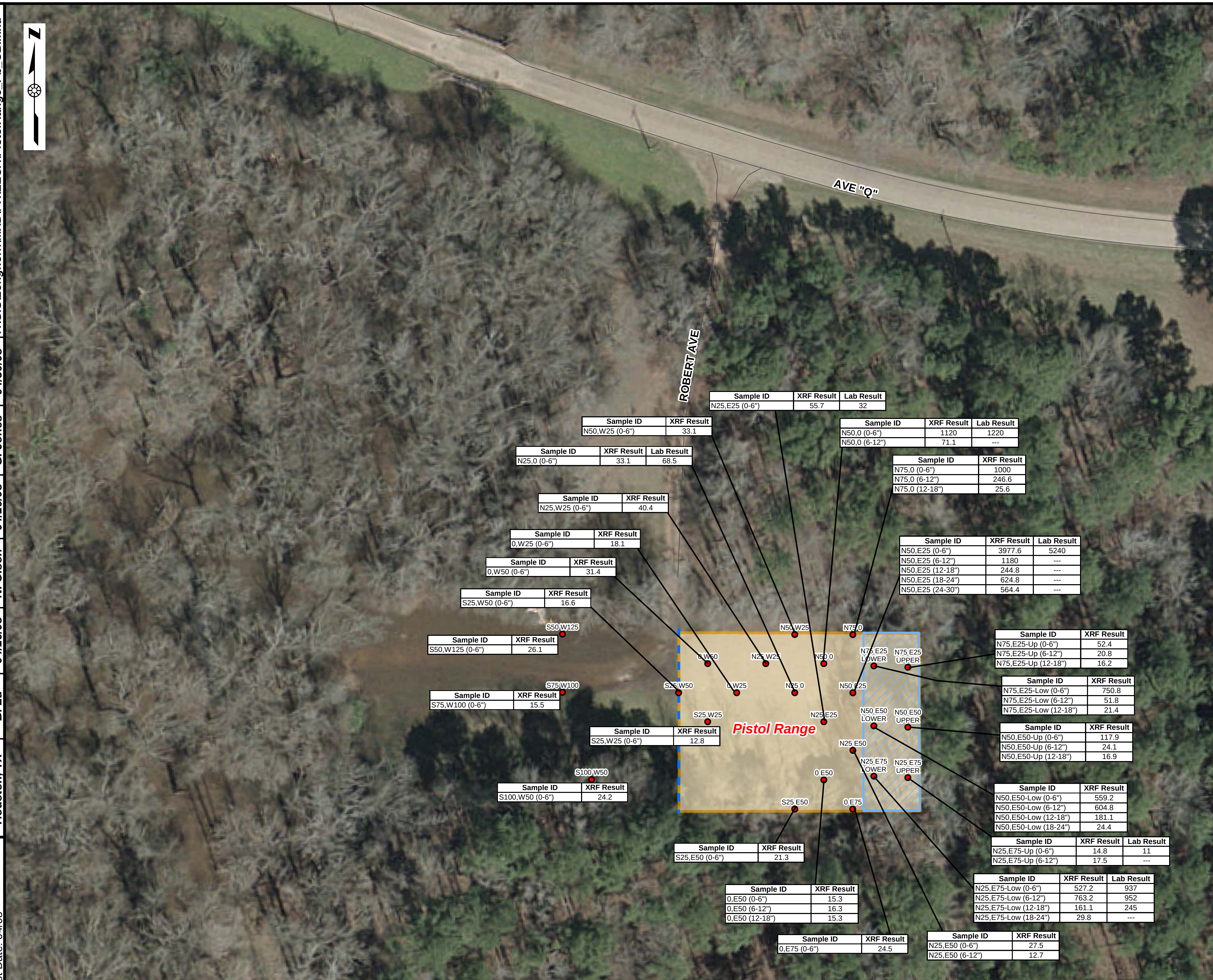
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2-5

SAMPLE LOCATION MAP
FORMER PISTOL RANGE

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

00071253




| Sample ID | XRF Result | Lab Result |
|---|---|---|
| N25,E25 (0-6") | 55.7 | 32 |

| Sample ID | XRF Result |
|---|---|
| N50,W25 (0-6") | 33.1 |

| Sample ID | XRF Result | Lab Result |
|---|---|---|
| N25,0 (0-6") | 33.1 | 68.5 |

| Sample ID | XRF Result | Lab Result |
|---|---|---|
| N50,0 (0-6") | 1120 | 1220 |
| N50,0 (6-12") | 71.1 | --- |

| Sample ID | XRF Result |
|---|---|
| N75,0 (0-6") | 1000 |
| N75,0 (6-12") | 246.6 |
| N75,0 (12-18") | 25.6 |

| Sample ID | XRF Result |
|---|---|
| N25,W25 (0-6") | 40.4 |

| Sample ID | XRF Result |
|---|---|
| 0,W25 (0-6") | 18.1 |

| Sample ID | XRF Result | Lab Result |
|---|---|---|
| N50,E25 (0-6") | 3977.6 | 5240 |
| N50,E25 (6-12") | 1180 | --- |
| N50,E25 (12-18") | 244.8 | --- |
| N50,E25 (18-24") | 624.8 | --- |
| N50,E25 (24-30") | 564.4 | --- |

| Sample ID | XRF Result |
|---|---|
| 0,W50 (0-6") | 31.4 |

| Sample ID | XRF Result |
|---|---|
| S25,W50 (0-6") | 16.6 |

| Sample ID | XRF Result |
|---|---|
| S50,W125 (0-6") | 26.1 |

| Sample ID | XRF Result |
|---|---|
| N75,E25-Up (0-6") | 52.4 |
| N75,E25-Up (6-12") | 20.8 |
| N75,E25-Up (12-18") | 16.2 |

| Sample ID | XRF Result |
|---|---|
| N75,E25-Low (0-6") | 750.8 |
| N75,E25-Low (6-12") | 51.8 |
| N75,E25-Low (12-18") | 21.4 |

| Sample ID | XRF Result |
|---|---|
| S75,W100 (0-6") | 15.5 |

| Sample ID | XRF Result |
|---|---|
| S25,W25 (0-6") | 12.8 |

| Sample ID | XRF Result |
|---|---|
| N50,E50-Up (0-6") | 117.9 |
| N50,E50-Up (6-12") | 24.1 |
| N50,E50-Up (12-18") | 16.9 |

| Sample ID | XRF Result |
|---|---|
| S100,W50 (0-6") | 24.2 |

| Sample ID | XRF Result |
|---|---|
| N50,E50-Low (0-6") | 559.2 |
| N50,E50-Low (6-12") | 604.8 |
| N50,E50-Low (12-18") | 181.1 |
| N50,E50-Low (18-24") | 24.4 |

| Sample ID | XRF Result | Lab Result |
|---|---|---|
| N25,E75-Up (0-6") | 14.8 | 11 |
| N25,E75-Up (6-12") | 17.5 | --- |

| Sample ID | XRF Result |
|---|---|
| S25,E50 (0-6") | 21.3 |

| Sample ID | XRF Result | Lab Result |
|---|---|---|
| N25,E75-Low (0-6") | 527.2 | 937 |
| N25,E75-Low (6-12") | 763.2 | 952 |
| N25,E75-Low (12-18") | 161.1 | 245 |
| N25,E75-Low (18-24") | 29.8 | --- |

| Sample ID | XRF Result |
|---|---|
| 0,E50 (0-6") | 15.3 |
| 0,E50 (6-12") | 16.3 |
| 0,E50 (12-18") | 15.3 |

| Sample ID | XRF Result |
|---|---|
| 0,E75 (0-6") | 24.5 |

| Sample ID | XRF Result |
|---|---|
| N25,E50 (0-6") | 27.5 |
| N25,E50 (6-12") | 12.7 |

## LEGEND

- XRF Sample Point
- Road
- Approximate Firing Line Location
- Target Embankment
- Pistol Range

Note:

Lead concentrations reported in milligrams per kilogram (mg/kg).

0 30 60 120
Feet

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TULSA, OKLAHOMA

FIGURE 2-6

DETECTED LEAD RESULTS
FORMER PISTOL RANGE

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

| OFFICE | DRAWN BY | CHECKED BY | APPROVED BY | FILE PATH |
|---|---|---|---|---|
| Houston, TX | B. Lu 04/16/08 | N. Olson 04/16/08 | G. Jones 04/30/08 | T:\GIS\Longhorn\MXD\PRIEECA\PistolRange_Pb_CB.mxd |

Plot Date: 04/08

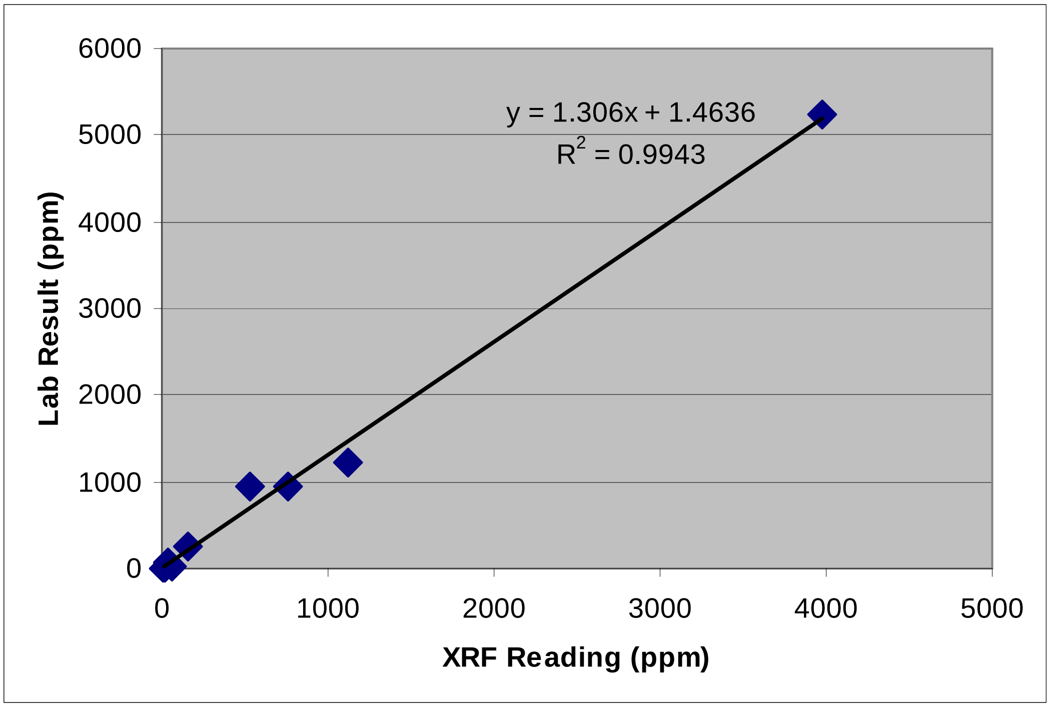


**Figure 2-7**
**Relationship between Laboratory Analytical Results and XRF Readings for Lead**

# 3.0 Removal Action Objectives

This section identifies specific removal action objectives (RAOs) that serve as the basis for the development of removal action alternatives in **Sections 4.0** and **5.0**. The section also provides applicable cleanup levels and specific regulatory requirements.

## 3.1 Removal Action Objectives

A removal action at the former Pistol Range must protect human health and meet applicable or relevant and appropriate requirements (ARARs). As noted in **Section 2.9**, ecological risk is not an issue at the former Pistol Range. Therefore, any proposed removal action need not specifically address ecological risk except as it forms the basis of certain ARARs. As discussed in **Section 2.0**, the threat that must be addressed at the former Pistol Range is soil contamination that could adversely affect human health via ingestion, inhalation, and direct contact.

The RAO for the former Pistol Range, consistent with the reasonably anticipated future use as a wildlife refuge, can be described as follows:

- Minimize the potential for human contact with soil containing lead at concentrations that could adversely affect future maintenance workers

This objective will be the basis for formulating alternatives in **Sections 4.0** and **5.0** of this EE/CA. There are no outstanding policy issues that will affect a proposed cleanup to address this RAO at the former Pistol Range. If the removal action proposed in this document is delayed or not taken, the potential exposure of human receptors to hazardous substances found in the surface and near-surface soils at the former Pistol Range will remain unabated.

In December 1991, the State of Texas, USEPA, and the Department of Defense - U.S. Army Longhorn Army Ammunition Plant, entered into a Federal Facility Agreement (FFA) to address the contamination at LHAAP. Any proposed action will be carried out under CERCLA with the U.S. Army as the lead agency, in conformity with the FFA.

## 3.2 Chemical- and Location-Specific ARARs

The NCP, 40 Code of Federal Regulations (CFR) 300.415(j) states that on-site removal actions conducted under CERCLA must attain, or have waived, legally applicable ARARs under federal or more stringent state environmental or facility siting laws.

This section provides a preliminary identification and evaluation of potential federal and State of Texas chemical- and location-specific ARARs for the remediation of the former Pistol Range under CERCLA. Action-specific ARARs are presented following the development of alternative actions in **Section 4.0**.

### 3.2.1 Definitions and Methods

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site (40 CFR 300.5). A requirement is applicable if all the jurisdictional and site-specific prerequisites of the requirement are met; that is, a requirement is applicable if it directly and fully addresses the situation at the site.

Relevant and appropriate requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable, address problems or situations sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the particular site (40 CFR 300.5). The criteria for determining relevance and appropriateness are listed at 40 CFR 300.400(g)(2). A relevant and appropriate requirement must be complied with to the same extent as an applicable requirement.

To qualify as a state ARAR mandating cleanup standards under 40 CFR 300.400(g)(4) of the NCP, a state requirement must be (1) promulgated (of general applicability and legally enforceable), (2) an environmental or facility siting law or regulation, (3) substantive (not procedural or administrative), (4) more stringent than a comparable federal requirement, (5) identified by the state in a timely manner, and (6) consistently applied throughout the state. Following USEPA guidance (1989), where USEPA has delegated to a state the authority to implement a federal program, the state regulations replace the equivalent federal requirements as the potential ARARs.

ARARs are generally divided into chemical-, location-, and action-specific requirements. Chemical-specific ARARs are usually promulgated health- or risk-based numerical values or methods used to determine acceptable concentrations of chemicals that may be found in, or discharged to, the environment. Location-specific ARARs restrict actions or contaminant concentrations in certain environmentally sensitive areas. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes.

An on-site action need not comply with administrative parts of requirements identified as ARARs. According to USEPA guidance (1988), administrative requirements are mechanisms that facilitate the implementation of the related substantive requirements of a statute or regulation (e.g., approval of or consultation with administrative bodies, documentation, permit issuance, reporting, record keeping, and enforcement).

The NCP at 40 CFR 300.400(e)(1) exempts on-site actions from having to obtain federal, state, or local permits and defines "on-site" as meaning "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for the implementation of the response action." However, on-site actions must still be in compliance with any substantive permit requirements. Off-site actions must not only comply with requirements that are legally applicable, but they must comply with both the substantive and the administrative parts of those requirements. Permits, if required, must be obtained for all remedial activities conducted off site (40 CFR 300.400[e][2]). Statutory waivers of ARARs (40 CFR 300.430[f][1][ii][C]) may not be used for off-site actions.

In addition to ARARs, 40 CFR 300.400(g)(3) states that federal or state non-promulgated advisories or guidance may be identified as to-be-considered (TBC) guidance for contaminants, conditions, and/or actions at the site. TBCs include non-promulgated criteria, advisories, guidance, and proposed standards. TBCs are not ARARs because they are neither promulgated nor enforceable. TBCs may be used to interpret ARARs and to determine preliminary remediation goals when ARARs do not exist for particular contaminants or are not sufficiently protective to develop cleanup goals. TBCs such as guidance or policy documents developed to implement regulations may be considered and used where necessary to ensure protectiveness.

Chemical-specific requirements are discussed in **Section 3.2.2**; Location-specific requirements for the sensitive resources potentially identified at the former Pistol Range are discussed in **Section 3.3.3** and listed in **Table 3-1**. Action-specific ARARs evaluated as part of the screening and detailed analysis of alternatives in this EE/CA are discussed in **Section 4.0**.

### *3.2.2 Chemical-Specific ARARs*

Soil that is treated in situ, or that is excavated, treated ex situ, and then replaced on the site, may be subject to the chemical-specific requirements and guidance identified in this section. As noted in **Section 2.0**, lead concentrations in surface and near-surface soil at the target embankment are sufficiently high to be a potential risk to a maintenance worker. Therefore, potential ARARs were considered for cleanup of soil contaminated with lead. Based on a review of federal and state regulations and guidance, there are a number of potential ARARs/TBCs that are specific to lead. These include (1) USEPA's guidance for the cleanup of lead in soil (1994; 1998), (2) USEPA's Superfund Soil Screening Guidance, a set of three documents (1996a, 1996b, 1996c), and (3) TCEQ's Risk Reduction Rules (2006).

#### *USEPA Soil Lead Cleanup Guidance*

USEPA has issued interim guidance for lead in soil at CERCLA sites that recommends cleanup levels based on studies of lead concentration in the blood of children (USEPA 1994, 1998). USEPA more recently published a final rule establishing standards for lead-based paint hazards in pre-1978 housing and child-occupied facilities (66 Federal Register [FR] 1206, January 5, 2001; effective March 6, 2001). If a cleanup level for lead in soil is needed, USEPA recommends that a risk-based level, incorporating potential future land uses, be calculated in accordance with these guidance documents. Accordingly, proposed end uses for the land need to be considered when developing a final cleanup level for lead in soils at the former Pistol Range. Since the USEPA's lead cleanup guidance, and the 2001 rule, apply only to residential real property, not to any soil or property, they would not be legally applicable (under the ARARs process) to remediation of contaminated soil under CERCLA. Therefore, the guidance discussed above will be TBC guidance for cleanup of lead, if more appropriate requirements are not established.

*USEPA Superfund Soil Screening Guidance*

Guidance issued on May 31, 1996 (61 FR 27349). The Soil Screening Guidance is presented in three documents: (1) a Quick Reference Fact Sheet (USEPA, 1996a), which provides an overview of the development and use of soil screening levels (SSLs); (2) a User's Guide (USEPA 1996b), which provides details for implementing a simple method for calculating site-specific SSLs; and (3) a Technical Background Document (USEPA 1996c), which presents generic SSLs and the technical foundation of the methods for establishing SSLs. The guidance is intended to be used to screen out areas, exposure pathways, or chemicals of concern from further consideration, assuming certain conditions are present, or to determine that further study is warranted at a site. The agency notes that it is not a rule, does not have the force of a regulation, and should not be interpreted to represent cleanup standards for soil at a site (61 FR 27349, May 31, 1996); therefore, the guidance is not an ARAR or TBC guidance for setting final cleanup standards for soil.

*TCEQ Risk Reduction Rules*

The Texas Commission on Environmental Quality has issued Risk Reduction Standards under Title 30 of the Texas Administrative Code, Chapter 335 - Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S. These standards are provided specifically by §§335.551 - 335.569 (effective September 1, 2003). Appendix II (§335.568) provides a medium-specific concentration (MSC) for lead of 1,000 mg/kg for industrial cleanups. The MSC for lead in soil is based on values calculated by the USEPA using the Lead Uptake/Biokinetic Model, Version 0.4, which has been developed by the USEPA Office of Health and Environmental Assessment. The concentration is formally referred to as the SAI-Ind, or the Soil MSC for Industrial Use Based on Inhalation, Ingestion and Dermal Contact.

The SAI-Ind will be TBC guidance for cleanup of lead. The SAI-Ind is more applicable than the USEPA lead cleanup guidance described above because it is promulgated specifically as a cleanup standard. Therefore, an MSC of 1,000 mg/kg lead is applicable to this project and will serve as the cleanup goal for the site.

### 3.2.3 Location-Specific ARARs

A number of location-specific requirements were considered for potential application to the former Pistol Range. These included Preservation of Archaeological and Paleontological Artifacts, Preservation of Native American Artifacts, Protection of Fish and Wildlife Resources, Protection of Caddo Lake National Wildlife Refuge System, Protection of Wetlands, Protection of Threatened and Endangered Species, and Protection of Floodplains. Of these, only Protection of Floodplains (Executive Order 11988 [*Floodplain Management*, May 24, 1997]) was identified as an ARAR.

# 4.0 Development of Alternatives

## 4.1 Development of Alternatives

This section presents the development and detailed analysis of the removal action alternatives for the former Pistol Range. This section also identifies the volume and area of the contaminated media of concern, and identifies and screens general response actions (GRAs), technologies, and process options that may be appropriate for satisfying the RAO for the former Pistol Range. Select GRAs, technologies, or process options will be carried forward after the initial screening and combined to develop removal action alternatives.

## 4.2 Areas and Volumes Requiring Removal

**Section 2.0** presents the detailed site conditions at the former Pistol Range. Based on available sampling data, the soil at the former Pistol Range has been identified as a medium of concern due to the presence of lead concentrations exceeding the TCEQ SAI-Ind value of 1,000 mg/kg. Lead concentrations exceeding the TCEQ SAI-Ind value were detected in the 0-0.5 foot interval at locations N50,E25; N50,0; and N75,0 and the 0.5-1.0 feet interval at N50,E25. These and other detected results are presented in **Figure 2-6**.

Based on the sampling results, the area of lead contaminated soil exceeding the TCEQ SAI-Ind is estimated to be less than 2,500 $ft^2$. This area is illustrated on **Figure 4-1** as the region bounded by the 1,000 mg/kg concentration contour. The depth of the lead contaminated soil at the former Pistol Range varies from 0.5 foot to 1.0 foot over the contaminated area. Therefore, under an industrial use scenario, the volume of soil at the former Pistol Range that exceeds the SAI-Ind is estimated to be 150 cubic yards (in-place).

## 4.3 Identification of Applicable Technologies

This section identifies and screens technologies that may be appropriate for satisfying the RAO for the former Pistol Range. Technologies were selected for consideration based on technical and regulatory documents (e.g., USEPA, 1999; ITRC, 2003; ITRC, 2005) and experience at other sites. Five technology categories were evaluated, and four were retained for alternative development as shown in **Table 4-1**.

## 4.4 Development of Removal Action Alternatives

Lead exists in soil at the former Pistol Range at levels that exceed the TCEQ SAI-Ind value of 1,000 mg/kg. The remedial technologies were carried forward from the initial screening and are used to form removal action alternatives to address the RAO for the soil. A detailed analysis of these alternatives based on effectiveness, implementability and cost is included in **Section 5.0**. The alternatives to be considered for detailed analysis include the following:

- Alternative 1 – No Action
- Alternative 2 – Land Use Controls
- Alternative 3 – Excavate Soil Exceeding 1,000 mg/kg Lead and Dispose Off Site;

A "No Action" alternative (Alternative 1) is being evaluated as a comparative baseline. A limited action alternative (Alternative 2) will be evaluated to provide an alternative that uses solely land use controls, without intrusive field activities, to prevent human exposure to soil contamination at the former Pistol Range. Alternative 3 seeks to minimize the potential for human exposure to contaminated soils containing lead by removing the soil based on an industrial land use scenario. Since the clean-up level has been selected based on future use of the site as part of a wildlife refuge, Alternative 3 also includes implementation of land use controls to ensure that the site is not used for another purpose in which there is greater potential for human exposure (e.g., residential use).

### *4.5 Description of Removal Action Alternatives*

This section provides a description of each removal action alternative, including an identification and discussion of the technologies that make up the alternative. The description includes any phasing of the work required to facilitate construction, necessary facilities equipment, and construction items. A breakdown of the quantities, dimensions, and sizes of major components of the alternative are provided where possible as a basis for cost estimation.

Because contamination would be left in place indefinitely at the former Pistol Range for Alternatives 2 and 3, land use controls would be common to these alternatives. The land use controls include access controls and surveillance. Access controls may likely include the following:

- **Covenants/Use Restrictions—**Legal restrictions would be made to a property deed if contaminated property is transferred to a non-government owner. These restrictions (e.g., excavation restrictions, and residential/agricultural land use restrictions) would prohibit or restrict property uses that may result in exposure to contaminated soil. For transfers between Federal entities, a notification would be recorded at the Harrison County Courthouse as needed. Documentation of land use restriction would be required under both Alternatives 2 and 3.

- **Administrative controls—**Minimization of worker exposure to on-site contamination would be achieved through training and other administrative procedures that control or otherwise limit the potential activities of maintenance workers at the former Pistol Range. This would be required under Alternative 2.

- **Physical Mechanisms—**Physical mechanisms include physical barriers intended to limit access to property, such as fences and signs. Fencing could be installed at the former Pistol Range to prevent human access to contaminated soils that are present above acceptable levels. Warning signs could also be posted. These would be needed under Alternative 2.

Alternatives 2 and 3 may also include the following inspection and long-term media monitoring activities:

- **Physical inspections—**Scheduled periodic inspections would be performed to assess the condition of physical mechanisms such as fencing and warning signs in Alternative 2. Systematic inspection and documentation protocol would be followed. Any damage to these components would be repaired as required. Under both alternatives, land use would be checked as required to demonstrate compliance with ARARs and the RAO and in support of CERCLA 5-year reviews.

### *4.5.1 Alternative 1 – No Action*

The no-action alternative is provided to serve as a baseline for comparison with the other alternatives. This alternative would leave the contaminated soil in place with no controls to prevent human exposure. No removal actions would be undertaken as part of this alternative to contain, remove, or treat the contaminated soil at the former Pistol Range.

### *4.5.2 Alternative 2 – Land Use Controls*

This alternative involves the implementation of land use controls at the former Pistol Range to prevent exposure of the future maintenance worker to contaminated soil above permissible levels, but would not provide containment, removal or treatment of the contaminated soil. Land use controls would be maintained to prevent human exposure to soil in those areas where lead remains at concentrations exceeding the TCEQ SAI-Ind value of 1,000 mg/kg through access controls (i.e., legal restrictions, administrative controls, and physical mechanisms such as fencing or warning signs). Land use controls would limit subsurface activities such as drilling and excavation in the designated area. Controls would also restrict future land use at the former Pistol Range, including areas less than the SAI-Ind, to industrial purposes since soil contamination above residential cleanup levels would remain at the site.

Long-term operational requirements under this alternative would be minimal, and would involve surveillance activities and maintenance of the land use controls. Effectiveness of the controls would be evaluated and documented in 5-year reviews. A period of 30 years has been assumed for surveillance and maintenance for cost estimation purposes.

### *4.5.3 Alternative 3 – Excavation and Off-site Disposal, Land Use Controls*

This alternative involves the removal of soil at the former Pistol Range containing lead concentrations exceeding the TCEQ SAI-Ind value of 1,000 mg/kg from the areas illustrated on **Figure 4-1** by excavation, and the subsequent transport of these soils to an appropriately licensed off-site facility for disposal. This alternative also involves the implementation, documentation, and management of land use controls (LUCs) to restrict activities other than those fitting the definition of industrial use since soil contamination above residential cleanup levels would remain at the site. No fencing or signs would be installed under this alternative since soil with lead concentrations exceeding the TCEQ SAI-Ind value would be permanently removed from the site. However, the site would be subject to 5-year reviews to confirm the effectiveness of the LUCs to prohibit unrestricted use.

The quantity of lead-contaminated soils requiring excavation is estimated to be approximately 375 tons. Excavation would proceed until confirmatory analysis has determined that all lead contamination above the TCEQ SAI-Ind value of 1,000 mg/kg has been removed. Excavation would be accomplished by utilizing conventional earth moving equipment. It is assumed for scoping and costing purposes that sheet piling or other shoring methods would not be required to maintain the integrity of the excavation areas during excavation activities due to the limited depth of the excavation (1 ft bgs).

The initial excavation limits would be established based on the existing data. Once the excavation areas have been delineated, removal of shrubs and other vegetative cover within the excavation areas would commence. However, trees of greater than 4-inch diameter will be left in place. Clearing of the vegetation would be conducted using conventional equipment. The contaminated soils would then be excavated, stockpiled and transported to a disposal facility. Preliminary TCLP testing conducted on composite soil samples obtained by Shaw has shown that the lead contaminated soils from the former Pistol Range exhibited TCLP-leachable lead levels above the RCRA Toxicity Characteristic Level of 5.0 mg/L. For cost estimating purposes, it was assumed that all excavated materials would be transported to a RCRA Subtitle C permitted disposal facility and disposed per applicable regulations as hazardous waste. However, facilities offering treatment followed by non-hazardous disposal would also be considered at that time. Upon completion of the soil removal, the excavation area would be graded to match surrounding topography and promote drainage. Clean soil would be imported, if necessary, to fill depressions. The area would be compacted to restore the site to the conditions specified in the approved work plan. Topsoil would be added, seeded, and mulched as required. Erosion control matting would be used on steep slopes.

The following details the major components of this alternative:

***Reporting and Work Plans.*** Site-specific work plans would be completed prior to remediation activities that would include a quality assurance project plan, health and safety plan, sampling and analysis plan, and remediation work plan. The plans will be reviewed and approved by the USACE, BRAC, USEPA, and TCEQ prior to removal activities. After the removal action has been completed, a Closure Report would be prepared. The report would include site drawings, sample data, copies of all bills of lading, and a detailed narrative of the removal action.

***Site Set-up.*** Site set-up for the excavation would include setting up a decontamination station. The equipment decontamination station would be constructed with material such as high-density polyethylene for containment purposes. This decontamination station would be bermed to ensure containment of any decontamination liquids. Since the only water needs are for decontamination, water would be trucked to the site and stored in a portable tank.

The area to be excavated would be established prior to mobilization of the excavation personnel. It is anticipated that the existing XRF sample results would be used to identify the initial limits of excavation.

***Health and Safety.*** Health and safety measures would be taken to protect on-site workers during excavation activities. For cost estimating purposes, modified Level D personal protective equipment and decontamination equipment has been assumed. It was also assumed that an industrial hygienist would be required on-site during construction activities.

***Clearing and Grubbing.*** Large numbers of bullets or casings have not been observed during investigations at the former Pistol Range. Such "source" material may be hidden by vegetation, and could bias any confirmation sampling. Therefore, small vegetation and vegetation debris will be removed from the area to be excavated and a surrounding zone of approximately 25 feet. The area will be sprayed with a defoliant to destroy any hazardous vegetation (e.g., poison ivy), and then will be cleared using conventional equipment, such as brush mowers and weed eaters. Larger shrubs will be left in place where practical; no trees over 4-inch diameter would be removed. The area will be raked by mechanical equipment and/or by hand to remove vegetative debris and allow visual observation of the ground surface. Unless it contains soil, the vegetative debris will be stockpiled on site and allowed to decay naturally. If portions of the vegetative debris contain soil, that material will be disposed with the soil from the excavation.

***Excavation and Off-Site Disposal.*** Excavation would be performed using conventional equipment such as backhoes, excavators, and/or loaders. The project team will first inspect the cleared area for evidence of bullet pockets or other range debris (e.g., casings). Such isolated locations will be excavated until no further debris or bullet fragments are observed. Then the project team will proceed to excavate the pre-designated limits of excavation (**Figure 4-1**). Because XRF results tended to slightly underestimate the laboratory results for soil lead concentrations (see **Section 2.6**), the work plan will address isolated sample locations near the cleanup level (e.g., N75,E25-lower, which had an XRF lead result of 750.8 mg/kg) by expanding the excavation to include them or specifying confirmation samples at such locations. Excavated material will be segregated in separate stockpiles or roll-off containers based on the suspected level of contamination. One composite sample will be collected for approximately each 100 tons of excavated material and submitted to an off-site laboratory for TCLP metals analysis to confirm whether or not the soil is classified as a hazardous waste. Based on waste classification, the soil will be loaded and transported by truck to the appropriate permitted disposal facility. For estimating purposes in this EE/CA, it is assumed that all the material will be hazardous.

Water would be supplied on site during excavation activities for decontamination and dust suppression. Decontamination liquids would be stored in a portable tank for subsequent disposal. Following waste characterization analysis, the liquid would be disposed at an off-site hazardous waste facility if found to be hazardous, or at the groundwater treatment plant at LHAAP-18/24 if determined to be non-hazardous.

Excavation and soil handling activities would be performed utilizing standard health and safety practices in order to minimize airborne particle generation and exposure pathways which might place workers at risk. Particulate air monitoring would be conducted in work areas to determine if airborne emissions exceed acceptable levels.

***Confirmation Sampling.*** Confirmation sampling would be conducted concurrently with excavation activities to document that the remaining soils meet established cleanup levels. Excavation would continue until the TCEQ SAI-Ind value of 1,000 mg/kg has been met. It is estimated that ten samples (five on the floor, four from the sides, and one field duplicate) would be collected during excavation activities and sent to an off-site laboratory for lead analysis.

***Site Restoration.*** Once the excavation has been completed, the excavation area would be graded to match the original topography and ensure positive drainage and then compacted. Clean fill would be imported if needed. Erosion control matting would be applied over the excavated portion of the embankment. Upon completion of site restoration operations, any temporary construction facilities would be removed from the area.

The estimated length of time for construction activities including site setup, clearing and grubbing, excavation, disposal, confirmatory sampling, waste characterization and site restoration is approximately 2½ weeks.

## *4.6 Action-Specific ARARS*

Action-specific ARARs include operation, performance, and design requirements or limitations based on the waste types, media, and remedial activities. This section provides a preliminary identification and evaluation of potential federal and state of Texas action-specific ARARs for the proposed removal action alternatives at the former Pistol Range.

The removal action alternatives other than the no action alternative involve one or more of the following activities: site preparation, construction, and excavation activities; waste characterization, staging, transportation, and disposal activities; and land use controls and monitoring. Action-specific ARARs are discussed here for the removal action alternatives retained for the former Pistol Range.

### 4.6.1 Site Preparation, Construction, and Excavation

Certain on-site preparation, construction, and/or excavation activities will be necessary under Alternative 3, including clearing and grubbing and soil-moving activities. Control of fugitive emissions during implementation of these activities may be required.

Airborne particulate matter resulting from construction, demolition, or excavation activities is subject to the fugitive dust and opacity limits listed in 30 TAC 111, Subchapter A. No person may cause, suffer, allow, or permit visible emissions from any source to exceed an opacity of 30 percent for any 6-minute period [30 TAC 111.111(a)]. Reasonable precautions must also be taken to achieve maximum control of dust to the extent practicable, including the application of water or suitable chemicals or the complete covering of materials (30 TAC 111.143 and 30 TAC 111.145).

Texas has also promulgated general nuisance rules for air contaminants mandating that no person shall discharge from any source whatsoever one or more air contaminants, or combinations thereof, in such concentration and of such duration as are or may tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property (30 TAC 101.4).

Stormwater discharges from construction activities that disturb equal to or greater than 1 acre of land must comply with the substantive requirements of a National Pollutant Discharge Elimination System general permit (40 CFR 122.26; 30 TAC 205, Subchapter A; and 30 TAC 308.121). This requirement is not applicable at the former Pistol Range because the areal extent of contamination is less than one acre.

### 4.6.2 Waste Characterization, Staging, Transportation, and Disposal

The soil has the potential to be RCRA characteristically hazardous waste. All solid waste [defined as any solid, liquid, semisolid, or contained gaseous material intended for discard (40 CFR 261.2)] generated during removal action activities must be appropriately characterized to determine whether it contains RCRA hazardous waste [40 CFR 262.11; 30 TAC 335.62; 30 TAC 335.503(a)(4); 30 TAC 335.504]. Excavated environmental media—including soil excavated during the installation of monitoring wells or as part of a removal action—may be consolidated on site in a staging area before being sent off site for disposal.

For Alternative 3, in which contaminated soil would be excavated and sent to an off-site permitted disposal facility, any wastes or contaminated media classified as hazardous and transferred off-site or transported in commerce along public rights-of-way must meet U.S. Department of Transportation requirements for hazardous materials as well as the specific requirements for the type of waste (e.g. RCRA, solid waste). These include packaging, labeling, marking, manifesting, and placarding requirements for the specific waste type. In addition, all wastes sent off site must also meet the Texas waste acceptance criteria for disposal facilities (30 TAC 451, Subchapter B). None of these standards are ARARs since, pursuant to the NCP, ARARs only pertain to on-site actions. These requirements are, however, legally applicable to off-site actions, and compliance is required with both the administrative and the substantive parts of the regulations. In addition, CERCLA, Section 121(d)(3), provides that the off-site transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be sent to a treatment, storage, and disposal facility that is in compliance with applicable federal and state laws and has been approved by USEPA for acceptance of CERCLA waste (40 CFR 300.440 et seq.). Accordingly, the U.S. Department of Defense will need to verify with the appropriate USEPA regional contact that any needed off-site facility is acceptable for receipt of CERCLA wastes before transfer.

### *4.6.3 Land Use Controls and Long-Term Monitoring*

Some combination of deed restrictions (if property becomes owned by a non-government entity), restrictive covenants, administrative controls, physical barriers, physical surveillance or other controls will be necessary under Alternatives 2 and 3 to restrict access to contamination and protect human health and the environment because none of the alternatives actively reduce soil contamination to levels that would allow unrestricted access and use of the property.

When engineering or land use control measures are required to protect human health and the environment, 30 TAC 335.565 requires compliance with the identified post-closure care requirements and deed recordation of the facility in accordance with Sections 335.566(b) through (e). The deed recordation must include a description of post-closure measures required and any land use controls placed on the future use of the property, as well as a metes and bounds description of the tract of land. Some or all of these requirements may be ARARs for this remedial measure; the specific combination of controls negotiated for this measure will be listed in a signed Action Memorandum.

Texas has also promulgated standards in 30 TAC 335, Subchapter P, for the placement of warning signs on property contaminated with hazardous substances when such contamination presents a danger to public health or safety. Warning signs can be removed when it is determined that no further hazard to the public health and safety exists.

**Table 4-1**
**Technology Screening for the Former Pistol Range**

| Category | Description | Retained | Reasoning |
|---|---|---|---|
| No Action | No Action provides a baseline for comparison. | Yes | No Action does not prevent exposure to contaminated soil. Retained to serve as a baseline for comparison. |
| Land Use Controls | Application of access controls such as land use restrictions, deed notices, and fencing or signs to protect human health through management of potential risk. Also may include physical surveillance to ensure integrity of the fencing/signage to verify compliance with RAO. | Yes | Land Use Controls can be effective in reducing potential exposure to contaminated soil. |
| Capping | Addition of an engineered cover system over the area of contaminated soil to prevent contact, minimize infiltration, and prevent erosion. Capping would be supported by land use controls and perpetual maintenance. | No | Capping can be effective in reducing potential exposure to contaminated soil. However, infiltration and erosion have not proved to be environmental issues at the Former Pistol Range. Thus capping would offer little more protectiveness than land use controls alone, while requiring LUCs (both physical and administrative) to be implemented. |
| Removal | Physical removal of contaminated materials utilizing conventional earth moving equipment. The primary removal technology is excavation. | Yes | Excavation would be effective for removal of lead contaminated soil and can easily be implemented with commercially available equipment. |
| Treatment | Stabilization, physical treatment, and biological treatment to meet waste acceptance criteria of the designated disposal facility. Process options include reagent-based stabilization, soil-washing, screening of bullet fragments/debris, and phytoremediation. | No | Due to small volume, any treatment would be performed in conjunction with disposal and does not need to be evaluated separately. Screening not likely to be effective due to limited bullet fragments/debris observed at site. |
| Disposal | Off-site disposal of excavated soil at either a RCRA Subtitle C landfill facility if the soil is classified as hazardous or a RCRA Subtitle D permitted disposal facility if the soil is non-hazardous. | Yes | RCRA Subtitle C permitted disposal facility retained since excavated soil is likely to be classified as hazardous. |

Abbreviations:

GRA General Response Action
RAO removal action objective
RCRA Resource Conservation and Recovery Act


## LEGEND

- XRF Sediment Sample Location
- XRF Sample Location
- Lead Concentration Contour
- Stream
- Road
- Approximate Firing Line Location
- 25-foot Grid
- Target Embankment
- Pistol Range

NOTES:

1. LOD is level of detection.
2. Lead concentrations are in milligrams per kilogram.
3. 1000 contour is boundary of area of removal.

0 20 40 80 Feet

Shaw

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 4-1

EXTENT OF LEAD IN SOIL
FORMER PISTOL RANGE

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

| OFFICE | DRAWN BY | CHECKED BY | APPROVED BY | FILE PATH |
|---|---|---|---|---|
| Houston, TX | GWT 1/09/07 | N. Olson 04/09/08 | G. Jones 02/24/09 | T:\GIS\Longhorn\MXD\PR\EECA\PistolRange_XRF_Data.mxd |

Plot Date: 02/09

00071270

# 5.0 Analysis of Removal Action Alternatives

The analysis of removal action alternatives provides the basis for selecting an alternative and preparing an action memorandum. **Section 5.1** provides an overview of the three criteria (effectiveness, implementability and cost) against which the removal action alternatives are evaluated. The analysis begins with an individual evaluation of each alternative according to the evaluation criteria. The individual analysis is presented in **Section 5.2**. Following the individual analyses, the alternatives are compared to one another, highlighting the key advantages, disadvantages, and trade-offs that would affect the selection of an alternative.

## 5.1 Evaluation Criteria

Each removal action alternative is evaluated according to its effectiveness, implementability and cost. These criteria are defined as follows:

- **Effectiveness.** This evaluation criterion assesses the degree of protection to human health and the environment provided by an alternative. The evaluation determines if the alternative achieves the RAOs and explains how the alternative reduces, eliminates, and/or controls risks posed by each of the potential exposure pathways identified for the site. Compliance with ARARs is also assessed along with the potential effects the construction and implementation of the alternative may have on human health and the environment (e.g., what are the risks to worker health and safety). Factors to be evaluated include protection of the workers and the community during the implementation of removal actions, environmental impacts resulting from the implementation of the removal actions, and the length of time required to implement the action.

- **Implementability.** This evaluation criterion assesses the technical and administrative feasibility of implementing an alternative. Technical feasibility addresses the difficulties and unknowns associated with a technology, the reliability of a technology, the ease of undertaking future removal actions, and the ability to monitor the effectiveness of the system. Administrative feasibility refers to the activities required to coordinate with regulatory agencies and the availability of equipment and services.

- **Cost.** This criterion evaluates the capital, and operation and maintenance (O&M) costs associated with an alternative. Present worth analysis is used to evaluate expenditures that occur over multiple years (maximum 30 years).

## 5.2 Analysis of Removal Action Alternatives

The following sections provide individual evaluations for each removal action alternative.

### *5.2.1 Alternative 1 – No Action*

**Effectiveness:** Alternative 1, no action, provides no control of human exposure to the contaminated soil at the former Pistol Range. The no action alternative does not actively reduce the COC concentration in soil to the cleanup goal and, therefore, does not achieve the RAOs.

Under this alternative, COC concentrations would remain at levels exceeding cleanup levels; therefore, this alternative does not comply with the chemical-specific ARARs. Since no remedial activities would be conducted under this alternative, action-specific and location-specific ARARs would not apply. Because the no-action alternative does not involve any active removal measures, no short-term risks to the community, workers or the environment would exist.

**Implementability:** This criterion does not apply because no removal action would be taken as part of this alternative.

**Cost:** No capital or O&M costs would be associated with this alternative because no removal activities would be conducted.

### *5.2.2 Alternative 2 – Land Use Controls*

**Effectiveness:** The implementation of LUCs at the former Pistol Range would prevent unacceptable human exposure to soil and groundwater contaminants through physical, legal, and administrative mechanisms and, therefore, would be protective of human health. Physical mechanisms would include fencing and warning signs to warn of soil contamination, specifically in those areas where lead remains at concentrations exceeding the TCEQ SAI-Ind value of 1,000 mg/kg. Legal mechanisms would protect potential current and future human receptors through deed and zoning restrictions which would restrict use of the area exceeding SAI-Ind; this portion of the site would not be available for either industrial or residential use. Administrative mechanisms would ensure the LUCs are maintained and inspected effectively. This alternative would achieve the RAO for the former Pistol Range.

Alternative 2 would comply with chemical-specific ARAR (the TCEQ SAI-Ind value of 1,000 mg/kg for lead) by preventing contact with the contaminated soil. However, this alternative is not fully compatible with use of the site as a wildlife refuge. While most of the site would be accessible by maintenance workers, the restricted (greater than GW-Ind) areas would not be. The activities that would be conducted under this alternative would comply with all location-specific ARARs since no activities would take place in sensitive environments such as wetlands, and no impacts to archeological resources or threatened and endangered species are anticipated. The activities that would be conducted under this alternative would comply with all action-specific ARARs.

This alternative is protective of the surrounding community during remedy implementation primarily because all activities would occur on site with very little disturbance of contaminated material. No significant short-term risks to workers or the environment would exist during implementation of this alternative.

**Implementability:** All components of this alternative are readily implementable. Minimal technical concerns exist that would hinder the implementation of this alternative because no removal activities would be performed under this alternative. However, routine inspection and maintenance of the LUCs would be required. All services and materials are readily available to conduct the inspection and maintenance of LUCs for this alternative. LUCs, although administratively implementable, would require the following: development of an implementation plan; a site approval process to approve land-use changes to ensure the integrity of the controls, the installation of fencing and markers to identify areas of restricted use, training of appropriate personnel regarding the location and care of the controls, and internal notices to relevant regulatory offices of the existence of the LUCs. Approval by the USEPA and the State of Texas is required prior to the modification or termination of LUCs, implementation actions, or modification of land-use by the Army. The Army shall also seek concurrence from the USEPA and the State of Texas prior to any action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs.

**Cost:** The total present worth cost of this alternative is $285,000, the capital cost portion being $84,000. These costs are itemized in **Appendix F**.

### *5.2.3 Alternative 3 – Excavation and Off-site Disposal; Land Use Controls*

**Effectiveness:** This alternative involves the complete removal and off-site disposal of soil containing lead at levels that exceed the TCEQ SAI-Ind value of 1000 mg/kg, and would therefore be consistent with the future use of the former Pistol Range as a wildlife refuge. The implementation, documentation, and management of LUCs at the former Pistol Range would protect human health by restricting activities other than those fitting the definition of industrial use since soil contamination above residential cleanup levels would remain at the site. This alternative complies with chemical-specific ARARs for soil. This alternative would comply with all action-specific and location-specific ARARs through proper planning and management, and the implementation of engineering controls. This alternative would achieve the RAO for the former Pistol Range.

This alternative would involve the execution of construction activities (e.g., excavation, material stockpiling, and material load-out) that may pose short-term risks to worker health and safety. Potential risks to workers include those generally associated with construction activities (e.g., slip/trip/fall and equipment operation hazards). The handling of contaminated soils involved with this alternative increases the potential for workers to be exposed to contaminants through either ingestion or inhalation of airborne particles. The use of dust control measures, air monitoring, and adequate personal protective equipment may minimize such risks. With the exception of heavy truck traffic during material transport to the disposal facility, the local community would not be significantly impacted by remediation activities.

**Implementability:** All components of this alternative are readily implementable. This alternative involves soil excavation, stockpiling, and off-site disposal which are well developed, proven, and conventionally used methods. Conventional earthwork equipment is provided by many vendors and is readily available. Further, excavation may easily be performed to depths below the expected limit of contamination.

LUCs, although administratively implementable, would require the following: development of an implementation plan; a site approval process to approve land-use changes to ensure the integrity of the controls, training of appropriate personnel regarding the location and care of the controls, and internal notices to relevant regulatory offices of the existence of the LUCs. Approval by the USEPA and the State of Texas is required prior to the modification or termination of LUCs, implementation actions, or modification of land-use by the Army. The Army shall also seek concurrence from the USEPA and the State of Texas prior to any action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs.

**Cost:** The total present worth cost of this alternative is $381,000, the capital cost portion being $283,000. These costs are itemized in **Appendix F**.

## *5.3 Comparative Analysis of Removal Action Alternatives*

This chapter presents a comparative analysis of the removal action alternatives to evaluate the relative performance of each alternative with respect to the three evaluation criteria (effectiveness, implementability and cost) as presented in **Section 5.1**. The purpose of this analysis is to determine the advantages and disadvantages of each alternative, which will ultimately provide the rationale for recommending a preferred alternative.

### *5.3.1 Effectiveness*

Each of the alternatives provides varying levels of human health protection. Alternative 1, No Action, does not achieve the RAOs and provides the least protection of all the alternatives; it provides no reduction in risks to human health because no measures would be implemented to eliminate the pathway for human exposure to soil. Furthermore, Alternative 1 does not actively reduce contaminant concentrations in soil to the cleanup goals.

Alternatives 2 and 3 both satisfy the RAO for the former Pistol Range. Alternative 2 relies on LUCs and does not provide contaminant removal or treatment, but would be protective of human health because LUCs would prevent unacceptable human exposure to soil contaminants through physical, legal, and administrative mechanisms. Alternative 3 provides a higher level of overall protection than Alternative 2 by excavating lead contaminated soils above the cleanup level and transporting them to an off-site disposal facility. Under Alternative 3, LUCs would further protect human health by restricting activities other than those fitting the definition of industrial use since soil contamination above residential cleanup levels would remain at the site. However, Alternative 2 is not fully compatible with future use as a wildlife refuge since it would restrict maintenance worker access to certain portions of the former Pistol Range.

Alternative 1 does not comply with the chemical-specific ARAR because no removal action or measures would be implemented. Alternative 2 and Alternative 3 would comply with the chemical-specific ARAR for soil. Location-specific and action-specific ARARs would not apply to Alternative 1 since no remedial activities would be conducted. Alternatives 2 and 3 would comply with location-specific and action-specific ARARs.

Because Alternative 1 does not involve any removal measures, no short-term risk to workers or the community would exist. The activities associated with Alternative 2 would have little potential for short-term risk to workers. The components of Alternative 3 may pose potential short-term risks to worker health and safety that are associated with construction activities and handling of contaminated soils. The use of engineering controls, dust control measures, air monitoring, and adequate personal protective equipment may minimize such risks. With the exception of truck traffic during material transport to the disposal facility, the local community would not be significantly impacted by remediation activities.

### *5.3.2 Implementability*

This criterion does not apply to Alternative 1, No Action, because no removal action would be taken as part of this alternative. Alternative 2 is easily implemented because no removal activities would be performed, although routine maintenance of the LUCs and sampling would be required. Alternative 3 is also implementable, although less easily than Alternative 2. From a technical standpoint, the excavation, stockpiling, material transport and sampling components of Alternative 3 are well developed, proven, and conventionally used. Administratively, all of the alternatives are implementable.

All services and materials are readily available to conduct the inspection and/or maintenance of LUCs for Alternatives 2 and 3.

### *5.3.3 Cost*

Cost estimates are used in this EE/CA to eliminate those removal alternatives that are significantly more expensive than others without offering commensurate increases in performance or overall protection of human health. The cost estimates developed are preliminary estimates. Final costs will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final scope, final schedule, final engineering design, and other variables.

Costs developed are capital costs and long-term O&M costs. Overall 30-year present worth costs are developed for each alternative assuming a discount rate of 7 percent. Total project present worth costs for each alternative are presented in **Appendix F**.

The progression of present worth costs from the least expensive alternative to the most expensive alternative is as follows: Alternative 1, Alternative 2, and Alternative 3.

No cost is associated with Alternative 1 because no removal activities or LUCs would be implemented to address soil and groundwater contamination at the site. The highest present worth and capital cost is associated with Alternative 3 because it involves the complete off-site disposal of contaminated soil exceeding the lead cleanup level.

# 6.0 Conclusions and Recommendations

This section presents the recommended removal action alternative for the former Pistol Range. This action is expected to protect human health and the environment from soil contamination at the site. As presented in **Section 3.2**, a specific RAO was developed. This RAO serves as the basis for formulating the removal action alternatives in this EE/CA, and is consistent with the reasonably anticipated future use of the Pistol Range as a wildlife refuge.

Evaluation of investigation and modeling results for the former Pistol Range revealed the following:

- Surface and near-surface soil at and near portions of the target embankment are contaminated with lead at levels exceeding the SAI-Ind.
- Sediment, surface water, and groundwater have not been adversely impacted.
- Vertical migration of lead will not cause the groundwater to exceed the GW-Ind (i.e., the maximum contaminant level) for lead in the future.
- If excavated, soil exceeding the SAI-Ind will also likely be a RCRA hazardous waste due to lead contamination.

Based on the detailed analysis of remedial alternatives presented in **Section 5.0**, Alternative 3, Excavation and Off-site Disposal with Land Use Controls, most appropriately addresses the soil contamination at the former Pistol Range in a manner that is cost-effective and consistent with future land use as a wildlife refuge. Alternative 3 would be protective of the future maintenance worker because it completely removes and disposes soils containing lead at concentrations that exceed the TCEQ SAI-Ind. The implementation of LUCs at the former Pistol Range would protect human health by restricting land uses to those fitting the industrial land use definition since the site would still encompass limited areas where unrestricted use would be unacceptable due to local lead concentrations. The removal of lead contaminated soil above the industrial cleanup level would preclude the necessity for physical mechanisms such as fencing to prevent human access and/or exposure to these soils, and the necessity for inspection/maintenance of the physical mechanisms over the long term. Alternative 3 satisfies the RAO for the former Pistol Range, and complies with chemical-specific ARAR for soil. It would also comply with action-specific and location-specific ARARs specific to the components of the alternative, provided proper planning and management, and engineering controls are implemented. Alternative 3 is highly implementable because the equipment and materials to conduct the remedial activities are readily available and proven. Because it meets the RAO, complies with ARARs, and is fully compatible with future use of the site, Alternative 3 will serve as a final action for the former Pistol Range.

# 7.0 Community Involvement

To disseminate information about the former Pistol Range and promote community involvement in the removal action selection process, the following actions will be implemented:

- The EE/CA will be placed in the Administrative Record
- A public comment period will be held for 30 calendar days, during which Longhorn Army Ammunition Plant will accept written and oral comments on the EE/CA
- The public comment period will be announced in the media
- A public meeting will be held in conjunction with the comment period
- Significant comments and written responses will be placed in the Administrative Record

# 8.0 References

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# *Appendix A*

# *Boring Log and Well Construction Diagram*

HOLE NO. PRWW01

00071281

| BORING LOG | DIVISION Houston Federal | INSTALLATION LHAAP | SHEET 1 OF 3 SHEETS |
|---|---|---|---|
| 1. PROJECT LHAAP | | 9. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL | |
| 2. LOCATION Karnack, Texas | | 10. MANUFACTURER'S DESIGNATION OF DRILL CME-75 | |
| 3. DRILLING AGENCY Jedi Drilling | | 11. OVERBURDEN SAMPLES | DISTURBED / UNDISTURBED Yes |
| 4. HOLE NO. (As shown on drawing title and file number) PRWW01 | | 12. TOTAL NUMBER CORE BOXES / 13. ELEVATION GROUND WATER | |
| 5. NAME OF DRILLER Oscar Garcia | | 14. DATE HOLE | STARTED 9/5/07 COMPLETED 9/5/07 |
| 6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED 0° DEG. FROM VERT. | | 15. ELEVATION TOP OF HOLE | |
| 7. TOTAL DEPTH OF HOLE 34' | | 16. TOTAL CORE RECOVERY FOR BORING % | |
| 8. SIZE AND TYPE OF BIT 8" O.D. HSA, 2" Split Spoon | | 17. LOGGED BY A. Willmore | QC |

| PID (ppm) a | DEPTH b | USCS c | CLASSIFICATION OF MATERIALS (Description) d | % CORE RECOVERY e | SAMPLE f | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g |
|---|---|---|---|---|---|---|
| 0.0 | | CL | CLAY, SILTY, LOW TO MEDIUM PLASTICITY, SOFT, MOIST, REDDISH-BROWN | 50% | | SURFACE SOIL MOIST DUE TO RAIN |
| 0.0 | 5 | SC | SAND, CLAYEY, DENSE, MEDIUM-SOFT, MOIST, GRAY w/ RED IRON-STAINING | 100% | | |
| | | | CLAY, SANDY, MEDIUM PLASTICITY, MILDLY STIFF, GRAY w/ RED IRON STAINING, DRY | | | |
| 0.0 | | | | 100% | | |
| 0.8 | 10 | | -BECOMES SILTY, ~~HIGHER~~ ~~PLASTICITY~~ | 100% | | |

00071282

| DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | Hole No. PRWW01 |
|---|---|---|
| PROJECT LHAAP | INSTALLATION LHAAP | SHEET 2 OF 3 SHEETS |

| PID | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|---|---|---|---|---|---|---|
| a | b | c | d | e | f | g |
| 0.0 | | | SAME AS ABOVE | 100% | | |
| 0.0 | 15 | CL | | 100% | | |
| 0.0 | | | - LESS IRON STAINING | 100% | | |
| 0.0 | 20 | | | 100% | | |
| 0.0 | 25 | SC | SAND, CLAYEY, DENSE, POORLY TO MODERATELY SORTED, GRAY, WET | 100% | | |
| 0.0 | | CL | CLAY, SANDY, MEDIUM PLASTICITY, STIFF, GRAY, DRY TO SLIGHTLY MOIST<br>- BECOMES SILTY, HARD | 100% | | |
| 0.0 | | | | 100% | | |

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PROJECT | HOLE NO.

00071283

| DRILLING LOG (Cont Sheet) | ELEVATION TOP OF HOLE | Hole No. PRWW01 |
|---|---|---|
| PROJECT LHAAP | INSTALLATION LHAAP | SHEET 3 OF 3 SHEETS |

| PID ELEVATION | DEPTH | LEGEND | CLASSIFICATION OF MATERIALS (Description) | % CORE RECOVERY | BOX OR SAMPLE NO. | REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) |
|---|---|---|---|---|---|---|
| a | b | c | d | e | f | g |
| 0.0 | 30 | SC | SAND, CLAYEY, MOIST, DENSE, MODERATE SORT, REDDISH BROWN | 100% | | |
| 0.0 | 34 | CL | CLAY, SANDY, MED. PLAST., STIFF TO HARD DRY, GRAY w/ RED IRON STAINING | 100% | | |
| | | | END OF BORING @ 34' bgs. GROUTED HOLE w/ BENTONITE TO 33' TO SET WELL | | | GROUTED HOLE w/ BENTONITE TO 33' BGS TO SET WELL. |

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MAR 71

PROJECT | HOLE NO.

PRWW01

00071284

# WELL COMPLETION FORM (Stickup or Above Grade Completion Well)

FIELD REPRESENTATIVE: A. Willmore

DRILLING CONTRACTOR: JEDI

DRILLING TECHNIQUE: HSA
AUGER SIZE AND TYPE: 8" Auger

BOREHOLE IDENTIFICATION: PRWW01
BOREHOLE DIAMETER: 8"
WELL IDENTIFICATION: PRWW01

WELL CONSTRUCTION START DATE: 9/5/07
WELL CONSTRUCTION COMPLETE DATE: 9/5/07

SCREEN MATERIAL: SCH 40 PVC
SCREEN DIAMETER: 2"
STRATUM-SCREENED INTERVAL (FT): 10'

CASING MATERIAL: SCH 40 PVC
CASING DIAMETER: 2"

TYPE OF FILTER PACK: 20/40 SILICA SAND
GRADIATION: 20/40
AMOUNT OF FILTER PACK USED: 5 - 50 lb bags

TYPE OF BENTONITE: pellets
AMOUNT BENTONITE USED: ~12.5 lbs

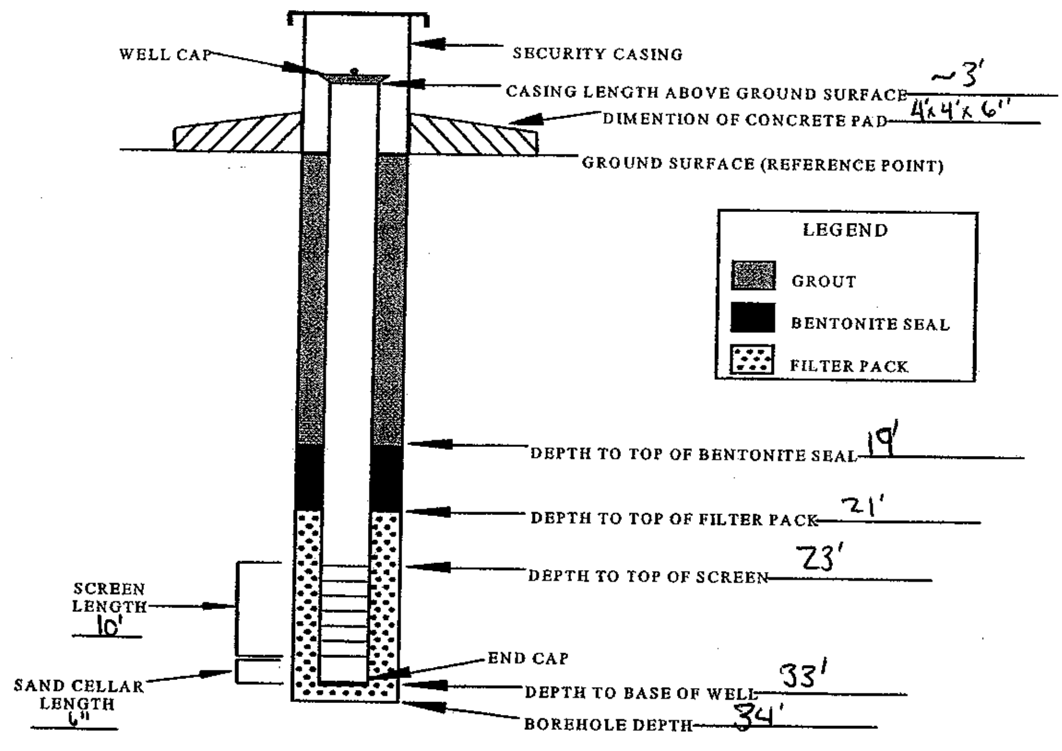
TYPE OF CEMENT: PORTLAND - CEMENT
AMOUNT CEMENT USED: 6 - 94 lb bags
GROUT MATERIALS USED: slurry

DIMENSIONS OF SECURITY CASING: 6" x 6"

TYPE OF WELL CAP: 2" well plugging cap
TYPE OF END CAP: SCH. 40 PVC

COMMENTS:

SPECIAL CONDITIONS
(describe and draw)




NOT TO SCALE

INSTALLED BY: Oscar Garcia - JEDI INSTALLATION OBSERVED BY: Allen Willmore - Shaw

DISCREPANCIES:

# *Appendix B*

## *1995 TCLP Analyses*

00071286

Complete
Environmental Service
Hwy. 134 @ Spur 449 - P.O. Box 170 - Karnack, Texas 75661
Ph 903-679-3448 Fax 903-679-3357 E-mail ces@shreve.net

WRC-04-GWTP05-CES-102
July 6, 2004

Rose M. Zeiler
LHAAP Site Manager
Department of the Army
Box 3, B1440
Fort Chaffee, AR 72905
Ph.# (479)484-2516
Fax# 479-484-2055

**Reference:** **Contract No. DACA56-00-C-2014**
**Operation and Maintenance of the Groundwater Treatment Plant**
**Longhorn Army Ammunition Plant, Karnack, Texas**

**Subject:** **Data from samples at Pistol Firing Range**

Dear Ms. Zeiler:

At the March TRC meeting I had mentioned that we had once collected soil samples from the LHAAP Pistol Firing Range. Six samples were collected on June 21, 1995 and a subsequent sample was collected on November 11, 1995. Provided are the laboratory analysis and COC for those samples. A sketch depicting the sample locations is also provided.

Basically, the contamination from lead at the site is limited to surface contamination where the spent lead bullets are located. Samples collected from twelve inches depth into the clay embankment or beneath the fragments were ND or had concentrations up to .46 mg/L. Samples of clay mixed with the spent lead fragments had concentrations up to 1100 mg/L for lead.

Please contact me at (903)679-3448 if you have any questions or require additional information.

Sincerely,

William R. Corrigan III

William R. Corrigan III
GWTP Manager
*Complete Environmental Service*

cf: CESWT-EC-ER, Cliff Murray
CES File - LHAAP

Encl. Analab Sample reports 300951 through 300956 and 311636
Sketch of Sample Locations at LHAAP Pistol Firing Range

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P. O. BOX 9000 – KILGORE, TEXAS 75663-9000 – 903/984-0551 – FAX 903/984-5914

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**TEST REPORT: 300951**

Thiokol Corporation
ATTN: Procurement
P.O. Box 1029
Marshall, TX 75671
Attention: Bill Corrigan

**Sample Identification:** FR-1
**Collected By:** W.R.Corrigan
**Date & Time Taken:** 06/21/95 0800

**Other Data:** 12" dp-horizontal into bank
**Bottle Data:**

- #01 - Unpreserved Plastic
- #02 - TCLP Extract
  Derived in lab from: 01 (100 G)
- #03 - TCLP Extract for Metals
  Derived in lab from: 02 (500 ML)
- #04 - TCLP Extract for Metals
  Derived in lab from: 03 (50 ML)
- #05 - ICP Digestion
  Derived in lab from: 04 (50 ml)
- #06 - ICP Digestion
  Derived in lab from: 04 (50 ml)

**Sample Matrix:** Soil
**Report Date:** 06/27/95 **Received:** 06/21/95 **Client:** THK1

| PARAMETER | RESULTS | UNITS | ANALYZED | EQL | METHOD | BY |
|---|---|---|---|---|---|---|
| TCLP Lead (Reg. Limit 5.0) | ND | mg/l | 1557 06/26/95 | 0.1 | EPA Method 6010 | TFC |

## Sample Preparation Steps for 300951

| | | | | | |
|---|---|---|---|---|---|
| TCLP Extraction: Non-Volatile | Sol Ext #1 | | 1400 06/22/95 | EPA Method 1311 | FSO |
| Fax This Report AS Soon As DONE! | FAXED | | 11:3806/27/95 | FAX | |
| Metals Digestion TCLP 3010 | 50/50 S/A | ml/ml | 0530 06/26/95 | EPA Method 3010 | KLG |

## Quality Assurance for the SET with Sample 300951

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| | **TCLP Lead (Reg. Limit 5.0)** | | | | | | | | |
| | Blank | <0.10 | ppm | | | | 1557 | 06/26/95 | TFC |
| | Standard | 9.8 | ppm | 10 | | 98 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |
| | Standard | 5.0 | ppm | 5.0 | | 100 | 1557 | 06/26/95 | TFC |
| | Standard | 4.8 | ppm | 5.0 | | 96 | 1557 | 06/26/95 | TFC |
| | Standard | 4.7 | ppm | 5.0 | | 94 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |

Continued

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06/27/95 300951 Continued 

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| 301056 | Duplicate | ND | mg/l | ND | | 0 | 1557 | 06/26/95 | TFC |
| 300951 | Spike | | ppm | | 5.0 | 99 | 1557 | 06/26/95 | TFC |
| 300953 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 300954 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300955 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300956 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 301056 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301184 | Spike | | ppm | | 5.0 | 97 | 1557 | 06/26/95 | TFC |
| 301185 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301186 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300952 | Spike | | ppm | | 5.0 | 100 | 1557 | 06/26/95 | TFC |

EQL is Estimated Quantitation Limit. The EQL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL). Our analytical result must be above our EQL before we report a value for any parameter. Otherwise, we report ND (Not Detected above EQL).



I certify that the results were generated using the above specified methods.

Bill Peery

C.H. Whiteside, Ph.D., President

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TEST REPORT: 300952

Thiokol Corporation
ATTN: Procurement
P.O. Box 1029
Marshall, TX 75671
Attention: Bill Corrigan

Sample Identification:FR-2
Collected By:W.R.Corrigan
Date & Time Taken:06/21/95 0807

Other Data: Surface behind target 12'
Bottle Data:
#01 - Unpreserved Plastic
#02 - TCLP Extract
Derived in lab from: 01 (100 G)
#03 - TCLP Extract for Metals
Derived in lab from: 02 (500 ML)
#04 - TCLP Extract for Metals
Derived in lab from: 03 (50 ML)
#05 - ICP Digestion
Derived in lab from: 04 (50 ml)
#06 - ICP Digestion
Derived in lab from: 04 (50 ml)

Sample Matrix: Soil
Report Date: 06/27/95 Received: 06/21/95 Client: THK1

| PARAMETER | RESULTS | UNITS | ANALYZED | EQL | METHOD | BY |
|---|---|---|---|---|---|---|
| TCLP Lead (Reg. Limit 5.0) | 570 | mg/l | 1557 06/26/95 | 10 | EPA Method 6010 | TFC |

Sample Preparation Steps for 300952

| | | | | | |
|---|---|---|---|---|---|
| TCLP Extraction: Non-Volatile | Sol Ext #1 | | 1400 06/22/95 | EPA Method 1311 | FSO |
| Fax This Report AS Soon As DONE! | FAXED | | 11:3806/27/95 | FAX | |
| Metals Digestion TCLP 3010 | 50/50 S/A | ml/ml | 0530 06/26/95 | EPA Method 3010 | KLG |

Quality Assurance for the SET with Sample 300952

TCLP Lead (Reg. Limit 5.0)

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| | Blank | <0.10 | ppm | | | | 1557 | 06/26/95 | TFC |
| | Standard | 9.8 | ppm | 10 | | 98 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |
| | Standard | 5.0 | ppm | 5.0 | | 100 | 1557 | 06/26/95 | TFC |
| | Standard | 4.8 | ppm | 5.0 | | 96 | 1557 | 06/26/95 | TFC |
| | Standard | 4.7 | ppm | 5.0 | | 94 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |

Continued

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06/27/95 300952 Continued 

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| 301056 | Duplicate | ND | mg/l | ND | | 0 | 1557 | 06/26/95 | TFC |
| 300951 | Spike | | ppm | | 5.0 | 99 | 1557 | 06/26/95 | TFC |
| 300953 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 300954 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300955 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300956 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 301056 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301184 | Spike | | ppm | | 5.0 | 97 | 1557 | 06/26/95 | TFC |
| 301185 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301186 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300952 | Spike | | ppm | | 5.0 | 100 | 1557 | 06/26/95 | TFC |

EQL is Estimated Quantitation Limit. The EQL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL). Our analytical result must be above our EQL before we report a value for any parameter. Otherwise, we report ND (Not Detected above EQL).



I certify that the results were generated using the above specified methods.

C.H. Whiteside, Ph.D., President

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TEST REPORT: 300953

**Thiokol Corporation**
**ATTN: Procurement**
**P.O. Box 1029**
**Marshall, TX 75671**
**Attention: Bill Corrigan**

**Sample Identification:** FR-3
**Collected By:** W.R.Corrigan
**Date & Time Taken:** 06/21/95 0810

**Other Data:** 12" dp. 3' behind target
**Bottle Data:**

- #01 - Unpreserved Plastic
- #02 - TCLP Extract
  Derived in lab from: 01 (100 G)
- #03 - TCLP Extract for Metals
  Derived in lab from: 02 (500 ML)
- #04 - TCLP Extract for Metals
  Derived in lab from: 03 (50 ML)
- #05 - ICP Digestion
  Derived in lab from: 04 (50 ml)
- #06 - ICP Digestion
  Derived in lab from: 04 (50 ml)

**Sample Matrix:** Soil
**Report Date:** 06/27/95 **Received:** 06/21/95 **Client:** THK1

| PARAMETER | RESULTS | UNITS | ANALYZED | EQL | METHOD | BY |
|---|---|---|---|---|---|---|
| TCLP Lead (Reg. Limit 5.0) | 0.46 | mg/l | 1557 06/26/95 | 0.1 | EPA Method 6010 | TFC |

## Sample Preparation Steps for 300953

| | | | | | |
|---|---|---|---|---|---|
| TCLP Extraction: Non-Volatile | Sol Ext #1 | | 1400 06/22/95 | EPA Method 1311 | FSO |
| Fax This Report AS Soon As DONE! | FAXED | | 11:3806/27/95 | FAX | |
| Metals Digestion TCLP 3010 | 50/50 S/A | ml/ml | 0530 06/26/95 | EPA Method 3010 | KLG |

## Quality Assurance for the SET with Sample 300953

TCLP Lead (Reg. Limit 5.0)

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| | Blank | <0.10 | ppm | | | | 1557 | 06/26/95 | TFC |
| | Standard | 9.8 | ppm | 10 | | 98 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |
| | Standard | 5.0 | ppm | 5.0 | | 100 | 1557 | 06/26/95 | TFC |
| | Standard | 4.8 | ppm | 5.0 | | 96 | 1557 | 06/26/95 | TFC |
| | Standard | 4.7 | ppm | 5.0 | | 94 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |

Continued

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*Analytical Chemistry • Utility Operations*



| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| 301056 | Duplicate | ND | mg/l | ND | | 0 | 1557 | 06/26/95 | TFC |
| 300951 | Spike | | ppm | | 5.0 | 99 | 1557 | 06/26/95 | TFC |
| 300953 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 300954 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300955 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300956 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 301056 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301184 | Spike | | ppm | | 5.0 | 97 | 1557 | 06/26/95 | TFC |
| 301185 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301186 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300952 | Spike | | ppm | | 5.0 | 100 | 1557 | 06/26/95 | TFC |

EQL is Estimated Quantitation Limit. The EQL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL). Our analytical result must be above our EQL before we report a value for any parameter. Otherwise, we report ND (Not Detected above EQL).



I certify that the results were generated using the above specified methods.

C.H. Whiteside, Ph.D., President

ANA-LAB CORP.
THE COMPLETE SERVICE LAB

P. O. BOX 9000 – KILGORE, TEXAS 75663-9000 – 903/984-0551 – FAX 903/984-5914

*Analytical Chemistry • Utility Operations*


**TEST REPORT: 300954**

Thiokol Corporation
ATTN: Procurement
P.O. Box 1029
Marshall, TX 75671
Attention: Bill Corrigan

**Sample Identification:** FR-4
**Collected By:** W.R.Corrigan
**Date & Time Taken:** 06/21/95 0818

**Other Data:** 12" dp 12' S. of target
**Bottle Data:**

#01 - Unpreserved Plastic
#02 - TCLP Extract
Derived in lab from: 01 (100 G)
#03 - TCLP Extract for Metals
Derived in lab from: 02 (500 ML)
#04 - TCLP Extract for Metals
Derived in lab from: 03 (50 ML)
#05 - ICP Digestion
Derived in lab from: 04 (50 ml)
#06 - ICP Digestion
Derived in lab from: 04 (50 ml)

**Sample Matrix:** Soil
**Report Date:** 06/27/95 **Received:** 06/21/95 **Client:** THK1

| PARAMETER | RESULTS | UNITS | ANALYZED | EQL | METHOD | BY |
|---|---|---|---|---|---|---|
| TCLP Lead (Reg. Limit 5.0) | 0.16 | mg/l | 1557 06/26/95 | 0.1 | EPA Method 6010 | TFC |

## Sample Preparation Steps for 300954

| | | | | | |
|---|---|---|---|---|---|
| TCLP Extraction: Non-Volatile | Sol Ext#1 | | 1400 06/22/95 | EPA Method 1311 | FSO |
| Fax This Report AS Soon As DONE! | FAXED | | 11:3806/27/95 | FAX | |
| Metals Digestion TCLP 3010 | 50/50 S/A | ml/ml | 0530 06/26/95 | EPA Method 3010 | KLG |

## Quality Assurance for the SET with Sample 300954

**TCLP Lead (Reg. Limit 5.0)**

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| | Blank | <0.10 | ppm | | | | 1557 | 06/26/95 | TFC |
| | Standard | 9.8 | ppm | 10 | | 98 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |
| | Standard | 5.0 | ppm | 5.0 | | 100 | 1557 | 06/26/95 | TFC |
| | Standard | 4.8 | ppm | 5.0 | | 96 | 1557 | 06/26/95 | TFC |
| | Standard | 4.7 | ppm | 5.0 | | 94 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |

Continued

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*Analytical Chemistry • Utility Operations*

06/27/95 300954 Continued 

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| 301056 | Duplicate | ND | mg/l | ND | | 0 | 1557 | 06/26/95 | TFC |
| 300951 | Spike | | ppm | | 5.0 | 99 | 1557 | 06/26/95 | TFC |
| 300953 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 300954 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300955 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300956 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 301056 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301184 | Spike | | ppm | | 5.0 | 97 | 1557 | 06/26/95 | TFC |
| 301185 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301186 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300952 | Spike | | ppm | | 5.0 | 100 | 1557 | 06/26/95 | TFC |

EQL is Estimated Quantitation Limit. The EQL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL). Our analytical result must be above our EQL before we report a value for any parameter. Otherwise, we report ND (Not Detected above EQL).

These analytical results relate to the sample tested. This report may not be reproduced except in full without written approval of Ana-Lab Corp.

I certify that the results were generated using the above specified methods.

C.H. Whiteside, Ph.D., President

00071295

P. O. BOX 9000 – KILGORE, TEXAS 75663-9000 – 903/984-0551 – FAX 903/984-5914

ANA-LAB CORP. THE COMPLETE SERVICE LAB

*Analytical Chemistry • Utility Operations*


**TEST REPORT: 300955**

**Thiokol Corporation**
**ATTN: Procurement**
**P.O. Box 1029**
**Marshall, TX 75671**
**Attention: Bill Corrigan**

**Sample Identification:**FR-5
**Collected By:**W.R.Corrigan
**Date & Time Taken:**06/21/95 0822

**Other Data:** 12" dp. 12' N. of target
**Bottle Data:**

#01 - Unpreserved Plastic
#02 - TCLP Extract
Derived in lab from: 01 (100 G)
#03 - TCLP Extract for Metals
Derived in lab from: 02 (500 ML)
#04 - TCLP Extract for Metals
Derived in lab from: 03 (50 ML)
#05 - ICP Digestion
Derived in lab from: 04 (50 ml)
#06 - ICP Digestion
Derived in lab from: 04 (50 ml)

**Sample Matrix:** Soil
**Report Date:** 06/27/95 **Received:** 06/21/95 **Client:** THK1

| PARAMETER | RESULTS | UNITS | ANALYZED | EQL | METHOD | BY |
|---|---|---|---|---|---|---|
| TCLP Lead (Reg. Limit 5.0) | ND | mg/l | 1557 06/26/95 | 0.1 | EPA Method 6010 | TFC |

## Sample Preparation Steps for 300955

| | | | | | |
|---|---|---|---|---|---|
| TCLP Extraction: Non-Volatile | Sol Ext #1 | | 1400 06/22/95 | EPA Method 1311 | FSO |
| Fax This Report AS Soon As DONE! | FAXED | | 11:3806/27/95 | FAX | |
| Metals Digestion TCLP 3010 | 50/50 S/A | ml/ml | 0530 06/26/95 | EPA Method 3010 | KLG |

## Quality Assurance for the SET with Sample 300955

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| | **TCLP Lead (Reg. Limit 5.0)** | | | | | | | | |
| | Blank | <0.10 | ppm | | | | 1557 | 06/26/95 | TFC |
| | Standard | 9.8 | ppm | 10 | | 98 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |
| | Standard | 5.0 | ppm | 5.0 | | 100 | 1557 | 06/26/95 | TFC |
| | Standard | 4.8 | ppm | 5.0 | | 96 | 1557 | 06/26/95 | TFC |
| | Standard | 4.7 | ppm | 5.0 | | 94 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |

Continued

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*Analytical Chemistry • Utility Operations*

ANA-LAB CORP. THE COMPLETE SERVICE LAB

06/27/95 300955 Continued 

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| 301056 | Duplicate | ND | mg/l | ND | | 0 | 1557 | 06/26/95 | TFC |
| 300951 | Spike | | ppm | | 5.0 | 99 | 1557 | 06/26/95 | TFC |
| 300953 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 300954 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300955 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300956 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 301056 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301184 | Spike | | ppm | | 5.0 | 97 | 1557 | 06/26/95 | TFC |
| 301185 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301186 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300952 | Spike | | ppm | | 5.0 | 100 | 1557 | 06/26/95 | TFC |

EQL is Estimated Quantitation Limit. The EQL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL). Our analytical result must be above our EQL before we report a value for any parameter. Otherwise, we report ND (Not Detected above EQL).



I certify that the results were generated using the above specified methods.

C.H. Whiteside, Ph.D., President

00071297

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P. O. BOX 9000 – KILGORE, TEXAS 75663-9000 – 903/984-0551 – FAX 903/984-5914

*Analytical Chemistry • Utility Operations*


**TEST REPORT:** 300956

Thiokol Corporation
ATTN: Procurement
P.O. Box 1029
Marshall, TX 75671
Attention: Bill Corrigan

**Sample Identification:** FR-6
**Collected By:** W.R.Corrigan
**Date & Time Taken:** 06/21/95 0830

**Other Data:** 6" dp 40' N.,35' E., of target
**Bottle Data:**

- #01 - Unpreserved Plastic
- #02 - TCLP Extract
  Derived in lab from: 01 (100 G)
- #03 - TCLP Extract for Metals
  Derived in lab from: 02 (500 ML)
- #04 - TCLP Extract for Metals
  Derived in lab from: 03 (50 ML)
- #05 - ICP Digestion
  Derived in lab from: 04 (50 ml)
- #06 - ICP Digestion
  Derived in lab from: 04 (50 ml)

**Sample Matrix:** Soil
**Report Date:** 06/27/95 **Received:** 06/21/95 **Client:** THK1

| PARAMETER | RESULTS | UNITS | ANALYZED | EQL | METHOD | BY |
|---|---|---|---|---|---|---|
| TCLP Lead (Reg. Limit 5.0) | ND | mg/l | 1557 06/26/95 | 0.1 | EPA Method 6010 | TFC |

## Sample Preparation Steps for 300956

| | | | | | |
|---|---|---|---|---|---|
| TCLP Extraction: Non-Volatile | Sol Ext #1 | | 1400 06/22/95 | EPA Method 1311 | FSO |
| Fax This Report AS Soon As DONE! | FAXED | | 11:3806/27/95 | FAX | |
| Metals Digestion TCLP 3010 | 50/50 S/A | ml/ml | 0530 06/26/95 | EPA Method 3010 | KLG |

## Quality Assurance for the SET with Sample 300956

TCLP Lead (Reg. Limit 5.0)

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| | Blank | <0.10 | ppm | | | | 1557 | 06/26/95 | TFC |
| | Standard | 9.8 | ppm | 10 | | 98 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |
| | Standard | 5.0 | ppm | 5.0 | | 100 | 1557 | 06/26/95 | TFC |
| | Standard | 4.8 | ppm | 5.0 | | 96 | 1557 | 06/26/95 | TFC |
| | Standard | 4.7 | ppm | 5.0 | | 94 | 1557 | 06/26/95 | TFC |
| | Standard | 5.1 | ppm | 5.0 | | 102 | 1557 | 06/26/95 | TFC |

Continued

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*Analytical Chemistry • Utility Operations*

06/27/95 300956 Continued 

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| 301056 | Duplicate | ND | mg/l | ND | | 0 | 1557 | 06/26/95 | TFC |
| 300951 | Spike | | ppm | | 5.0 | 99 | 1557 | 06/26/95 | TFC |
| 300953 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 300954 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300955 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300956 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 301056 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301184 | Spike | | ppm | | 5.0 | 97 | 1557 | 06/26/95 | TFC |
| 301185 | Spike | | ppm | | 5.0 | 95 | 1557 | 06/26/95 | TFC |
| 301186 | Spike | | ppm | | 5.0 | 98 | 1557 | 06/26/95 | TFC |
| 300952 | Spike | | ppm | | 5.0 | 100 | 1557 | 06/26/95 | TFC |

EQL is Estimated Quantitation Limit. The EQL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL). Our analytical result must be above our EQL before we report a value for any parameter. Otherwise, we report ND. (Not Detected above EQL).



I certify that the results were generated using the above specified methods.

C.H. Whiteside, Ph.D., President

THIOKOL CORPORATION

LONGHORN ARMY AMMUNITION PLANT
P. O. BOX 1149
MARSHALL, TEXAS 75671

CHAIN-OF-CUSTODY RECORD

Contractor P.O.No. 24248

00071299

PROJECT NAME/NUMBER Firing Range Lead Analysis
REPORT RESULTS TO: William R. Corrigan

LAB DESTINATION Analab
Phone No
FAX (903) 679-~~2910~~ 2057
OFFICE (903) 679-2219

| Sample Number | Sample Location & Description | Date & Time Collected | Analysis Type | Container/ Preservative | Initials | Condition on Receipt (Name & Date) |
|---|---|---|---|---|---|---|
| FR-1 | 12" dp - into bank horizontal | 6/21/95 0800 | TCLP Lead | Plastic, cool 4°C, no pres. | WRC III | 300751 |
| FR-2 | surface 12' behind target | 6/21/95 0807 | TCLP Lead | " " | WRC III | 300752 |
| FR-3 | 12" dp. 3' behind target | 6/21/95 0810 | TCLP Lead | " " | WRC III | 300753 |
| FR-4 | 12" dp 12' S. of target | 6/21/95 0818 | TCLP Lead | " " | WRC III | 300754 |
| FR-5 | 12" dp. 12' N of target | 6/21/95 0822 | TCLP Lead | " " | WRC III | 300755 |
| FR-6 | 6" db 40' NW, 35' E of target | 6/21/95 0830 | TCLP Lead | " " | WRC III | 300756 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Special Instructions Fax results to LHAAP

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By William R. Corrigan, LHAAP, 6/21/95, 0845
Received By J T Proctor 6-21 / 1020

2. Relinquished By
Received By [illegible]

3. Relinquished By

4. Relinquished By

00071300

P. O. BOX 9000 – KILGORE, TEXAS 75663-9000 – 903/984-0551 – FAX 903/984-5914

*Analytical Chemistry • Utility Operations*

ANA-LAB CORP. THE COMPLETE SERVICE LAB



TEST REPORT: 311636

Thiokol Corporation
ATTN: Procurement
P.O. Box 1029
Marshall, TX 75671
Attention: Bill Corrigan

**Sample Identification:** Pistol Firing Range
**Collected By:** Bill Corrigan
**Date & Time Taken:** 11/20/95 1400

**Other Data:** FR-7, Surface behind target
**Bottle Data:**

#01 - Unpreserved Plastic
#02 - TCLP Extract
Derived in lab from: 01 (100 g)
#03 - TCLP Extract for Metals
Derived in lab from: 02 (500 ml)
#04 - TCLP Extract for Metals
Derived in lab from: 03 (50 ml)
#05 - ICP Digestion
Derived in lab from: 03 (50 ml)
#06 - ICP Digestion
Derived in lab from: 03 (50 ml)
#07 - ICP Digestion
Derived in lab from: 03 (50 ml)

**Sample Matrix:** Solid
**Report Date:** 11/30/95 **Received:** 11/21/95 **Client:** THK1

| PARAMETER | RESULTS | UNITS | ANALYZED | EQL | METHOD | BY |
|---|---|---|---|---|---|---|
| TCLP Lead (Reg. Limit 5.0) | 1100 | mg/l | 0904 11/29/95 | 50 | EPA Method 6010 | SKM |

## Sample Preparation Steps for 311636

| | | | | | |
|---|---|---|---|---|---|
| TCLP Extraction: Non-Volatile | SOL EXT #1 | | 1440 11/27/95 | EPA Method 1311 | RHC |
| Fax This Report AS Soon As DONE! | FAXED | | 13:1711/30/95 | FAX | |
| Metals Digestion TCLP 3010 | 50/50 S/B/A | ml/ml | 1700 11/28/95 | EPA Method 3010 | PJD |

## Quality Assurance for the SET with Sample 311636

TCLP Lead (Reg. Limit 5.0)

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| | Blank | <0.10 | ppm | | | | 0904 | 11/29/95 | SKM |
| | Standard | 10 | ppm | 10 | | 100 | 0904 | 11/29/95 | SKM |
| | Standard | 5.3 | ppm | 5.0 | | 106 | 0904 | 11/29/95 | SKM |
| | Standard | 5.3 | ppm | 5.0 | | 106 | 0904 | 11/29/95 | SKM |
| | Standard | 5.4 | ppm | 5.0 | | 108 | 0904 | 11/29/95 | SKM |

Continued

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P. O. BOX 9000 – KILGORE, TEXAS 75663-9000 – 903/984-0551 – FAX 903/984-5914

*Analytical Chemistry • Utility Operations*

11/30/95 311636 Continued 

| Sample # | Description | Result | Units | Dup/Std Value | Spk Conc. | Percent | Time | Date | By |
|---|---|---|---|---|---|---|---|---|---|
| 311636 | Duplicate | 1100 | mg/l | 1100 | | 0 | 0904 | 11/29/95 | SKM |
| 311636 | Spike | | ppm | | 5.0 | 107 | 0904 | 11/29/95 | SKM |

EQL is Estimated Quantitation Limit. The EQL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL). Our analytical result must be above our EQL before we report a value for any parameter. Otherwise, we report ND (Not Detected above EQL).



I certify that the results were generated using the above specified methods.

C.H. Whiteside

C.H. Whiteside, Ph.D., President

THIOKOL CORPORATION

LONGHORN ARMY AMMUNITION PLANT
P. O. BOX 1149
MARSHALL, TEXAS 75671

CHAIN-OF-CUSTODY RECORD

Contractor P.O.No. 94948

00071302

PROJECT NAME/NUMBER Firing Range Lead Analysis
REPORT RESULTS TO: Bill Corrigan

LAB DESTINATION Analab
Phone No
FAX (903) 679-2910
OFFICE (903) 679-2219

| Sample Number | Sample Location & Description | Date & Time Collected | Analysis Type | Container/ Preservative | Initials | Condition on Receipt (Name & Date) |
|---|---|---|---|---|---|---|
| FR-7 | LHAAP - Pistol Firing Range - surface behind target | 11-20-95 1400 | TCLP Lead | Plastic 250ml, no pres. | WRC | |
| | | | | | | |
| | | 211634- | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Special Instructions fax results to Bill Corrigan at (903) 679-2057

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By William R. Corrigan, Thiokol, 11-22-95, 0800

Received By [illegible] 11-21-95 1045

2. Relinquished By

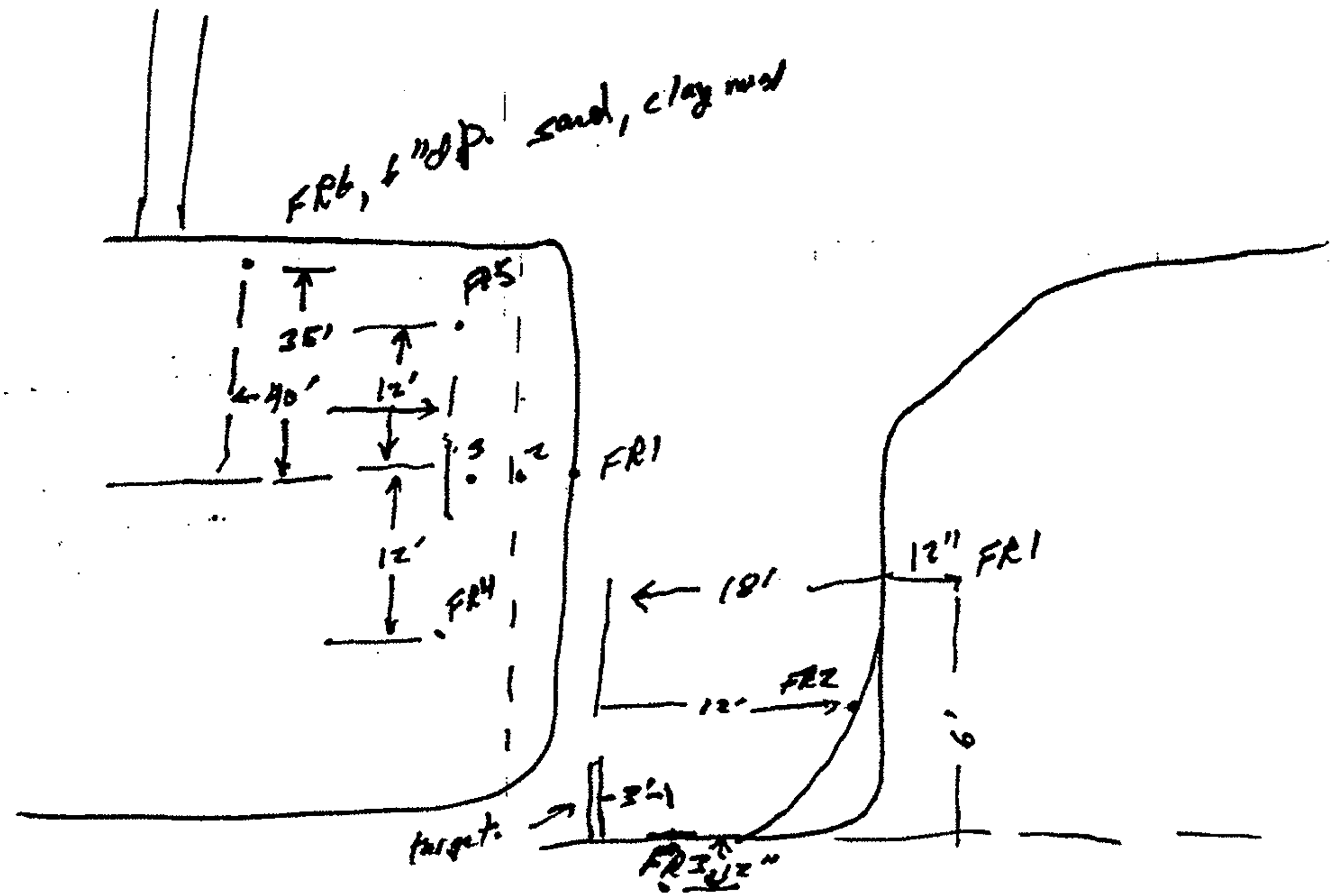
3. Relinquished By

Received By

4. Relinquished By

6/21/95
Firing Range






FR2- Surface where shot has been hitting. Lead shot mixed in sample.

All samples clay unless noted.

# *Appendix C*

# *2006 Soil Results*

00071305

*FINAL*

# ADDITIONAL INVESTIGATION RESULTS
# THE PISTOL RANGE
# BUILDING 407 AT LHAAP-46 (PLANT 2 AREA/PYROTECHNIC OPERATIONS AREA)
# LONGHORN ARMY AMMUNITION PLANT
# KARNACK, TEXAS

**Prepared for**

**U.S. Army Corps of Engineers**
**Tulsa District**
**1645 South 101st Avenue**
**Tulsa, Oklahoma**

**Prepared by**

**Shaw Environmental, Inc.**
**3010 Briarpark Suite 4N**
**Houston, Texas 77042**

**Contract Number W912QR-04-D-0027**
**Task Order No. DS02**

**February 2009**

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# Acronyms and Abbreviations

| | |
|---|---|
| bgs | below ground surface |
| DPT | direct push technology |
| GPS | global positioning system |
| LHAAP | Longhorn Army Ammunition Plant |
| MARC | Multiple Award Remediation Contract |
| mg/kg | milligrams per kilogram |
| mg/L | milligrams per liter |
| ppm | parts per million |
| RPD | relative percent difference |
| Shaw | Shaw Environmental, Inc. |
| TCLP | toxicity characteristic leaching procedure |
| UPL | upper prediction limit |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| XRF | x-ray fluorescence |

# 1.0 Introduction

The U.S. Army Corps of Engineers (USACE), Tulsa District, contracted Shaw Environmental, Inc. (Shaw), to perform closure of multiple sites at the former Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas, under the Louisville District's Multiple Award Remediation Contract (MARC) No. W912QR-04-D-0027, Task Order DS02. As part of this contract, Shaw performed an additional investigation to delineate the horizontal and vertical extent of metals at the Pistol Range, and at Building 407 located within LHAAP-46. The additional investigation was performed with oversight by the Tulsa District. This report provides details about the work activities performed for the field investigation of the Pistol Range and Building 407 at LHAAP-46, and describes the results of the investigation.

## 1.1 Project Objectives

The objective of the activities described in this report was to delineate the horizontal and vertical extent of metals contamination, within the areas designated as the Pistol Range, and Building 407 at LHAAP-46. A portable x-ray fluorescence (XRF) spectrometer was used to quantify the horizontal and vertical extent of metals. Soil samples were collected for laboratory analysis to confirm the XRF results.

## 1.2 Pistol Range and Building 407 Location and Background

The Pistol Range is located in a heavily wooded area at the end of Robert Avenue, south of Avenue "Q". The site is located directly east of Harrison Bayou in the southern portion of the former LHAAP installation, as depicted in **Figure 1**. The Pistol Range was a small arms firing range, but its history and usage is not well documented.

Building 407 is located in the north-central section of the LHAAP installation in the area known as Production Area 2. It is located off of Jennings Avenue at the far western edge of the LHAAP-46 site boundary (**Figure 1**). Pyrotechnic and illuminant testing operations were performed in Building 407 using a chamber. This operation resulted in an ash residue that was released in the vicinity of Building 407. Ash material was also reported to be present inside Building 407 (Plexus, 2005).

## 1.3 Report Organization

This report consists of five sections and two appendices. **Section 1.0** provides a brief introduction to the LHAAP installation and specifically describes the location, background and investigation objectives at the Pistol Range and at Building 407 at LHAAP-46. **Section 2.0** explains field procedures and rationale for the investigation activities performed at the sites. **Section 3.0** presents the analytical data, **Section 4.0** summarizes the findings at each site, and

**Section 5.0** cites the references used in this report. **Appendix A** contains field data forms associated with these field investigations and **Appendix B** contains the Data Evaluation Reports.

### *1.4 Previous Investigation*

Six soil samples were collected on June 21, 1995, and a subsequent sample was collected on November 11, 1995 at the Pistol Range (Complete Environmental Service, 2004). The samples were analyzed for toxicity characteristic leaching procedure (TCLP) lead. Samples collected from 12 inches below ground surface (bgs) or from the clay berm had TCLP lead concentrations of 0.46 milligrams per liter (mg/L) or less. Soil samples collected from the ground surface between the berm and the target line had concentrations up to 1,100 mg/L for TCLP lead.

Historical documentation indicated that ash from Building 407 may have been deposited in the vicinity of the building in the northwest direction. There was no indication that ash was deposited outside the close vicinity (greater than 30 feet) of Building 407. In 1993, sampling was conducted near other buildings in the Plant 2, but not in the vicinity of Building 407. In 2005 sampling of the ash residue inside Building 407 indicated high levels of chromium (1,740 milligrams per kilogram [mg/kg]) and lead (12,000 mg/kg) (Plexus, 2005).

# 2.0 Field Investigation

Field sampling activities performed at the Pistol Range and in the vicinity of Building 407 at LHAAP-46 included site reconnaissance, marking the sampling locations at the sites prior to sampling, screening with a field portable Niton 733Q XRF spectrometer to delineate metals contamination, and the collection of confirmation analytical samples.

## 2.1 XRF Screening Methods

The XRF spectrometer was utilized to field screen soil samples at the Pistol Range and Building 407 at LHAAP-46 in order to determine the presence of metals contamination and to characterize the lateral and vertical extent of contamination. For field screening, soil was analyzed in situ or in a sample container in accordance with SW-846 Method 6200 (U.S. Environmental Protection Agency [EPA], 1997), utilizing the XRF spectrometer. To verify the accuracy of the XRF spectrometer in the field, chemical standards of lead, copper, arsenic, zinc, and nickel were used to calibrate the instrument. More information on the operation of the portable XRF spectrometer can be found in the standard operating procedure located in Appendix D of the *Final Installation-Wide Work Plan* (Shaw, 2006a).

Screening samples were collected with a decontaminated stainless steel hand trowel or auger to a depth of 0 to 6 inches at all locations. The sampled soil was placed into a disposable aluminum pan for homogenization and preparation**.** Any large or non-representative debris was removed from the soil before analysis. This debris included rocks, pebbles, leaves, vegetation, roots, and concrete. The soil surface was as smooth as possible so that the probe window had a good contact with the surface. The soil had a moisture content of less than 20 percent.

Surface soil samples were collected for screening from every sample location at the Pistol Range and Building 407 at LHAAP-46. In the XRF samples collected from both sites, the measured surface soil lead concentration was compared to the maximum background value of 33.8 parts per million (ppm), and if the concentration was less than 33.8 ppm, then no subsurface soil samples were collected. At the Pistol Range, near the toe of the berm face at the range impact zone, 11 soil borings were advanced to a minimum depth of 18 inches bgs with one boring reaching refusal at 12 inches bgs. One soil boring (N50, E25) was advanced to 30 inches bgs. In the vicinity of Building 407 at LHAAP-46, 25 samples were collected from the surface.

## 2.2 Pistol Range Investigation

XRF sample locations were positioned and marked using wooden stakes. The locations were based on a pre-established grid. **Figure 2** shows the grid pattern established in 25-foot rectangular sections to cover the site. The historical findings discussed in **Section 1.4** were used to adjust the grid. The grid provided 38 locations to be screened (sampled) at the grid node points. Samples were taken at incremental depths. Originally, 25 sample locations were proposed in the *Final Addendum 2 Additional Investigation at Pistol Range to Final Installation-Wide Work Plan* (Shaw, 2006b). However, due to the lack of historical information pertaining to the western part of the Pistol Range, the grid was extended 135 feet west to include 13 additional sampling locations to determine if any contamination existed in this area. The grid was also extended northeast to include three additional sample locations, since screening results indicated elevated concentrations of lead at location N75,0. Three samples were collected and screened within the ditch south of the Pistol Range, yielding a total of 52 sampling locations screened at the Pistol Range.

Samples were collected at each of the grid nodes shown on **Figure 2.** Additional sample locations were established on and around the berm since lead concentrations were higher at these locations. Sample locations at the berm varied as a function of elevation along the west-facing berm. Locations included two height intervals corresponding to the approximate lower and upper half of the berm. At each of these height intervals in the berm, a series of grab samples were collected from borings drilled into the face of the berm at intervals ranging from 0 to 6 inches, 6 to 12 inches, 12 to 18 inches, and 18 to 24 inches. Sample location labels were suffixed with –Upper or –Up and –Lower or –Low, depending upon whether a sample was collected from the upper half or lower half of the berm. Four sampling locations were established at the firing line to check for the presence of lead residue from firearm discharge.

For sampling the area west of the berm, initial samples were collected at each sampling point at the ground surface using a decontaminated hand auger or stainless steel trowel advanced to 6 inches bgs. A second sample was collected at the 0.5- to 1-foot bgs interval. A third sample was collected from the 1- to 1.5-feet bgs. XRF readings exhibited high concentrations for the third interval at N25,E75-Lower; N50,E25; and N50,E50-Lower; therefore, a fourth sample was collected at the 18- to 24-inch interval at these locations. XRF readings still exhibited high concentrations at N50,E25. Subsequently, a fifth sample was collected from the 24 to 30 inch interval.

All sample locations for the Pistol Range are listed in **Table 1**. Nine of the samples screened using the XRF spectrometer were also collected as confirmation laboratory samples (see **Table 2**). To the extent practical, the confirmation samples covered the range of results observed with the XRF spectrometer. Laboratory analytical results provided a quality control check for the XRF results. Results of both XRF screening and laboratory samples are provided in **Table 1.**

## 2.3 Building 407 Investigation

XRF sample locations were based on a 25-foot grid system and marked with stakes in the vicinity of Building 407 at LHAAP-46. Twenty-two samples were screened at the surface grid node points to 6 inches bgs. No deeper samples were needed for vertical delineation according to XRF sample screening results (see **Figure 3**). Following the *Draft Final Addendum 3 Additional Investigation at Building 407 within LHAAP-46, Plant 2 Area/Pyrotechnic Operations Area, Final Installation-Wide Work Plan* (Shaw, 2006c), additional samples were collected inside the building from the incineration chamber (Shaw, 2006c). Three samples were also collected from a ditch that was observed northwest of Building 407, along Jennings Avenue.

All sample locations for Building 407 are listed in **Table 3**. Three of the 22 samples screened using the XRF spectrometer were collected and submitted as confirmation laboratory samples (see **Table 4**). To the extent practical, the confirmation samples covered the range of results observed with the XRF. The laboratory samples are identified as NA5, SA3, and SA6. In addition, a sample of the ash residue was collected from the incineration chamber inside Building 407 and analyzed for lead and chromium.

## 2.4 Surveying

Shaw used a global positioning system (GPS) unit (Trimble© XRS) to survey the sampling locations, approximate boundary of the actual firing range, approximate location of the firing line, and general boundaries of the berm.

# 3.0 Investigation Results

## 3.1 XRF Screening Results at the Pistol Range

Fifty-two locations (88 samples total) were screened with the XRF spectrometer for lead, copper, arsenic, zinc, and nickel. All five metals were detected within the soil samples. The XRF screening results are provided in **Table 1** and locations with results above the upper prediction limit (UPL) of background are shown in **Figure 2**. The UPLs were calculated from the LHAAP background soil dataset presented in the *Final Background Soil Study Report* (Shaw, 2005).

The 95 percent UPL of background concentrations were used for screening XRF measurements. The 95 percent UPL value represents the concentration that will be above the next single background measurement with 95 percent confidence. The 95 percent UPL background concentrations were calculated according to EPA (1992) guidance.

The TCEQ has shown preference in the past for, and EPA has accepted, the use of UPLs instead of other criteria, such as upper tolerance limits or upper confidence limits for comparing site data to background data.

The maximum surface concentration of lead, 3,978 ppm, was detected at the surface soil sample (0 to 6 inches bgs) at N50,E25. This location also yielded the highest subsurface (6 to 12 inches) concentration of lead, 1,180 ppm. Elevated lead readings were also present at this location for the 12 to 18, 18 to 24, and 24 to 30 inches intervals. Copper was detected by the XRF spectrometer in 6 of 88 samples. The maximum surface concentration of copper, 148 ppm, was detected at N50,E25 (0 to 6 inches). The maximum subsurface concentration, 104 ppm, was observed from the sample collected from N25,E75-Lower (6 to 12 inches). Arsenic was detected in 2 of 88 samples. N50,0 (0 to 6 inches), which had an arsenic concentration of 102 yielded the maximum reading. Zinc was detected in 60 of 88 samples. The maximum concentration, 142 ppm, was detected at S25,0 (0 to 6 inches). The sample collected from N50,E50-Lower (6 to 12 inches), yielded the highest subsurface concentration of Zinc, 65.6 ppm. The maximum nickel concentration, 145 ppm, was detected at 0,E50 (6 to 12 inches). This was also the maximum subsurface concentration. The maximum surface concentration was 142 ppm at N25,0 (0 to 6 inches).

Sample locations 0,W75; S25,W50; S50,W25; and S75,0 were associated with the firing line where shells, shot, and/or bullets may have been discharged. Zinc was the only metal detected by the XRF spectrometer at the surface (0 to 6 inches) at location S75,0 (0 to 6 inches). Concentrations of lead and zinc were detected within the surface soil at S25,W50. No metals were detected by the XRF spectrometer at S50,W25.

Sample locations N75,E25-Lower; N75,E25-Upper; N50,E50-Lower; N50,E50-Upper; N25,E75-Lower; and N25,E75-Upper were associated with the berm. The "upper" sample description refers to the upper area of the berm where the sample was collected; and likewise, the "lower" designates samples from the lower area of the berm.

Due to the possibility of runoff from the site, samples from the ditch located south of the Pistol Range were also screened with the XRF spectrometer. Zinc was detected at concentrations of 29.9 ppm and 36.9 ppm in the Center Ditch and the East Ditch, respectively. Lead concentrations of 10.70 mg/kg were detected in the West Ditch laboratory confirmation sample. All other metals were below levels of detection in the other samples associated with the ditch.

## 3.2 XRF Screening Results at Building 407 at LHAAP-46

Twenty-two locations were screened with the XRF spectrometer for lead, chromium, arsenic, copper, nickel, and zinc in the vicinity of Building 407 at LHAAP-46. The XRF results are presented in **Table 3**. Of the 22 locations screened, only 9 samples were above the detection limit for lead ranging from 13.5 ppm (NA3) to 43.7 ppm (SA3). The only hit of chromium was observed in the NA5 sample with a concentration of 143 ppm. Arsenic was recorded only in the EA (0,W50) sample with a concentration of 18.1 ppm and no copper concentrations were recorded above the detection limit for the samples screened. Five hits of nickel were observed ranging from 84.7 ppm (NA4) to 120.6 ppm (EA [0,W50]). There were 14 hits of zinc observed ranging from 36 ppm (NA4) to 273.6 ppm (NA5).

Three locations were screened with the XRF spectrometer in the ditch located north of Building 407 at LHAAP-46 along Jennings Avenue due to the possibility of runoff from the site. Three XRF readings from 0 to 6 inches (North Ditch #1, North Ditch #2, and North Ditch #3) were taken along the ditch. Lead was detected in the Ditch #1 sample at a concentration of 11.5 ppm. Zinc was detected at concentrations of 52.2 ppm (North Ditch #1), 69.3 ppm (North Ditch #2), and 64.2 ppm (North Ditch #3).

A sample of the ash residue collected from the incineration chamber inside Building 407 was screened with the XRF spectrometer for lead, chromium, arsenic, copper, nickel, and zinc. Lead concentrations were recorded as 1,170 ppm. Chromium was recorded as 3,250 ppm. Copper was recorded as 2,509 ppm and zinc was 469 ppm. Arsenic and nickel were less than the limit of detection.

## 3.3 Laboratory Confirmation Sampling

To provide a quality control check for the XRF results, nine samples collected from the Pistol Range and three samples collected from Building 407 at LHAAP-46 were submitted to the laboratory for analysis. These samples were selected in the field, based on the XRF survey results. The samples selected for laboratory confirmation were N50,E25 (0 to 6 inches), N50,0

(0 to 6 inches), N25,E75-Lower (6 to 12 inches), N25,E75-Lower (0 to 6 inches), N25,E75 Lower (12 to 18 inches), N25,0 (0 to 6 inches), N25,E25 (0 to 6 inches), N25,E75-Upper (0 to 6 inches), West Ditch (0 to 6 inches) from the Pistol Range, and NA5, SA3, and SA6 from Building 407. **Tables 2** and **4** present the parameters analyzed for these locations.

During the field screening process, the XRF was used to obtain the lowest detection concentrations for lead, the leading screening parameter. With the confirmation laboratory results, a relative percent difference (RPD) was calculated by taking the difference in the XRF screening results and the laboratory data results, dividing this value by the average of the two data (XRF and laboratory data results) and multiplying by 100 (see **Table 5**). The RPDs calculated for lead are up to 70 percent and indicate that the XRF results for lead appear to be biased low in comparison to laboratory analytical results. Calculated RPDs for arsenic, copper, chromium, nickel, and zinc are frequently higher, as shown in **Table 5**. Several of these RPDs are indicative of very low laboratory analytical results and high XRF detection limits.

# 4.0 Summary of Findings

During this investigation, the extent of metals contamination was determined laterally and vertically at the Pistol Range and Building 407 at LHAAP-46 by screening soil samples collected using the XRF spectrometer. Nine confirmation laboratory samples were collected from the samples screened with the XRF spectrometer at the Pistol Range, and three confirmation laboratory samples were collected from the samples screened with the XRF spectrometer from Building 407 at LHAAP-46. These laboratory samples helped correlate the results of the XRF survey.

## 4.1 Pistol Range

As expected, the highest levels of metals concentration were associated with the berm, specifically in the northern berm area and the area immediately west of the berm. The maximum concentration of lead, 3,978 ppm was observed in the surface sample at the N50,E25 boring location with lead concentrations progressively declining with depth.

Copper was detected by the XRF spectrometer unit in 6 of 88 samples. Arsenic was detected in 2 of 88 samples. Zinc was detected in 60 of 88 samples and was the only metal detected by the XRF at the surface (0 to 6 inches) at location S75,0 (0 to 6 inches). Nickel was detected in 13 of 88 samples.

Sample locations 0,W75; S25,W50; S50,W25; and S75,0 were associated with the firing line where shells, shot, and/or bullets may have been discharged. Concentrations of lead and zinc were detected within the surface soil at S25,W50, but no metals were detected by the XRF spectrometer at S50,W25.

These results indicate that the contamination associated with the operation of the Pistol Range is limited primarily to the northern part of the berm and the area immediately west of the berm. Further, the contamination is shallow, limited to the upper 18 inches at most locations. No contamination was observed in the western part of the site, to the west of Robert Avenue.

## 4.2 Building 407 at LHAAP-46

The highest concentrations of chromium and zinc, 143 ppm and 274 ppm, respectively, were observed in the NA5 sample located next to the northern side of the building. There were sporadic hits of metals, including lead, chromium, nickel, and zinc observed at the site consistent with the operational description.

Of the three samples collected along the northern ditch area, only one sample showed lead at 11.5 ppm (North Ditch 1 sample). All three samples were above the detection limits for zinc; the results ranged from 52.2 ppm to 69.3 ppm. Samples collected from the chamber inside Building 407 indicated high concentrations of chromium and lead, which is consistent with results from a previous investigation of the material found in the chamber (Plexus, 2005).

These results indicate that chromium, lead, and zinc levels are elevated with respect to the background in the area around Building 407. The elevated concentrations of metals are, however, limited to the surface soil only (0 to 6 inches) and the chamber ash found inside the building. Zinc is slightly elevated in the ditch north of the building.

# 5.0 References


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**Figure 1**
**Site Location Map, Pistol Range and LHAAP-46**

**Figure 2**
**XRF Sample Location Map and Results, Pistol Range**

**Figure 3**
**XRF Sample Location Map and Results, Building 407 at LHAAP-46**

# *Tables*

## Table 1
## XRF Screening and Laboratory Results for the Pistol Range

| Sample Location | Date/Time | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pb | Pb | Cu | Cu | As | As | Zn | Zn | Ni | Ni |
| UPL in mg/kg | | 17.8 | | 8.37 | | 5.86 | | 24.5 | | 9.4 | |
| N75,0 (0-6") | 2/22/2006 10:20 | 1000 | | <49.35 | | <56.25 | | 92.6 | | 81.1 | |
| N75,0 (6-12") | 2/22/2006 10:32 | 246.6 | | <51.45 | | <33.75 | | 60.3 | | <89.85 | |
| N75,0 (12-18") | 2/22/2006 10:48 | 25.6 | | <54.9 | | <19.65 | | 57.4 | | <103.2 | |
| N50,E25 (0-6") | 2/22/2006 11:02 | 3977.6 | 5,240.00 | 148.4 | 186 | <110.55 | 2.51 | 39 | 65.1 | <79.8 | 7.51 |
| N50,E25 (6-12") | 2/22/2006 11:11 | 1180 | | 79.1 | | <55.2 | | 56.8 | | <64.65 | |
| N50,E25 (12-18") | 2/22/2006 11:20 | 244.8 | | 77.8 | | <30.6 | | 53.3 | | <73.8 | |
| N50,E25 (18-24") | 2/22/2006 11:32 | 624.8 | | <52.8 | | <46.5 | | <33.15 | | | |
| N50,E25 (24-30") | 2/22/2006 11:51 | 564.4 | | <51.15 | | <45.15 | | 51.3 | | <77.85 | |
| N25,E50 (0-6") | 2/22/2006 13:46 | 27.5 | | <48.15 | | <16.95 | | 40 | | <71.85 | |
| N25,E50 (6-12") | 2/22/2006 13:53 | 12.7 | | <43.8 | | <14.55 | | 40.7 | | <65.85 | |
| 0,E75 (0-6") | 2/22/2006 14:31 | 24.5 | | <48.75 | | <16.65 | | 39.3 | | <84.6 | |
| 0,E75 (6-12") | 2/22/2006 14:45 | <12.9 | | <46.8 | | <15.75 | | 45.2 | | <85.5 | |
| 0,E75 (12-18") | 2/22/2006 14:59 | <11.85 | | <44.4 | | <14.7 | | 33.8 | | <77.55 | |
| 0,E50 (0-6") | 2/22/2006 15:31 | 15.3 | | <48.45 | | <15.9 | | <30 | | 118.6 | |
| 0,E50 (6-12") | 2/22/2006 15:47 | 16.3 | | <51.15 | | <17.85 | | <31.8 | | 144.9 | |
| 0,E50 (12-18") | 2/22/2006 15:59 | 15.3 | | <48 | | <16.35 | | 52.6 | | <85.35 | |
| N25,E25 (0-6") | 2/22/2006 16:16 | 55.7 | 32.00 | <62.85 | NA | <24.75 | NA | <37.65 | NA | <124.2 | NA |
| N25,E25 (6-12") | 2/22/2006 16:27 | <13.2 | | <48.75 | | <16.35 | | <30.15 | | 79.4 | |
| N25,E25 (12-18") | 2/22/2006 16:39 | <12.75 | | <47.55 | | <15.3 | | 35.7 | | <72.6 | |
| N50,0 (0-6") | 2/23/2006 9:13 | 1120 | 1,220.00 | <59.7 | 5.86 | 101.5 | 14.2 | 66 | 46.6 | <108.3 | 8.71 |
| N50,0 (6-12") | 2/23/2006 9:25 | 71.1 | | <48.6 | | <21.3 | | 33.1 | | <84.75 | |
| N50,0 (12-18") | 2/23/2006 9:33 | <13.05 | | <45.45 | | <15.75 | | <28.5 | | <75.15 | |
| N50,W25 (0-6") | 2/23/2006 9:48 | 33.1 | | <46.2 | | <16.95 | | 43.2 | | <74.85 | |
| N25,0 (0-6") | 2/23/2006 9:56 | 33.1 | 68.50 | <85.2 | NA | <29.1 | NA | <52.65 | NA | 141.6 | NA |
| 0,E25 (0-6") | 2/23/2006 10:03 | <15 | | <52.8 | | <17.4 | | <32.85 | | <92.4 | |
| S25,E50 (0-6") | 2/23/2006 10:10 | 21.3 | | <46.2 | | <16.2 | | 55.1 | | <83.7 | |
| N25,W25 (0-6") | 2/23/2006 10:18 | 40.4 | | <45.3 | | <17.4 | | <28.5 | | <70.2 | |
| 0,0 (0-6") | 2/23/2006 10:29 | <13.65 | | <47.85 | | <15.6 | | 34.1 | | <79.2 | |
| S25,E25 (0-6") | 2/23/2006 10:40 | <12.6 | | <49.5 | | <16.35 | | <30.75 | | 88.3 | |
| N25,W50 (0-6") | 2/23/2006 10:47 | <13.05 | | <45.15 | | <15.3 | | 41.9 | | <75.15 | |
| 0,W25 (0-6") | 2/23/2006 10:58 | 18.1 | | 58.8 | | <17.1 | | 72.7 | | <90.45 | |
| S25,0 (0-6") | 2/23/2006 11:08 | <14.7 | | <58.35 | | 18.4 | | 142.4 | | <96.3 | |
| S50,E25 (0-6") | 2/23/2006 11:17 | <9.9 | | <38.85 | | <11.85 | | 35.1 | | <59.25 | |

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# Table 1
## XRF Screening and Laboratory Results for the Pistol Range

| Sample Location | Date/Time | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pb | Pb | Cu | Cu | As | As | Zn | Zn | Ni | Ni |
| UPL in mg/kg | | 17.8 | | 8.37 | | 5.86 | | 24.5 | | 9.4 | |
| 0,W50 (0-6") | 2/23/2006 11:24 | 31.4 | | <43.2 | | <16.95 | | 46.9 | | <70.8 | |
| S25,W25 (0-6") | 2/23/2006 11:31 | 12.8 | | 66.7 | | <10.35 | | 43.9 | | 62 | |
| S50,0 (0-6") | 2/23/2006 11:49 | <12 | | <43.5 | | <14.85 | | <27.3 | | <82.2 | |
| N75,W25 (0-6") | 2/23/2006 15:09 | <12.75 | | <47.55 | | <15.45 | | 31.3 | | <77.25 | |
| N75,W25 (6-12") | 2/23/2006 15:19 | <13.8 | | <52.5 | | <16.35 | | <32.85 | | <87.75 | |
| N75,W25 (12-18") | 2/23/2006 15:29 | <14.1 | | <51.9 | | <16.8 | | 37.7 | | <86.85 | |
| N100,W25 (0-6") | 2/23/2006 15:41 | <12.9 | | <49.5 | | <15.6 | | 37.7 | | <82.05 | |
| N100,W25 (6-12") | 2/23/2006 15:53 | <14.25 | | <51.6 | | <17.25 | | 39 | | <88.95 | |
| N100,W25 (12-18") | 2/23/2006 16:05 | <15 | | <53.25 | | <17.55 | | <33.6 | | <100.95 | |
| N100,0 (0-6") | 2/23/2006 16:22 | <13.35 | | <47.1 | | <15.9 | | 39.8 | | <82.35 | |
| N100,0 (6-12") | 2/23/2006 16:36 | <12.9 | | <49.95 | | <15.3 | | <30.6 | | 113 | |
| N100,0 (12-18") | 2/23/2006 16:48 | <14.25 | | <51.9 | | <16.65 | | 52.7 | | <84 | |
| N75,E25-Low (0-6") | 2/24/2006 10:02 | 750.8 | | <46.5 | | <50.1 | | <30.15 | | <67.65 | |
| N75,E25-Low (6-12") | 2/24/2006 10:09 | 51.8 | | <49.95 | | <20.55 | | <30.75 | | <74.4 | |
| N75,E25-Low (12-18") | 2/24/2006 10:16 | 21.4 | | <49.2 | | <17.85 | | <30.3 | | <74.4 | |
| N75,E25-Up (0-6") | 2/24/2006 10:25 | 52.4 | | <44.1 | | <18.9 | | <28.5 | | <65.55 | |
| N75,E25-Up (6-12") | 2/24/2006 10:33 | 20.8 | | <49.2 | | <17.25 | | 36.2 | | <76.65 | |
| N75,E25-Up (12-18") | 2/24/2006 10:42 | 16.2 | | <47.7 | | <16.35 | | 36.4 | | <74.1 | |
| N50,E50-Low (0-6") | 2/24/2006 11:00 | 559.2 | | <50.85 | | <45.3 | | 46.1 | | <81.75 | |
| N50,E50-Low (6-12") | 2/24/2006 11:12 | 604.8 | | <54.15 | | <47.7 | | 65.6 | | <89.55 | |
| N50,E50-Low (12-18") | 2/24/2006 11:21 | 181.1 | | <49.95 | | <27.3 | | 37.2 | | <76.95 | |
| N50,E50-Low (18-24") | 2/24/2006 11:36 | 24.4 | | <47.7 | | <16.8 | | 44.7 | | <73.8 | |
| N50,E50-Up (0-6") | 2/24/2006 13:11 | 117.9 | | <50.55 | | <25.2 | | 37.1 | | <74.85 | |
| N50,E50-Up (6-12") | 2/24/2006 13:19 | 24.1 | | <46.2 | | <16.65 | | 42.2 | | 80.6 | |
| N50,E50-Up (12-18") | 2/24/2006 13:28 | 16.9 | | <43.8 | | <14.55 | | 41.8 | | <75.45 | |
| N25,E75-Low (0-6") | 2/24/2006 13:42 | 527.2 | 937.00 | <45.15 | NA | <40.35 | NA | <28.2 | NA | <67.65 | NA |
| N25,E75-Low (6-12") | 2/24/2006 13:49 | 763.2 | 952.00 | 104.1 | 148 | <52.65 | 1.75 | 41.2 | 52.2 | 92.9 | 8.11 |
| N25,E75-Low (12-18") | 2/24/2006 13:57 | 161.1 | 245.00 | <50.85 | NA | <27 | NA | <31.65 | NA | 7<5.9 | NA |
| N25,E75-Low (18-24") | 2/24/2006 14:05 | 29.8 | | <40.35 | | <14.55 | | 40.1 | | <61.05 | |
| N25,E75-Up (0-6") | 2/24/2006 14:19 | 14.8 | 11.00 | <44.85 | NA | <15.75 | NA | <28.5 | NA | <65.25 | NA |
| N25,E75-Up (6-12") | 2/24/2006 14:26 | 17.5 | | <48.45 | | <16.65 | | <30.15 | | <70.2 | |
| N25,E75-Up (12-18") | 2/24/2006 14:32 | <12.15 | | <44.25 | | <15.15 | | 28.9 | | <67.05 | |

00071323

## Table 1
## XRF Screening and Laboratory Results for the Pistol Range

| Sample Location | Date/Time | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pb | Pb | Cu | Cu | As | As | Zn | Zn | Ni | Ni |
| UPL in mg/kg | | 17.8 | | 8.37 | | 5.86 | | 24.5 | | 9.4 | |
| 0,E100 (0-6") | 2/24/2006 14:44 | <12.3 | | <47.85 | | <15.3 | | 60 | | <77.85 | |
| 0,E100 (6-12") | 2/24/2006 14:51 | <14.4 | | <54 | | <17.1 | | 64.7 | | <91.2 | |
| 0,E100 (12-18") | 2/24/2006 14:58 | <13.95 | | <52.35 | | <16.65 | | 54.6 | | <100.5 | |
| 0,W75 (0-6") | 2/24/2006 15:42 | <14.55 | | <55.95 | | <17.55 | | 47.8 | | <95.4 | |
| S25,W50 (0-6") | 2/24/2006 15:47 | 16.6 | | <52.2 | | <17.7 | | 40.6 | | <87.9 | |
| S50,W25 (0-6") | 2/24/2006 15:53 | <12.3 | | <42.45 | | <14.25 | | <26.7 | | <72.3 | |
| S75,0 (0-6") | 2/24/2006 15:59 | <12.15 | | <48.45 | | <15 | | 35.8 | | <84.3 | |
| S50,W100 (0-6") | 2/24/2006 16:05 | <14.1 | | <50.4 | | <16.8 | | 34.5 | | <80.85 | |
| S75,W75 (0-6") | 2/24/2006 16:10 | <12 | | <45.75 | | <14.55 | | <28.2 | | <69.9 | |
| S100,W50 (0-6") | 2/24/2006 16:16 | 24.2 | | <46.2 | | <16.05 | | <28.95 | | 97.4 | |
| S50,W125 (0-6") | 2/24/2006 16:22 | 26.1 | | <49.05 | | <17.25 | | 31.1 | | <78.15 | |
| S75,W100 (0-6") | 2/24/2006 16:28 | 15.5 | | <51.3 | | <16.2 | | <31.5 | | <78.6 | |
| S100,W75 (0-6") | 2/24/2006 16:34 | <13.05 | | <49.2 | | <15.75 | | 49.1 | | <86.55 | |
| S125,W50 (0-6") | 2/24/2006 16:40 | <12.15 | | <45.6 | | <14.7 | | 41.7 | | 77.1 | |
| S150,W100 (0-6") | 2/24/2006 16:46 | <12.45 | | <45.15 | | <14.1 | | 33.2 | | <70.05 | |
| S125,W125 (0-6") | 2/24/2006 16:52 | <12.6 | | <43.35 | | <15.15 | | 42 | | <69.9 | |
| S100,W150 (0-6") | 2/24/2006 16:58 | <12.15 | | <45 | | <14.4 | | 38.7 | | <71.25 | |
| S100,W175 (0-6") | 2/24/2006 17:04 | <13.8 | | <47.7 | | <15.45 | | 45.1 | | 85.2 | |
| S125,W150 (0-6") | 2/24/2006 17:10 | <12.9 | | <47.85 | | <15.15 | | <28.8 | | <76.65 | |
| S150,W125 (0-6") | 2/24/2006 17:16 | <13.5 | | <47.55 | | <16.05 | | 34.6 | | <82.5 | |
| East Ditch (0-6") | 2/24/2006 17:22 | <11.4 | | <43.2 | | <13.65 | | 36.9 | | <67.65 | |
| Center Ditch (0-6") | 2/24/2006 17:27 | <12.6 | | <45 | | <14.55 | | 29.9 | | <73.05 | |
| **West Ditch (0-6")** | 2/24/2006 17:34 | <11.4 | 10.70 | <41.7 | NA | <13.2 | NA | <24.9 | NA | <64.5 | NA |

Notes:

Laboratory resutls were analyzed using EPA Method 6010B

**Bold** Confirmation (Laboratory) Sample Collected
As Arsenic
Cu Copper
mg/kg milligrams per kilogram
NA not available
Ni Nickel
Pb Lead
ppm parts per million
UPL upper prediction limit
XRF x-ray fluorescence
Zn Zinc

## Table 2
## Laboratory Confirmation Samples from the Pistol Range

| Sample ID | Chromium | Lead | Copper | Arsenic | Nickel | Zinc |
|---|---|---|---|---|---|---|
| Pistol Range | | | | | | |
| West Ditch (0-6") | NA | X | NA | NA | NA | NA |
| N25,E75-Up (0-6") | NA | X | NA | NA | NA | NA |
| N25,E25 (0-6") | NA | X | NA | NA | NA | NA |
| N25,0 (0-6") | NA | X | NA | NA | NA | NA |
| N25,E75-Low (12-18") | NA | X | NA | NA | NA | NA |
| N25,E75-Low (0-6") | NA | X | NA | NA | NA | NA |
| N25,E75-Low (6-12") | NA | X | X | X | X | X |
| N50,0 (0-6") | NA | X | X | X | X | X |
| N50,E25 (0-6") | NA | X | X | X | X | X |

Notes:
NA Not Analyzed
X Analyzed

## Table 3
## XRF Screening and Laboratory Results for Building 407 at LHAAP-46

| | | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | Laboratory Result in mg/kg | XRF Result in ppm | XRF Result in ppm | XRF Result in ppm | XRF Result in ppm |
|---|---|---|---|---|---|---|---|---|---|
| Site | Date/Time | Pb | Pb | Cr | Cr | As | Cu | Ni | Zn |
| UPL in mg/kg | | 17.8 | | 29 | | 5.86 | 8.37 | 9.4 | 24.5 |
| NA6 | 2/27/2006 9:24 | 17.5 | | <195 | | <18.3 | <54.45 | <97.35 | 48.5 |
| NA5 | 2/27/2006 9:30 | 22 | 39.80 | 143 | 12.90 | <16.65 | <52.65 | <70.05 | 273.6 |
| NA4 | 2/27/2006 9:36 | 14.3 | | <150 | | <15.9 | <46.95 | 84.7 | 36 |
| SA3 | 2/27/2006 9:44 | 43.7 | 56.80 | <131.1 | 10.90 | <17.1 | <48.15 | <69.75 | 115.3 |
| SA2 | 2/27/2006 9:50 | 13.7 | | <128.25 | | <15.15 | <44.55 | <66.15 | 35.3 |
| SA1 | 2/27/2006 9:57 | 19.7 | | <127.5 | | <15.45 | <45.3 | <66.6 | 97 |
| NA1 | 2/27/2006 10:04 | <12.3 | | <150 | | <15 | <49.5 | 107.2 | 97 |
| NA2 | 2/27/2006 10:12 | <13.2 | | <165 | | <15.75 | <46.35 | <82.65 | <28.2 |
| NA3 | 2/27/2006 10:20 | 13.5 | | <150 | | <15.6 | <45.6 | 88 | 43.5 |
| SA6 | 2/27/2006 10:27 | 18.6 | 30.90 | <150 | 12.40 | <17.55 | <49.8 | <79.5 | 73.5 |
| SA5 | 2/27/2006 10:34 | <12.6 | | <129.75 | | <14.4 | <45.15 | <69.9 | 30.6 |
| SA4 | 2/27/2006 10:43 | <11.25 | | <114.15 | | <13.95 | <42.75 | <62.4 | 77.4 |
| EA1 | 2/27/2006 10:50 | <11.85 | | <134.4 | | <14.4 | <45.9 | <70.65 | <28.8 |
| EA (N50,0) | 2/27/2006 10:57 | <13.8 | | <150 | | <16.05 | <48.6 | <79.2 | <30.6 |
| EA (N25,0) | 2/27/2006 11:03 | <12.75 | | <134.1 | | <15.45 | <45.9 | <72.15 | <28.5 |
| EA (0,0) | 2/27/2006 11:09 | <14.25 | | <150 | | <15.9 | <48.15 | 114.8 | <30.3 |
| EA (0,W25) | 2/27/2006 11:16 | <13.65 | | <148.05 | | <15.9 | <47.55 | <76.95 | <30 |
| EA (N25,W25) | 2/27/2006 11:22 | <12.3 | | <137.7 | | <15.15 | <46.05 | <72.3 | 45.7 |
| EA (N50,W25) | 2/27/2006 11:28 | 17.7 | | <149.1 | | <16.35 | <46.2 | <76.65 | <29.85 |
| EA (N50,W50) | 2/27/2006 11:34 | <14.55 | | <165 | | <16.8 | <51.45 | <88.95 | 41.3 |
| EA (N25,W50) | 2/27/2006 11:40 | <13.8 | | <150 | | <16.2 | <50.4 | <77.25 | <31.5 |
| EA (0,W50) | 2/27/2006 11:47 | <13.95 | | <180 | | 18.1 | <51.6 | 120.6 | 45 |
| North Ditch 1 | 2/27/2006 13:24 | 11.5 | | <127.5 | | <12.6 | <38.7 | <63.6 | 52.2 |
| North Ditch 2 | 2/27/2006 13:33 | <12.6 | | <136.5 | | <14.7 | <47.4 | <75.15 | 69.3 |
| North Ditch 3 | 2/27/2006 13:40 | <12.6 | | <150 | | <15.3 | <47.85 | <78.6 | 64.2 |
| Chamber Ash | 2/27/2006 14:07 | 1269.6 | | 3249.6 | | <255 | 2508.8 | <900 | 468.8 |
| NA5 - FD | 2/27/2006 14:49 | 25.2 | | <165 | | <18.3 | <53.4 | <79.95 | 185.5 |
| SA3 - FD | 2/27/2006 14:58 | 46.1 | | <150 | | <19.2 | <53.7 | <81.6 | 159.2 |
| SA6 - FD | 2/27/2006 15:07 | 19.6 | | <150 | | <17.4 | <49.95 | <77.7 | 46.4 |

Notes:

This table includes the electronic data file from the XRF instrument and contains more information than the handwritten field sheets.

Laboratory results were analyzed using EPA Method 6010B

**Bold** Confirmation (Laboratory) Sample Collected

As Arsenic
Cu Copper
FD Field Duplicate
mg/kg milligram per kilogram
Ni Nickel
Pb Lead
ppm parts per million
XRF x-ray fluorescence
Zn Zinc

# Table 4
# Laboratory Confirmation Samples from Building 407 at LHAAP-46

| Sample ID | Chromium | Lead | Copper | Arsenic | Nickel | Zinc |
|---|---|---|---|---|---|---|
| Building 407 at LHAAP-46 | | | | | | |
| NA5 | X | X | NA | NA | NA | NA |
| SA3 | X | X | NA | NA | NA | NA |
| SA6 | X | X | NA | NA | NA | NA |

Notes:
NA not analyzed
X analyzed

# Table 5
## Relative Percent Difference in XRF Screening and Laboratory Results for the Pistol Range and Building 407 of LHAAP-46

**Pistol Range**

| Sample Location | XRF Result in ppm | Laboratory Result in mg/kg | Relative % Difference | XRF Result in ppm | Laboratory Result in mg/kg | Relative % Difference | XRF Result in ppm | Laboratory Result in mg/kg | Relative % Difference | XRF Result in ppm | Laboratory Result in mg/kg | Relative % Difference | XRF Result in ppm | Laboratory Result | Relative % Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pb | Pb | Pb | Cu | Cu | Cu | As | As | As | Zn | Zn | Zn | Ni | Ni | Ni |
| N50,E25 (0-6") | 3977.6 | 5,240.00 | 27.39 | 148.4 | 186.00 | 22.49 | <110.55 | 2.51 | 191.12 | 39 | 65.10 | 50.14 | <79.8 | 7.51 | 169.59 |
| N25,E25 (0-6") | 55.7 | 32.00 | 54.05 | <62.85 | NA | | <24.75 | NA | | <37.65 | NA | | <124.2 | NA | |
| N50,0 (0-6") | 1120 | 1,220.00 | 8.55 | <59.7 | 5.86 | 164.25 | 101.5 | 14.2 | 150.91 | 66 | 46.6 | 34.46 | <108.3 | 8.71 | 170.22 |
| N25,0 (0-6") | 33.1 | 68.50 | 69.69 | <85.2 | NA | | <29.1 | NA | | <52.65 | NA | | 141.6 | NA | |
| N25,E75-Low (0-6") | 527.2 | 937.00 | 55.98 | <45.15 | NA | | <40.35 | NA | | <28.2 | NA | | <67.65 | NA | |
| N25,E75-Low (6-12") | | 952.00 | 22.01 | 104.1 | 148.00 | 34.83 | <52.65 | 1.75 | 187.13 | 41.2 | 52.2 | 23.55 | 92.9 | 8.11 | 167.88 |
| N25,E75-Low (12-18") | 161.1 | 245.00 | 41.32 | <50.85 | NA | | <27 | NA | | <31.65 | NA | | <75.9 | NA | |
| N25,E75-Up (0-6") | 14.8 | 11.00 | 29.46 | <44.85 | NA | | <15.75 | NA | | <28.5 | NA | | <65.25 | NA | |
| West Ditch (0-6") | <11.4 | 10.70 | 6.33 | <41.7 | NA | | <13.2 | NA | | <24.9 | NA | | <64.5 | NA | |

**Building 407 at LHAAP-46**

| Sample Location | XRF Result in ppm | Laboratory Result in mg/kg | Relative % Difference | XRF Result in ppm | Laboratory Result in mg/kg | Relative % Difference |
|---|---|---|---|---|---|---|
| | Pb | Pb | Pb | Cr | Cr | Cr |
| NA5 | 22 | 39.80 | 57.61 | 143 | 12.90 | 166.90 |
| SA3 | 43.7 | 56.80 | 26.07 | <131.1 | 10.90 | 169.30 |
| SA6 | 18.6 | 30.90 | 49.70 | <150 | 12.40 | 169.46 |

Notes:

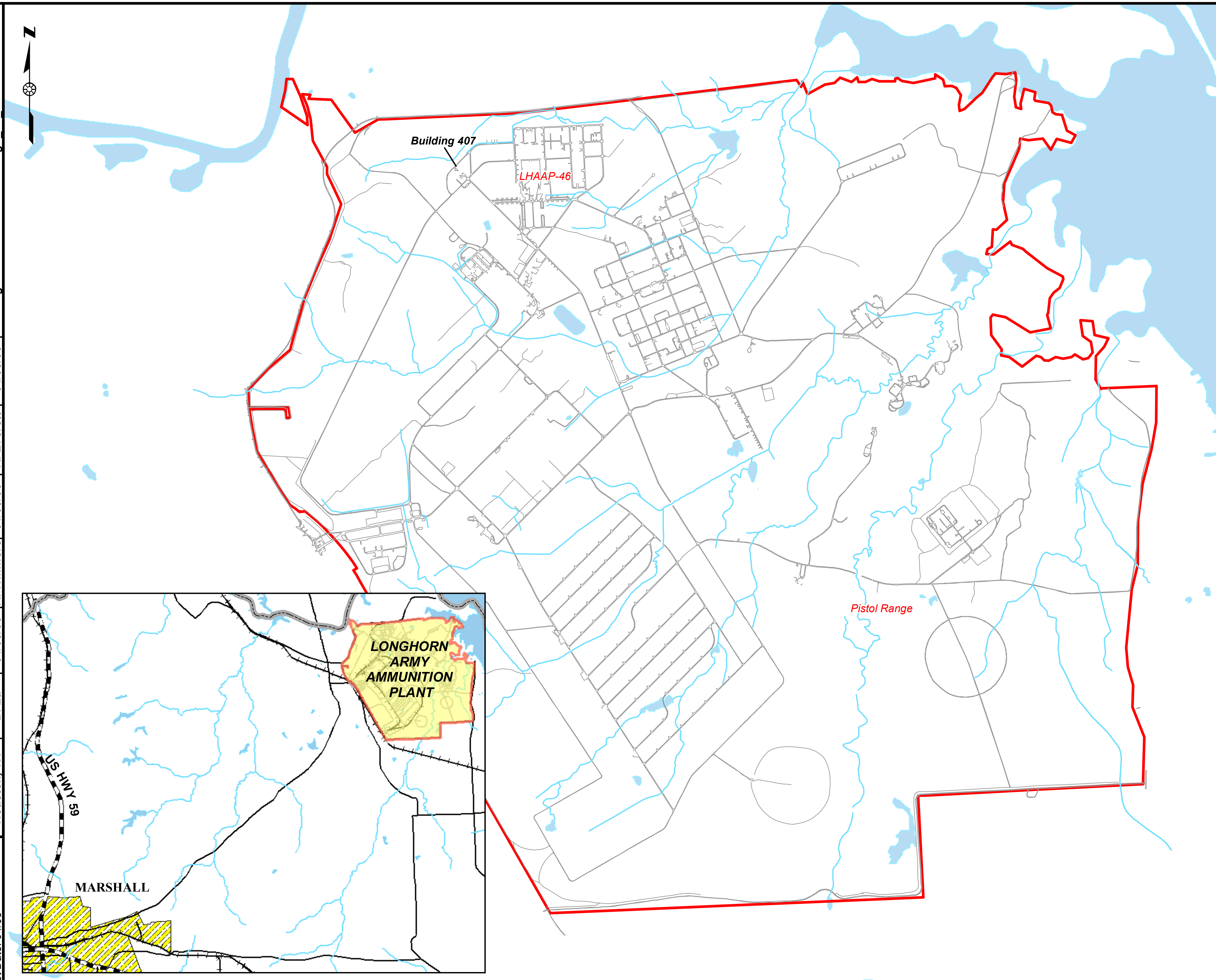
Laboratory resutls were analyzed using EPA Method 6010B

Relative % difference is the difference in XRF screening result and laboratory data result divided by the average of two results and multiplied by 100.

As Arsenic
Cr Chromium
Cu Copper
mg/kg milligrams per kilogram
NA not available
Ni Nickel
Pb Lead
ppm parts per million
XRF x-ray fluorescence
Zn Zinc

# *Figures*

00071329




**Legend**

- Stream
- Road
- Former Building or Tank
- Site
- Lake
- LHAAP Boundary

0 1,250 2,500 5,000 Feet

| OFFICE | DRAWN BY | CHECKED BY | APPROVED BY | FILE PATH |
|---|---|---|---|---|
| Houston, TX | B. Lu 04/03/06 | A. Willmore 04/03/06 | K. Everett 04/03/06 | T:\Longhorn\MXD\PR\PistolRange 46 SiteLocs.mxd |

Plot Date: 04/08

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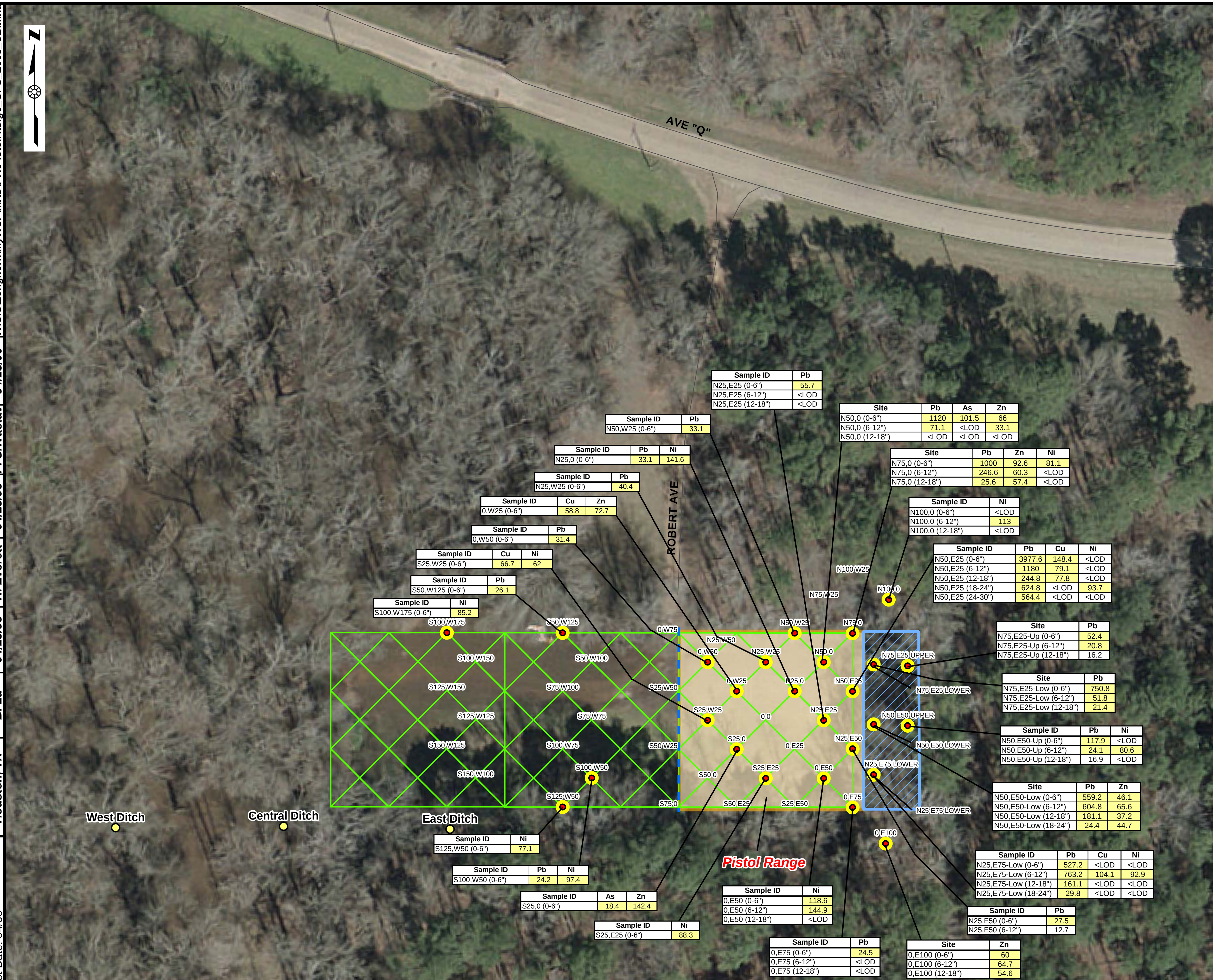
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1

SITE LOCATION MAP
PISTOL RANGE & LHAAP-46

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS




| Sample ID | Pb |
|---|---|
| N25,E25 (0-6") | 55.7 |
| N25,E25 (6-12") | <LOD |
| N25,E25 (12-18") | <LOD |

| Sample ID | Pb |
|---|---|
| N50,W25 (0-6") | 33.1 |

| Sample ID | Pb | Ni |
|---|---|---|
| N25,0 (0-6") | 33.1 | 141.6 |

| Sample ID | Pb |
|---|---|
| N25,W25 (0-6") | 40.4 |

| Sample ID | Cu | Zn |
|---|---|---|
| 0,W25 (0-6") | 58.8 | 72.7 |

| Sample ID | Pb |
|---|---|
| 0,W50 (0-6") | 31.4 |

| Sample ID | Cu | Ni |
|---|---|---|
| S25,W25 (0-6") | 66.7 | 62 |

| Sample ID | Pb |
|---|---|
| S50,W125 (0-6") | 26.1 |

| Sample ID | Ni |
|---|---|
| S100,W175 (0-6") | 85.2 |

| Site | Pb | As | Zn |
|---|---|---|---|
| N50,0 (0-6") | 1120 | 101.5 | 66 |
| N50,0 (6-12") | 71.1 | <LOD | 33.1 |
| N50,0 (12-18") | <LOD | <LOD | <LOD |

| Site | Pb | Zn | Ni |
|---|---|---|---|
| N75,0 (0-6") | 1000 | 92.6 | 81.1 |
| N75,0 (6-12") | 246.6 | 60.3 | <LOD |
| N75,0 (12-18") | 25.6 | 57.4 | <LOD |

| Sample ID | Ni |
|---|---|
| N100,0 (0-6") | <LOD |
| N100,0 (6-12") | 113 |
| N100,0 (12-18") | <LOD |

| Sample ID | Pb | Cu | Ni |
|---|---|---|---|
| N50,E25 (0-6") | 3977.6 | 148.4 | <LOD |
| N50,E25 (6-12") | 1180 | 79.1 | <LOD |
| N50,E25 (12-18") | 244.8 | 77.8 | <LOD |
| N50,E25 (18-24") | 624.8 | <LOD | 93.7 |
| N50,E25 (24-30") | 564.4 | <LOD | <LOD |

| Site | Pb |
|---|---|
| N75,E25-Up (0-6") | 52.4 |
| N75,E25-Up (6-12") | 20.8 |
| N75,E25-Up (12-18") | 16.2 |

| Site | Pb |
|---|---|
| N75,E25-Low (0-6") | 750.8 |
| N75,E25-Low (6-12") | 51.8 |
| N75,E25-Low (12-18") | 21.4 |

| Sample ID | Pb | Ni |
|---|---|---|
| N50,E50-Up (0-6") | 117.9 | <LOD |
| N50,E50-Up (6-12") | 24.1 | 80.6 |
| N50,E50-Up (12-18") | 16.9 | <LOD |

| Site | Pb | Zn |
|---|---|---|
| N50,E50-Low (0-6") | 559.2 | 46.1 |
| N50,E50-Low (6-12") | 604.8 | 65.6 |
| N50,E50-Low (12-18") | 181.1 | 37.2 |
| N50,E50-Low (18-24") | 24.4 | 44.7 |

| Sample ID | Pb | Cu | Ni |
|---|---|---|---|
| N25,E75-Low (0-6") | 527.2 | <LOD | <LOD |
| N25,E75-Low (6-12") | 763.2 | 104.1 | 92.9 |
| N25,E75-Low (12-18") | 161.1 | <LOD | <LOD |
| N25,E75-Low (18-24") | 29.8 | <LOD | <LOD |

| Sample ID | Pb |
|---|---|
| N25,E50 (0-6") | 27.5 |
| N25,E50 (6-12") | 12.7 |

| Site | Zn |
|---|---|
| 0,E100 (0-6") | 60 |
| 0,E100 (6-12") | 64.7 |
| 0,E100 (12-18") | 54.6 |

| Sample ID | Pb |
|---|---|
| 0,E75 (0-6") | 24.5 |
| 0,E75 (6-12") | <LOD |
| 0,E75 (12-18") | <LOD |

| Sample ID | Ni |
|---|---|
| 0,E50 (0-6") | 118.6 |
| 0,E50 (6-12") | 144.9 |
| 0,E50 (12-18") | <LOD |

| Sample ID | Ni |
|---|---|
| S125,W50 (0-6") | 77.1 |

| Sample ID | Pb | Ni |
|---|---|---|
| S100,W50 (0-6") | 24.2 | 97.4 |

| Sample ID | As | Zn |
|---|---|---|
| S25,0 (0-6") | 18.4 | 142.4 |

| Sample ID | Ni |
|---|---|
| S25,E25 (0-6") | 88.3 |

**Legend**

- XRF Soil Sample Location
- Sample Location with Result above UPL
- XRF Sediment Sample Location
- Road
- Firing Line
- Site
- 25-foot Grid
- BERM

Notes:

1. Highlighted concentrations exceed background Upper Prediction Limits (UPLs).
2. XRF screening concentrations reported in parts per million (ppm).
3. Results are presented only for locations with samples exceeding UPLs.
4. <LOD - below level of detection
5. Upper Prediction Limit (UPL) values in mg/kg:
   Arsenic (As): 5.86
   Copper (Cu): 8.37
   Nickel (Ni): 9.4
   Lead (Pb): 17.8
   Zinc (Zn): 24.5

0 30 60 120 Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2

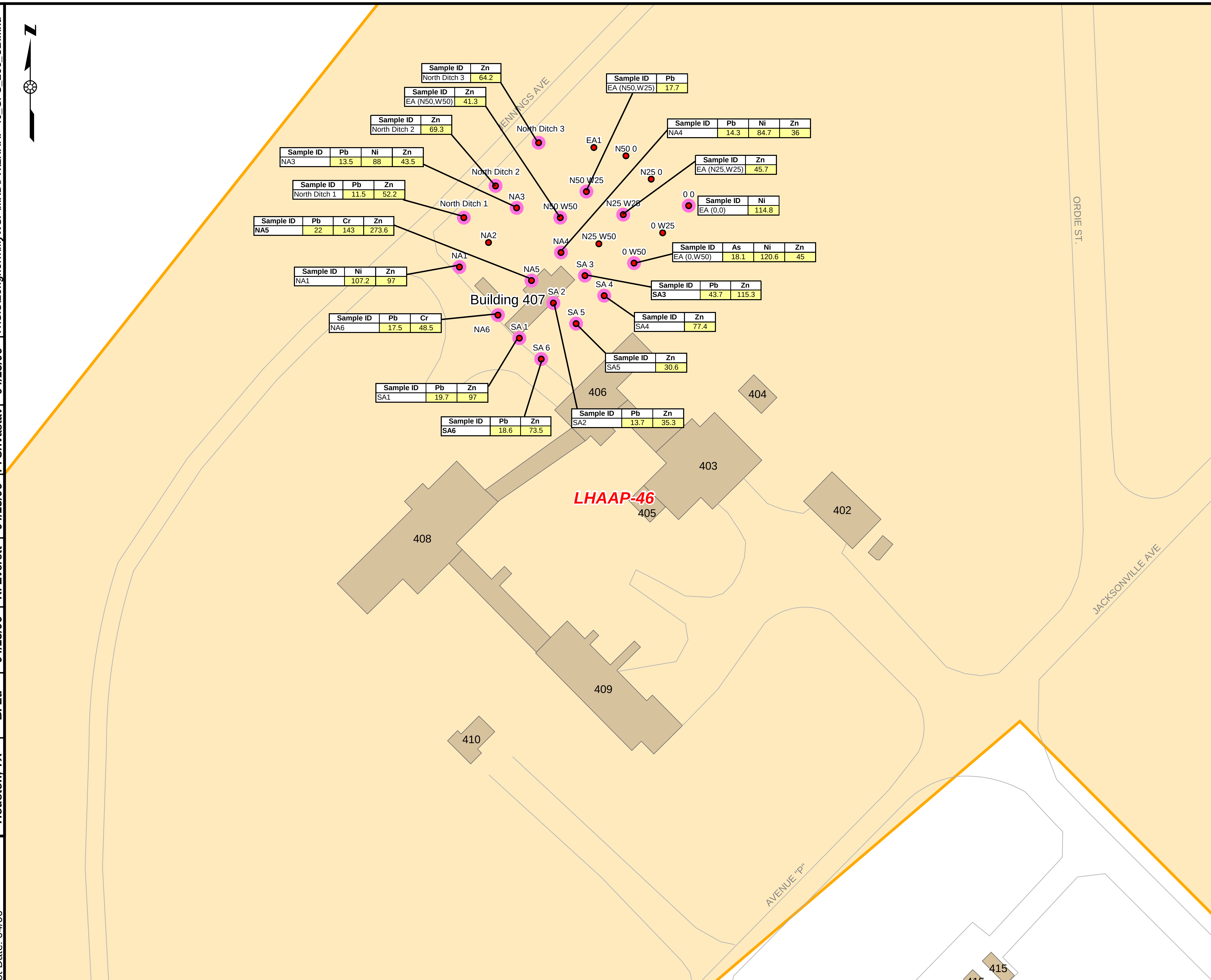
XRF SAMPLE LOCATION MAP AND RESULTS
PISTOL RANGE

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

| OFFICE | DRAWN BY | CHECKED BY | APPROVED BY | FILE PATH |
|---|---|---|---|---|
| Houston, TX | B. Lu 04/13/06 | K. Everett 04/13/06 | P. Srivastav 04/13/06 | T:\GIS\Longhorn\MyWSP\MXD\PR\PistolRange_GPS_Locs_CB.mxd |

Plot Date: 04/06

00071331




## Legend

- XRF Sample Location
- Sample Location with Result above UPL
- Road
- Building or Concrete Slab
- Site

Notes:

1. Highlighted concentrations exceed background Upper Prediction Limits (UPLs).
2. XRF screening concentrations reported in parts per million (ppm).
3. Call out boxes generated for locations with samples exceeding UPLs.
4. <LOD - below level of detection
5. All XRF readings were taken on the surface.
6. Upper Prediction Limit (UPL) values in mg/kg:
   Arsenic (As): 5.86
   Chromium (Cr): 29
   Copper (Cu): 8.37
   Nickel (Ni): 9.4
   Lead (Pb): 17.8
   Zinc (Zn): 24.5

0 30 60 120 Feet

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U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 3

XRF SAMPLE LOCATION MAP AND RESULTS
BUILDING 407 AT LHAAP-46

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

| OFFICE | DRAWN BY | CHECKED BY | APPROVED BY | FILE PATH |
| --- | --- | --- | --- | --- |
| Houston, TX | B. Lu 04/13/06 | K. Everett 04/13/06 | P. Srivastav 04/13/06 | T:\GIS\Longhorn\MyWSP\MXD\PR\LHAAP-46_GPS_Loc_CB.mxd |

Plot Date: 04/06

# *Appendix A*

# *XRF Field Data Forms*

DATE: 2-22-06 00071333

PAGE 1 OF 2

# XRF Summary of Results
## Longhorn AAP Pistol Range, Karnack, Texas

| Location ID | | Sampling Data | | Prep | | | XRF Data | | Conc (ppm) | | | | | Split to | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth | Date | Time | Pan | Lab | Frag? | Read No. | Count (sec) | Pb | Std | Cu | Std | Other Metals | Lab | Comments |
| Grid Node | | | | | | | | | | | | | | | |
| N75,0 | 0-6" | 2-22-06 | 1010 | Y | N | N | 9 | 131 | 1,000 | ±37 | <49 | | ZN 92.6, Ni 81.1 | | |
| N75,0 | 6-12" | 2-22-06 | 1025 | Y | N | N | 10 | 133 | 247 | ±21 | <51 | | ZN 60.3 | | |
| N75,0 | 12-18" | 2-22-06 | 1035 | Y | N | N | 11 | 133 | 25.6 | ±11 | <55 | | ZN 57.4 ± 24 | | |
| N50E25 | 0-6" | 2-22-06 | 1100 | Y | N | N | 12 | 157 | 3980 | ±81 | 148 | ±40 | ZN 39 | | |
| N50E25 | 6-12" | 2-22-06 | 1105 | Y | N | ~~N~~ Y | 13 | 162 | 1180 | ±36 | 79.1 | ±31 | ZN 56.8 | | 38 Cal. Brass Bullet Casing |
| N50E25 | 12-18" | 2-22-06 | 1115 | Y | N | N | 14 | 136 | 245 | ±19 | 77.8 | ±35 | ZN 53.3 ± 22 | | |
| N50E25 | 18-24" | 2-22-06 | 1125 | Y | N | N | 15 | 137 | 625 | ±30 | <53 | | ZN <38 | | |
| N50E25 | 24-30" | 2-22-06 | 1135 | Y | N | N | 16 | 143 | 564 | ±29 | <51 | | ZN 51.3 | | Auger Refusal |
| N25E50 | 0-6" | 2-22-06 | 1345 | Y | N | N | 18 | 135 | 27.5 | ±9.9 | <48 | | ZN 42.40 | | |
| N25E50 | 6-12" | 2-22-06 | 1350 | Y | N | | 19 | | | | | | | | |
| N25E50 | 12-18" | 2-22-06 | 1400 | Y | N | | | | | | | | | | |

- CONTINUED ON NEXT PAGE -

[signature] 2-22-06

# XRF Summary of Results
## Longhorn AAP Pistol Range, Karnack, Texas

| Location ID | | Sampling Data | | Prep | | | XRF Data | | Conc (ppm) | | | | | Split to | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth | Date | Time | Pan | Lab | Frag? | Read No. | Count (sec) | Pb | Std | Cu | Std | Other Metals | Lab | Comments |
| Grid Node | | | | | | | | | | | | | | | |
| N25E50 | 6-12" | 2-22-06 | 1350 | Y | N | N | 19 | 162 | 12.7 | ±8.2 | <44 | | ZN40.7 | | |
| N25E50 | 12-18" | 2-22-06 | Auger Refusal - No Sample Collected | | | | | | | | | | | | |
| Ø,E75 | 0-6" | 2-22-06 | 1420 | Y | N | N | 20 | 152 | 24.5 | ±10 | <49 | | ZN39.3 | | |
| Ø,E75 | 6-12" | 2-22-06 | 1435 | Y | N | N | 21 | 131 | <13 | | <47 | | ZN45.2 | | |
| Ø,E75 | 12-18" | 2-22-06 | 1450 | Y | N | N | 22 | 197 | <12 | | <44 | | ZN33.8 | | |
| Ø,E50 | 0-6" | 2-22-06 | 1525 | Y | N | N | 23 | 132 | 15.3 | ±9.3 | <48 | | NI 119±55 | | |
| Ø,E50 | 6-12" | 2-22-06 | 1540 | Y | N | N | 24 | 131 | 16.3 | ±10 | <51 | | NI 145±61 | | |
| Ø,E50 | 12-18" | 2-22-06 | 1550 | Y | N | N | 25 | 133 | 15.3 | | <48 | | ZN52.6 | | |
| N25E25 | 0-6" | 2-22-06 | 1610 | Y | N | N | 28 | 131 | 55.7 | ±14 | <63 | | | | |
| N25E25 | 6-12" | 2-22-06 | 1620 | Y | N | N | 29 | 130 | <13 | | <49 | | NI 79.4 | | |
| N25E25 | 12-18" | 2-22-06 | 1630 | Y | N | N | 30 | 131 | <13 | | <48 | | ZN 35.7 | | |

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# XRF Summary of Results
## Longhorn AAP Pistol Range, Karnack, Texas

| Location ID | | Sampling Data | | Prep | | | XRF Data | | Conc (ppm) | | | | | Split to | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth | Date | Time | Pan | Lab | Frag? | Read No. | Count (sec) | Pb | Std | Cu | Std | Other Metals | Lab | Comments |
| Grid Node | | | | | | | | | | | | | | | |
| N50Ø | 0-6" | 2-23-06 | 0905 | Y | N | N | 7 | 131 | 1120 ± 46 | | <60 | | ZN 66 ± 26<br>AS 101 ± 47 | | |
| N50Ø | 6-12" | 2-23-06 | 0915 | Y | N | N | 8 | 145 | 71.1 ± 13 | | <49 | | ZN 33.1 | | |
| N50Ø | 12-18" | 2-23-06 | 0930 | Y | N | N | 9 | 158 | <13 | | <45 | | | | |
| N50W25 | 0-6" | 2-23-06 | 0940 | Y | N | N | 10 | 141 | 33.1 ± 10 | | <46 | | ZN 43.2 ± 20 | | |
| N50W25 | 6-12" | 2-23-06 | NOT | COLLECTED. | | | | | | | | | | | |
| N25Ø | 0-6" | 2-23-06 | 0950 | Y | N | N | 11 | 131 | 33.1 ± 17 | | <85 | | NI 142 ± 90 | | |
| ØE25 | 0-6" | 2-23-06 | 1000 | Y | N | N | 12 | 131 | <15 | | <53 | | | | |
| S25E50 | 0-6" | 2-23-06 | 1005 | Y | N | N | 13 | 137 | 21.3 ± 9.5 | | <46 | | ZN 55.1 | | |
| N25W25 | 0-6" | 2-23-06 | 1010 | Y | N | N | 14 | 131 | 40.4 ± 11 | | <45 | | | | |
| Ø,Ø | 0-6" | 2-23-06 | 1025 | Y | N | N | 15 | 130 | <14 | | <48 | | ZN 34.1 | | |
| S25E25 | 0-6" | 2-23-06 | 1040 | Y | N | N | 16 | 133 | <13 | | <49 | | NI 88.3 | | |
| N25W50 | 0-6" | 2-23-06 | 1045 | Y | N | N | 17 | 130 | <13 | | <45 | | ZN 41.9 | | |
| ØW25 | 0-6" | 2-23-06 | 1055 | Y | N | N | 18 | 131 | 18.1 ± 9.8 | | 58.8 ± 37 | | ZN 72.7 | | |
| S25Ø | 0-6" | 2-23-06 | 1105 | Y | N | N | 19 | 146 | <15 | | <58 | | ZN 142 ±<br>AS 18.4 ± 12 | | |
| S50E25 | 0-6" | 2-23-06 | 1115 | Y | N | N | 20 | 139 | <9.9 | | <39 | | ZN 35.1 | | |
| ØW50 | 0-6" | 2-23-06 | 1120 | Y | N | N | 21 | 130 | 31.4 ± 9.7 | | <43 | | ZN 46.9 | | |
| S25W25 | 0-6" | 2-23-06 | 1130 | Y | N | N | 22 | 348 | 12.8 ± 5.8 | | 66.7 ± 23 | | ZN 43.9<br>NI 62 | | |
| S50Ø | 0-6" | 2-23-06 | 1145 | Y | N | N | 23 | 178 | <12 | | <43 | | CR 169 ± 110 | | |
| N75W25 | 0-6" | 2-23-06 | 1505 | Y | N | N | 24 | 154 | <13 | | <48 | | ZN 31.3 | | |
| N75W25 | 6-12" | 2-23-06 | 1510 | Y | N | N | 25 | 137 | <14 | | <52 | | | | |
| N75W25 | 12-18" | 2-23-06 | 1520 | Y | N | | 26 | 131 | <14 | | <52 | | ZN 37.7 | | |

# XRF Summary of Results
## Longhorn AAP Pistol Range, Karnack, Texas

| Location ID | | Sampling Data | | Prep | | | XRF Data | | Conc (ppm) | | | | | Split to | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth | Date | Time | Pan | Lab | Frag? | Read No. | Count (sec) | Pb | Std | Cu | Std | Other Metals | Lab | Comments |
| Grid Node | | | | | | | | | | | | | | | |
| N100W25 | 0-6" | 2-23-06 | 1535 | Y | N | N | 27 | 133 | <13 | | <49 | | ZN 37.7 | | |
| N100W25 | 6-12" | 2-23-06 | 1545 | Y | N | N | 28 | 134 | <14 | | <52 | | ZN 39 | | |
| N100W25 | 12-18" | 2-23-06 | 1555 | Y | N | N | 29 | 132 | <15 | | <53 | | | | |
| N100,Φ | 0-6" | 2-23-06 | 1615 | Y | N | N | 31 | 131 | <13 | | <47 | | ZN 39.8 | | |
| N100,Φ | 6-12" | 2-23-06 | 1630 | Y | N | N | 32 | 135 | <13 | | <50 | | NI 113 | | |
| N100,Φ | 12-18" | 2-23-06 | 1640 | Y | N | N | 33 | 140 | <14 | | <52 | | ZN 52.7 | | |

# XRF Summary of Results
## Longhorn AAP Pistol Range, Karnack, Texas

| Location ID | | Sampling Data | | Prep | | | XRF Data | | Conc (ppm) | | | | | Split to | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth | Date | Time | Pan | Lab | Frag? | Read No. | Count (sec) | Pb | Std | Cu | Std | Other Metals | Lab | Comments |
| Grid Node | | | | | | | | | | | | | | | |
| Lower N75E25 | 0-6" | 2-24-06 | 1000 | Y | N | Y | 10 | 131 | 751 | ±32 | <46 | | | | 1 Small Caliber Expended Round |
| Lower N75E25 | 6-12" | 2-24-06 | 1005 | Y | N | N | 11 | 133 | 51.8 | ±12 | <50 | | | | |
| Lower N75E25 | 12-18" | 2-24-06 | 1010 | Y | N | N | 12 | 130 | 21.4 | ±10 | <49 | | | | |
| Upper N75E25 | 0-6" | 2-24-06 | 1020 | Y | N | N | 13 | 131 | 52.4 | ±11 | <44 | | | | |
| Upper N75E25 | 6-12" | 2-24-06 | 1030 | Y | N | N | 14 | 136 | 20.8 | ±9.9 | <49 | | ZN 36.2 | | |
| Upper N75E25 | 12-18" | 2-24-06 | 1035 | Y | N | N | 15 | 138 | 16.2 | ±9.2 | <48 | | ZN 36.4 | | |
| Lower N50E50 | 0-6" | 2-24-06 | 1055 | Y | N | N | 16 | 139 | 559 | ±30 | <51 | | ZN 46.1 | | |
| Lower N50E50 | 6-12" | 2-24-06 | 1105 | Y | N | N | 17 | 130 | 605 | ±31 | <54 | | ZN 65.6 | | |
| Lower N50E50 | 12-18" | 2-24-06 | 1115 | Y | N | N | 18 | 130 | 181 | ±17 | <50 | | ZN 37.2 | | |
| Upper N50E50 | 0-6" | 2-24-06 | 1305 | Y | N | N | 20 | 133 | 118 | ±15 | <51 | | ZN 37.1 | | |
| Lower N50E50 | 18-24" | 2-24-06 | 1125 | Y | N | N | 19 | 150 | 24.4 | ±9.8 | <48 | | ZN 44.7 | | |
| Upper N50E50 | 6-12" | 2-24-06 | 1315 | Y | N | N | 21 | 133 | 24.1 | ±9.4 | <46 | | ZN 42.2<br>NI 80.6 | | |
| Upper N50E50 | 12-18" | 2-24-06 | 1320 | Y | N | N | 22 | 175 | 16.9 | ±8.5 | <44 | | ZN 41.8 | | |
| Lower N25E75 | 0-6" | 2-24-06 | 1340 | Y | N | N | 23 | 147 | 527 | ±26 | <45 | | | | |
| Lower N25E75 | 6-12" | 2-24-06 | 1345 | Y | N | N | 24 | 131 | 763 | ±35 | 104 | ±39 | ZN 41.2<br>NI 92.9 | | |
| Lower N25E75 | 12-18" | 2-24-06 | 1355 | Y | N | N | 25 | 136 | 161 | ±17 | <51 | | | | |
| Lower N25E75 | 18-24" | 2-24-06 | 1400 | Y | N | N | 26 | 163 | 29.8 | ±8.7 | <40 | | NI <61 | | |
| Upper N25E75 | 0-6" | 2-24-06 | 1415 | Y | N | N | 27 | 131 | 14.8 | ±8.8 | <45 | | | | |
| Upper N25E75 | 6-12" | 2-24-06 | 1420 | Y | N | N | 28 | 130 | 17.5 | ±9.7 | <48 | | | | |
| Upper N25E75 | 12-18" | 2-24-06 | 1430 | Y | N | N | 29 | 139 | <12 | | <44 | | ZN 28.9 | | |
| 0E100 | 0-6" | 2-24-06 | 1445 | Y | N | N | 30 | 133 | <12 | | <48 | | ZN 60 | | |

# XRF Summary of Results
## Longhorn AAP Pistol Range, Karnack, Texas

| Location ID | | Sampling Data | | Prep | | | XRF Data | | Conc (ppm) | | | | | Split to | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth | Date | Time | Pan | Lab | Frag? | Read No. | Count (sec) | Pb | Std | Cu | Std | Other Metals | Lab | Comments |
| Grid Node | | | | | | | | | | | | | | | |
| OE100 | 6-12" | 2-24-06 | 1448 | Y | N | N | 31 | 134 | <14 | | <54 | | ZN 64.7 | | |
| OE100 | 12-18" | 2-24-06 | 1455 | Y | N | N | 32 | 130 | <14 | | <52 | | ZN 54.6 | | |
| OW75 | | 2-24-06 | 1540 | Y | N | N | 33 | 122 | <15 | | <56 | | ZN 47.8 | | |
| S25W50 | | 2-24-06 | 1545 | Y | N | N | 34 | 121 | 16.6 | ±9.9 | <52 | | ZN 40.6 | | |
| 4 (25') S50W25 | | 2-24-06 | 1550 | Y | N | N | 35 | 121 | <12 | | <42 | | | | |
| S75Ø | | 2-24-06 | 1555 | Y | N | N | 36 | 120 | <12 | | <48 | | ZN 35.8 | | |
| S50W100 | | 2-24-06 | 1600 | Y | N | N | 37 | 100 | <14 | | <50 | | ZN 34.5 | | |
| S75W75 | | 2-24-06 | 1605 | Y | N | N | 38 | 120 | <12 | | <46 | | | | |
| S100W50 | | 2-24-06 | 1610 | Y | N | N | 39 | 121 | 24.2 | ±9.9 | <46 | | NI 97.4 | | |
| S50W125 | | 2-24-06 | 1620 | Y | N | N | 40 | 121 | 26.1 | ±10 | <49 | | ZN 31.1 | | |
| S75W100 | | 2-24-06 | 1625 | Y | N | N | 41 | 128 | 15.5 | ±9.7 | <51 | | | | |
| ~~75W100~~ | | | | | | | | | | | | | | | |
| S100W75 | | 2-24-06 | 1630 | Y | N | N | 42 | 120 | <13 | | <49 | | ZN 49.1 | | |
| ~~S125W50~~ | | ~~2-24-06~~ | ~~1640~~ | Y | N | | | | | | | | | | |
| S150W100 | | 2-24-06 | 1640 | Y | N | N | 44 | 121 | <12 | | <45 | | ZN 33.2 | | |
| S125W50 | | 2-24-06 | 1635 | Y | N | N | 43 | 121 | <12 | | <46 | | ZN 41.7 NI 72.1 | | |
| S125W125 | | 2-24-06 | 1645 | Y | N | N | 45 | 121 | <13 | | <43 | | ZN 42 | | |
| S100W150 | | 2-24-06 | 1650 | Y | N | N | 46 | 126 | <12 | | <45 | | ZN 38.7 | | |
| S100W175 | | 2-24-06 | 1700 | Y | N | N | 47 | 130 | <14 | | <48 | | ZN 45.1 NI 85.2 | | |
| S125W150 | | 2-24-06 | 1705 | Y | N | N | 48 | 121 | <13 | | <48 | | | | |
| 13 (50' west) S150W125 | | 2-24-06 | 1710 | Y | N | N | 49 | 121 | <13 | | <48 | | ZN 34.6 | | |

# XRF Summary of Results
## Longhorn AAP Pistol Range, Karnack, Texas

| Location ID | | Sampling Data | | Prep | | | XRF Data | | Conc (ppm) | | | | | Split to | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth | Date | Time | Pan | Lab | Frag? | Read No. | Count (sec) | Pb | Std | Cu | Std | Other Metals | Lab | Comments |
| Grid Node | | | | | | | | | | | | | | | |
| East Ditch | | 2-24-06 | 1715 | Y | N | N | 50 | 121 | <11 | | <43 | | Zn 36.9 | | |
| Center Ditch | | 2-24-06 | 1720 | Y | N | | 51 | 148 | <13 | | <45 | | Zn 29.9 | | |
| West Ditch | | 2-24-06 | 1730 | Y | N | | 52 | 100 | <11 | | <42 | | | | |

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# XRF Summary of Results
## Longhorn AAP ~~Pistol Range~~, Karnack, Texas
BLDG. 407 RM 2-27

| Location ID: Location | Location ID: Depth | Sampling Data: Date | Sampling Data: Time | Prep: Pan | Prep: Lab | Prep: Frag? | XRF Data: Read No. | XRF Data: Count (sec) | Conc (ppm): Pb / Std | Conc (ppm): Cu | Conc (ppm): Std | Other Metals | Split to Lab | Other Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grid Node | | | | | | | | | | | | | | |
| NA6 | | 2-27-06 | 0925 | Y | N | N | 7 | 120 | 17.5±11 | | | CR<190 | | |
| NA5 | | 2-27-06 | 0927 | Y | N | N | 8 | 120 | 22±9.3 | | | ZN 274±29<br>CR 143±91 | Y | |
| NA4 | | 2-27-06 | 0933 | Y | N | N | 9 | 120 | 14.3±9.2 | | | NI 84.7<br>ZN 36 | | CR<150 |
| SA3 | | 2-27-06 | 0940 | Y | N | N | 10 | 128 | 43.7±11 | | | ZN 115±23<br>CR<130 | Y | |
| SA2 | | 2-27-06 | 0945 | Y | N | N | 11 | 129 | 13.7±8.5 | | | CR<130 | | |
| SA1 | | 2-27-06 | 0955 | Y | N | N | 12 | 127 | 19.7±9 | | | ZN 97±22<br>CR<130 | | |
| NA1 | | 2-27-06 | 1000 | Y | N | N | 13 | 128 | <12 | | | NI 107±56<br>ZN 97±23 | | CR<150 |
| NA2 | | 2-27-06 | 1010 | Y | N | N | 14 | 125 | <13 | | | CR<160 | | |
| NA3 | | 2-27-06 | 1015 | Y | N | N | 15 | 133 | 13.5±8.9 | | | Z 43.5<br>NI 88 | | CR<150 |
| SA6 | | 2-27-06 | 1025 | Y | N | N | 16 | 121 | 18.6±9.6 | | | ZN 73.5±22<br>CR<150 | Y | |
| SA5 | | 2-27-06 | 1030 | Y | N | N | 17 | 134 | <13 | | | CR<130 | | |
| SA4 | | 2-27-06 | 1040 | Y | N | N | 18 | 125 | <11 | | | CR<110<br>ZN 77.4 | | |
| EA1 | | 2-27-06 | 1045 | Y | N | N | 19 | 128 | <12 | | | CR<130 | | |
| EAST Area N50,Ø | | 2-27-06 | 1050 | Y | N | N | 20 | 122 | <14 | | | CR<150 | | |
| N25,Ø | | 2-27-06 | 1100 | Y | N | N | 21 | 121 | <13 | | | CR<130<br>NI 115±54 | | |
| Ø,Ø | | 2-27-06 | 1105 | Y | N | N | 22 | 128 | <14 | | | CR<150 | | |
| ØW25 | | 2-27-06 | 1110 | Y | N | N | 23 | 120 | <14 | | | CR<150 | | |
| N25W25 | | 2-27-06 | 1120 | Y | N | N | 24 | 122 | <12 | | | CR<140 | | |
| N50W25 | | 2-27-06 | 1125 | Y | N | N | 25 | 127 | 17.7±9.4 | | | CR<150 | | |
| N50W50 | | 2-27-06 | 1130 | Y | N | N | 26 | 132 | <15 | | | CR<160 | | |
| N25, W30 ~~N50 W25~~ RM 2-27 | | 2-27-06 | 1140 | Y | N | N | 27 | 124 | <14 | | | CR<150 | | |
| ØW50 | | 2-27-06 | 1145 | Y | N | N | 28 | 123 | <14 | | | CR<180 | | AS 18.21<br>NI 121 |

# XRF Summary of Results
## Longhorn AAP ~~Pistol Range~~, Karnack, Texas
BLDG. 407 RM 2-27

| Location ID | | Sampling Data | | Prep | | | XRF Data | | Conc (ppm) | | | | | Split to | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | Depth | Date | Time | Pan | Lab | Frag? | Read No. | Count (sec) | Pb | Std | Cu | Std | Other Metals | Lab | Comments |
| Grid Node | | | | | | | | | | | | | | | |
| North Ditch 1 | | 2-27-06 | 1320 | Y | N | N | 29 | 158 | 11.5 ± 7.2 | | | | ZN 52.2 <130 CR | | |
| North Ditch 2 | | 2-27-06 | 1330 | Y | N | N | 30 | 123 | <13 | | | | ZN 69.3 CR<140 | | |
| North Ditch 3 | | 2-27-06 | 1335 | Y | N | N | 31 | 120 | <13 | | | | CR<150 ZN 64.2 | | |
| Paint Chip #1 | | 2-27-06 | 1350 | N | N | N | 34 | 20 | 295 ± 45 | | | | ZN 2080 ± 150 | AS 145 ± 54 | Near N Door |
| Paint Chip #2 | | 2-27-06 | 1405 | N | N | N | 43 | 20 | 423 ± 68 | | | | ZN ~~9044~~ 9140 | | Near S. Door |
| Interior Ash | | | 1410 | N | N | N | 45 | 22 | 1270 | | 2510 | | ZN 469 CR 3250 | | Blue Gray Ash in Burning Chamber |
| Field Duplicates | | | | | | | | | | | | | | | |
| NA5-Fd | | 2-27-06 | 0927 | | | | 46 | 120 | 25.2 ± 10 | | | | CR<160 ZN 185 ± 28 | | |
| SA3-Fd | | 2-27-06 | 0940 | | | | 47 | 120 | 46.1 ± 12 | | | | CR<150 ZN 159 | | |
| SA6-Fd | | 2-27-06 | 1025 | | | | 48 | 120 | 19.6 ± 9.9 | | | | CR < 150 ZN 46.4 | | |

# *Appendix B*

# *Data Evaluation Reports*

# DATA EVALUATION REPORT OF KEMRON REPORT NUMBER L0603017 LONGHORN ARMY AMMUNITION PLANT PISTOL RANGE KARNACK, TEXAS

**SHAW PROJECT NUMBER 117591**

**Prepared by**

**Shaw Environmental, Inc.**
**3010 Briarpark Drive, Suite 4N**
**Houston, Texas 77042**

**March 13, 2006**

00071344

**DATA EVALUATION REPORT**
**KEMRON REPORT NUMBER L0603017**
**PISTOL RANGE**
**LONGHORN ARMY AMMUNITION PLANT**
**KARNACK, TEXAS**

March 13, 2006

Approved by: Diane Meyer    Date: 3/13/06

Diane Meyer, Program Chemist

## Table of Contents



## List of Tables

# Acronyms and Abbreviations

| | |
|---|---|
| COC | chain of custody |
| IDL | instrument detection limit |
| LCS | laboratory control sample |
| LHAAP | Longhorn Army Ammunition Plant |
| MARC | Multiple Award Remediation Contract |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| QA | quality assurance |
| QC | quality control |
| RCRA | Resource Conservation and Recovery Act |
| RPD | relative percent difference |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |

# 1.0 Introduction

Shaw Environmental, Inc. has performed a review of the laboratory data associated with sampling at the Pistol Range at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. **Table 1-1** provides a list of the samples collected, a sample identification number and laboratory sample number cross-references, sample matrix, chain of custody (COC) number, date collected, sample location, and analytical method performed for each sample.

The work was performed under the Louisville District's Multiple Award Remediation Contract (MARC), No. W912QR-04-D-0027, and Task Order DS02. This Data Evaluation Report is a summary of the analytical data generated by Kemron Environmental Services, Marietta, Ohio.

The purpose of the analytical data review is to assess the effect of the overall analytical process on the usability of the data. The review involved comparing the analytical data summary forms, as submitted by the laboratory, to method requirements set forth in methods found in SW-846, 3rd Edition, Update III, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA, 1997) and project-imposed requirements specified in the task order. Additionally, surrogate spike recoveries, if applicable, matrix spike recoveries, and duplicate sample results were reviewed to determine any matrix interference. The data packages were reviewed by the Project Chemist using the process outlined in Standard Operating Procedure 1141, Analytical Data Quality Evaluation and Reporting (Shaw, revised 2002).

This data evaluation report discusses accuracy, precision, and representativeness for each type of analysis. **Section 2.0** contains a discussion of precision, accuracy, and representativeness for each method. **Section 3.0** of this report is a technical summary of the data review for the data group as a whole, including completeness. **Section 4.0** lists references.

Data qualifiers were added to the applicable results in the data package. A list of validation qualifiers is shown in **Table 3-1**.

# Table 1-1
# Chain-of-Custody Summary

| Sample I.D. | Lab Sample Number | Matrix | Chain of Custody Number | Date Collected | Methods SW-846[1] |
|---|---|---|---|---|---|
| PR-SS-N50E25-0-6 | L0603017-01 | Soil | 56569 | 2/22/06 | Lead, arsenic, antimony, copper, nickel & zinc – 6010B |
| PR-SS-N50,0-0-6 | L0603017-02 | Soil | 56569 | 2/23/06 | Lead, arsenic, antimony, copper, nickel & zinc – 6010B |
| PR-SS-N75E75-Low-6-12 | L0603017-03 | Soil | 56569 | 2/24/06 | Lead, arsenic, antimony, copper, nickel & zinc – 6010B |
| PR-SS-N25E75-Low-0-6 | L0603017-04 | Soil | 56569 | 2/24/06 | Lead – 6010B |
| PR-SS-N25E75-Low-12-18 | L0603017-05 | Soil | 56569 | 2/24/06 | Lead – 6010B |
| PR-SS-N25E25-0-6 | L0603017-06 | Soil | 56569 | 2/22/06 | Lead – 6010B |
| PR-SS-N250-0-6 | L0603017-07 | Soil | 56569 | 2/23/06 | Lead – 6010B |
| PR-SS-N25E75-Upper-0-6 | L0603017-08 | Soil | 56569 | 2/24/06 | Lead – 6010B |
| PR-SS-W-Ditch | L0603017-09 | Soil | 56569 | 2/24/06 | Lead – 6010B |

Notes and Abbreviations:

1 United States Environmental Protection Agency (USEPA), 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Update III*, Washington, D.C.

# 2.0 Metals

The soil samples were collected and analyzed for metals – lead, arsenic, antimony, copper, nickel, and zinc by SW-846 Method 6010B.

## 2.1 Initial and Continuing Calibration

The initial and continuing calibrations were within established limits. The interference check standard was within quality control limits.

## 2.2 Accuracy

The laboratory control sample (LCS) was within quality control limits. The matrix spike (MS), and matrix spike duplicate (MSD) were outside quality control limits for copper, lead, nickel, zinc, and antimony. The MS/MSD recoveries exceeded the upper control limit of 125% for copper, lead, nickel, and zinc. The MS/MSD recovery was below the lower QC limits of 75% for antimony. The sample selected for the matrix spike was a non-project sample and the data were not qualified. The post digestion spike was within quality control limits. The serial dilution criterion of < 10% was met when the samples results were > 50 times the instrument detection limit (IDL).

## 2.3 Precision

The MS/MSD relative percent (RPD) values were within quality control limits.

## 2.4 Representativeness

The method blanks, initial calibration blanks, and continuing calibration blanks were free of contamination. No QC replicate sample was submitted. The samples were analyzed within the six month holding time.

# 3.0 Technical Summary

The following summarizes the data review for the sampling at LHAAP.

## 3.1 Documentation

The COC were complete and contained the required information. The actual methods used for sample analysis were based upon the COC submitted with the samples. Upon receipt at the laboratory, cooler receipt forms were completed and are included as part of the laboratory data package. All holding times for extraction and analyses were met.

## 3.2 Completeness

The 100% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). None of the data was rejected or qualified as estimated. The data are acceptable as reported.

## 3.3 Conclusion

An overall review of the samples collected indicates that the chain of custody procedures and laboratory analyses have been conducted in an acceptable manner according to the USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C. (October 1999). **Table 3-1** lists qualifier definitions applied to the samples.

**Table 3-1**
**Data Validation Qualifier Definitions**

| Qualifier | Definitions |
|---|---|
| U | Not detected: The analyte was analyzed for, but was not detected above the level of the associated value. The associate value is the sample quantitation limit (SQL). |
| J | Estimated: The analyte was detected and positively identified. The associated numerical value is the approximate concentration of the analyte in the sample. |
| UJ | Not detected, SQL is estimated: The analyte was analyzed for, but was not detected above the reported SQL. However, the reported SQL is an estimate and may be inaccurate or imprecise. |
| R | Rejected: The data are unusable. (Note: The presence or absence of the analyte cannot be confirmed.) |
| B | Analyte was detected in method blank at concentration within 5X/10X sample concentration. Sample result is likely a non-detect. |

# 4.0 References

Shaw Environmental, Inc, (revised 2002), *Standard Operating Procedure Manual*, Houston, Texas.

United States Environmental Protection Agency (USEPA), 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Update III*, Washington, D.C.

Department of the Army, U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans USACE Engineering Manual 200-1-3 (February 2001).

USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C., October 1999.

# SHAW ENVIRONMENTAL, INC.
## ANALYTICAL DATA EVALUATION

The Project Chemist reviewed the attached Data Package. Detailed comments concerning specific analyses (i.e. GC/MS Semivolatiles) are provided in the attached review sheets. Any additional comments concerning the data package as a whole are listed below

Site/Location: Longhorn - Pistol Range
Project No.: 117591
Laboratory: Kemron
Report No.: L0603017

COMMENTS:
Data acceptable as reported

| DATA COMPLETENESS | | | |
|---|---|---|---|
| **REQUIREMENTS: Cooler receipt** | **Y** | **N** | **NA** |
| Cooler receipt form present? | ✓ | | |
| Documentation of broken bottles, bubbles in VOA vials, missing labels, seals, etc.? | ✓ | | |
| Was the cooler temperature upon receipt at the laboratory between 2° and 6° C? | | ✓ | |
| Was the pH of the sample acceptable? | | | ✓ |
| Original chain of custody/analytical request form present and complete? | ✓ | | |
| Comparison of the reported parameters to the request on the chain of custody? | ✓ | | |
| Each sample number transcribed by the laboratory and correct sample date? | ✓ | | |
| Cross reference of field sample number, laboratory number and analytical batch? | ✓ | | |
| Date of preparation / extraction and analysis for each sample? | ✓ | | |
| Detection / Quantitation limits reported as specified? | ✓ | | |
| Results reported for method blanks? | ✓ | | |
| Results reported for trip blanks (VOCs only)? | | | ✓ |
| Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported? | ✓ | | |
| Laboratory Control Samples (LCS) / LCSD % recoveries and RPDs reported? | ✓ | | |
| Surrogate values provided (organic samples only)? | | | ✓ |

Sx received at 17°C - metals only. Data acceptable

Data Reviewed by: Diane Meyer Date: 3/13/06
Diane Meyer, Project Chemist

# TIER 1 DATA REVIEW – Metal ANALYSIS

ANALYSIS: Metals- Pb, ~~Cr~~ As, Sb
EPA METHOD: Cu, Ni, Zn
BY: GF OR ICP 6010B

MATRIX: LIQUID
SOLID/SOIL X
TCLP

| REQUIREMENTS | | Y | N | NA |
|---|---|---|---|---|
| Method / Preparation Blank | Every Batch or 20 Sample | ✓ | | |
| | All Compounds <IDL / MDL / RL | ✓ | | |
| Equipment Rinsate Sample | All Compounds <IDL / MDL / RL | | | ✓ |
| Matrix Spike Recovery Values | 75-125% Recovery or Lab Limits | | ✓ | |
| Matrix Spike Duplicate Recovery Values | 75-125% Recovery or Lab Limits | | ✓ | |
| Matrix Spike / Matrix Spike Duplicate | <20% | ✓ | | |
| Laboratory Control Sample (LCS) Analysis | 80-120% Recovery | ✓ | | |
| ICP Serial Dilutions | <10% difference when the amount is greater than 50 X IDL | ✓ | | |
| Field Duplicate Evaluation | Ratio <2.0 for Water | | | ✓ |
| | Ratio <5.0 for Soil | | | ✓ |

If "NO," then list

Method Blank or Equipment Rinsate

| Blank ID | Sample ID | Date Collected | Type of Analysis | Analyte | Concentration (units) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

| Sample Type | Sample ID | Analyte | MS Recovery | MSD Recovery | Result -1 | Result - 2 | RPD% |
|---|---|---|---|---|---|---|---|
| Soil | non-project | Sb | 43.1 | 62.5 | 75-125 | | 36.7 <20 |
| | | Cu | 170 | 166 | | | |
| | | Ni | 180 | 166 | | | |
| | | Zn | 258 | 314 | | | |
| | | Pb | 144 | 152 | | | |

post digestion spike - OK
Data not qualified

Laboratory Control Sample Analysis and Duplicate Sample Analysis

| Analysis Type / Element | Recovery % |
|---|---|
| | |
| | |
| | |

ICP Serial Dilutions

| Analysis Type / Element | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|
| | | | |
| | | | |

ANALYSIS: METALS

MATRIX: LIQUID____ SOLID / SOIL X TCLP____

METHOD: 6010B

BY: ____________

| REQUIREMENT | | Y | N | NA |
|---|---|---|---|---|
| Initial Calibration Verification (ICV) | Beginning and every 10 samples | ✓ | | |
| | ICV % Recovery (90-110%) except HG (80-120%) and | ✓ | | |
| | Cn- (85-115%) | | | ✓ |
| RSD of Initial Calibration | Correlation coefficient must be > 0.995 | ✓ | | |
| Initial Calibration Blank (ICB) | Initial calibration present for every analysis date, element, and instrument | ✓ ✓ | | |
| ICP Interference Check Sample (ICSA / ICSB) | Beginning and end of sample batch | ✓ | | |
| | 80-100% Recovery | ✓ | | |
| Continuing Calibration Verification (CCV) | Every 10 samples | ✓ | | |
| | CCV % Recovery (90-110%) except Hg (80-120%) | ✓ | | |
| | and Cn- (85-115%) | | | ✓ |
| Continuing Calibration Blank (CCB) | Every 10 samples | ✓ | | |
| | | | | |

If "NO," list all samples below

Standard / Blank Check and RSD of Initial Calibration

| Calibration Date | Instrument ID | Run No. | Analyte | Standard Levels | Correlation Coefficient |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

ICV / CCV and ICP Interference Check Sample

| Analysis Type / Element | Instrument ID | Run No. | ICV /CCV | Run Date | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

ICP Interference Check Sample

| File Name | Analysis Type / Element | Instrument ID | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

# LABORATORY REPORT

L0603017

00071355

03/10/06 08:26

Submitted By

KEMRON Environmental Services
156 Starlite Drive
Marietta , OH 45750
( 740 ) 373 - 4071

For

Account Name: Shaw E & I, Inc.
ABB Lummus Biulding
3010 Briarpark
Houston, TX 77042
Attention: Diane Meyer

Account Number: 2773
Work ID: PISTOL RANGE

P.O. Number: 143588

## Sample Summary

| Client ID | Lab ID | Date Collected | Date Received |
|---|---|---|---|
| PR-SS-N50E25-0-6 | L0603017-01 | 22-FEB-06 | 01-MAR-06 |
| PR-SS-N50,0-0-6 | L0603017-02 | 23-FEB-06 | 01-MAR-06 |
| PR-SS-N75E75-LOW-6-12 | L0603017-03 | 24-FEB-06 | 01-MAR-06 |
| PR-SS-N25E75-LOW-0-6 | L0603017-04 | 24-FEB-06 | 01-MAR-06 |
| PR-SS-N25E75-LOW-12-18 | L0603017-05 | 24-FEB-06 | 01-MAR-06 |
| PR-SS-N25E25-0-6 | L0603017-06 | 22-FEB-06 | 01-MAR-06 |
| PR-SS-N250-0-6 | L0603017-07 | 23-FEB-06 | 01-MAR-06 |
| PR-SS-N25E75-UPPER-0-6 | L0603017-08 | 24-FEB-06 | 01-MAR-06 |
| PR-SS-W-DITCH | L0603017-09 | 24-FEB-06 | 01-MAR-06 |

Sample Number:L0603017-01
Client ID:PR-SS-N50E25-0-6
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/22/2006 11:00
Sample Tag:02

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 12:22
File ID:IR.030806.122200
Percent Solid:80.5

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 5240 | | 0.875 | 0.437 |

Sample Number:L0603017-01
Client ID:PR-SS-N50E25-0-6
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/22/2006 11:00
Sample Tag:03

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/03/2006 11:40
Run Date:03/03/2006 14:17
File ID:IR.030306.141700
Percent Solid:80.5

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Arsenic, Total | 7440-38-2 | 2.51 | | 0.875 | 0.437 |
| Copper, Total | 7440-50-8 | 186 | | 0.875 | 0.437 |
| Nickel, Total | 7440-02-0 | 7.51 | | 1.75 | 0.437 |
| Antimony, Total | 7440-36-0 | 15.6 | | 0.875 | 0.437 |
| Zinc, Total | 7440-66-6 | 65.1 | | 0.875 | 0.437 |

Sample Number:L0603017-01
Client ID:PR-SS-N50E25-0-6
Matrix:Soil
Workgroup Number:WG207709
Collect Date:02/22/2006 11:00

PrePrep Method:NONE
Prep Method:D2216-90
Analytical Method:D2216-90
Analyst:TMM
Dilution:1
Units:weight %

Instrument:OVEN
Prep Date:03/01/2006 15:45
Cal Date:
Run Date:03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 80.5 | | 1.00 | 1.00 |

Sample Number:L0603017-02
Client ID:PR-SS-N50,0-0-6
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/23/2006 09:05
Sample Tag:02

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 12:28
File ID:IR.030806.122800
Percent Solid:82.2

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 1220 | | 0.839 | 0.420 |

Sample Number:L0603017-02
Client ID:PR-SS-N50,0-0-6
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/23/2006 09:05
Sample Tag:03

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/03/2006 11:40
Run Date:03/03/2006 14:23
File ID:IR.030306.142300
Percent Solid:82.2

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Arsenic, Total | 7440-38-2 | 14.2 | | 0.839 | 0.420 |
| Copper, Total | 7440-50-8 | 5.86 | | 0.839 | 0.420 |
| Nickel, Total | 7440-02-0 | 8.71 | | 1.68 | 0.420 |
| Antimony, Total | 7440-36-0 | 4.87 | | 0.839 | 0.420 |
| Zinc, Total | 7440-66-6 | 46.6 | | 0.839 | 0.420 |

Sample Number:L0603017-02
Client ID:PR-SS-N50,0-0-6
Matrix:Soil
Workgroup Number:WG207709
Collect Date:02/23/2006 09:05

PrePrep Method:NONE
Prep Method:D2216-90
Analytical Method:D2216-90
Analyst:TMM
Dilution:1
Units:weight %

Instrument:OVEN
Prep Date:03/01/2006 15:45
Cal Date:
Run Date:03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 82.2 | | 1.00 | 1.00 |

Sample Number:L0603017-03
Client ID:PR-SS-NZ5E75-LOW-6-12
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/24/2006 13:45
Sample Tag:02

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 12:46
File ID:IR.030806.124600
Percent Solid:85.3

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 952 | | 0.882 | 0.441 |

Sample Number:L0603017-03
Client ID:PR-SS-NZ5E75-LOW-6-12
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/24/2006 13:45
Sample Tag:03

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/03/2006 11:40
Run Date:03/03/2006 14:29
File ID:IR.030306.142900
Percent Solid:85.3

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Arsenic, Total | 7440-38-2 | 1.75 | | 0.882 | 0.441 |
| Copper, Total | 7440-50-8 | 148 | | 0.882 | 0.441 |
| Nickel, Total | 7440-02-0 | 8.11 | | 1.76 | 0.441 |
| Antimony, Total | 7440-36-0 | 1.77 | | 0.882 | 0.441 |
| Zinc, Total | 7440-66-6 | 52.2 | | 0.882 | 0.441 |

Sample Number:L0603017-03
Client ID:PR-SS-N75E75-LOW-6-12
Matrix:Soil
Workgroup Number:WG207709
Collect Date:02/24/2006 13:45

PrePrep Method:NONE
Prep Method:D2216-90
Analytical Method:D2216-90
Analyst:TMM
Dilution:1
Units:weight %

Instrument:OVEN
Prep Date:03/01/2006 15:45
Cal Date:
Run Date:03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 85.3 | | 1.00 | 1.00 |

Sample Number:L0603017-04
Client ID:PR-SS-N25E75-LOW-0-6
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/24/2006 13:40
Sample Tag:01

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 12:52
File ID:IR.030806.125200
Percent Solid:82.3

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 937 | | 0.893 | 0.447 |

Sample Number:L0603017-04
Client ID:PR-SS-N25E75-LOW-0-6
Matrix:Soil
Workgroup Number:WG207709
Collect Date:02/24/2006 13:40

PrePrep Method:NONE
Prep Method:D2216-90
Analytical Method:D2216-90
Analyst:TMM
Dilution:1
Units:weight %

Instrument:OVEN
Prep Date:03/01/2006 15:45
Cal Date:
Run Date:03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 82.3 | | 1.00 | 1.00 |

Sample Number:L0603017-05
Client ID:PR-SS-N25E75-LOW-12-18
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/24/2006 13:55
Sample Tag:01

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 12:58
File ID:IR.030806.125800
Percent Solid:85.7

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 245 | | 0.810 | 0.405 |

Sample Number: L0603017-05
Client ID: PR-SS-N25E75-LOW-12-18
Matrix: Soil
Workgroup Number: WG207709
Collect Date: 02/24/2006 13:55

PrePrep Method: NONE
Prep Method: D2216-90
Analytical Method: D2216-90
Analyst: TMM
Dilution: 1
Units: weight %

Instrument: OVEN
Prep Date: 03/01/2006 15:45
Cal Date:
Run Date: 03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 85.7 | | 1.00 | 1.00 |

Sample Number: L0603017-06
Client ID: PR-SS-N25E25-0-6
Matrix: Soil
Workgroup Number: WG207839
Collect Date: 02/22/2006 16:10
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3050B
Analytical Method: 6010B
Analyst: CRC
Dilution: 1
Units: mg/kg

Instrument: IRIS-ICP
Prep Date: 03/02/2006 08:20
Cal Date: 03/08/2006 09:11
Run Date: 03/08/2006 13:04
File ID: IR.030806.130400
Percent Solid: 84.3

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 32.0 | | 0.860 | 0.430 |

Sample Number: L0603017-06
Client ID: PR-SS-N25E25-0-6
Matrix: Soil
Workgroup Number: WG207709
Collect Date: 02/22/2006 16:10

PrePrep Method: NONE
Prep Method: D2216-90
Analytical Method: D2216-90
Analyst: TMM
Dilution: 1
Units: weight %

Instrument: OVEN
Prep Date: 03/01/2006 15:45
Cal Date:
Run Date: 03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 84.3 | | 1.00 | 1.00 |

Sample Number: L0603017-07
Client ID: PR-SS-N250-0-6
Matrix: Soil
Workgroup Number: WG207839
Collect Date: 02/23/2006 09:50
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3050B
Analytical Method: 6010B
Analyst: CRC
Dilution: 1
Units: mg/kg

Instrument: IRIS-ICP
Prep Date: 03/02/2006 08:20
Cal Date: 03/08/2006 09:11
Run Date: 03/08/2006 13:10
File ID: IR.030806.131000
Percent Solid: 81.0

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 68.5 | | 0.907 | 0.454 |

Sample Number:L0603017-07
Client ID:PR-SS-N250-0-6
Matrix:Soil
Workgroup Number:WG207709
Collect Date:02/23/2006 09:50

PrePrep Method:NONE
Prep Method:D2216-90
Analytical Method:D2216-90
Analyst:TMM
Dilution:1
Units:weight %

Instrument:OVEN
Prep Date:03/01/2006 15:45
Cal Date:
Run Date:03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 81.0 | | 1.00 | 1.00 |

Sample Number:L0603017-08
Client ID:PR-SS-N25E75-UPPER-0-6
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/24/2006 14:15
Sample Tag:01

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 13:16
File ID:IR.030806.131600
Percent Solid:83.3

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 11.0 | | 0.917 | 0.458 |

Sample Number:L0603017-08
Client ID:PR-SS-N25E75-UPPER-0-6
Matrix:Soil
Workgroup Number:WG207709
Collect Date:02/24/2006 14:15

PrePrep Method:NONE
Prep Method:D2216-90
Analytical Method:D2216-90
Analyst:TMM
Dilution:1
Units:weight %

Instrument:OVEN
Prep Date:03/01/2006 15:45
Cal Date:
Run Date:03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 83.3 | | 1.00 | 1.00 |

Sample Number:L0603017-09
Client ID:PR-SS-W-DITCH
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/24/2006 17:30
Sample Tag:01

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 13:22
File ID:IR.030806.132200
Percent Solid:67.7

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 10.7 | | 1.02 | 0.509 |

Sample Number: L0603017-09
Client ID: PR-SS-W-DITCH
Matrix: Soil
Workgroup Number: WG207709
Collect Date: 02/24/2006 17:30

PrePrep Method: NONE
Prep Method: D2216-90
Analytical Method: D2216-90
Analyst: TMM
Dilution: 1
Units: weight %

Instrument: OVEN
Prep Date: 03/01/2006 15:45
Cal Date:
Run Date: 03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 67.7 | | 1.00 | 1.00 |

B2199

00071362

81560

COC No. A 56569

156 Starlite Drive
Marietta, OH 45750

Kemron
ENVIRONMENTAL SERVICES
CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Fax: 740-373-4835

Company Name: SHAW ENVIRONMENTAL

Project Contact: RANDY McBRIDE | Contact Phone #: 678-227-0212

Turn Around Requirements: NORMAL | Location: LONGHORN AAP

Project #: 117591 | Project Name: PISTOL RANGE

Sampler (print): R. McBRIDE / S. McADOO | Signature: [signature]

Program: ☐ NPDES ☐ AFCEE ☐ RCRA ☐ USAGE ☐ Other

ADDITIONAL REQUIREMENTS

| Sample I.D. No. | Comp* | Grab | Date | Time | Protocol CWA | Protocol SW846 | NUMBER OF CONTAINERS | Hold | Pb only (6010B) | Pb, As, Sb, Cu, Ni, Zn (6010B) | TCLP METALS (1311/6010B) | SPLP Pb, As, Cu, Ni, Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PR-SS-N50E25-0-6 | | ✓ | 2-22-06 | 1100 | | | 1 | SK | ~~✓~~ | ✓ | ✓ | ✓ |
| PR-SS-N500-0-6 | | ✓ | 2-23-06 | 0905 | | | ~~1~~ 2 | | | ✓ | ✓ | ✓ |
| PR-SS-N75E75-low-6-12 | | ✓ | 2-24-06 | 1345 | | | 1 | | | ✓ | ✓ | ✓ |
| PR-SS-N25E75-low-0-6 | | ✓ | 2-24-06 | 1340 | | | 1 | | ✓ | | | |
| PR-SS-N25E75-low-12-18 | | ✓ | 2-24-06 | 1355 | | | 1 | | ✓ | | | |
| PR-SS-N25E25-0-6 | | ✓ | 2-22-06 | 1610 | | | 1 | | ✓ | | | |
| PR-SS-N250-0-6 | | ✓ | 2-23-06 | 0950 | | | 1 | | ✓ | | | |
| PR-SS-N25E75-Upper-0-6 | | ✓ | 2-24-06 | 1415 | | | 1 | | ✓ | | | |
| PR-SS-W-Ditch | | ✓ | 2-24-06 | 1730 | | | 1 | | ✓ | | | |

| Relinquished by: (Signature) | Date | Time | Received by: (Signature) | Relinquished by: (Signature) | Date | Time | Received by: (Signature) |
|---|---|---|---|---|---|---|---|
| R. McBride | 2-28-06 | 1200 | FedEx 8520 7302 9265 | | | | Cle sealed & intact |

| Relinquished by: (Signature) | Date | Time | Received for Laboratory by: (Signature) | Date | Time | Cooler Temp in °C | Remarks: |
|---|---|---|---|---|---|---|---|
| | | | Brenda Gregory | 3/1/06 | 1030 | 17 | 8oz CONTAINERS bg |

*Homogenize all composite samples prior to analysis

Page ____ of ____

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# DATA EVALUATION REPORT
# OF KEMRON REPORT NUMBER L0603015
# LONGHORN ARMY AMMUNITION PLANT
# BUILDING 407
# KARNACK, TEXAS

**SHAW PROJECT NUMBER 117591**

**Prepared by**

**Shaw Environmental, Inc.**
**3010 Briarpark Drive, Suite 4N**
**Houston, Texas 77042**

**March 13, 2006**

00071364

# DATA EVALUATION REPORT
# KEMRON REPORT NUMBER L0603015
# ~~PISTOL RANGE~~
# LONGHORN ARMY AMMUNITION PLANT
# KARNACK, TEXAS

March 13, 2006

Approved by: Diane Meyer
Diane Meyer, Program Chemist

Date: 3/13/06

# Table of Contents



# List of Tables

# Acronyms and Abbreviations

| | |
|---|---|
| COC | chain of custody |
| IDL | instrument detection limit |
| LCS | laboratory control sample |
| LHAAP | Longhorn Army Ammunition Plant |
| MARC | Multiple Award Remediation Contract |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| QA | quality assurance |
| QC | quality control |
| RCRA | Resource Conservation and Recovery Act |
| RPD | relative percent difference |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |

# 1.0 Introduction

Shaw Environmental, Inc. has performed a review of the laboratory data associated with sampling at Building 407 at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. **Table 1-1** provides a list of the samples collected, a sample identification number and laboratory sample number cross-references, sample matrix, chain of custody (COC) number, date collected, sample location, and analytical method performed for each sample.

The work was performed under the Louisville District's Multiple Award Remediation Contract (MARC), No. W912QR-04-D-0027, and Task Order DS02. This Data Evaluation Report is a summary of the analytical data generated by Kemron Environmental Services, Marietta, Ohio.

The purpose of the analytical data review is to assess the effect of the overall analytical process on the usability of the data. The review involved comparing the analytical data summary forms, as submitted by the laboratory, to method requirements set forth in methods found in SW-846, 3rd Edition, Update III, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA, 1997) and project-imposed requirements specified in the task order. Additionally, surrogate spike recoveries, if applicable, matrix spike recoveries, and duplicate sample results were reviewed to determine any matrix interference. The data packages were reviewed by the Project Chemist using the process outlined in Standard Operating Procedure 1141, Analytical Data Quality Evaluation and Reporting (Shaw, revised 2002).

This data evaluation report discusses accuracy, precision, and representativeness for each type of analysis. **Section 2.0** contains a discussion of precision, accuracy, and representativeness for each method. **Section 3.0** of this report is a technical summary of the data review for the data group as a whole, including completeness. **Section 4.0** lists references.

Data qualifiers were added to the applicable results in the data package. A list of validation qualifiers is shown in **Table 3-1**.

# Table 1-1
# Chain-of-Custody Summary

| Sample I.D. | Lab Sample Number | Matrix | Chain of Custody Number | Date Collected | Methods SW-846[1] |
|---|---|---|---|---|---|
| NA5 | L0603015-01 | Soil | 56571 | 2/27/06 | Chromium & lead – 6010B |
| SA3 | L0603015-02 | Soil | 56571 | 2/27/06 | Chromium & lead – 6010B |
| SA6 | L0603015-03 | Soil | 56571 | 2/27/06 | Chromium & lead – 6010B |

Notes and Abbreviations:

1 United States Environmental Protection Agency (USEPA), 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Update III*, Washington, D.C.

# 2.0 Metals

The soil samples were collected and analyzed for metals – chromium and lead by SW-846 Method 6010B.

## 2.1 Initial and Continuing Calibration

The initial and continuing calibrations were within established limits. The interference check standard was within quality control limits.

## 2.2 Accuracy

The laboratory control sample (LCS), matrix spike (MS), and matrix spike duplicate (MSD) were within quality control limits, except the MS/MSD recoveries exceeded the upper control limit. The sample selected for the matrix spike was a non-project sample and the data were not qualified. The post digestion spike was within quality control limits. The serial dilution criterion of < 10% was met when the samples results were > 50 times the instrument detection limit (IDL).

## 2.3 Precision

The MS/MSD relative percent (RPD) values were within quality control limits.

## 2.4 Representativeness

The method blanks, initial calibration blanks, and continuing calibration blanks were free of contamination. No QC replicate sample was submitted. The samples were analyzed within the six month holding time.

# 3.0 Technical Summary

The following summarizes the data review for the sampling at LHAAP.

## 3.1 Documentation

The COC were complete and contained the required information. The actual methods used for sample analysis were based upon the COC submitted with the samples. Upon receipt at the laboratory, cooler receipt forms were completed and are included as part of the laboratory data package. All holding times for extraction and analyses were met.

## 3.2 Completeness

The 100% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). None of the data was rejected or qualified as estimated. The data are acceptable as reported.

## 3.3 Conclusion

An overall review of the samples collected indicates that the chain of custody procedures and laboratory analyses have been conducted in an acceptable manner according to the USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C. (October 1999). **Table 3-1** lists qualifier definitions applied to the samples.

**Table 3-1**
**Data Validation Qualifier Definitions**

| Qualifier | Definitions |
|---|---|
| U | Not detected: The analyte was analyzed for, but was not detected above the level of the associated value. The associate value is the sample quantitation limit (SQL). |
| J | Estimated: The analyte was detected and positively identified. The associated numerical value is the approximate concentration of the analyte in the sample. |
| UJ | Not detected, SQL is estimated: The analyte was analyzed for, but was not detected above the reported SQL. However, the reported SQL is an estimate and may be inaccurate or imprecise. |
| R | Rejected: The data are unusable. (Note: The presence or absence of the analyte cannot be confirmed.) |
| B | Analyte was detected in method blank at concentration within 5X/10X sample concentration. Sample result is likely a non-detect. |

# 4.0 References

Shaw Environmental, Inc, (revised 2002), *Standard Operating Procedure Manual*, Houston, Texas.

United States Environmental Protection Agency (USEPA), 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Update III*, Washington, D.C.

Department of the Army, U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans USACE Engineering Manual 200-1-3 (February 2001).

USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C., October 1999.

00071372

# SHAW ENVIRONMENTAL, INC.
## ANALYTICAL DATA EVALUATION

The Project Chemist reviewed the attached Data Package. Detailed comments concerning specific analyses (i.e. GC/MS Semivolatiles) are provided in the attached review sheets. Any additional comments concerning the data package as a whole are listed below

Site/Location: Longhorn - ~~pistol range~~ DM Bldg 407
Project No.: 117591
Laboratory: Kemron
Report No.: L0603015

COMMENTS:

| DATA COMPLETENESS | | | |
|---|---|---|---|
| **REQUIREMENTS: Cooler receipt** | **Y** | **N** | **NA** |
| Cooler receipt form present? | ✓ | | |
| Documentation of broken bottles, bubbles in VOA vials, missing labels, seals, etc.? | ✓ | | |
| Was the cooler temperature upon receipt at the laboratory between 2° and 6° C? | | ✓ | |
| Was the pH of the sample acceptable? | | | ✓ |
| Original chain of custody/analytical request form present and complete? | ✓ | | |
| Comparison of the reported parameters to the request on the chain of custody? | ✓ | | |
| Each sample number transcribed by the laboratory and correct sample date? | ✓ | | |
| Cross reference of field sample number, laboratory number and analytical batch? | ✓ | | |
| Date of preparation / extraction and analysis for each sample? | ✓ | | |
| Detection / Quantitation limits reported as specified? | ✓ | | |
| Results reported for method blanks? | ✓ | | |
| Results reported for trip blanks (VOCs only)? | | | ✓ |
| Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported? | ✓ | | |
| Laboratory Control Samples (LCS) / LCSD % recoveries and RPDs reported? | ✓ | | |
| Surrogate values provided (organic samples only)? | | | ✓ |

temperature 17°C - metals only - data acceptable

Data Reviewed by: Diane Meyer Date: 3/13/06
Diane Meyer, Project Chemist

ANALYSIS: METALS — MATRIX: — LIQUID_____

METHOD: Pb and Cr — SOLID / SOIL X — TCLP_____

BY: ____________________

| REQUIREMENT | | Y | N | NA |
|---|---|---|---|---|
| Initial Calibration Verification (ICV) | Beginning and every 10 samples | ✓ | | |
| | ICV % Recovery (90-110%) except HG (80-120%) and | ✓ | | |
| | Cn- (85-115%) | | | ✓ |
| RSD of Initial Calibration | Correlation coefficient must be > 0.995 | ✓ | | |
| Initial Calibration Blank (ICB) | Initial calibration present for every analysis date, element, and instrument | ✓ ✓ | | |
| ICP Interference Check Sample (ICSA / ICSB) | Beginning and end of sample batch | ✓ | | |
| | 80-100% Recovery | ✓ | | |
| Continuing Calibration Verification (CCV) | Every 10 samples | ✓ | | |
| | CCV % Recovery (90-110%) except Hg (80-120%) | ✓ | | |
| | and Cn- (85-115%) | | | |
| Continuing Calibration Blank (CCB) | Every 10 samples | ✓ ✓ | | |
| | | | | |

If "NO," list all samples below

Standard / Blank Check and RSD of Initial Calibration

| Calibration Date | Instrument ID | Run No. | Analyte | Standard Levels | Correlation Coefficient |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

ICV / CCV and ICP Interference Check Sample

| Analysis Type / Element | Instrument ID | Run No. | ICV /CCV | Run Date | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

ICP Interference Check Sample

| File Name | Analysis Type / Element | Instrument ID | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

# TIER 1 DATA REVIEW – Metal ANALYSIS

ANALYSIS: Metals - lead + Chromium MATRIX: LIQUID

EPA METHOD: 6010B SOLID/SOIL X TCLP

BY: GF OR ICP

| REQUIREMENTS | | Y | N | NA |
|---|---|---|---|---|
| Method / Preparation Blank | Every Batch or 20 Sample<br>All Compounds <IDL / MDL / RL | ✓<br>✓ | | |
| Equipment Rinsate Sample | All Compounds <IDL / MDL / RL | | | ✓ |
| Matrix Spike Recovery Values | 75-125% Recovery or Lab Limits | | ✓ | |
| Matrix Spike Duplicate Recovery Values | 75-125% Recovery or Lab Limits | | ✓ | |
| Matrix Spike / Matrix Spike Duplicate | <20% | ✓ | | |
| Laboratory Control Sample (LCS) Analysis | 80-120% Recovery | ✓ | | |
| ICP Serial Dilutions | <10% difference when the amount is greater than 50 X IDL | ✓ | | |
| Field Duplicate Evaluation | Ratio <2.0 for Water | | | ✓ |
| | Ratio <5.0 for Soil | | | ✓ |

If "NO," then list

Method Blank or Equipment Rinsate

| Blank ID | Sample ID | Date Collected | Type of Analysis | Analyte | Concentration (units) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

| Sample Type | Sample ID | Analyte | MS Recovery | MSD Recovery | Result -1 | Result - 2 | RPD% |
|---|---|---|---|---|---|---|---|
| soil | non-project | Cr | 201 | 176 | 25-125 | data not | |
| | ✓ | Pb | 144 | 152 | ✓ | Qualified | |
| post digestion spike was w/in QC limits | | | | | | | |
| | | | | | | | |

Laboratory Control Sample Analysis and Duplicate Sample Analysis

| Analysis Type / Element | Recovery % |
|---|---|
| | |
| | |
| | |

ICP Serial Dilutions

| Analysis Type / Element | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|
| | | | |
| | | | |

# LABORATORY REPORT

00071375

L0603015

03/10/06 08:26

Submitted By

KEMRON Environmental Services
156 Starlite Drive
Marietta , OH 45750
( 740 ) 373 - 4071

For

Account Name: Shaw E & I, Inc.
ABB Lummus Biulding
3010 Briarpark
Houston, TX 77042
Attention: Diane Meyer

Account Number: 2773
Work ID: BLDG 407

P.O. Number: 143588

## Sample Summary

| Client ID | Lab ID | Date Collected | Date Received |
|---|---|---|---|
| NA5 | L0603015-01 | 27-FEB-06 | 01-MAR-06 |
| SA3 | L0603015-02 | 27-FEB-06 | 01-MAR-06 |
| SA6 | L0603015-03 | 27-FEB-06 | 01-MAR-06 |

Sample Number:L0603015-01
Client ID:NA5
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/27/2006 09:27
Sample Tag:02

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 12:04
File ID:IR.030806.120400
Percent Solid:82.6

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 39.8 | | 0.847 | 0.423 |

Sample Number:L0603015-01
Client ID:NA5
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/27/2006 09:27
Sample Tag:03

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/03/2006 11:40
Run Date:03/03/2006 13:59
File ID:IR.030306.135900
Percent Solid:82.6

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Chromium, Total | 7440-47-3 | 12.9 | | 0.212 | 0.102 |

Sample Number:L0603015-01
Client ID:NA5
Matrix:Soil
Workgroup Number:WG207709
Collect Date:02/27/2006 09:27

PrePrep Method:NONE
Prep Method:D2216-90
Analytical Method:D2216-90
Analyst:TMM
Dilution:1
Units:weight %

Instrument:OVEN
Prep Date:03/01/2006 15:45
Cal Date:
Run Date:03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 82.6 | | 1.00 | 1.00 |

Sample Number:L0603015-02
Client ID:SA3
Matrix:Soil
Workgroup Number:WG207839
Collect Date:02/27/2006 09:40
Sample Tag:02

PrePrep Method:NONE
Prep Method:3050B
Analytical Method:6010B
Analyst:CRC
Dilution:1
Units:mg/kg

Instrument:IRIS-ICP
Prep Date:03/02/2006 08:20
Cal Date:03/08/2006 09:11
Run Date:03/08/2006 12:10
File ID:IR.030806.121000
Percent Solid:81.7

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 56.8 | | 0.868 | 0.434 |

Sample Number: L0603015-02
Client ID: SA3
Matrix: Soil
Workgroup Number: WG207839
Collect Date: 02/27/2006 09:40
Sample Tag: 03

PrePrep Method: NONE
Prep Method: 3050B
Analytical Method: 6010B
Analyst: CRC
Dilution: 1
Units: mg/kg

Instrument: IRIS-ICP
Prep Date: 03/02/2006 08:20
Cal Date: 03/03/2006 11:40
Run Date: 03/03/2006 14:05
File ID: IR.030306.140500
Percent Solid: 81.7

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Chromium, Total | 7440-47-3 | 10.9 | | 0.217 | 0.104 |

Sample Number: L0603015-02
Client ID: SA3
Matrix: Soil
Workgroup Number: WG207709
Collect Date: 02/27/2006 09:40

PrePrep Method: NONE
Prep Method: D2216-90
Analytical Method: D2216-90
Analyst: TMM
Dilution: 1
Units: weight %

Instrument: OVEN
Prep Date: 03/01/2006 15:45
Cal Date:
Run Date: 03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 81.7 | | 1.00 | 1.00 |

Sample Number: L0603015-03
Client ID: SA6
Matrix: Soil
Workgroup Number: WG207839
Collect Date: 02/27/2006 10:25
Sample Tag: 02

PrePrep Method: NONE
Prep Method: 3050B
Analytical Method: 6010B
Analyst: CRC
Dilution: 1
Units: mg/kg

Instrument: IRIS-ICP
Prep Date: 03/02/2006 08:20
Cal Date: 03/08/2006 09:11
Run Date: 03/08/2006 12:16
File ID: IR.030806.121600
Percent Solid: 84.8

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 30.9 | | 0.791 | 0.396 |

Sample Number: L0603015-03
Client ID: SA6
Matrix: Soil
Workgroup Number: WG207839
Collect Date: 02/27/2006 10:25
Sample Tag: 03

PrePrep Method: NONE
Prep Method: 3050B
Analytical Method: 6010B
Analyst: CRC
Dilution: 1
Units: mg/kg

Instrument: IRIS-ICP
Prep Date: 03/02/2006 08:20
Cal Date: 03/03/2006 11:40
Run Date: 03/03/2006 14:11
File ID: IR.030306.141100
Percent Solid: 84.8

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Chromium, Total | 7440-47-3 | 12.4 | | 0.198 | 0.0949 |

Sample Number:L0603015-03
Client ID:SA6
Matrix:Soil
Workgroup Number:WG207709
Collect Date:02/27/2006 10:25

PrePrep Method:NONE
Prep Method:D2216-90
Analytical Method:D2216-90
Analyst:TMM
Dilution:1
Units:weight %

Instrument:OVEN
Prep Date:03/01/2006 15:45
Cal Date:
Run Date:03/01/2006 15:45
File ID:

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Percent Solids | 10-02-6 | 84.8 | | 1.00 | 1.00 |

B1560 00071379

COC No. A 56571

156 Starlite Drive
Marietta, OH 45750

**KEMRON**
ENVIRONMENTAL SERVICES
**CHAIN-OF-CUSTODY RECORD**

Phone: 740-373-4071
Fax: 740-373-4835

| | |
|---|---|
| Company Name: Shaw Environmental | |
| Project Contact: Randy McBride | Contact Phone #: 675-227-0212 |
| Turn Around Requirements: Normal | Location: Longhorn AAP |
| Project #: Call | Project Name: Bldg. 407 |
| Sampler (print): R.McBride/S.McAdoo | Signature: [illegible] |

Program: ☐ NPDES ☐ AFCEE ☐ RCRA ☐ USAGE ☐ Other ______

| Sample I.D. No. | Comp* | Grab | Date | Time | Protocol CWA | Protocol SW846 | Number of Containers | Hold | Pb and Cr (By 6010B) | Homogenize and TCLP-Metals (1311/6010B) | Additional Requirements |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NA5 | | ✓ | 2-27-06 | 0927 | | | 1 | | ✓ | | Homogenize from |
| SA3 | | ✓ | 2-27-06 | 0940 | | | 1 | | ✓ | ✓ | All 3 samples |
| SA6 | | ✓ | 2-27-06 | 1025 | | | 1 | | ✓ | | for TCLP-Metals |

| Relinquished by: (Signature) | Date | Time | Received by: (Signature) | Relinquished by: (Signature) | Date | Time | Received by: (Signature) |
|---|---|---|---|---|---|---|---|
| R. McBride | 2-28-06 | 1200 | FedEx 8520 7302 9265 | | | | Cl Sealed SR intact |

| Relinquished by: (Signature) | Date | Time | Received for Laboratory by: (Signature) | Date | Time | Cooler Temp in °C | Remarks: |
|---|---|---|---|---|---|---|---|
| | | | Brenda Gregory | 3/1/06 | 1030 | 17 | 8 oz Containers bag |

*Homogenize all composite samples prior to analysis

Page ______ of ______

# DATA EVALUATION REPORT OF KEMRON REPORT NUMBER L0605525 LONGHORN ARMY AMMUNITION PLANT PISTOL RANGE KARNACK, TEXAS

**SHAW PROJECT NUMBER 117591**

**Prepared by**

**Shaw Environmental, Inc.**
**3010 Briarpark Drive, Suite 4N**
**Houston, Texas 77042**

**June 8, 2006**

0007138[illegible]

**DATA EVALUATION REPORT**
**KEMRON REPORT NUMBER L0605525**
**PISTOL RANGE**
**LONGHORN ARMY AMMUNITION PLANT**
**KARNACK, TEXAS**

June 8, 2006

Approved by: Diane Meyer
Diane Meyer, Program Chemist

Date: 6/8/06

00071382

# Table of Contents



# List of Tables

## *Acronyms and Abbreviations*

| | |
|---|---|
| COC | chain of custody |
| IDL | instrument detection limit |
| LCS | laboratory control sample |
| LHAAP | Longhorn Army Ammunition Plant |
| MARC | Multiple Award Remediation Contract |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| QA | quality assurance |
| QC | quality control |
| RCRA | Resource Conservation and Recovery Act |
| RPD | relative percent difference |
| SPLP | synthetic precipitation leaching procedure |
| TCLP | toxicity characteristic leaching procedure |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |

# 1.0 Introduction

Shaw Environmental, Inc. has performed a review of the laboratory data associated with sampling at the Pistol Range at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. **Table 1-1** provides a list of the samples collected, a sample identification number and laboratory sample number cross-references, sample matrix, chain of custody (COC) number, date collected, sample location, and analytical method performed for each sample.

The work was performed under the Louisville District's Multiple Award Remediation Contract (MARC), No. W912QR-04-D-0027, and Task Order DS02. This Data Evaluation Report is a summary of the analytical data generated by Kemron Environmental Services, Marietta, Ohio.

The purpose of the analytical data review is to assess the effect of the overall analytical process on the usability of the data. The review involved comparing the analytical data summary forms, as submitted by the laboratory, to method requirements set forth in methods found in SW-846, 3rd Edition, Update III, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA, 1997) and project-imposed requirements specified in the task order. Additionally, surrogate spike recoveries, if applicable, matrix spike recoveries, and duplicate sample results were reviewed to determine any matrix interference. The data packages were reviewed by the Project Chemist using the process outlined in Standard Operating Procedure 1141, Analytical Data Quality Evaluation and Reporting (Shaw, revised 2002).

This data evaluation report discusses accuracy, precision, and representativeness for each type of analysis. **Section 2.0** contains a discussion of precision, accuracy, and representativeness for each method. **Section 3.0** of this report is a technical summary of the data review for the data group as a whole, including completeness. **Section 4.0** lists references.

Data qualifiers were added to the applicable results in the data package. A list of validation qualifiers is shown in **Table 3-1**.

**Table 1-1**
**Chain-of-Custody Summary**

| Sample I.D. | Lab Sample Number | Matrix | Chain of Custody Number | Date Collected | Methods SW-846[1] |
|---|---|---|---|---|---|
| PR-SS-N50E25-0-6 | L0605525-01 | Soil | 56569 | 2/22/06 | TCLP metals- 1311/601B/7470A |
| PR-SS-N50E25-0-6 | L0605525-02 | Soil | 56569 | 2/23/06 | SPLP-arsenic, copper, nickel, lead, zinc-!312/6010B |
| PR-SSN50-0-6 | L0605525-03 | Soil | 56569 | 2/24/06 | TCLP metals- 1311/601B/7470A |
| PR-SSN50-0-6 | L0605525-04 | Soil | 56569 | 2/24/06 | SPLP-arsenic, copper, nickel, lead, zinc-!312/6010B |
| PR-SS-N75E75-LOW-6-12 | L0605525-05 | Soil | 56569 | 2/24/06 | TCLP metals- 1311/601B/7470A |
| PR-SS-N75E75-LOW-6-12 | L0605525-06 | Soil | 56569 | 2/24/06 | SPLP-arsenic, copper, nickel, lead, zinc-!312/6010B |

Notes and Abbreviations:

1 United States Environmental Protection Agency (USEPA), 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Update III*, Washington, D.C.

# 2.0 Metals

The soil samples were collected and analyzed for toxicity characteristic leaching procedure (TCLP) metals – arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury by SW-846 Methods 1311, 6010B, and 7470A. The soil samples were also analyzed for synthetic precipitation leaching procedure (SPLP) metals – arsenic, copper, nickel, lead, and zinc.

## 2.1 Initial and Continuing Calibration

The initial and continuing calibrations were within established limits. The interference check standard was within quality control limits.

## 2.2 Accuracy

The laboratory control sample (LCS) was within quality control limits. The matrix spike (MS), and matrix spike duplicate (MSD) were within quality control limits for the SPLP metals. The MS/MSD recoveries exceeded the upper control limit of 125% for lead in the TCLP analyses. The selected matrix spike sample was a non-project sample and the data were not qualified. The post digestion spike was within quality control limits. The serial dilution criterion of < 10% was met when the samples results were > 50 times the instrument detection limit (IDL).

## 2.3 Precision

The MS/MSD relative percent (RPD) values were within quality control limits.

## 2.4 Representativeness

The method blanks, initial calibration blanks, and continuing calibration blanks were free of contamination. No QC replicate sample was submitted. The samples were analyzed within the six month holding time. Mercury analyses exceeded the 28 day holding time. The mercury data is estimated. Samples were resubmitted for analyses at a much later date.

# 3.0 Technical Summary

The following summarizes the data review for the sampling at LHAAP.

## 3.1 Documentation

The COC were complete and contained the required information. The actual methods used for sample analysis were based upon the COC submitted with the samples. Upon receipt at the laboratory, cooler receipt forms were completed and are included as part of the laboratory data package.

## 3.2 Completeness

The 100% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). None of the data was rejected. The mercury data was qualified as estimated.

## 3.3 Conclusion

An overall review of the samples collected indicates that the chain of custody procedures and laboratory analyses have been conducted in an acceptable manner according to the USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C. (October 1999). **Table 3-1** lists qualifier definitions applied to the samples.

**Table 3-1**
**Data Validation Qualifier Definitions**

| Qualifier | Definitions |
|---|---|
| U | Not detected: The analyte was analyzed for, but was not detected above the level of the associated value. The associate value is the sample quantitation limit (SQL). |
| J | Estimated: The analyte was detected and positively identified. The associated numerical value is the approximate concentration of the analyte in the sample. |
| UJ | Not detected, SQL is estimated: The analyte was analyzed for, but was not detected above the reported SQL. However, the reported SQL is an estimate and may be inaccurate or imprecise. |
| R | Rejected: The data are unusable. (Note: The presence or absence of the analyte cannot be confirmed.) |
| B | Analyte was detected in method blank at concentration within 5X/10X sample concentration. Sample result is likely a non-detect. |

# 4.0 References

Shaw Environmental, Inc, (revised 2002), *Standard Operating Procedure Manual,* Houston, Texas.

United States Environmental Protection Agency (USEPA), 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Update III,* Washington, D.C.

Department of the Army, U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans USACE Engineering Manual 200-1-3 (February 2001).

USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C., October 1999.

# SHAW ENVIRONMENTAL, INC.
# ANALYTICAL DATA EVALUATION

The Project Chemist reviewed the attached Data Package. Detailed comments concerning specific analyses (i.e. GC/MS Semivolatiles) are provided in the attached review sheets. Any additional comments concerning the data package as a whole are listed below

Site/Location: Longhorn
Project No.: 117591
Laboratory: Kemron
Report No.: L0605525

COMMENTS:
Pistol Range

| DATA COMPLETENESS | | | |
|---|---|---|---|
| **REQUIREMENTS: Cooler receipt** | **Y** | **N** | **NA** |
| Cooler receipt form present? | ✓ | | |
| Documentation of broken bottles, bubbles in VOA vials, missing labels, seals, etc.? | ✓ | | |
| Was the cooler temperature upon receipt at the laboratory between 2° and 6° C? | metals only - ok | | ✓ |
| Was the pH of the sample acceptable? | | | ✓ |
| Original chain of custody/analytical request form present and complete? | ✓ | | |
| Comparison of the reported parameters to the request on the chain of custody? | ✓ | | |
| Each sample number transcribed by the laboratory and correct sample date? | ✓ | | |
| Cross reference of field sample number, laboratory number and analytical batch? | ✓ | | |
| Date of preparation / extraction and analysis for each sample? | ✓ | | |
| Detection / Quantitation limits reported as specified? | ✓ | | |
| Results reported for method blanks? | ✓ | | |
| Results reported for trip blanks (VOCs only)? | | | ✓ |
| Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported? | ✓ | | |
| Laboratory Control Samples (LCS) / LCSD % recoveries and RPDs reported? | ✓ | | |
| Surrogate values provided (organic samples only)? | | | ✓ |

Data Reviewed by: Diane Meyer Date: 6/8/06
Diane Meyer, Project Chemist

# TIER 1 DATA REVIEW – Metal ANALYSIS

ANALYSIS: Metals MATRIX: LIQUID

EPA METHOD: 6010B ~~SOLID/SOIL~~ X TCLP X

BY: GF OR ICP SPLP

| REQUIREMENTS | | Y | N | NA |
|---|---|---|---|---|
| Method / Preparation Blank | Every Batch or 20 Sample<br>All Compounds <IDL / MDL / RL | ✓ | | |
| Equipment Rinsate Sample | All Compounds <IDL / MDL / RL | | | ✓ |
| Matrix Spike Recovery Values | 75-125% Recovery or Lab Limits | ✓ SPLP | ✓ TCLP | |
| Matrix Spike Duplicate Recovery Values | 75-125% Recovery or Lab Limits | ✓ | | |
| Matrix Spike / Matrix Spike Duplicate | <20% | ✓ | | |
| Laboratory Control Sample (LCS) Analysis | 80-120% Recovery | ✓ | | |
| ICP Serial Dilutions | <10% difference when the amount is greater than 50 X IDL | ✓ | | |
| Field Duplicate Evaluation | Ratio <2.0 for Water | | | ✓ |
| | Ratio <5.0 for Soil or RPD < 50% | | | ✓ |

If "NO," then list

Method Blank or Equipment Rinsate

| Blank ID | Sample ID | Date Collected | Type of Analysis | Analyte | Concentration (units) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

| Sample Type | Sample ID | Analyte | MS Recovery | MSD Recovery | Result -1 | Result - 2 | RPD% |
|---|---|---|---|---|---|---|---|
| TCLP-Pb | | Pb | 157 | 110 | 75-125 | original | 5x unknown |
| | post digestion spike ok | | | | | data not | qualified |
| | | | | | | | |
| | | | | | | | |

Laboratory Control Sample Analysis and Duplicate Sample Analysis

| Analysis Type / Element | Recovery % |
|---|---|
| | |
| | |
| | |

ICP Serial Dilutions

| Analysis Type / Element | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|
| | | | |
| | | | |

hold time missed for mercury - qualify UJL.

| | | |
|---|---|---|
| ANALYSIS: METALS | MATRIX: | LIQUID____ |
| METHOD: 6010B | ~~SOLID / SOIL~~ X | TCLP X |
| BY: ____________ | SPLP | |

| REQUIREMENT | | Y | N | NA |
|---|---|---|---|---|
| Initial Calibration Verification (ICV) | Beginning and every 10 samples | ✓ | | |
| | ICV % Recovery (90-110%) except HG (80-120%) and | ✓ | | |
| | Cn- (85-115%) | | | ✓ |
| RSD of Initial Calibration | Correlation coefficient must be > 0.995 | ✓ | | |
| Initial Calibration Blank (ICB) | Initial calibration present for every analysis date, element, and instrument | ✓ ✓ | | |
| ICP Interference Check Sample (ICSA / ICSB) | Beginning and end of sample batch | ✓ | | |
| | 80-100% Recovery | ✓ | | |
| Continuing Calibration Verification (CCV) | Every 10 samples | ✓ | | |
| | CCV % Recovery (90-110%) except Hg (80-120%) | ✓ | | |
| | and Cn- (85-115%) | | | ✓ |
| Continuing Calibration Blank (CCB) | Every 10 samples | ✓ | | |
| | | | | |

If "NO," list all samples below

Standard / Blank Check and RSD of Initial Calibration

| Calibration Date | Instrument ID | Run No. | Analyte | Standard Levels | Correlation Coefficient |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

ICV / CCV and ICP Interference Check Sample

| Analysis Type / Element | Instrument ID | Run No. | ICV /CCV | Run Date | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

ICP Interference Check Sample

| File Name | Analysis Type / Element | Instrument ID | Concentration True | Concentration Found | Percent Recovery |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

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B1560

**Kemron** ENVIRONMENTAL SERVICES

COC No. A 56569

156 Starlite Drive
Marietta, OH 45750

# CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Fax: 740-373-4835

| | |
|---|---|
| Company Name: SHAW ENVIRONMENTAL | |
| Project Contact: RANDY McBRIDE | Contact Phone #: 678-227-0212 |
| Turn Around Requirements: NORMAL | Location: LONGHORN AAP |
| Project #: 117591 | Project Name: PISTOL RANGE |
| Sampler (print): R. McBRIDE / S. McADOO | Signature: [signature] |

Program: ☐ NPDES ☐ AFCEE ☐ RCRA ☐ USAGE ☐ Other ______

ADDITIONAL REQUIREMENTS

| Sample I.D. No. | Comp* | Grab | Date | Time | Protocol CWA | Protocol SW846 | NUMBER OF CONTAINERS | Hold | Pb only (6010B) | Pb, As, Sb, Cu, Ni, Zn (6010B) | TCLP METALS (1311/6010B) | SPLP Pb, As, Cu, Ni, Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PR-SS-N50E25-0-6 | | ✓ | 2-22-06 | 1100 | | | 1 | SK | ~~✓~~ | ✓ | ✓ | ✓ |
| PR-SS-N50-0-6 | | ✓ | 2-23-06 | 0905 | | | ~~1~~ 2 | | | ✓ | ✓ | ✓ |
| PR-SS-N75E75-Low-6-12 | | ✓ | 2-24-06 | 1345 | | | 1 | | | ✓ | ✓ | ✓ |
| PR-SS-N25E75-Low-0-6 | | ✓ | 2-24-06 | 1340 | | | 1 | | ✓ | | | |
| PR-SS-N25E75-Low-12-18 | | ✓ | 2-24-06 | 1355 | | | 1 | | ✓ | | | |
| PR-SS-N25E25-0-6 | | ✓ | 2-22-06 | 1610 | | | 1 | | ✓ | | | |
| PR-SS-N250-0-6 | | ✓ | 2-23-06 | 0950 | | | 1 | | ✓ | | | |
| PR-SS-N25E75-Upper-0-6 | | ✓ | 2-24-06 | 1415 | | | 1 | | ✓ | | | |
| PR-SS-W-Ditch | | ✓ | 2-24-06 | 1730 | | | 1 | | ✓ | | | |

| Relinquished by: (Signature) | Date | Time | Received by: (Signature) | Relinquished by: (Signature) | Date | Time | Received by: (Signature) |
|---|---|---|---|---|---|---|---|
| R. McBride | 2-28-06 | 1200 | FedEx 8520 7302 9265 | | | | CK sealed & intact |

| Relinquished by: (Signature) | Date | Time | Received for Laboratory by: (Signature) | Date | Time | Cooler Temp in °C | Remarks: |
|---|---|---|---|---|---|---|---|
| | | | Brenda Gregory | 3/1/06 | 1030 | 17 | 8oz CONTAINERS bg |

*Homogenize all composite samples prior to analysis

Page ____ of ____

# *Appendix D*

## *2007 Soil and Groundwater Results*

# *Laboratory Reports*

**A full copy of Appendix D is provided on compact disk in a pocket on the inside back cover of this document. That copy includes the following laboratory reports:**

| Report | Associated Samples |
|---|---|
| L0708355 | N50,E25 – 0-6" |
| | N50,E25 – .5-2.0 |
| | N50,E25 – 2.0-4.0 |
| | N50,E25 – 2.0-4.0-FD |
| | N50,E25 – 4.0-6.0 |
| L0709261 | PRSB01 (9-10) |
| | PRSB01 (14-14) |
| | PRSB01 (19-20) |
| T18781 | PRWW01 – 090707 |
| L0709459 | PRWW01 – 091807 |

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# Table D-1
## 2007 Soil Results

| | | LOCATION_CODE | PR-SS-N50E25 | | | | | | PR-SS-N50E25 | | | | | | PR-SS-N50E25 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SAMPLE_NO | N50,E25-_5-2_0 | | | | | | N50,E25-0-6 | | | | | | N50,E25-2_0-4_0 | | | | | |
| | | SAMPLE_DATE | 13-Aug-07 | | | | | | 13-Aug-07 | | | | | | 13-Aug-07 | | | | | |
| | | DEPTH | .5 - 2 Ft | | | | | | 0 - .5 Ft | | | | | | 2 - 4 Ft | | | | | |
| | | SAMPLE_PURPOSE | REG | | | | | | REG | | | | | | REG | | | | | |
| Suite | Parameter | Units | Result | Qual | ValQual | DIL | RC1 | RC2 | Result | Qual | ValQual | DIL | RC1 | RC2 | Result | Qual | ValQual | DIL | RC1 | RC2 |
| GEN CHEMISTRY | PERCENT SOLIDS | Percent | 84.5 | | | 1 | | | 81.2 | | | 1 | | | 80.1 | | | 1 | | |
| METALS | Antimony | mg/kg | | | | | | | | | | | | | | | | | | |
| METALS | Arsenic | mg/kg | 3.17 | | | 1 | | | 2.67 | | | 1 | | | 3.63 | | | 1 | | |
| METALS | Copper | mg/kg | 8.09 | | | 1 | | | 19.1 | | | 1 | | | 9.12 | | | 1 | | |
| METALS | Lead | mg/kg | 55.8 | | | 1 | | | 425 | | | 1 | | | 32.4 | | | 1 | | |
| METALS | Nickel | mg/kg | 9.68 | | | 1 | | | 7.1 | | | 1 | | | 13.4 | | | 1 | | |
| METALS | Zinc | mg/kg | 34.7 | | | 1 | | | 30.2 | | | 1 | | | 39 | | | 1 | | |

Notes and Abbreviations:

DIL - dilution factor

Ft - feet below ground surface

mg/kg - milligrams per kilogram

Qual - qualifier assigned by analytical laboratory

Reg - regular sample

RC - reason code for validation qualifier, if needed

ValQual - validation qualifier (assigned by Shaw chemist)

# Table D-1
## 2007 Soil Results

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LOCATION_CODE | PR-SS-N50E25 | | | | | | PR-SS-N50E25 | | | | | | PRWW01 | | | | | |
| | | SAMPLE_NO | N50,E25-2_0-4_0-FD | | | | | | N50,E25-4_0-6_0 | | | | | | PRSB01 (14-15) | | | | | |
| | | SAMPLE_DATE | 13-Aug-07 | | | | | | 13-Aug-07 | | | | | | 7-Sep-07 | | | | | |
| | | DEPTH | 2 - 4 Ft | | | | | | 4 - 6 Ft | | | | | | 14 - 15 Ft | | | | | |
| | | SAMPLE_PURPOSE | FD | | | | | | REG | | | | | | REG | | | | | |
| Suite | Parameter | Units | Result | Qual | ValQual | DIL | RC1 | RC2 | Result | Qual | ValQual | DIL | RC1 | RC2 | Result | Qual | ValQual | DIL | RC1 | RC2 |
| GEN CHEMISTRY | PERCENT SOLIDS | Percent | 83.5 | | | 1 | | | 79.8 | | | 1 | | | 78.2 | | | 1 | | |
| METALS | Antimony | mg/kg | | | | | | | | | | | | | | | | | | |
| METALS | Arsenic | mg/kg | 3.28 | | | 1 | | | 2.73 | | | 1 | | | | | | | | |
| METALS | Copper | mg/kg | 9.02 | | | 1 | | | 10.3 | | | 1 | | | | | | | | |
| METALS | Lead | mg/kg | 20.3 | | | 1 | | | 126 | | | 1 | | | 11.1 | | | 1 | | |
| METALS | Nickel | mg/kg | 13.9 | | | 1 | | | 9.55 | | | 1 | | | | | | | | |
| METALS | Zinc | mg/kg | 39.6 | | | 1 | | | 25.5 | | | 1 | | | | | | | | |

Notes and Abbreviations:

DIL - dilution factor

Ft - feet below ground surface

mg/kg - milligrams per kilogram

Qual - qualifier assigned by analytical laboratory

Reg - regular sample

RC - reason code for validation qualifier, if needed

ValQual - validation qualifier (assigned by Shaw chemist)

# Table D-1
## 2007 Soil Results

| | | LOCATION_CODE | PRWW01 | | | | | | PRWW01 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SAMPLE_NO | PRSB01 (19-20) | | | | | | PRSB01 (9-10) | | | | | |
| | | SAMPLE_DATE | 7-Sep-07 | | | | | | 7-Sep-07 | | | | | |
| | | DEPTH | 19 - 20 Ft | | | | | | 9 - 10 Ft | | | | | |
| | | SAMPLE_PURPOSE | REG | | | | | | REG | | | | | |
| Suite | Parameter | Units | Result | Qual | ValQual | DIL | RC1 | RC2 | Result | Qual | ValQual | DIL | RC1 | RC2 |
| GEN CHEMISTRY | PERCENT SOLIDS | Percent | 79.1 | | | 1 | | | 72.7 | | | 1 | | |
| METALS | Antimony | mg/kg | | | | | | | | | | | | |
| METALS | Arsenic | mg/kg | | | | | | | | | | | | |
| METALS | Copper | mg/kg | | | | | | | | | | | | |
| METALS | Lead | mg/kg | 7.59 | | | 1 | | | 11.4 | | | 1 | | |
| METALS | Nickel | mg/kg | | | | | | | | | | | | |
| METALS | Zinc | mg/kg | | | | | | | | | | | | |

Notes and Abbreviations:

DIL - dilution factor

Ft - feet below ground surface

mg/kg - milligrams per kilogram

Qual - qualifier assigned by analytical laboratory

Reg - regular sample

RC - reason code for validation qualifier, if needed

ValQual - validation qualifier (assigned by Shaw chemist)

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# Table D-2
## Groundwater Results

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LOCATION_CODE | PRWW01 | | | | | | PRWW01 | | | | | |
| | | SAMPLE_NO | PRWW01-090707 | | | | | | PRWW01-091807 | | | | | |
| | | SAMPLE_DATE | 7-Sep-07 | | | | | | 18-Sep-07 | | | | | |
| | | SAMPLE_PURPOSE | REG | | | | | | REG | | | | | |
| Suite | Parameter | Units | Result | Qual | ValQual | DIL | RC1 | RC2 | Result | Qual | ValQual | DIL | RC1 | RC2 |
| METALS | Aluminum | mg/L | 8.36 | | | 1 | 06A | | 2.68 | | U | 1 | | |
| METALS | Antimony | mg/L | 0.0028 | B | | 1 | 06A | | | | | | | |
| METALS | Arsenic | mg/L | 0.0027 | U | U | 1 | | | | | | | | |
| METALS | Barium | mg/L | 0.209 | | | 1 | | | | | | | | |
| METALS | Beryllium | mg/L | 0.00027 | B | | 1 | 06A | | | | | | | |
| METALS | Cadmium | mg/L | 0.0018 | U | U | 1 | | | | | | | | |
| METALS | Calcium | mg/L | 26.5 | | | 1 | | | | | | | | |
| METALS | Chromium | mg/L | 0.0073 | B | | 1 | 06A | | | | | | | |
| METALS | Cobalt | mg/L | 0.0096 | U | U | 1 | | | | | | | | |
| METALS | Copper | mg/L | 0.013 | B | | 1 | 06A | | | | | | | |
| METALS | Iron | mg/L | 5.15 | | | 1 | | | 2.32 | J | | 1 | 13 | |
| METALS | Lead | mg/L | 0.0172 | | | 1 | | | 0.00541 | | U | 1 | | |
| METALS | Magnesium | mg/L | 16.9 | | | 1 | | | | | | | | |
| METALS | Manganese | mg/L | 0.199 | | | 1 | | | | | | | | |
| METALS | Mercury | mg/L | 0.000094 | U | U | 1 | | | | | | | | |
| METALS | Nickel | mg/L | 0.0042 | B | | 1 | 06A | | | | | | | |
| METALS | Potassium | mg/L | 4.14 | B | | 1 | 06A | 13 | | | | | | |
| METALS | Selenium | mg/L | 0.0023 | B | | 1 | 06A | | | | | | | |
| METALS | Silver | mg/L | 0.0011 | U | U | 1 | | | | | | | | |
| METALS | Sodium | mg/L | 87.2 | | | 1 | | | | | | | | |
| METALS | Thallium | mg/L | 0.0015 | U | U | 1 | | | | | | | | |
| METALS | Vanadium | mg/L | 0.0148 | B | | 1 | 06A | | | | | | | |
| METALS | Zinc | mg/L | 0.0194 | B | | 1 | 06A | | | | | | | |
| METALS-DISS | Aluminum, Dissolved | mg/L | 0.086 | U | U | 1 | 13 | | 0.1 | U | U | 1 | | |
| METALS-DISS | Antimony, Dissolved | mg/L | 0.0027 | U | U | 1 | | | | | | | | |
| METALS-DISS | Arsenic, Dissolved | mg/L | 0.0027 | U | U | 1 | | | | | | | | |
| METALS-DISS | Barium, Dissolved | mg/L | 0.137 | B | | 1 | 06A | | | | | | | |
| METALS-DISS | Beryllium, Dissolved | mg/L | 0.00026 | U | U | 1 | | | | | | | | |
| METALS-DISS | Cadmium, Dissolved | mg/L | 0.0018 | U | U | 1 | | | | | | | | |
| METALS-DISS | Calcium, Dissolved | mg/L | 25 | | | 1 | | | | | | | | |
| METALS-DISS | Chromium, Dissolved | mg/L | 0.0015 | U | U | 1 | | | | | | | | |
| METALS-DISS | Cobalt, Dissolved | mg/L | 0.0096 | U | U | 1 | | | | | | | | |
| METALS-DISS | Copper, Dissolved | mg/L | 0.0059 | U | U | 1 | | | | | | | | |
| METALS-DISS | Iron, Dissolved | mg/L | 0.0252 | B | | 1 | 06A | | 0.129 | J | | 1 | 13 | |
| METALS-DISS | Lead, Dissolved | mg/L | 0.0028 | U | U | 1 | | | 0.0005 | U | U | 1 | | |

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# Table D-2
# Groundwater Results

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LOCATION_CODE | | PRWW01 | | | | | | PRWW01 | | | | | |
| | SAMPLE_NO | | PRWW01-090707 | | | | | | PRWW01-091807 | | | | | |
| | SAMPLE_DATE | | 7-Sep-07 | | | | | | 18-Sep-07 | | | | | |
| | SAMPLE_PURPOSE | | REG | | | | | | REG | | | | | |
| Suite | Parameter | Units | Result | Qual | ValQual | DIL | RC1 | RC2 | Result | Qual | ValQual | DIL | RC1 | RC2 |
| METALS-DISS | Magnesium, Dissolved | mg/L | 15.4 | | | 1 | | | | | | | | |
| METALS-DISS | Manganese, Dissolved | mg/L | 0.171 | | | 1 | | | | | | | | |
| METALS-DISS | Mercury, Dissolved | mg/L | 0.000094 | U | U | 1 | | | | | | | | |
| METALS-DISS | Nickel, Dissolved | mg/L | 0.0026 | U | U | 1 | | | | | | | | |
| METALS-DISS | Potassium, Dissolved | mg/L | 3.08 | B | | 1 | 06A | 13 | | | | | | |
| METALS-DISS | Selenium, Dissolved | mg/L | 0.0023 | U | U | 1 | | | | | | | | |
| METALS-DISS | Silver, Dissolved | mg/L | 0.0011 | U | U | 1 | | | | | | | | |
| METALS-DISS | Sodium, Dissolved | mg/L | 87 | | | 1 | | | | | | | | |
| METALS-DISS | Thallium, Dissolved | mg/L | 0.0015 | U | U | 1 | | | | | | | | |
| METALS-DISS | Vanadium, Dissolved | mg/L | 0.00098 | B | | 1 | 06A | | | | | | | |
| METALS-DISS | Zinc, Dissolved | mg/L | 0.0075 | U | U | 1 | | | | | | | | |

Notes and Abbreviations:

B - analyte deleted in blank

DIL - dilution factor

J - estimated r3sult

METALS - total metals

METALS-DISS - metals in filtered sample

mg/L - milligrams per liter

Qual - qualifier assigned by analytical laboratory

REG - regular sample

U - non-detect; posted result is the detection limit

RC - reason code for validation qualifier, if needed (Reason Code definitions are provided on page following results tables)

ValQual - validation qualifier (assigned by Shaw chemist)

# VALIDATION REASON CODE DEFINITIONS

| Reason Code | Description |
|---|---|
| 01 | Sample received outside of 4 +/-2 degrees Celsius |
| 01A | Improper sample preservation |
| 02 | Holding time exceeded |
| 02A | Extraction |
| 02B | Analysis |
| 03 | Instrument performance outside criteria |
| 03A | BFB tune for GC/MS volatiles |
| 03B | DFTPP tune for GC/MS semivolatiles |
| 03C | DDT and/or endrin % breakdown exceeds criteria |
| 03D | Retention time windows |
| 03E | Resolution |
| 04 | Initial calibration results outside specified criteria |
| 04A | Compound mean RRF QC criteria not met |
| 04B | Individual % RSD criteria not met |
| 04C | Correlation coefficient < 0.995 |
| 05 | Continuing calibration results outsides specified criteria |
| 05A | Compound mean RRF QC criteria not met |
| 05B | Compound %deviation QC criteria not met |
| 06 | Result qualified as a results of the 5X/10X blank correction |
| 06A | Method or preparation blank |
| 06B | Initial calibration blank (ICB) or continuing calibration blank (CCB) |
| 06C | Equipment rinsate |
| 06D | Trip blank |
| 06E | Field blank |
| 07 | Surrogate recoveries outside control limits |
| 07A | Sample |
| 07B | Associated method blank or LCS |
| 08 | MS/MSD/duplicate results outside criteria |
| 08A | MS and/or MSD recovery not within control limits (accuracy) |
| 08B | % RPD outside acceptance criteria (precision) |
| 09 | Post digestion spike outside criteria (GFAA) |
| 10 | Internal standards outside specified control limits |
| 10A | Recovery |
| 10B | Retention time |
| 11 | Laboratory control sample recoveries outside specified control limits |
| 11A | Recovery |
| 11B | % RPD (if run in duplicate) |
| 12 | Interference check standard |
| 13 | Serial dilution |
| 14 | Tentatively identified compounds |
| 15 | Quantitation |
| 16 | Multiple results available; alternate analysis preferred |
| 17 | Field duplicate RPD criteria is exceeded |
| 18 | Percent difference between original and second column exceeds QC criteria |
| 19 | Professional judgment was used to qualify the data |
| 20 | Pesticide clean-up checks |
| 21 | Target compound identification |
| 22 | Radiological calibration |
| 23 | Radiological quantitation |
| 24 | Reported result and/or lab qualifier revised to reflect validation findings |

# LABORATORY REPORTS

| Report | Associated Samples |
|---|---|
| **L0708355** | **N50,E25 – 0-6”** |
| | **N50,E25 – .5-2.0** |
| | **N50,E25 – 2.0-4.0** |
| | **N50,E25 – 2.0-4.0-FD** |
| | **N50,E25 – 4.0-6.0** |
| **L0709261** | **PRSB01 (9-10)** |
| | **PRSB01 (14-14)** |
| | **PRSB01 (19-20)** |
| **T18781** | **PRWW01 – 090707** |
| **L0709459** | **PRWW01 – 091807** |

00071402

KEMRON ENVIRONMENTAL SERVICES

156 Starlite Drive, Marietta, OH 45750 • TEL 740-373-4071 • FAX 740-373-4835 • http://www.kemron.com

**Laboratory Report Number: L0708355**

Please find enclosed the analytical results for the samples you submitted to KEMRON Environmental Services.

Review and compilation of your report was completed by KEMRON's Sales and Service Team. If you have questions, comments or require further assistance regarding this report, please contact your team member noted in the reviewed box bleow at 800-373-4071. Team member e-mail addresses also appear here for your convenience.

**Debra Elliott - Team Leader**
delliott@kemron-lab.com

**Kathy Albertson - Team Chemist/Data Specialist**
kalbertson@kemron-lab.com

**Stephanie Mossburg - Team Chemist/Data Specialist**
smossburg@kemron-lab.com

**Brenda Gregory - Client Services Specialist**
bgregory@kemron-lab.com

**Jacqueline Parsons - Team Assistant**
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**Amanda Fickiesen - Client Services Specialist**
afickiesen@kemron-lab.com

**Annie Bock - Client Services Specialist**
abock@kemron-lab.com

**Katie Barnes - Team Assistant**
kbarnes@kemron-lab.com

**Cara Strickler - Team Assistant**
cstrickler@kemron-lab.com

This report was reviewed on August 17, 2007.

Stephanie Mossburg

STEPHANIE MOSSBURG - Team Chemist/Data Specialist

I certify that all test results meet all of the requirements of the NELAP standards and other applicable contract terms and conditions. All results for soil samples are reported on a 'dry-weight' basis unless specified otherwise. Analytical results for water and wastes are reported on a 'as received' basis unless specified otherwise. A statement of uncertainty for each analysis is available upon request. This laboratory report shall not be reproduced, except in full, without the written approval of KEMRON Environmental Services.

This report was certified on August 17, 2007.

David E. Vandenberg

David Vandenberg - Vice President

FL DOH NELAP ID: E8755
This report contains a total of 74 pages.

**Protecting Our Environmental Future**

# 1.0 Introduction

KEMRON ENVIRONMENTAL SERVICES
REPORT NARRATIVE

**KEMRON Login No.:** L0708355

**CHAIN OF CUSTODY:** The chain of custody number was 10212

**SHIPMENT CONDITIONS:** The chain of custody forms were received sealed in a cooler. The cooler temperature was 2 degrees C.

**SAMPLE MANAGEMENT:** All samples received were intact. The COC requested lead only, but the client added As, Ni, Cu and Zn to all fractions.

I certify that this data package is in compliance with the terms and conditions agreed to by the client and KEMRON Environmental Services, both technically and for completeness, except for the conditions noted above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or designated person, as verified by the following signature.

| Approved: 15-AUG-07 |
|---|
| Stephanie Mossburg |

# Laboratory Data Package Cover Page

00071406

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
b) dilution factors,
c) preparation methods,
d) Cleanup methods, and
e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

a) Calculated recovery (%R) for each analyte, and
b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:

a) LCS spiking amount,
b) Calculated %R for each analyte, and
c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

a) Samples associated with the MS/MSD clearly identified,
b) MS/MSD spiking amounts,
c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
d) Calculated %R and relative percent differences (RPDs), and
e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

a) the amount of analyte measured in the duplicate,
b) the calculated RPD, and
c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| DEANNA I. HESSON | Deanna I Hesson | Conventional Lab Supervisor | August 16, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

00071407

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0708355 |
| Project Name: | 798-LONGHORN |
| Method: | PCTSOLIDS |
| Prep Batch Number(s): | WG247841 |
| Reviewer Name: | DEANNA I. HESSON |
| LRC Date: | August 16, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | | | ✓ | | |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | | | ✓ | | |
| Were sample quantitation limits reported for all analytes not detected? | | | ✓ | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | | | ✓ | | |
| Were blanks analyzed at the appropriate frequency? | | | ✓ | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | | | ✓ | | |
| Were blank concentrations <MQL? | | | ✓ | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | | | ✓ | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | | | ✓ | | |
| Were LCSs analyzed at the required frequency? | | | ✓ | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |
| Does the detectability data document the laboratorys capability to detect the COCs at the MDL used to calculate the SQLs? | | | ✓ | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

00071408

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | ✓ | | | | |
| Were analytical duplicates analyzed at the appropriate frequency? | ✓ | | | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | ✓ | | | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | | | ✓ | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | | | ✓ | | |
| Are unadjusted MQLs included in the laboratory data package? | | | ✓ | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | | | ✓ | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | | | ✓ | | |
| Was the number of standards recommended in the method used for all analytes? | | | ✓ | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | | | ✓ | | |
| Are ICAL data available for all instruments used? | | | ✓ | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | | | ✓ | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | | | ✓ | | |
| Were percent differences for each analyte within the method-required QC limits? | | | ✓ | | |
| Was the ICAL curve verified for each analyte? | | | ✓ | | |
| Was the absolute value of the analyte concentration in the inorganic CCB $<$MDL? | | | ✓ | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | | | ✓ | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | | ✓ | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | | | ✓ | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | | | ✓ | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | | | ✓ | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | | | ✓ | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | | | ✓ | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

00071409

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0708355 |
| Project Name: | 798-LONGHORN |
| Method: | PCTSOLIDS |
| Prep Batch Number(s): | WG247841 |
| Reviewer Name: | DEANNA I. HESSON |
| LRC Date: | August 16, 2007 |

**EXCEPTIONS REPORT**
**ER# - Description**
Footnotes:
(1) NA = Not applicable to method or project
(2) NR = Not reviewed
(3) ER# = Exception report number

# Laboratory Data Package Cover Page

00071411

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:
- a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) Cleanup methods, and
- e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:
- a) Calculated recovery (%R) for each analyte, and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:
- a) LCS spiking amount,
- b) Calculated %R for each analyte, and
- c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %R and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:
- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| MAREN M. BEERY | Maren Beery | Metals Supervisor | August 15, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

00071412

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0708355 |
| Project Name: | 798-LONGHORN |
| Method: | 6010 |
| Prep Batch Number(s): | WG247709 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | August 15, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | | | ✓ | | |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <RL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | |
| **ICAL** | | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | ✓ | | | | |
| Was the number of standards recommended in the method used for all analytes? | ✓ | | | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | ✓ | | | | |
| Are ICAL data available for all instruments used? | ✓ | | | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | ✓ | | | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | ✓ | | | | |
| Were percent differences for each analyte within the method-required QC limits? | ✓ | | | | |
| Was the ICAL curve verified for each analyte? | ✓ | | | | |
| Was the absolute value of the analyte concentration in the inorganic CCB $<$RL? | ✓ | | | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | ✓ | | | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | ✓ | | | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | 00071414 | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0708355 |
| Project Name: | 798-LONGHORN |
| Method: | 6010 |
| Prep Batch Number(s): | WG247709 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | August 15, 2007 |

**EXCEPTIONS REPORT**
**ER# - Description**
Footnotes:
(1) NA = Not applicable to method or project
(2) NR = Not reviewed
(3) ER# = Exception report number

# 2.1 Metals Data

# 2.1.1 Metals I C P Data

# 2.1.1.1 Summary Data

# LABORATORY REPORT

**L0708355**

**08/17/07 10:10**

00071419

**Submitted By**

**KEMRON Environmental Services**
**156 Starlite Drive**
**Marietta , OH 45750**
**( 740 ) 373 - 4071**

**For**

**Account Name:** Shaw E & I, Inc.
ABB Lummus Biulding
3010 Briarpark Drive Suite 4N
Houston, TX 77042
**Attention:** Larry Duty

**Account Number:** 2773
**Work ID:** LHAAP

**P.O. Number:** 200328

## Sample Analysis Summary

| Client ID | Lab ID | Method | Dilution | Date Received |
|---|---|---|---|---|
| N50,E25-0-6" | L0708355-01 | 6010B | 1 | 14-AUG-07 |
| N50,E25-.5-2.0 | L0708355-02 | 6010B | 1 | 14-AUG-07 |
| N50,E25-2.0-4.0 | L0708355-03 | 6010B | 1 | 14-AUG-07 |
| N50,E25-2.0-4.0-FD | L0708355-04 | 6010B | 1 | 14-AUG-07 |
| N50,E25-4.0-6.0 | L0708355-05 | 6010B | 1 | 14-AUG-07 |

KEMRON FORMS - Modified 11/30/2005 1 OF 1
Version 1.5 PDF File ID: 850814
Report generated 08/17/2007 10:10

Report Number: **L0708355**

Report Date : **August 17, 2007**

00071420

| | | |
|---|---|---|
| Sample Number: **L0708355-01** | PrePrep Method: **NONE** | Instrument: **IRIS-ICP** |
| Client ID: **N50,E25-0-6"** | Prep Method: **3050B** | Prep Date: **08/14/2007 12:00** |
| Matrix: **Soil** | Analytical Method: **6010B** | Cal Date: **08/14/2007 10:40** |
| Workgroup Number: **WG247741** | Analyst: **JYH** | Run Date: **08/14/2007 17:57** |
| Collect Date: **08/13/2007 09:25** | Dilution: **1** | File ID: **IR.081407.175700** |
| Sample Tag: **01** | Units: **mg/kg** | Percent Solid: **81.2** |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Arsenic, Total | 7440-38-2 | 2.67 | | 0.905 | 0.453 |
| Copper, Total | 7440-50-8 | 19.1 | | 0.905 | 0.453 |
| Nickel, Total | 7440-02-0 | 7.10 | | 1.81 | 0.453 |
| Lead, Total | 7439-92-1 | 425 | | 0.905 | 0.453 |
| Zinc, Total | 7440-66-6 | 30.2 | | 0.905 | 0.453 |

00071421

Sample Number:**L0708355-02**
Client ID:**N50,E25-.5-2.0**
Matrix:**Soil**
Workgroup Number:**WG247741**
Collect Date:**08/13/2007 09:35**
Sample Tag:**01**

PrePrep Method:**NONE**
Prep Method:**3050B**
Analytical Method:**6010B**
Analyst:**JYH**
Dilution:**1**
Units:**mg/kg**

Instrument:**IRIS-ICP**
Prep Date:**08/14/2007 12:00**
Cal Date:**08/14/2007 10:40**
Run Date:**08/14/2007 18:03**
File ID:**IR.081407.180300**
Percent Solid:**84.5**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Arsenic, Total | 7440-38-2 | 3.17 | | 0.877 | 0.439 |
| Copper, Total | 7440-50-8 | 8.09 | | 0.877 | 0.439 |
| Nickel, Total | 7440-02-0 | 9.68 | | 1.75 | 0.439 |
| Lead, Total | 7439-92-1 | 55.8 | | 0.877 | 0.439 |
| Zinc, Total | 7440-66-6 | 34.7 | | 0.877 | 0.439 |

Report Number: **L0708355**
Report Date : **August 17, 2007**

00071422

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0708355-03** | PrePrep Method: | **NONE** | Instrument: | **IRIS-ICP** |
| Client ID: | **N50,E25-2.0-4.0** | Prep Method: | **3050B** | Prep Date: | **08/14/2007 12:00** |
| Matrix: | **Soil** | Analytical Method: | **6010B** | Cal Date: | **08/14/2007 10:40** |
| Workgroup Number: | **WG247741** | Analyst: | **JYH** | Run Date: | **08/14/2007 18:09** |
| Collect Date: | **08/13/2007 09:45** | Dilution: | **1** | File ID: | **IR.081407.180900** |
| Sample Tag: | **01** | Units: | **mg/kg** | Percent Solid: | **80.1** |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Arsenic, Total** | **7440-38-2** | **3.63** | | **0.918** | **0.459** |
| **Copper, Total** | **7440-50-8** | **9.12** | | **0.918** | **0.459** |
| **Nickel, Total** | **7440-02-0** | **13.4** | | **1.84** | **0.459** |
| **Lead, Total** | **7439-92-1** | **32.4** | | **0.918** | **0.459** |
| **Zinc, Total** | **7440-66-6** | **39.0** | | **0.918** | **0.459** |

Report Number: **L0708355**

Report Date : **August 17, 2007**

00071423

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0708355-04** | PrePrep Method: | **NONE** | Instrument: | **IRIS-ICP** |
| Client ID: | **N50,E25-2.0-4.0-FD** | Prep Method: | **3050B** | Prep Date: | **08/14/2007 12:00** |
| Matrix: | **Soil** | Analytical Method: | **6010B** | Cal Date: | **08/14/2007 10:40** |
| Workgroup Number: | **WG247741** | Analyst: | **JYH** | Run Date: | **08/14/2007 18:15** |
| Collect Date: | **08/13/2007 09:45** | Dilution: | **1** | File ID: | **IR.081407.181500** |
| Sample Tag: | **01** | Units: | **mg/kg** | Percent Solid: | **83.5** |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Arsenic, Total** | **7440-38-2** | **3.28** | | **0.861** | **0.431** |
| **Copper, Total** | **7440-50-8** | **9.02** | | **0.861** | **0.431** |
| **Nickel, Total** | **7440-02-0** | **13.9** | | **1.72** | **0.431** |
| **Lead, Total** | **7439-92-1** | **20.3** | | **0.861** | **0.431** |
| **Zinc, Total** | **7440-66-6** | **39.6** | | **0.861** | **0.431** |

00071424

Sample Number: **L0708355-05**
Client ID: **N50,E25-4.0-6.0**
Matrix: **Soil**
Workgroup Number: **WG247741**
Collect Date: **08/13/2007 10:00**
Sample Tag: **01**

PrePrep Method: **NONE**
Prep Method: **3050B**
Analytical Method: **6010B**
Analyst: **JYH**
Dilution: **1**
Units: **mg/kg**

Instrument: **IRIS-ICP**
Prep Date: **08/14/2007 12:00**
Cal Date: **08/14/2007 10:40**
Run Date: **08/14/2007 16:13**
File ID: **IR.081407.161300**
Percent Solid: **79.8**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Arsenic, Total | 7440-38-2 | 2.73 | | 0.901 | 0.451 |
| Copper, Total | 7440-50-8 | 10.3 | | 0.901 | 0.451 |
| Nickel, Total | 7440-02-0 | 9.55 | | 1.80 | 0.451 |
| Lead, Total | 7439-92-1 | 126 | | 0.901 | 0.451 |
| Zinc, Total | 7440-66-6 | 25.5 | | 0.901 | 0.451 |

# 2.1.1.2 QC Summary Data

**1.0 Initial Calibration (ICAL) Parameters**

The system performs linear regression from data consisting of a blank and three standards.

**2.0 Calculating the concentration (C) of an element in water using data from prep log, run log, and quantitation report (note:the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (mg/L) (ppm) | 0.1 |
| $Vf$ = Final volume | 1 |
| $Vi$ = Initial volume | 1 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in ppm (mg/L) | 0.1 |

**3.0 Calculating the concentration (C) of an element in soil using data from prep log, run log, and quantitation report (note: the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (mg/L) (ppm) | 0.1 |
| $Vf$ = Final volume | 50 |
| $Vi$ = Initial volume | 1 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in ppm (mg/L) | 5 |

**4.0 Adjusting the concentration to dry weight:**

$$Cdry = \frac{Cx \times 100}{Px}$$

| Where: | **Example:** |
|---|---|
| $Cx$ = Concentration calculated as received (wet basis) | 125 |
| $Px$ = Percent solids of sample (%wt) | 80 |
| | |
| $Cdry$ = Dry weight of sample (mg/kg) | 156.25 |

**1.0 Initial Calibration (ICAL) Parameters**
The system performs linear regression from data consisting of a blank and three standards.

**2.0 Calculating the concentration (C) of an element in water using data from prep log, run log, and quantitation report (note:the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (mg/L) (ppm) | 0.1 |
| $Vf$ = Final volume | 1 |
| $Vi$ = Initial volume | 1 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| $Cx$ = Concentration of element in ppm (mg/L) | 0.1 |

**3.0 Calculating the concentration (C) of an element in soil using data from prep log, run log, and quantitation report (note: the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (mg/L) (ppm) | 0.1 |
| $Vf$ = Final volume | 50 |
| $Vi$ = Initial volume | 1 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| $Cx$ = Concentration of element in ppm (mg/L) | 5 |

**4.0 Adjusting the concentration to dry weight:**

$$Cdry = \frac{Cx \times 100}{Px}$$

| Where: | **Example:** |
|---|---|
| $Cx$ = Concentration calculated as received (wet basis) | 125 |
| $Px$ = Percent solids of sample (%wt) | 80 |
| $Cdry$ = Dry weight of sample (mg/kg) | 156.25 |

# Microwave Digestion Log

Analyst(s): VC
Date: 8/14/07 12:00
LCS: 5ml STD 21287
MS/MSD: 5ml STD21287
Witness: 
HNO3 Lot #: CON 12438
HCl Lot #: CON 12455
Digest Tube Lot #: CON 12210
Earliest Sample Due Date: 8/15
Microwave # 2

Box: 34
1254011
Digestion Work Group: WG 247709

**ME407 Revision #** ____ Method 3015-Water
**ME406 Revision #** 8 Method 3051-Soil-Oil

Relinquished By: VC
Digest Received By: [illegible] Date: 08-14-07

| | KEMRON # | Initial Wt/Vol | Final Volume | Initial Weight | Final Weight | Comments | Due Date |
|---|---|---|---|---|---|---|---|
| 1 | PBS | 1.00g | 50ml | 177.43g | 177.43g | 02 | |
| 2 | LCSS | 1 | | 182.72 | 182.72 | 03 | |
| 3 | 08-355-01 | 1.36 | | 179.08 | 177.54 | | 8/17 |
| 4 | -02 | 1.35 | | 178.06 | 177.75 | | |
| 5 | -03 | 1.36 | | 178.58 | 178.48 | | |
| 6 | -04 | 1.39 | | 179.82 | 178.39 | | |
| 7 | -05 | 1.39 | | 179.84 | 178.73 | 01 | |
| 8 | -05 MS | 1.39 | | 183.88 | 183.62 | 04 | |
| 9 | -05 MSD | 1.39 | | 182.80 | 180.48 | 05 | |
| 10 | 359-01 ★ | 1.35 | | 177.55 | 177.15 | | 8/15 |
| 11 | 02 | 1.36 | | 178.45 | 178.15 | | |
| 12 | 03 | 1.42 | | 177.46 | 177.25 | | |
| 13 | 04 | 1.35 | | 178.30 | 177.41 | | |
| 14 | 05 | 1.35 | | 178.29 | 178.25 | | |
| 15 | 06 | 1.35 | | 178.33 | 177.27 | | |
| 16 | 07 | 1.37 | | 177.56 | 177.53 | | |
| 17 | 08 | 1.43 | | 178.81 | 177.90 | | |
| 18 | 09 | 1.36 | | 179.71 | 178.52 | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | | | |
| 26 | | | | | | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |

VC 8/14/07

Comments: 

Primary Review: Vicki Cullip 8/14/07 Secondary Review: [illegible] 8/14/07

**KEMRON Environmental Services**

Instrument Run Log

00071429

Instrument: IRIS-ICP Dataset: 20070814.2

Analyst1: JYH Analyst2: N/A

Method: 6010B SOP: ME600F Rev: 6

Maintenance Log ID: 20369

Calibration Std: STD21216 ICV/CCV Std: STD21055 Post Spike: STD20609

ICSA: STD21129 ICSAB: STD21009

Workgroups: 247672,247721,247741

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | IR.081407.100900 | WG247766-01 | Calibration Point | | 1 | | 08/14/07 10:09 |
| 2 | IR.081407.101500 | WG247766-02 | Calibration Point | | 1 | | 08/14/07 10:15 |
| 3 | IR.081407.102100 | WG247766-03 | Calibration Point | | 1 | | 08/14/07 10:21 |
| 4 | IR.081407.102700 | WG247766-04 | Calibration Point | | 1 | | 08/14/07 10:27 |
| 5 | IR.081407.103400 | WG247766-05 | Calibration Point | | 1 | | 08/14/07 10:34 |
| 6 | IR.081407.104000 | WG247766-06 | Calibration Point | | 1 | | 08/14/07 10:40 |
| 7 | IR.081407.104700 | WG247766-07 | Initial Calibration Verification | | 1 | | 08/14/07 10:47 |
| 8 | IR.081407.105300 | WG247766-08 | Initial Calib Blank | | 1 | | 08/14/07 10:53 |
| 9 | IR.081407.105900 | WG247766-09 | Interference Check | | 1 | | 08/14/07 10:59 |
| 10 | IR.081407.110500 | WG247766-10 | Interference Check | | 1 | | 08/14/07 11:05 |
| 11 | IR.081407.111100 | WG247766-11 | CCV | | 1 | | 08/14/07 11:11 |
| 12 | IR.081407.111700 | WG247766-12 | CCB | | 1 | | 08/14/07 11:17 |
| 13 | IR.081407.112300 | WG247538-02 | Method/Prep Blank | 1/50 | 1 | | 08/14/07 11:23 |
| 14 | IR.081407.112900 | WG247538-03 | Laboratory Control S | 1/50 | 1 | | 08/14/07 11:29 |
| 15 | IR.081407.113500 | WG247538-01 | Reference Sample | | 1 | L0708300-01 | 08/14/07 11:35 |
| 16 | IR.081407.114100 | WG247538-04 | Matrix Spike | 1/50 | 1 | | 08/14/07 11:41 |
| 17 | IR.081407.114800 | WG247538-05 | Matrix Spike Duplica | 1/50 | 1 | | 08/14/07 11:48 |
| 18 | IR.081407.115400 | L0708300-02 | AV-NCB-AS-UNK-79-0809 | 1/50 | 1 | | 08/14/07 11:54 |
| 19 | IR.081407.120000 | WG247672-01 | Post Digestion Spike | | 1 | L0708300-02 | 08/14/07 12:00 |
| 20 | IR.081407.120600 | WG247672-01 | Post Digestion Spike | | 5 | L0708300-02 | 08/14/07 12:06 |
| 21 | IR.081407.121200 | WG247672-02 | Serial Dilution | | 5 | L0708300-02 | 08/14/07 12:12 |
| 22 | IR.081407.121800 | WG247672-02 | Serial Dilution | | 25 | L0708300-02 | 08/14/07 12:18 |
| 23 | IR.081407.122400 | WG247766-13 | CCV | | 1 | | 08/14/07 12:24 |
| 24 | IR.081407.123000 | WG247766-14 | CCB | | 1 | | 08/14/07 12:30 |
| 25 | IR.081407.123600 | L0708244-01 | CISTERN | 1.07/50 | 1 | | 08/14/07 12:36 |
| 26 | IR.081407.124200 | L0708248-01 | GM070129 | 1.01/50 | 1 | | 08/14/07 12:42 |
| 27 | IR.081407.124800 | L0708302-01 | AV-OU10-PE-IJ35-1-2-C- | 1.01/50 | 1 | | 08/14/07 12:48 |
| 28 | IR.081407.125400 | L0708314-06 | FP-006 | 1.02/50 | 1 | | 08/14/07 12:54 |
| 29 | IR.081407.130000 | WG247766-15 | CCV | | 1 | | 08/14/07 13:00 |
| 30 | IR.081407.130600 | WG247766-16 | CCB | | 1 | | 08/14/07 13:06 |
| 31 | IR.081407.132800 | L0708244-01 | CISTERN | 1.07/50 | 100 | | 08/14/07 13:28 |
| 32 | IR.081407.133400 | WG247138-02 | Method/Prep Blank | 1/50 | 1 | | 08/14/07 13:34 |
| 33 | IR.081407.134000 | WG247138-03 | Laboratory Control S | 1/50 | 1 | | 08/14/07 13:40 |
| 34 | IR.081407.134600 | L0708031-21 | ORG-T2A-215-10 | 1.31/50 | 1 | WG247437-01 | 08/14/07 13:46 |
| 35 | IR.081407.135300 | WG247138-01 | Reference Sample | | 1 | L0708031-22 | 08/14/07 13:53 |
| 36 | IR.081407.135900 | WG247138-04 | Matrix Spike | 1.31/50 | 1 | L0708031-23 | 08/14/07 13:59 |
| 37 | IR.081407.140500 | WG247138-05 | Matrix Spike Duplica | 1.31/50 | 1 | L0708031-24 | 08/14/07 14:05 |

Page: 1 Approved: August 15, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071430

Instrument: IRIS-ICP  Dataset: 20070814.2

Analyst1: JYH  Analyst2: N/A

Method: 6010B  SOP: ME600F  Rev: 6

Maintenance Log ID: 20369

Calibration Std: STD21216  ICV/CCV Std: STD21055  Post Spike: STD20609

ICSA: STD21129  ICSAB: STD21009

Workgroups: 247672,247721,247741

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | IR.081407.141100 | L0708031-25 | ORG-U4A-215-10 | 1.35/50 | 1 | | 08/14/07 14:11 |
| 39 | IR.081407.141700 | WG247721-01 | Post Digestion Spike | | 1 | L0708031-25 | 08/14/07 14:17 |
| 40 | IR.081407.142300 | WG247721-02 | Serial Dilution | | 5 | L0708031-25 | 08/14/07 14:23 |
| 41 | IR.081407.142900 | WG247766-17 | CCV | | 1 | | 08/14/07 14:29 |
| 42 | IR.081407.143500 | WG247766-18 | CCB | | 1 | | 08/14/07 14:35 |
| 43 | IR.081407.144100 | L0708031-26 | ORG-U4B-215-10 | 1.33/50 | 1 | | 08/14/07 14:41 |
| 44 | IR.081407.144700 | L0708031-27 | ORG-W2A-215-10 | 1.33/50 | 1 | | 08/14/07 14:47 |
| 45 | IR.081407.145300 | L0708031-28 | ORG-Y1A-215-10 | 1.3/50 | 1 | WG246996-02 | 08/14/07 14:53 |
| 46 | IR.081407.145900 | L0708031-29 | ORG-Y4A-215-10 | 1.35/50 | 1 | | 08/14/07 14:59 |
| 47 | IR.081407.150500 | L0708031-30 | ORG-Z3A-215-10 | 1.34/50 | 1 | | 08/14/07 15:05 |
| 48 | IR.081407.151200 | L0708031-31 | ORG-HH1-215-10 | 1.43/50 | 1 | | 08/14/07 15:12 |
| 49 | IR.081407.151800 | L0708031-32 | ORG-EE1-215-10 | 1.32/50 | 1 | | 08/14/07 15:18 |
| 50 | IR.081407.152400 | L0708031-33 | ORG-AA1-215-10 | 1.48/50 | 1 | | 08/14/07 15:24 |
| 51 | IR.081407.154300 | L0708031-34 | ORG-DD1-215-10 | 1.47/50 | 1 | | 08/14/07 15:43 |
| 52 | IR.081407.154900 | WG247709-02 | Method/Prep Blank | 1/50 | 1 | | 08/14/07 15:49 |
| 53 | IR.081407.155500 | WG247766-19 | CCV | | 1 | | 08/14/07 15:55 |
| 54 | IR.081407.160100 | WG247766-20 | CCB | | 1 | | 08/14/07 16:01 |
| 55 | IR.081407.160700 | WG247709-03 | Laboratory Control S | 1/50 | 1 | | 08/14/07 16:07 |
| 56 | IR.081407.161300 | WG247709-01 | Reference Sample | | 1 | L0708355-05 | 08/14/07 16:13 |
| 57 | IR.081407.161900 | WG247709-04 | Matrix Spike | 1.39/50 | 1 | | 08/14/07 16:19 |
| 58 | IR.081407.162600 | WG247709-05 | Matrix Spike Duplica | 1.39/50 | 1 | | 08/14/07 16:26 |
| 59 | IR.081407.163200 | L0708359-01 | 1025-CS20-24 | 1.35/50 | 1 | | 08/14/07 16:32 |
| 60 | IR.081407.163800 | L0708359-02 | 1025-CS20-25 | 1.36/50 | 1 | | 08/14/07 16:38 |
| 61 | IR.081407.164400 | L0708359-03 | 1025-CS20-26 | 1.42/50 | 1 | | 08/14/07 16:44 |
| 62 | IR.081407.165000 | WG247741-01 | Post Digestion Spike | | 1 | L0708359-03 | 08/14/07 16:50 |
| 63 | IR.081407.165600 | WG247741-01 | Post Digestion Spike | | 5 | L0708359-03 | 08/14/07 16:56 |
| 64 | IR.081407.170200 | WG247741-02 | Serial Dilution | | 5 | L0708359-03 | 08/14/07 17:02 |
| 65 | IR.081407.170800 | WG247766-21 | CCV | | 1 | | 08/14/07 17:08 |
| 66 | IR.081407.171400 | WG247766-22 | CCB | | 1 | | 08/14/07 17:14 |
| 67 | IR.081407.172000 | L0708359-04 | 1025-CS20-27 | 1.35/50 | 1 | | 08/14/07 17:20 |
| 68 | IR.081407.172600 | L0708359-05 | 1025-CS1-P | 1.35/50 | 1 | | 08/14/07 17:26 |
| 69 | IR.081407.173200 | L0708359-06 | 1025-CS1-P | 1.35/50 | 1 | | 08/14/07 17:32 |
| 70 | IR.081407.173800 | L0708359-07 | 1025-CS6-P | 1.37/50 | 1 | | 08/14/07 17:38 |
| 71 | IR.081407.174500 | L0708359-08 | 1025-CS26-P | 1.43/50 | 1 | | 08/14/07 17:45 |
| 72 | IR.081407.175100 | L0708359-09 | 1025-CS14-P | 1.36/50 | 1 | WG247704-01 | 08/14/07 17:51 |
| 73 | IR.081407.175700 | L0708355-01 | N50,E25-0-6" | 1.36/50 | 1 | | 08/14/07 17:57 |
| 74 | IR.081407.180300 | L0708355-02 | N50,E25-.5-2.0 | 1.35/50 | 1 | | 08/14/07 18:03 |



Approved: August 15, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071431

Instrument: IRIS-ICP    Dataset: 20070814.2

Analyst1: JYH    Analyst2: N/A

Method: 6010B    SOP: ME600F    Rev: 6

Maintenance Log ID: 20369

Calibration Std: STD21216    ICV/CCV Std: STD21055    Post Spike: STD20609

ICSA: STD21129    ICSAB: STD21009

Workgroups: 247672,247721,247741

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 75 | IR.081407.180900 | L0708355-03 | N50,E25-2.0-4.0 | 1.36/50 | 1 | | 08/14/07 18:09 |
| 76 | IR.081407.181500 | L0708355-04 | N50,E25-2.0-4.0-FD | 1.39/50 | 1 | | 08/14/07 18:15 |
| 77 | IR.081407.182100 | WG247766-23 | CCV | | 1 | | 08/14/07 18:21 |
| 78 | IR.081407.182700 | WG247766-24 | CCB | | 1 | | 08/14/07 18:27 |



Approved: August 15, 2007

Maren Beery

KEMRON Environmental Services
Data Checklist

00071432

Date: 15-AUG-2007
Analyst: JYH
Analyst: NA
Method: 6010B
Instrument: IRIS-ICP
Curve Workgroup: 247766
Runlog ID: 17731
Analytical Workgroups: 247672,247721,247741

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | X |
| Case Narrative | 248,300,302,314,031,355,359 |
| Client Forms | X |
| Level X | |
| Level 3 | 355 |
| Level 4 | 300,302,314,359 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | JYH |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer:
15-AUG-2007
Ji-Yu Hu

Secondary Reviewer:
15-AUG-2007
Maren Beery

Generated: AUG-15-2007 15:08:22

# HOLDING TIMES

## EQUIVALENT TO AFCEE FORM 9

00071433

Analytical Method: 6010B

AAB#: WG247741

Login Number: L0708355

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| N50,E25-0-6" | 08/13/07 | 08/14/07 | 08/14/07 | 180 | 1.11 | 08/14/07 | 180 | 0.248 | |
| N50,E25-4.0-6.0 | 08/13/07 | 08/14/07 | 08/14/07 | 180 | 1.08 | 08/14/07 | 180 | 0.176 | |
| N50,E25-2.0-4.0-FD | 08/13/07 | 08/14/07 | 08/14/07 | 180 | 1.09 | 08/14/07 | 180 | 0.260 | |
| N50,E25-.5-2.0 | 08/13/07 | 08/14/07 | 08/14/07 | 180 | 1.10 | 08/14/07 | 180 | 0.252 | |
| N50,E25-2.0-4.0 | 08/13/07 | 08/14/07 | 08/14/07 | 180 | 1.09 | 08/14/07 | 180 | 0.256 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS
*ANAL = SEE PROJECT QAPP REQUIREMENTS

KEMRON FORMS - Modified 11/20/2006
Version 1.5 PDF File ID: 847713
Report generated 08/15/2007 08:50

## METHOD BLANK SUMMARY

00071434

| | | | |
|---|---|---|---|
| Login Number: | L0708355 | Work Group: | WG247741 |
| Blank File ID: | IR.081407.154900 | Blank Sample ID: | WG247709-02 |
| Prep Date: | 08/14/07 12:00 | Instrument ID: | IRIS-ICP |
| Analyzed Date: | 08/14/07 15:49 | Method: | 6010B |
| Analyst: | JYH | | |

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG247709-03 | IR.081407.160700 | 08/14/07 16:07 | 01 |
| N50,E25-4.0-6.0 | L0708355-05 | IR.081407.161300 | 08/14/07 16:13 | 01 |
| N50,E25-0-6" | L0708355-01 | IR.081407.175700 | 08/14/07 17:57 | 01 |
| N50,E25-.5-2.0 | L0708355-02 | IR.081407.180300 | 08/14/07 18:03 | 01 |
| N50,E25-2.0-4.0 | L0708355-03 | IR.081407.180900 | 08/14/07 18:09 | 01 |
| N50,E25-2.0-4.0-FD | L0708355-04 | IR.081407.181500 | 08/14/07 18:15 | 01 |

# METHOD BLANK REPORT

00071435

Login Number: L0708355 Prep Date: 08/14/07 12:00 Sample ID: WG247709-02
Instrument ID: IRIS-ICP Run Date: 08/14/07 15:49 Prep Method: 3050B
File ID: IR.081407.154900 Analyst: JYH Method: 6010B
Workgroup (AAB#): WG247741 Matrix: Soil Units: mg/kg
Contract #: DACA56-94-D-0020 Cal ID: IRIS-I - 14-AUG-07

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Arsenic, Total | 0.500 | 1.00 | 0.500 | 1 | U |
| Copper, Total | 0.500 | 1.00 | 0.500 | 1 | U |
| Nickel, Total | 0.500 | 2.00 | 0.500 | 1 | U |
| Lead, Total | 0.500 | 1.00 | 0.500 | 1 | U |
| Zinc, Total | 0.500 | 1.00 | 0.500 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

KEMRON FORMS - Modified 12/07/2006
Version 1.5 PDF File ID: 847715
Report generated 08/15/2007 08:50

00071436

## LABORATORY CONTROL SAMPLE (LCS)

Login Number: L0708355
Run Date: 08/14/2007
Sample ID: WG247709-03
Instrument ID: IRIS-ICP
Run Time: 16:07
Prep Method: 3050B
File ID: IR.081407.160700
Analyst: JYH
Method: 6010B
Workgroup (AAB#): WG247741
Matrix: Soil
Units: mg/kg
Contract #: DACA56-94-D-0020
Cal ID: IRIS-I-14-AUG-07

| Analytes | Expected | Found | % Rec | LCS Limits | Q |
|---|---|---|---|---|---|
| Arsenic, Total | 10.0 | 9.46 | 94.6 | 80 - 120 | |
| Copper, Total | 12.5 | 11.3 | 90.5 | 80 - 120 | |
| Nickel, Total | 12.5 | 12.0 | 96.2 | 80 - 120 | |
| Lead, Total | 12.5 | 12.0 | 95.6 | 80 - 120 | |
| Zinc, Total | 25.0 | 23.4 | 93.8 | 80 - 120 | |

KEMRON FORMS - Modified 12/15/2006
Version 1.5 PDF File ID: 847716
Report generated 08/15/2007 08:50

# MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071437

Loginnum:L0708355 Cal ID: IRIS-ICP - Worknum:WG247741
Instrument ID:IRIS-ICP Contract #:DACA56-94-D-0020 Method:6010B
Parent ID:WG247709-01 File ID:IR.081407.161300 Dil:1 Matrix:SOLID
Sample ID:WG247709-04 MS File ID:IR.081407.161900 Dil:1 Units:mg/kg
Sample ID:WG247709-05 MSD File ID:IR.081407.162600 Dil:1 Percent Solid:100

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arsenic, Total | 2.18 | 7.19 | 9.55 | 103 | 7.19 | 9.41 | 101 | 1.52 | 75 - 125 | 20 | |
| Copper, Total | 8.24 | 8.99 | 15.0 | 74.7 | 8.99 | 14.4 | 68.5 | 3.84 | 75 - 125 | 20 | * |
| Lead, Total | 101 | 8.99 | 53.2 | -531 | 8.99 | 44.9 | -623 | 16.9 | 75 - 125 | 20 | * |
| Nickel, Total | 7.63 | 8.99 | 17.9 | 114 | 8.99 | 18.3 | 119 | 2.38 | 75 - 125 | 20 | |
| Zinc, Total | 20.3 | 18.0 | 39.9 | 109 | 18.0 | 41.4 | 117 | 3.74 | 75 - 125 | 20 | |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
Version 1.5 PDF File ID: 847717
Report generated 08/15/2007 08:50

# SERIAL DILUTION REPORT

00071438

Sample Login ID: L0708355 Worknum: WG247741
Instrument ID: IRIS-ICP Method: 6010B
Sample ID: L0708359-03 File ID: IR.081407.164400 Dil: 1 Units: mg/kg
Serial Dilution ID: WG247741-02 File ID: IR.081407.170200 Dil: 5

| Analyte | Sample | C | Serial Dilution | C | % Difference | Q |
|---|---|---|---|---|---|---|
| Arsenic | 0.146 | X | 0.164 | X | 12.3 | E |
| Copper | 0.399 | X | 0.410 | X | 2.76 | |
| Lead | 4.28 | | 4.75 | | 11.0 | E |
| Nickel | 0.223 | X | 0.243 | X | 8.97 | |
| Zinc | 1.24 | | 1.35 | X | 8.87 | |

U = Result is below MDL
F = Result is between MDL and RL
X = Result is greater than RL and less than 50 times the MDL
E = %D exceeds control limit of 10% and initial
sample result is greater than or equal to 50 times the MDL

# KEMRON ENVIRONMENTAL SERVICES
## POST SPIKE REPORT

00071439

**Sample Login ID:** L0708355 **Worknum:** WG247741
**Instrument ID:** IRIS-ICP **Method:** 6010B
**Post Spike ID:** WG247741-01 **File ID:** IR.081407.165000 **Dil:** 1 **Units:** mg/L
**Sample ID:** L0708359-03 **File ID:** IR.081407.164400 **Dil:** 1 **Matrix:** Soil

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| ARSENIC | 0.333 | | 0.146 | | .2 | 100.7 | 75 - 125 | |
| COPPER | 0.612 | | 0.399 | | .25 | 101.5 | 75 - 125 | |
| LEAD | 4.05 | | 4.28 | | .25 | 78.8 | 75 - 125 | |
| NICKEL | 0.441 | | 0.223 | | .25 | 96.3 | 75 - 125 | |
| ZINC | 1.60 | | 1.24 | | .5 | 96.2 | 75 - 125 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

**KEMRON FORMS - Modified 04/20/2007 - POST_SPIKE**
**Version 2.0 PDF File ID: 847712**
**Report generated 08/15/2007 08:50**

# INITIAL CALIBRATION SUMMARY

Login Number:L0708355 Workgroup (AAB#):WG247741
Analytical Method:6010B Instrument ID:IRIS-ICP 00071440
ICAL Worknum:WG247766 Initial Calibration Date:14-AUG-2007 10:40

| Analyte | WG247766-01 | | WG247766-02 | | WG247766-03 | | WG247766-04 | | WG247766-05 | | WG247766-06 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT |
| Arsenic | 0 | -.02255 | **NA** | **NA** | .008 | .00808 | .2 | .94137 | .4 | 1.9739 | .8 | 4.0205 |
| Copper | 0 | .11635 | NA | NA | .01 | .42118 | .25 | 7.9268 | .5 | 16.226 | 1 | 32.312 |
| Lead | 0 | .08917 | **NA** | **NA** | .01 | .19719 | .25 | 2.6134 | .5 | 5.1489 | 1 | 10.385 |
| Nickel | 0 | .16354 | **NA** | **NA** | .01 | .78337 | .25 | 14.371 | .5 | 29.181 | 1 | 58.426 |
| Zinc | 0 | .13325 | .01 | 1.3772 | .02 | 2.5332 | .5 | 57.93 | 1 | 118.01 | 2 | 237.48 |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 03/08/2007
Version 1.5 PDF File ID: 847720
Report generated 08/15/2007 08:50

# INITIAL CALIBRATION SUMMARY

Login Number: L0708355
Workgroup (AAB#): WG247741
Analytical Method: 6010B
Instrument ID: IRIS-ICP
ICAL Worknum: WG247766
Initial Calibration Date: 14-AUG-2007 10:40

00071441

| Analyte | R | Q |
|---|---|---|
| Arsenic | 0.999720 | |
| Copper | 0.999911 | |
| Lead | 0.999951 | |
| Nickel | 0.999952 | |
| Zinc | 0.999956 | |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

# INITIAL CALIBRATION BLANK (ICB)

00071442

Login Number: L0708355
Run Date: 08/14/2007
Sample ID: WG247766-08
Instrument ID: IRIS-ICP
Run Time: 10:53
Method: 6010B
File ID: IR.081407.105300
Analyst: JYH
Units: mg/L
Workgroup (AAB#): WG247741
Cal ID: IRIS-I - 14-AUG-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Arsenic | 0.0100 | 0.0200 | -.00224 | 1 | U |
| Copper | 0.0100 | 0.0200 | -.00058 | 1 | U |
| Nickel | 0.0100 | 0.0400 | .0002 | 1 | U |
| Lead | 0.0100 | 0.0200 | -.00168 | 1 | U |
| Zinc | 0.0100 | 0.0200 | .00007 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 10/02/2006
Version 1.5 PDF File ID: 847722
Report generated 08/15/2007 08:50

# CONTINUING CALIBRATION BLANK (CCB)

00071443

Login Number: L0708355
Run Date: 08/14/2007
Sample ID: WG247766-12
Instrument ID: IRIS-ICP
Run Time: 11:17
Method: 6010B
File ID: IR.081407.111700
Analyst: JYH
Units: mg/L
Workgroup (AAB#): WG247741
Cal ID: IRIS-I - 14-AUG-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Arsenic | 0.0100 | 0.0200 | -0.000860 | 1 | U |
| Copper | 0.0100 | 0.0200 | 0.000510 | 1 | U |
| Nickel | 0.0100 | 0.0400 | 0.0000600 | 1 | U |
| Lead | 0.0100 | 0.0200 | 0.000770 | 1 | U |
| Zinc | 0.0100 | 0.0200 | 0.000200 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 847725
Report generated 08/15/2007 08:50

KEMRON Environmental Services

# CONTINUING CALIBRATION BLANK (CCB)

00071444

Login Number: L0708355 | Run Date: 08/14/2007 | Sample ID: WG247766-18
Instrument ID: IRIS-ICP | Run Time: 14:35 | Method: 6010B
File ID: IR.081407.143500 | Analyst: JYH | Units: mg/L
Workgroup (AAB#): WG247741 | Cal ID: IRIS-I - 14-AUG-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Arsenic | 0.0100 | 0.0200 | -0.00241 | 1 | U |
| Copper | 0.0100 | 0.0200 | -0.000980 | 1 | U |
| Nickel | 0.0100 | 0.0400 | 0.000280 | 1 | U |
| Lead | 0.0100 | 0.0200 | -0.0000200 | 1 | U |
| Zinc | 0.0100 | 0.0200 | -0.000250 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 847725
Report generated 08/15/2007 08:50

# CONTINUING CALIBRATION BLANK (CCB)

00071445

Login Number: L0708355
Instrument ID: IRIS-ICP
File ID: IR.081407.160100
Workgroup (AAB#): WG247741

Run Date: 08/14/2007
Run Time: 16:01
Analyst: JYH
Cal ID: IRIS-I - 14-AUG-07

Sample ID: WG247766-20
Method: 6010B
Units: mg/L

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Arsenic | 0.0100 | 0.0200 | -0.00123 | 1 | U |
| Copper | 0.0100 | 0.0200 | 0.00120 | 1 | U |
| Nickel | 0.0100 | 0.0400 | -0.000130 | 1 | U |
| Lead | 0.0100 | 0.0200 | -0.000400 | 1 | U |
| Zinc | 0.0100 | 0.0200 | -0.000180 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 847725
Report generated 08/15/2007 08:50

# CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0708355 Run Date: 08/14/2007 Sample ID: WG247766-09 00071446
Instrument ID: IRIS-ICP Run Time: 17:14 Method: 6010B
File ID: IR.081407.171400 Analyst: JYH Units: mg/L
Workgroup (AAB#): WG247741 Cal ID: IRIS-I - 14-AUG-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Arsenic | 0.0100 | 0.0200 | -0.00200 | 1 | U |
| Copper | 0.0100 | 0.0200 | 0.000680 | 1 | U |
| Nickel | 0.0100 | 0.0400 | 0.0000100 | 1 | U |
| Lead | 0.0100 | 0.0200 | 0.00162 | 1 | U |
| Zinc | 0.0100 | 0.0200 | -0.0000800 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 847725
Report generated 08/15/2007 08:50

# CONTINUING CALIBRATION BLANK (CCB)

00071447

Login Number: L0708355
Instrument ID: IRIS-ICP
File ID: IR.081407.182700
Workgroup (AAB#): WG247741

Run Date: 08/14/2007
Run Time: 18:27
Analyst: JYH
Cal ID: IRIS-I - 14-AUG-07

Sample ID: WG247766-24
Method: 6010B
Units: mg/L

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Arsenic | 0.0100 | 0.0200 | -0.00123 | 1 | U |
| Copper | 0.0100 | 0.0200 | -0.000250 | 1 | U |
| Nickel | 0.0100 | 0.0400 | 0.0000900 | 1 | U |
| Lead | 0.0100 | 0.0200 | 0.00191 | 1 | U |
| Zinc | 0.0100 | 0.0200 | -0.0000800 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 847725
Report generated 08/15/2007 08:50

# INITIAL CALIBRATION VERIFICATION (ICV)

00071448

Login Number: L0708355 Run Date: 08/14/2007 Sample ID: WG247766-07
Instrument ID: IRIS-ICP Run Time: 10:47 Method: 6010B
File ID: IR.081407.104700 Analyst: JYH Units: mg/L
Workgroup (AAB#): WG247741 Cal ID: IRIS-I - 14-AUG-07

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Arsenic | | .4 | 0.403 | 101 | 90 - 110 | |
| Copper | | .5 | 0.491 | 98.3 | 90 - 110 | |
| Nickel | | .5 | 0.492 | 98.5 | 90 - 110 | |
| Lead | | .5 | 0.494 | 98.9 | 90 - 110 | |
| Zinc | | 1 | 0.990 | 99.0 | 90 - 110 | |

* Exceeds LIMITS Limit

KEMRON FORMS - Modified 03/03/2006
Version 1.3 PDF File ID: 847721
Report generated 08/15/2007 08:50

CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0708355
Run Date: 08/14/2007
Sample ID: WG247766-01
00071449
Instrument ID: IRIS-ICP
Run Time: 11:11
Method: 6010B
File ID: IR.081407.111100
Analyst: JYH
Workgroup (AAB#): WG247741
Cal ID: IRIS-I - 14-AUG-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Arsenic | | 0.400 | 0.404 | mg/L | 101 | 90 - 110 | | |
| Copper | | 0.500 | 0.488 | mg/L | 97.6 | 90 - 110 | | |
| Nickel | | 0.500 | 0.493 | mg/L | 98.7 | 90 - 110 | | |
| Lead | | 0.500 | 0.496 | mg/L | 99.2 | 90 - 110 | | |
| Zinc | | 1.00 | 0.990 | mg/L | 99.0 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 12/11/2006 - (CCV)
Version 1.3 PDF File ID: 847724
Report generated 08/15/2007 08:50

# CONTINUING CALIBRATION VERIFICATION (CCV)



Login Number: L0708355
Run Date: 08/14/2007
Sample ID: WG247766-07
Instrument ID: IRIS-ICP
Run Time: 14:29
Method: 6010B
File ID: IR.081407.142900
Analyst: JYH
Workgroup (AAB#): WG247741
Cal ID: IRIS-I - 14-AUG-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Arsenic | | 0.400 | 0.411 | mg/L | 103 | 90 - 110 | | |
| Copper | | 0.500 | 0.499 | mg/L | 99.7 | 90 - 110 | | |
| Nickel | | 0.500 | 0.504 | mg/L | 101 | 90 - 110 | | |
| Lead | | 0.500 | 0.506 | mg/L | 101 | 90 - 110 | | |
| Zinc | | 1.00 | 1.00 | mg/L | 100 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 12/11/2006 - (CCV)
Version 1.3 PDF File ID: 847724
Report generated 08/15/2007 08:50

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071451

Login Number: L0708355 Run Date: 08/14/2007 Sample ID: WG247766-10
Instrument ID: IRIS-ICP Run Time: 15:55 Method: 6010B
File ID: IR.081407.155500 Analyst: JYH
Workgroup (AAB#): WG247741 Cal ID: IRIS-I - 14-AUG-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Arsenic | | 0.400 | 0.412 | mg/L | 103 | 90 - 110 | | |
| Copper | | 0.500 | 0.485 | mg/L | 97.1 | 90 - 110 | | |
| Nickel | | 0.500 | 0.503 | mg/L | 101 | 90 - 110 | | |
| Lead | | 0.500 | 0.501 | mg/L | 100 | 90 - 110 | | |
| Zinc | | 1.00 | 0.996 | mg/L | 99.6 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 12/11/2006 - (CCV)
Version 1.3 PDF File ID: 847724
Report generated 08/15/2007 08:50

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071452

Login Number: L0708355
Instrument ID: IRIS-ICP
File ID: IR.081407.170800
Workgroup (AAB#): WG247741

Run Date: 08/14/2007
Run Time: 17:08
Analyst: JYH
Cal ID: IRIS-I - 14-AUG-07

Sample ID: WG247766-01
Method: 6010B

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Arsenic | | 0.400 | 0.410 | mg/L | 103 | 90 - 110 | | |
| Copper | | 0.500 | 0.487 | mg/L | 97.4 | 90 - 110 | | |
| Nickel | | 0.500 | 0.501 | mg/L | 100 | 90 - 110 | | |
| Lead | | 0.500 | 0.498 | mg/L | 99.6 | 90 - 110 | | |
| Zinc | | 1.00 | 0.994 | mg/L | 99.4 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 12/11/2006 - (CCV)
Version 1.3 PDF File ID: 847724
Report generated 08/15/2007 08:50

CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0708355
Run Date: 08/14/2007
Sample ID: WG247766-08
00071453
Instrument ID: IRIS-ICP
Run Time: 18:21
Method: 6010B
File ID: IR.081407.182100
Analyst: JYH
Workgroup (AAB#): WG247741
Cal ID: IRIS-I - 14-AUG-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Arsenic | | 0.400 | 0.416 | mg/L | 104 | 90 - 110 | | |
| Copper | | 0.500 | 0.485 | mg/L | 97.1 | 90 - 110 | | |
| Nickel | | 0.500 | 0.507 | mg/L | 101 | 90 - 110 | | |
| Lead | | 0.500 | 0.507 | mg/L | 101 | 90 - 110 | | |
| Zinc | | 1.00 | 1.00 | mg/L | 100 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 12/11/2006 - (CCV)
Version 1.3 PDF File ID: 847724
Report generated 08/15/2007 08:50

# INTERFERENCE CHECK SAMPLES

00071454

**Login number:** L0708355 **Workgroup (AAB#):** WG247741
**Instrument ID:** IRIS-ICP **Method:** 6010B
**Sol. A :** WG247766-09 **File ID:** IR.081407.105900 **Units:** mg/L
**Sol. AB :** WG247766-10 **File ID:** IR.081407.110500

| | Sol. A | | | Sol. AB | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Arsenic | NS | -0.00195 | NS | 0.250 | 0.247 | 98.8 | |
| Copper | NS | -0.0000700 | NS | 0.250 | 0.238 | 95.2 | |
| Lead | NS | -0.00281 | NS | 0.500 | 0.462 | 92.4 | |
| Nickel | NS | 0.00588 | NS | 0.500 | 0.468 | 93.6 | |
| Zinc | NS | -0.00404 | NS | 0.500 | 0.494 | 98.8 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

# INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071455

**Login Number:** L0708355 **Date:** 01/05/2007
**Insturment ID:** IRIS-ICP **Method:** 6010B

| Analyte | Wave Length | AL | AS | B | BA | BE |
|---|---|---|---|---|---|---|
| ALUMINUM | 308.20 | 0 | 0 | 0 | 0 | 0 |
| ANTIMONY | 206.80 | -0.00000400 | -0.00000300 | 0 | 0 | 0 |
| ARSENIC | 189.00 | 0.0000100 | 0 | 0 | 0 | 0 |
| BARIUM | 455.40 | 0 | 0 | 0 | 0 | 0 |
| BERYLLIUM | 313.00 | 0 | 0 | 0 | 0 | 0 |
| BORON | 249.70 | 0 | 0 | 0 | 0 | 0 |
| CADMIUM | 228.80 | 0.00000100 | 0.0116 | 0 | -0.00130 | 0 |
| CALCIUM | 373.70 | 0 | 0 | 0 | 0 | 0 |
| CHROMIUM | 267.70 | 0 | 0 | 0 | 0 | 0 |
| COBALT | 228.60 | 0 | 0 | 0 | 0 | 0 |
| COPPER | 324.70 | 0 | 0 | 0 | 0 | 0 |
| IRON | 271.40 | 0 | 0 | 0 | 0 | 0 |
| LEAD | 220.30 | 0.000429 | 0 | 0 | 0 | 0 |
| LITHIUM | 670.80 | 0 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 277.90 | 0 | -0.0743 | 0 | 0 | 0 |
| MANGANESE | 257.60 | 0 | 0 | 0 | 0 | 0 |
| MOLYBDENUM | 202.03 | 0 | 0 | 0 | 0 | 0 |
| NICKEL | 231.60 | 0 | 0 | 0 | 0 | 0.00830 |
| POTASSIUM | 766.40 | 0 | 0 | 0 | -0.0346 | 0 |
| SELENIUM | 196.00 | 0.0000750 | 0.000198 | 0 | 0 | 0 |
| SILICON | 251.60 | 0 | 0 | -0.0157 | 0 | 0 |
| SILVER | 328.00 | 0.00000100 | 0 | 0 | 0 | 0 |
| SODIUM | 589.50 | 0 | 0 | 0 | 0 | 0 |
| STRONTIUM | 215.20 | 0 | 0 | 0 | 0 | 0 |
| THALLIUM | 190.80 | -0.0000300 | 0 | 0 | 0 | 0 |
| TIN | 189.90 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.90 | 0 | 0 | 0 | 0 | 0 |
| VANADIUM | 310.20 | -0.0000340 | 0 | 0 | 0 | 0.00900 |
| ZINC | 213.80 | 0.0000200 | 0 | 0 | 0 | 0 |

**KEMRON FORMS - Modified 02/14/2006**
**Version 1.5 PDF File ID: 847719**
**Report generated 08/15/2007 08:50**

**INTERELEMENT CORRECTION FACTORS (ANNUALLY)**

00071456

**Login Number:** L0708355 **Date:** 01/05/2007
**Insturment ID:** IRIS-ICP **Method:** 6010B

| Analyte | Wave Length | CA | CO | CR | CU | FE |
|---|---|---|---|---|---|---|
| ALUMINUM | 308.20 | 0 | -0.00524 | 0 | 0 | 0 |
| ANTIMONY | 206.80 | 0 | 0 | 0.0183 | 0 | 0.00000500 |
| ARSENIC | 189.00 | 0 | 0 | 0.000280 | 0 | -0.000110 |
| BARIUM | 455.40 | 0 | 0 | 0 | 0 | 0 |
| BERYLLIUM | 313.00 | 0 | 0 | 0 | 0 | 0 |
| BORON | 249.70 | 0.0000440 | 0.00160 | 0 | 0 | 0.0000250 |
| CADMIUM | 228.80 | 0.00000200 | 0.0000780 | 0 | 0 | 0.00000300 |
| CALCIUM | 373.70 | 0 | 0 | 0 | 0 | 0.00329 |
| CHROMIUM | 267.70 | 0 | 0 | 0 | 0 | -0.0000100 |
| COBALT | 228.60 | 0 | 0 | 0.0000450 | 0 | 0.00000200 |
| COPPER | 324.70 | 0 | 0 | -0.000150 | 0 | 0.00000900 |
| IRON | 271.40 | 0.00000600 | 0.0844 | 0 | 0 | 0 |
| LEAD | 220.30 | 0 | -0.000300 | -0.000220 | 0 | 0.0000170 |
| LITHIUM | 670.80 | -0.0000500 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 277.90 | 0 | 0 | -0.0330 | 0 | 0.00135 |
| MANGANESE | 257.60 | 0 | 0 | 0 | 0 | -0.0000340 |
| MOLYBDENUM | 202.03 | 0 | 0 | 0 | 0 | 0 |
| NICKEL | 231.60 | 0 | 0.000400 | 0 | 0 | 0.00000700 |
| POTASSIUM | 766.40 | 0 | 0 | 0 | 0 | 0 |
| SELENIUM | 196.00 | 0 | 0.00541 | 0 | 0 | -0.000668 |
| SILICON | 251.60 | 0 | 0 | 0 | 0 | 0 |
| SILVER | 328.00 | 0 | 0 | -0.0000420 | 0 | -0.00000800 |
| SODIUM | 589.50 | 0 | 0 | 0 | 0 | 0 |
| STRONTIUM | 215.20 | 0 | 0.0000580 | 0 | 0 | -0.000304 |
| THALLIUM | 190.80 | 0 | 0.00708 | 0.000190 | 0 | -0.000150 |
| TIN | 189.90 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.90 | -0.0000300 | 0 | 0.000300 | 0 | 0 |
| VANADIUM | 310.20 | 0 | 0 | -0.000646 | 0 | -0.00000600 |
| ZINC | 213.80 | 0 | 0.000312 | 0 | 0.000523 | 0.0000600 |

**KEMRON FORMS - Modified 02/14/2006**
**Version 1.5 PDF File ID: 847719**
**Report generated 08/15/2007 08:50**

# INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071457

**Login Number:** L0708355 **Date:** 01/05/2007
**Insturment ID:** IRIS-ICP **Method:** 6010B

| Analyte | Wave Length | LI | MG | MN | MO | NA |
|---|---|---|---|---|---|---|
| ALUMINUM | 308.20 | 0 | 0 | 0.00180 | 0.0228 | 0 |
| ANTIMONY | 206.80 | 0 | 0 | 0 | -0.00800 | 0 |
| ARSENIC | 189.00 | 0 | 0 | 0 | 0.00108 | 0 |
| BARIUM | 455.40 | 0 | 0 | 0 | 0 | 0 |
| BERYLLIUM | 313.00 | 0 | 0 | 0 | -0.0000500 | 0 |
| BORON | 249.70 | 0 | 0 | 0 | 0 | 0 |
| CADMIUM | 228.80 | 0 | 0.00000200 | 0 | 0 | 0 |
| CALCIUM | 373.70 | 0 | 0 | 0.00160 | 0 | 0 |
| CHROMIUM | 267.70 | 0 | 0 | 0.000510 | 0 | 0 |
| COBALT | 228.60 | 0 | 0 | 0 | 0 | 0 |
| COPPER | 324.70 | 0 | 0 | 0 | 0.000424 | 0 |
| IRON | 271.40 | 0 | 0 | -0.000500 | -0.00740 | 0 |
| LEAD | 220.30 | 0 | 0 | 0 | -0.00300 | 0 |
| LITHIUM | 670.80 | 0 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 277.90 | 0 | 0 | 0.00132 | 0.0452 | 0 |
| MANGANESE | 257.60 | 0 | 0.0000190 | 0 | 0 | 0 |
| MOLYBDENUM | 202.03 | 0 | 0 | 0 | 0 | 0 |
| NICKEL | 231.60 | 0 | 0 | 0 | 0 | 0 |
| POTASSIUM | 766.40 | 0 | 0 | 0 | 0 | 0 |
| SELENIUM | 196.00 | 0 | 0 | 0.00114 | 0.00147 | 0 |
| SILICON | 251.60 | 0 | 0 | 0 | 0.00800 | 0 |
| SILVER | 328.00 | 0 | 0 | 0.0000600 | -0.000290 | -0.0000370 |
| SODIUM | 589.50 | 0 | 0 | 0 | 0 | 0 |
| STRONTIUM | 215.20 | 0 | 0 | 0 | -0.0000800 | 0 |
| THALLIUM | 190.80 | 0 | 0 | 0.00110 | -0.00710 | 0 |
| TIN | 189.90 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.90 | -0.00250 | 0 | 0 | 0 | 0 |
| VANADIUM | 310.20 | 0 | -0.00000400 | 0 | 0 | 0 |
| ZINC | 213.80 | 0 | 0.0000180 | 0.000279 | 0 | 0.000186 |

# INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071458

**Login Number:** L0708355 **Date:** 01/05/2007
**Insturment ID:** IRIS-ICP **Method:** 6010B

| Analyte | Wave Length | NI | SB | SN | SR | TI |
|---|---|---|---|---|---|---|
| ALUMINUM | 308.20 | 0 | 0 | 0 | 0 | -0.00200 |
| ANTIMONY | 206.80 | -0.000100 | 0 | 0 | 0 | 0.000620 |
| ARSENIC | 189.00 | 0 | -0.000420 | 0 | 0 | 0 |
| BARIUM | 455.40 | 0 | 0 | 0 | 0 | 0 |
| BERYLLIUM | 313.00 | 0 | 0 | 0 | 0 | 0 |
| BORON | 249.70 | 0 | 0 | 0 | 0 | 0 |
| CADMIUM | 228.80 | -0.0000710 | 0 | 0 | 0 | 0 |
| CALCIUM | 373.70 | 0.00195 | 0 | 0 | 0 | 0 |
| CHROMIUM | 267.70 | 0 | 0 | 0 | 0 | 0 |
| COBALT | 228.60 | 0 | 0 | -0.00386 | 0 | 0.00180 |
| COPPER | 324.70 | 0 | 0 | 0 | 0 | -0.000950 |
| IRON | 271.40 | -0.000613 | 0 | 0 | -0.00410 | 0 |
| LEAD | 220.30 | 0.000489 | 0 | 0 | 0 | 0 |
| LITHIUM | 670.80 | 0 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 277.90 | 0 | 0 | 0.0347 | 0 | 0 |
| MANGANESE | 257.60 | 0 | 0 | 0 | 0 | 0 |
| MOLYBDENUM | 202.03 | 0 | 0 | 0 | 0 | 0 |
| NICKEL | 231.60 | 0 | 0 | 0 | 0 | 0 |
| POTASSIUM | 766.40 | 0 | 0 | 0 | 0 | 0 |
| SELENIUM | 196.00 | 0.0000180 | 0 | 0 | 0 | 0 |
| SILICON | 251.60 | 0 | 0 | 0 | 0 | 0.00665 |
| SILVER | 328.00 | 0 | 0 | 0 | 0 | 0.000978 |
| SODIUM | 589.50 | 0 | 0 | 0 | 0 | 0 |
| STRONTIUM | 215.20 | 0 | 0 | 0 | 0 | 0 |
| THALLIUM | 190.80 | 0 | -0.000146 | 0 | 0 | 0.00180 |
| TIN | 189.90 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.90 | 0 | 0 | 0 | 0 | 0 |
| VANADIUM | 310.20 | 0 | 0 | 0 | 0 | 0 |
| ZINC | 213.80 | 0.00507 | 0 | 0 | 0 | 0 |

## INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071459

**Login Number:** L0708355 **Date:** 01/05/2007
**Insturment ID:** IRIS-ICP **Method:** 6010B

| Analyte | Wave Length | V | ZN |
|---|---|---|---|
| ALUMINUM | 308.20 | 0.0299 | 0 |
| ANTIMONY | 206.80 | 0.0000700 | 0 |
| ARSENIC | 189.00 | 0 | 0 |
| BARIUM | 455.40 | 0 | 0 |
| BERYLLIUM | 313.00 | 0.00139 | 0 |
| BORON | 249.70 | 0 | 0 |
| CADMIUM | 228.80 | 0.0000850 | 0 |
| CALCIUM | 373.70 | 0 | 0 |
| CHROMIUM | 267.70 | 0.000100 | 0 |
| COBALT | 228.60 | 0 | -0.00100 |
| COPPER | 324.70 | 0 | -0.00203 |
| IRON | 271.40 | -0.0775 | 0 |
| LEAD | 220.30 | 0 | 0 |
| LITHIUM | 670.80 | 0 | 0 |
| MAGNESIUM | 277.90 | 0.0180 | 0 |
| MANGANESE | 257.60 | -0.0000750 | 0 |
| MOLYBDENUM | 202.03 | -0.000247 | 0.00200 |
| NICKEL | 231.60 | 0 | 0 |
| POTASSIUM | 766.40 | 0 | 0 |
| SELENIUM | 196.00 | 0.000152 | 0.0265 |
| SILICON | 251.60 | 0 | 0 |
| SILVER | 328.00 | -0.0211 | -0.000144 |
| SODIUM | 589.50 | 0 | 0 |
| STRONTIUM | 215.20 | 0 | 0.000200 |
| THALLIUM | 190.80 | 0.00321 | 0 |
| TIN | 189.90 | 0 | 0 |
| TITANIUM | 334.90 | 0 | 0 |
| VANADIUM | 310.20 | 0 | 0 |
| ZINC | 213.80 | 0.000220 | 0 |

# LINEAR RANGE (QUARTERLY)

00071460

**Login Number:** L0708355 **Date:** 07/12/2007
**Insturment ID:** IRIS-ICP **Method:** 6010B

| Analyte | Integration Time (Sec.) | Concentration (mg/L) |
|---|---|---|
| Aluminum | 10.00 | 720.0 |
| Antimony | 55.00 | 45.0 |
| Arsenic | 55.00 | 90.0 |
| Barium | 10.00 | 18.0 |
| Beryllium | 10.00 | 3.6 |
| Boron | 55.00 | 90.0 |
| Cadmium | 55.00 | 27.0 |
| Calcium | 10.00 | 450.0 |
| Chromium | 55.00 | 18.0 |
| Cobalt | 55.00 | 90.0 |
| Copper | 10.00 | 45.0 |
| Iron | 55.00 | 810.0 |
| Lead | 55.00 | 180.0 |
| Lithium | 10.00 | 9.0 |
| Magnesium | 55.00 | 900.0 |
| Manganese | 55.00 | 18.0 |
| Molybdenum | 55.00 | 27.0 |
| Nickel | 55.00 | 90.0 |
| Potassium | 10.00 | 180.0 |
| Selenium | 55.00 | 18.0 |
| Silicon | 55.00 | 45.0 |
| Silver | 10.00 | 9.0 |
| Sodium | 10.00 | 135.0 |
| Strontium | 55.00 | 27.0 |
| Thallium | 55.00 | 18.0 |
| Tin | 55.00 | 27.0 |
| Titanium | 10.00 | 22.5 |
| Vanadium | 10.00 | 90.0 |
| Zinc | 55.00 | 18.0 |

**Comments:**

**KEMRON FORMS - Modified 02/14/2006**
**Version 1.5 PDF File ID: 847718**
**Report generated 08/15/2007 08:50**

# 2.2 General Chemistry Data

# 2.2.1 Percent Solids Data

# 2.2.1.1 Raw Data

**1.0 Calculating the percent solids of a sample.**

$$\%Solids = \frac{WT3 - WT1}{WT2 - WT1} \times F$$

| | |
|---|---|
| Where: | |
| WT1 = Weight, in grams, of the empty container | 1.30 g |
| WT2 = Weight, in grams, of the container and wet sample | 21.274 g |
| WT3 = Weight, in grams, of the container and dried sample | 5.21 g |
| F = Factor to get units as percent weight | 100 |
| %Solids = Percent solids present in sample. | 19.58% |

WORKGROUP: WG247841

**PERCENT SOLIDS**

SOP K0003 Rev: 9

Balance: OHAUS EIRW60/Other

| Sample | Empty Pan WT 1 | WET WT2 | DRY WT 3A | WET WT 3B | DRY WT 3C |
|---|---|---|---|---|---|
| 08-314-01 | 1.26 | 17.89 | 17.19 | | |
| 08-355-01 | 1.27 | 23.46 | 19.29 | | |
| -02 | 1.28 | 21.80 | 18.61 | | |
| -03 | 1.27 | 25.46 | 20.64 | | |
| -04 | 1.28 | 26.65 | 22.47 | | |
| -05 | 1.27 | 27.93 | 22.55 | | |
| 08-385-01 | 1.26 | 31.01 | 28.31 | | |
| -02 | 1.27 | 27.17 | 25.30 | | |
| -03 | 1.26 | 20.39 | 18.94 | | |
| -04 | 1.27 | 31.20 | 28.17 | | |
| -05 | 1.28 | 27.53 | 24.24 | | |
| -06 | 1.26 | 26.10 | 21.34 | | |
| -07 | 1.27 | 30.17 | 25.16 | | |
| -08 | 1.28 | 33.10 | 27.22 | | |
| 08-327-01 | 1.29 | 27.62 | 24.91 | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Duplicate: 08-385-8 | 1.28 | 33.55 | 27.46 | | |

Analyst: [signature]

ADT (on): 8/15/07 Ø HAR 8/15/07 1315

ADT (off): TMB 8/16/07 @ 0840

ADT (off): ______

DCN#70586

Approved: August 16, 2007

KEMRON ENVIRONMENTAL SERVICES
PERCENT SOLID REPORT

Workgroup (AAB#):WG247841 Run Date:08/15/2007
Method:D2216-90 Run Time:13:15
Analyst:HJR

| SAMPLE NUMBER | Pan WT. | Int WT. | Fnl WT. | % Solid | % Moist | UNITS |
|---|---|---|---|---|---|---|
| L0708314-01 | 1.260 | 17.89 | 17.19 | 95.79 | | % |
| L0708327-01 | 1.290 | 27.62 | 24.91 | 89.71 | | % |
| L0708355-01 | 1.270 | 23.46 | 19.29 | 81.21 | | % |
| L0708355-02 | 1.280 | 21.80 | 18.61 | 84.45 | | % |
| L0708355-03 | 1.270 | 25.46 | 20.64 | 80.07 | | % |
| L0708355-04 | 1.280 | 26.65 | 22.47 | 83.52 | | % |
| L0708355-05 | 1.270 | 27.93 | 22.55 | 79.82 | | % |
| L0708385-01 | 1.260 | 31.01 | 28.31 | 90.92 | | % |
| L0708385-02 | 1.270 | 27.17 | 25.30 | 92.78 | | % |
| L0708385-03 | 1.260 | 20.39 | 18.94 | 92.42 | | % |
| L0708385-04 | 1.270 | 31.20 | 28.17 | 89.88 | | % |
| L0708385-05 | 1.280 | 27.53 | 24.24 | 87.47 | | % |
| L0708385-06 | 1.260 | 26.10 | 21.36 | 80.92 | | % |
| L0708385-07 | 1.270 | 30.17 | 25.16 | 82.66 | | % |
| L0708385-08 | 1.280 | 33.10 | 27.22 | 81.52 | | % |
| WG247841-01 | 1.280 | 33.10 | 27.22 | 81.52 | 18.48 | % |
| WG247841-02 | 1.280 | 33.55 | 27.46 | 81.13 | 18.87 | % |

KEMRON FORMS - Modified 02/25/2007
Version 1.2
Report generated 08/16/2007 08:55

Donna Eisson
Approved: August 16, 2007

# 3.0 Attachments

| | | |
|---|---|---|
| AJF - AMANDA J. FICKIESEN | AJM - ANTHONY J. MOSSBURG | ALB - ANNIE L. BOCK |
| ARA - ADRIAN R. ACHTERMANN | ASP - AARON S. PETRIE | BRG - BRENDA R. GREGORY |
| CAA - CASSIE A. AUGENSTEIN | CAF - CHERYL A. FLOWERS | CEB - CHAD E. BARNES |
| CLC - CHRYS L. CRAWFORD | CLS - CARA L. STRICKLER | CLW - CHARISSA L. WINTERS |
| CM - CHARLIE MARTIN | CMS - CRYSTAL M. STEPHENS | CPD - CHAD P. DAVIS |
| CSH - CHRIS S. HILL | DD - DIANE M. DENNIS | DDE - DEBRA D. ELLIOTT |
| DEL - DON E. LIGHTFRITZ | DEV - DAVID E. VANDENBERG | DGB - DOUGLAS G. BUTCHER |
| DIH - DEANNA I. HESSON | DLB - DAVID L. BUMGARNER | DLP - DOROTHY L. PAYNE |
| DLR - DIANNA L. RAUCH | DR - DEANNA ROBERTS | DRP - DAVE R. PITZER |
| DSF - DEBRA S. FREDERICK | DST - DENNIS S. TEPE | ECL - ERIC C. LAWSON |
| ED - EMILY E. DECKER | ERE - ERIN R. ELDER | FJB - FRANCES J. BOLDEN |
| HAV - HEMA VILASAGAR | HJR - HOLLY J. REED | JAB - JUANITA A. BECKER |
| JAL - JOHN A. LENT | JCO - JOE C. OWENS | JKP - JACQUELINE K. PARSONS |
| JKT - JANE K. THOMPSON | JWR - JOHN W. RICHARDS | JWS - JACK W. SHEAVES |
| JYH - JI Y. HU | KCZ - KEVIN C. ZUMBRO | KEB - KATHRYN E. BARNES |
| KHR - KIM H. RHODES | KJW - KATIE J. WIEFERICH | KRA - KATHY R. ALBERTSON |
| KRV - KATHRINE R. VICKERS | LKN - LINDA K. NEDEFF | LSB - LESLIE S. BUCINA |
| MDA - MIKE D. ALBERTSON | MDC - MICHAEL D. COCHRAN | MES - MARY E. SCHILLING |
| MKZ - MARILYN K. ZUMBRO | MLR - MARY L. ROCHOTTE | MMB - MAREN M. BEERY |
| MRT - MICHELLE R. TAYLOR | MSW - MATT S. WILSON | NJB - NATALIE J. BOOTH |
| PJM - PAUL J. MILLER | RAH - ROY A. HALSTEAD | RB - ROBERT BUCHANAN |
| REK - ROBERT E. KYER | RNP - RICK N. PETTY | RWC - RODNEY W. CAMPBELL |
| SLM - STEPHANIE L. MOSSBURG | SLP - SHERI L. PFALZGRAF | SMH - SHAUNA M. HYDE |
| TDH - TRICIA D. HUCK | TMB - TIFFANY M. BAILEY | TMM - TAMMY M. MORRIS |
| VC - VICKI COLLIER | WFM - WALTER F. MARTIN | |

**KEMRON Environmental Services**

List of Valid Qualifiers

August 17, 2007

00071469

Qualkey: STD

| Qualifier | Description |
|---|---|
| * | Surrogate or spike compound out of range |
| + | Correlation coefficient for the MSA is less than 0.995 |
| < | Result is less than the associated numerical value. |
| > | Result is greater than the associated numerical value. |
| A | See the report narrative |
| B | Analyte present in method blank |
| C | Confirmed by GC/MS |
| CG | Confluent growth |
| DL | Surrogate or spike compound was diluted out |
| E | Estimated concentration due to sample matrix interference |
| EDL | Elevated sample reporting limits, presence of non-target analytes |
| EMPC | Estimated Maximum Possible Concentration |
| FL | Free Liquid |
| I | Semiquantitative result (out of instrument calibration range) |
| J | The analyte was positively identified, but the quantitation was below the RL |
| J,B | Analyte detected in both the method blank and sample above the MDL. |
| J,P | Estimate; columns don't agree to within 40% |
| J,S | Estimated concentration; analyzed by method of standard addition (MSA) |
| L | Sample reporting limits elevated due to matrix interference |
| M | Matrix effect; the concentration is an estimate due to matrix effect. |
| N | Tentatively identified compound(TIC) |
| NA | Not applicable |
| ND | Not detected at or above the reporting limit |
| ND,L | Not detected; sample reporting limit (RL) elevated due to interference |
| ND,S | Not detected; analyzed by method of standard addition (MSA) |
| NF | Not found by library search |
| NFL | No free liquid |
| NI | Non-ignitable |
| NR | Analyte is not required to be analyzed |
| NS | Not spiked |
| P | Concentrations >40% difference between the two GC columns |
| Q | One or more quality control criteria fail. See narrative. |
| QNS | Quantity of sample not sufficient to perform analysis |
| RA | Reanalysis confirms reported results |
| RE | Reanalysis confirms sample matrix interference |
| S | Analyzed by method of standard addition (MSA) |
| SMI | Sample matrix interference on surrogate |
| SP | Reported results are for spike compounds only |
| TIC | Library Search Compound |
| TNTC | Too numerous to count |
| U | Undetected; the concentration is below the reported MDL. |
| UJ | Undetected; the MDL and RL are estimated due to quality control discrepancies. |
| W | Post-digestion spike for furnace AA out of control limits |
| X | Exceeds regulatory limit |
| X, S | Exceeds regulatory limit; method of standard additions (MSA) |
| Z | Cannot be resolved from isomer - see below |

*****Special Notes for Organic Analytes**

1. Acrolein and acrylonitrile by method 624 are semi-quantitative screens only.
2. 1,2-Diphenylhydrazine is unstable and is reported as azobenzene.
3. N-nitrosodiphenylamine cannot be separated from diphenylamine.
4. 3-Methylphenol and 4-Methylphenol are unresolvable compounds.
5. m-Xylene and p-Xylene are unresolvable compounds.
6. The reporting limits for Appendix II/IX compounds by method 8270 are based on EPA estimated PQLs referenced in 40 CFR Part 264, Appendix IX. They are not always achievable for every compound an are matrix dependent.

# Chain of Custody

00071470
NO. 10212

Shaw® Shaw Environmental & Infrastructure, Inc.
3010 Briarpark Drive, Suite 400
Houston, TX 77042
(713) 996-4400

Laboratory Name: KEMRON
Address: 156 Starlite Dr. MARIETTA, OH 45750
Contact: STEPHANIE MOSSBERG

Project Name: LHAAP
Project Location: KARNACK, TX.
Project No.: 117591
Project Contact: LARRY DUTY
Project Telephone No.: 713-996-4547
Point of Contact: LARRY DUTY
Telephone No.: 713-996-4547
Project Manager/Supervisor: PRAVEEN SRIVASTAV

Analysis and Method Desired (Indicate separate containers)

| Item No. | Sample ~~Telephone~~ Number | Date | Time | Comp | Grab | Matrix | Sample Description, Location | Number of Containers | LEAD | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | N50, E25-0-.5 | 8/13/07 | 9:25 | | | Soil | Soil, Pistol Range | 2 | ✓ | | | | | | |
| 2 | N50, E25-.5-2.0 | 8/13/07 | 9:35 | | | Soil | Soil, Pistol Range | 2 | ✓ | | | | | | |
| 3 | N50, E25-2.0-4.0 | 8/13/07 | 9:45 | | | Soil | Soil, Pistol Range | 2 | ✓ | | | | | | |
| 4 | N50, E25-2.0-4.0-FD | 8/13/07 | 9:45 | | | Soil | Soil, Pistol Range | 2 | ✓ | | | | | | |
| 5 | N50, E25-4.0-6.0 | 8/13/07 | 10:00 | | | Soil | Soil, Pistol Range | 2 | ✓ | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | |

| Transfers Relinquished By (signature) | Date/Time | Transfers Accepted By (signature) | Date/Time |
|---|---|---|---|
| Scott Beesinger | 8/13/07 2:00 | | |
| | | | |
| | | | |
| | | Laboratory: Brenda Gregory | 8/14/07 0950 |

Special Instructions: 3 DAY TAT

FedEx Airbill No.:

Sampler's Signature: Scott Beesinger

TAT: ____ Standard ____ Rush Date ____ Seals Intact? ____ Y ____ N Received Good Condition ____ Y ____ N ____ Cold

3 DAY TAT

White - Lab Copy Canary - Field Copy Pink - File Copy

Form Number: 433_1
Rev. 03-19-07

KEMRON Environmental Services

# SAMPLE RECEIPT FORM

156 Starlite Drive
Marietta, OH 45750
(740) 373-4071



| | | | | | |
|---|---|---|---|---|---|
| **Client:** SHAW Houston / Kemron | | | | | |
| **Workorder Number:** B 2 | | | | | |
| **Date Received:** 8-14-07 | | | | | |
| **Delivered by:** | ( ) Fedx | (✓) UPS | ( ) Client | ( ) Courier | **Time:** 950 |
| **Opened by:** EC | | | | | |
| **IR Temp Gun:** | ( ) D | (✓) G | | | |
| **Logged by:** BLG | | | | L 8-355 | |

**Cooler information**

| Cooler ID | Temp C | Airbill# | COC# | Other |
|---|---|---|---|---|
| 412 | 2 | 1Z6W72501929973146 | | 3 DAy Turn AroUnD Time |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| Inspection Checklist | Y | N | NA | Discrepancy ID |
|---|---|---|---|---|
| Were shipping coolers sealed? | ✓ | | | |
| Were custody seals intact? | ✓ | | | |
| Were cooler temperatures in range of 0 - 6? | ✓ | | | |
| Was ice present? | ✓ | | | |
| Were COC's received/information complete/signed/dated? | ✓ | | | |
| Were sample containers and labels intact? | ✓ | | | |
| Were correct containers used? | ✓ | | | |
| Were correct preservatives used (water only)? | | | ✓ | |
| Were pH ranges acceptable? | | | ✓ | |
| Were VOA samples free of headspace? | | | ✓ | |
| Were samples received within EPA hold times? | ✓ | | | |

**Discrepancy/Comments/Other Problems**

**Distribution**

| | |
|---|---|
| Name of KEMRON representative | |
| Client/Company: | |
| Person Contacted: | |
| Date contacted: | |

**Resolution/other comments:**

**KEMRON Environmental Services**

Internal Chain of Custody Report

**Login:** L0708355

**Account:** 2773

**Project:** 2773.025

**Samples:** 5

**Due Date:** 17-AUG-2007

00071472

| Samplenum | Container ID | Products |
|---|---|---|
| **L0708355-01** | 364839 | PB-AX |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 14-AUG-2007 10:47 | BRG | |
| 2 | PREP | W1 | DIG | 14-AUG-2007 11:09 | REK | JKT |
| 3 | STORE | DIG | W1 | 14-AUG-2007 14:04 | ERE | REK |
| 4 | ANALYZ | W1 | WET | 15-AUG-2007 12:11 | HJR | JKT |
| 5 | STORE | WET | A1 | 16-AUG-2007 08:04 | JKT | TMB |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0708355-02** | 364840 | PB-AX |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 14-AUG-2007 10:47 | BRG | |
| 2 | PREP | W1 | DIG | 14-AUG-2007 11:09 | REK | JKT |
| 3 | STORE | DIG | W1 | 14-AUG-2007 14:04 | ERE | REK |
| 4 | ANALYZ | W1 | WET | 15-AUG-2007 12:11 | HJR | JKT |
| 5 | STORE | WET | A1 | 16-AUG-2007 08:04 | JKT | TMB |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0708355-04** | 364842 | PB-AX |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 14-AUG-2007 10:47 | BRG | |
| 2 | PREP | W1 | DIG | 14-AUG-2007 11:09 | REK | JKT |
| 3 | STORE | DIG | W1 | 14-AUG-2007 14:04 | ERE | REK |
| 4 | ANALYZ | W1 | WET | 15-AUG-2007 12:11 | HJR | JKT |
| 5 | STORE | WET | A1 | 16-AUG-2007 08:05 | JKT | TMB |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0708355-03** | 364841 | PB-AX |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 14-AUG-2007 10:47 | BRG | |
| 2 | PREP | W1 | DIG | 14-AUG-2007 11:09 | REK | JKT |
| 3 | STORE | DIG | W1 | 14-AUG-2007 14:04 | ERE | REK |
| 4 | ANALYZ | W1 | WET | 15-AUG-2007 12:11 | HJR | JKT |
| 5 | STORE | WET | A1 | 16-AUG-2007 08:04 | JKT | TMB |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report

00071473

**Login:** L0708355
**Account:** 2773
**Project:** 2773.025
**Samples:** 5
**Due Date:** 17-AUG-2007

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0708355-05** | 364843 | PB-AX |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 14-AUG-2007 10:47 | BRG | |
| 2 | PREP | W1 | DIG | 14-AUG-2007 11:09 | REK | JKT |
| 3 | STORE | DIG | W1 | 14-AUG-2007 14:04 | ERE | REK |
| 4 | ANALYZ | W1 | WET | 15-AUG-2007 12:11 | HJR | JKT |
| 5 | STORE | WET | A1 | 16-AUG-2007 08:04 | JKT | TMB |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

# WORKGROUP SUMMARY BY METHOD

# WORKGROUP SUMMARY BY METHOD

00071475

Analysis: Metals Analysis
Extraction Method: 3050B
Workgroup: WG247709

| Lab ID | Client ID | Tclp Date | Prep Date | Analysis Date | Tag | Inst Id | Analyst |
|---|---|---|---|---|---|---|---|
| L0708355-01 | N50,E25-0-6" | | 08/14/07 12:00 | | | MICROWAVE | VC |
| L0708355-02 | N50,E25-.5-2.0 | | 08/14/07 12:00 | | | MICROWAVE | VC |
| L0708355-03 | N50,E25-2.0-4.0 | | 08/14/07 12:00 | | | MICROWAVE | VC |
| L0708355-04 | N50,E25-2.0-4.0-FD | | 08/14/07 12:00 | | | MICROWAVE | VC |
| L0708355-05 | N50,E25-4.0-6.0 | | 08/14/07 12:00 | | | MICROWAVE | VC |

Analysis: Metals Analysis
Analytical Method: 6010B
Workgroup: WG247741

| Lab ID | Client ID | Tclp Date | Prep Date | Analysis Date | Tag | Inst Id | Analyst |
|---|---|---|---|---|---|---|---|
| L0708355-01 | N50,E25-0-6" | | 08/14/07 12:00 | 08/14/07 17:57 | 01 | IRIS-ICP | JYH |
| L0708355-02 | N50,E25-.5-2.0 | | 08/14/07 12:00 | 08/14/07 18:03 | 01 | IRIS-ICP | JYH |
| L0708355-03 | N50,E25-2.0-4.0 | | 08/14/07 12:00 | 08/14/07 18:09 | 01 | IRIS-ICP | JYH |
| L0708355-04 | N50,E25-2.0-4.0-FD | | 08/14/07 12:00 | 08/14/07 18:15 | 01 | IRIS-ICP | JYH |
| L0708355-05 | N50,E25-4.0-6.0 | | 08/14/07 12:00 | 08/14/07 16:13 | 01 | IRIS-ICP | JYH |

Analysis: Percent Solids
Analytical Method: D2216-90
Workgroup: WG247841

| Lab ID | Client ID | Tclp Date | Prep Date | Analysis Date | Tag | Inst Id | Analyst |
|---|---|---|---|---|---|---|---|
| L0708355-01 | N50,E25-0-6" | | | 08/15/07 13:15 | | OVEN | HJR |
| L0708355-02 | N50,E25-.5-2.0 | | | 08/15/07 13:15 | | OVEN | HJR |
| L0708355-03 | N50,E25-2.0-4.0 | | | 08/15/07 13:15 | | OVEN | HJR |
| L0708355-04 | N50,E25-2.0-4.0-FD | | | 08/15/07 13:15 | | OVEN | HJR |
| L0708355-05 | N50,E25-4.0-6.0 | | | 08/15/07 13:15 | | OVEN | HJR |

Analysis: Percent Solids
Extraction Method: D2216-90
Workgroup: WG247841

| Lab ID | Client ID | Tclp Date | Prep Date | Analysis Date | Tag | Inst Id | Analyst |
|---|---|---|---|---|---|---|---|
| L0708355-01 | N50,E25-0-6" | | | 08/15/07 13:15 | | OVEN | HJR |
| L0708355-02 | N50,E25-.5-2.0 | | | 08/15/07 13:15 | | OVEN | HJR |
| L0708355-03 | N50,E25-2.0-4.0 | | | 08/15/07 13:15 | | OVEN | HJR |
| L0708355-04 | N50,E25-2.0-4.0-FD | | | 08/15/07 13:15 | | OVEN | HJR |
| L0708355-05 | N50,E25-4.0-6.0 | | | 08/15/07 13:15 | | OVEN | HJR |

KEMRON ENVIRONMENTAL SERVICES

00071476

156 Starlite Drive, Marietta, OH 45750 • TEL 740-373-4071 • FAX 740-373-4835 • http://www.kemron.com

**Laboratory Report Number: L0709261**

Please find enclosed the analytical results for the samples you submitted to KEMRON Environmental Services.

Review and compilation of your report was completed by KEMRON's Sales and Service Team. If you have questions, comments or require further assistance regarding this report, please contact your team member noted in the reviewed box bleow at 800-373-4071. Team member e-mail addresses also appear here for your convenience.

**Debra Elliott - Team Leader**
delliott@kemron-lab.com

**Amanda Fickiesen - Client Services Specialist**
afickiesen@kemron-lab.com

**Kathy Albertson - Team Chemist/Data Specialist**
kalbertson@kemron-lab.com

**Annie Bock - Client Services Specialist**
abock@kemron-lab.com

**Stephanie Mossburg - Team Chemist/Data Specialist**
smossburg@kemron-lab.com

**Katie Barnes - Team Assistant**
kbarnes@kemron-lab.com

**Brenda Gregory - Client Services Specialist**
bgregory@kemron-lab.com

**Jacqueline Parsons - Team Assistant**
jparsons@kemron-lab.com

This report was reviewed on September 26, 2007.

Stephanie Mossburg

STEPHANIE MOSSBURG - Team Chemist/Data Specialist

I certify that all test results meet all of the requirements of the NELAP standards and other applicable contract terms and conditions. All results for soil samples are reported on a 'dry-weight' basis unless specified otherwise. Analytical results for water and wastes are reported on a 'as received' basis unless specified otherwise. A statement of uncertainty for each analysis is available upon request. This laboratory report shall not be reproduced, except in full, without the written approval of KEMRON Environmental Services.

This report was certified on September 26, 2007.

David E. Vandenberg

David Vandenberg - Vice President

FL DOH NELAP ID: E8755
This report contains a total of 456 pages.

**Protecting Our Environmental Future**

Service Quality Ethics ACIL 2006 Seal of Excellence Program Environmental

# 1.0 Introduction

KEMRON ENVIRONMENTAL SERVICES
REPORT NARRATIVE

00071479

**KEMRON Login No.:** L0709261

**CHAIN OF CUSTODY:** The chain of custody numbers were 10225 and 10749

**SHIPMENT CONDITIONS:** The chain of custody forms were received sealed in a cooler. The cooler temperatures were 3 and 2 degrees C.

**SAMPLE MANAGEMENT:** All samples received were intact. The metals bottle associated with ID 15-091007 was received with a pH of 6. The pH was adjusted by the lab.

I certify that this data package is in compliance with the terms and conditions agreed to by the client and KEMRON Environmental Services, both technically and for completeness, except for the conditions noted above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or designated person, as verified by the following signature.

| Approved: 14-SEP-07 |
|---|
| Stephanie Mossburg |

# Laboratory Data Package Cover Page

00071480

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:
- a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) Cleanup methods, and
- e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:
- a) Calculated recovery (%R) for each analyte, and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:
- a) LCS spiking amount,
- b) Calculated %R for each analyte, and
- c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %R and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:
- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| SHERI L. PFALZGRAF | Sheri L. Pfalzgraf | Chemist II | September 20, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 6020 |
| Prep Batch Number(s): | WG250364 |
| Reviewer Name: | SHERI L. PFALZGRAF |
| LRC Date: | September 20, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | | ✓ | | | 1 |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <RL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | |
| **ICAL** | | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | ✓ | | | | |
| Was the number of standards recommended in the method used for all analytes? | ✓ | | | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | ✓ | | | | |
| Are ICAL data available for all instruments used? | ✓ | | | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | ✓ | | | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | ✓ | | | | |
| Were percent differences for each analyte within the method-required QC limits? | ✓ | | | | |
| Was the ICAL curve verified for each analyte? | ✓ | | | | |
| Was the absolute value of the analyte concentration in the inorganic CCB <RL? | ✓ | | | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | ✓ | | | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | ✓ | | | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

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| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 6020 |
| Prep Batch Number(s): | WG250364 |
| Reviewer Name: | SHERI L. PFALZGRAF |
| LRC Date: | September 20, 2007 |

**EXCEPTIONS REPORT**

**ER1 - Due to high levels of nontarget analytes, client samples 02, 04, 06, 08, 10, 12, 14, 16, 18, and 20 were initially analyzed at dilutions. Samples 04 and 14 required further dilution analyses in order to obtain results for manganese and nickel within the linear range.**

**Footnotes:**

**(1) NA = Not applicable to method or project**

**(2) NR = Not reviewed**

**(3) ER# = Exception report number**

# Laboratory Data Package Cover Page

00071485

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

- a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) Cleanup methods, and
- e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

- a) Calculated recovery (%R) for each analyte, and
- b) The laboratory’s surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:

- a) LCS spiking amount,
- b) Calculated %R for each analyte, and
- c) The laboratory”s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %R and relative percent differences (RPDs), and
- e) The laboratory’s MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory’s QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every ”No” or ”Not Reviewed (NR)” item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| MAREN M. BEERY | Maren Beery | Metals Supervisor | September 17, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

00071486

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 6010 |
| Prep Batch Number(s): | WG250098 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | September 17, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | | | ✓ | | ER1 |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <RL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | ER2 |
| **ICAL** | | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | ✓ | | | | |
| Was the number of standards recommended in the method used for all analytes? | ✓ | | | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | ✓ | | | | |
| Are ICAL data available for all instruments used? | ✓ | | | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | ✓ | | | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | ✓ | | | | |
| Were percent differences for each analyte within the method-required QC limits? | ✓ | | | | |
| Was the ICAL curve verified for each analyte? | ✓ | | | | |
| Was the absolute value of the analyte concentration in the inorganic CCB $<$RL? | ✓ | | | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | ✓ | | | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | ✓ | | | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

00071488

**KEMRON Environmental Services**

00071489

Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 6010 |
| Prep Batch Number(s): | WG250098 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | September 17, 2007 |

**EXCEPTIONS REPORT**

**ER#1 -Due to results that exceeded the linear range of the instrument, client samples 03 (reference sample to the MS/MSD), 05, 09, 13, 15, 17, the MS, the MSD, and 19 were reported from dilution analyses for sodium, client samples 09, 13, 17, and 19 were reported from dilution analyses for calcium, client sample 09 was reported from a dilution for zinc, and client sample 13 was reported from a dilution for magnesium. ER2 - Due to results that were noncompliant on the negative side, client samples 09, 13, 17, and 19 were reported from dilution analyses for aluminum, and client sample 11 was reported from a dilution for vanadium.**

**Footnotes:**

**(1) NA = Not applicable to method or project**

**(2) NR = Not reviewed**

**(3) ER# = Exception report number**

# Laboratory Data Package Cover Page

00071490

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:
- a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) Cleanup methods, and
- e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:
- a) Calculated recovery (%R) for each analyte, and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:
- a) LCS spiking amount,
- b) Calculated %R for each analyte, and
- c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %R and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:
- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| SHERI L. PFALZGRAF | Sheri L. Pfalzgraf | Chemist II | September 26, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 7471 |
| Prep Batch Number(s): | WG250137 |
| Reviewer Name: | SHERI L. PFALZGRAF |
| LRC Date: | September 26, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory’s standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | ✓ | | | | |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <RL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratory’s capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

00071492

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | |
| **ICAL** | | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | ✓ | | | | |
| Was the number of standards recommended in the method used for all analytes? | ✓ | | | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | ✓ | | | | |
| Are ICAL data available for all instruments used? | ✓ | | | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | ✓ | | | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | ✓ | | | | |
| Were percent differences for each analyte within the method-required QC limits? | ✓ | | | | |
| Was the ICAL curve verified for each analyte? | ✓ | | | | |
| Was the absolute value of the analyte concentration in the inorganic CCB <RL? | ✓ | | | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | | | ✓ | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | ✓ | | | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

00071493

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 7471 |
| Prep Batch Number(s): | WG250137 |
| Reviewer Name: | SHERI L. PFALZGRAF |
| LRC Date: | September 26, 2007 |

**EXCEPTIONS REPORT**
**ER# - Description**
Footnotes:
(1) NA = Not applicable to method or project
(2) NR = Not reviewed
(3) ER# = Exception report number

# Laboratory Data Package Cover Page

00071495

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

- a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) Cleanup methods, and
- e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

- a) Calculated recovery (%R) for each analyte, and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:

- a) LCS spiking amount,
- b) Calculated %R for each analyte, and
- c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %R and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| SHERI L. PFALZGRAF | Sheri L. Pfalzgraf | Chemist II | September 26, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 7471 |
| Prep Batch Number(s): | WG250107 |
| Reviewer Name: | SHERI L. PFALZGRAF |
| LRC Date: | September 26, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | ✓ | | | | |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <RL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | |
| **ICAL** | | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | ✓ | | | | |
| Was the number of standards recommended in the method used for all analytes? | ✓ | | | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | ✓ | | | | |
| Are ICAL data available for all instruments used? | ✓ | | | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | ✓ | | | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | ✓ | | | | |
| Were percent differences for each analyte within the method-required QC limits? | ✓ | | | | |
| Was the ICAL curve verified for each analyte? | ✓ | | | | |
| Was the absolute value of the analyte concentration in the inorganic CCB <RL? | ✓ | | | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | | | ✓ | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | ✓ | | | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

00071497

00071498

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

**KEMRON Environmental Services**
Laboratory Review Checklist

00071499

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 7471 |
| Prep Batch Number(s): | WG250107 |
| Reviewer Name: | SHERI L. PFALZGRAF |
| LRC Date: | September 26, 2007 |

**EXCEPTIONS REPORT**
**ER# - Description**
Footnotes:
(1) NA = Not applicable to method or project
(2) NR = Not reviewed
(3) ER# = Exception report number

# Laboratory Data Package Cover Page

00071500

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

- a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) Cleanup methods, and
- e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

- a) Calculated recovery (%R) for each analyte, and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:

- a) LCS spiking amount,
- b) Calculated %R for each analyte, and
- c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %R and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| DEANNA I. HESSON | Deanna I Hesson | Conventional Lab Supervisor | September 18, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

00071501

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | PCTSOLIDS |
| Prep Batch Number(s): | WG250297 |
| Reviewer Name: | DEANNA I. HESSON |
| LRC Date: | September 18, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | | | ✓ | | |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | | | ✓ | | |
| Were sample quantitation limits reported for all analytes not detected? | | | ✓ | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | | | ✓ | | |
| Were blanks analyzed at the appropriate frequency? | | | ✓ | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | | | ✓ | | |
| Were blank concentrations <MQL? | | | ✓ | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | | | ✓ | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | | | ✓ | | |
| Were LCSs analyzed at the required frequency? | | | ✓ | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |
| Does the detectability data document the laboratorys capability to detect the COCs at the MDL used to calculate the SQLs? | | | ✓ | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | ✓ | | | | |
| Were analytical duplicates analyzed at the appropriate frequency? | ✓ | | | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | ✓ | | | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | | | ✓ | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | | | ✓ | | |
| Are unadjusted MQLs included in the laboratory data package? | | | ✓ | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | | | ✓ | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | | | ✓ | | |
| Was the number of standards recommended in the method used for all analytes? | | | ✓ | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | | | ✓ | | |
| Are ICAL data available for all instruments used? | | | ✓ | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | | | ✓ | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | | | ✓ | | |
| Were percent differences for each analyte within the method-required QC limits? | | | ✓ | | |
| Was the ICAL curve verified for each analyte? | | | ✓ | | |
| Was the absolute value of the analyte concentration in the inorganic CCB <MDL? | | | ✓ | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | | | ✓ | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | | ✓ | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | | | ✓ | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | | | ✓ | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | | | ✓ | | |

00071502

00071503

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | | | ✓ | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | | | ✓ | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

00071504

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | PCTSOLIDS |
| Prep Batch Number(s): | WG250297 |
| Reviewer Name: | DEANNA I. HESSON |
| LRC Date: | September 18, 2007 |

**EXCEPTIONS REPORT**
**ER# - Description**
Footnotes:
(1) NA = Not applicable to method or project
(2) NR = Not reviewed
(3) ER# = Exception report number

# Laboratory Data Package Cover Page

00071505

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10

b) dilution factors,

c) preparation methods,

d) Cleanup methods, and

e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

a) Calculated recovery (%R) for each analyte, and

b) The laboratory's surrogate QC limits.

✓R5 Test reports/summary forms for blank samples;

✓R6 Test reports/summary forms for laboratory control samples (LCSs) including:

a) LCS spiking amount,

b) Calculated %R for each analyte, and

c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

a) Samples associated with the MS/MSD clearly identified,

b) MS/MSD spiking amounts,

c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,

d) Calculated %R and relative percent differences (RPDs), and

e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

a) the amount of analyte measured in the duplicate,

b) the calculated RPD, and

c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| DEANNA I. HESSON | Deanna I Hesson | Conventional Lab Supervisor | September 18, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

00071506

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | TDS |
| Prep Batch Number(s): | WG250079 |
| Reviewer Name: | DEANNA I. HESSON |
| LRC Date: | September 18, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | | | ✓ | | |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | | | ✓ | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | | | ✓ | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <MQL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratorys capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | ✓ | | | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | | | ✓ | | |
| Was the number of standards recommended in the method used for all analytes? | | | ✓ | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | | | ✓ | | |
| Are ICAL data available for all instruments used? | | | ✓ | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | | | ✓ | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | | | ✓ | | |
| Were percent differences for each analyte within the method-required QC limits? | | | ✓ | | |
| Was the ICAL curve verified for each analyte? | | | ✓ | | |
| Was the absolute value of the analyte concentration in the inorganic CCB <MDL? | | | ✓ | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | | | ✓ | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | | ✓ | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

00071507

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

00071508

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | TDS |
| Prep Batch Number(s): | WG250079 |
| Reviewer Name: | DEANNA I. HESSON |
| LRC Date: | September 18, 2007 |

**EXCEPTIONS REPORT**
**ER# - Description**
Footnotes:
(1) NA = Not applicable to method or project
(2) NR = Not reviewed
(3) ER# = Exception report number

# Laboratory Data Package Cover Page

00071510

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
b) dilution factors,
c) preparation methods,
d) Cleanup methods, and
e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

a) Calculated recovery (%R) for each analyte, and
b) The laboratory's surrogate QC limits.

✓R5 Test reports/summary forms for blank samples;

✓R6 Test reports/summary forms for laboratory control samples (LCSs) including:

a) LCS spiking amount,
b) Calculated %R for each analyte, and
c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

a) Samples associated with the MS/MSD clearly identified,
b) MS/MSD spiking amounts,
c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
d) Calculated %R and relative percent differences (RPDs), and
e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

a) the amount of analyte measured in the duplicate,
b) the calculated RPD, and
c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| DEANNA I. HESSON | Deanna I Hesson | Conventional Lab Supervisor | September 18, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | TSS |
| Prep Batch Number(s): | WG250078 |
| Reviewer Name: | DEANNA I. HESSON |
| LRC Date: | September 18, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | | | ✓ | | |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | | | ✓ | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | | | ✓ | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <MQL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratorys capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | ✓ | | | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

00071512

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | | | ✓ | | |
| Was the number of standards recommended in the method used for all analytes? | | | ✓ | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | | | ✓ | | |
| Are ICAL data available for all instruments used? | | | ✓ | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | | | ✓ | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | | | ✓ | | |
| Were percent differences for each analyte within the method-required QC limits? | | | ✓ | | |
| Was the ICAL curve verified for each analyte? | | | ✓ | | |
| Was the absolute value of the analyte concentration in the inorganic CCB $<$MDL? | | | ✓ | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | | | ✓ | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | | | ✓ | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

00071513

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | TSS |
| Prep Batch Number(s): | WG250078 |
| Reviewer Name: | DEANNA I. HESSON |
| LRC Date: | September 18, 2007 |

**EXCEPTIONS REPORT**
**ER# - Description**
Footnotes:
(1) NA = Not applicable to method or project
(2) NR = Not reviewed
(3) ER# = Exception report number

# Laboratory Data Package Cover Page

00071515

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
b) dilution factors,
c) preparation methods,
d) Cleanup methods, and
e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

a) Calculated recovery (%R) for each analyte, and
b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:

a) LCS spiking amount,
b) Calculated %R for each analyte, and
c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

a) Samples associated with the MS/MSD clearly identified,
b) MS/MSD spiking amounts,
c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
d) Calculated %R and relative percent differences (RPDs), and
e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

a) the amount of analyte measured in the duplicate,
b) the calculated RPD, and
c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| MAREN M. BEERY | Maren Beery | Metals Supervisor | September 19, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 6010 |
| Prep Batch Number(s): | WG250200 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | September 19, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | | | ✓ | | ER1 |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <RL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

00071517

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | ER2 |
| **ICAL** | | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | ✓ | | | | |
| Was the number of standards recommended in the method used for all analytes? | ✓ | | | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | ✓ | | | | |
| Are ICAL data available for all instruments used? | ✓ | | | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | ✓ | | | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | ✓ | | | | |
| Were percent differences for each analyte within the method-required QC limits? | ✓ | | | | |
| Was the ICAL curve verified for each analyte? | ✓ | | | | |
| Was the absolute value of the analyte concentration in the inorganic CCB <RL? | ✓ | | | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | ✓ | | | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | ✓ | | | | ER3 |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

00071518

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 6010 |
| Prep Batch Number(s): | WG250200 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | September 19, 2007 |

**EXCEPTIONS REPORT**
**ER#1 - Due to results that exceeded the linear range of the instrument, client samples 04 (reference sample to the MS/MSD), 06, 10, 14, 16, 18, 20, the MS, and the MSD were reported from dilution analyses for sodium, client samples 10, 14, 18, and 20 were reported from dilution analyses for calcium, and client sample 14 was reported from a dilution for magnesium.**
**ER2 - Due to results that were noncompliant on the negative side, client samples 02, 04 (reference sample to the MS/MSD), 06, 10, 12, 16, 18, 20, the MS, and the MSD were reported from dilution analyses for vanadium, client samples 10, 14, 18, and 20 were reported from dilution analyses for aluminum. ER3 - Due to a result that was noncompliant on the negative side in the reference sample to the post spike, the post spike was reported from a dilution for vanadium.**
**Footnotes:**
**(1) NA = Not applicable to method or project**
**(2) NR = Not reviewed**
**(3) ER# = Exception report number**

# Laboratory Data Package Cover Page

00071520

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

- a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) Cleanup methods, and
- e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

- a) Calculated recovery (%R) for each analyte, and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:

- a) LCS spiking amount,
- b) Calculated %R for each analyte, and
- c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %R and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| MAREN M. BEERY | Maren Beery | Metals Supervisor | September 18, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 6020 |
| Prep Batch Number(s): | WG250135 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | September 18, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | ✓ | | | | ER1 |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <RL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

00071522

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | |
| **ICAL** | | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | ✓ | | | | |
| Was the number of standards recommended in the method used for all analytes? | ✓ | | | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | ✓ | | | | |
| Are ICAL data available for all instruments used? | ✓ | | | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | ✓ | | | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | ✓ | | | | |
| Were percent differences for each analyte within the method-required QC limits? | ✓ | | | | |
| Was the ICAL curve verified for each analyte? | ✓ | | | | |
| Was the absolute value of the analyte concentration in the inorganic CCB $<$RL? | ✓ | | | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | ✓ | | | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | ✓ | | | | ER2 |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

00071523

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 6020 |
| Prep Batch Number(s): | WG250135 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | September 18, 2007 |

**EXCEPTIONS REPORT**
**ER#1 - Due to high levels of nontarget analytes, samples 01, 03, 05, 07, 09, 11, 13, 15, 17, and 19 were analyzed at dilutions. Sample fractions 03 and 13 required further dilution analyses in order to obtain results for manganese and nickel within the linear range.**
**ER2 - Manganese and nickel for sample fraction 05 were reported from 100-fold dilution analysis. Dilution was necessary for consistency in order to obtain results for manganese and nickel within the linear range for the post digestion spike of sample 05.**
**Footnotes:**
**(1) NA = Not applicable to method or project**
**(2) NR = Not reviewed**
**(3) ER# = Exception report number**

# Laboratory Data Package Cover Page

00071525

This data Package consists of:

This signature page, the laboratory review checklists, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 sample identification cross-reference;

R3 Test reports (analytical data sheets) for each enviornmental sample that includes:

- a) Items consistant with NELAC 5.13 or ISO/IEC 17025 Section 5.10
- b) dilution factors,
- c) preparation methods,
- d) Cleanup methods, and
- e) If required for the project, tentatively identified compounds (TICs)

R4 Surrogate recovery data including:

- a) Calculated recovery (%R) for each analyte, and
- b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms FOR laboratory control samples (LCSs) including:

- a) LCS spiking amount,
- b) Calculated %R for each analyte, and
- c) The laboratory"s LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

- a) Samples associated with the MS/MSD clearly identified,
- b) MS/MSD spiking amounts,
- c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d) Calculated %R and relative percent differences (RPDs), and
- e) The laboratory's MS/MSD QC limits

R8 Laboratory analytical duplicate (if applicable) revocery and precision:

- a) the amount of analyte measured in the duplicate,
- b) the calculated RPD, and
- c) the laboratory's QC limits for anlytical duplicates.

R9 List of method quantitation limits (MQLs) for each analyte for each method and matrix;

R10 Other problems or anomalies.

The exception Report for every "No" or "Not Reviewed (NR)" item in laboratory review checklist.

**Release statement:** I am responsible for the release of this laboratory data package. This data package has been reviewed by the laboratory and is complete and technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exceptions reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory as having the potential to affect the quality of the data, have been identified by the laboratoy in the Laboratory Review Checklist, and no information or data have been knowingly withheld that would affect the quality of the data.

**Check, If applicable: []** This laboratory is an in-house laboratory controlled by the person repsonding to rule. The official signing the cover page of the rule-required report (for example, the APAR) in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is trus.

| MAREN M. BEERY | Maren Beery | Metals Supervisor | September 18, 2007 |
|---|---|---|---|
| Name (Printed) | Signature | Official Title (printed) | DATE |

RG-366/TRRP-13 December 2002 A1

00071526

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 7471 |
| Prep Batch Number(s): | WG250231 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | September 18, 2007 |

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Chain-Of-Custody (C-O-C)** | | | | | |
| Did samples meet the laboratory's standard conditions of sample acceptability upon receipt? | ✓ | | | | |
| Were all departures from standard conditions described in an exception report? | ✓ | | | | |
| **Sample and quality control (QC) identification** | | | | | |
| Are all field sample ID numbers cross-referenced to the laboratory ID numbers? | ✓ | | | | |
| Are all laboratory ID numbers cross-referenced to the corresponding QC data? | ✓ | | | | |
| **Test reports** | | | | | |
| Were all samples prepared and analyzed within holding times? | ✓ | | | | |
| Other than those results <MQL, were all other raw values bracketed by calibration standards? | ✓ | | | | |
| Were calculations checked by a peer or supervisor? | ✓ | | | | |
| Were all analyte identifications checked by a peer or supervisor? | ✓ | | | | |
| Were sample quantitation limits reported for all analytes not detected? | ✓ | | | | |
| Were all results for soil and sediment samples reported on a dry weight basis? | ✓ | | | | |
| Were % moisture (or solids) reported for all soil and sediment samples? | ✓ | | | | |
| If required for the project, TICs reported? | | | ✓ | | |
| **Surrogate recovery data** | | | | | |
| Were surrogates added prior to extraction? | | | ✓ | | |
| Were surrogate percent recoveries in all samples within the laboratory QC limits? | | | ✓ | | |
| **Test reports/summary forms for blank samples** | | | | | |
| Were appropriate type(s) of blanks analyzed? | ✓ | | | | |
| Were blanks analyzed at the appropriate frequency? | ✓ | | | | |
| Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures? | ✓ | | | | |
| Were blank concentrations <RL? | ✓ | | | | |
| **Laboratory control samples (LCS):** | | | | | |
| Were all COCs included in the LCS? | ✓ | | | | |
| Was each LCS taken through the entire analytical procedure, including prep and cleanup steps? | ✓ | | | | |
| Were LCSs analyzed at the required frequency? | ✓ | | | | |
| Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits? | ✓ | | | | |
| Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SQLs? | ✓ | | | | |
| Was the LCSD RPD within QC limits? | | | ✓ | | |
| **Matrix spike (MS) and matrix spike duplicate (MSD) data** | | | | | |
| Were the project/method specified analytes included in the MS and MSD? | | | ✓ | | |
| Were MS/MSD analyzed at the appropriate frequency? | | | ✓ | | |
| Were MS (and MSD, if applicable) %Rs within the laboratory QC limits? | | | ✓ | | |

00071527

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| Were MS/MSD RPDs within laboratory QC limits? | | | ✓ | | |
| **Analytical duplicate data** | | | | | |
| Were appropriate analytical duplicates analyzed for each matrix? | | | ✓ | | |
| Were analytical duplicates analyzed at the appropriate frequency? | | | ✓ | | |
| Were RPDs or relative standard deviations within the laboratory QC limits? | | | ✓ | | |
| **Method quantitation limits (MQLs):** | | | | | |
| Are the MQLs for each method analyte included in the laboratory data package? | ✓ | | | | |
| Do the MQLs correspond to the concentration of the lowest non-zero calibration standard? | ✓ | | | | |
| Are unadjusted MQLs included in the laboratory data package? | ✓ | | | | |
| **Other problems/anomalies** | | | | | |
| Are all known problems/anomalies/special conditions noted in this LRC and ER? | ✓ | | | | |
| Were all necessary corrective actions performed for the reported data? | ✓ | | | | |
| Was applicable and available technology used to lower the SQL minimize the matrix interference affects on the sample results? | ✓ | | | | |
| **ICAL** | | | | | |
| Were response factors and/or relative response factors for each analyte within QC limits? | | | ✓ | | |
| Were percent RSDs or correlation coefficient criteria met? | ✓ | | | | |
| Was the number of standards recommended in the method used for all analytes? | ✓ | | | | |
| Were all points generated between the lowest and highest standard used to calculate the curve? | ✓ | | | | |
| Are ICAL data available for all instruments used? | ✓ | | | | |
| Has the initial calibration curve been verified using an appropriate second source standard? | ✓ | | | | |
| **Initial and continuing calibration verification (ICV and CCV) and continuing calibration blank (CCB):** | | | | | |
| Was the CCV analyzed at the method-required frequency? | ✓ | | | | |
| Were percent differences for each analyte within the method-required QC limits? | ✓ | | | | |
| Was the ICAL curve verified for each analyte? | ✓ | | | | ER1 |
| Was the absolute value of the analyte concentration in the inorganic CCB <RL? | ✓ | | | | |
| **Mass spectral tuning:** | | | | | |
| Was the appropriate compound for the method used for tuning? | | | ✓ | | |
| Were ion abundance data within the method-required QC limits? | | | ✓ | | |
| **Internal standards (IS):** | | | | | |
| Were IS area counts and retention times within the method-required QC limits? | | | ✓ | | |
| **Raw data (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section 4.12.2)** | | | | | |
| Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst? | ✓ | | | | |
| Were data associated with manual integrations flagged on the raw data? | | | ✓ | | |
| **Dual column confirmation** | | | | | |
| Did dual column confirmation results meet the method-required QC? | | | ✓ | | |
| **Tentatively identified compounds (TICs):** | | | | | |
| If TICs were requested, were the mass spectra and TIC data subject to appropriate checks? | | | ✓ | | |
| **Interference Check Sample (ICS) results:** | | | | | |
| Were percent recoveries within method QC limits? | | | ✓ | | |
| **Serial dilutions, post digestion spikes, and method of standard additions** | | | | | |
| Were percent differences, recoveries, and the linearity within the QC limits specified in the method? | ✓ | | | | |
| **Method detection limit (MDL) studies** | | | | | |
| Was a MDL study performed for each reported analyte? | ✓ | | | | |
| Is the MDL either adjusted or supported by the analysis of DCSs? | ✓ | | | | |
| **Proficiency test reports:** | | | | | |
| Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies? | ✓ | | | | |

00071528

| Description | Yes | No | NA(1) | NR(2) | ER(3) |
|---|---|---|---|---|---|
| **Standards documentation** | | | | | |
| Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources? | ✓ | | | | |
| **Compound/analyte identification procedures** | | | | | |
| Are the procedures for compound/analyte identification documented? | ✓ | | | | |
| **Demonstration of analyst competency (DOC)** | | | | | |
| Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4? | ✓ | | | | |
| Is documentation of the analyst's competency up-to-date and on file? | ✓ | | | | |
| **Verification/validation documentation for methods (NELAC Chap 5 or ISO/IEC 17025 Section 5)** | | | | | |
| Are all the methods used to generate the data documented, verified, and validated, where applicable? | ✓ | | | | |
| **Laboratory standard operating procedures (SOPs):** | | | | | |
| Are laboratory SOPs current and on file for each method performed? | ✓ | | | | |

**KEMRON Environmental Services**
Laboratory Review Checklist

| | |
|---|---|
| Laboratory Name: | KEMRON |
| Laboratory Log Number: | L0709261 |
| Project Name: | 798-LONGHORN |
| Method: | 7471 |
| Prep Batch Number(s): | WG250231 |
| Reviewer Name: | MAREN M. BEERY |
| LRC Date: | September 18, 2007 |

**EXCEPTIONS REPORT**
**ER#1 - The ICV analyzed initially on 18-SEP-2007 at 10:47 yielded a noncompliant result for mercury. The ICV was immediately repoured and reanalyzed at 10:51 prior to sample analysis and yielded a compliant result.**
**Footnotes:**
**(1) NA = Not applicable to method or project**
**(2) NR = Not reviewed**
**(3) ER# = Exception report number**

# 2.1 Metals Data

# 2.1.1 Metals I C P Data

# 2.1.1.1 Summary Data

# LABORATORY REPORT

**L0709261**

**09/26/07 14:09**

00071533

**Submitted By**


**KEMRON Environmental Services**
**156 Starlite Drive**
**Marietta , OH 45750**
**( 740 ) 373 - 4071**


**For**

Account Name: Shaw E & I, Inc.
ABB Lummus Biulding
3010 Briarpark Drive Suite 4N
Houston, TX 77042
Attention: Larry Duty

Account Number: 2773
Work ID: LHAAP-46

P.O. Number: 200328

## Sample Analysis Summary

| Client ID | Lab ID | Method | Dilution | Date Received |
|---|---|---|---|---|
| 46WW02-090707 | L0709261-01 | 6010B | 1 | 13-SEP-07 |
| 46WW02-090707 | L0709261-02 | 6010B | 1 | 13-SEP-07 |
| 46WW02-090707 | L0709261-02 | 6010B | 5 | 13-SEP-07 |
| 46WW04-090707 | L0709261-03 | 6010B | 1 | 13-SEP-07 |
| 46WW04-090707 | L0709261-03 | 6010B | 20 | 13-SEP-07 |
| 46WW04-090707 | L0709261-04 | 6010B | 1 | 13-SEP-07 |
| 46WW04-090707 | L0709261-04 | 6010B | 20 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-05 | 6010B | 1 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-05 | 6010B | 20 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-06 | 6010B | 1 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-06 | 6010B | 20 | 13-SEP-07 |
| LHSMW14-090707 | L0709261-07 | 6010B | 1 | 13-SEP-07 |
| LHSMW14-090707 | L0709261-08 | 6010B | 1 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-09 | 6010B | 1 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-09 | 6010B | 2 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-09 | 6010B | 20 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-10 | 6010B | 1 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-10 | 6010B | 2 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-10 | 6010B | 20 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-11 | 6010B | 1 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-11 | 6010B | 5 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-12 | 6010B | 1 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-12 | 6010B | 20 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-13 | 6010B | 1 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-13 | 6010B | 2 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-13 | 6010B | 20 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-14 | 6010B | 1 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-14 | 6010B | 2 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-14 | 6010B | 20 | 13-SEP-07 |

# LABORATORY REPORT

**L0709261**

**09/26/07 14:09**

00071534

## Sample Analysis Summary

| Client ID | Lab ID | Method | Dilution | Date Received |
|---|---|---|---|---|
| LHSMW23-090707 | L0709261-15 | 6010B | 1 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-15 | 6010B | 20 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-16 | 6010B | 1 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-16 | 6010B | 20 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-17 | 6010B | 1 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-17 | 6010B | 2 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-17 | 6010B | 20 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-18 | 6010B | 1 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-18 | 6010B | 2 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-18 | 6010B | 20 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-18 | 6010B | 50 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-19 | 6010B | 1 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-19 | 6010B | 2 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-19 | 6010B | 20 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-20 | 6010B | 1 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-20 | 6010B | 2 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-20 | 6010B | 20 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-20 | 6010B | 50 | 13-SEP-07 |

00071535

Sample Number: L0709261-01
Client ID: 46WW02-090707
Matrix: Water
Workgroup Number: WG250152
Collect Date: 09/07/2007 08:30
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 1
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/14/2007 06:55
Cal Date: 09/14/2007 09:22
Run Date: 09/14/2007 15:51
File ID: P2.091407.155157

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | 0.233 | | 0.100 | 0.0500 |
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Total | 7440-70-2 | 20.3 | | 0.200 | 0.100 |
| Cobalt, Total | 7440-48-4 | 0.0165 | | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 1.65 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 2.33 | | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 17.0 | | 0.500 | 0.250 |
| Sodium, Total | 7440-23-5 | 46.8 | | 0.500 | 0.250 |
| Vanadium, Total | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Total | 7440-66-6 | 0.0879 | | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit

00071536

Sample Number: L0709261-02
Client ID: 46WW02-090707
Matrix: Water
Workgroup Number: WG250289
Collect Date: 09/07/2007 08:30
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 1
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/17/2007 06:25
Cal Date: 09/18/2007 08:50
Run Date: 09/18/2007 15:07
File ID: P2.091807.150720

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.100 | 0.0500 |
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Dissolved | 7440-70-2 | 22.3 | | 0.200 | 0.100 |
| Cobalt, Dissolved | 7440-48-4 | 0.0152 | | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | 0.749 | | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 2.57 | | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 16.4 | | 0.500 | 0.250 |
| Sodium, Dissolved | 7440-23-5 | 57.7 | | 0.500 | 0.250 |
| Zinc, Dissolved | 7440-66-6 | 0.0443 | | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071537

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-02** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **46WW02-090707** | Prep Method: | **3005A** | Prep Date: | **09/17/2007 06:25** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/19/2007 08:57** |
| Workgroup Number: | **WG250289** | Analyst: | **KRV** | Run Date: | **09/19/2007 13:41** |
| Collect Date: | **09/07/2007 08:30** | Dilution: | **5** | File ID: | **P2.091907.134135** |
| Sample Tag: | **DL01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Vanadium, Dissolved | 7440-62-2 | | U | 0.0500 | 0.0250 |

**U Not detected at or above adjusted sample detection limit**

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071538

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-03 | PrePrep Method: | NONE | Instrument: | PE-ICP2 |
| Client ID: | 46WW04-090707 | Prep Method: | 3005A | Prep Date: | 09/14/2007 06:55 |
| Matrix: | Water | Analytical Method: | 6010B | Cal Date: | 09/14/2007 09:22 |
| Workgroup Number: | WG250152 | Analyst: | KHR | Run Date: | 09/14/2007 15:35 |
| Collect Date: | 09/07/2007 10:10 | Dilution: | 1 | File ID: | P2.091407.153531 |
| Sample Tag: | 01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | | U | 0.100 | 0.0500 |
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Total | 7440-70-2 | 328 | | 0.200 | 0.100 |
| Cobalt, Total | 7440-48-4 | 0.0499 | | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 9.82 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 3.04 | | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 165 | | 0.500 | 0.250 |
| Vanadium, Total | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Total | 7440-66-6 | 0.00652 | J | 0.0200 | 0.00500 |

**U** Not detected at or above adjusted sample detection limit
**J** The analyte was positively identified, but the quantitation was below the RL

00071539

Sample Number: L0709261-03
Client ID: 46WW04-090707
Matrix: Water
Workgroup Number: WG250152
Collect Date: 09/07/2007 10:10
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 20
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/14/2007 06:55
Cal Date: 09/17/2007 08:39
Run Date: 09/17/2007 12:43
File ID: P2.091707.124336

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Total | 7440-23-5 | 492 | | 10.0 | 5.00 |

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-04** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **46WW04-090707** | Prep Method: | **3005A** | Prep Date: | **09/17/2007 06:25** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/18/2007 08:50** |
| Workgroup Number: | **WG250289** | Analyst: | **KHR** | Run Date: | **09/18/2007 14:35** |
| Collect Date: | **09/07/2007 10:10** | Dilution: | **1** | File ID: | **P2.091807.143515** |
| Sample Tag: | **01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.100 | 0.0500 |
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Dissolved | 7440-70-2 | 357 | | 0.200 | 0.100 |
| Cobalt, Dissolved | 7440-48-4 | 0.0556 | | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | 3.35 | | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 3.73 | | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 169 | | 0.500 | 0.250 |
| Zinc, Dissolved | 7440-66-6 | | U | 0.0200 | 0.00500 |

**U Not detected at or above adjusted sample detection limit**

00071541

Sample Number: L0709261-04
Client ID: 46WW04-090707
Matrix: Water
Workgroup Number: WG250289
Collect Date: 09/07/2007 10:10
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KRV
Dilution: 20
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/17/2007 06:25
Cal Date: 09/19/2007 08:57
Run Date: 09/19/2007 13:09
File ID: P2.091907.130911

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Dissolved | 7440-23-5 | 433 | | 10.0 | 5.00 |
| Vanadium, Dissolved | 7440-62-2 | | U | 0.200 | 0.100 |

U Not detected at or above adjusted sample detection limit

Sample Number: L0709261-05
Client ID: LHSMW11-090707
Matrix: Water
Workgroup Number: WG250152
Collect Date: 09/07/2007 12:20
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 1
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/14/2007 06:55
Cal Date: 09/14/2007 09:22
Run Date: 09/14/2007 15:58
File ID: P2.091407.155818

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | 0.508 | | 0.100 | 0.0500 |
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Total | 7440-70-2 | 269 | | 0.200 | 0.100 |
| Cobalt, Total | 7440-48-4 | 0.0227 | | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 7.88 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 1.27 | | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 119 | | 0.500 | 0.250 |
| Vanadium, Total | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Total | 7440-66-6 | 0.00897 | J | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

00071543

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-05 | PrePrep Method: | NONE | Instrument: | PE-ICP2 |
| Client ID: | LHSMW11-090707 | Prep Method: | 3005A | Prep Date: | 09/14/2007 06:55 |
| Matrix: | Water | Analytical Method: | 6010B | Cal Date: | 09/17/2007 08:39 |
| Workgroup Number: | WG250152 | Analyst: | KHR | Run Date: | 09/17/2007 13:02 |
| Collect Date: | 09/07/2007 12:20 | Dilution: | 20 | File ID: | P2.091707.130230 |
| Sample Tag: | DL01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Total | 7440-23-5 | 597 | | 10.0 | 5.00 |

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-06** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **LHSMW11-090707** | Prep Method: | **3005A** | Prep Date: | **09/17/2007 06:25** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/18/2007 08:50** |
| Workgroup Number: | **WG250289** | Analyst: | **KHR** | Run Date: | **09/18/2007 14:54** |
| Collect Date: | **09/07/2007 12:20** | Dilution: | **1** | File ID: | **P2.091807.145435** |
| Sample Tag: | **01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.100 | 0.0500 |
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Dissolved | 7440-70-2 | 277 | | 0.200 | 0.100 |
| Cobalt, Dissolved | 7440-48-4 | 0.0205 | | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | | U | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 1.56 | | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 113 | | 0.500 | 0.250 |
| Zinc, Dissolved | 7440-66-6 | | U | 0.0200 | 0.00500 |

**U Not detected at or above adjusted sample detection limit**

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071545

Sample Number: **L0709261-06**
Client ID: **LHSMW11-090707**
Matrix: **Water**
Workgroup Number: **WG250289**
Collect Date: **09/07/2007 12:20**
Sample Tag: **DL01**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KRV**
Dilution: **20**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/17/2007 06:25**
Cal Date: **09/19/2007 08:57**
Run Date: **09/19/2007 13:28**
File ID: **P2.091907.132816**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Dissolved | 7440-23-5 | 655 | | 10.0 | 5.00 |
| Vanadium, Dissolved | 7440-62-2 | | U | 0.200 | 0.100 |

**U Not detected at or above adjusted sample detection limit**

00071546

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-07 | PrePrep Method: | NONE | Instrument: | PE-ICP2 |
| Client ID: | LHSMW14-090707 | Prep Method: | 3005A | Prep Date: | 09/14/2007 06:55 |
| Matrix: | Water | Analytical Method: | 6010B | Cal Date: | 09/14/2007 09:22 |
| Workgroup Number: | WG250152 | Analyst: | KHR | Run Date: | 09/14/2007 17:26 |
| Collect Date: | 09/10/2007 13:30 | Dilution: | 1 | File ID: | P2.091407.172623 |
| Sample Tag: | 01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | 1.36 | | 0.100 | 0.0500 |
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Total | 7440-70-2 | 2.55 | | 0.200 | 0.100 |
| Cobalt, Total | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 1.61 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 0.754 | J | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 1.81 | | 0.500 | 0.250 |
| Sodium, Total | 7440-23-5 | 12.1 | | 0.500 | 0.250 |
| Vanadium, Total | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Total | 7440-66-6 | 0.00714 | J | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-08 | PrePrep Method: | NONE | Instrument: | PE-ICP2 |
| Client ID: | LHSMW14-090707 | Prep Method: | 3005A | Prep Date: | 09/17/2007 06:25 |
| Matrix: | Water | Analytical Method: | 6010B | Cal Date: | 09/18/2007 08:50 |
| Workgroup Number: | WG250289 | Analyst: | KHR | Run Date: | 09/18/2007 15:00 |
| Collect Date: | 09/10/2007 13:30 | Dilution: | 1 | File ID: | P2.091807.150059 |
| Sample Tag: | 01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.100 | 0.0500 |
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Dissolved | 7440-70-2 | 3.64 | | 0.200 | 0.100 |
| Cobalt, Dissolved | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | 0.0493 | J | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 0.928 | J | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 1.80 | | 0.500 | 0.250 |
| Sodium, Dissolved | 7440-23-5 | 22.5 | | 0.500 | 0.250 |
| Vanadium, Dissolved | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Dissolved | 7440-66-6 | | U | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**
Report Date : **September 26, 2007**

00071548

Sample Number: **L0709261-09**
Client ID: **LHSMW15-090707**
Matrix: **Water**
Workgroup Number: **WG250152**
Collect Date: **09/10/2007 15:45**
Sample Tag: **01**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KHR**
Dilution: **1**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/14/2007 06:55**
Cal Date: **09/14/2007 09:22**
Run Date: **09/14/2007 17:32**
File ID: **P2.091407.173237**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Cobalt, Total | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 4.31 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 5.70 | | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 273 | | 0.500 | 0.250 |
| Vanadium, Total | 7440-62-2 | | U | 0.0100 | 0.00500 |

**U Not detected at or above adjusted sample detection limit**

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-09 | PrePrep Method: | NONE | Instrument: | PE-ICP2 |
| Client ID: | LHSMW15-090707 | Prep Method: | 3005A | Prep Date: | 09/14/2007 06:55 |
| Matrix: | Water | Analytical Method: | 6010B | Cal Date: | 09/17/2007 08:39 |
| Workgroup Number: | WG250152 | Analyst: | KHR | Run Date: | 09/17/2007 13:22 |
| Collect Date: | 09/10/2007 15:45 | Dilution: | 2 | File ID: | P2.091707.132217 |
| Sample Tag: | DL01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | | U | 0.200 | 0.100 |
| Calcium, Total | 7440-70-2 | 523 | | 0.400 | 0.200 |

U Not detected at or above adjusted sample detection limit

00071550

Sample Number:L0709261-09
Client ID:LHSMW15-090707
Matrix:Water
Workgroup Number:WG250152
Collect Date:09/10/2007 15:45
Sample Tag:DL02

PrePrep Method:NONE
Prep Method:3005A
Analytical Method:6010B
Analyst:KHR
Dilution:20
Units:mg/L

Instrument:PE-ICP2
Prep Date:09/14/2007 06:55
Cal Date:09/17/2007 08:39
Run Date:09/17/2007 13:28
File ID:P2.091707.132841

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Total | 7440-23-5 | 2850 | | 10.0 | 5.00 |
| Zinc, Total | 7440-66-6 | 300 | | 0.400 | 0.100 |

Sample Number: L0709261-10
Client ID: LHSMW15-090707
Matrix: Water
Workgroup Number: WG250289
Collect Date: 09/10/2007 15:45
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 1
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/17/2007 06:25
Cal Date: 09/18/2007 08:50
Run Date: 09/18/2007 15:38
File ID: P2.091807.153849

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Cobalt, Dissolved | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | | U | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 4.14 | | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 262 | | 0.500 | 0.250 |
| Zinc, Dissolved | 7440-66-6 | 0.00807 | J | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

00071552

Sample Number: L0709261-10
Client ID: LHSMW15-090707
Matrix: Water
Workgroup Number: WG250289
Collect Date: 09/10/2007 15:45
Sample Tag: DL02

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KRV
Dilution: 2
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/17/2007 06:25
Cal Date: 09/19/2007 08:57
Run Date: 09/19/2007 14:07
File ID: P2.091907.140755

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.200 | 0.100 |
| Calcium, Dissolved | 7440-70-2 | 500 | | 0.400 | 0.200 |

U Not detected at or above adjusted sample detection limit

Sample Number: L0709261-10
Client ID: LHSMW15-090707
Matrix: Water
Workgroup Number: WG250289
Collect Date: 09/10/2007 15:45
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KRV
Dilution: 20
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/17/2007 06:25
Cal Date: 09/19/2007 08:57
Run Date: 09/19/2007 14:01
File ID: P2.091907.140121

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Dissolved | 7440-23-5 | 1020 | | 10.0 | 5.00 |
| Vanadium, Dissolved | 7440-62-2 | | U | 0.200 | 0.100 |

U Not detected at or above adjusted sample detection limit

Sample Number: **L0709261-11**
Client ID: **LHSMW19-090707**
Matrix: **Water**
Workgroup Number: **WG250152**
Collect Date: **09/11/2007 08:20**
Sample Tag: **01**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KHR**
Dilution: **1**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/14/2007 06:55**
Cal Date: **09/14/2007 09:22**
Run Date: **09/14/2007 17:51**
File ID: **P2.091407.175133**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | 0.251 | | 0.100 | 0.0500 |
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Total | 7440-70-2 | 64.7 | | 0.200 | 0.100 |
| Cobalt, Total | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 0.529 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 2.77 | | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 44.8 | | 0.500 | 0.250 |
| Sodium, Total | 7440-23-5 | 163 | | 0.500 | 0.250 |
| Zinc, Total | 7440-66-6 | 0.0136 | J | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071555

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-11** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **LHSMW19-090707** | Prep Method: | **3005A** | Prep Date: | **09/14/2007 06:55** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/17/2007 08:39** |
| Workgroup Number: | **WG250152** | Analyst: | **KHR** | Run Date: | **09/17/2007 13:15** |
| Collect Date: | **09/11/2007 08:20** | Dilution: | **5** | File ID: | **P2.091707.131554** |
| Sample Tag: | **DL01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Vanadium, Total | 7440-62-2 | | U | 0.0500 | 0.0250 |

**U Not detected at or above adjusted sample detection limit**

00071556

Sample Number: L0709261-12
Client ID: LHSMW19-090707
Matrix: Water
Workgroup Number: WG250289
Collect Date: 09/11/2007 08:20
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 1
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/17/2007 06:25
Cal Date: 09/18/2007 08:50
Run Date: 09/18/2007 15:45
File ID: P2.091807.154511

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.100 | 0.0500 |
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Dissolved | 7440-70-2 | 68.4 | | 0.200 | 0.100 |
| Cobalt, Dissolved | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | | U | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 2.57 | | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 39.8 | | 0.500 | 0.250 |
| Sodium, Dissolved | 7440-23-5 | 172 | | 0.500 | 0.250 |
| Zinc, Dissolved | 7440-66-6 | | U | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit

Sample Number: **L0709261-12**
Client ID: **LHSMW19-090707**
Matrix: **Water**
Workgroup Number: **WG250289**
Collect Date: **09/11/2007 08:20**
Sample Tag: **DL01**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KRV**
Dilution: **20**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/17/2007 06:25**
Cal Date: **09/19/2007 08:57**
Run Date: **09/19/2007 13:54**
File ID: **P2.091907.135453**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Vanadium, Dissolved** | **7440-62-2** | | **U** | **0.200** | **0.100** |

**U Not detected at or above adjusted sample detection limit**

Sample Number:**L0709261-13**
Client ID:**LHSMW22-090707**
Matrix:**Water**
Workgroup Number:**WG250152**
Collect Date:**09/11/2007 09:50**
Sample Tag:**01**

PrePrep Method:**NONE**
Prep Method:**3005A**
Analytical Method:**6010B**
Analyst:**KHR**
Dilution:**1**
Units:**mg/L**

Instrument:**PE-ICP2**
Prep Date:**09/14/2007 06:55**
Cal Date:**09/14/2007 09:22**
Run Date:**09/14/2007 17:57**
File ID:**P2.091407.175757**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Cobalt, Total | 7440-48-4 | 0.0830 | | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 2.91 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 3.26 | | 1.00 | 0.250 |
| Vanadium, Total | 7440-62-2 | 0.00924 | J | 0.0100 | 0.00500 |
| Zinc, Total | 7440-66-6 | 0.0488 | | 0.0200 | 0.00500 |

**U** Not detected at or above adjusted sample detection limit
**J** The analyte was positively identified, but the quantitation was below the RL

00071559

Sample Number:L0709261-13
Client ID:LHSMW22-090707
Matrix:Water
Workgroup Number:WG250152
Collect Date:09/11/2007 09:50
Sample Tag:DL01

PrePrep Method:NONE
Prep Method:3005A
Analytical Method:6010B
Analyst:KHR
Dilution:2
Units:mg/L

Instrument:PE-ICP2
Prep Date:09/14/2007 06:55
Cal Date:09/17/2007 08:39
Run Date:09/17/2007 13:35
File ID:P2.091707.133512

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | | U | 0.200 | 0.100 |
| Calcium, Total | 7440-70-2 | 562 | | 0.400 | 0.200 |
| Magnesium, Total | 7439-95-4 | 451 | | 1.00 | 0.500 |

U Not detected at or above adjusted sample detection limit

00071560

Sample Number: L0709261-13
Client ID: LHSMW22-090707
Matrix: Water
Workgroup Number: WG250152
Collect Date: 09/11/2007 09:50
Sample Tag: DL02

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 20
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/14/2007 06:55
Cal Date: 09/17/2007 08:39
Run Date: 09/17/2007 13:41
File ID: P2.091707.134143

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Total | 7440-23-5 | 911 | | 10.0 | 5.00 |

00071561

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-14** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **LHSMW22-090707** | Prep Method: | **3005A** | Prep Date: | **09/17/2007 06:25** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/18/2007 08:50** |
| Workgroup Number: | **WG250289** | Analyst: | **KHR** | Run Date: | **09/18/2007 15:51** |
| Collect Date: | **09/11/2007 09:50** | Dilution: | **1** | File ID: | **P2.091807.155130** |
| Sample Tag: | **01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Cobalt, Dissolved | 7440-48-4 | 0.0929 | | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | 2.65 | | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 3.24 | | 1.00 | 0.250 |
| Vanadium, Dissolved | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Dissolved | 7440-66-6 | 0.0332 | | 0.0200 | 0.00500 |

**U Not detected at or above adjusted sample detection limit**

Sample Number: **L0709261-14**
Client ID: **LHSMW22-090707**
Matrix: **Water**
Workgroup Number: **WG250289**
Collect Date: **09/11/2007 09:50**
Sample Tag: **DL01**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KRV**
Dilution: **2**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/17/2007 06:25**
Cal Date: **09/19/2007 08:57**
Run Date: **09/19/2007 14:52**
File ID: **P2.091907.145224**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.200 | 0.100 |
| Calcium, Dissolved | 7440-70-2 | 555 | | 0.400 | 0.200 |
| Magnesium, Dissolved | 7439-95-4 | 466 | | 1.00 | 0.500 |

**U Not detected at or above adjusted sample detection limit**

00071563

| | | |
|---|---|---|
| Sample Number:L0709261-14 | PrePrep Method:NONE | Instrument:PE-ICP2 |
| Client ID:LHSMW22-090707 | Prep Method:3005A | Prep Date:09/17/2007 06:25 |
| Matrix:Water | Analytical Method:6010B | Cal Date:09/19/2007 08:57 |
| Workgroup Number:WG250289 | Analyst:KRV | Run Date:09/19/2007 14:58 |
| Collect Date:09/11/2007 09:50 | Dilution:20 | File ID:P2.091907.145842 |
| Sample Tag:DL02 | Units:mg/L | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Dissolved | 7440-23-5 | 945 | | 10.0 | 5.00 |

00071564

Sample Number: L0709261-15
Client ID: LHSMW23-090707
Matrix: Water
Workgroup Number: WG250152
Collect Date: 09/11/2007 13:35
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 1
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/14/2007 06:55
Cal Date: 09/14/2007 09:22
Run Date: 09/14/2007 18:04
File ID: P2.091407.180426

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | | U | 0.100 | 0.0500 |
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Total | 7440-70-2 | 330 | | 0.200 | 0.100 |
| Cobalt, Total | 7440-48-4 | 0.00437 | J | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 5.59 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 3.07 | | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 237 | | 0.500 | 0.250 |
| Vanadium, Total | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Total | 7440-66-6 | 0.0143 | J | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071565

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-15 | PrePrep Method: | NONE | Instrument: | PE-ICP2 |
| Client ID: | LHSMW23-090707 | Prep Method: | 3005A | Prep Date: | 09/14/2007 06:55 |
| Matrix: | Water | Analytical Method: | 6010B | Cal Date: | 09/17/2007 08:39 |
| Workgroup Number: | WG250152 | Analyst: | KHR | Run Date: | 09/17/2007 13:08 |
| Collect Date: | 09/11/2007 13:35 | Dilution: | 20 | File ID: | P2.091707.130841 |
| Sample Tag: | DL01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Total | 7440-23-5 | 460 | | 10.0 | 5.00 |

00071566

Sample Number:L0709261-16
Client ID:LHSMW23-090707
Matrix:Water
Workgroup Number:WG250289
Collect Date:09/11/2007 13:35
Sample Tag:01

PrePrep Method:NONE
Prep Method:3005A
Analytical Method:6010B
Analyst:KHR
Dilution:1
Units:mg/L

Instrument:PE-ICP2
Prep Date:09/17/2007 06:25
Cal Date:09/18/2007 08:50
Run Date:09/18/2007 15:57
File ID:P2.091807.155759

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.100 | 0.0500 |
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Calcium, Dissolved | 7440-70-2 | 345 | | 0.200 | 0.100 |
| Cobalt, Dissolved | 7440-48-4 | 0.00411 | J | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | 0.147 | | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 3.23 | | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 220 | | 0.500 | 0.250 |
| Zinc, Dissolved | 7440-66-6 | | U | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071567

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-16** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **LHSMW23-090707** | Prep Method: | **3005A** | Prep Date: | **09/17/2007 06:25** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/19/2007 08:57** |
| Workgroup Number: | **WG250289** | Analyst: | **KRV** | Run Date: | **09/19/2007 13:35** |
| Collect Date: | **09/11/2007 13:35** | Dilution: | **20** | File ID: | **P2.091907.133500** |
| Sample Tag: | **DL01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Sodium, Dissolved** | **7440-23-5** | **505** | | **10.0** | **5.00** |
| **Vanadium, Dissolved** | **7440-62-2** | | **U** | **0.200** | **0.100** |

**U Not detected at or above adjusted sample detection limit**

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071568

Sample Number: **L0709261-17**
Client ID: **LHSMW24-090707**
Matrix: **Water**
Workgroup Number: **WG250152**
Collect Date: **09/11/2007 15:35**
Sample Tag: **01**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KHR**
Dilution: **1**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/14/2007 06:55**
Cal Date: **09/14/2007 09:22**
Run Date: **09/14/2007 18:10**
File ID: **P2.091407.181047**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Cobalt, Total | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 0.449 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 2.21 | | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 393 | | 0.500 | 0.250 |
| Vanadium, Total | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Total | 7440-66-6 | 0.00619 | J | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071569

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-17** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **LHSMW24-090707** | Prep Method: | **3005A** | Prep Date: | **09/14/2007 06:55** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/17/2007 08:39** |
| Workgroup Number: | **WG250152** | Analyst: | **KHR** | Run Date: | **09/17/2007 14:01** |
| Collect Date: | **09/11/2007 15:35** | Dilution: | **2** | File ID: | **P2.091707.140104** |
| Sample Tag: | **DL01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Total | 7429-90-5 | | U | 0.200 | 0.100 |
| Calcium, Total | 7440-70-2 | 610 | | 0.400 | 0.200 |

**U Not detected at or above adjusted sample detection limit**

00071570

Sample Number: **L0709261-17**
Client ID: **LHSMW24-090707**
Matrix: **Water**
Workgroup Number: **WG250152**
Collect Date: **09/11/2007 15:35**
Sample Tag: **DL02**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KHR**
Dilution: **20**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/14/2007 06:55**
Cal Date: **09/17/2007 08:39**
Run Date: **09/17/2007 14:07**
File ID: **P2.091707.140724**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Total | 7440-23-5 | 1160 | | 10.0 | 5.00 |

Sample Number: **L0709261-18**
Client ID: **LHSMW24-090707**
Matrix: **Water**
Workgroup Number: **WG250289**
Collect Date: **09/11/2007 15:35**
Sample Tag: **01**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KHR**
Dilution: **1**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/17/2007 06:25**
Cal Date: **09/18/2007 08:50**
Run Date: **09/18/2007 16:04**
File ID: **P2.091807.160424**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Cobalt, Dissolved | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | | U | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 2.43 | | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 370 | | 0.500 | 0.250 |
| Zinc, Dissolved | 7440-66-6 | | U | 0.0200 | 0.00500 |

**U Not detected at or above adjusted sample detection limit**

Sample Number: L0709261-18
Client ID: LHSMW24-090707
Matrix: Water
Workgroup Number: WG250289
Collect Date: 09/11/2007 15:35
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KRV
Dilution: 2
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/17/2007 06:25
Cal Date: 09/19/2007 08:57
Run Date: 09/19/2007 14:27
File ID: P2.091907.142700

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.200 | 0.100 |
| Calcium, Dissolved | 7440-70-2 | 612 | | 0.400 | 0.200 |

U Not detected at or above adjusted sample detection limit

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071573

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-18 | PrePrep Method: | NONE | Instrument: | PE-ICP2 |
| Client ID: | LHSMW24-090707 | Prep Method: | 3005A | Prep Date: | 09/17/2007 06:25 |
| Matrix: | Water | Analytical Method: | 6010B | Cal Date: | 09/19/2007 08:57 |
| Workgroup Number: | WG250289 | Analyst: | KRV | Run Date: | 09/19/2007 14:33 |
| Collect Date: | 09/11/2007 15:35 | Dilution: | 20 | File ID: | P2.091907.143324 |
| Sample Tag: | DL02 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Dissolved | 7440-23-5 | 1150 | | 10.0 | 5.00 |

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071574

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-18** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **LHSMW24-090707** | Prep Method: | **3005A** | Prep Date: | **09/17/2007 06:25** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/20/2007 08:22** |
| Workgroup Number: | **WG250289** | Analyst: | **KHR** | Run Date: | **09/20/2007 10:06** |
| Collect Date: | **09/11/2007 15:35** | Dilution: | **50** | File ID: | **P2.092007.100630** |
| Sample Tag: | **DL03** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Vanadium, Dissolved | 7440-62-2 | | U | 0.500 | 0.250 |

**U Not detected at or above adjusted sample detection limit**

00071575

Sample Number: L0709261-19
Client ID: LHSMW24-090707-FD
Matrix: Water
Workgroup Number: WG250152
Collect Date: 09/11/2007 15:35
Sample Tag: 01

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 1
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/14/2007 06:55
Cal Date: 09/14/2007 09:22
Run Date: 09/14/2007 18:17
File ID: P2.091407.181706

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Beryllium, Total | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Cobalt, Total | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Total | 7439-89-6 | 0.413 | | 0.100 | 0.0250 |
| Potassium, Total | 7440-09-7 | 2.25 | | 1.00 | 0.250 |
| Magnesium, Total | 7439-95-4 | 391 | | 0.500 | 0.250 |
| Vanadium, Total | 7440-62-2 | | U | 0.0100 | 0.00500 |
| Zinc, Total | 7440-66-6 | 0.00579 | J | 0.0200 | 0.00500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071576

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-19** | PrePrep Method: | **NONE** | Instrument: | **PE-ICP2** |
| Client ID: | **LHSMW24-090707-FD** | Prep Method: | **3005A** | Prep Date: | **09/14/2007 06:55** |
| Matrix: | **Water** | Analytical Method: | **6010B** | Cal Date: | **09/17/2007 08:39** |
| Workgroup Number: | **WG250152** | Analyst: | **KHR** | Run Date: | **09/17/2007 14:13** |
| Collect Date: | **09/11/2007 15:35** | Dilution: | **2** | File ID: | **P2.091707.141345** |
| Sample Tag: | **DL01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Aluminum, Total** | **7429-90-5** | | **U** | **0.200** | **0.100** |
| **Calcium, Total** | **7440-70-2** | **581** | | **0.400** | **0.200** |

**U Not detected at or above adjusted sample detection limit**

Sample Number: L0709261-19
Client ID: LHSMW24-090707-FD
Matrix: Water
Workgroup Number: WG250152
Collect Date: 09/11/2007 15:35
Sample Tag: DL02

PrePrep Method: NONE
Prep Method: 3005A
Analytical Method: 6010B
Analyst: KHR
Dilution: 20
Units: mg/L

Instrument: PE-ICP2
Prep Date: 09/14/2007 06:55
Cal Date: 09/17/2007 08:39
Run Date: 09/17/2007 14:20
File ID: P2.091707.142009

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Total | 7440-23-5 | 1450 | | 10.0 | 5.00 |

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071578

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-20 | PrePrep Method: | NONE | Instrument: | PE-ICP2 |
| Client ID: | LHSMW24-090707-FD | Prep Method: | 3005A | Prep Date: | 09/17/2007 06:25 |
| Matrix: | Water | Analytical Method: | 6010B | Cal Date: | 09/18/2007 08:50 |
| Workgroup Number: | WG250289 | Analyst: | KHR | Run Date: | 09/18/2007 16:10 |
| Collect Date: | 09/11/2007 15:35 | Dilution: | 1 | File ID: | P2.091807.161044 |
| Sample Tag: | 01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Beryllium, Dissolved | 7440-41-7 | | U | 0.00200 | 0.000500 |
| Cobalt, Dissolved | 7440-48-4 | | U | 0.00500 | 0.00250 |
| Iron, Dissolved | 7439-89-6 | | U | 0.100 | 0.0250 |
| Potassium, Dissolved | 7440-09-7 | 2.42 | | 1.00 | 0.250 |
| Magnesium, Dissolved | 7439-95-4 | 367 | | 0.500 | 0.250 |
| Zinc, Dissolved | 7440-66-6 | | U | 0.0200 | 0.00500 |

**U Not detected at or above adjusted sample detection limit**

00071579

Sample Number:L0709261-20
Client ID:LHSMW24-090707-FD
Matrix:Water
Workgroup Number:WG250289
Collect Date:09/11/2007 15:35
Sample Tag:DL01

PrePrep Method:NONE
Prep Method:3005A
Analytical Method:6010B
Analyst:KRV
Dilution:2
Units:mg/L

Instrument:PE-ICP2
Prep Date:09/17/2007 06:25
Cal Date:09/19/2007 08:57
Run Date:09/19/2007 14:39
File ID:P2.091907.143940

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 7429-90-5 | | U | 0.200 | 0.100 |
| Calcium, Dissolved | 7440-70-2 | 605 | | 0.400 | 0.200 |

U  Not detected at or above adjusted sample detection limit

00071580

Sample Number: **L0709261-20**
Client ID: **LHSMW24-090707-FD**
Matrix: **Water**
Workgroup Number: **WG250289**
Collect Date: **09/11/2007 15:35**
Sample Tag: **DL02**

PrePrep Method: **NONE**
Prep Method: **3005A**
Analytical Method: **6010B**
Analyst: **KRV**
Dilution: **20**
Units: **mg/L**

Instrument: **PE-ICP2**
Prep Date: **09/17/2007 06:25**
Cal Date: **09/19/2007 08:57**
Run Date: **09/19/2007 14:46**
File ID: **P2.091907.144601**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Sodium, Dissolved | 7440-23-5 | 1150 | | 10.0 | 5.00 |

00071581

Sample Number:**L0709261-20**
Client ID:**LHSMW24-090707-FD**
Matrix:**Water**
Workgroup Number:**WG250289**
Collect Date:**09/11/2007 15:35**
Sample Tag:**DL03**

PrePrep Method:**NONE**
Prep Method:**3005A**
Analytical Method:**6010B**
Analyst:**KHR**
Dilution:**50**
Units:**mg/L**

Instrument:**PE-ICP2**
Prep Date:**09/17/2007 06:25**
Cal Date:**09/20/2007 08:22**
Run Date:**09/20/2007 10:12**
File ID:**P2.092007.101249**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Vanadium, Dissolved | 7440-62-2 | | U | 0.500 | 0.250 |

**U Not detected at or above adjusted sample detection limit**

# 2.1.1.2 QC Summary Data

**1.0 Initial Calibration (ICAL) Parameters**
The system performs linear regression from data consisting of a blank and three standards.

**2.0 Calculating the concentration (C) of an element in water using data from prep log, run log, and quantitation report (note:the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system in ug/mL (ppm) | 0.1 |
| $Vf$ = Final volume (mL) | 50 |
| $Vi$ = Initial volume (mL) | 50 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in ug/mL (mg/L) | 0.1 |

**3.0 Calculating the concentration (C) of an element in soil using data from prep log, run log, and quantitation report (note: the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (mg/L) (ppm) | 0.1 |
| $Vf$ = Final volume (mL) | 50 |
| $Vi$ = Initial weight (g) | 1 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in ug/g (mg/kg) | 5 |

**4.0 Adjusting the concentration to dry weight:**

$$Cdry = \frac{Cx \times 100}{Px}$$

| Where: | **Example:** |
|---|---|
| $Cx$ = Concentration calculated as received (wet basis) | 5 |
| $Px$ = Percent solids of sample (%wt) | 80 |
| | |
| $Cdry$ = Concentration calculated as dry weight (mg/kg) | 6.25 |

**1.0 Initial Calibration (ICAL) Parameters**
The system performs linear regression from data consisting of a blank and three standards.

**2.0 Calculating the concentration (C) of an element in water using data from prep log, run log, and quantitation report (note:the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system in ug/mL (ppm) | 0.1 |
| $Vf$ = Final volume (mL) | 50 |
| $Vi$ = Initial volume (mL) | 50 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in ug/mL (mg/L) | 0.1 |

**3.0 Calculating the concentration (C) of an element in soil using data from prep log, run log, and quantitation report (note: the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (mg/L) (ppm) | 0.1 |
| $Vf$ = Final volume (mL) | 50 |
| $Vi$ = Initial weight (g) | 1 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in ug/g (mg/kg) | 5 |

**4.0 Adjusting the concentration to dry weight:**

$$Cdry = \frac{Cx \times 100}{Px}$$

| Where: | **Example:** |
|---|---|
| $Cx$ = Concentration calculated as received (wet basis) | 5 |
| $Px$ = Percent solids of sample (%wt) | 80 |
| | |
| $Cdry$ = Concentration calculated as dry weight (mg/kg) | 6.25 |

KEMRON ENVIRONMENTAL SERVICES

# Metals Digest Log

Analyst(s): PW
Date: 9/14/07
LCS: 5ml STD 21660
MS/MSD: 5ml STD 21660
Witness: P
$HNO_3$ Lot #: CUO 12526
$1:1HNO_3$: NA
HCl Lot #: CUO 12527
$H_2O_2$ Lot #: NA
Earliest Sample Due Date: 9/17
Digest Tube Lot #: CUO 12521
Hotblock #: 2
Hotblock Temp - Start: 95.1 @ 0655
Hotblock Temp - End: 94.9 @ 1055

Box: 15
Digestion Work Group: WG250098

General Digestion
**ME401 Revision #** 12 - Method 3005A-Water
**ME403 Revision #** ______ - Method 3050B-Soil

Furnace Digestion
**ME402 Revision #** ______ - Method 3020A-Water
**ME403 Revision #** ______ - Method 3050B-Soil

AS/SE Digestion
**ME410 Revision #** ______ - Method 7060/7740-Water

Relinquished By: PW
Digest Received By: [signature] Date: 9/14/07

| | KEMRON # | Initial WT/Vol | Final Volume | Comments | Due Date |
|---|---|---|---|---|---|
| 1 | PBW | 50ml | 50ml | -02 | |
| 2 | LCSW | | | -03 | |
| 3 | 09-251-01 | | | Level 4 | 9/21 |
| 4 | -02 | | | | |
| 5 | -03 | | | | |
| 6 | -04 | | | | |
| 7 | -05 | | | | |
| 8 | -06 | | | | |
| 9 | -07 | | | | |
| 10 | -08 | | | | |
| 11 | 09-253-01 | | | | 9/17 |
| 12 | 09-261-01 | | | | 9/24 |
| 13 | -03 | | | -01 | |
| 14 | -03MS | | | -04 | |
| 15 | -03MSD | | | -05 | |
| 16 | -05 | | | | |
| 17 | -07 | | | | |
| 18 | -09 | | | | |
| 19 | -11 | | | | |
| 20 | -13 | | | | |
| 21 | -15 | | | | |
| 22 | -17 | | | | |
| 23 | -19 | | | | |
| 24 | | | | | |
| 25 | | | | | |
| 26 | | PW 9/14/07 | | | |
| 27 | | | | | |
| 28 | | | | | |

Comments: ______________________

Primary Review: [signature] 9/14/07
Secondary Review: Vicki Collier 9/14/07

KEMRON ENVIRONMENTAL SERVICES

# Metals Digest Log

Document Control No.: MP0099 Page 10 of 100

Analyst(s): [illegible]
Date: 9/17/07
LCS: 5ml STD 21660
MS/MSD: 5ml STD 21660
Witness: [illegible]
$HNO_3$ Lot #: COA 12526
$1:1HNO_3$: NA
HCl Lot #: COA 12527
$H_2O_2$ Lot #: NA
Earliest Sample Due Date: 9/24
Digest Tube Lot #: COA 12400
Hotblock #: 2
Hotblock Temp - Start: 94.9 @ 0625
Hotblock Temp - End: 95.1 @ 1025

Box: C4
Digestion Work Group: WG 250200

General Digestion
**ME401 Revision #** 12 - Method 3005A-Water
**ME403 Revision #** ______ - Method 3050B-Soil

Furnace Digestion
**ME402 Revision #** ______ - Method 3020A-Water
**ME403 Revision #** ______ - Method 3050B-Soil

AS/SE Digestion
**ME410 Revision #** ______ - Method 7060/7740-Water

Relinquished By: [illegible]
Digest Received By: JYH Date: 9/17/07

| | KEMRON # | Initial WT/Vol | Final Volume | Comments | Due Date |
|---|---|---|---|---|---|
| 1 | PBW | 50ml | 50ml | LAB FILT 9/14 -02 | |
| 2 | LCSW | | | -03 | |
| 3 | 09-261-02 | | | | 9/24 |
| 4 | -04 | | | -01 | |
| 5 | -04 MS | | | -04 | |
| 6 | -04 MSD | | | -05 | |
| 7 | -06 | | | | |
| 8 | -08 | | | | |
| 9 | -10 | | | | |
| 10 | -12 | | | | |
| 11 | -14 | | | | |
| 12 | -16 | | | | |
| 13 | -18 | | | | |
| 14 | -20 | | | | |
| 15 | | | | | |
| 16 | | | | | |
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| 28 | | | | | |

[illegible] 9/17/07

Comments: ______

Primary Review: [illegible] 9/17/07
Secondary Review: Vicki Collier 9/17/07

**KEMRON Environmental Services**

Instrument Run Log

00071587

Instrument: PE-ICP2 Dataset: 091407H2.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20825

Calibration Std: STD21870 ICV/CCV Std: STD21884 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250019, 250020, 250152, 250163

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | P2.091407.085705 | WG250147-01 | Calibration Point | | 1 | | 09/14/07 08:57 |
| 2 | P2.091407.090314 | WG250147-02 | Calibration Point | | 1 | | 09/14/07 09:03 |
| 3 | P2.091407.090928 | WG250147-03 | Calibration Point | | 1 | | 09/14/07 09:09 |
| 4 | P2.091407.091546 | WG250147-04 | Calibration Point | | 1 | | 09/14/07 09:15 |
| 5 | P2.091407.092200 | WG250147-05 | Calibration Point | | 1 | | 09/14/07 09:22 |
| 6 | P2.091407.092729 | WG250147-06 | Initial Calibration Verification | | 1 | | 09/14/07 09:27 |
| 7 | P2.091407.093346 | WG250147-07 | Initial Calib Blank | | 1 | | 09/14/07 09:33 |
| 8 | P2.091407.094001 | WG250147-08 | Interference Check | | 1 | | 09/14/07 09:40 |
| 9 | P2.091407.094522 | WG250147-09 | Interference Check | | 1 | | 09/14/07 09:45 |
| 10 | P2.091407.095043 | WG250147-10 | CCV | | 1 | | 09/14/07 09:50 |
| 11 | P2.091407.095700 | WG250147-11 | CCB | | 1 | | 09/14/07 09:57 |
| 12 | P2.091407.100223 | WG249978-02 | Method/Prep Blank | 50/50 | 1 | | 09/14/07 10:02 |
| 13 | P2.091407.100837 | WG249978-03 | Laboratory Control S | 50/50 | 1 | | 09/14/07 10:08 |
| 14 | P2.091407.101504 | WG249978-01 | Reference Sample | | 1 | L0709165-10 | 09/14/07 10:15 |
| 15 | P2.091407.102023 | WG249978-04 | Matrix Spike | 50/50 | 1 | L0709165-11 | 09/14/07 10:20 |
| 16 | P2.091407.102547 | WG249978-05 | Matrix Spike Duplica | 50/50 | 1 | L0709165-12 | 09/14/07 10:25 |
| 17 | P2.091407.103116 | L0709165-09 | ATK-EB090907 | 50/50 | 1 | | 09/14/07 10:31 |
| 18 | P2.091407.103738 | L0709168-02 | C-004 | 50/50 | 1 | | 09/14/07 10:37 |
| 19 | P2.091407.104401 | L0709201-02 | MW-01-02 | 50/50 | 1 | | 09/14/07 10:44 |
| 20 | P2.091407.105027 | WG250019-01 | Post Digestion Spike | | 1 | L0709201-02 | 09/14/07 10:50 |
| 21 | P2.091407.105649 | WG250019-02 | Serial Dilution | | 5 | L0709201-02 | 09/14/07 10:56 |
| 22 | P2.091407.110312 | WG250147-12 | CCV | | 1 | | 09/14/07 11:03 |
| 23 | P2.091407.110930 | WG250147-13 | CCB | | 1 | | 09/14/07 11:09 |
| 24 | P2.091407.111544 | L0709165-13 | ATK-25F-GW02-0907 | 50/50 | 1 | | 09/14/07 11:15 |
| 25 | P2.091407.112105 | L0709165-14 | ATK-25F-GW02P-0907 | 50/50 | 1 | | 09/14/07 11:21 |
| 26 | P2.091407.112623 | L0709165-15 | ATK-25F-GW03-0907 | 50/50 | 1 | | 09/14/07 11:26 |
| 27 | P2.091407.113248 | L0709201-04 | MW-01-03 | 50/50 | 1 | | 09/14/07 11:32 |
| 28 | P2.091407.113912 | L0709201-06 | MW-03-12 | 50/50 | 1 | | 09/14/07 11:39 |
| 29 | P2.091407.114537 | L0709201-08 | MW-01-07 | 50/50 | 1 | | 09/14/07 11:45 |
| 30 | P2.091407.115156 | L0709201-10 | DUPLICATE | 50/50 | 1 | | 09/14/07 11:51 |
| 31 | P2.091407.115820 | WG250147-14 | CCV | | 1 | | 09/14/07 11:58 |
| 32 | P2.091407.120439 | WG250147-15 | CCB | | 1 | | 09/14/07 12:04 |
| 33 | P2.091407.121056 | WG249980-02 | Method/Prep Blank | 50/50 | 1 | | 09/14/07 12:10 |
| 34 | P2.091407.121715 | WG249980-03 | Laboratory Control S | 50/50 | 1 | | 09/14/07 12:17 |
| 35 | P2.091407.122340 | WG249980-01 | Reference Sample | | 1 | L0709182-01 | 09/14/07 12:23 |
| 36 | P2.091407.122904 | WG249980-04 | Matrix Spike | 50/50 | 1 | | 09/14/07 12:29 |
| 37 | P2.091407.123428 | WG249980-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/14/07 12:34 |

Page: 1

Approved: September 17, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071588

Instrument: PE-ICP2 Dataset: 091407H2.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20825

Calibration Std: STD21870 ICV/CCV Std: STD21884 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250019, 250020, 250152, 250163

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | P2.091407.123953 | L0709182-02 | PMW85-04-EBT-4 | 50/50 | 1 | WG249903-07 | 09/14/07 12:39 |
| 39 | P2.091407.124522 | L0709182-03 | PMW85-05-EBT-4 | 50/50 | 1 | | 09/14/07 12:45 |
| 40 | P2.091407.125136 | L0709201-01 | MW-01-02 | 50/50 | 1 | | 09/14/07 12:51 |
| 41 | P2.091407.125759 | WG250020-01 | Post Digestion Spike | | 1 | L0709201-01 | 09/14/07 12:57 |
| 42 | P2.091407.130424 | WG250020-02 | Serial Dilution | | 5 | L0709201-01 | 09/14/07 13:04 |
| 43 | P2.091407.131047 | WG250147-16 | CCV | | 1 | | 09/14/07 13:10 |
| 44 | P2.091407.131704 | WG250147-17 | CCB | | 1 | | 09/14/07 13:17 |
| 45 | P2.091407.132328 | L0709182-04 | DUP5-EBT-4 | 50/50 | 1 | | 09/14/07 13:23 |
| 46 | P2.091407.132846 | L0709182-05 | IW101-08A-EBT-4 | 50/50 | 1 | | 09/14/07 13:28 |
| 47 | P2.091407.133416 | L0709182-06 | IW101-08B-EBT-4 | 50/50 | 1 | | 09/14/07 13:34 |
| 48 | P2.091407.133953 | L0709182-07 | IW101-08C-EBT-4 | 50/50 | 1 | | 09/14/07 13:39 |
| 49 | P2.091407.134528 | L0709182-09 | DUP3-EBT-4 | 50/50 | 1 | | 09/14/07 13:45 |
| 50 | P2.091407.135102 | L0709182-10 | IW101-01A-EBT-4 | 50/50 | 1 | | 09/14/07 13:51 |
| 51 | P2.091407.135632 | L0709182-11 | IW101-01B-EBT-4 | 50/50 | 1 | | 09/14/07 13:56 |
| 52 | P2.091407.140150 | L0709201-03 | MW-01-03 | 50/50 | 1 | WG250025-01 | 09/14/07 14:01 |
| 53 | P2.091407.140816 | L0709201-05 | MW-03-12 | 50/50 | 1 | | 09/14/07 14:08 |
| 54 | P2.091407.141448 | L0709201-07 | MW-01-07 | 50/50 | 1 | | 09/14/07 14:14 |
| 55 | P2.091407.142111 | WG250147-18 | CCV | | 1 | | 09/14/07 14:21 |
| 56 | P2.091407.142735 | WG250147-19 | CCB | | 1 | | 09/14/07 14:27 |
| 57 | P2.091407.143402 | L0709201-09 | DUPLICATE | 50/50 | 1 | | 09/14/07 14:34 |
| 58 | P2.091407.144030 | L0709212-01 | ST105-GW-0523-01 | 50/50 | 1 | | 09/14/07 14:40 |
| 59 | P2.091407.144654 | L0709212-02 | ST105-GW-0521A-01 | 50/50 | 1 | | 09/14/07 14:46 |
| 60 | P2.091407.145319 | L0709212-03 | ST105-GW-0521B-01 | 50/50 | 1 | | 09/14/07 14:53 |
| 61 | P2.091407.145937 | L0709212-04 | ST105-GW-0521C-01 | 50/50 | 1 | | 09/14/07 14:59 |
| 62 | P2.091407.150600 | L0709212-05 | ST105-GW-0519-01 | 50/50 | 1 | WG250125-07 | 09/14/07 15:06 |
| 63 | P2.091407.151225 | WG250147-20 | CCV | | 1 | | 09/14/07 15:12 |
| 64 | P2.091407.151842 | WG250147-21 | CCB | | 1 | | 09/14/07 15:18 |
| 65 | P2.091407.152240 | WG250098-02 | Method/Prep Blank | 50/50 | 1 | | 09/14/07 15:22 |
| 66 | P2.091407.152859 | WG250098-03 | Laboratory Control S | 50/50 | 1 | | 09/14/07 15:28 |
| 67 | P2.091407.153531 | WG250098-01 | Reference Sample | | 1 | L0709261-03 | 09/14/07 15:35 |
| 68 | P2.091407.154054 | WG250098-04 | Matrix Spike | 50/50 | 1 | | 09/14/07 15:40 |
| 69 | P2.091407.154624 | WG250098-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/14/07 15:46 |
| 70 | P2.091407.155157 | L0709261-01 | 46WW02-090707 | 50/50 | 1 | | 09/14/07 15:51 |
| 71 | P2.091407.155818 | L0709261-05 | LHSMW11-090707 | 50/50 | 1 | | 09/14/07 15:58 |
| 72 | P2.091407.160345 | L0709253-01 | SE-3005P | 50/50 | 1 | WG250049-01 | 09/14/07 16:03 |
| 73 | P2.091407.161007 | WG250152-01 | Post Digestion Spike | | 1 | L0709253-01 | 09/14/07 16:10 |
| 74 | P2.091407.161629 | WG250152-02 | Serial Dilution | | 5 | L0709253-01 | 09/14/07 16:16 |

Page: 2

Approved: September 17, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071589

Instrument: PE-ICP2 Dataset: 091407H2.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20825

Calibration Std: STD21870 ICV/CCV Std: STD21884 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250019, 250020, 250152, 250163

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 75 | P2.091407.162251 | WG250147-22 | CCV | | 1 | | 09/14/07 16:22 |
| 76 | P2.091407.162909 | WG250147-23 | CCB | | 1 | | 09/14/07 16:29 |
| 77 | P2.091407.163527 | L0709251-01 | MW-01-08 | 50/50 | 1 | WG250135-01 | 09/14/07 16:35 |
| 78 | P2.091407.164149 | L0709251-02 | MW-01-08 | 50/50 | 1 | | 09/14/07 16:41 |
| 79 | P2.091407.164805 | L0709251-03 | MW-03-09 | 50/50 | 1 | WG250205-04 | 09/14/07 16:48 |
| 80 | P2.091407.165435 | L0709251-04 | MW-03-09 | 50/50 | 1 | | 09/14/07 16:54 |
| 81 | P2.091407.170103 | L0709251-05 | EQUIP BLANK | 50/50 | 1 | | 09/14/07 17:01 |
| 82 | P2.091407.170724 | L0709251-06 | EQUIP BLANK | 50/50 | 1 | | 09/14/07 17:07 |
| 83 | P2.091407.171337 | L0709251-07 | MW-03-11 | 50/50 | 1 | | 09/14/07 17:13 |
| 84 | P2.091407.171958 | L0709251-08 | MW-03-11 | 50/50 | 1 | | 09/14/07 17:19 |
| 85 | P2.091407.172623 | L0709261-07 | LHSMW14-090707 | 50/50 | 1 | WG250078-04 | 09/14/07 17:26 |
| 86 | P2.091407.173237 | L0709261-09 | LHSMW15-090707 | 50/50 | 1 | | 09/14/07 17:32 |
| 87 | P2.091407.173858 | WG250147-24 | CCV | | 1 | | 09/14/07 17:38 |
| 88 | P2.091407.174517 | WG250147-25 | CCB | | 1 | | 09/14/07 17:45 |
| 89 | P2.091407.175133 | L0709261-11 | LHSMW19-090707 | 50/50 | 1 | | 09/14/07 17:51 |
| 90 | P2.091407.175757 | L0709261-13 | LHSMW22-090707 | 50/50 | 1 | | 09/14/07 17:57 |
| 91 | P2.091407.180426 | L0709261-15 | LHSMW23-090707 | 50/50 | 1 | | 09/14/07 18:04 |
| 92 | P2.091407.181047 | L0709261-17 | LHSMW24-090707 | 50/50 | 1 | | 09/14/07 18:10 |
| 93 | P2.091407.181706 | L0709261-19 | LHSMW24-090707-FD | 50/50 | 1 | | 09/14/07 18:17 |
| 94 | P2.091407.182328 | L0709248-01 | COLD MILL TANK DIKE | 5/50 | 1 | | 09/14/07 18:23 |
| 95 | P2.091407.182946 | WG250147-26 | CCV | | 1 | | 09/14/07 18:29 |
| 96 | P2.091407.183607 | WG250147-27 | CCB | | 1 | | 09/14/07 18:36 |
| 97 | P2.091407.184228 | WG250132-02 | Method/Prep Blank | 50/50 | 1 | | 09/14/07 18:42 |
| 98 | P2.091407.184848 | WG250132-03 | Laboratory Control S | 50/50 | 1 | | 09/14/07 18:48 |
| 99 | P2.091407.185511 | WG250058-01 | Fluid Blank | | 1 | | 09/14/07 18:55 |
| 100 | P2.091407.190135 | WG250132-01 | Reference Sample | | 1 | L0709230-01 | 09/14/07 19:01 |
| 101 | P2.091407.190800 | WG250132-04 | Matrix Spike | 5/50 | 1 | | 09/14/07 19:08 |
| 102 | P2.091407.191547 | WG250132-05 | Matrix Spike Duplica | 5/50 | 1 | | 09/14/07 19:15 |
| 103 | P2.091407.192209 | L0709265-02 | BARTON \#B | 5/50 | 1 | | 09/14/07 19:22 |
| 104 | P2.091407.192833 | L0709265-01 | BARTON \#A | 5/50 | 1 | | 09/14/07 19:28 |
| 105 | P2.091407.193451 | WG250163-01 | Post Digestion Spike | | 1 | L0709265-01 | 09/14/07 19:34 |
| 106 | P2.091407.194113 | WG250163-02 | Serial Dilution | | 5 | L0709265-01 | 09/14/07 19:41 |
| 107 | P2.091407.194744 | WG250147-28 | CCV | | 1 | | 09/14/07 19:47 |
| 108 | P2.091407.195405 | WG250147-29 | CCB | | 1 | | 09/14/07 19:54 |



Approved: September 17, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071590

Instrument: PE-ICP2 Dataset: 091707HR.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20847

Calibration Std: STD21409 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250116, 250166, 250152, 250020, 250159

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | P2.091707.081431 | WG250264-01 | Calibration Point | | 1 | | 09/17/07 08:14 |
| 2 | P2.091707.082043 | WG250264-02 | Calibration Point | | 1 | | 09/17/07 08:20 |
| 3 | P2.091707.082659 | WG250264-03 | Calibration Point | | 1 | | 09/17/07 08:26 |
| 4 | P2.091707.083311 | WG250264-04 | Calibration Point | | 1 | | 09/17/07 08:33 |
| 5 | P2.091707.083939 | WG250264-05 | Calibration Point | | 1 | | 09/17/07 08:39 |
| 6 | P2.091707.084510 | WG250264-06 | Initial Calibration Verification | | 1 | | 09/17/07 08:45 |
| 7 | P2.091707.085130 | WG250264-07 | Initial Calib Blank | | 1 | | 09/17/07 08:51 |
| 8 | P2.091707.085757 | WG250264-08 | Interference Check | | 1 | | 09/17/07 08:57 |
| 9 | P2.091707.090356 | WG250264-09 | Interference Check | | 1 | | 09/17/07 09:03 |
| 10 | P2.091707.090918 | WG250264-10 | CCV | | 1 | | 09/17/07 09:09 |
| 11 | P2.091707.091612 | WG250264-11 | CCB | | 1 | | 09/17/07 09:16 |
| 12 | P2.091707.093506 | WG250027-02 | Method/Prep Blank | 50/50 | 1 | | 09/17/07 09:35 |
| 13 | P2.091707.094124 | WG250027-03 | Laboratory Control S | 50/50 | 1 | | 09/17/07 09:41 |
| 14 | P2.091707.094754 | WG249913-01 | Fluid Blank | | 1 | | 09/17/07 09:47 |
| 15 | P2.091707.095419 | WG250027-01 | Reference Sample | | 1 | L0709145-01 | 09/17/07 09:54 |
| 16 | P2.091707.100101 | WG250027-04 | Matrix Spike | 5/50 | 1 | | 09/17/07 10:01 |
| 17 | P2.091707.100736 | WG250027-05 | Matrix Spike Duplica | 5/50 | 1 | | 09/17/07 10:07 |
| 18 | P2.091707.101407 | L0709144-01 | S0709131-01A/CT070030 | 5/50 | 1 | WG249996-04 | 09/17/07 10:14 |
| 19 | P2.091707.102059 | L0709145-02 | S0709132-02A/GM071516 | 5/50 | 1 | | 09/17/07 10:20 |
| 20 | P2.091707.102721 | WG250116-01 | Post Digestion Spike | | 1 | L0709145-02 | 09/17/07 10:27 |
| 21 | P2.091707.103342 | WG250116-02 | Serial Dilution | | 5 | L0709145-02 | 09/17/07 10:33 |
| 22 | P2.091707.104002 | WG250264-12 | CCV | | 1 | | 09/17/07 10:40 |
| 23 | P2.091707.104621 | WG250264-13 | CCB | | 1 | | 09/17/07 10:46 |
| 24 | P2.091707.105237 | L0709155-02 | 015B | 5/50 | 10 | | 09/17/07 10:52 |
| 25 | P2.091707.105856 | L0709155-03 | 064TC | 5/50 | 10 | | 09/17/07 10:58 |
| 26 | P2.091707.110513 | L0709155-01 | 141TP | 5/50 | 1 | | 09/17/07 11:05 |
| 27 | P2.091707.111138 | L0709155-05 | 275D | 5/50 | 1 | | 09/17/07 11:11 |
| 28 | P2.091707.111759 | WG250264-14 | CCV | | 1 | | 09/17/07 11:17 |
| 29 | P2.091707.112417 | WG250264-15 | CCB | | 1 | | 09/17/07 11:24 |
| 30 | P2.091707.113033 | WG250143-01 | Method/Prep Blank | .25/50 | 1 | | 09/17/07 11:30 |
| 31 | P2.091707.113653 | WG250143-02 | Laboratory Control S | .25/50 | 1 | | 09/17/07 11:36 |
| 32 | P2.091707.114317 | WG250143-03 | Laboratory Control S | .25/50 | 1 | | 09/17/07 11:43 |
| 33 | P2.091707.114938 | L0709007-01 | S0709133-01A/GM070087 | .28/50 | 1 | WG249803-03 | 09/17/07 11:49 |
| 34 | P2.091707.115558 | L0709179-02 | GT070008 | .26/50 | 1 | | 09/17/07 11:55 |
| 35 | P2.091707.120212 | L0709221-01 | HW6092 | .26/50 | 1 | | 09/17/07 12:02 |
| 36 | P2.091707.120829 | L0709007-02 | S0709133-02A/GM070088 | .27/50 | 1 | | 09/17/07 12:08 |
| 37 | P2.091707.121448 | WG250166-01 | Post Digestion Spike | | 1 | L0709007-02 | 09/17/07 12:14 |



Approved: September 18, 2007

Maren Beery

## KEMRON Environmental Services

Instrument Run Log

00071591

Instrument: PE-ICP2 Dataset: 091707HR.CSV
Analyst1: KRV Analyst2: N/A
Method: 6010B SOP: ME600E Rev: 6
Maintenance Log ID: 20847

Calibration Std: STD21409 ICV/CCV Std: STD21638 Post Spike: STD21659
ICSA: STD21758 ICSAB: STD21616

Workgroups: 250116, 250166, 250152, 250020, 250159

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | P2.091707.122013 | WG250166-02 | Serial Dilution | | 5 | L0709007-02 | 09/17/07 12:20 |
| 39 | P2.091707.122636 | WG250264-16 | CCV | | 1 | | 09/17/07 12:26 |
| 40 | P2.091707.123253 | WG250264-17 | CCB | | 1 | | 09/17/07 12:32 |
| 41 | P2.091707.124336 | WG250098-01 | Reference Sample | | 20 | L0709261-03 | 09/17/07 12:43 |
| 42 | P2.091707.124952 | WG250098-04 | Matrix Spike | 50/50 | 20 | | 09/17/07 12:49 |
| 43 | P2.091707.125609 | WG250098-05 | Matrix Spike Duplica | 50/50 | 20 | | 09/17/07 12:56 |
| 44 | P2.091707.130230 | L0709261-05 | LHSMW11-090707 | 50/50 | 20 | | 09/17/07 13:02 |
| 45 | P2.091707.130841 | L0709261-15 | LHSMW23-090707 | 50/50 | 20 | | 09/17/07 13:08 |
| 46 | P2.091707.131554 | L0709261-11 | LHSMW19-090707 | 50/50 | 5 | | 09/17/07 13:15 |
| 47 | P2.091707.132217 | L0709261-09 | LHSMW15-090707 | 50/50 | 2 | | 09/17/07 13:22 |
| 48 | P2.091707.132841 | L0709261-09 | LHSMW15-090707 | 50/50 | 20 | | 09/17/07 13:28 |
| 49 | P2.091707.133512 | L0709261-13 | LHSMW22-090707 | 50/50 | 2 | | 09/17/07 13:35 |
| 50 | P2.091707.134143 | L0709261-13 | LHSMW22-090707 | 50/50 | 20 | | 09/17/07 13:41 |
| 51 | P2.091707.134816 | WG250264-18 | CCV | | 1 | | 09/17/07 13:48 |
| 52 | P2.091707.135442 | WG250264-19 | CCB | | 1 | | 09/17/07 13:54 |
| 53 | P2.091707.140104 | L0709261-17 | LHSMW24-090707 | 50/50 | 2 | | 09/17/07 14:01 |
| 54 | P2.091707.140724 | L0709261-17 | LHSMW24-090707 | 50/50 | 20 | | 09/17/07 14:07 |
| 55 | P2.091707.141345 | L0709261-19 | LHSMW24-090707-FD | 50/50 | 2 | | 09/17/07 14:13 |
| 56 | P2.091707.142009 | L0709261-19 | LHSMW24-090707-FD | 50/50 | 20 | | 09/17/07 14:20 |
| 57 | P2.091707.142626 | L0709251-01 | MW-01-08 | | 5 | | 09/17/07 14:26 |
| 58 | P2.091707.143256 | L0709251-03 | MW-03-09 | | 5 | | 09/17/07 14:32 |
| 59 | P2.091707.143928 | L0709251-07 | MW-03-11 | 50/50 | 5 | | 09/17/07 14:39 |
| 60 | P2.091707.144557 | L0709251-01 | MW-01-08 | 50/50 | 10 | | 09/17/07 14:45 |
| 61 | P2.091707.145214 | L0709251-03 | MW-03-09 | 50/50 | 10 | | 09/17/07 14:52 |
| 62 | P2.091707.145834 | WG250264-20 | CCV | | 1 | | 09/17/07 14:58 |
| 63 | P2.091707.150454 | WG250264-21 | CCB | | 1 | | 09/17/07 15:04 |
| 64 | P2.091707.151142 | L0709182-02 | PMW85-04-EBT-4 | 50/50 | 2 | | 09/17/07 15:11 |
| 65 | P2.091707.151709 | L0709201-01 | MW-01-02 | 50/50 | 5 | | 09/17/07 15:17 |
| 66 | P2.091707.152333 | WG250020-01 | Post Digestion Spike | | 5 | L0709201-01 | 09/17/07 15:23 |
| 67 | P2.091707.152959 | L0709201-03 | MW-01-03 | 50/50 | 5 | | 09/17/07 15:29 |
| 68 | P2.091707.153615 | L0709201-05 | MW-03-12 | 50/50 | 5 | | 09/17/07 15:36 |
| 69 | P2.091707.154239 | L0709201-07 | MW-01-07 | 50/50 | 5 | | 09/17/07 15:42 |
| 70 | P2.091707.154855 | L0709201-09 | DUPLICATE | 50/50 | 5 | | 09/17/07 15:48 |
| 71 | P2.091707.155514 | WG250264-22 | CCV | | 1 | | 09/17/07 15:55 |
| 72 | P2.091707.160134 | WG250264-23 | CCB | | 1 | | 09/17/07 16:01 |
| 73 | P2.091707.161147 | WG250264-24 | CCV | | 1 | | 09/17/07 16:11 |
| 74 | P2.091707.161809 | WG250264-25 | CCB | | 1 | | 09/17/07 16:18 |

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Approved: September 18, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071592

Instrument: PE-ICP2 Dataset: 091707HR.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20847

Calibration Std: STD21409 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250116, 250166, 250152, 250020, 250159

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 75 | P2.091707.162427 | WG250106-02 | Method/Prep Blank | 50/50 | 1 | | 09/17/07 16:24 |
| 76 | P2.091707.163047 | WG250106-03 | Laboratory Control S | 50/50 | 1 | | 09/17/07 16:30 |
| 77 | P2.091707.163712 | WG250106-01 | Reference Sample | | 1 | L0709224-02 | 09/17/07 16:37 |
| 78 | P2.091707.164330 | WG250106-04 | Matrix Spike | 50/50 | 1 | | 09/17/07 16:43 |
| 79 | P2.091707.165001 | WG250106-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/17/07 16:50 |
| 80 | P2.091707.165624 | L0709259-01 | 001/COMP. | | 1 | | 09/17/07 16:56 |
| 81 | P2.091707.170243 | L0709224-03 | E-3WG-MW001(091107) | 50/50 | 1 | | 09/17/07 17:02 |
| 82 | P2.091707.170910 | L0709277-01 | NMEFF001/Z07115 | 50/50 | 1 | | 09/17/07 17:09 |
| 83 | P2.091707.171540 | WG250159-01 | Post Digestion Spike | | 1 | L0709277-01 | 09/17/07 17:15 |
| 84 | P2.091707.172207 | WG250159-02 | Serial Dilution | | 5 | L0709277-01 | 09/17/07 17:22 |
| 85 | P2.091707.172831 | WG250264-26 | CCV | | 1 | | 09/17/07 17:28 |
| 86 | P2.091707.173547 | WG250264-27 | CCB | | 1 | | 09/17/07 17:35 |
| 87 | P2.091707.174202 | L0709224-05 | E-3WG-MW002(091107) | 50/50 | 1 | | 09/17/07 17:42 |
| 88 | P2.091707.174825 | L0709224-06 | E-3WG-MW002(091107) | 50/50 | 1 | | 09/17/07 17:48 |
| 89 | P2.091707.175451 | L0709224-08 | E-3WG-MW003(091107) | 50/50 | 1 | | 09/17/07 17:54 |
| 90 | P2.091707.180009 | L0709224-09 | E-3WG-MW003(091107) | 50/50 | 1 | | 09/17/07 18:00 |
| 91 | P2.091707.180536 | L0709224-11 | E-70-MW002(091107) | 50/50 | 1 | | 09/17/07 18:05 |
| 92 | P2.091707.181158 | L0709224-12 | E-70-MW002(091107) | 50/50 | 1 | | 09/17/07 18:11 |
| 93 | P2.091707.181816 | L0709224-14 | E-70-MW003(091107) | 50/50 | 1 | | 09/17/07 18:18 |
| 94 | P2.091707.182338 | L0709224-15 | E-70-MW003(091107) | 50/50 | 1 | | 09/17/07 18:23 |
| 95 | P2.091707.182903 | L0709224-17 | E-70-MW004(091107) | 50/50 | 1 | | 09/17/07 18:29 |
| 96 | P2.091707.183518 | L0709224-18 | E-70-MW004(091107) | 50/50 | 1 | | 09/17/07 18:35 |
| 97 | P2.091707.184140 | WG250264-28 | CCV | | 1 | | 09/17/07 18:41 |
| 98 | P2.091707.184759 | WG250264-29 | CCB | | 1 | | 09/17/07 18:47 |
| 99 | P2.091707.185415 | L0709224-20 | FB002(091107) | 50/50 | 1 | | 09/17/07 18:54 |
| 100 | P2.091707.190035 | L0709224-22 | E-18-MW001(091107) | 50/50 | 1 | | 09/17/07 19:00 |
| 101 | P2.091707.190700 | L0709224-23 | E-18-MW001(091107) | 50/50 | 1 | | 09/17/07 19:07 |
| 102 | P2.091707.191318 | L0709224-25 | E-MW011(091107) | 50/50 | 1 | | 09/17/07 19:13 |
| 103 | P2.091707.191946 | L0709224-26 | E-MW011(091107) | 50/50 | 1 | | 09/17/07 19:19 |
| 104 | P2.091707.192611 | L0709224-28 | EB1(091107) | 50/50 | 1 | | 09/17/07 19:26 |
| 105 | P2.091707.193225 | WG250264-30 | CCV | | 1 | | 09/17/07 19:32 |
| 106 | P2.091707.193853 | WG250264-31 | CCB | | 1 | | 09/17/07 19:38 |

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Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071593

Instrument: PE-ICP2 Dataset: 091807HR.CSV
Analyst1: KRV Analyst2: N/A
Method: 6010B SOP: ME600E Rev: 6
Maintenance Log ID: 20865

Calibration Std: STD21409 ICV/CCV Std: STD21638 Post Spike: STD21659
ICSA: STD21758 ICSAB: STD21616

Workgroups: 250159, 250285, 250289, 250291

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | P2.091807.082455 | WG250358-01 | Calibration Point | | 1 | | 09/18/07 08:24 |
| 2 | P2.091807.083114 | WG250358-02 | Calibration Point | | 1 | | 09/18/07 08:31 |
| 3 | P2.091807.083752 | WG250358-03 | Calibration Point | | 1 | | 09/18/07 08:37 |
| 4 | P2.091807.084404 | WG250358-04 | Calibration Point | | 1 | | 09/18/07 08:44 |
| 5 | P2.091807.085031 | WG250358-05 | Calibration Point | | 1 | | 09/18/07 08:50 |
| 6 | P2.091807.085608 | WG250358-06 | Initial Calibration Verification | | 1 | | 09/18/07 08:56 |
| 7 | P2.091807.090231 | WG250358-07 | Initial Calib Blank | | 1 | | 09/18/07 09:02 |
| 8 | P2.091807.090845 | WG250358-08 | Interference Check | | 1 | | 09/18/07 09:08 |
| 9 | P2.091807.091413 | WG250358-09 | Interference Check | | 1 | | 09/18/07 09:14 |
| 10 | P2.091807.091939 | WG250358-10 | CCV | | 1 | | 09/18/07 09:19 |
| 11 | P2.091807.092556 | WG250358-11 | CCB | | 1 | | 09/18/07 09:25 |
| 12 | P2.091807.095857 | WG250106-02 | Method/Prep Blank | 50/50 | 1 | | 09/18/07 09:58 |
| 13 | P2.091807.100512 | WG250106-03 | Laboratory Control S | 50/50 | 1 | | 09/18/07 10:05 |
| 14 | P2.091807.101142 | WG250106-01 | Reference Sample | | 1 | L0709224-02 | 09/18/07 10:11 |
| 15 | P2.091807.101801 | WG250106-04 | Matrix Spike | 50/50 | 1 | | 09/18/07 10:18 |
| 16 | P2.091807.102421 | WG250106-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/18/07 10:24 |
| 17 | P2.091807.103046 | L0709259-01 | 001/COMP. | 50/50 | 1 | | 09/18/07 10:30 |
| 18 | P2.091807.103803 | WG250159-03 | Post Digestion Spike | | 1 | L0709259-01 | 09/18/07 10:38 |
| 19 | P2.091807.104426 | WG250159-04 | Serial Dilution | | 5 | L0709259-01 | 09/18/07 10:44 |
| 20 | P2.091807.105048 | WG250358-12 | CCV | | 1 | | 09/18/07 10:50 |
| 21 | P2.091807.105707 | WG250358-13 | CCB | | 1 | | 09/18/07 10:57 |
| 22 | P2.091807.110327 | WG250210-02 | Method/Prep Blank | 50/50 | 1 | | 09/18/07 11:03 |
| 23 | P2.091807.110942 | WG250210-03 | Laboratory Control S | 50/50 | 1 | | 09/18/07 11:09 |
| 24 | P2.091807.111619 | WG250210-01 | Reference Sample | | 1 | L0709333-01 | 09/18/07 11:16 |
| 25 | P2.091807.112237 | WG250210-04 | Matrix Spike | 50/50 | 1 | | 09/18/07 11:22 |
| 26 | P2.091807.112855 | WG250210-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/18/07 11:28 |
| 27 | P2.091807.113522 | L0709293-13 | W0089-ER | 50/50 | 1 | | 09/18/07 11:35 |
| 28 | P2.091807.114136 | L0709293-14 | W0090-ER | 50/50 | 1 | | 09/18/07 11:41 |
| 29 | P2.091807.114753 | L0709333-02 | ST105-GW-0507-99 | 50/50 | 1 | | 09/18/07 11:47 |
| 30 | P2.091807.115414 | WG250285-01 | Post Digestion Spike | | 1 | L0709333-02 | 09/18/07 11:54 |
| 31 | P2.091807.120033 | WG250285-02 | Serial Dilution | | 5 | L0709333-02 | 09/18/07 12:00 |
| 32 | P2.091807.120715 | WG250358-14 | CCV | | 1 | | 09/18/07 12:07 |
| 33 | P2.091807.121330 | WG250358-15 | CCB | | 1 | | 09/18/07 12:13 |
| 34 | P2.091807.121942 | L0709333-03 | ST105-GW-0505-01 | 50/50 | 1 | WG250206-04 | 09/18/07 12:19 |
| 35 | P2.091807.122603 | L0709267-01 | ST105-GW-1009-01 | 50/50 | 1 | | 09/18/07 12:26 |
| 36 | P2.091807.123225 | L0709267-02 | ST105-GW-1007-01 | 50/50 | 1 | | 09/18/07 12:32 |
| 37 | P2.091807.123744 | L0709267-03 | ST105-GW-1006-01 | 50/50 | 1 | WG250079-04 | 09/18/07 12:37 |

Page: 1 Approved: September 19, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071594

Instrument: PE-ICP2 Dataset: 091807HR.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20865

Calibration Std: STD21409 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250159, 250285, 250289, 250291

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | P2.091807.124405 | L0709267-04 | ST105-GW-1008-01 | 50/50 | 1 | | 09/18/07 12:44 |
| 39 | P2.091807.125027 | L0709272-02 | W-18 | 50/50 | 1 | | 09/18/07 12:50 |
| 40 | P2.091807.125645 | L0709272-03 | W-30WTR | 50/50 | 1 | | 09/18/07 12:56 |
| 41 | P2.091807.130307 | L0709295-19 | W0085-ER | 50/50 | 1 | | 09/18/07 13:03 |
| 42 | P2.091807.130940 | L0709295-20 | W0086-ER | 50/50 | 1 | | 09/18/07 13:09 |
| 43 | P2.091807.131603 | L0709295-21 | W0088-ER | 50/50 | 1 | | 09/18/07 13:16 |
| 44 | P2.091807.132221 | WG250358-16 | CCV | | 1 | | 09/18/07 13:22 |
| 45 | P2.091807.132837 | WG250358-17 | CCB | | 1 | | 09/18/07 13:28 |
| 46 | P2.091807.133449 | L0709321-01 | FT023-MW12 | 50/50 | 1 | | 09/18/07 13:34 |
| 47 | P2.091807.134110 | L0709321-02 | FT023-MW14R | 50/50 | 1 | | 09/18/07 13:41 |
| 48 | P2.091807.134726 | L0709321-03 | FT023-MW10R | 50/50 | 1 | | 09/18/07 13:47 |
| 49 | P2.091807.135244 | L0709321-04 | FT023-AFMW1R-2 | 50/50 | 1 | | 09/18/07 13:52 |
| 50 | P2.091807.135907 | L0709321-09 | FT023-T11-2 | 50/50 | 1 | | 09/18/07 13:59 |
| 51 | P2.091807.140436 | L0709321-10 | FT023-MWQ1R | 50/50 | 1 | | 09/18/07 14:04 |
| 52 | P2.091807.140954 | WG250358-18 | CCV | | 1 | | 09/18/07 14:09 |
| 53 | P2.091807.141615 | WG250358-19 | CCB | | 1 | | 09/18/07 14:16 |
| 54 | P2.091807.142228 | WG250200-02 | Method/Prep Blank | 50/50 | 1 | | 09/18/07 14:22 |
| 55 | P2.091807.142845 | WG250200-03 | Laboratory Control S | 50/50 | 1 | | 09/18/07 14:28 |
| 56 | P2.091807.143515 | WG250200-01 | Reference Sample | | 1 | L0709261-04 | 09/18/07 14:35 |
| 57 | P2.091807.144146 | WG250200-04 | Matrix Spike | 50/50 | 1 | | 09/18/07 14:41 |
| 58 | P2.091807.144811 | WG250200-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/18/07 14:48 |
| 59 | P2.091807.145435 | L0709261-06 | LHSMW11-090707 | 50/50 | 1 | | 09/18/07 14:54 |
| 60 | P2.091807.150059 | L0709261-08 | LHSMW14-090707 | 50/50 | 1 | | 09/18/07 15:00 |
| 61 | P2.091807.150720 | L0709261-02 | 46WW02-090707 | 50/50 | 1 | | 09/18/07 15:07 |
| 62 | P2.091807.151338 | WG250289-01 | Post Digestion Spike | | 1 | L0709261-02 | 09/18/07 15:13 |
| 63 | P2.091807.152000 | WG250289-02 | Serial Dilution | | 5 | L0709261-02 | 09/18/07 15:20 |
| 64 | P2.091807.152617 | WG250358-20 | CCV | | 1 | | 09/18/07 15:26 |
| 65 | P2.091807.153234 | WG250358-21 | CCB | | 1 | | 09/18/07 15:32 |
| 66 | P2.091807.153849 | L0709261-10 | LHSMW15-090707 | 50/50 | 1 | | 09/18/07 15:38 |
| 67 | P2.091807.154511 | L0709261-12 | LHSMW19-090707 | 50/50 | 1 | | 09/18/07 15:45 |
| 68 | P2.091807.155130 | L0709261-14 | LHSMW22-090707 | 50/50 | 1 | | 09/18/07 15:51 |
| 69 | P2.091807.155759 | L0709261-16 | LHSMW23-090707 | 50/50 | 1 | | 09/18/07 15:57 |
| 70 | P2.091807.160424 | L0709261-18 | LHSMW24-090707 | 50/50 | 1 | | 09/18/07 16:04 |
| 71 | P2.091807.161044 | L0709261-20 | LHSMW24-090707-FD | 50/50 | 1 | | 09/18/07 16:10 |
| 72 | P2.091807.161702 | WG250358-22 | CCV | | 1 | | 09/18/07 16:17 |
| 73 | P2.091807.162320 | WG250358-23 | CCB | | 1 | | 09/18/07 16:23 |
| 74 | P2.091807.163057 | WG250212-02 | Method/Prep Blank | 50/50 | 1 | | 09/18/07 16:30 |



Approved: September 19, 2007

Maren Beery

## KEMRON Environmental Services

Instrument Run Log

00071595

Instrument: PE-ICP2 Dataset: 091807HR.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20865

Calibration Std: STD21409 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250159, 250285, 250289, 250291

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 75 | P2.091807.163708 | WG250212-03 | Laboratory Control S | 50/50 | 1 | | 09/18/07 16:37 |
| 76 | P2.091807.164329 | WG250212-01 | Reference Sample | | 1 | L0709318-01 | 09/18/07 16:43 |
| 77 | P2.091807.164946 | WG250212-04 | Matrix Spike | 50/50 | 1 | | 09/18/07 16:49 |
| 78 | P2.091807.165604 | WG250212-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/18/07 16:56 |
| 79 | P2.091807.170224 | L0709273-02 | E-80-MW001(092107) | 50/50 | 1 | | 09/18/07 17:02 |
| 80 | P2.091807.170745 | L0709278-04 | RANNEY WELL/Z07 | 50/50 | 1 | | 09/18/07 17:07 |
| 81 | P2.091807.171400 | L0709278-03 | OHIO RIVER/Z07 | 50/50 | 1 | | 09/18/07 17:14 |
| 82 | P2.091807.172019 | WG250291-01 | Post Digestion Spike | | 1 | L0709278-03 | 09/18/07 17:20 |
| 83 | P2.091807.172637 | WG250291-02 | Serial Dilution | | 5 | L0709278-03 | 09/18/07 17:26 |
| 84 | P2.091807.173254 | WG250358-24 | CCV | | 1 | | 09/18/07 17:32 |
| 85 | P2.091807.173909 | WG250358-25 | CCB | | 1 | | 09/18/07 17:39 |
| 86 | P2.091807.174522 | L0709273-03 | E-80-MW001(092107) | 50/50 | 1 | | 09/18/07 17:45 |
| 87 | P2.091807.175042 | L0709273-05 | E-80-MW002(091207) | 50/50 | 1 | | 09/18/07 17:50 |
| 88 | P2.091807.175600 | L0709273-06 | E-80-MW002(091207) | 50/50 | 1 | | 09/18/07 17:56 |
| 89 | P2.091807.180121 | L0709273-08 | E-80-MW003(091207) | 50/50 | 1 | | 09/18/07 18:01 |
| 90 | P2.091807.180736 | L0709273-09 | E-80-MW003(091207) | 50/50 | 1 | | 09/18/07 18:07 |
| 91 | P2.091807.181354 | L0709273-11 | E-82-MW001(091207) | 50/50 | 1 | | 09/18/07 18:13 |
| 92 | P2.091807.181910 | L0709273-12 | E-82-MW001(091207) | 50/50 | 1 | | 09/18/07 18:19 |
| 93 | P2.091807.182528 | L0709273-14 | E-82-MW002(091207) | 50/50 | 1 | | 09/18/07 18:25 |
| 94 | P2.091807.183145 | L0709273-15 | E-82-MW002(091207) | 50/50 | 1 | | 09/18/07 18:31 |
| 95 | P2.091807.183759 | L0709273-17 | E-82-MW003(091207) | 50/50 | 1 | | 09/18/07 18:37 |
| 96 | P2.091807.184316 | WG250358-26 | CCV | | 1 | | 09/18/07 18:43 |
| 97 | P2.091807.184934 | WG250358-27 | CCB | | 1 | | 09/18/07 18:49 |
| 98 | P2.091807.185546 | L0709273-18 | E-82-MW003(091207) | 50/50 | 1 | | 09/18/07 18:55 |
| 99 | P2.091807.190206 | L0709273-20 | FB003(091207) | 50/50 | 1 | | 09/18/07 19:02 |
| 100 | P2.091807.190821 | L0709273-22 | E-95-MW003(091207) | 50/50 | 1 | | 09/18/07 19:08 |
| 101 | P2.091807.191438 | L0709273-23 | E-95-MW003(091207) | 50/50 | 1 | | 09/18/07 19:14 |
| 102 | P2.091807.192057 | L0709273-25 | E-MW012H(091207) | 50/50 | 1 | | 09/18/07 19:20 |
| 103 | P2.091807.192717 | L0709273-26 | E-MW012H(091207) | 50/50 | 1 | | 09/18/07 19:27 |
| 104 | P2.091807.193333 | WG250358-28 | CCV | | 1 | | 09/18/07 19:33 |
| 105 | P2.091807.193950 | WG250358-29 | CCB | | 1 | | 09/18/07 19:39 |



Approved: September 19, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071596

Instrument: PE-ICP2 Dataset: 091907H.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20886

Calibration Std: STD21870 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250427, 248097, 250285, 250289, 250381, 250497

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | P2.091907.083227 | WG250490-01 | Calibration Point | | 1 | | 09/19/07 08:32 |
| 2 | P2.091907.083840 | WG250490-02 | Calibration Point | | 1 | | 09/19/07 08:38 |
| 3 | P2.091907.084455 | WG250490-03 | Calibration Point | | 1 | | 09/19/07 08:44 |
| 4 | P2.091907.085111 | WG250490-04 | Calibration Point | | 1 | | 09/19/07 08:51 |
| 5 | P2.091907.085750 | WG250490-05 | Calibration Point | | 1 | | 09/19/07 08:57 |
| 6 | P2.091907.090320 | WG250490-06 | Initial Calibration Verification | | 1 | | 09/19/07 09:03 |
| 7 | P2.091907.091006 | WG250490-07 | Initial Calib Blank | | 1 | | 09/19/07 09:10 |
| 8 | P2.091907.091659 | WG250490-08 | Interference Check | | 1 | | 09/19/07 09:16 |
| 9 | P2.091907.092222 | WG250490-09 | Interference Check | | 1 | | 09/19/07 09:22 |
| 10 | P2.091907.092757 | WG250490-10 | CCV | | 1 | | 09/19/07 09:27 |
| 11 | P2.091907.093424 | WG250490-11 | CCB | | 1 | | 09/19/07 09:34 |
| 12 | P2.091907.093853 | WG250363-02 | Method/Prep Blank | 50/50 | 1 | | 09/19/07 09:38 |
| 13 | P2.091907.094538 | WG250363-03 | Laboratory Control S | 50/50 | 1 | | 09/19/07 09:45 |
| 14 | P2.091907.095230 | WG250278-01 | Fluid Blank | | 1 | | 09/19/07 09:52 |
| 15 | P2.091907.095858 | WG250363-01 | Reference Sample | | 1 | L0709276-01 | 09/19/07 09:58 |
| 16 | P2.091907.100521 | WG250363-04 | Matrix Spike | 5/50 | 1 | | 09/19/07 10:05 |
| 17 | P2.091907.101144 | WG250363-05 | Matrix Spike Duplica | 5/50 | 1 | | 09/19/07 10:11 |
| 18 | P2.091907.101810 | L0709288-02 | GT TT 0058 | 5/50 | 1 | | 09/19/07 10:18 |
| 19 | P2.091907.102428 | L0709288-01 | GT TT 0058 | 5/50 | 1 | WG250402-01 | 09/19/07 10:24 |
| 20 | P2.091907.103050 | WG250427-01 | Post Digestion Spike | | 1 | L0709288-01 | 09/19/07 10:30 |
| 21 | P2.091907.103713 | WG250427-02 | Serial Dilution | | 5 | L0709288-01 | 09/19/07 10:37 |
| 22 | P2.091907.104336 | WG250490-12 | CCV | | 1 | | 09/19/07 10:43 |
| 23 | P2.091907.104953 | WG250490-13 | CCB | | 1 | | 09/19/07 10:49 |
| 24 | P2.091907.105608 | L0709330-01 | REDCRAIDW01 | 5/50 | 1 | WG250348-01 | 09/19/07 10:56 |
| 25 | P2.091907.110230 | L0709330-02 | REDCRAIDW02 | 5/50 | 1 | | 09/19/07 11:02 |
| 26 | P2.091907.110847 | L0709344-01 | GT070048 | 5/50 | 1 | | 09/19/07 11:08 |
| 27 | P2.091907.111511 | WG250490-14 | CCV | | 1 | | 09/19/07 11:15 |
| 28 | P2.091907.112128 | WG250490-15 | CCB | | 1 | | 09/19/07 11:21 |
| 29 | P2.091907.112742 | L0709232-03 | CS070032 | 5/50 | 10 | | 09/19/07 11:27 |
| 30 | P2.091907.113402 | L0709232-04 | CS070033 | 5/50 | 1 | | 09/19/07 11:34 |
| 31 | P2.091907.114026 | L0709287-01 | GM070089 | 5/50 | 1 | | 09/19/07 11:40 |
| 32 | P2.091907.114643 | L0709287-02 | GM070090 | 5/50 | 1 | WG250146-01 | 09/19/07 11:46 |
| 33 | P2.091907.115258 | L0709287-03 | GM070091 | 5/50 | 5 | | 09/19/07 11:52 |
| 34 | P2.091907.115916 | L0709287-04 | GM070092 | 5/50 | 1 | | 09/19/07 11:59 |
| 35 | P2.091907.120529 | L0708401-21 | EB-081407 | 50/50 | 1 | | 09/19/07 12:05 |
| 36 | P2.091907.121149 | WG250490-16 | CCV | | 1 | | 09/19/07 12:11 |
| 37 | P2.091907.121808 | WG250490-17 | CCB | | 1 | | 09/19/07 12:18 |

Page: 1 Approved: September 20, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071597

Instrument: PE-ICP2 Dataset: 091907H.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20886

Calibration Std: STD21870 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250427, 248097, 250285, 250289, 250381, 250497

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | P2.091907.122423 | WG250210-01 | Reference Sample | | 5 | L0709333-01 | 09/19/07 12:24 |
| 39 | P2.091907.123041 | WG250210-04 | Matrix Spike | 50/50 | 5 | | 09/19/07 12:30 |
| 40 | P2.091907.123659 | WG250210-05 | Matrix Spike Duplica | 50/50 | 5 | | 09/19/07 12:36 |
| 41 | P2.091907.124312 | L0709333-02 | ST105-GW-0507-99 | 50/50 | 5 | | 09/19/07 12:43 |
| 42 | P2.091907.124929 | WG250285-01 | Post Digestion Spike | | 5 | L0709333-02 | 09/19/07 12:49 |
| 43 | P2.091907.125551 | WG250490-18 | CCV | | 1 | | 09/19/07 12:55 |
| 44 | P2.091907.130257 | WG250490-19 | CCB | | 1 | | 09/19/07 13:02 |
| 45 | P2.091907.130911 | WG250200-01 | Reference Sample | | 20 | L0709261-04 | 09/19/07 13:09 |
| 46 | P2.091907.131533 | WG250200-04 | Matrix Spike | 50/50 | 20 | | 09/19/07 13:15 |
| 47 | P2.091907.132147 | WG250200-05 | Matrix Spike Duplica | 50/50 | 20 | | 09/19/07 13:21 |
| 48 | P2.091907.132816 | L0709261-06 | LHSMW11-090707 | 50/50 | 20 | | 09/19/07 13:28 |
| 49 | P2.091907.133500 | L0709261-16 | LHSMW23-090707 | 50/50 | 20 | | 09/19/07 13:35 |
| 50 | P2.091907.134135 | L0709261-02 | 46WW02-090707 | 50/50 | 5 | | 09/19/07 13:41 |
| 51 | P2.091907.134831 | WG250289-01 | Post Digestion Spike | | 5 | L0709261-02 | 09/19/07 13:48 |
| 52 | P2.091907.135453 | L0709261-12 | LHSMW19-090707 | 50/50 | 20 | | 09/19/07 13:54 |
| 53 | P2.091907.140121 | L0709261-10 | LHSMW15-090707 | 50/50 | 20 | | 09/19/07 14:01 |
| 54 | P2.091907.140755 | L0709261-10 | LHSMW15-090707 | 50/50 | 2 | | 09/19/07 14:07 |
| 55 | P2.091907.141421 | WG250490-20 | CCV | | 1 | | 09/19/07 14:14 |
| 56 | P2.091907.142045 | WG250490-21 | CCB | | 1 | | 09/19/07 14:20 |
| 57 | P2.091907.142700 | L0709261-18 | LHSMW24-090707 | 50/50 | 2 | | 09/19/07 14:27 |
| 58 | P2.091907.143324 | L0709261-18 | LHSMW24-090707 | 50/50 | 20 | | 09/19/07 14:33 |
| 59 | P2.091907.143940 | L0709261-20 | LHSMW24-090707-FD | 50/50 | 2 | | 09/19/07 14:39 |
| 60 | P2.091907.144601 | L0709261-20 | LHSMW24-090707-FD | 50/50 | 20 | | 09/19/07 14:46 |
| 61 | P2.091907.145224 | L0709261-14 | LHSMW22-090707 | 50/50 | 2 | | 09/19/07 14:52 |
| 62 | P2.091907.145842 | L0709261-14 | LHSMW22-090707 | 50/50 | 20 | | 09/19/07 14:58 |
| 63 | P2.091907.150505 | WG250490-22 | CCV | | 1 | | 09/19/07 15:05 |
| 64 | P2.091907.151123 | WG250490-23 | CCB | | 1 | | 09/19/07 15:11 |
| 65 | P2.091907.151955 | WG250442-02 | Method/Prep Blank | 50/50 | 1 | | 09/19/07 15:19 |
| 66 | P2.091907.152609 | WG250442-03 | Laboratory Control S | 50/50 | 1 | | 09/19/07 15:26 |
| 67 | P2.091907.153245 | WG250442-01 | Reference Sample | | 1 | L0709394-03 | 09/19/07 15:32 |
| 68 | P2.091907.153905 | WG250442-04 | Matrix Spike | 50/50 | 1 | | 09/19/07 15:39 |
| 69 | P2.091907.154437 | WG250442-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/19/07 15:44 |
| 70 | P2.091907.155012 | L0709394-01 | V-700 | 50/50 | 1 | | 09/19/07 15:50 |
| 71 | P2.091907.155637 | L0709394-02 | V-404 | | 1 | | 09/19/07 15:56 |
| 72 | P2.091907.160304 | L0709375-03 | LTA16-CS-EB | 50/50 | 1 | WG250508-01 | 09/19/07 16:03 |
| 73 | P2.091907.160926 | WG250497-01 | Post Digestion Spike | | 1 | L0709375-03 | 09/19/07 16:09 |
| 74 | P2.091907.161548 | WG250497-02 | Serial Dilution | | 5 | L0709375-03 | 09/19/07 16:15 |

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Approved: September 20, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071598

Instrument: PE-ICP2 Dataset: 091907H.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20886

Calibration Std: STD21870 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250427, 248097, 250285, 250289, 250381, 250497

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 75 | P2.091907.162209 | WG250490-24 | CCV | | 1 | | 09/19/07 16:22 |
| 76 | P2.091907.162829 | WG250490-25 | CCB | | 1 | | 09/19/07 16:28 |
| 77 | P2.091907.163444 | L0709394-04 | TT ROSS 135 | 50/50 | 1 | | 09/19/07 16:34 |
| 78 | P2.091907.164106 | L0709394-05 | 1R1760HP | 50/50 | 1 | | 09/19/07 16:41 |
| 79 | P2.091907.164728 | L0709362-03 | SB-01 | 50/50 | 1 | | 09/19/07 16:47 |
| 80 | P2.091907.165254 | L0709362-04 | SB-01 | 50/50 | 1 | | 09/19/07 16:52 |
| 81 | P2.091907.165819 | L0709389-06 | W0093-ER | 50/50 | 1 | | 09/19/07 16:58 |
| 82 | P2.091907.170440 | L0709389-07 | W0094-ER | 50/50 | 1 | | 09/19/07 17:04 |
| 83 | P2.091907.171056 | L0709389-08 | W0095-ER | 50/50 | 1 | | 09/19/07 17:10 |
| 84 | P2.091907.171716 | L0709389-09 | W0106-ER | 50/50 | 1 | | 09/19/07 17:17 |
| 85 | P2.091907.172338 | L0709389-10 | W0107-ER | 50/50 | 1 | | 09/19/07 17:23 |
| 86 | P2.091907.172953 | L0709389-11 | W0108-ER | 50/50 | 1 | | 09/19/07 17:29 |
| 87 | P2.091907.173613 | WG250490-26 | CCV | | 1 | | 09/19/07 17:36 |
| 88 | P2.091907.174235 | WG250490-27 | CCB | | 1 | | 09/19/07 17:42 |
| 89 | P2.091907.174854 | L0709391-09 | W0111-ER | 50/50 | 1 | | 09/19/07 17:48 |
| 90 | P2.091907.175514 | L0709391-10 | W0112-ER | 50/50 | 1 | | 09/19/07 17:55 |
| 91 | P2.091907.180136 | L0709391-36 | W0109-ER | 50/50 | 1 | | 09/19/07 18:01 |
| 92 | P2.091907.180751 | L0709391-37 | W0110-ER | 50/50 | 1 | | 09/19/07 18:07 |
| 93 | P2.091907.181411 | WG250490-28 | CCV | | 1 | | 09/19/07 18:14 |
| 94 | P2.091907.182031 | WG250490-29 | CCB | | 1 | | 09/19/07 18:20 |
| 95 | P2.091907.182647 | WG250345-02 | Method/Prep Blank | 50/50 | 1 | | 09/19/07 18:26 |
| 96 | P2.091907.183307 | WG250345-03 | Laboratory Control S | 50/50 | 1 | | 09/19/07 18:33 |
| 97 | P2.091907.183933 | WG250345-01 | Reference Sample | | 1 | L0709334-09 | 09/19/07 18:39 |
| 98 | P2.091907.184559 | WG250345-04 | Matrix Spike | 50/50 | 1 | | 09/19/07 18:45 |
| 99 | P2.091907.185226 | WG250345-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/19/07 18:52 |
| 100 | P2.091907.185853 | L0709313-11 | W0098-ER | 50/50 | 1 | | 09/19/07 18:58 |
| 101 | P2.091907.190514 | L0709315-17 | W0096-ER | 50/50 | 1 | | 09/19/07 19:05 |
| 102 | P2.091907.191130 | L0709313-10 | W0097-ER | 50/50 | 1 | | 09/19/07 19:11 |
| 103 | P2.091907.191751 | WG250381-01 | Post Digestion Spike | | 1 | L0709313-10 | 09/19/07 19:17 |
| 104 | P2.091907.192417 | WG250381-02 | Serial Dilution | | 5 | L0709313-10 | 09/19/07 19:24 |
| 105 | P2.091907.193038 | WG250490-30 | CCV | | 1 | | 09/19/07 19:30 |
| 106 | P2.091907.193657 | WG250490-31 | CCB | | 1 | | 09/19/07 19:36 |
| 107 | P2.091907.194311 | L0709334-01 | MW-03-06 | 50/50 | 1 | WG250387-03 | 09/19/07 19:43 |
| 108 | P2.091907.194936 | L0709334-02 | MW-03-06 | 50/50 | 1 | | 09/19/07 19:49 |
| 109 | P2.091907.195601 | L0709334-03 | MW-03-05 | 50/50 | 1 | | 09/19/07 19:56 |
| 110 | P2.091907.200228 | L0709334-04 | MW-03-05 | 50/50 | 1 | | 09/19/07 20:02 |
| 111 | P2.091907.200849 | L0709334-05 | MW-03-04 | 50/50 | 1 | | 09/19/07 20:08 |

Page: 3 Approved: September 20, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071599

Instrument: PE-ICP2 Dataset: 091907H.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20886

Calibration Std: STD21870 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250427, 248097, 250285, 250289, 250381, 250497

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 112 | P2.091907.201518 | L0709334-06 | MW-03-04 | 50/50 | 1 | | 09/19/07 20:15 |
| 113 | P2.091907.202148 | L0709334-07 | MW-01-10 | 50/50 | 1 | WG250276-04 | 09/19/07 20:21 |
| 114 | P2.091907.202809 | L0709334-08 | MW-01-10 | 50/50 | 1 | | 09/19/07 20:28 |
| 115 | P2.091907.203435 | L0709334-10 | MW-01-01 | 50/50 | 1 | | 09/19/07 20:34 |
| 116 | P2.091907.204105 | L0709337-07 | W0087-ER | 50/50 | 1 | | 09/19/07 20:41 |
| 117 | P2.091907.204721 | WG250490-32 | CCV | | 1 | | 09/19/07 20:47 |
| 118 | P2.091907.205345 | WG250490-33 | CCB | | 1 | | 09/19/07 20:53 |
| 119 | P2.091907.210008 | L0709337-16 | W0092-ER | 50/50 | 1 | | 09/19/07 21:00 |
| 120 | P2.091907.210624 | L0709339-11 | W0091-ER | 50/50 | 1 | | 09/19/07 21:06 |
| 121 | P2.091907.211245 | L0709348-03 | AV-NCB-EB-1-091407 | 50/50 | 1 | | 09/19/07 21:12 |
| 122 | P2.091907.211907 | WG250490-34 | CCV | | 1 | | 09/19/07 21:19 |
| 123 | P2.091907.212526 | WG250490-35 | CCB | | 1 | | 09/19/07 21:25 |



Approved: September 20, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071600

Instrument: PE-ICP2 Dataset: 092007HR.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20904

Calibration Std: STD21870 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250497, 250289, 250381, 250573, 250576

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | P2.092007.075615 | WG250563-01 | Calibration Point | | 1 | | 09/20/07 07:56 |
| 2 | P2.092007.080234 | WG250563-02 | Calibration Point | | 1 | | 09/20/07 08:02 |
| 3 | P2.092007.080855 | WG250563-03 | Calibration Point | | 1 | | 09/20/07 08:08 |
| 4 | P2.092007.081531 | WG250563-04 | Calibration Point | | 1 | | 09/20/07 08:15 |
| 5 | P2.092007.082209 | WG250563-05 | Calibration Point | | 1 | | 09/20/07 08:22 |
| 6 | P2.092007.082742 | WG250563-06 | Initial Calibration Verification | | 1 | | 09/20/07 08:27 |
| 7 | P2.092007.083406 | WG250563-07 | Initial Calib Blank | | 1 | | 09/20/07 08:34 |
| 8 | P2.092007.084047 | WG250563-08 | Interference Check | | 1 | | 09/20/07 08:40 |
| 9 | P2.092007.084625 | WG250563-09 | Interference Check | | 1 | | 09/20/07 08:46 |
| 10 | P2.092007.085150 | WG250563-10 | CCV | | 1 | | 09/20/07 08:51 |
| 11 | P2.092007.085820 | WG250563-11 | CCB | | 1 | | 09/20/07 08:58 |
| 12 | P2.092007.094126 | WG250442-01 | Reference Sample | | 5 | L0709394-03 | 09/20/07 09:41 |
| 13 | P2.092007.094742 | WG250442-04 | Matrix Spike | 50/50 | 5 | | 09/20/07 09:47 |
| 14 | P2.092007.095359 | WG250442-05 | Matrix Spike Duplica | 50/50 | 5 | | 09/20/07 09:53 |
| 15 | P2.092007.100018 | L0709394-02 | V-404 | 50/50 | 5 | | 09/20/07 10:00 |
| 16 | P2.092007.100630 | L0709261-18 | LHSMW24-090707 | 50/50 | 50 | | 09/20/07 10:06 |
| 17 | P2.092007.101249 | L0709261-20 | LHSMW24-090707-FD | 50/50 | 50 | | 09/20/07 10:12 |
| 18 | P2.092007.101914 | WG250563-12 | CCV | | 1 | | 09/20/07 10:19 |
| 19 | P2.092007.102546 | WG250563-13 | CCB | | 1 | | 09/20/07 10:25 |
| 20 | P2.092007.103217 | WG250345-02 | Method/Prep Blank | 50/50 | 1 | | 09/20/07 10:32 |
| 21 | P2.092007.103849 | WG250345-03 | Laboratory Control S | 50/50 | 1 | | 09/20/07 10:38 |
| 22 | P2.092007.104526 | WG250345-01 | Reference Sample | | 1 | L0709334-09 | 09/20/07 10:45 |
| 23 | P2.092007.105148 | WG250345-04 | Matrix Spike | 50/50 | 1 | | 09/20/07 10:51 |
| 24 | P2.092007.105830 | WG250345-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/20/07 10:58 |
| 25 | P2.092007.110503 | L0709348-03 | AV-NCB-EB-1-091407 | 50/50 | 1 | | 09/20/07 11:05 |
| 26 | P2.092007.111123 | L0709313-10 | W0097-ER | 50/50 | 1 | | 09/20/07 11:11 |
| 27 | P2.092007.111747 | WG250381-01 | Post Digestion Spike | | 1 | L0709313-10 | 09/20/07 11:17 |
| 28 | P2.092007.112412 | WG250381-02 | Serial Dilution | | 5 | L0709313-10 | 09/20/07 11:24 |
| 29 | P2.092007.113047 | WG250563-14 | CCV | | 1 | | 09/20/07 11:30 |
| 30 | P2.092007.113704 | WG250563-15 | CCB | | 1 | | 09/20/07 11:37 |
| 31 | P2.092007.114321 | L0709334-02 | MW-03-06 | 50/50 | 1 | | 09/20/07 11:43 |
| 32 | P2.092007.114937 | L0709334-04 | MW-03-05 | 50/50 | 1 | | 09/20/07 11:49 |
| 33 | P2.092007.115556 | L0709334-06 | MW-03-04 | 50/50 | 1 | | 09/20/07 11:55 |
| 34 | P2.092007.120222 | L0709334-08 | MW-01-10 | 50/50 | 1 | | 09/20/07 12:02 |
| 35 | P2.092007.120840 | L0709334-10 | MW-01-01 | 50/50 | 1 | | 09/20/07 12:08 |
| 36 | P2.092007.121504 | WG250345-01 | Reference Sample | | 20 | L0709334-09 | 09/20/07 12:15 |
| 37 | P2.092007.122125 | WG250345-04 | Matrix Spike | 50/50 | 20 | | 09/20/07 12:21 |

Page: 1

Approved: September 21, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071601

Instrument: PE-ICP2 Dataset: 092007HR.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20904

Calibration Std: STD21870 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250497, 250289, 250381, 250573, 250576

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | P2.092007.122747 | WG250345-05 | Matrix Spike Duplica | 50/50 | 20 | | 09/20/07 12:27 |
| 39 | P2.092007.123403 | WG250563-16 | CCV | | 1 | | 09/20/07 12:34 |
| 40 | P2.092007.124021 | WG250563-17 | CCB | | 1 | | 09/20/07 12:40 |
| 41 | P2.092007.124636 | WG250345-01 | Reference Sample | | 5 | L0709334-09 | 09/20/07 12:46 |
| 42 | P2.092007.125302 | WG250345-04 | Matrix Spike | 50/50 | 5 | | 09/20/07 12:53 |
| 43 | P2.092007.125936 | WG250345-05 | Matrix Spike Duplica | 50/50 | 5 | | 09/20/07 12:59 |
| 44 | P2.092007.130552 | L0709334-01 | MW-03-06 | 50/50 | 5 | | 09/20/07 13:05 |
| 45 | P2.092007.131216 | L0709334-03 | MW-03-05 | 50/50 | 5 | | 09/20/07 13:12 |
| 46 | P2.092007.131839 | L0709334-05 | MW-03-04 | 50/50 | 5 | | 09/20/07 13:18 |
| 47 | P2.092007.132454 | L0709334-07 | MW-01-10 | 50/50 | 20 | | 09/20/07 13:24 |
| 48 | P2.092007.133117 | WG250563-18 | CCV | | 1 | | 09/20/07 13:31 |
| 49 | P2.092007.133736 | WG250563-19 | CCB | | 1 | | 09/20/07 13:37 |
| 50 | P2.092007.135304 | WG250545-02 | Method/Prep Blank | 50/50 | 1 | | 09/20/07 13:53 |
| 51 | P2.092007.135918 | WG250545-03 | Laboratory Control S | 50/50 | 1 | | 09/20/07 13:59 |
| 52 | P2.092007.140542 | WG250545-01 | Reference Sample | | 1 | L0709431-02 | 09/20/07 14:05 |
| 53 | P2.092007.141155 | WG250545-04 | Matrix Spike | 50/50 | 1 | | 09/20/07 14:11 |
| 54 | P2.092007.141814 | WG250545-05 | Matrix Spike Duplica | 50/50 | 1 | | 09/20/07 14:18 |
| 55 | P2.092007.142432 | L0709419-01 | OUTFALL 002/COMP | 50/50 | 1 | WG250533-03 | 09/20/07 14:24 |
| 56 | P2.092007.143056 | L0709418-06 | OUTFALL 800/COMP | 50/50 | 1 | | 09/20/07 14:30 |
| 57 | P2.092007.143719 | L0709418-04 | OUTFALL 003/COMP | 50/50 | 1 | WG250511-05 | 09/20/07 14:37 |
| 58 | P2.092007.144344 | WG250573-01 | Post Digestion Spike | | 1 | L0709418-04 | 09/20/07 14:43 |
| 59 | P2.092007.145003 | WG250573-02 | Serial Dilution | | 5 | L0709418-04 | 09/20/07 14:50 |
| 60 | P2.092007.145628 | WG250563-20 | CCV | | 1 | | 09/20/07 14:56 |
| 61 | P2.092007.150249 | WG250563-21 | CCB | | 1 | | 09/20/07 15:02 |
| 62 | P2.092007.150907 | L0709403-01 | C-004/COMP | 50/50 | 1 | | 09/20/07 15:09 |
| 63 | P2.092007.151532 | L0709404-01 | C-004 | 50/50 | 1 | | 09/20/07 15:15 |
| 64 | P2.092007.152151 | L0709410-02 | FINAL EFFLUENT (COMP) | 50/50 | 1 | | 09/20/07 15:21 |
| 65 | P2.092007.152818 | L0709415-01 | 72 FLUME | 5/50 | 1 | | 09/20/07 15:28 |
| 66 | P2.092007.153439 | L0709415-02 | AFC EFFLUENT | 5/50 | 1 | WG250511-04 | 09/20/07 15:34 |
| 67 | P2.092007.154105 | L0709415-03 | AFC BLEED | 5/50 | 1 | | 09/20/07 15:41 |
| 68 | P2.092007.154726 | L0709431-04 | OUTFALL 002/COMP | 50/50 | 1 | WG250634-04 | 09/20/07 15:47 |
| 69 | P2.092007.155351 | L0709431-05 | OUTFALL 102/COMP | 50/50 | 1 | | 09/20/07 15:53 |
| 70 | P2.092007.160017 | L0709434-01 | OUTFALL 104 | 50/50 | 1 | | 09/20/07 16:00 |
| 71 | P2.092007.160636 | WG250563-22 | CCV | | 1 | | 09/20/07 16:06 |
| 72 | P2.092007.161255 | WG250563-23 | CCB | | 1 | | 09/20/07 16:12 |
| 73 | P2.092007.161916 | WG250546-03 | Method/Prep Blank | 50/50 | 1 | | 09/20/07 16:19 |
| 74 | P2.092007.162537 | WG250546-04 | Laboratory Control S | 50/50 | 1 | | 09/20/07 16:25 |

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Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071602

Instrument: PE-ICP2 Dataset: 092007HR.CSV

Analyst1: KRV Analyst2: N/A

Method: 6010B SOP: ME600E Rev: 6

Maintenance Log ID: 20904

Calibration Std: STD21870 ICV/CCV Std: STD21638 Post Spike: STD21659

ICSA: STD21758 ICSAB: STD21616

Workgroups: 250497, 250289, 250381, 250573, 250576

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 75 | P2.092007.163159 | WG250396-01 | Fluid Blank | | 1 | | 09/20/07 16:31 |
| 76 | P2.092007.163820 | WG250546-02 | Reference Sample | | 1 | L0709412-02 | 09/20/07 16:38 |
| 77 | P2.092007.164440 | WG250546-07 | Matrix Spike | 50/50 | 1 | L0709412-03 | 09/20/07 16:44 |
| 78 | P2.092007.165103 | WG250546-08 | Matrix Spike Duplica | 50/50 | 1 | L0709412-04 | 09/20/07 16:51 |
| 79 | P2.092007.165726 | L0709412-06 | CN0352 | 50/50 | 1 | | 09/20/07 16:57 |
| 80 | P2.092007.170347 | L0709412-05 | CN0340 | 50/50 | 1 | | 09/20/07 17:03 |
| 81 | P2.092007.171003 | WG250576-01 | Post Digestion Spike | | 1 | L0709412-05 | 09/20/07 17:10 |
| 82 | P2.092007.171626 | WG250576-02 | Serial Dilution | | 5 | L0709412-05 | 09/20/07 17:16 |
| 83 | P2.092007.172253 | WG250563-24 | CCV | | 1 | | 09/20/07 17:22 |
| 84 | P2.092007.172912 | WG250563-25 | CCB | | 1 | | 09/20/07 17:29 |
| 85 | P2.092007.173531 | L0709412-07 | CN0361 | 50/50 | 1 | | 09/20/07 17:35 |
| 86 | P2.092007.174152 | WG250546-01 | Reference Sample | | 1 | L0709373-12 | 09/20/07 17:41 |
| 87 | P2.092007.174812 | WG250546-05 | Matrix Spike | 50/50 | 1 | L0709373-14 | 09/20/07 17:48 |
| 88 | P2.092007.175435 | WG250546-06 | Matrix Spike Duplica | 50/50 | 1 | L0709373-16 | 09/20/07 17:54 |
| 89 | P2.092007.180059 | L0709373-02 | TW-89 | 50/50 | 1 | | 09/20/07 18:00 |
| 90 | P2.092007.180619 | L0709348-02 | AV-NCB-PE-AC1-32-C1-0 | 50/50 | 1 | WG250502-01 | 09/20/07 18:06 |
| 91 | P2.092007.181243 | L0709348-04 | AV-NCB-AS-AC1-2-09140 | 50/50 | 1 | | 09/20/07 18:12 |
| 92 | P2.092007.181909 | L0709348-05 | AV-NCB-PE-MUL-32-C1-0 | 50/50 | 1 | | 09/20/07 18:19 |
| 93 | P2.092007.182528 | L0709348-06 | AV-NCB-AS-MUL-1--0914 | 50/50 | 1 | WG250359-01 | 09/20/07 18:25 |
| 94 | P2.092007.183157 | L0709348-07 | AV-NCB-AS-STO-G-55-09 | 50/50 | 1 | | 09/20/07 18:31 |
| 95 | P2.092007.183822 | WG250563-26 | CCV | | 1 | | 09/20/07 18:38 |
| 96 | P2.092007.184444 | WG250563-27 | CCB | | 1 | | 09/20/07 18:44 |
| 97 | P2.092007.185102 | L0709373-04 | TW-50 | 50/50 | 1 | | 09/20/07 18:51 |
| 98 | P2.092007.185634 | L0709373-06 | TW-49 | 50/50 | 1 | | 09/20/07 18:56 |
| 99 | P2.092007.190251 | L0709373-08 | TW-56D | 50/50 | 1 | | 09/20/07 19:02 |
| 100 | P2.092007.190916 | L0709373-10 | BLIND DUP | 50/50 | 1 | | 09/20/07 19:09 |
| 101 | P2.092007.191539 | WG250563-28 | CCV | | 1 | | 09/20/07 19:15 |
| 102 | P2.092007.192201 | WG250563-29 | CCB | | 1 | | 09/20/07 19:22 |



Approved: September 21, 2007

Maren Beery

KEMRON Environmental Services
Data Checklist

00071603

Date: 14-SEP-2007
Analyst: KRV
Analyst: NA
Method: 6010
Instrument: PE-ICP2
Curve Workgroup: WG250147
Runlog ID: 18211
Analytical Workgroups: 250019, 250020, 250152, 250163

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | X |
| Case Narrative | X |
| Client Forms | X |
| Level X | |
| Level 3 | 261 |
| Level 4 | 165,182,201,212,251,265 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | KRV |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer: 14-SEP-2007 Katie Vickers

Secondary Reviewer: 17-SEP-2007 Maren Beery

Generated: SEP-17-2007 11:49:45

KEMRON Environmental Services
Data Checklist

00071604

Date: 17-SEP-2007
Analyst: KRV
Analyst: NA
Method: 6010
Instrument: PE-ICP2
Curve Workgroup: WG250264
Runlog ID: 18240
Analytical Workgroups: 250116, 250166, 250152, 250020, 250159

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | X |
| Case Narrative | X |
| Client Forms | X |
| Level X | |
| Level 3 | 261 |
| Level 4 | 182,201,224,251 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | KRV |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer: 17-SEP-2007 Katie Vickers

Secondary Reviewer: 18-SEP-2007 Maren Beery

Generated: SEP-18-2007 18:43:10

KEMRON Environmental Services
Data Checklist

00071605

Date: 18-SEP-2007
Analyst: KRV
Analyst: NA
Method: 6010
Instrument: PE-ICP2
Curve Workgroup: WG250358
Runlog ID: 18269
Analytical Workgroups: 250159,250285,250289,250291

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | X |
| Case Narrative | X |
| Client Forms | X |
| Level X | |
| Level 3 | 261 |
| Level 4 | 267,273,293,295,321,333 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | KRV |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer: 18-SEP-2007 Katie Vickers

Secondary Reviewer: 19-SEP-2007 Maren Beery

Generated: SEP-19-2007 15:21:08

KEMRON Environmental Services
Data Checklist

00071606

Date: 19-SEP-2007
Analyst: KRV
Analyst: NA
Method: 6010
Instrument: PE-ICP2
Curve Workgroup: WG250490
Runlog ID: 18292
Analytical Workgroups: 250427,248097,250285,250289,250381,250497

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | X |
| Case Narrative | X |
| Client Forms | X |
| Level X | |
| Level 3 | 261 |
| Level 4 | 276,293,295,313,315,330,334,337,339,348,375 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | KRV |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer: 19-SEP-2007 Katie Vickers

Secondary Reviewer: 20-SEP-2007 Maren Beery

Generated: SEP-20-2007 18:35:07

KEMRON Environmental Services
Data Checklist

00071607

Date: 20-SEP-2007
Analyst: KRV
Analyst: NA
Method: 6010
Instrument: PE-ICP2
Curve Workgroup: WG250563
Runlog ID: 18312
Analytical Workgroups: 250497,250289,250381,250573,250576

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | X |
| Case Narrative | X |
| Client Forms | X |
| Level X | |
| Level 3 | 261 |
| Level 4 | 334,348,373,412 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | KRV |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer:
20-SEP-2007
Katie Vickers

Secondary Reviewer:
21-SEP-2007
Maren Beery

Generated: SEP-21-2007 15:19:41

00071608

Analytical Method: 6010B AAB#: WG250289

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 180 | 9.75 | 09/19/07 | 180 | 2.29 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/17/07 | 180 | 6.61 | 09/18/07 | 180 | 1.38 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.92 | 09/19/07 | 180 | 2.31 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/17/07 | 180 | 6.61 | 09/19/07 | 180 | 2.32 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 180 | 9.84 | 09/19/07 | 180 | 2.28 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.86 | 09/19/07 | 180 | 2.35 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.62 | 09/20/07 | 180 | 3.16 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.62 | 09/20/07 | 180 | 3.15 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.70 | 09/18/07 | 180 | 1.40 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/17/07 | 180 | 6.61 | 09/19/07 | 180 | 2.32 | |
| LHSMW14-090707 | 09/10/07 | 09/13/07 | 09/17/07 | 180 | 6.70 | 09/18/07 | 180 | 1.36 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.62 | 09/18/07 | 180 | 1.41 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.86 | 09/18/07 | 180 | 1.39 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.86 | 09/19/07 | 180 | 2.36 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 180 | 9.84 | 09/18/07 | 180 | 1.34 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.62 | 09/18/07 | 180 | 1.40 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.62 | 09/19/07 | 180 | 2.33 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.62 | 09/19/07 | 180 | 2.35 | |
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 180 | 9.91 | 09/18/07 | 180 | 1.36 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.92 | 09/18/07 | 180 | 1.39 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.70 | 09/19/07 | 180 | 2.30 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 180 | 9.75 | 09/18/07 | 180 | 1.35 | |
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 180 | 9.91 | 09/19/07 | 180 | 2.30 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.62 | 09/19/07 | 180 | 2.34 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 180 | 5.62 | 09/19/07 | 180 | 2.34 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS
*ANAL = SEE PROJECT QAPP REQUIREMENTS

KEMRON Environmental Services
HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

00071609

Analytical Method: 6010B AAB#: WG250152

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.93 | 09/14/07 | 180 | 0.373 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.88 | 09/14/07 | 180 | 0.460 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.72 | 09/14/07 | 180 | 0.465 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.64 | 09/17/07 | 180 | 3.30 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.64 | 09/17/07 | 180 | 3.30 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.64 | 09/17/07 | 180 | 3.31 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 180 | 3.63 | 09/14/07 | 180 | 0.443 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.64 | 09/14/07 | 180 | 0.469 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.94 | 09/17/07 | 180 | 3.26 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.86 | 09/17/07 | 180 | 3.24 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.88 | 09/17/07 | 180 | 3.28 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.72 | 09/17/07 | 180 | 3.26 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.88 | 09/17/07 | 180 | 3.28 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 180 | 3.63 | 09/17/07 | 180 | 3.27 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.86 | 09/14/07 | 180 | 0.361 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.77 | 09/14/07 | 180 | 0.377 | |
| LHSMW14-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 180 | 3.73 | 09/14/07 | 180 | 0.438 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.94 | 09/14/07 | 180 | 0.456 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.77 | 09/17/07 | 180 | 3.26 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.64 | 09/17/07 | 180 | 3.30 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.64 | 09/14/07 | 180 | 0.474 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 180 | 3.63 | 09/17/07 | 180 | 3.27 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS
*ANAL = SEE PROJECT QAPP REQUIREMENTS

KEMRON FORMS - Modified 11/20/2006
Version 1.5 PDF File ID: 876087
Report generated 09/20/2007 11:26

# METHOD BLANK SUMMARY

00071610

Login Number: L0709261
Work Group: WG250152
Blank File ID: P2.091407.152240
Blank Sample ID: WG250098-02
Prep Date: 09/14/07 06:55
Instrument ID: PE-ICP2
Analyzed Date: 09/14/07 15:22
Method: 6010B
Analyst: KHR

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG250098-03 | P2.091407.152859 | 09/14/07 15:28 | 01 |
| 46WW04-090707 | L0709261-03 | P2.091407.153531 | 09/14/07 15:35 | 01 |
| 46WW02-090707 | L0709261-01 | P2.091407.155157 | 09/14/07 15:51 | 01 |
| LHSMW11-090707 | L0709261-05 | P2.091407.155818 | 09/14/07 15:58 | 01 |
| LHSMW14-090707 | L0709261-07 | P2.091407.172623 | 09/14/07 17:26 | 01 |
| LHSMW15-090707 | L0709261-09 | P2.091407.173237 | 09/14/07 17:32 | 01 |
| LHSMW19-090707 | L0709261-11 | P2.091407.175133 | 09/14/07 17:51 | 01 |
| LHSMW22-090707 | L0709261-13 | P2.091407.175757 | 09/14/07 17:57 | 01 |
| LHSMW23-090707 | L0709261-15 | P2.091407.180426 | 09/14/07 18:04 | 01 |
| LHSMW24-090707 | L0709261-17 | P2.091407.181047 | 09/14/07 18:10 | 01 |
| LHSMW24-090707-FD | L0709261-19 | P2.091407.181706 | 09/14/07 18:17 | 01 |
| 46WW04-090707 | L0709261-03 | P2.091707.124336 | 09/17/07 12:43 | DL01 |
| LHSMW11-090707 | L0709261-05 | P2.091707.130230 | 09/17/07 13:02 | DL01 |
| LHSMW23-090707 | L0709261-15 | P2.091707.130841 | 09/17/07 13:08 | DL01 |
| LHSMW19-090707 | L0709261-11 | P2.091707.131554 | 09/17/07 13:15 | DL01 |
| LHSMW15-090707 | L0709261-09 | P2.091707.132217 | 09/17/07 13:22 | DL01 |
| LHSMW15-090707 | L0709261-09 | P2.091707.132841 | 09/17/07 13:28 | DL02 |
| LHSMW22-090707 | L0709261-13 | P2.091707.133512 | 09/17/07 13:35 | DL01 |
| LHSMW22-090707 | L0709261-13 | P2.091707.134143 | 09/17/07 13:41 | DL02 |
| LHSMW24-090707 | L0709261-17 | P2.091707.140104 | 09/17/07 14:01 | DL01 |
| LHSMW24-090707 | L0709261-17 | P2.091707.140724 | 09/17/07 14:07 | DL02 |
| LHSMW24-090707-FD | L0709261-19 | P2.091707.141345 | 09/17/07 14:13 | DL01 |
| LHSMW24-090707-FD | L0709261-19 | P2.091707.142009 | 09/17/07 14:20 | DL02 |

KEMRON FORMS - Modified 01/31/2007
Version 1.5 PDF File ID: 876088
Report generated 09/20/2007 11:26

# METHOD BLANK SUMMARY

00071611

Login Number: L0709261
Blank File ID: P2.091807.142228
Prep Date: 09/17/07 06:25
Analyzed Date: 09/18/07 14:22
Analyst: KHR

Work Group: WG250289
Blank Sample ID: WG250200-02
Instrument ID: PE-ICP2
Method: 6010B

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG250200-03 | P2.091807.142845 | 09/18/07 14:28 | 01 |
| 46WW04-090707 | L0709261-04 | P2.091807.143515 | 09/18/07 14:35 | 01 |
| LHSMW11-090707 | L0709261-06 | P2.091807.145435 | 09/18/07 14:54 | 01 |
| LHSMW14-090707 | L0709261-08 | P2.091807.150059 | 09/18/07 15:00 | 01 |
| 46WW02-090707 | L0709261-02 | P2.091807.150720 | 09/18/07 15:07 | 01 |
| LHSMW15-090707 | L0709261-10 | P2.091807.153849 | 09/18/07 15:38 | 01 |
| LHSMW19-090707 | L0709261-12 | P2.091807.154511 | 09/18/07 15:45 | 01 |
| LHSMW22-090707 | L0709261-14 | P2.091807.155130 | 09/18/07 15:51 | 01 |
| LHSMW23-090707 | L0709261-16 | P2.091807.155759 | 09/18/07 15:57 | 01 |
| LHSMW24-090707 | L0709261-18 | P2.091807.160424 | 09/18/07 16:04 | 01 |
| LHSMW24-090707-FD | L0709261-20 | P2.091807.161044 | 09/18/07 16:10 | 01 |
| 46WW04-090707 | L0709261-04 | P2.091907.130911 | 09/19/07 13:09 | DL01 |
| LHSMW11-090707 | L0709261-06 | P2.091907.132816 | 09/19/07 13:28 | DL01 |
| LHSMW23-090707 | L0709261-16 | P2.091907.133500 | 09/19/07 13:35 | DL01 |
| 46WW02-090707 | L0709261-02 | P2.091907.134135 | 09/19/07 13:41 | DL01 |
| LHSMW19-090707 | L0709261-12 | P2.091907.135453 | 09/19/07 13:54 | DL01 |
| LHSMW15-090707 | L0709261-10 | P2.091907.140121 | 09/19/07 14:01 | DL01 |
| LHSMW15-090707 | L0709261-10 | P2.091907.140755 | 09/19/07 14:07 | DL02 |
| LHSMW24-090707 | L0709261-18 | P2.091907.142700 | 09/19/07 14:27 | DL01 |
| LHSMW24-090707 | L0709261-18 | P2.091907.143324 | 09/19/07 14:33 | DL02 |
| LHSMW24-090707-FD | L0709261-20 | P2.091907.143940 | 09/19/07 14:39 | DL01 |
| LHSMW24-090707-FD | L0709261-20 | P2.091907.144601 | 09/19/07 14:46 | DL02 |
| LHSMW22-090707 | L0709261-14 | P2.091907.145224 | 09/19/07 14:52 | DL01 |
| LHSMW22-090707 | L0709261-14 | P2.091907.145842 | 09/19/07 14:58 | DL02 |
| LHSMW24-090707 | L0709261-18 | P2.092007.100630 | 09/20/07 10:06 | DL03 |
| LHSMW24-090707-FD | L0709261-20 | P2.092007.101249 | 09/20/07 10:12 | DL03 |

KEMRON FORMS - Modified 01/31/2007
Version 1.5 PDF File ID: 876088
Report generated 09/20/2007 11:26

# METHOD BLANK REPORT

00071612

Login Number: L0709261 Prep Date: 09/14/07 06:55 Sample ID: WG250098-02
Instrument ID: PE-ICP2 Run Date: 09/14/07 15:22 Prep Method: 3005A
File ID: P2.091407.152240 Analyst: KHR Method: 6010B
Workgroup (AAB#): WG250152 Matrix: Water Units: mg/L
Contract #: DACA56-94-D-0020 Cal ID: PE-ICP - 14-SEP-07

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum, Total | 0.0500 | 0.100 | 0.0500 | 1 | U |
| Beryllium, Total | 0.000500 | 0.00200 | 0.000500 | 1 | U |
| Calcium, Total | 0.100 | 0.200 | 0.100 | 1 | U |
| Cobalt, Total | 0.00250 | 0.00500 | 0.00250 | 1 | U |
| Iron, Total | 0.0250 | 0.100 | 0.0250 | 1 | U |
| Potassium, Total | 0.250 | 1.00 | 0.250 | 1 | U |
| Magnesium, Total | 0.250 | 0.500 | 0.250 | 1 | U |
| Sodium, Total | 0.250 | 0.500 | 0.250 | 1 | U |
| Vanadium, Total | 0.00500 | 0.0100 | 0.00500 | 1 | U |
| Zinc, Total | 0.00500 | 0.0200 | 0.00500 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

KEMRON FORMS - Modified 12/07/2006
Version 1.5 PDF File ID: 876089
Report generated 09/19/2007 09:22

# METHOD BLANK REPORT



Login Number: L0709261 | Prep Date: 09/17/07 06:25 | Sample ID: WG250200-02
Instrument ID: PE-ICP2 | Run Date: 09/18/07 14:22 | Prep Method: 3005A
File ID: P2.091807.142228 | Analyst: KHR | Method: 6010B
Workgroup (AAB#): WG250289 | Matrix: Water | Units: mg/L
Contract #: DACA56-94-D-0020 | Cal ID: PE-ICP - 18-SEP-07

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 0.0500 | 0.100 | 0.0500 | 1 | U |
| Beryllium, Dissolved | 0.000500 | 0.00200 | 0.000500 | 1 | U |
| Calcium, Dissolved | 0.100 | 0.200 | 0.100 | 1 | U |
| Cobalt, Dissolved | 0.00250 | 0.00500 | 0.00250 | 1 | U |
| Iron, Dissolved | 0.0250 | 0.100 | 0.0250 | 1 | U |
| Potassium, Dissolved | 0.250 | 1.00 | 0.250 | 1 | U |
| Magnesium, Dissolved | 0.250 | 0.500 | 0.250 | 1 | U |
| Sodium, Dissolved | 0.250 | 0.500 | 0.250 | 1 | U |
| Vanadium, Dissolved | 0.00500 | 0.0100 | 0.00500 | 1 | U |
| Zinc, Dissolved | 0.00500 | 0.0200 | 0.00500 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

# LABORATORY CONTROL SAMPLE (LCS)



Login Number: L0709261 Run Date: 09/14/2007 Sample ID: WG250098-03
Instrument ID: PE-ICP2 Run Time: 15:28 Prep Method: 3005A
File ID: P2.091407.152859 Analyst: KHR Method: 6010B
Workgroup (AAB#): WG250152 Matrix: Water Units: mg/L
QC Key: STD Lot#: MI0058-81 Cal ID: PE-ICP - 14-SEP-07

| Analytes | Expected | Found | % Rec | LCS Limits | Q |
|---|---|---|---|---|---|
| Aluminum, Total | 5.00 | 5.40 | 108 | 85 - 115 | |
| Beryllium, Total | 0.0250 | 0.0258 | 103 | 85 - 115 | |
| Calcium, Total | 5.00 | 5.24 | 105 | 85 - 115 | |
| Cobalt, Total | 0.100 | 0.103 | 103 | 85 - 115 | |
| Iron, Total | 2.00 | 2.23 | 112 | 85 - 115 | |
| Potassium, Total | 25.0 | 27.3 | 109 | 85 - 115 | |
| Magnesium, Total | 5.00 | 5.47 | 109 | 85 - 115 | |
| Sodium, Total | 25.0 | 27.7 | 111 | 85 - 115 | |
| Vanadium, Total | 0.500 | 0.517 | 103 | 85 - 115 | |
| Zinc, Total | 0.500 | 0.522 | 104 | 85 - 115 | |

KEMRON FORMS - Modified 09/06/2007
Version 1.5 PDF File ID: 876090
Report generated 09/19/2007 09:22

# LABORATORY CONTROL SAMPLE (LCS)

00071615

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250200-03
Instrument ID: PE-ICP2
Run Time: 14:28
Prep Method: 3005A
File ID: P2.091807.142845
Analyst: KHR
Method: 6010B
Workgroup (AAB#): WG250289
Matrix: Water
Units: mg/L
QC Key: STD
Lot#: MI0058-81
Cal ID: PE-ICP - 18-SEP-07

| Analytes | Expected | Found | % Rec | LCS Limits | Q |
|---|---|---|---|---|---|
| Aluminum, Dissolved | 5.00 | 5.16 | 103 | 85 - 115 | |
| Beryllium, Dissolved | 0.0250 | 0.0262 | 105 | 85 - 115 | |
| Calcium, Dissolved | 5.00 | 5.34 | 107 | 85 - 115 | |
| Cobalt, Dissolved | 0.100 | 0.104 | 104 | 85 - 115 | |
| Iron, Dissolved | 2.00 | 2.00 | 100 | 85 - 115 | |
| Potassium, Dissolved | 25.0 | 24.9 | 99.7 | 85 - 115 | |
| Magnesium, Dissolved | 5.00 | 4.97 | 99.4 | 85 - 115 | |
| Sodium, Dissolved | 25.0 | 25.2 | 101 | 85 - 115 | |
| Vanadium, Dissolved | 0.500 | 0.523 | 105 | 85 - 115 | |
| Zinc, Dissolved | 0.500 | 0.528 | 106 | 85 - 115 | |

KEMRON FORMS - Modified 09/06/2007
Version 1.5 PDF File ID: 876090
Report generated 09/19/2007 09:22

# MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071616

Loginnum:L0709261 Cal ID: PE-ICP2 - Worknum:WG250152
Instrument ID:PE-ICP2 Contract #:DACA56-94-D-0020 Method:6010B
Parent ID:WG250098-01 File ID:P2.091407.153531 Dil:1 Matrix:WATER
Sample ID:WG250098-04 MS File ID:P2.091407.154054 Dil:1 Units:mg/L
Sample ID:WG250098-05 MSD File ID:P2.091407.154624 Dil:1

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum, Total | ND | 5.00 | 4.85 | 97.0 | 5.00 | 4.84 | 96.8 | 0.176 | 80 - 120 | 20 | |
| Beryllium, Total | ND | 0.0250 | 0.0247 | 98.6 | 0.0250 | 0.0244 | 97.8 | 0.872 | 80 - 120 | 20 | |
| Calcium, Total | 328 | 5.00 | 349 | 420 | 5.00 | 340 | 249 | 2.47 | 80 - 120 | 20 | * |
| Cobalt, Total | 0.0499 | 0.100 | 0.148 | 97.9 | 0.100 | 0.147 | 97.5 | 0.293 | 80 - 120 | 20 | |
| Iron, Total | 9.82 | 2.00 | 12.4 | 130 | 2.00 | 12.6 | 137 | 1.08 | 80 - 120 | 20 | * |
| Magnesium, Total | 165 | 5.00 | 177 | 243 | 5.00 | 179 | 265 | 0.613 | 80 - 120 | 20 | * |
| Potassium, Total | 3.04 | 25.0 | 30.2 | 109 | 25.0 | 30.2 | 109 | 0.150 | 80 - 120 | 20 | |
| Vanadium, Total | ND | 0.500 | 0.510 | 102 | 0.500 | 0.507 | 101 | 0.673 | 80 - 120 | 20 | |
| Zinc, Total | 0.00652 | 0.500 | 0.485 | 95.6 | 0.500 | 0.486 | 95.8 | 0.172 | 80 - 120 | 20 | |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
Version 1.5 PDF File ID: 876091
Report generated 09/20/2007 09:25

# MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071617

Loginnum:L0709261 Cal ID: PE-ICP2 - Worknum:WG250152
Instrument ID:PE-ICP2 Contract #:DACA56-94-D-0020 Method:6010B
Parent ID:WG250098-01 File ID:P2.091707.124336 Dil:20 Matrix:WATER
Sample ID:WG250098-04 MS File ID:P2.091707.124952 Dil:20 Units:mg/L
Sample ID:WG250098-05 MSD File ID:P2.091707.125609 Dil:20

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sodium, Total | 492 | 25.0 | 531 | 154 | 25.0 | 501 | 34.1 | 5.82 | 80 - 120 | 20 | * |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
Version 1.5 PDF File ID: 876091
Report generated 09/20/2007 09:25

# MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071618

Loginnum: L0709261 Cal ID: PE-ICP2 - Worknum: WG250289
Instrument ID: PE-ICP2 Contract #: DACA56-94-D-0020 Method: 6010B
Parent ID: WG250200-01 File ID: P2.091907.130911 Dil: 20 Matrix: WATER
Sample ID: WG250200-04 MS File ID: P2.091907.131533 Dil: 20 Units: mg/L
Sample ID: WG250200-05 MSD File ID: P2.091907.132147 Dil: 20

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sodium, Dissolved | 433 | 25.0 | 463 | 121 | 25.0 | 466 | 135 | 0.736 | 80 - 120 | 20 | * |
| Vanadium, Dissolved | ND | 0.500 | 0.424 | 84.9 | 0.500 | 0.382 | 76.5 | 10.4 | 80 - 120 | 20 | * |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
Version 1.5 PDF File ID: 876091
Report generated 09/20/2007 09:25

MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071619

Loginnum: L0709261 Cal ID: PE-ICP2 - Worknum: WG250289
Instrument ID: PE-ICP2 Contract #: DACA56-94-D-0020 Method: 6010B
Parent ID: WG250200-01 File ID: P2.091807.143515 Dil: 1 Matrix: WATER
Sample ID: WG250200-04 MS File ID: P2.091807.144146 Dil: 1 Units: mg/L
Sample ID: WG250200-05 MSD File ID: P2.091807.144811 Dil: 1

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum, Dissolved | ND | 5.00 | 4.94 | 98.9 | 5.00 | 4.96 | 99.2 | 0.329 | 80 - 120 | 20 | |
| Beryllium, Dissolved | ND | 0.0250 | 0.0250 | 100 | 0.0250 | 0.0246 | 98.5 | 1.69 | 80 - 120 | 20 | |
| Calcium, Dissolved | 357 | 5.00 | 363 | 130 | 5.00 | 356 | -24.6 | 2.15 | 80 - 120 | 20 | * |
| Cobalt, Dissolved | 0.0556 | 0.100 | 0.154 | 98.1 | 0.100 | 0.151 | 95.4 | 1.78 | 80 - 120 | 20 | |
| Iron, Dissolved | 3.35 | 2.00 | 5.35 | 100 | 2.00 | 5.22 | 93.9 | 2.39 | 80 - 120 | 20 | |
| Magnesium, Dissolved | 169 | 5.00 | 177 | 164 | 5.00 | 172 | 68.7 | 2.73 | 80 - 120 | 20 | * |
| Potassium, Dissolved | 3.73 | 25.0 | 30.5 | 107 | 25.0 | 30.7 | 108 | 0.601 | 80 - 120 | 20 | |
| Zinc, Dissolved | ND | 0.500 | 0.485 | 97.0 | 0.500 | 0.478 | 95.6 | 1.43 | 80 - 120 | 20 | |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
Version 1.5 PDF File ID: 876091
Report generated 09/20/2007 09:25

# SERIAL DILUTION REPORT

00071620

Sample Login ID: L0709261 Worknum: WG250152
Instrument ID: PE-ICP2 Method: 6010B
Sample ID: L0709253-01 File ID: P2.091407.160345 Dil: 1 Units: mg/L
Serial Dilution ID: WG250152-02 File ID: P2.091407.161629 Dil: 5

| Analyte | Sample | C | Serial Dilution | C | % Difference | Q |
|---|---|---|---|---|---|---|
| Aluminum | 0 | U | ND | U | | |
| Beryllium | 0 | U | 0 | U | | |
| Calcium | 9.89 | | 10.2 | X | 3.13 | |
| Cobalt | 0 | U | ND | U | | |
| Iron | 1.89 | | 1.91 | X | 1.06 | |
| Magnesium | 7.95 | X | 8.11 | X | 2.01 | |
| Potassium | 2.19 | X | 2.42 | F | 10.5 | E |
| Sodium | 4.22 | X | 4.68 | X | 10.9 | E |
| Vanadium | ND | U | 0 | U | | |
| Zinc | 0.0104 | F | 0.0497 | F | 378 | E |

U = Result is below MDL
F = Result is between MDL and RL
X = Result is greater than RL and less than 50 times the MDL
E = %D exceeds control limit of 10% and initial
sample result is greater than or equal to 50 times the MDL

KEMRON FORMS - Modified 02/14/2006
Version 1.3 PDF File ID: 876085
Report generated 09/19/2007 09:22

# KEMRON ENVIRONMENTAL SERVICES
## SERIAL DILUTION REPORT

00071621

Sample Login ID: L0709261     Worknum: WG250289
Instrument ID: PE-ICP2     Method: 6010B
Sample ID: L0709261-02 File ID: P2.091807.150720 Dil: 1     Units: mg/L
Serial Dilution ID: WG250289-02 File ID: P2.091807.152000 Dil: 5

| Analyte | Sample | C | Serial Dilution | C | % Difference | Q |
|---|---|---|---|---|---|---|
| Aluminum | 0 | U | ND | U | | |
| Beryllium | 0 | U | ND | U | | |
| Calcium | 22.3 | | 21.6 | X | 3.14 | |
| Cobalt | 0.0152 | X | 0 | U | 100 | E |
| Iron | 0.749 | X | 0.714 | X | 4.67 | |
| Magnesium | 16.4 | | 16.5 | X | 0.610 | |
| Potassium | 2.57 | X | 2.80 | F | 8.95 | |
| Sodium | 57.7 | | 56.9 | X | 1.39 | |
| Vanadium | ND | U | ND | U | | |
| Zinc | 0.0443 | X | 0.0263 | F | 40.6 | E |

U = Result is below MDL
F = Result is between MDL and RL
X = Result is greater than RL and less than 50 times the MDL
E = %D exceeds control limit of 10% and initial
sample result is greater than or equal to 50 times the MDL

KEMRON FORMS - Modified 02/14/2006
Version 1.3 PDF File ID: 876085
Report generated 09/19/2007 09:22

**KEMRON ENVIRONMENTAL SERVICES**
**POST SPIKE REPORT**

00071622

**Sample Login ID:** L0709261 **Worknum:** WG250289
**Instrument ID:** PE-ICP2 **Method:** 6010B
**Post Spike ID:** WG250289-01 **File ID:** P2.091907.134831 **Dil:** 5 **Units:** mg/L
**Sample ID:** L0709261-02 **File ID:** P2.091907.134135 **Dil:** 5 **Matrix:** Water

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| ALUMINUM | 5.10 | | 0 | U | 5 | 101.9 | 75 - 125 | |
| BERYLLIUM | 0.0255 | | 0 | U | .025 | 101.8 | 75 - 125 | |
| CALCIUM | 9.65 | | 4.37 | | 5 | 105.7 | 75 - 125 | |
| COBALT | 0.106 | | 0.00307 | F | .1 | 103.1 | 75 - 125 | |
| IRON | 2.23 | | 0.150 | | 2 | 103.8 | 75 - 125 | |
| MAGNESIUM | 8.52 | | 3.47 | | 5 | 100.9 | 75 - 125 | |
| POTASSIUM | 25.8 | | 0.594 | F | 25 | 100.9 | 75 - 125 | |
| SODIUM | 37.1 | | 12.0 | | 25 | 100.6 | 75 - 125 | |
| VANADIUM | 0.512 | | 0 | U | .5 | 102.5 | 75 - 125 | |
| ZINC | 0.532 | | 0.00993 | F | .5 | 104.4 | 75 - 125 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

# POST SPIKE REPORT

00071623

**Sample Login ID:** L0709261 **Worknum:** WG250289
**Instrument ID:** PE-ICP2 **Method:** 6010B
**Post Spike ID:** WG250289-01 **File ID:** P2.091807.151338 **Dil:** 1 **Units:** mg/L
**Sample ID:** L0709261-02 **File ID:** P2.091807.150720 **Dil:** 1 **Matrix:** Water

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| ALUMINUM | 5.07 | | 0 | U | 5 | 101.5 | 75 - 125 | |
| BERYLLIUM | 0.0256 | | 0 | U | .025 | 102.2 | 75 - 125 | |
| CALCIUM | 25.3 | | 22.3 | | 5 | 105.1 | 75 - 125 | |
| COBALT | 0.117 | | 0.0152 | F | .1 | 103.3 | 75 - 125 | |
| IRON | 2.68 | | 0.749 | | 2 | 100.3 | 75 - 125 | |
| MAGNESIUM | 19.5 | | 16.4 | | 5 | 95.0 | 75 - 125 | |
| POTASSIUM | 27.1 | | 2.57 | | 25 | 99.2 | 75 - 125 | |
| SODIUM | 76.7 | | 57.7 | | 25 | 99.1 | 75 - 125 | |
| VANADIUM | 0.508 | | 0 | U | .5 | 101.5 | 75 - 125 | |
| ZINC | 0.557 | | 0.0443 | | .5 | 103.5 | 75 - 125 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

# KEMRON ENVIRONMENTAL SERVICES
## POST SPIKE REPORT

00071624

**Sample Login ID:** L0709261 **Worknum:** WG250152
**Instrument ID:** PE-ICP2 **Method:** 6010B
**Post Spike ID:** WG250152-01 **File ID:** P2.091407.161007 **Dil:** 1 **Units:** mg/L
**Sample ID:** L0709253-01 **File ID:** P2.091407.160345 **Dil:** 1 **Matrix:** Water

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| ALUMINUM | 5.10 | | 0 | U | 5 | 102.0 | 75 - 125 | |
| BERYLLIUM | 0.0256 | | 0 | U | .025 | 102.4 | 75 - 125 | |
| CALCIUM | 14.4 | | 9.89 | | 5 | 109.6 | 75 - 125 | |
| COBALT | 0.103 | | 0 | U | .1 | 103.1 | 75 - 125 | |
| IRON | 3.86 | | 1.89 | | 2 | 107.8 | 75 - 125 | |
| MAGNESIUM | 12.4 | | 7.95 | | 5 | 105.8 | 75 - 125 | |
| POTASSIUM | 27.5 | | 2.19 | | 25 | 102.2 | 75 - 125 | |
| SODIUM | 29.6 | | 4.22 | | 25 | 103.4 | 75 - 125 | |
| VANADIUM | 0.510 | | 0 | U | .5 | 101.9 | 75 - 125 | |
| ZINC | 0.520 | | 0.0104 | F | .5 | 102.2 | 75 - 125 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

**KEMRON FORMS - Modified 04/20/2007 - POST_SPIKE**
**Version 2.0 PDF File ID: 876086**
**Report generated 09/20/2007 09:25**

# INITIAL CALIBRATION SUMMARY

Login Number: L0709261 Workgroup (AAB#): WG250152

Analytical Method: 6010B Instrument ID: PE-ICP2

00071625

ICAL Worknum: WG250147 Initial Calibration Date: 14-SEP-2007 09:22

| Analyte | WG250147-01 | | WG250147-02 | | WG250147-03 | | WG250147-04 | | WG250147-05 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT | R | Q |
| Aluminum | 0 | 210.4020305 | .1 | 662.922591 | .2 | 1491.469717 | 5 | 77250.08815 | 10 | 153761.2532 | 0.999997 | |
| Beryllium | 0 | -1061.44229 | .0005 | 303.9833527 | .001 | 643.8002819 | .025 | 32352.69672 | .05 | 65028.00869 | 0.999997 | |
| Calcium | 0 | -78.1878137 | .1 | 14.4534169 | .2 | 31.81313229 | 5 | 1802.962573 | 10 | 3666.448869 | 0.999970 | |
| Cobalt | 0 | -69.5484710 | .002 | 84.57101231 | .004 | 171.4098471 | .1 | 8661.064722 | .2 | 17197.42839 | 0.999994 | |
| Iron | 0 | .187091156 | .04 | 26.27802857 | .08 | 53.58172165 | 2 | 2592.1743 | 4 | 5154.58186 | 0.999996 | |
| Magnesium | 0 | 16.33006281 | .1 | 70.81716112 | .2 | 137.8735276 | 5 | 6572.841847 | 10 | 13059.20291 | 0.999995 | |
| Potassium | 0 | -757.103288 | .5 | 1409.794379 | 1 | 2925.353287 | 25 | 152524.4367 | 50 | 309571.2171 | 1.00000 | |
| Sodium | 0 | 1197.356229 | .5 | 4606.307775 | 1 | 9107.018448 | 25 | 439985.0364 | 50 | 875122.1201 | 1.00000 | |
| Vanadium | 0 | 5111.849852 | .01 | 1547.630624 | .02 | 2776.233082 | .5 | 132668.8227 | 1 | 268608.5848 | 0.999981 | |
| Zinc | 0 | -14.0594813 | .01 | 260.4174924 | .02 | 510.8025826 | .5 | 23930.97369 | 1 | 48144.00913 | 0.999995 | |

**INT = Instrument intensity**
**R = Coefficient of correlation**
**Q = Data Qualifier**
*** = Out of Compliance; R < 0.995**

# INITIAL CALIBRATION SUMMARY

Login Number: L0709261  Workgroup (AAB#): WG250152 00071626
Analytical Method: 6010B  Instrument ID: PE-ICP2
ICAL Worknum: WG250264  Initial Calibration Date: 17-SEP-2007 08:39

| Analyte | WG250264-01 | | WG250264-02 | | WG250264-03 | | WG250264-04 | | WG250264-05 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT | R | Q |
| Aluminum | 0 | -133.263759 | .1 | 774.2415426 | .2 | 1454.150874 | 5 | 70324.39657 | 10 | 137856.3365 | 0.999953 | |
| Beryllium | 0 | -1126.72457 | .0005 | 296.2805671 | .001 | 618.5053966 | .025 | 32468.41513 | .05 | 65064.96776 | 1.00000 | |
| Calcium | 0 | -88.058934 | .1 | 10.28186353 | .2 | 26.0914832 | 5 | 1789.489613 | 10 | 3633.916394 | 0.999976 | |
| Cobalt | 0 | -91.8176471 | .002 | 87.23968975 | .004 | 174.5179982 | .1 | 8623.129597 | .2 | 17167.43338 | 0.999998 | |
| Iron | 0 | -.828998981 | .04 | 29.40809282 | .08 | 57.15798321 | 2 | 2775.178954 | 4 | 5489.129538 | 0.999986 | |
| Magnesium | 0 | 23.16430687 | .1 | 67.41422185 | .2 | 139.1184297 | 5 | 7033.210865 | 10 | 13935.71222 | 0.999989 | |
| Potassium | 0 | -655.267740 | .5 | 1387.312933 | 1 | 2903.859203 | 25 | 141411.4934 | 50 | 282532.1116 | 1.00000 | |
| Sodium | 0 | 1208.556721 | .5 | 4480.016191 | 1 | 8722.896795 | 25 | 429617.2556 | 50 | 849360.892 | 1.00000 | |
| Vanadium | 0 | 5184.336504 | .01 | 1520.929739 | .02 | 2827.212466 | .5 | 132259.603 | 1 | 264908.5227 | 0.999999 | |
| Zinc | 0 | 27.62636408 | .01 | 309.9805549 | .02 | 585.3206018 | .5 | 24746.76575 | 1 | 49349.20742 | 0.999998 | |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 03/08/2007
Version 1.5 PDF File ID: 876094
Report generated 09/21/2007 13:05

# INITIAL CALIBRATION SUMMARY

Login Number: L0709261
Workgroup (AAB#): WG250289
Analytical Method: 6010B
Instrument ID: PE-ICP2
00071627
ICAL Worknum: WG250358
Initial Calibration Date: 18-SEP-2007 08:50

| Analyte | WG250358-01 | | WG250358-02 | | WG250358-03 | | WG250358-04 | | WG250358-05 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT | R | Q |
| Aluminum | 0 | -153.994412 | .1 | 761.3629109 | .2 | 1515.907079 | 5 | 75087.34944 | 10 | 145274.8445 | 0.999868 | |
| Beryllium | 0 | -1091.69509 | .0005 | 335.5006887 | .001 | 661.0693264 | .025 | 33210.59562 | .05 | 63779.16028 | 0.999800 | |
| Calcium | 0 | -82.5775167 | .1 | 8.579297245 | .2 | 28.89882769 | 5 | 1826.056385 | 10 | 3604.108858 | 0.999972 | |
| Cobalt | 0 | -91.6988775 | .002 | 89.8540969 | .004 | 175.7080482 | .1 | 8859.330903 | .2 | 16970.16572 | 0.999774 | |
| Iron | 0 | .7699404169 | .04 | 27.76718013 | .08 | 55.38239515 | 2 | 2762.468592 | 4 | 5428.985086 | 0.999964 | |
| Magnesium | 0 | 20.9748411 | .1 | 75.66235928 | .2 | 143.3389637 | 5 | 7064.169288 | 10 | 13806.07224 | 0.999937 | |
| Potassium | 0 | -604.961029 | .5 | 1371.750974 | 1 | 2879.50455 | 25 | 149156.7758 | 50 | 295508.9293 | 1.00000 | |
| Sodium | 0 | 1197.945283 | .5 | 4677.956172 | 1 | 9302.936016 | 25 | 447862.0367 | 50 | 872712.1183 | 1.00000 | |
| Vanadium | 0 | 5178.893958 | .01 | 1467.717809 | .02 | 2766.938959 | .5 | 135109.4779 | 1 | 259893.806 | 0.999818 | |
| Zinc | 0 | 3.517417264 | .01 | 311.6995418 | .02 | 671.7854559 | .5 | 25665.37705 | 1 | 49035.70844 | 0.999756 | |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 03/08/2007
Version 1.5 PDF File ID: 876094
Report generated 09/21/2007 13:05

# INITIAL CALIBRATION SUMMARY

Login Number: L0709261
Workgroup (AAB#): WG250289
Analytical Method: 6010B
Instrument ID: PE-ICP2
00071628
ICAL Worknum: WG250490
Initial Calibration Date: 19-SEP-2007 08:57

| Analyte | WG250490-01 | | WG250490-02 | | WG250490-03 | | WG250490-04 | | WG250490-05 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT | R | Q |
| Aluminum | 0 | -111.070263 | .1 | 841.1908268 | .2 | 1598.259631 | 5 | 77396.34446 | 10 | 152896.9029 | 0.999983 | |
| Beryllium | 0 | -1097.51743 | .0005 | 328.0017575 | .001 | 658.3181276 | .025 | 33152.12147 | .05 | 65954.72496 | 0.999997 | |
| Calcium | 0 | -91.0496153 | .1 | 31.77071936 | .2 | 39.89981665 | 5 | 1813.172053 | 10 | 3726.033354 | 0.999900 | |
| Cobalt | 0 | -89.0862699 | .002 | 90.52437809 | .004 | 170.5334502 | .1 | 8789.600814 | .2 | 17525.92266 | 0.999999 | |
| Iron | 0 | -1.69358475 | .04 | 29.14059907 | .08 | 55.14528038 | 2 | 2664.585269 | 4 | 5267.637563 | 0.999985 | |
| Magnesium | 0 | 28.58458058 | .1 | 66.87651609 | .2 | 142.7524036 | 5 | 6782.158608 | 10 | 13413.942 | 0.999986 | |
| Potassium | 0 | -665.5764 | .5 | 1542.237759 | 1 | 3033.254034 | 25 | 153159.361 | 50 | 308667.796 | 1.00000 | |
| Sodium | 0 | 1217.884544 | .5 | 4773.229638 | 1 | 9476.649641 | 25 | 457657.9054 | 50 | 909081.7657 | 1.00000 | |
| Vanadium | 0 | 5209.27969 | .01 | 1349.080343 | .02 | 2765.00527 | .5 | 134709.1464 | 1 | 268650.2493 | 0.999999 | |
| Zinc | 0 | 8.391843463 | .01 | 283.0794209 | .02 | 576.9474039 | .5 | 25521.6199 | 1 | 50492.14107 | 0.999987 | |

**INT = Instrument intensity**
**R = Coefficient of correlation**
**Q = Data Qualifier**
*** = Out of Compliance; R < 0.995**

KEMRON Environmental Services

INITIAL CALIBRATION SUMMARY

Login Number:L0709261 Workgroup (AAB#):WG250289

Analytical Method:6010B Instrument ID:PE-ICP2 00071629

ICAL Worknum:WG250563 Initial Calibration Date:20-SEP-2007 08:22

| Analyte | WG250563-01 | | WG250563-02 | | WG250563-03 | | WG250563-04 | | WG250563-05 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT | R | Q |
| Aluminum | 0 | -126.568342 | .1 | 802.0678542 | .2 | 1684.737938 | 5 | 80158.36067 | 10 | 156312.9754 | 0.999924 | |
| Beryllium | 0 | -1115.44139 | .0005 | 382.0546714 | .001 | 739.8781489 | .025 | 32634.32709 | .05 | 65035.28446 | 0.999998 | |
| Calcium | 0 | -89.8760017 | .1 | 11.71282165 | .2 | 39.68477017 | 5 | 1786.011122 | 10 | 3607.141534 | 0.999987 | |
| Cobalt | 0 | -87.6029536 | .002 | 94.49395323 | .004 | 181.3927689 | .1 | 8745.598132 | .2 | 17353.32109 | 0.999993 | |
| Iron | 0 | 3.068410366 | .04 | 25.7998188 | .08 | 52.37421391 | 2 | 2719.689018 | 4 | 5297.171554 | 0.999915 | |
| Magnesium | 0 | 28.26871715 | .1 | 67.50723098 | .2 | 135.94396 | 5 | 6955.289731 | 10 | 13517.02215 | 0.999900 | |
| Potassium | 0 | -648.858951 | .5 | 1632.266304 | 1 | 3170.064128 | 25 | 157352.7938 | 50 | 312793.1028 | 1.00000 | |
| Sodium | 0 | 1460.881482 | .5 | 4912.518088 | 1 | 9859.831425 | 25 | 470702.0586 | 50 | 917304.6093 | 1.00000 | |
| Vanadium | 0 | 5195.637137 | .01 | 1382.734993 | .02 | 2808.010954 | .5 | 133219.3827 | 1 | 266112.9387 | 1.00000 | |
| Zinc | 0 | 15.48110068 | .01 | 306.9775198 | .02 | 561.7448415 | .5 | 25075.92761 | 1 | 49778.79915 | 0.999994 | |

INT = Instrument intensity

R = Coefficient of correlation

Q = Data Qualifier

* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 03/08/2007
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Report generated 09/21/2007 13:05

# INITIAL CALIBRATION BLANK (ICB)



Login Number: L0709261 Run Date: 09/19/2007 Sample ID: WG250490-07
Instrument ID: PE-ICP2 Run Time: 09:10 Method: 6010B
File ID: P2.091907.091006 Analyst: KRV Units: mg/L
Workgroup (AAB#): WG250289 Cal ID: PE-ICP - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -.0229 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -.0000231 | 1 | U |
| Calcium | 0.100 | 0.200 | .0444 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -.0000886 | 1 | U |
| Iron | 0.0250 | 0.100 | -.00877 | 1 | U |
| Potassium | 0.250 | 1.00 | .0598 | 1 | U |
| Magnesium | 0.250 | 0.500 | -.025 | 1 | U |
| Sodium | 0.250 | 0.500 | .00315 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -.000522 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -.00243 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 10/02/2006
Version 1.5 PDF File ID: 876096
Report generated 09/20/2007 11:26

# INITIAL CALIBRATION BLANK (ICB)



Login Number: L0709261
Run Date: 09/20/2007
Sample ID: WG250563-07
Instrument ID: PE-ICP2
Run Time: 08:34
Method: 6010B
File ID: P2.092007.083406
Analvst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 20-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -.0355 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -.0000237 | 1 | U |
| Calcium | 0.100 | 0.200 | .0105 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -.000248 | 1 | U |
| Iron | 0.0250 | 0.100 | -.0144 | 1 | U |
| Potassium | 0.250 | 1.00 | .0504 | 1 | U |
| Magnesium | 0.250 | 0.500 | -.0484 | 1 | U |
| Sodium | 0.250 | 0.500 | .00525 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -.000754 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -.00258 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

# INITIAL CALIBRATION BLANK (ICB)

00071632

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250358-07
Instrument ID: PE-ICP2
Run Time: 09:02
Method: 6010B
File ID: P2.091807.090231
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 18-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -.048 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -.000294 | 1 | U |
| Calcium | 0.100 | 0.200 | -.0455 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -.00112 | 1 | U |
| Iron | 0.0250 | 0.100 | -.0122 | 1 | U |
| Potassium | 0.250 | 1.00 | .0886 | 1 | U |
| Magnesium | 0.250 | 0.500 | -.0277 | 1 | U |
| Sodium | 0.250 | 0.500 | .0137 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -.00446 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -.00896 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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Report generated 09/20/2007 11:26

# INITIAL CALIBRATION BLANK (ICB)

00071633

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-07
Instrument ID: PE-ICP2
Run Time: 09:33
Method: 6010B
File ID: P2.091407.093346
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -.0173 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | .000029 | 1 | U |
| Calcium | 0.100 | 0.200 | .0378 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -.000137 | 1 | U |
| Iron | 0.0250 | 0.100 | -.00545 | 1 | U |
| Potassium | 0.250 | 1.00 | .0402 | 1 | U |
| Magnesium | 0.250 | 0.500 | -.0077 | 1 | U |
| Sodium | 0.250 | 0.500 | .0196 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | .00141 | 1 | U |
| Zinc | 0.00500 | 0.0200 | .000302 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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Report generated 09/20/2007 11:26

KEMRON Environmental Services

INITIAL CALIBRATION BLANK (ICB)

00071634

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250264-07
Instrument ID: PE-ICP2
Run Time: 08:51
Method: 6010B
File ID: P2.091707.085130
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -.0256 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | .00000803 | 1 | U |
| Calcium | 0.100 | 0.200 | .0595 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -.0000636 | 1 | U |
| Iron | 0.0250 | 0.100 | -.00466 | 1 | U |
| Potassium | 0.250 | 1.00 | .0957 | 1 | U |
| Magnesium | 0.250 | 0.500 | -.00418 | 1 | U |
| Sodium | 0.250 | 0.500 | .0172 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | .0012 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -.00259 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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Version 1.5 PDF File ID: 876096
Report generated 09/20/2007 11:26

# CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-01
00071635
Instrument ID: PE-ICP2
Run Time: 09:57
Method: 6010B
File ID: P2.091407.095700
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0122 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | 0.0000210 | 1 | U |
| Calcium | 0.100 | 0.200 | -0.0167 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000285 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00371 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0454 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.00622 | 1 | U |
| Sodium | 0.250 | 0.500 | -0.00512 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.00106 | 1 | U |
| Zinc | 0.00500 | 0.0200 | 0.000466 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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## CONTINUING CALIBRATION BLANK (CCB)

00071636

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-21
Instrument ID: PE-ICP2
Run Time: 15:18
Method: 6010B
File ID: P2.091407.151842
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.00867 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.0000423 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0134 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000387 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00350 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0244 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.00275 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.0374 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.00208 | 1 | U |
| Zinc | 0.00500 | 0.0200 | 0.000368 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

00071637

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-08
Instrument ID: PE-ICP2
Run Time: 16:29
Method: 6010B
File ID: P2.091407.162909
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0122 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | 0.00000698 | 1 | U |
| Calcium | 0.100 | 0.200 | -0.00619 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000306 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00334 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0719 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.00761 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.0883 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.000361 | 1 | U |
| Zinc | 0.00500 | 0.0200 | 0.000167 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

# CONTINUING CALIBRATION BLANK (CCB)



Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-05
Instrument ID: PE-ICP2
Run Time: 17:45
Method: 6010B
File ID: P2.091407.174517
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.00902 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.00000912 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.00698 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000354 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.000448 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.184 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0129 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.399 | 1 | F |
| Vanadium | 0.00500 | 0.0100 | 0.00119 | 1 | U |
| Zinc | 0.00500 | 0.0200 | 0.00897 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

# CONTINUING CALIBRATION BLANK (CCB)

00071639

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-07
Instrument ID: PE-ICP2
Run Time: 18:36
Method: 6010B
File ID: P2.091407.183607
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0103 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.0000457 | 1 | U |
| Calcium | 0.100 | 0.200 | -0.0367 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000560 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00398 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.104 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.00813 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.258 | 1 | F |
| Vanadium | 0.00500 | 0.0100 | 0.00236 | 1 | U |
| Zinc | 0.00500 | 0.0200 | 0.00205 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0709261 Run Date: 09/17/2007 Sample ID: WG250264-10 00071640
Instrument ID: PE-ICP2 Run Time: 09:16 Method: 6010B
File ID: P2.091707.091612 Analyst: KHR Units: mg/L
Workgroup (AAB#): WG250152 Cal ID: PE-ICP - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0242 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.0000165 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.00514 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000326 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00323 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0697 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.00421 | 1 | U |
| Sodium | 0.250 | 0.500 | -0.000778 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.00102 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00254 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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## CONTINUING CALIBRATION BLANK (CCB)

00071641

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250264-07
Instrument ID: PE-ICP2
Run Time: 12:32
Method: 6010B
File ID: P2.091707.123253
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0319 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | 0.000114 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0608 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.0000106 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00850 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0645 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.00370 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.0135 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.000247 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00231 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

00071642

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250264-19
Instrument ID: PE-ICP2
Run Time: 13:54
Method: 6010B
File ID: P2.091707.135442
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0238 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | 0.0000534 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0554 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | 0.0000460 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00734 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0983 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0111 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.113 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.00128 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.000463 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

00071643

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250264-01
Instrument ID: PE-ICP2
Run Time: 15:04
Method: 6010B
File ID: P2.091707.150454
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0245 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | 0.0000376 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0473 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000131 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00878 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0665 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.00699 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.0410 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.00147 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00227 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

## CONTINUING CALIBRATION BLANK (CCB)

00071644

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250358-11
Instrument ID: PE-ICP2
Run Time: 09:25
Method: 6010B
File ID: P2.091807.092556
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 18-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0503 | 1 | F |
| Beryllium | 0.000500 | 0.00200 | -0.000278 | 1 | U |
| Calcium | 0.100 | 0.200 | -0.0368 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.00117 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00820 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0608 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0357 | 1 | U |
| Sodium | 0.250 | 0.500 | -0.00266 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -0.00492 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00896 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)



Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250358-19
Instrument ID: PE-ICP2
Run Time: 14:16
Method: 6010B
File ID: P2.091807.141615
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 18-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0419 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.000266 | 1 | U |
| Calcium | 0.100 | 0.200 | -0.0511 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.00113 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00990 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0648 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0212 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.0250 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -0.00486 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00933 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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KEMRON Environmental Services

CONTINUING CALIBRATION BLANK (CCB)

00071646

Login Number: L0709261 | Run Date: 09/18/2007 | Sample ID: WG250358-21
Instrument ID: PE-ICP2 | Run Time: 15:32 | Method: 6010B
File ID: P2.091807.153234 | Analyst: KHR | Units: mg/L
Workgroup (AAB#): WG250289 | Cal ID: PE-ICP - 18-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0457 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.000293 | 1 | U |
| Calcium | 0.100 | 0.200 | -0.00165 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.00135 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00800 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.128 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0337 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.0827 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -0.00618 | 1 | F |
| Zinc | 0.00500 | 0.0200 | -0.00923 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

00071647

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250358-08
Instrument ID: PE-ICP2
Run Time: 16:23
Method: 6010B
File ID: P2.091807.162320
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 18-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0498 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.000248 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.00578 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.00106 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.0100 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.154 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0355 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.300 | 1 | F |
| Vanadium | 0.00500 | 0.0100 | -0.00608 | 1 | F |
| Zinc | 0.00500 | 0.0200 | -0.00930 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250490-11
00071648
Instrument ID: PE-ICP2
Run Time: 09:34
Method: 6010B
File ID: P2.091907.093424
Analyst: KRV
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0191 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.0000310 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0294 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000129 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.000893 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0522 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0220 | 1 | U |
| Sodium | 0.250 | 0.500 | -0.00284 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -0.0000513 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00233 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)



Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250490-10
Instrument ID: PE-ICP2
Run Time: 13:02
Method: 6010B
File ID: P2.091907.130257
Analyst: KRV
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0258 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.0000143 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0228 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.0000312 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00211 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0516 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0232 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.0353 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.000271 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00253 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0709261 Run Date: 09/19/2007 Sample ID: WG250490-01 00071650
Instrument ID: PE-ICP2 Run Time: 14:20 Method: 6010B
File ID: P2.091907.142045 Analyst: KRV Units: mg/L
Workgroup (AAB#): WG250289 Cal ID: PE-ICP - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0205 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.0000563 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0861 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000215 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00408 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0586 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0283 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.105 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -0.000626 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00267 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

00071651

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250490-28
Instrument ID: PE-ICP2
Run Time: 15:11
Method: 6010B
File ID: P2.091907.151123
Analyst: KRV
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0181 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.0000544 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0120 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.0000746 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.00592 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.109 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0216 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.123 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -0.0000445 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00261 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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## CONTINUING CALIBRATION BLANK (CCB)

00071652

Login Number: L0709261
Run Date: 09/20/2007
Sample ID: WG250563-[illegible]
Instrument ID: PE-ICP2
Run Time: 08:58
Method: 6010B
File ID: P2.092007.085820
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 20-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0369 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | -0.0000143 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.0269 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.0000990 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.0148 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0206 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0402 | 1 | U |
| Sodium | 0.250 | 0.500 | -0.0314 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | 0.0000523 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00261 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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## CONTINUING CALIBRATION BLANK (CCB)



Login Number: L0709261
Run Date: 09/20/2007
Sample ID: WG250563-18
Instrument ID: PE-ICP2
Run Time: 10:25
Method: 6010B
File ID: P2.092007.102546
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 20-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Aluminum | 0.0500 | 0.100 | -0.0359 | 1 | U |
| Beryllium | 0.000500 | 0.00200 | 0.0000257 | 1 | U |
| Calcium | 0.100 | 0.200 | 0.00421 | 1 | U |
| Cobalt | 0.00250 | 0.00500 | -0.000113 | 1 | U |
| Iron | 0.0250 | 0.100 | -0.0150 | 1 | U |
| Potassium | 0.250 | 1.00 | 0.0222 | 1 | U |
| Magnesium | 0.250 | 0.500 | -0.0446 | 1 | U |
| Sodium | 0.250 | 0.500 | 0.00870 | 1 | U |
| Vanadium | 0.00500 | 0.0100 | -0.00111 | 1 | U |
| Zinc | 0.00500 | 0.0200 | -0.00283 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# INITIAL CALIBRATION VERIFICATION (ICV)

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-06
Instrument ID: PE-ICP2
Run Time: 09:27
Method: 6010B
File ID: P2.091407.092729
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07
QC Key: STD

00071654

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Aluminum | | 10 | 9.94 | 99.4 | 90 - 110 | |
| Beryllium | | .05 | 0.0487 | 97.5 | 90 - 110 | |
| Calcium | | 10 | 10.2 | 102 | 90 - 110 | |
| Cobalt | | .2 | 0.197 | 98.6 | 90 - 110 | |
| Iron | | 4 | 4.13 | 103 | 90 - 110 | |
| Potassium | | 50 | 49.5 | 99.0 | 90 - 110 | |
| Magnesium | | 10 | 10.1 | 101 | 90 - 110 | |
| Sodium | | 50 | 49.1 | 98.2 | 90 - 110 | |
| Vanadium | | 1 | 0.958 | 95.8 | 90 - 110 | |
| Zinc | | 1 | 0.998 | 99.8 | 90 - 110 | |

* Exceeds LIMITS Limit

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Version 1.5 PDF File ID: 876095
Report generated 09/20/2007 11:26

## INITIAL CALIBRATION VERIFICATION (ICV)

00071655

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250264-06
Instrument ID: PE-ICP2
Run Time: 08:45
Method: 6010B
File ID: P2.091707.084510
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 17-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Aluminum | | 10 | 10.0 | 100 | 90 - 110 | |
| Beryllium | | .05 | 0.0499 | 99.7 | 90 - 110 | |
| Calcium | | 10 | 10.4 | 104 | 90 - 110 | |
| Cobalt | | .2 | 0.200 | 99.9 | 90 - 110 | |
| Iron | | 4 | 4.00 | 99.9 | 90 - 110 | |
| Potassium | | 50 | 49.5 | 98.9 | 90 - 110 | |
| Magnesium | | 10 | 9.79 | 97.9 | 90 - 110 | |
| Sodium | | 50 | 49.2 | 98.4 | 90 - 110 | |
| Vanadium | | 1 | 0.981 | 98.1 | 90 - 110 | |
| Zinc | | 1 | 1.02 | 102 | 90 - 110 | |

* Exceeds LIMITS Limit

KEMRON FORMS - Modified 09/06/2007 (ICV)
Version 1.5 PDF File ID: 876095
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# INITIAL CALIBRATION VERIFICATION (ICV)

Login Number: L0709261
Run Date: 09/20/2007
Sample ID: WG250563-06
00071656
Instrument ID: PE-ICP2
Run Time: 08:27
Method: 6010B
File ID: P2.092007.082742
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 20-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Aluminum | | 10 | 10.0 | 100 | 90 - 110 | |
| Beryllium | | .05 | 0.0490 | 97.9 | 90 - 110 | |
| Calcium | | 10 | 10.3 | 103 | 90 - 110 | |
| Cobalt | | .2 | 0.199 | 99.7 | 90 - 110 | |
| Iron | | 4 | 3.99 | 99.8 | 90 - 110 | |
| Potassium | | 50 | 49.2 | 98.5 | 90 - 110 | |
| Magnesium | | 10 | 9.83 | 98.3 | 90 - 110 | |
| Sodium | | 50 | 48.6 | 97.2 | 90 - 110 | |
| Vanadium | | 1 | 0.968 | 96.8 | 90 - 110 | |
| Zinc | | 1 | 1.01 | 101 | 90 - 110 | |

* Exceeds LIMITS Limit

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# INITIAL CALIBRATION VERIFICATION (ICV)

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250358-06
00071657
Instrument ID: PE-ICP2
Run Time: 08:56
Method: 6010B
File ID: P2.091807.085608
Analyst: KHR
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 18-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Aluminum | | 10 | 10.0 | 100 | 90 - 110 | |
| Beryllium | | .05 | 0.0498 | 99.6 | 90 - 110 | |
| Calcium | | 10 | 10.3 | 103 | 90 - 110 | |
| Cobalt | | .2 | 0.199 | 99.7 | 90 - 110 | |
| Iron | | 4 | 4.09 | 102 | 90 - 110 | |
| Potassium | | 50 | 49.0 | 98.1 | 90 - 110 | |
| Magnesium | | 10 | 10.1 | 101 | 90 - 110 | |
| Sodium | | 50 | 48.5 | 97.0 | 90 - 110 | |
| Vanadium | | 1 | 0.976 | 97.6 | 90 - 110 | |
| Zinc | | 1 | 1.01 | 101 | 90 - 110 | |

* Exceeds LIMITS Limit

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# INITIAL CALIBRATION VERIFICATION (ICV)

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250490-06 00071658
Instrument ID: PE-ICP2
Run Time: 09:03
Method: 6010B
File ID: P2.091907.090320
Analyst: KRV
Units: mg/L
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 19-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Aluminum | | 10 | 10.3 | 103 | 90 - 110 | |
| Beryllium | | .05 | 0.0501 | 100 | 90 - 110 | |
| Calcium | | 10 | 10.4 | 104 | 90 - 110 | |
| Cobalt | | .2 | 0.203 | 101 | 90 - 110 | |
| Iron | | 4 | 4.20 | 105 | 90 - 110 | |
| Potassium | | 50 | 50.9 | 102 | 90 - 110 | |
| Magnesium | | 10 | 10.3 | 103 | 90 - 110 | |
| Sodium | | 50 | 50.5 | 101 | 90 - 110 | |
| Vanadium | | 1 | 0.990 | 99.0 | 90 - 110 | |
| Zinc | | 1 | 1.02 | 102 | 90 - 110 | |

* Exceeds LIMITS Limit

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# CONTINUING CALIBRATION VERIFICATION (CCV)

00071659

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-10
Instrument ID: PE-ICP2
Run Time: 09:50
Method: 6010B
File ID: P2.091407.095043
Analyst: KHR
QC Key: STD
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 9.88 | mg/L | 98.8 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0491 | mg/L | 98.2 | 90 - 110 | | |
| Calcium | | 10.0 | 10.2 | mg/L | 102 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.199 | mg/L | 99.3 | 90 - 110 | | |
| Iron | | 4.00 | 4.19 | mg/L | 105 | 90 - 110 | | |
| Potassium | | 50.0 | 49.2 | mg/L | 98.4 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Sodium | | 50.0 | 48.9 | mg/L | 97.8 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.970 | mg/L | 97.0 | 90 - 110 | | |
| Zinc | | 1.00 | 1.01 | mg/L | 101 | 90 - 110 | | |

* Exceeds LIMITS Criteria

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CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-20
00071660
Instrument ID: PE-ICP2
Run Time: 15:12
Method: 6010B
File ID: P2.091407.151225
Analyst: KHR
QC Key: STD
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0498 | mg/L | 99.6 | 90 - 110 | | |
| Calcium | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.199 | mg/L | 99.7 | 90 - 110 | | |
| Iron | | 4.00 | 4.22 | mg/L | 106 | 90 - 110 | | |
| Potassium | | 50.0 | 50.3 | mg/L | 101 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Sodium | | 50.0 | 50.7 | mg/L | 101 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.982 | mg/L | 98.2 | 90 - 110 | | |
| Zinc | | 1.00 | 1.02 | mg/L | 102 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
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CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 Run Date: 09/14/2007 Sample ID: WG250147-02 00071661
Instrument ID: PE-ICP2 Run Time: 16:22 Method: 6010B
File ID: P2.091407.162251 Analyst: KHR QC Key: STD
Workgroup (AAB#): WG250152 Cal ID: PE-ICP - 14-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0493 | mg/L | 98.6 | 90 - 110 | | |
| Calcium | | 10.0 | 10.2 | mg/L | 102 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.200 | mg/L | 100 | 90 - 110 | | |
| Iron | | 4.00 | 4.35 | mg/L | 109 | 90 - 110 | | |
| Potassium | | 50.0 | 50.4 | mg/L | 101 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.6 | mg/L | 106 | 90 - 110 | | |
| Sodium | | 50.0 | 50.9 | mg/L | 102 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.972 | mg/L | 97.2 | 90 - 110 | | |
| Zinc | | 1.00 | 1.01 | mg/L | 101 | 90 - 110 | | |

* Exceeds LIMITS Criteria

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250147-24
00071662
Instrument ID: PE-ICP2
Run Time: 17:38
Method: 6010B
File ID: P2.091407.173858
Analyst: KHR
QC Key: STD
Workgroup (AAB#): WG250152
Cal ID: PE-ICP - 14-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0492 | mg/L | 98.4 | 90 - 110 | | |
| Calcium | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.200 | mg/L | 99.9 | 90 - 110 | | |
| Iron | | 4.00 | 4.32 | mg/L | 108 | 90 - 110 | | |
| Potassium | | 50.0 | 50.6 | mg/L | 101 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.5 | mg/L | 105 | 90 - 110 | | |
| Sodium | | 50.0 | 51.5 | mg/L | 103 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.967 | mg/L | 96.7 | 90 - 110 | | |
| Zinc | | 1.00 | 1.03 | mg/L | 103 | 90 - 110 | | |

* Exceeds LIMITS Criteria

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## CONTINUING CALIBRATION VERIFICATION (CCV)

00071663

| | | |
|---|---|---|
| Login Number: L0709261 | Run Date: 09/14/2007 | Sample ID: WG250147-26 |
| Instrument ID: PE-ICP2 | Run Time: 18:29 | Method: 6010B |
| File ID: P2.091407.182946 | Analyst: KHR | QC Key: STD |
| Workgroup (AAB#): WG250152 | Cal ID: PE-ICP - 14-SEP-07 | |

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0501 | mg/L | 100 | 90 - 110 | | |
| Calcium | | 10.0 | 10.4 | mg/L | 104 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.203 | mg/L | 102 | 90 - 110 | | |
| Iron | | 4.00 | 4.31 | mg/L | 108 | 90 - 110 | | |
| Potassium | | 50.0 | 50.7 | mg/L | 101 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.4 | mg/L | 104 | 90 - 110 | | |
| Sodium | | 50.0 | 51.6 | mg/L | 103 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.994 | mg/L | 99.4 | 90 - 110 | | |
| Zinc | | 1.00 | 1.04 | mg/L | 104 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

## CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 Run Date: 09/17/2007 Sample ID: WG250264-10 00071664

Instrument ID: PE-ICP2 Run Time: 09:09 Method: 6010B

File ID: P2.091707.090918 Analyst: KHR QC Key: STD

Workgroup (AAB#): WG250152 Cal ID: PE-ICP - 17-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.2 | mg/L | 102 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0502 | mg/L | 100 | 90 - 110 | | |
| Calcium | | 10.0 | 10.5 | mg/L | 105 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.202 | mg/L | 101 | 90 - 110 | | |
| Iron | | 4.00 | 4.04 | mg/L | 101 | 90 - 110 | | |
| Potassium | | 50.0 | 49.9 | mg/L | 99.8 | 90 - 110 | | |
| Magnesium | | 10.0 | 9.89 | mg/L | 98.9 | 90 - 110 | | |
| Sodium | | 50.0 | 49.4 | mg/L | 98.8 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.990 | mg/L | 99.0 | 90 - 110 | | |
| Zinc | | 1.00 | 1.03 | mg/L | 103 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
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# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 Run Date: 09/17/2007 Sample ID: WG250264-06 00071665
Instrument ID: PE-ICP2 Run Time: 12:26 Method: 6010B
File ID: P2.091707.122636 Analyst: KHR QC Key: STD
Workgroup (AAB#): WG250152 Cal ID: PE-ICP - 17-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0502 | mg/L | 100 | 90 - 110 | | |
| Calcium | | 10.0 | 10.6 | mg/L | 106 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.206 | mg/L | 103 | 90 - 110 | | |
| Iron | | 4.00 | 3.94 | mg/L | 98.6 | 90 - 110 | | |
| Potassium | | 50.0 | 50.5 | mg/L | 101 | 90 - 110 | | |
| Magnesium | | 10.0 | 9.66 | mg/L | 96.6 | 90 - 110 | | |
| Sodium | | 50.0 | 49.3 | mg/L | 98.5 | 90 - 110 | | |
| Vanadium | | 1.00 | 1.00 | mg/L | 100 | 90 - 110 | | |
| Zinc | | 1.00 | 1.04 | mg/L | 104 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Instrument ID: PE-ICP2
File ID: P2.091707.134816
Workgroup (AAB#): WG250152

Run Date: 09/17/2007
Run Time: 13:48
Analyst: KHR
Cal ID: PE-ICP - 17-SEP-07

Sample ID: WG250264-18
Method: 6010B
QC Key: STD

00071666

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.4 | mg/L | 104 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0515 | mg/L | 103 | 90 - 110 | | |
| Calcium | | 10.0 | 10.8 | mg/L | 108 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.211 | mg/L | 105 | 90 - 110 | | |
| Iron | | 4.00 | 4.00 | mg/L | 99.9 | 90 - 110 | | |
| Potassium | | 50.0 | 50.8 | mg/L | 102 | 90 - 110 | | |
| Magnesium | | 10.0 | 9.82 | mg/L | 98.2 | 90 - 110 | | |
| Sodium | | 50.0 | 49.5 | mg/L | 99.0 | 90 - 110 | | |
| Vanadium | | 1.00 | 1.01 | mg/L | 101 | 90 - 110 | | |
| Zinc | | 1.00 | 1.07 | mg/L | 107 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 Run Date: 09/17/2007 Sample ID: WG250264-20 00071667

Instrument ID: PE-ICP2 Run Time: 14:58 Method: 6010B

File ID: P2.091707.145834 Analyst: KHR QC Key: STD

Workgroup (AAB#): WG250152 Cal ID: PE-ICP - 17-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.5 | mg/L | 105 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0524 | mg/L | 105 | 90 - 110 | | |
| Calcium | | 10.0 | 10.8 | mg/L | 108 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.209 | mg/L | 105 | 90 - 110 | | |
| Iron | | 4.00 | 3.96 | mg/L | 99.0 | 90 - 110 | | |
| Potassium | | 50.0 | 51.0 | mg/L | 102 | 90 - 110 | | |
| Magnesium | | 10.0 | 9.73 | mg/L | 97.3 | 90 - 110 | | |
| Sodium | | 50.0 | 49.7 | mg/L | 99.4 | 90 - 110 | | |
| Vanadium | | 1.00 | 1.02 | mg/L | 102 | 90 - 110 | | |
| Zinc | | 1.00 | 1.08 | mg/L | 108 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071668

Login Number: L0709261
Instrument ID: PE-ICP2
File ID: P2.091807.091939
Workgroup (AAB#): WG250289

Run Date: 09/18/2007
Run Time: 09:19
Analyst: KHR
Cal ID: PE-ICP - 18-SEP-07

Sample ID: WG250358-10
Method: 6010B
QC Key: STD

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0502 | mg/L | 100 | 90 - 110 | | |
| Calcium | | 10.0 | 10.4 | mg/L | 104 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.203 | mg/L | 102 | 90 - 110 | | |
| Iron | | 4.00 | 4.19 | mg/L | 105 | 90 - 110 | | |
| Potassium | | 50.0 | 49.9 | mg/L | 99.7 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Sodium | | 50.0 | 49.4 | mg/L | 98.8 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.984 | mg/L | 98.4 | 90 - 110 | | |
| Zinc | | 1.00 | 1.02 | mg/L | 102 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 | Run Date: 09/18/2007 | Sample ID: WG250358-03 | 00071669
Instrument ID: PE-ICP2 | Run Time: 14:09 | Method: 6010B
File ID: P2.091807.140954 | Analyst: KHR | QC Key: STD
Workgroup (AAB#): WG250289 | Cal ID: PE-ICP - 18-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.2 | mg/L | 102 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0505 | mg/L | 101 | 90 - 110 | | |
| Calcium | | 10.0 | 10.5 | mg/L | 105 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.204 | mg/L | 102 | 90 - 110 | | |
| Iron | | 4.00 | 4.06 | mg/L | 102 | 90 - 110 | | |
| Potassium | | 50.0 | 49.9 | mg/L | 99.7 | 90 - 110 | | |
| Magnesium | | 10.0 | 9.96 | mg/L | 99.6 | 90 - 110 | | |
| Sodium | | 50.0 | 49.0 | mg/L | 98.0 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.988 | mg/L | 98.8 | 90 - 110 | | |
| Zinc | | 1.00 | 1.03 | mg/L | 103 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071670

Login Number: L0709261 | Run Date: 09/18/2007 | Sample ID: WG250358-20
Instrument ID: PE-ICP2 | Run Time: 15:26 | Method: 6010B
File ID: P2.091807.152617 | Analvst: KHR | QC Key: STD
Workgroup (AAB#): WG250289 | Cal ID: PE-ICP - 18-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0515 | mg/L | 103 | 90 - 110 | | |
| Calcium | | 10.0 | 10.5 | mg/L | 105 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.206 | mg/L | 103 | 90 - 110 | | |
| Iron | | 4.00 | 4.01 | mg/L | 100 | 90 - 110 | | |
| Potassium | | 50.0 | 50.1 | mg/L | 100 | 90 - 110 | | |
| Magnesium | | 10.0 | 9.84 | mg/L | 98.4 | 90 - 110 | | |
| Sodium | | 50.0 | 49.4 | mg/L | 98.7 | 90 - 110 | | |
| Vanadium | | 1.00 | 1.00 | mg/L | 100 | 90 - 110 | | |
| Zinc | | 1.00 | 1.05 | mg/L | 105 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 | Run Date: 09/18/2007 | Sample ID: WG250358-02 00071671
Instrument ID: PE-ICP2 | Run Time: 16:17 | Method: 6010B
File ID: P2.091807.161702 | Analyst: KHR | QC Key: STD
Workgroup (AAB#): WG250289 | Cal ID: PE-ICP - 18-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.2 | mg/L | 102 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0520 | mg/L | 104 | 90 - 110 | | |
| Calcium | | 10.0 | 10.5 | mg/L | 105 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.206 | mg/L | 103 | 90 - 110 | | |
| Iron | | 4.00 | 4.09 | mg/L | 102 | 90 - 110 | | |
| Potassium | | 50.0 | 49.9 | mg/L | 99.8 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.0 | mg/L | 100 | 90 - 110 | | |
| Sodium | | 50.0 | 49.6 | mg/L | 99.3 | 90 - 110 | | |
| Vanadium | | 1.00 | 1.01 | mg/L | 101 | 90 - 110 | | |
| Zinc | | 1.00 | 1.06 | mg/L | 106 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

## CONTINUING CALIBRATION VERIFICATION (CCV)

00071672

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250490-10
Instrument ID: PE-ICP2
Run Time: 09:27
Method: 6010B
File ID: P2.091907.092757
Analyst: KRV
QC Key: STD
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 19-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0508 | mg/L | 102 | 90 - 110 | | |
| Calcium | | 10.0 | 10.5 | mg/L | 105 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.204 | mg/L | 102 | 90 - 110 | | |
| Iron | | 4.00 | 4.18 | mg/L | 104 | 90 - 110 | | |
| Potassium | | 50.0 | 50.9 | mg/L | 102 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.2 | mg/L | 102 | 90 - 110 | | |
| Sodium | | 50.0 | 50.3 | mg/L | 101 | 90 - 110 | | |
| Vanadium | | 1.00 | 1.00 | mg/L | 100 | 90 - 110 | | |
| Zinc | | 1.00 | 1.04 | mg/L | 104 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250490-18
00071673
Instrument ID: PE-ICP2
Run Time: 12:55
Method: 6010B
File ID: P2.091907.125551
Analvst: KRV
QC Key: STD
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 19-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0503 | mg/L | 101 | 90 - 110 | | |
| Calcium | | 10.0 | 10.4 | mg/L | 104 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.202 | mg/L | 101 | 90 - 110 | | |
| Iron | | 4.00 | 4.11 | mg/L | 103 | 90 - 110 | | |
| Potassium | | 50.0 | 50.9 | mg/L | 102 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Sodium | | 50.0 | 50.5 | mg/L | 101 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.991 | mg/L | 99.1 | 90 - 110 | | |
| Zinc | | 1.00 | 1.03 | mg/L | 103 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

CONTINUING CALIBRATION VERIFICATION (CCV)



Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250490-20
Instrument ID: PE-ICP2
Run Time: 14:14
Method: 6010B
File ID: P2.091907.141421
Analyst: KRV
QC Key: STD
Workgroup (AAB#): WG250289
Cal ID: PE-ICP - 19-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0515 | mg/L | 103 | 90 - 110 | | |
| Calcium | | 10.0 | 10.5 | mg/L | 105 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.207 | mg/L | 104 | 90 - 110 | | |
| Iron | | 4.00 | 4.07 | mg/L | 102 | 90 - 110 | | |
| Potassium | | 50.0 | 51.1 | mg/L | 102 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.0 | mg/L | 100 | 90 - 110 | | |
| Sodium | | 50.0 | 50.5 | mg/L | 101 | 90 - 110 | | |
| Vanadium | | 1.00 | 1.01 | mg/L | 101 | 90 - 110 | | |
| Zinc | | 1.00 | 1.06 | mg/L | 106 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071675

Login Number: L0709261 Run Date: 09/19/2007 Sample ID: WG250490-02
Instrument ID: PE-ICP2 Run Time: 15:05 Method: 6010B
File ID: P2.091907.150505 Analyst: KRV QC Key: STD
Workgroup (AAB#): WG250289 Cal ID: PE-ICP - 19-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.4 | mg/L | 104 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0530 | mg/L | 106 | 90 - 110 | | |
| Calcium | | 10.0 | 10.7 | mg/L | 107 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.210 | mg/L | 105 | 90 - 110 | | |
| Iron | | 4.00 | 4.12 | mg/L | 103 | 90 - 110 | | |
| Potassium | | 50.0 | 51.2 | mg/L | 102 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Sodium | | 50.0 | 50.7 | mg/L | 101 | 90 - 110 | | |
| Vanadium | | 1.00 | 1.04 | mg/L | 104 | 90 - 110 | | |
| Zinc | | 1.00 | 1.09 | mg/L | 109 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 Run Date: 09/20/2007 Sample ID: WG250563-10 00071676
Instrument ID: PE-ICP2 Run Time: 08:51 Method: 6010B
File ID: P2.092007.085150 Analyst: KHR QC Key: STD
Workgroup (AAB#): WG250289 Cal ID: PE-ICP - 20-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0499 | mg/L | 99.7 | 90 - 110 | | |
| Calcium | | 10.0 | 10.3 | mg/L | 103 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.199 | mg/L | 99.3 | 90 - 110 | | |
| Iron | | 4.00 | 4.11 | mg/L | 103 | 90 - 110 | | |
| Potassium | | 50.0 | 49.6 | mg/L | 99.2 | 90 - 110 | | |
| Magnesium | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Sodium | | 50.0 | 49.1 | mg/L | 98.1 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.982 | mg/L | 98.2 | 90 - 110 | | |
| Zinc | | 1.00 | 1.03 | mg/L | 103 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 | Run Date: 09/20/2007 | Sample ID: WG250563-12 00071677

Instrument ID: PE-ICP2 | Run Time: 10:19 | Method: 6010B

File ID: P2.092007.101914 | Analvst: KHR | QC Key: STD

Workgroup (AAB#): WG250289 | Cal ID: PE-ICP - 20-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Aluminum | | 10.0 | 10.0 | mg/L | 100 | 90 - 110 | | |
| Beryllium | | 0.0500 | 0.0490 | mg/L | 97.9 | 90 - 110 | | |
| Calcium | | 10.0 | 10.1 | mg/L | 101 | 90 - 110 | | |
| Cobalt | | 0.200 | 0.195 | mg/L | 97.3 | 90 - 110 | | |
| Iron | | 4.00 | 3.95 | mg/L | 98.7 | 90 - 110 | | |
| Potassium | | 50.0 | 48.9 | mg/L | 97.8 | 90 - 110 | | |
| Magnesium | | 10.0 | 9.71 | mg/L | 97.1 | 90 - 110 | | |
| Sodium | | 50.0 | 48.5 | mg/L | 96.9 | 90 - 110 | | |
| Vanadium | | 1.00 | 0.959 | mg/L | 95.9 | 90 - 110 | | |
| Zinc | | 1.00 | 1.00 | mg/L | 100 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876098
Report generated 09/24/2007 11:18

# INTERFERENCE CHECK SAMPLES

00071678

**Login number:** L0709261
**Instrument ID:** PE-ICP2
**Sol. A :** WG250147-08 **File ID:** P2.091407.094001
**Sol. AB :** WG250147-09 **File ID:** P2.091407.094522

**Workgroup (AAB#):** WG250152
**Method:** 6010B
**Units:** mg/L

| | Sol. A | | | Sol. AB | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Aluminum | 250 | 247 | 98.8 | 250 | 242 | 96.8 | |
| Beryllium | NS | -0.000320 | NS | 0.250 | 0.249 | 99.6 | |
| Calcium | 250 | 254 | 102 | 250 | 257 | 103 | |
| Cobalt | NS | 0.000180 | NS | 0.250 | 0.230 | 92.0 | |
| Iron | 100 | 100 | 100 | 100 | 99.7 | 99.7 | |
| Magnesium | 250 | 253 | 101 | 250 | 251 | 100 | |
| Potassium | NS | -0.0795 | NS | 5.00 | 5.18 | 104 | |
| Sodium | NS | 0.0299 | NS | 5.00 | 5.19 | 104 | |
| Vanadium | NS | 0.00636 | NS | 0.250 | 0.255 | 102 | |
| Zinc | NS | 0.00691 | NS | 0.500 | 0.479 | 95.8 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

**KEMRON FORMS - Modified 03/05/2007**
**Version 1.3 PDF File ID: 876097**
**Report generated 09/20/2007 11:26**

# INTERFERENCE CHECK SAMPLES

00071679

**Login number:** L0709261
**Workgroup (AAB#):** WG250152
**Instrument ID:** PE-ICP2
**Method:** 6010B
**Sol. A :** WG250264-08 **File ID:** P2.091707.085757
**Units:** mg/L
**Sol. AB :** WG250264-09 **File ID:** P2.091707.090356

| | Sol. A | | | Sol. AB | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Aluminum | 250 | 249 | 99.6 | 250 | 243 | 97.2 | |
| Beryllium | NS | 0.000400 | NS | 0.250 | 0.251 | 100 | |
| Calcium | 250 | 267 | 107 | 250 | 261 | 104 | |
| Cobalt | NS | 0.000460 | NS | 0.250 | 0.234 | 93.6 | |
| Iron | 100 | 98.9 | 98.9 | 100 | 95.5 | 95.5 | |
| Magnesium | 250 | 250 | 100 | 250 | 241 | 96.4 | |
| Potassium | NS | -0.0657 | NS | 5.00 | 5.10 | 102 | |
| Sodium | NS | 0.0331 | NS | 5.00 | 5.15 | 103 | |
| Vanadium | NS | -0.00407 | NS | 0.250 | 0.247 | 98.8 | |
| Zinc | NS | 0.00461 | NS | 0.500 | 0.485 | 97.0 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

# INTERFERENCE CHECK SAMPLES

00071680

**Login number:** L0709261 **Workgroup (AAB#):** WG250289
**Instrument ID:** PE-ICP2 **Method:** 6010B
**Sol. A :** WG250358-08 **File ID:** P2.091807.090845 **Units:** mg/L
**Sol. AB :** WG250358-09 **File ID:** P2.091807.091413

| | Sol. A | | | Sol. AB | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Aluminum | 250 | 251 | 100 | 250 | 241 | 96.4 | |
| Beryllium | NS | 0.000430 | NS | 0.250 | 0.256 | 102 | |
| Calcium | 250 | 272 | 109 | 250 | 264 | 106 | |
| Cobalt | NS | -0.000640 | NS | 0.250 | 0.236 | 94.4 | |
| Iron | 100 | 98.9 | 98.9 | 100 | 97.4 | 97.4 | |
| Magnesium | 250 | 251 | 100 | 250 | 246 | 98.4 | |
| Potassium | NS | -0.0488 | NS | 5.00 | 5.06 | 101 | |
| Sodium | NS | 0.0385 | NS | 5.00 | 5.04 | 101 | |
| Vanadium | NS | -0.00596 | NS | 0.250 | 0.249 | 99.6 | |
| Zinc | NS | -0.00226 | NS | 0.500 | 0.485 | 97.0 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

00071681

**Login number:** L0709261 **Workgroup (AAB#):** WG250289
**Instrument ID:** PE-ICP2 **Method:** 6010B
**Sol. A :** WG250490-08 **File ID:** P2.091907.091659 **Units:** mg/L
**Sol. AB :** WG250490-09 **File ID:** P2.091907.092222

| | Sol. A | | | Sol. AB | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Aluminum | 250 | 249 | 99.6 | 250 | 245 | 98.0 | |
| Beryllium | NS | 0.000210 | NS | 0.250 | 0.251 | 100 | |
| Calcium | 250 | 262 | 105 | 250 | 258 | 103 | |
| Cobalt | NS | 0.0000900 | NS | 0.250 | 0.233 | 93.2 | |
| Iron | 100 | 99.1 | 99.1 | 100 | 97.5 | 97.5 | |
| Magnesium | 250 | 250 | 100 | 250 | 246 | 98.4 | |
| Potassium | NS | -0.0648 | NS | 5.00 | 5.24 | 105 | |
| Sodium | NS | 0.0292 | NS | 5.00 | 5.21 | 104 | |
| Vanadium | NS | -0.00155 | NS | 0.250 | 0.248 | 99.2 | |
| Zinc | NS | 0.00429 | NS | 0.500 | 0.483 | 96.6 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

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00071682

**Login number:** L0709261
**Workgroup (AAB#):** WG250289
**Instrument ID:** PE-ICP2
**Method:** 6010B
**Sol. A :** WG250563-08 **File ID:** P2.092007.084047
**Units:** mg/L
**Sol. AB :** WG250563-09 **File ID:** P2.092007.084625

| | **Sol. A** | | | **Sol. AB** | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Aluminum | 250 | 253 | 101 | 250 | 244 | 97.6 | |
| Beryllium | NS | 0.0000600 | NS | 0.250 | 0.250 | 100 | |
| Calcium | 250 | 266 | 106 | 250 | 264 | 106 | |
| Cobalt | NS | 0.000220 | NS | 0.250 | 0.234 | 93.6 | |
| Iron | 100 | 99.8 | 99.8 | 100 | 97.3 | 97.3 | |
| Magnesium | 250 | 254 | 102 | 250 | 246 | 98.4 | |
| Potassium | NS | -0.0293 | NS | 5.00 | 5.13 | 103 | |
| Sodium | NS | 0.0182 | NS | 5.00 | 5.06 | 101 | |
| Vanadium | NS | -0.000110 | NS | 0.250 | 0.253 | 101 | |
| Zinc | NS | 0.00429 | NS | 0.500 | 0.486 | 97.2 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

## INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071683

**Login Number:** L0709261 **Date:** 01/08/2007
**Insturment ID:** PE-ICP2 **Method:** 6010B

| Analyte | Wave Length | AG | AL | AS | B | BA |
|---|---|---|---|---|---|---|
| ALUMINUM | 396.15 | 0 | 0 | 0.206 | 0 | 0 |
| ANTIMONY | 206.84 | 0 | 0 | -0.740 | 0 | 0 |
| ARSENIC | 188.98 | 0 | 0.0237 | 0 | 0 | 0 |
| BARIUM | 233.53 | 0 | 0 | 0 | 0 | 0 |
| BERYLLIUM | 234.86 | 0 | 0 | 0 | 0 | 0 |
| BORON | 249.68 | 0 | 0 | 0 | 0 | 0 |
| CADMIUM | 228.80 | 0 | -0.000453 | 1.00 | 0 | 0 |
| CALCIUM | 227.55 | 0 | -0.370 | 0.0414 | 0 | 0 |
| CHROMIUM | 267.72 | 0 | 0 | 0 | 0 | 0 |
| COBALT | 228.62 | 0 | 0 | 0 | 0 | -0.0647 |
| COPPER | 327.39 | 0 | 0 | 0 | 0 | 0 |
| IRON | 239.56 | 0 | 0 | 0 | 0 | 0 |
| LEAD | 220.35 | 0 | -0.143 | 0 | 0 | 0 |
| LITHIUM | 670.78 | 0 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 279.08 | 0 | 0 | 0 | 0 | 0 |
| MANGANESE | 257.61 | -0.185 | 0 | -0.231 | -0.0949 | -0.230 |
| MOLYBDENUM | 202.03 | 0 | 0 | 0 | 0 | 0 |
| NICKEL | 231.60 | 0 | 0 | 0 | 0 | 0 |
| POTASSIUM | 766.49 | 0 | 0 | 0 | 0 | 0 |
| SELENIUM | 196.03 | 0 | 0.0416 | 0 | 0 | 0 |
| SILICON | 251.61 | 0 | 0 | 0 | 0 | 0 |
| SILVER | 328.07 | 0 | 0 | 0 | 0 | 0 |
| SODIUM | 589.59 | 0 | 0 | 0 | 0 | 0 |
| STRONTIUM | 407.77 | 0 | 0 | 0 | 0 | 0 |
| THALLIUM | 190.80 | 0 | 0 | 0 | 0 | 0 |
| TIN | 189.93 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.94 | 0 | 0 | 0 | 0 | 0 |
| VANADIUM | 290.88 | 0.504 | 0 | 0.200 | 0 | -0.130 |
| ZINC | 206.20 | 0 | 0 | 0 | 0 | 0 |

**KEMRON FORMS - Modified 02/14/2006**
**Version 1.5 PDF File ID:** 876093
**Report generated** 09/20/2007 11:26

## INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071684

**Login Number:** L0709261 **Date:** 01/08/2007
**Insturment ID:** PE-ICP2 **Method:** 6010B

| Analyte | Wave Length | BE | CA | CD | CO | CR |
|---|---|---|---|---|---|---|
| ALUMINUM | 396.15 | 0 | 0.274 | 0 | 0 | 0 |
| ANTIMONY | 206.84 | 0 | 0 | 0 | 0 | 19.8 |
| ARSENIC | 188.98 | 0 | -0.0104 | -0.0875 | 0 | -3.78 |
| BARIUM | 233.53 | 0 | 0 | 0 | 0 | 0 |
| BERYLLIUM | 234.86 | 0 | 0 | 0 | 0 | -0.0105 |
| BORON | 249.68 | 0 | 0.0238 | 50.1 | 3.51 | 1.50 |
| CADMIUM | 228.80 | 0 | 0 | 0 | -7.33 | 0 |
| CALCIUM | 227.55 | 0 | 0 | 0 | 174 | -21.8 |
| CHROMIUM | 267.72 | 0 | 0 | 0 | 0 | 0 |
| COBALT | 228.62 | 0 | 0 | 0 | 0 | 0.436 |
| COPPER | 327.39 | 0 | -0.0137 | 0 | 0.380 | -0.0467 |
| IRON | 239.56 | 0 | 0.0227 | 0 | 1.91 | 0.331 |
| LEAD | 220.35 | 0 | -0.0214 | 0 | 0.666 | -0.100 |
| LITHIUM | 670.78 | 0 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 279.08 | 0 | 0.638 | 0 | 0 | 0 |
| MANGANESE | 257.61 | -1.04 | -0.0173 | -0.755 | -0.0418 | -0.110 |
| MOLYBDENUM | 202.03 | 0 | 0 | 0 | 0 | 0 |
| NICKEL | 231.60 | 0 | 0 | 0 | 0.948 | 0 |
| POTASSIUM | 766.49 | 0 | 0 | 0 | 0 | 0 |
| SELENIUM | 196.03 | 0 | 0.0228 | 0 | -0.382 | 0 |
| SILICON | 251.61 | 0 | 0 | 0 | 0 | 0 |
| SILVER | 328.07 | 0 | 0 | 0 | 0 | 0 |
| SODIUM | 589.59 | 0 | 0 | 0 | 0 | 0 |
| STRONTIUM | 407.77 | 0 | 0 | 0 | 0 | 0 |
| THALLIUM | 190.80 | 0 | 0 | 0 | 2.97 | 0 |
| TIN | 189.93 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.94 | 0 | -0.0233 | 0 | 0 | 0.297 |
| VANADIUM | 290.88 | 0 | 0.00481 | 0 | 0 | 0 |
| ZINC | 206.20 | 0 | 0.00300 | 0 | 0 | -6.39 |

## INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071685

**Login Number:** L0709261 **Date:** 01/08/2007
**Insturment ID:** PE-ICP2 **Method:** 6010B

| Analyte | Wave Length | CU | FE | K | LI | MG |
|---|---|---|---|---|---|---|
| ALUMINUM | 396.15 | 0 | 0.108 | 0 | 0 | 0 |
| ANTIMONY | 206.84 | 0 | 0 | 0 | 0 | 0 |
| ARSENIC | 188.98 | 0 | -0.115 | 0 | 0 | 0.0133 |
| BARIUM | 233.53 | 0 | 0.0217 | 0 | 0 | 0 |
| BERYLLIUM | 234.86 | 0 | 0.171 | 0 | 0 | 0 |
| BORON | 249.68 | 0 | -4.09 | 0 | 0 | 0 |
| CADMIUM | 228.80 | 0 | -0.00172 | 0 | 0 | 0 |
| CALCIUM | 227.55 | -2.44 | -8.15 | 0 | 0 | 0.104 |
| CHROMIUM | 267.72 | 0 | -0.0115 | 0 | 0 | 0 |
| COBALT | 228.62 | 0 | 0 | 0 | 0 | 0 |
| COPPER | 327.39 | 0 | -0.0550 | 0 | 0 | 0 |
| IRON | 239.56 | 0 | 0 | 0 | 0 | 0.0276 |
| LEAD | 220.35 | 0.341 | 0.0593 | 0 | 0 | 0 |
| LITHIUM | 670.78 | 0 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 279.08 | 0 | 0.174 | 0 | 0 | 0 |
| MANGANESE | 257.61 | -0.0457 | -0.0659 | -0.0181 | -0.794 | 0.0147 |
| MOLYBDENUM | 202.03 | 0 | -0.0342 | 0 | 11.9 | 0 |
| NICKEL | 231.60 | 0 | 0 | 0 | 0 | 0 |
| POTASSIUM | 766.49 | 0 | 0.831 | 0 | 0 | 0 |
| SELENIUM | 196.03 | 0 | -0.444 | 0 | 0 | 0.00120 |
| SILICON | 251.61 | 0 | 0 | 0 | 0 | 0 |
| SILVER | 328.07 | 0.0717 | -0.0541 | 0 | 0 | 0.00521 |
| SODIUM | 589.59 | 0 | 0 | 0 | 0 | 0 |
| STRONTIUM | 407.77 | 0 | -16.4 | 0 | 0 | 0 |
| THALLIUM | 190.80 | 0 | 0 | 0 | 0 | 0 |
| TIN | 189.93 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.94 | 0 | 0 | 0 | 0 | 0.0284 |
| VANADIUM | 290.88 | 0 | -0.0723 | 0 | 0 | -0.0542 |
| ZINC | 206.20 | -0.309 | 0.00450 | 0 | 0 | 0 |

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# INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071686

**Login Number:** L0709261 **Date:** 01/08/2007
**Insturment ID:** PE-ICP2 **Method:** 6010B

| Analyte | Wave Length | MN | MO | NA | NI | PB |
|---|---|---|---|---|---|---|
| ALUMINUM | 396.15 | 0 | 51.0 | 0 | 0 | 0 |
| ANTIMONY | 206.84 | 0 | -17.4 | 0 | 0 | 0 |
| ARSENIC | 188.98 | 0 | 3.15 | 0 | 0 | 0 |
| BARIUM | 233.53 | 0 | -0.740 | 0 | 0 | 0 |
| BERYLLIUM | 234.86 | -0.131 | -0.545 | 0 | -0.00974 | 0 |
| BORON | 249.68 | 0 | -2.08 | 0 | 0 | 0 |
| CADMIUM | 228.80 | 0 | 0 | 0 | -0.0660 | 0 |
| CALCIUM | 227.55 | 0 | -25.0 | 0 | -1100 | 0 |
| CHROMIUM | 267.72 | 0.554 | -0.0135 | 0 | 0 | 0 |
| COBALT | 228.62 | 0 | -0.668 | 0 | 0.129 | 0 |
| COPPER | 327.39 | 0 | -0.519 | 0 | -0.0905 | -0.0630 |
| IRON | 239.56 | -1.38 | 0 | 0 | 0 | 0 |
| LEAD | 220.35 | 0.232 | -2.35 | 0 | 0 | 0 |
| LITHIUM | 670.78 | 0 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 279.08 | 0 | -5.58 | 0 | 0 | 0.0252 |
| MANGANESE | 257.61 | 0 | -0.0482 | -0.00916 | -0.0340 | -0.0413 |
| MOLYBDENUM | 202.03 | -0.209 | 0 | 0 | 0.134 | 0 |
| NICKEL | 231.60 | 0 | 0 | 0 | 0 | 0 |
| POTASSIUM | 766.49 | 0 | 0 | 0.0278 | 0 | 0 |
| SELENIUM | 196.03 | 1.11 | 0.199 | 0 | -0.202 | 0 |
| SILICON | 251.61 | 0 | 12.9 | 0 | 0 | 0 |
| SILVER | 328.07 | 0.130 | 0.0781 | 0 | 0 | 0 |
| SODIUM | 589.59 | 0 | 0 | 0.181 | 0 | 0 |
| STRONTIUM | 407.77 | 0 | 0 | 0 | 0 | 0 |
| THALLIUM | 190.80 | -1.50 | 0.660 | 0 | 0 | 0 |
| TIN | 189.93 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.94 | 0 | 0 | 0 | 0 | 0 |
| VANADIUM | 290.88 | 0 | 0.578 | 0 | 0 | 0 |
| ZINC | 206.20 | 0 | 0 | 0 | -0.244 | -0.330 |

**INTERELEMENT CORRECTION FACTORS (ANNUALLY)**

00071687

**Login Number:** L0709261 **Date:** 01/08/2007
**Insturment ID:** PE-ICP2 **Method:** 6010B

| Analyte | Wave Length | SB | SE | SI | SN | SR |
|---|---|---|---|---|---|---|
| ALUMINUM | 396.15 | 0 | 0 | 0 | 0 | 0 |
| ANTIMONY | 206.84 | 0 | 0 | 0 | -7.64 | 0 |
| ARSENIC | 188.98 | 0 | 0 | 0 | 0 | 0 |
| BARIUM | 233.53 | 0 | 0 | 0 | 0 | 0 |
| BERYLLIUM | 234.86 | 0 | 0 | 0 | 0 | 0 |
| BORON | 249.68 | 0 | 0 | 0 | 0 | 0 |
| CADMIUM | 228.80 | 0 | 0 | 0 | 0 | 0 |
| CALCIUM | 227.55 | 0 | 0 | 2.79 | 0 | 0 |
| CHROMIUM | 267.72 | 0 | -0.0706 | 0 | 0 | 0 |
| COBALT | 228.62 | 0 | 0 | 0 | 0 | 0 |
| COPPER | 327.39 | 0 | 0 | 0 | 0 | 0 |
| IRON | 239.56 | 0 | 0 | 0 | 0 | 0 |
| LEAD | 220.35 | -0.117 | 0 | 0 | 0 | 0 |
| LITHIUM | 670.78 | 0 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 279.08 | 0 | -0.0924 | 0 | 0 | 0 |
| MANGANESE | 257.61 | -0.0505 | -0.0281 | -0.185 | -0.0445 | -0.625 |
| MOLYBDENUM | 202.03 | 0 | 0 | 0 | 0 | 0 |
| NICKEL | 231.60 | -0.288 | -0.262 | 0 | 0 | 0 |
| POTASSIUM | 766.49 | 0 | 0 | 0 | 0 | 0 |
| SELENIUM | 196.03 | 0 | 0 | 0 | 0 | 0 |
| SILICON | 251.61 | 0 | 0 | 0 | 0 | 0 |
| SILVER | 328.07 | 0 | 0 | 0 | 0 | 1.61 |
| SODIUM | 589.59 | 0 | 0 | 0 | 0 | 0 |
| STRONTIUM | 407.77 | 0 | 0 | 0 | 0 | 0 |
| THALLIUM | 190.80 | 0 | 0 | 0 | 0 | 0 |
| TIN | 189.93 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.94 | 0 | 0 | 0 | 0 | 0 |
| VANADIUM | 290.88 | 0 | 0 | 0 | 0 | 0 |
| ZINC | 206.20 | -0.420 | 0 | 0 | 0 | 0 |

INTERELEMENT CORRECTION FACTORS (ANNUALLY)

00071688

**Login Number:** L0709261 **Date:** 01/08/2007
**Insturment ID:** PE-ICP2 **Method:** 6010B

| Analyte | Wave Length | TI | TL | V | ZN |
|---|---|---|---|---|---|
| ALUMINUM | 396.15 | 0 | 0 | 0 | 0 |
| ANTIMONY | 206.84 | 0 | 0 | -3.59 | 0 |
| ARSENIC | 188.98 | 0 | 0 | 0.0930 | 0 |
| BARIUM | 233.53 | 0 | 0 | -2.27 | 0 |
| BERYLLIUM | 234.86 | 0 | 0 | 0 | 0 |
| BORON | 249.68 | 0 | 0 | 0 | 0 |
| CADMIUM | 228.80 | 0 | 0 | 0.0980 | 0 |
| CALCIUM | 227.55 | 0 | 0 | 11.3 | 0 |
| CHROMIUM | 267.72 | 0 | 0 | -0.605 | -0.0845 |
| COBALT | 228.62 | 2.07 | 0 | 0 | 0 |
| COPPER | 327.39 | -1.79 | 0 | -0.842 | -0.0613 |
| IRON | 239.56 | 0 | 0 | 0 | 0 |
| LEAD | 220.35 | -0.776 | 0 | -0.153 | 0 |
| LITHIUM | 670.78 | 0 | 0 | 0 | 0 |
| MAGNESIUM | 279.08 | 0 | 0 | -0.0280 | 0 |
| MANGANESE | 257.61 | -0.227 | -0.0414 | -0.0601 | -0.0553 |
| MOLYBDENUM | 202.03 | 0 | 0 | -0.288 | 0 |
| NICKEL | 231.60 | 0 | 0.286 | 0 | 0 |
| POTASSIUM | 766.49 | 0 | 0 | 0 | 0 |
| SELENIUM | 196.03 | 0 | 0 | 0.593 | 0 |
| SILICON | 251.61 | 0 | 0 | 0 | 0 |
| SILVER | 328.07 | 0 | 0 | -6.38 | 0 |
| SODIUM | 589.59 | 0 | 0 | 0 | 0 |
| STRONTIUM | 407.77 | 0 | 0 | 0 | 0 |
| THALLIUM | 190.80 | -10.1 | 0 | 0 | 0 |
| TIN | 189.93 | 0 | 0 | 0 | 0 |
| TITANIUM | 334.94 | 0 | 0 | 0 | 0 |
| VANADIUM | 290.88 | 0 | 0 | 0 | 0 |
| ZINC | 206.20 | 0 | 0 | -0.100 | 0 |

**KEMRON FORMS - Modified 02/14/2006**
**Version 1.5 PDF File ID: 876093**
**Report generated 09/20/2007 11:26**

# LINEAR RANGE (QUARTERLY)

00071689

**Login Number:** L0709261 **Date:** 09/11/2007
**Insturment ID:** PE-ICP2 **Method:** 6010B

| Analyte | Integration Time (Sec.) | Concentration (mg/L) |
|---|---|---|
| Aluminum | 10.00 | 450.0 |
| Antimony | 10.00 | 36.0 |
| Arsenic | 10.00 | 9.0 |
| Barium | 10.00 | 9.0 |
| Beryllium | 10.00 | 1.8 |
| Boron | 10.00 | 18.0 |
| Cadmium | 10.00 | 2.7 |
| Calcium | 10.00 | 450.0 |
| Chromium | 10.00 | 45.0 |
| Cobalt | 10.00 | 45.0 |
| Copper | 10.00 | 45.0 |
| Iron | 10.00 | 360.0 |
| Lead | 10.00 | 45.0 |
| Lithium | 10.00 | 1.8 |
| Magnesium | 10.00 | 450.0 |
| Manganese | 10.00 | 27.0 |
| Molybdenum | 10.00 | 45.0 |
| Nickel | 10.00 | 45.0 |
| Potassium | 10.00 | 90.0 |
| Selenium | 10.00 | 45.0 |
| Silicon | 10.00 | 9.0 |
| Silver | 10.00 | 9.0 |
| Sodium | 10.00 | 180.0 |
| Strontium | 10.00 | 2.7 |
| Thallium | 10.00 | 45.0 |
| Tin | 10.00 | 45.0 |
| Titanium | 10.00 | 9.0 |
| Vanadium | 10.00 | 45.0 |
| Zinc | 10.00 | 36.0 |

**Comments:**

**KEMRON FORMS - Modified 02/14/2006**
**Version 1.5 PDF File ID: 876092**
**Report generated 09/20/2007 11:26**

# 2.1.2 Metals ICP-MS Data

# 2.1.2.1 Summary Data

# LABORATORY REPORT

**L0709261**

**09/26/07 14:09**

00071692

**Submitted By**

**KEMRON Environmental Services**
**156 Starlite Drive**
**Marietta , OH 45750**
**( 740 ) 373 - 4071**

**For**

Account Name: Shaw E & I, Inc.
ABB Lummus Biulding
3010 Briarpark Drive Suite 4N
Houston, TX 77042
Attention: Larry Duty

Account Number: 2773
Work ID: LHAAP-46

P.O. Number: 200328

## Sample Analysis Summary

| Client ID | Lab ID | Method | Dilution | Date Received |
|---|---|---|---|---|
| 46WW02-090707 | L0709261-01 | 6020 | 10 | 13-SEP-07 |
| 46WW02-090707 | L0709261-02 | 6020 | 10 | 13-SEP-07 |
| 46WW04-090707 | L0709261-03 | 6020 | 10 | 13-SEP-07 |
| 46WW04-090707 | L0709261-03 | 6020 | 100 | 13-SEP-07 |
| 46WW04-090707 | L0709261-04 | 6020 | 10 | 13-SEP-07 |
| 46WW04-090707 | L0709261-04 | 6020 | 100 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-05 | 6020 | 10 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-05 | 6020 | 100 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-06 | 6020 | 10 | 13-SEP-07 |
| LHSMW14-090707 | L0709261-07 | 6020 | 10 | 13-SEP-07 |
| LHSMW14-090707 | L0709261-08 | 6020 | 10 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-09 | 6020 | 10 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-10 | 6020 | 10 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-11 | 6020 | 10 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-12 | 6020 | 10 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-13 | 6020 | 10 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-13 | 6020 | 100 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-14 | 6020 | 10 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-14 | 6020 | 100 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-15 | 6020 | 10 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-16 | 6020 | 10 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-17 | 6020 | 10 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-18 | 6020 | 10 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-19 | 6020 | 10 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-20 | 6020 | 10 | 13-SEP-07 |
| PRSB01 (9-10) | L0709261-21 | 6020 | 1 | 13-SEP-07 |
| PRSB01 (14-15) | L0709261-22 | 6020 | 1 | 13-SEP-07 |
| PRSB01 (19-20) | L0709261-23 | 6020 | 1 | 13-SEP-07 |

00071693

Sample Number: L0709261-01
Client ID: 46WW02-090707
Matrix: Water
Workgroup Number: WG250211
Collect Date: 09/07/2007 08:30
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 10
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 10:39
Run Date: 09/17/2007 12:11
File ID: EL.091707.121144

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | | U | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0219 | J | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | 0.00193 | J | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.00887 | J | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | 0.00550 | J | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Total | 7439-96-5 | 0.178 | | 0.0200 | 0.00500 |
| Nickel, Total | 7440-02-0 | 0.0616 | | 0.0400 | 0.0100 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | | U | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00388 | | 0.00200 | 0.000500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071694

Sample Number: **L0709261-02**
Client ID: **46WW02-090707**
Matrix: **Water**
Workgroup Number: **WG250414**
Collect Date: **09/07/2007 08:30**
Sample Tag: **DL01**

PrePrep Method: **NONE**
Prep Method: **3015**
Analytical Method: **6020**
Analyst: **JYH**
Dilution: **10**
Units: **mg/L**

Instrument: **ELAN-ICP**
Prep Date: **09/18/2007 10:00**
Cal Date: **09/19/2007 10:07**
Run Date: **09/19/2007 11:20**
File ID: **EL.091907.112027**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | | U | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0195 | J | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | | U | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | | U | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Dissolved | 7439-96-5 | 0.148 | | 0.0200 | 0.00500 |
| Nickel, Dissolved | 7440-02-0 | 0.0586 | | 0.0400 | 0.0100 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | | U | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00348 | | 0.00200 | 0.000500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071695

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-03 | PrePrep Method: | NONE | Instrument: | ELAN-ICP |
| Client ID: | 46WW04-090707 | Prep Method: | 3015 | Prep Date: | 09/14/2007 08:30 |
| Matrix: | Water | Analytical Method: | 6020 | Cal Date: | 09/17/2007 10:39 |
| Workgroup Number: | WG250211 | Analyst: | JYH | Run Date: | 09/17/2007 12:18 |
| Collect Date: | 09/07/2007 10:10 | Dilution: | 10 | File ID: | EL.091707.121816 |
| Sample Tag: | DL01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | 0.00287 | J | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0296 | J | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.509 | | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | 0.0137 | J | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | 0.00921 | J | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00761 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL

U Not detected at or above adjusted sample detection limit

00071696

Sample Number:L0709261-03
Client ID:46WW04-090707
Matrix:Water
Workgroup Number:WG250211
Collect Date:09/07/2007 10:10
Sample Tag:DL02

PrePrep Method:NONE
Prep Method:3015
Analytical Method:6020
Analyst:JYH
Dilution:100
Units:mg/L

Instrument:ELAN-ICP
Prep Date:09/14/2007 08:30
Cal Date:09/17/2007 10:39
Run Date:09/17/2007 14:36
File ID:EL.091707.143654

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Manganese, Total | 7439-96-5 | 3.44 | | 0.200 | 0.0500 |
| Nickel, Total | 7440-02-0 | 3.04 | | 0.400 | 0.100 |

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071697

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-04 | PrePrep Method: | NONE | Instrument: | ELAN-ICP |
| Client ID: | 46WW04-090707 | Prep Method: | 3015 | Prep Date: | 09/18/2007 10:00 |
| Matrix: | Water | Analytical Method: | 6020 | Cal Date: | 09/19/2007 10:07 |
| Workgroup Number: | WG250414 | Analyst: | JYH | Run Date: | 09/19/2007 11:40 |
| Collect Date: | 09/07/2007 10:10 | Dilution: | 10 | File ID: | EL.091907.114000 |
| Sample Tag: | DL01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | | U | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0356 | | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | 0.0128 | J | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | | U | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | 0.00561 | J | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00905 | | 0.00200 | 0.000500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Sample Number: **L0709261-04**
Client ID: **46WW04-090707**
Matrix: **Water**
Workgroup Number: **WG250414**
Collect Date: **09/07/2007 10:10**
Sample Tag: **DL02**

PrePrep Method: **NONE**
Prep Method: **3015**
Analytical Method: **6020**
Analyst: **JYH**
Dilution: **100**
Units: **mg/L**

Instrument: **ELAN-ICP**
Prep Date: **09/18/2007 10:00**
Cal Date: **09/19/2007 10:07**
Run Date: **09/19/2007 13:05**
File ID: **EL.091907.130515**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Manganese, Dissolved | 7439-96-5 | 2.95 | | 0.200 | 0.0500 |
| Nickel, Dissolved | 7440-02-0 | 3.03 | | 0.400 | 0.100 |

00071699

Sample Number:L0709261-05
Client ID:LHSMW11-090707
Matrix:Water
Workgroup Number:WG250211
Collect Date:09/07/2007 12:20
Sample Tag:DL01

PrePrep Method:NONE
Prep Method:3015
Analytical Method:6020
Analyst:JYH
Dilution:10
Units:mg/L

Instrument:ELAN-ICP
Prep Date:09/14/2007 08:30
Cal Date:09/17/2007 10:39
Run Date:09/17/2007 12:24
File ID:EL.091707.122448

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | 0.00531 | J | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0495 | | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 1.02 | | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | 0.0287 | | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | 0.0187 | | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00854 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

00071700

Sample Number: L0709261-05
Client ID: LHSMW11-090707
Matrix: Water
Workgroup Number: WG250211
Collect Date: 09/07/2007 12:20
Sample Tag: DL02

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 100
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 10:39
Run Date: 09/17/2007 14:43
File ID: EL.091707.144326

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Manganese, Total | 7439-96-5 | 1.38 | | 0.200 | 0.0500 |
| Nickel, Total | 7440-02-0 | 2.07 | | 0.400 | 0.100 |

Sample Number: L0709261-06
Client ID: LHSMW11-090707
Matrix: Water
Workgroup Number: WG250414
Collect Date: 09/07/2007 12:20
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 10
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/18/2007 10:00
Cal Date: 09/19/2007 10:07
Run Date: 09/19/2007 11:46
File ID: EL.091907.114632

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | 0.00335 | J | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0514 | | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | 0.00949 | J | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | 0.00542 | J | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Dissolved | 7439-96-5 | 1.06 | | 0.0200 | 0.00500 |
| Nickel, Dissolved | 7440-02-0 | 1.67 | | 0.0400 | 0.0100 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | 0.0136 | | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.0101 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

Sample Number: L0709261-07
Client ID: LHSMW14-090707
Matrix: Water
Workgroup Number: WG250211
Collect Date: 09/10/2007 13:30
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 10
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 10:39
Run Date: 09/17/2007 12:57
File ID: EL.091707.125749

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | | U | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0449 | | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.0627 | | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | | U | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Total | 7439-96-5 | 0.0237 | | 0.0200 | 0.00500 |
| Nickel, Total | 7440-02-0 | 0.0135 | J | 0.0400 | 0.0100 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | | U | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | | U | 0.00200 | 0.000500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-08 | PrePrep Method: | NONE | Instrument: | ELAN-ICP |
| Client ID: | LHSMW14-090707 | Prep Method: | 3015 | Prep Date: | 09/18/2007 10:00 |
| Matrix: | Water | Analytical Method: | 6020 | Cal Date: | 09/19/2007 10:07 |
| Workgroup Number: | WG250414 | Analyst: | JYH | Run Date: | 09/19/2007 11:53 |
| Collect Date: | 09/10/2007 13:30 | Dilution: | 10 | File ID: | EL.091907.115304 |
| Sample Tag: | DL01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | | U | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0114 | J | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | 0.00526 | J | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | | U | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Dissolved | 7439-96-5 | 0.0150 | J | 0.0200 | 0.00500 |
| Nickel, Dissolved | 7440-02-0 | 0.0174 | J | 0.0400 | 0.0100 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | | U | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00428 | | 0.00200 | 0.000500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

00071704

Sample Number: L0709261-09
Client ID: LHSMW15-090707
Matrix: Water
Workgroup Number: WG250211
Collect Date: 09/10/2007 15:45
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 10
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 10:39
Run Date: 09/17/2007 13:04
File ID: EL.091707.130422

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | 0.00620 | J | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0174 | J | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | 0.00193 | J | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.902 | | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | 0.0464 | | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Total | 7439-96-5 | 0.186 | | 0.0200 | 0.00500 |
| Nickel, Total | 7440-02-0 | 0.626 | | 0.0400 | 0.0100 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | 0.0227 | | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00492 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071705

| | | |
|---|---|---|
| Sample Number: **L0709261-10** | PrePrep Method: **NONE** | Instrument: **ELAN-ICP** |
| Client ID: **LHSMW15-090707** | Prep Method: **3015** | Prep Date: **09/18/2007 10:00** |
| Matrix: **Water** | Analytical Method: **6020** | Cal Date: **09/19/2007 10:07** |
| Workgroup Number: **WG250414** | Analyst: **JYH** | Run Date: **09/19/2007 12:26** |
| Collect Date: **09/10/2007 15:45** | Dilution: **10** | File ID: **EL.091907.122605** |
| Sample Tag: **DL01** | Units: **mg/L** | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | 0.00618 | J | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0267 | J | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | 0.0576 | | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | 0.0169 | J | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Dissolved | 7439-96-5 | 0.0937 | | 0.0200 | 0.00500 |
| Nickel, Dissolved | 7440-02-0 | 0.602 | | 0.0400 | 0.0100 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | 0.0208 | | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00621 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071706

| | | |
|---|---|---|
| Sample Number: **L0709261-11** | PrePrep Method: **NONE** | Instrument: **ELAN-ICP** |
| Client ID: **LHSMW19-090707** | Prep Method: **3015** | Prep Date: **09/14/2007 08:30** |
| Matrix: **Water** | Analytical Method: **6020** | Cal Date: **09/17/2007 10:39** |
| Workgroup Number: **WG250211** | Analyst: **JYH** | Run Date: **09/17/2007 13:10** |
| Collect Date: **09/11/2007 08:20** | Dilution: **10** | File ID: **EL.091707.131054** |
| Sample Tag: **DL01** | Units: **mg/L** | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | | U | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0316 | | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.0164 | J | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | | U | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Total | 7439-96-5 | 0.0635 | | 0.0200 | 0.00500 |
| Nickel, Total | 7440-02-0 | 0.0758 | | 0.0400 | 0.0100 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | | U | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00194 | J | 0.00200 | 0.000500 |

U Not detected at or above adjusted sample detection limit
J The analyte was positively identified, but the quantitation was below the RL

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071707

| | | |
|---|---|---|
| Sample Number: **L0709261-12** | PrePrep Method: **NONE** | Instrument: **ELAN-ICP** |
| Client ID: **LHSMW19-090707** | Prep Method: **3015** | Prep Date: **09/18/2007 10:00** |
| Matrix: **Water** | Analytical Method: **6020** | Cal Date: **09/19/2007 10:07** |
| Workgroup Number: **WG250414** | Analyst: **JYH** | Run Date: **09/19/2007 12:32** |
| Collect Date: **09/11/2007 08:20** | Dilution: **10** | File ID: **EL.091907.123238** |
| Sample Tag: **DL01** | Units: **mg/L** | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | | U | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0301 | | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | | U | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | | U | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Dissolved | 7439-96-5 | 0.0474 | | 0.0200 | 0.00500 |
| Nickel, Dissolved | 7440-02-0 | 0.0704 | | 0.0400 | 0.0100 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | | U | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00334 | | 0.00200 | 0.000500 |

**U Not detected at or above adjusted sample detection limit**

00071708

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-13 | PrePrep Method: | NONE | Instrument: | ELAN-ICP |
| Client ID: | LHSMW22-090707 | Prep Method: | 3015 | Prep Date: | 09/14/2007 08:30 |
| Matrix: | Water | Analytical Method: | 6020 | Cal Date: | 09/17/2007 10:39 |
| Workgroup Number: | WG250211 | Analyst: | JYH | Run Date: | 09/17/2007 13:17 |
| Collect Date: | 09/11/2007 09:50 | Dilution: | 10 | File ID: | EL.091707.131725 |
| Sample Tag: | DL01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | 0.00485 | J | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0166 | J | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | 0.00391 | J | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.0316 | | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | 0.0462 | | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | 0.0177 | | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00561 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071709

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-13** | PrePrep Method: | **NONE** | Instrument: | **ELAN-ICP** |
| Client ID: | **LHSMW22-090707** | Prep Method: | **3015** | Prep Date: | **09/14/2007 08:30** |
| Matrix: | **Water** | Analytical Method: | **6020** | Cal Date: | **09/17/2007 10:39** |
| Workgroup Number: | **WG250211** | Analyst: | **JYH** | Run Date: | **09/17/2007 15:03** |
| Collect Date: | **09/11/2007 09:50** | Dilution: | **100** | File ID: | **EL.091707.150303** |
| Sample Tag: | **DL02** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Manganese, Total** | **7439-96-5** | **3.79** | | **0.200** | **0.0500** |
| **Nickel, Total** | **7440-02-0** | **3.49** | | **0.400** | **0.100** |

00071710

Sample Number: L0709261-14
Client ID: LHSMW22-090707
Matrix: Water
Workgroup Number: WG250414
Collect Date: 09/11/2007 09:50
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 10
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/18/2007 10:00
Cal Date: 09/19/2007 10:07
Run Date: 09/19/2007 12:39
File ID: EL.091907.123910

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | 0.00680 | J | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0268 | J | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | 0.00239 | J | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | 0.0122 | J | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | 0.0491 | | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | 0.0257 | | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00623 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

00071711

Sample Number: L0709261-14
Client ID: LHSMW22-090707
Matrix: Water
Workgroup Number: WG250414
Collect Date: 09/11/2007 09:50
Sample Tag: DL02

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 100
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/18/2007 10:00
Cal Date: 09/19/2007 10:07
Run Date: 09/19/2007 13:11
File ID: EL.091907.131146

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Manganese, Dissolved | 7439-96-5 | 3.62 | | 0.200 | 0.0500 |
| Nickel, Dissolved | 7440-02-0 | 3.67 | | 0.400 | 0.100 |

00071712

Sample Number: L0709261-15
Client ID: LHSMW23-090707
Matrix: Water
Workgroup Number: WG250211
Collect Date: 09/11/2007 13:35
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 10
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 10:39
Run Date: 09/17/2007 13:23
File ID: EL.091707.132356

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | 0.00405 | J | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0229 | J | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.923 | | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | 0.00640 | J | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Total | 7439-96-5 | 1.59 | | 0.0200 | 0.00500 |
| Nickel, Total | 7440-02-0 | 0.0604 | | 0.0400 | 0.0100 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | 0.0166 | | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00504 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071713

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-16 | PrePrep Method: | NONE | Instrument: | ELAN-ICP |
| Client ID: | LHSMW23-090707 | Prep Method: | 3015 | Prep Date: | 09/18/2007 10:00 |
| Matrix: | Water | Analytical Method: | 6020 | Cal Date: | 09/19/2007 10:07 |
| Workgroup Number: | WG250414 | Analyst: | JYH | Run Date: | 09/19/2007 12:45 |
| Collect Date: | 09/11/2007 13:35 | Dilution: | 10 | File ID: | EL.091907.124541 |
| Sample Tag: | DL01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | 0.00522 | J | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0302 | | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | 0.0197 | J | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | | U | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Dissolved | 7439-96-5 | 1.36 | | 0.0200 | 0.00500 |
| Nickel, Dissolved | 7440-02-0 | 0.0521 | | 0.0400 | 0.0100 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | 0.0223 | | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00557 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

00071714

Sample Number: L0709261-17
Client ID: LHSMW24-090707
Matrix: Water
Workgroup Number: WG250211
Collect Date: 09/11/2007 15:35
Sample Tag: DL01

PrePrep Method: NONE
Prep Method: 3015
Analytical Method: 6020
Analyst: JYH
Dilution: 10
Units: mg/L

Instrument: ELAN-ICP
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 10:39
Run Date: 09/17/2007 13:30
File ID: EL.091707.133027

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | 0.00569 | J | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0325 | | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.0582 | | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | 0.0104 | J | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Total | 7439-96-5 | 0.153 | | 0.0200 | 0.00500 |
| Nickel, Total | 7440-02-0 | 0.0644 | | 0.0400 | 0.0100 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | 0.0264 | | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00529 | | 0.00200 | 0.000500 |

J The analyte was positively identified, but the quantitation was below the RL
U Not detected at or above adjusted sample detection limit

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071715

| | | |
|---|---|---|
| Sample Number: **L0709261-18** | PrePrep Method: **NONE** | Instrument: **ELAN-ICP** |
| Client ID: **LHSMW24-090707** | Prep Method: **3015** | Prep Date: **09/18/2007 10:00** |
| Matrix: **Water** | Analytical Method: **6020** | Cal Date: **09/19/2007 10:07** |
| Workgroup Number: **WG250414** | Analyst: **JYH** | Run Date: **09/19/2007 12:52** |
| Collect Date: **09/11/2007 15:35** | Dilution: **10** | File ID: **EL.091907.125212** |
| Sample Tag: **DL01** | Units: **mg/L** | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | 0.00759 | J | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0369 | | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | 0.0152 | J | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | 0.00798 | J | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Dissolved | 7439-96-5 | 0.128 | | 0.0200 | 0.00500 |
| Nickel, Dissolved | 7440-02-0 | 0.0944 | | 0.0400 | 0.0100 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | 0.0270 | | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00543 | | 0.00200 | 0.000500 |

**J The analyte was positively identified, but the quantitation was below the RL**
**U Not detected at or above adjusted sample detection limit**

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071716

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-19** | PrePrep Method: | **NONE** | Instrument: | **ELAN-ICP** |
| Client ID: | **LHSMW24-090707-FD** | Prep Method: | **3015** | Prep Date: | **09/14/2007 08:30** |
| Matrix: | **Water** | Analytical Method: | **6020** | Cal Date: | **09/17/2007 10:39** |
| Workgroup Number: | **WG250211** | Analyst: | **JYH** | Run Date: | **09/17/2007 13:36** |
| Collect Date: | **09/11/2007 15:35** | Dilution: | **10** | File ID: | **EL.091707.133659** |
| Sample Tag: | **DL01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Total | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Total | 7440-38-2 | 0.00871 | J | 0.0100 | 0.00250 |
| Barium, Total | 7440-39-3 | 0.0300 | | 0.0300 | 0.00500 |
| Cadmium, Total | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Total | 7440-47-3 | 0.0542 | | 0.0200 | 0.00500 |
| Copper, Total | 7440-50-8 | 0.00989 | J | 0.0200 | 0.00500 |
| Lead, Total | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Total | 7439-96-5 | 0.128 | | 0.0200 | 0.00500 |
| Nickel, Total | 7440-02-0 | 0.0584 | | 0.0400 | 0.0100 |
| Antimony, Total | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Total | 7782-49-2 | 0.0340 | | 0.0100 | 0.00500 |
| Thallium, Total | 7440-28-0 | 0.00522 | | 0.00200 | 0.000500 |

**J The analyte was positively identified, but the quantitation was below the RL**
**U Not detected at or above adjusted sample detection limit**

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071717

| | | |
|---|---|---|
| Sample Number: **L0709261-20** | PrePrep Method: **NONE** | Instrument: **ELAN-ICP** |
| Client ID: **LHSMW24-090707-FD** | Prep Method: **3015** | Prep Date: **09/18/2007 10:00** |
| Matrix: **Water** | Analytical Method: **6020** | Cal Date: **09/19/2007 10:07** |
| Workgroup Number: **WG250414** | Analyst: **JYH** | Run Date: **09/19/2007 12:58** |
| Collect Date: **09/11/2007 15:35** | Dilution: **10** | File ID: **EL.091907.125843** |
| Sample Tag: **DL01** | Units: **mg/L** | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Silver, Dissolved | 7440-22-4 | | U | 0.0100 | 0.00250 |
| Arsenic, Dissolved | 7440-38-2 | 0.00608 | J | 0.0100 | 0.00250 |
| Barium, Dissolved | 7440-39-3 | 0.0372 | | 0.0300 | 0.00500 |
| Cadmium, Dissolved | 7440-43-9 | | U | 0.00500 | 0.00125 |
| Chromium, Dissolved | 7440-47-3 | 0.0153 | J | 0.0200 | 0.00500 |
| Copper, Dissolved | 7440-50-8 | 0.00727 | J | 0.0200 | 0.00500 |
| Lead, Dissolved | 7439-92-1 | | U | 0.00500 | 0.00250 |
| Manganese, Dissolved | 7439-96-5 | 0.133 | | 0.0200 | 0.00500 |
| Nickel, Dissolved | 7440-02-0 | 0.0690 | | 0.0400 | 0.0100 |
| Antimony, Dissolved | 7440-36-0 | | U | 0.0100 | 0.00250 |
| Selenium, Dissolved | 7782-49-2 | 0.0202 | | 0.0100 | 0.00500 |
| Thallium, Dissolved | 7440-28-0 | 0.00518 | | 0.00200 | 0.000500 |

**J The analyte was positively identified, but the quantitation was below the RL**
**U Not detected at or above adjusted sample detection limit**

00071718

Sample Number:**L0709261-21**
Client ID:**PRSB01 (9-10)**
Matrix:**Soil**
Workgroup Number:**WG250151**
Collect Date:**09/07/2007 00:00**
Sample Tag:**01**

PrePrep Method:**NONE**
Prep Method:**3051**
Analytical Method:**6020**
Analyst:**JYH**
Dilution:**1**
Units:**mg/kg**

Instrument:**ELAN-ICP**
Prep Date:**09/14/2007 09:30**
Cal Date:**09/14/2007 10:00**
Run Date:**09/14/2007 15:18**
File ID:**EL.091407.151815**
Percent Solid:**72.7**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Lead, Total | 7439-92-1 | 11.4 | | 0.275 | 0.137 |

Report Number:**L0709261**

Report Date :**September 26, 2007**

00071719

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-22** | PrePrep Method: | **NONE** | Instrument: | **ELAN-ICP** |
| Client ID: | **PRSB01 (14-15)** | Prep Method: | **3051** | Prep Date: | **09/14/2007 09:30** |
| Matrix: | **Soil** | Analytical Method: | **6020** | Cal Date: | **09/14/2007 10:00** |
| Workgroup Number: | **WG250151** | Analyst: | **JYH** | Run Date: | **09/14/2007 15:24** |
| Collect Date: | **09/07/2007 00:00** | Dilution: | **1** | File ID: | **EL.091407.152448** |
| Sample Tag: | **01** | Units: | **mg/kg** | Percent Solid: | **78.2** |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Lead, Total** | **7439-92-1** | **11.1** | | **0.256** | **0.128** |

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071720

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-23** | PrePrep Method: | **NONE** | Instrument: | **ELAN-ICP** |
| Client ID: | **PRSB01 (19-20)** | Prep Method: | **3051** | Prep Date: | **09/14/2007 09:30** |
| Matrix: | **Soil** | Analytical Method: | **6020** | Cal Date: | **09/14/2007 10:00** |
| Workgroup Number: | **WG250151** | Analyst: | **JYH** | Run Date: | **09/14/2007 15:31** |
| Collect Date: | **09/07/2007 00:00** | Dilution: | **1** | File ID: | **EL.091407.153121** |
| Sample Tag: | **01** | Units: | **mg/kg** | Percent Solid: | **79.1** |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Lead, Total** | **7439-92-1** | **7.59** | | **0.250** | **0.125** |

# 2.1.2.2 QC Summary Data

**1.0 Initial Calibration (ICAL) Parameters**

The system performs linear regression from data consisting of a blank and three standards.

**2.0 Calculating the concentration (C) of an element in water using data from prep log, run log, and quantitation report (note:the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (ug/L) | 0.1 |
| $Vf$ = Final volume | 100 |
| $Vi$ = Initial volume | 40 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in (ug/L) | 0.25 |

**3.0 Calculating the concentration (C) of an element in soil using data from prep log, run log, and quantitation report (note: the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (ug/L) | 0.1 |
| $Vf$ = Final volume | 200 |
| $Vi$ = Initial volume | 0.5 |
| $D$ = Dilution factor as a multiplier (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in (ug/kg) | 40 |

**4.0 Adjusting the concentration to dry weight:**

$$Cdry = \frac{Cx \times 100}{Px}$$

| Where: | **Example:** |
|---|---|
| $Cx$ = Concentration calculated as received (wet basis) | 40 |
| $Px$ = Percent solids of sample (%wt) | 80 |
| | |
| $Cdry$ = Concentration calculated as dry weight (ug/kg) | 50 |

**50 ug/kg = 0.050 mg/kg**

**Perkin Elmer ELAN ICP/MS**

00071723

STANDARDS KEY

**QC Std 1 - ICV**
**QC Std 2 - ICB**
**QC Std 3 - CRI - Soil**
**QC Std 4 - CRI - Water**
**QC Std 5 - ICSA**
**QC Std 6 - ICSAB**
**QC Std 7 - CCV**
**QC Std 8 - CCB**

Calibration Solutions

| Analyte | Stock Conc. (mg/L) | S1 (mg/L) | S2 (mg/L) | S3 (mg/L) | S4 (mg/L) |
|---|---|---|---|---|---|
| Al | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Sb | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| As | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Ba | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Be | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Ca | 1000 | 0 | 0.04 | 5 | 10 |
| Cd | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Cr | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Co | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Cu | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Fe | 1000 | 0 | 0.04 | 5 | 10 |
| Pb | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Mg | 1000 | 0 | 0.04 | 5 | 10 |
| Mn | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Ni | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| K | 1000 | 0 | 0.04 | 5 | 10 |
| Se | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Ag | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Na | 1000 | 0 | 0.04 | 5 | 10 |
| Tl | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| V | 10 | 0 | 0.0004 | 0.05 | 0.1 |
| Zn | 10 | 0 | 0.0004 | 0.05 | 0.1 |

# Microwave Digestion Log

Analyst(s): VC
Date: 9/18/07 10:00
LCS: .25 mL STD 21717
MS/MSD: .25 mL STD 21717
Witness:
$HNO_3$ Lot #: COA 1252
HCl Lot #:
Digest Tube Lot #: COA 12410
Earliest Sample Due Date: 9/24
Microwave #: MW2

Box: 50
1272134
Digestion Work Group: WG 250344
**ME407 Revision #** 8 Method 3015-Water
**ME406 Revision #** ____ Method 3051-Soil-Oil

Relinquished By: VC
Digest Received By: ED Date: 09-18-07

| | KEMRON # | Initial Wt/Vol | Final Volume | Initial Weight | Final Weight | Comments | Due Date |
|---|---|---|---|---|---|---|---|
| 1 | PBW | 40 mL | 100 mL | 206.24 | 206.22 | 02 | |
| 2 | LCS | | | 206.24 | 206.23 | 03 | |
| 3 | 09.261-02 | | | 208.95 | 208.94 | Lab Filtered 01 | 9/24 |
| 4 | 02MS | | | 207.95 | 207.94 | 04 | |
| 5 | 02MSD | | | 208.32 | 208.31 | 05 | |
| 6 | 04 | | | 207.50 | 207.49 | | |
| 7 | 06 | | | 206.03 | 206.02 | | |
| 8 | 08 | | | 208.54 | 208.51 | | |
| 9 | 10 | | | 208.21 | 208.20 | | |
| 10 | 12 | | | 207.33 | 207.31 | | |
| 11 | 14 | | | 205.30 | 205.28 | | |
| 12 | 16 | | | 208.62 | 207.49 | | |
| 13 | 18 | | | 207.22 | 207.20 | | |
| 14 | 20 | | | 209.15 | 209.13 | | |
| 15 | ~~312.01~~ | | | 208.00 | 207.98 | NPDES ~~01~~ VC 9/18/07 | 9/25 |
| 16 | ~~01~~ VC 9/18/07 | | | 208.27 | 208.24 | | |
| 17 | ~~02~~ | | | 207.82 | 207.80 | | |
| 18 | ~~03~~ | | | 205.46 | 205.44 | | |
| 19 | ~~04~~ | | | 207.89 | 207.85 | | |
| 20 | 335.01 | | | 207.77 | 207.44 | | 9/28 |
| 21 | 336.01 | | | 206.15 | 206.09 | | 9/28 |
| 22 | 03 | | | 206.61 | 206.59 | | |
| 23 | 05 | | | 208.16 | 208.05 | | |
| 24 | 348.03 ★ | | | 208.68 | 208.06 | | 9/24 |
| 25 | 349.02 ★ | | | 206.31 | 206.30 | | 9/24 |
| 26 | | | | | | | |
| 27 | | | VC 9/18/07 | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |

Comments: 312's cancelled ★ level 4

Primary Review: Vicki Cully 9/18/07 Secondary Review: [signature] 9/18/07

# Microwave Digestion Log

Analyst(s): VC
Date: 9/14/07 09:30
LCS: 65 mCSTD 2177
MS/MSD: 65 mL STD2177
Witness:
$HNO_3$ Lot #: C0912526
HCl Lot #:
Digest Tube Lot #: C0AP521
Earliest Sample Due Date: 9/17
Microwave #: MW2

Box: 74

Digestion Work Group: WG 250137

**ME407 Revision #** ____ Method 3015-Water
**ME406 Revision #** 8 Method 3051-Soil-Oil

Relinquished By: VC
Digest Received By: Ed Date: 09-14-07

| | KEMRON # | Initial Wt/Vol | Final Volume | Initial Weight | Final Weight | Comments | Due Date |
|---|---|---|---|---|---|---|---|
| 1 | PBS | 0.500g | 200mL | 175.51g | 175.51g | 02 | |
| 2 | LCS | ↓ | | 175.75 | 175.74 | 03 | |
| 3 | 09-200-01 ★ | 0.528 | | 176.97 | 176.98 | | ~~9/18~~ 9/21 |
| 4 | 261-21 | 0.500 | | 175.95 | 175.96 | | 9/24 |
| 5 | 22 | 0.520 | | 176.45 | 176.45 | | |
| 6 | 23 | 0.505 | | 176.12 | 176.12 | | |
| 7 | 297-02 ★ | 0.520 | | 173.69 | 173.67 | 01 | 9/18 |
| 8 | 02MS | 0.520 | | 176.33 | 176.33 | 04 | |
| 9 | 02MSD | 0.520 | ↓ | 174.61 | 174.61 | 05 | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
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| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |

VC 9/14/07

Comments: ★ level IV

Primary Review: Vicki Colley 9/14/07 Secondary Review: 9/24/07

KEMRON
ENVIRONMENTAL SERVICES



00071726

# Microwave Digestion Log

Analyst(s): VC
Date: 9/14/07 830
LCS: .25 mL STD 2177
MS/MSD: .25 mL STD 2177
Witness: [illegible]
$HNO_3$ Lot #: C09 12569
HCl Lot #: —
Digest Tube Lot #: C0A 12521
Earliest Sample Due Date: 9/21
Microwave # MW 2

Box: 49

Digestion Work Group: WG 250135

**ME407 Revision #** 8 Method 3015-Water
**ME406 Revision #** ____ Method 3051-Soil-Oil

Relinquished By: VC
Digest Received By: Ed Date: 09-14-07

| | KEMRON # | Initial Wt/Vol | Final Volume | Initial Weight | Final Weight | Comments | Due Date |
|---|---|---|---|---|---|---|---|
| 1 | PBW 24 | 40 mL | 100 mL | 205.96 | 205.95 | 02 | |
| 2 | LCS | | | 205.84 | 205.83 | 03 | |
| 3 | 09.251-01 * | | | 207.30 | 207.29 | 01 | 9/21 |
| 4 | 01MS | | | 208.09 | 208.07 | 04 | |
| 5 | 01MSD | | | 207.08 | 207.05 | 05 | |
| 6 | 03 | | | 208.31 | 208.30 | | |
| 7 | 05 | | | 204.74 | 204.72 | | |
| 8 | 07 | | | 207.53 | 207.50 | | |
| 9 | 261-01 | | | 208.35 | 208.34 | | 9/24 |
| 10 | 03 | | | 207.21 | 207.19 | | |
| 11 | 05 | | | 208.14 | 208.11 | | |
| 12 | 07 | | | 206.96 | 206.95 | | |
| 13 | 09 | | | 208.97 | 208.96 | | |
| 14 | 11 | | | 208.31 | 208.30 | | |
| 15 | 13 | | | 208.54 | 208.53 | | |
| 16 | 15 | | | 209.57 | 209.57 | | |
| 17 | 17 | | | 208.36 | 208.34 | | |
| 18 | 19 | | | 207.89 | 207.88 | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | VC | | | |
| 25 | | | | | 9/14/07 | | |
| 26 | | | | | | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | | | |

Comments: * level 4

Primary Review: Vicki Colley 9/14/07 Secondary Review: [illegible] 9/14/07

**KEMRON Environmental Services**

Instrument Run Log

00071727

Instrument: ELAN-ICP  Dataset: 091407A.REP

Analyst1: JYH  Analyst2: N/A

Method: 6020  SOP: ME700  Rev: 4

Maintenance Log ID: 19692

Calibration Std: STD21454  ICV/CCV Std: STD21292  Post Spike: STD15023

ICSA: STD21316  ICSAB: STD21317

Workgroups: 249702,249620,250151

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | EL.091407.093401 | Blank | Blank | | 1 | | 09/14/07 09:34 |
| 2 | EL.091407.094031 | WG250165-01 | Calibration Point | | 1 | | 09/14/07 09:40 |
| 3 | EL.091407.094701 | WG250165-02 | Calibration Point | | 1 | | 09/14/07 09:47 |
| 4 | EL.091407.095332 | WG250165-03 | Calibration Point | | 1 | | 09/14/07 09:53 |
| 5 | EL.091407.100004 | WG250165-04 | Calibration Point | | 1 | | 09/14/07 10:00 |
| 6 | EL.091407.100637 | WG250165-05 | Initial Calibration Verification | | 1 | | 09/14/07 10:06 |
| 7 | EL.091407.101319 | WG250165-06 | Initial Calib Blank | | 1 | | 09/14/07 10:13 |
| 8 | EL.091407.102001 | WG250165-07 | CRQL Check Solid | | 1 | | 09/14/07 10:20 |
| 9 | EL.091407.102638 | WG250165-08 | CRQL Check Water | | 1 | | 09/14/07 10:26 |
| 10 | EL.091407.103313 | WG250165-09 | Interference Check | | 1 | | 09/14/07 10:33 |
| 11 | EL.091407.103947 | WG250165-10 | Interference Check | | 1 | | 09/14/07 10:39 |
| 12 | EL.091407.104620 | WG250165-11 | CCV | | 1 | | 09/14/07 10:46 |
| 13 | EL.091407.105302 | WG250165-12 | CCB | | 1 | | 09/14/07 10:53 |
| 14 | EL.091407.105942 | IDL1 | IDL1 | | 1 | | 09/14/07 10:59 |
| 15 | EL.091407.110612 | IDL2 | IDL2 | | 1 | | 09/14/07 11:06 |
| 16 | EL.091407.111243 | IDL3 | IDL3 | | 1 | | 09/14/07 11:12 |
| 17 | EL.091407.111914 | IDL4 | IDL4 | | 1 | | 09/14/07 11:19 |
| 18 | EL.091407.112545 | IDL5 | IDL5 | | 1 | | 09/14/07 11:25 |
| 19 | EL.091407.113216 | IDL6 | IDL6 | | 1 | | 09/14/07 11:32 |
| 20 | EL.091407.113847 | IDL7 | IDL7 | | 1 | | 09/14/07 11:38 |
| 21 | EL.091407.114520 | WG250165-13 | CCV | | 1 | | 09/14/07 11:45 |
| 22 | EL.091407.115201 | WG250165-14 | CCB | | 1 | | 09/14/07 11:52 |
| 23 | EL.091407.115843 | L0708740-01 | MDL-1 | .5/200 | 1 | | 09/14/07 11:58 |
| 24 | EL.091407.120515 | L0708740-02 | MDL-2 | .5/200 | 1 | | 09/14/07 12:05 |
| 25 | EL.091407.121148 | L0708740-03 | MDL-3 | .5/200 | 1 | | 09/14/07 12:11 |
| 26 | EL.091407.121821 | L0708740-04 | MDL-4 | .5/200 | 1 | | 09/14/07 12:18 |
| 27 | EL.091407.122454 | L0708740-05 | MDL-5 | .5/200 | 1 | | 09/14/07 12:24 |
| 28 | EL.091407.123126 | L0708740-06 | MDL-6 | .5/200 | 1 | | 09/14/07 12:31 |
| 29 | EL.091407.123757 | L0708740-07 | MDL-7 | .5/200 | 1 | | 09/14/07 12:37 |
| 30 | EL.091407.124429 | WG250165-15 | CCV | | 1 | | 09/14/07 12:44 |
| 31 | EL.091407.125110 | WG250165-16 | CCB | | 1 | | 09/14/07 12:51 |
| 32 | EL.091407.125751 | L0708333-01 | MDL1 | 40/100 | 1 | | 09/14/07 12:57 |
| 33 | EL.091407.130422 | L0708333-02 | MDL2 | 40/100 | 1 | | 09/14/07 13:04 |
| 34 | EL.091407.131054 | L0708333-03 | MDL3 | 40/100 | 1 | | 09/14/07 13:10 |
| 35 | EL.091407.131726 | L0708333-04 | MDL4 | 40/100 | 1 | | 09/14/07 13:17 |
| 36 | EL.091407.132358 | L0708333-05 | MDL5 | 40/100 | 1 | | 09/14/07 13:23 |
| 37 | EL.091407.133030 | L0708333-06 | MDL6 | 40/100 | 1 | | 09/14/07 13:30 |

Page: 1  Approved: September 19, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071728

Instrument: ELAN-ICP  Dataset: 091407A.REP

Analyst1: JYH  Analyst2: N/A

Method: 6020  SOP: ME700  Rev: 4

Maintenance Log ID: 19692

Calibration Std: STD21454  ICV/CCV Std: STD21292  Post Spike: STD15023

ICSA: STD21316  ICSAB: STD21317

Workgroups: 249702,249620,250151

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | EL.091407.133704 | L0708333-07 | MDL7 | 40/100 | 1 | | 09/14/07 13:37 |
| 39 | EL.091407.134336 | WG250165-17 | CCV | | 1 | | 09/14/07 13:43 |
| 40 | EL.091407.135018 | WG250165-18 | CCB | | 1 | | 09/14/07 13:50 |
| 41 | EL.091407.141242 | WG250137-02 | Method/Prep Blank | .5/200 | 1 | | 09/14/07 14:12 |
| 42 | EL.091407.141912 | WG250137-03 | Laboratory Control S | .5/200 | 1 | | 09/14/07 14:19 |
| 43 | EL.091407.142543 | WG250137-01 | Reference Sample | | 1 | L0709297-02 | 09/14/07 14:25 |
| 44 | EL.091407.143213 | WG250137-04 | Matrix Spike | .5/200 | 1 | | 09/14/07 14:32 |
| 45 | EL.091407.143844 | WG250137-05 | Matrix Spike Duplica | .5/200 | 1 | | 09/14/07 14:38 |
| 46 | EL.091407.144516 | L0709200-01 | NR-12-109-110/113 | .528/200 | 1 | | 09/14/07 14:45 |
| 47 | EL.091407.145147 | WG250151-01 | Post Digestion Spike | | 1 | L0709200-01 | 09/14/07 14:51 |
| 48 | EL.091407.145820 | WG250151-02 | Serial Dilution | | 5 | L0709200-01 | 09/14/07 14:58 |
| 49 | EL.091407.150452 | WG250165-19 | CCV | | 1 | | 09/14/07 15:04 |
| 50 | EL.091407.151134 | WG250165-20 | CCB | | 1 | | 09/14/07 15:11 |
| 51 | EL.091407.151815 | L0709261-21 | PRSB01 (9-10) | .5/200 | 1 | | 09/14/07 15:18 |
| 52 | EL.091407.152448 | L0709261-22 | PRSB01 (14-15) | .5/200 | 1 | | 09/14/07 15:24 |
| 53 | EL.091407.153121 | L0709261-23 | PRSB01 (19-20) | .505/200 | 1 | | 09/14/07 15:31 |
| 54 | EL.091407.153754 | WG250165-21 | CCV | | 1 | | 09/14/07 15:37 |
| 55 | EL.091407.154435 | WG250165-22 | CCB | | 1 | | 09/14/07 15:44 |



Approved: September 19, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071729

Instrument: ELAN-ICP | Dataset: 091707A.REP
Analyst1: JYH | Analyst2: N/A
Method: 6020 | SOP: ME700 | Rev: 4
Maintenance Log ID: 19692

Calibration Std: STD21454 | ICV/CCV Std: STD21292 | Post Spike: STD15023
ICSA: STD21316 | ICSAB: STD21317

Workgroups: 250211

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | EL.091707.101329 | Blank | Blank | | 1 | | 09/17/07 10:13 |
| 2 | EL.091707.102000 | WG250301-01 | Calibration Point | | 1 | | 09/17/07 10:20 |
| 3 | EL.091707.102630 | WG250301-02 | Calibration Point | | 1 | | 09/17/07 10:26 |
| 4 | EL.091707.103301 | WG250301-03 | Calibration Point | | 1 | | 09/17/07 10:33 |
| 5 | EL.091707.103933 | WG250301-04 | Calibration Point | | 1 | | 09/17/07 10:39 |
| 6 | EL.091707.104606 | WG250301-05 | Initial Calibration Verification | | 1 | | 09/17/07 10:46 |
| 7 | EL.091707.105247 | WG250301-06 | Initial Calib Blank | | 1 | | 09/17/07 10:52 |
| 8 | EL.091707.105930 | WG250301-07 | CRQL Check Solid | | 1 | | 09/17/07 10:59 |
| 9 | EL.091707.110606 | WG250301-08 | CRQL Check Water | | 1 | | 09/17/07 11:06 |
| 10 | EL.091707.111241 | WG250301-09 | Interference Check | | 1 | | 09/17/07 11:12 |
| 11 | EL.091707.111915 | WG250301-10 | Interference Check | | 1 | | 09/17/07 11:19 |
| 12 | EL.091707.112549 | WG250301-11 | CCV | | 1 | | 09/17/07 11:25 |
| 13 | EL.091707.113230 | WG250301-12 | CCB | | 1 | | 09/17/07 11:32 |
| 14 | EL.091707.113910 | WG250135-02 | Method/Prep Blank | 40/100 | 1 | | 09/17/07 11:39 |
| 15 | EL.091707.114540 | WG250135-03 | Laboratory Control S | 40/100 | 1 | | 09/17/07 11:45 |
| 16 | EL.091707.115211 | WG250135-01 | Reference Sample | | 1 | L0709251-01 | 09/17/07 11:52 |
| 17 | EL.091707.115841 | WG250135-04 | Matrix Spike | 40/100 | 1 | | 09/17/07 11:58 |
| 18 | EL.091707.120512 | WG250135-05 | Matrix Spike Duplica | 40/100 | 1 | | 09/17/07 12:05 |
| 19 | EL.091707.121144 | L0709261-01 | 46WW02-090707 | 40/100 | 10 | | 09/17/07 12:11 |
| 20 | EL.091707.121816 | L0709261-03 | 46WW04-090707 | 40/100 | 10 | WG250098-01 | 09/17/07 12:18 |
| 21 | EL.091707.122448 | L0709261-05 | LHSMW11-090707 | 40/100 | 10 | | 09/17/07 12:24 |
| 22 | EL.091707.123120 | WG250211-01 | Post Digestion Spike | | 10 | L0709261-05 | 09/17/07 12:31 |
| 23 | EL.091707.123753 | WG250211-02 | Serial Dilution | | 50 | L0709261-05 | 09/17/07 12:37 |
| 24 | EL.091707.124426 | WG250301-13 | CCV | | 1 | | 09/17/07 12:44 |
| 25 | EL.091707.125107 | WG250301-14 | CCB | | 1 | | 09/17/07 12:51 |
| 26 | EL.091707.125749 | L0709261-07 | LHSMW14-090707 | 40/100 | 10 | WG250078-04 | 09/17/07 12:57 |
| 27 | EL.091707.130422 | L0709261-09 | LHSMW15-090707 | 40/100 | 10 | | 09/17/07 13:04 |
| 28 | EL.091707.131054 | L0709261-11 | LHSMW19-090707 | 40/100 | 10 | | 09/17/07 13:10 |
| 29 | EL.091707.131725 | L0709261-13 | LHSMW22-090707 | 40/100 | 10 | | 09/17/07 13:17 |
| 30 | EL.091707.132356 | L0709261-15 | LHSMW23-090707 | 40/100 | 10 | | 09/17/07 13:23 |
| 31 | EL.091707.133027 | L0709261-17 | LHSMW24-090707 | 40/100 | 10 | | 09/17/07 13:30 |
| 32 | EL.091707.133659 | L0709261-19 | LHSMW24-090707-FD | 40/100 | 10 | | 09/17/07 13:36 |
| 33 | EL.091707.134329 | WG250135-01 | Reference Sample | | 10 | L0709251-01 | 09/17/07 13:43 |
| 34 | EL.091707.135000 | WG250135-04 | Matrix Spike | 40/100 | 10 | | 09/17/07 13:50 |
| 35 | EL.091707.135631 | WG250135-05 | Matrix Spike Duplica | 40/100 | 10 | | 09/17/07 13:56 |
| 36 | EL.091707.140303 | WG250301-15 | CCV | | 1 | | 09/17/07 14:03 |
| 37 | EL.091707.140945 | WG250301-16 | CCB | | 1 | | 09/17/07 14:09 |



Approved: September 18, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071730

Instrument: ELAN-ICP    Dataset: 091707A.REP

Analyst1: JYH    Analyst2: N/A

Method: 6020    SOP: ME700    Rev: 4

Maintenance Log ID: 19692

Calibration Std: STD21454    ICV/CCV Std: STD21292    Post Spike: STD15023

ICSA: STD21316    ICSAB: STD21317

Workgroups: 250211

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | EL.091707.141625 | L0709251-03 | MW-03-09 | 40/100 | 1 | WG250205-04 | 09/17/07 14:16 |
| 39 | EL.091707.142257 | L0709251-05 | EQUIP BLANK | 40/100 | 1 | | 09/17/07 14:22 |
| 40 | EL.091707.142930 | L0709251-07 | MW-03-11 | 40/100 | 1 | | 09/17/07 14:29 |
| 41 | EL.091707.143654 | L0709261-03 | 46WW04-090707 | 40/100 | 100 | WG250098-01 | 09/17/07 14:36 |
| 42 | EL.091707.144326 | L0709261-05 | LHSMW11-090707 | 40/100 | 100 | | 09/17/07 14:43 |
| 43 | EL.091707.144958 | WG250211-01 | Post Digestion Spike | | 100 | L0709261-05 | 09/17/07 14:49 |
| 44 | EL.091707.145631 | WG250211-02 | Serial Dilution | | 500 | L0709261-05 | 09/17/07 14:56 |
| 45 | EL.091707.150303 | L0709261-13 | LHSMW22-090707 | 40/100 | 100 | | 09/17/07 15:03 |
| 46 | EL.091707.150934 | WG250301-17 | CCV | | 1 | | 09/17/07 15:09 |
| 47 | EL.091707.151616 | WG250301-18 | CCB | | 1 | | 09/17/07 15:16 |
| 48 | EL.091707.152257 | IDL1 | IDL1 | | 1 | | 09/17/07 15:22 |
| 49 | EL.091707.152930 | IDL2 | IDL2 | | 1 | | 09/17/07 15:29 |
| 50 | EL.091707.153604 | IDL3 | IDL3 | | 1 | | 09/17/07 15:36 |
| 51 | EL.091707.154238 | IDL4 | IDL4 | | 1 | | 09/17/07 15:42 |
| 52 | EL.091707.154910 | IDL5 | IDL5 | | 1 | | 09/17/07 15:49 |
| 53 | EL.091707.155541 | IDL6 | IDL6 | | 1 | | 09/17/07 15:55 |
| 54 | EL.091707.160212 | IDL7 | IDL7 | | 1 | | 09/17/07 16:02 |
| 55 | EL.091707.160844 | WG250301-19 | CCV | | 1 | | 09/17/07 16:08 |
| 56 | EL.091707.161526 | WG250301-20 | CCB | | 1 | | 09/17/07 16:15 |

Page: 2    Approved: September 18, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071731

Instrument: ELAN-ICP    Dataset: 091907A.REP

Analyst1: JYH    Analyst2: N/A

Method: 6020    SOP: ME700    Rev: 4

Maintenance Log ID: 19692

Calibration Std: STD21454    ICV/CCV Std: STD21905    Post Spike: STD21680

ICSA: STD21872    ICSAB: STD21873

Workgroups: 250414,250504

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | EL.091907.094145 | Blank | Blank | | 1 | | 09/19/07 09:41 |
| 2 | EL.091907.094815 | WG250498-01 | Calibration Point | | 1 | | 09/19/07 09:48 |
| 3 | EL.091907.095446 | WG250498-02 | Calibration Point | | 1 | | 09/19/07 09:54 |
| 4 | EL.091907.100117 | WG250498-03 | Calibration Point | | 1 | | 09/19/07 10:01 |
| 5 | EL.091907.100749 | WG250498-04 | Calibration Point | | 1 | | 09/19/07 10:07 |
| 6 | EL.091907.101422 | WG250498-05 | Initial Calibration Verification | | 1 | | 09/19/07 10:14 |
| 7 | EL.091907.102103 | WG250498-06 | Initial Calib Blank | | 1 | | 09/19/07 10:21 |
| 8 | EL.091907.102746 | WG250498-07 | CRQL Check Solid | | 1 | | 09/19/07 10:27 |
| 9 | EL.091907.103422 | WG250498-08 | CRQL Check Water | | 1 | | 09/19/07 10:34 |
| 10 | EL.091907.104057 | WG250498-09 | Interference Check | | 1 | | 09/19/07 10:40 |
| 11 | EL.091907.104731 | WG250498-10 | Interference Check | | 1 | | 09/19/07 10:47 |
| 12 | EL.091907.105405 | WG250498-11 | CCV | | 1 | | 09/19/07 10:54 |
| 13 | EL.091907.110046 | WG250498-12 | CCB | | 1 | | 09/19/07 11:00 |
| 14 | EL.091907.110726 | WG250364-02 | Method/Prep Blank | 40/100 | 1 | | 09/19/07 11:07 |
| 15 | EL.091907.111356 | WG250364-03 | Laboratory Control S | 40/100 | 1 | | 09/19/07 11:13 |
| 16 | EL.091907.112027 | WG250364-01 | Reference Sample | | 10 | L0709261-02 | 09/19/07 11:20 |
| 17 | EL.091907.112657 | WG250364-04 | Matrix Spike | 40/100 | 10 | | 09/19/07 11:26 |
| 18 | EL.091907.113328 | WG250364-05 | Matrix Spike Duplica | 40/100 | 10 | | 09/19/07 11:33 |
| 19 | EL.091907.114000 | L0709261-04 | 46WW04-090707 | 40/100 | 10 | WG250200-01 | 09/19/07 11:40 |
| 20 | EL.091907.114632 | L0709261-06 | LHSMW11-090707 | 40/100 | 10 | | 09/19/07 11:46 |
| 21 | EL.091907.115304 | L0709261-08 | LHSMW14-090707 | 40/100 | 10 | | 09/19/07 11:53 |
| 22 | EL.091907.115936 | WG250414-01 | Post Digestion Spike | | 10 | L0709261-08 | 09/19/07 11:59 |
| 23 | EL.091907.120609 | WG250414-02 | Serial Dilution | | 50 | L0709261-08 | 09/19/07 12:06 |
| 24 | EL.091907.121242 | WG250498-13 | CCV | | 1 | | 09/19/07 12:12 |
| 25 | EL.091907.121923 | WG250498-14 | CCB | | 1 | | 09/19/07 12:19 |
| 26 | EL.091907.122605 | L0709261-10 | LHSMW15-090707 | 40/100 | 10 | | 09/19/07 12:26 |
| 27 | EL.091907.123238 | L0709261-12 | LHSMW19-090707 | 40/100 | 10 | | 09/19/07 12:32 |
| 28 | EL.091907.123910 | L0709261-14 | LHSMW22-090707 | 40/100 | 10 | | 09/19/07 12:39 |
| 29 | EL.091907.124541 | L0709261-16 | LHSMW23-090707 | 40/100 | 10 | | 09/19/07 12:45 |
| 30 | EL.091907.125212 | L0709261-18 | LHSMW24-090707 | 40/100 | 10 | | 09/19/07 12:52 |
| 31 | EL.091907.125843 | L0709261-20 | LHSMW24-090707-FD | 40/100 | 10 | | 09/19/07 12:58 |
| 32 | EL.091907.130515 | L0709261-04 | 46WW04-090707 | 40/100 | 100 | WG250200-01 | 09/19/07 13:05 |
| 33 | EL.091907.131146 | L0709261-14 | LHSMW22-090707 | 40/100 | 100 | | 09/19/07 13:11 |
| 34 | EL.091907.131817 | WG250498-15 | CCV | | 1 | | 09/19/07 13:18 |
| 35 | EL.091907.132459 | WG250498-16 | CCB | | 1 | | 09/19/07 13:24 |
| 36 | EL.091907.133243 | L0709335-01 | EOL-01 | 40/100 | 5 | WG250368-04 | 09/19/07 13:32 |
| 37 | EL.091907.133915 | L0709336-01 | OHD-01 | 40/100 | 5 | WG250228-04 | 09/19/07 13:39 |

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Sheri L. Pfalzgraf

**KEMRON Environmental Services**

Instrument Run Log

00071732

Instrument: ELAN-ICP Dataset: 091907A.REP

Analyst1: JYH Analyst2: N/A

Method: 6020 SOP: ME700 Rev: 4

Maintenance Log ID: 19692

Calibration Std: STD21454 ICV/CCV Std: STD21905 Post Spike: STD21680

ICSA: STD21872 ICSAB: STD21873

Workgroups: 250414,250504

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 38 | EL.091907.134547 | L0709336-03 | OHD-01D | 40/100 | 5 | | 09/19/07 13:45 |
| 39 | EL.091907.135220 | L0709336-05 | OHD-02 | 40/100 | 5 | | 09/19/07 13:52 |
| 40 | EL.091907.135853 | L0709348-03 | AV-NCB-EB-1-091407 | 40/100 | 1 | | 09/19/07 13:58 |
| 41 | EL.091907.140526 | L0709349-02 | AV-OU10-EB-1-091407 | 40/100 | 1 | | 09/19/07 14:05 |
| 42 | EL.091907.141159 | WG250498-17 | CCV | | 1 | | 09/19/07 14:11 |
| 43 | EL.091907.141841 | WG250498-18 | CCB | | 1 | | 09/19/07 14:18 |
| 44 | EL.091907.150546 | WG250468-02 | Method/Prep Blank | .5/200 | 1 | | 09/19/07 15:05 |
| 45 | EL.091907.151216 | WG250468-03 | Laboratory Control S | .5/200 | 1 | | 09/19/07 15:12 |
| 46 | EL.091907.151847 | WG250468-01 | Reference Sample | | 1 | L0709122-01 | 09/19/07 15:18 |
| 47 | EL.091907.152517 | WG250468-04 | Matrix Spike | .5/200 | 1 | | 09/19/07 15:25 |
| 48 | EL.091907.153148 | WG250468-05 | Matrix Spike Duplica | .5/200 | 1 | | 09/19/07 15:31 |
| 49 | EL.091907.153820 | L0709375-01 | LTA16-CS-06A | .5/200 | 1 | | 09/19/07 15:38 |
| 50 | EL.091907.154451 | L0709375-02 | LTA16-CS-FD | .503/200 | 1 | | 09/19/07 15:44 |
| 51 | EL.091907.155123 | WG250504-01 | Post Digestion Spike | | 1 | L0709375-02 | 09/19/07 15:51 |
| 52 | EL.091907.155756 | WG250504-02 | Serial Dilution | | 5 | L0709375-02 | 09/19/07 15:57 |
| 53 | EL.091907.160429 | WG250498-19 | CCV | | 1 | | 09/19/07 16:04 |
| 54 | EL.091907.161110 | WG250498-20 | CCB | | 1 | | 09/19/07 16:11 |
| 55 | EL.091907.161752 | L0709362-01 | SB-01_4.5-5 | .504/200 | 1 | WG250472-01 | 09/19/07 16:17 |
| 56 | EL.091907.162425 | L0709362-02 | SB-02_5.5-6 | .5/200 | 1 | WG250456-01 | 09/19/07 16:24 |
| 57 | EL.091907.163058 | L0709376-01 | BF-02 | .5/200 | 1 | | 09/19/07 16:30 |
| 58 | EL.091907.163731 | WG250498-21 | CCV | | 1 | | 09/19/07 16:37 |
| 59 | EL.091907.164413 | WG250498-22 | CCB | | 1 | | 09/19/07 16:44 |

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KEMRON Environmental Services
Data Checklist

00071733

Date: 14-SEP-2007
Analyst: JYH
Analyst: NA
Method: 6020
Instrument: ELAN
Curve Workgroup: 250165
Runlog ID: 18229
Analytical Workgroups: 249702,249620,250151

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | X |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | |
| Case Narrative | 200,261,297 |
| Client Forms | X |
| Level X | |
| Level 3 | |
| Level 4 | 740,333,200,261,297 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | JYH |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer: Ji-Yu Hu

Secondary Reviewer: 19-SEP-2007 Maren Beery

Generated: SEP-19-2007 13:45:29

KEMRON Environmental Services
Data Checklist

00071734

Date: 17-SEP-2007
Analyst: JYH
Analyst: NA
Method: 6020
Instrument: ELAN
Curve Workgroup: 250301
Runlog ID: 18251
Analytical Workgroups: 250211

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | X |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | |
| Case Narrative | 251,261 |
| Client Forms | X |
| Level X | |
| Level 3 | 261 |
| Level 4 | 251 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | JYH |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer:

Secondary Reviewer:
18-SEP-2007

Ji-Yeon Hu    Maren Beery

Generated: SEP-18-2007 17:00:12

KEMRON Environmental Services
Data Checklist

00071735

Date: 19-SEP-2007
Analyst: JYH
Analyst: NA
Method: 6020
Instrument: ELAN
Curve Workgroup: 250498
Runlog ID: 18298
Analytical Workgroups: 250414,250504

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | X |
| CRI | X |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | |
| Case Narrative | 261,335,336,348,349,122,375,376 |
| Client Forms | X |
| Level X | 335,336 |
| Level 3 | 261 |
| Level 4 | 348,349,122,375,376 |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | JYH |
| Secondary Reviewer | SLP |
| | |
| Comments | |

Primary Reviewer: Ji Yu Hu

Secondary Reviewer: 20-SEP-2007 Sheri L. Pfalzgraf

Generated: SEP-20-2007 10:42:56

# KEMRON Environmental Services
# HOLDING TIMES
# EQUIVALENT TO AFCEE FORM 9

00071736

Analytical Method: 6020 AAB#: WG250414

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/18/07 | 180 | 7.76 | 09/19/07 | 180 | 1.10 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/18/07 | 180 | 6.77 | 09/19/07 | 180 | 1.12 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/18/07 | 180 | 11.0 | 09/19/07 | 180 | 1.07 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/18/07 | 180 | 7.01 | 09/19/07 | 180 | 1.11 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/18/07 | 180 | 7.07 | 09/19/07 | 180 | 1.11 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/18/07 | 180 | 6.85 | 09/19/07 | 180 | 1.12 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/18/07 | 180 | 7.01 | 09/19/07 | 180 | 1.13 | |
| LHSMW14-090707 | 09/10/07 | 09/13/07 | 09/18/07 | 180 | 7.85 | 09/19/07 | 180 | 1.08 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/18/07 | 180 | 11.0 | 09/19/07 | 180 | 1.13 | |
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/18/07 | 180 | 11.1 | 09/19/07 | 180 | 1.06 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/18/07 | 180 | 6.77 | 09/19/07 | 180 | 1.12 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/18/07 | 180 | 10.9 | 09/19/07 | 180 | 1.07 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS
*ANAL = SEE PROJECT QAPP REQUIREMENTS

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KEMRON Environmental Services
HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

00071737

Analytical Method: 6020 AAB#: WG250151

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| PRSB01 (14-15) | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 7.40 | 09/14/07 | 180 | 0.246 | |
| PRSB01 (19-20) | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 7.40 | 09/14/07 | 180 | 0.251 | |
| PRSB01 (9-10) | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 7.40 | 09/14/07 | 180 | 0.242 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS
*ANAL = SEE PROJECT QAPP REQUIREMENTS

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Report generated 09/19/2007 14:30

KEMRON Environmental Services
HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

00071738

Analytical Method: 6020 AAB#: WG250211

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.79 | 09/17/07 | 180 | 3.20 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 3.01 | 09/17/07 | 180 | 3.20 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.94 | 09/17/07 | 180 | 3.20 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.93 | 09/17/07 | 180 | 3.25 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.93 | 09/17/07 | 180 | 3.16 | |
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 7.00 | 09/17/07 | 180 | 3.15 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.70 | 09/17/07 | 180 | 3.21 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.84 | 09/17/07 | 180 | 3.26 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 180 | 3.70 | 09/17/07 | 180 | 3.19 | |
| LHSMW14-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 180 | 3.79 | 09/17/07 | 180 | 3.19 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.70 | 09/17/07 | 180 | 3.21 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 180 | 6.84 | 09/17/07 | 180 | 3.16 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 180 | 2.94 | 09/17/07 | 180 | 3.27 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS

*ANAL = SEE PROJECT QAPP REQUIREMENTS

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# METHOD BLANK SUMMARY

00071739

| | | | |
|---|---|---|---|
| Login Number: | L0709261 | Work Group: | WG250151 |
| Blank File ID: | EL.091407.141242 | Blank Sample ID: | WG250137-02 |
| Prep Date: | 09/14/07 09:30 | Instrument ID: | ELAN-ICP |
| Analyzed Date: | 09/14/07 14:12 | Method: | 6020 |
| Analyst: | JYH | | |

**This Method Blank Applies To The Following Samples:**

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG250137-03 | EL.091407.141912 | 09/14/07 14:19 | 01 |
| PRSB01 (9-10) | L0709261-21 | EL.091407.151815 | 09/14/07 15:18 | 01 |
| PRSB01 (14-15) | L0709261-22 | EL.091407.152448 | 09/14/07 15:24 | 01 |
| PRSB01 (19-20) | L0709261-23 | EL.091407.153121 | 09/14/07 15:31 | 01 |

# METHOD BLANK SUMMARY

00071740

Login Number: L0709261
Work Group: WG250211
Blank File ID: EL.091707.113910
Blank Sample ID: WG250135-02
Prep Date: 09/14/07 08:30
Instrument ID: ELAN-ICP
Analyzed Date: 09/17/07 11:39
Method: 6020
Analyst: JYH

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG250135-03 | EL.091707.114540 | 09/17/07 11:45 | 01 |
| 46WW02-090707 | L0709261-01 | EL.091707.121144 | 09/17/07 12:11 | DL01 |
| 46WW04-090707 | L0709261-03 | EL.091707.121816 | 09/17/07 12:18 | DL01 |
| LHSMW11-090707 | L0709261-05 | EL.091707.122448 | 09/17/07 12:24 | DL01 |
| LHSMW14-090707 | L0709261-07 | EL.091707.125749 | 09/17/07 12:57 | DL01 |
| LHSMW15-090707 | L0709261-09 | EL.091707.130422 | 09/17/07 13:04 | DL01 |
| LHSMW19-090707 | L0709261-11 | EL.091707.131054 | 09/17/07 13:10 | DL01 |
| LHSMW22-090707 | L0709261-13 | EL.091707.131725 | 09/17/07 13:17 | DL01 |
| LHSMW23-090707 | L0709261-15 | EL.091707.132356 | 09/17/07 13:23 | DL01 |
| LHSMW24-090707 | L0709261-17 | EL.091707.133027 | 09/17/07 13:30 | DL01 |
| LHSMW24-090707-FD | L0709261-19 | EL.091707.133659 | 09/17/07 13:36 | DL01 |
| 46WW04-090707 | L0709261-03 | EL.091707.143654 | 09/17/07 14:36 | DL02 |
| LHSMW11-090707 | L0709261-05 | EL.091707.144326 | 09/17/07 14:43 | DL02 |
| LHSMW22-090707 | L0709261-13 | EL.091707.150303 | 09/17/07 15:03 | DL02 |

# METHOD BLANK SUMMARY

00071741

Login Number: L0709261
Blank File ID: EL.091907.110726
Prep Date: 09/18/07 10:00
Analyzed Date: 09/19/07 11:07
Analyst: JYH

Work Group: WG250414
Blank Sample ID: WG250364-02
Instrument ID: ELAN-ICP
Method: 6020

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG250364-03 | EL.091907.111356 | 09/19/07 11:13 | 01 |
| 46WW02-090707 | L0709261-02 | EL.091907.112027 | 09/19/07 11:20 | DL01 |
| 46WW04-090707 | L0709261-04 | EL.091907.114000 | 09/19/07 11:40 | DL01 |
| LHSMW11-090707 | L0709261-06 | EL.091907.114632 | 09/19/07 11:46 | DL01 |
| LHSMW14-090707 | L0709261-08 | EL.091907.115304 | 09/19/07 11:53 | DL01 |
| LHSMW15-090707 | L0709261-10 | EL.091907.122605 | 09/19/07 12:26 | DL01 |
| LHSMW19-090707 | L0709261-12 | EL.091907.123238 | 09/19/07 12:32 | DL01 |
| LHSMW22-090707 | L0709261-14 | EL.091907.123910 | 09/19/07 12:39 | DL01 |
| LHSMW23-090707 | L0709261-16 | EL.091907.124541 | 09/19/07 12:45 | DL01 |
| LHSMW24-090707 | L0709261-18 | EL.091907.125212 | 09/19/07 12:52 | DL01 |
| LHSMW24-090707-FD | L0709261-20 | EL.091907.125843 | 09/19/07 12:58 | DL01 |
| 46WW04-090707 | L0709261-04 | EL.091907.130515 | 09/19/07 13:05 | DL02 |
| LHSMW22-090707 | L0709261-14 | EL.091907.131146 | 09/19/07 13:11 | DL02 |

# METHOD BLANK REPORT



Login Number: L0709261 Prep Date: 09/14/07 09:30 Sample ID: WG250137-02
Instrument ID: ELAN-ICP Run Date: 09/14/07 14:12 Prep Method: 3051
File ID: EL.091407.141242 Analyst: JYH Method: 6020
Workgroup (AAB#): WG250151 Matrix: Soil Units: mg/kg
Contract #: DACA56-94-D-0020 Cal ID: ELAN-I - 14-SEP-07

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Lead, Total | 0.100 | 0.200 | 0.100 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

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Report generated 09/19/2007 14:30

# METHOD BLANK REPORT



Login Number: L0709261 Prep Date: 09/14/07 08:30 Sample ID: WG250135-02
Instrument ID: ELAN-ICP Run Date: 09/17/07 11:39 Prep Method: 3015
File ID: EL.091707.113910 Analyst: JYH Method: 6020
Workgroup (AAB#): WG250211 Matrix: Water Units: mg/L
Contract #: DACA56-94-D-0020 Cal ID: ELAN-I - 17-SEP-07

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver, Total | 0.000250 | 0.00100 | 0.000250 | 1 | U |
| Arsenic, Total | 0.000250 | 0.00100 | 0.000250 | 1 | U |
| Barium, Total | 0.000500 | 0.00300 | 0.000500 | 1 | U |
| Cadmium, Total | 0.000125 | 0.000500 | 0.000125 | 1 | U |
| Chromium, Total | 0.000500 | 0.00200 | 0.000500 | 1 | U |
| Copper, Total | 0.000500 | 0.00200 | 0.000867 | 1 | J |
| Lead, Total | 0.000250 | 0.000500 | 0.000250 | 1 | U |
| Manganese, Total | 0.000500 | 0.00200 | 0.000500 | 1 | U |
| Nickel, Total | 0.00100 | 0.00400 | 0.00100 | 1 | U |
| Antimony, Total | 0.000250 | 0.00100 | 0.000250 | 1 | U |
| Selenium, Total | 0.000500 | 0.00100 | 0.000500 | 1 | U |
| Thallium, Total | 0.0000500 | 0.000200 | 0.0000500 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

KEMRON FORMS - Modified 12/07/2006
Version 1.5 PDF File ID: 875847
Report generated 09/19/2007 14:30

# METHOD BLANK REPORT



Login Number: L0709261 Prep Date: 09/18/07 10:00 Sample ID: WG250364-02
Instrument ID: ELAN-ICP Run Date: 09/19/07 11:07 Prep Method: 3015
File ID: EL.091907.110726 Analyst: JYH Method: 6020
Workgroup (AAB#): WG250414 Matrix: Water Units: mg/L
Contract #: DACA56-94-D-0020 Cal ID: ELAN-I - 19-SEP-07

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver, Dissolved | 0.000250 | 0.00100 | 0.000250 | 1 | U |
| Arsenic, Dissolved | 0.000250 | 0.00100 | 0.000250 | 1 | U |
| Barium, Dissolved | 0.000500 | 0.00300 | 0.000500 | 1 | U |
| Cadmium, Dissolved | 0.000125 | 0.000500 | 0.000125 | 1 | U |
| Chromium, Dissolved | 0.000500 | 0.00200 | 0.000500 | 1 | U |
| Copper, Dissolved | 0.000500 | 0.00200 | 0.000500 | 1 | U |
| Lead, Dissolved | 0.000250 | 0.000500 | 0.000250 | 1 | U |
| Manganese, Dissolved | 0.000500 | 0.00200 | 0.000500 | 1 | U |
| Nickel, Dissolved | 0.00100 | 0.00400 | 0.00100 | 1 | U |
| Antimony, Dissolved | 0.000250 | 0.00100 | 0.000250 | 1 | U |
| Selenium, Dissolved | 0.000500 | 0.00100 | 0.000500 | 1 | U |
| Thallium, Dissolved | 0.0000500 | 0.000200 | 0.0000500 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

KEMRON FORMS - Modified 12/07/2006
Version 1.5 PDF File ID: 875847
Report generated 09/19/2007 14:30

# LABORATORY CONTROL SAMPLE (LCS)

00071745

Login Number: L0709261 Run Date: 09/14/2007 Sample ID: WG250137-03
Instrument ID: ELAN-ICP Run Time: 14:19 Prep Method: 3051
File ID: EL.091407.141912 Analyst: JYH Method: 6020
Workgroup (AAB#): WG250151 Matrix: Soil Units: mg/kg
QC Key: STD Lot#: STD21680 Cal ID: ELAN-I - 14-SEP-07

| Analytes | Expected | Found | % Rec | LCS Limits | Q |
|---|---|---|---|---|---|
| Lead, Total | 10.0 | 10.2 | 102 | 80 - 120 | |

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# LABORATORY CONTROL SAMPLE (LCS)

00071746

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250135-03
Instrument ID: ELAN-ICP
Run Time: 11:45
Prep Method: 3015
File ID: EL.091707.114540
Analyst: JYH
Method: 6020
Workgroup (AAB#): WG250211
Matrix: Water
Units: mg/L
QC Key: STD
Lot#: STD21680
Cal ID: ELAN-I - 17-SEP-07

| Analytes | Expected | Found | % Rec | LCS Limits | Q |
|---|---|---|---|---|---|
| Silver, Total | 0.0625 | 0.0610 | 97.6 | 80 - 120 | |
| Arsenic, Total | 0.0625 | 0.0649 | 104 | 80 - 120 | |
| Barium, Total | 0.0625 | 0.0636 | 102 | 80 - 120 | |
| Cadmium, Total | 0.0625 | 0.0642 | 103 | 80 - 120 | |
| Chromium, Total | 0.0625 | 0.0645 | 103 | 80 - 120 | |
| Copper, Total | 0.0625 | 0.0671 | 107 | 80 - 120 | |
| Lead, Total | 0.0625 | 0.0674 | 108 | 80 - 120 | |
| Manganese, Total | 0.0625 | 0.0638 | 102 | 80 - 120 | |
| Nickel, Total | 0.0625 | 0.0661 | 106 | 80 - 120 | |
| Antimony, Total | 0.0625 | 0.0650 | 104 | 80 - 120 | |
| Selenium, Total | 0.0625 | 0.0665 | 106 | 80 - 120 | |
| Thallium, Total | 0.0625 | 0.0671 | 107 | 80 - 120 | |

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# LABORATORY CONTROL SAMPLE (LCS)

00071747

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250364-03
Instrument ID: ELAN-ICP
Run Time: 11:13
Prep Method: 3015
File ID: EL.091907.111356
Analyst: JYH
Method: 6020
Workgroup (AAB#): WG250414
Matrix: Water
Units: mg/L
QC Key: STD
Lot#: STD21680
Cal ID: ELAN-I - 19-SEP-07

| Analytes | Expected | Found | % Rec | LCS Limits | Q |
|---|---|---|---|---|---|
| Silver, Dissolved | 0.0625 | 0.0631 | 101 | 80 - 120 | |
| Arsenic, Dissolved | 0.0625 | 0.0636 | 102 | 80 - 120 | |
| Barium, Dissolved | 0.0625 | 0.0652 | 104 | 80 - 120 | |
| Cadmium, Dissolved | 0.0625 | 0.0660 | 106 | 80 - 120 | |
| Chromium, Dissolved | 0.0625 | 0.0625 | 100 | 80 - 120 | |
| Copper, Dissolved | 0.0625 | 0.0648 | 104 | 80 - 120 | |
| Lead, Dissolved | 0.0625 | 0.0663 | 106 | 80 - 120 | |
| Manganese, Dissolved | 0.0625 | 0.0645 | 103 | 80 - 120 | |
| Nickel, Dissolved | 0.0625 | 0.0659 | 105 | 80 - 120 | |
| Antimony, Dissolved | 0.0625 | 0.0656 | 105 | 80 - 120 | |
| Selenium, Dissolved | 0.0625 | 0.0637 | 102 | 80 - 120 | |
| Thallium, Dissolved | 0.0625 | 0.0650 | 104 | 80 - 120 | |

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## MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071748

Loginnum: L0709261 Cal ID: ELAN-ICP - Worknum: WG250151
Instrument ID: ELAN-ICP Contract #: DACA56-94-D-0020 Method: 6020
Parent ID: WG250137-01 File ID: EL.091407.142543 Dil: 1 Matrix: SOLID
Sample ID: WG250137-04 MS File ID: EL.091407.143213 Dil: 1 Units: mg/kg
Sample ID: WG250137-05 MSD File ID: EL.091407.143844 Dil: 1 Percent Solid: 92.0

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lead, Total, Total | 14.4 | 10.9 | 25.5 | 102 | 10.9 | 24.8 | 94.9 | 2.97 | 75 - 125 | 20 | |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

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Report generated 09/19/2007 14:30

MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071749

Loginnum:L0709261 Cal ID: ELAN-ICP - Worknum:WG250211
Instrument ID:ELAN-ICP Contract #:DACA56-94-D-0020 Method:6020
Parent ID:WG250135-01 File ID:EL.091707.134329 Dil:10 Matrix:WATER
Sample ID:WG250135-04 MS File ID:EL.091707.135000 Dil:10 Units:mg/L
Sample ID:WG250135-05 MSD File ID:EL.091707.135631 Dil:10

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Manganese | 0.552 | 0.0625 | 0.616 | 103 | 0.0625 | 0.655 | 165 | 6.11 | 75 - 125 | 20 | * |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
Version 1.5 PDF File ID: 875849
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# MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071750

Loginnum: L0709261 Cal ID: ELAN-ICP - Worknum: WG250211
Instrument ID: ELAN-ICP Contract #: DACA56-94-D-0020 Method: 6020
Parent ID: WG250135-01 File ID: EL.091707.115211 Dil: 1 Matrix: WATER
Sample ID: WG250135-04 MS File ID: EL.091707.115841 Dil: 1 Units: mg/L
Sample ID: WG250135-05 MSD File ID: EL.091707.120512 Dil: 1

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.000381 | 0.0625 | 0.0671 | 107 | 0.0625 | 0.0644 | 102 | 4.06 | 75 - 125 | 20 | |
| Arsenic | 0.00106 | 0.0625 | 0.0635 | 99.9 | 0.0625 | 0.0616 | 96.8 | 3.10 | 75 - 125 | 20 | |
| Barium | 0.0131 | 0.0625 | 0.0790 | 105 | 0.0625 | 0.0763 | 101 | 3.45 | 75 - 125 | 20 | |
| Cadmium | ND | 0.0625 | 0.0630 | 101 | 0.0625 | 0.0612 | 97.9 | 2.85 | 75 - 125 | 20 | |
| Chromium | 0.00643 | 0.0625 | 0.0692 | 100 | 0.0625 | 0.0670 | 96.9 | 3.24 | 75 - 125 | 20 | |
| Copper | 0.00233 | 0.0625 | 0.0703 | 109 | 0.0625 | 0.0688 | 106 | 2.12 | 75 - 125 | 20 | |
| Lead | 0.000425 | 0.0625 | 0.0678 | 108 | 0.0625 | 0.0679 | 108 | 0.0814 | 75 - 125 | 20 | |
| Nickel | 0.0119 | 0.0625 | 0.0765 | 103 | 0.0625 | 0.0750 | 101 | 2.05 | 75 - 125 | 20 | |
| Selenium | 0.00234 | 0.0625 | 0.0596 | 91.6 | 0.0625 | 0.0586 | 90.0 | 1.62 | 75 - 125 | 20 | |
| Silver | ND | 0.0625 | 0.0603 | 96.4 | 0.0625 | 0.0594 | 95.0 | 1.54 | 75 - 125 | 20 | |
| Thallium | 0.00202 | 0.0625 | 0.0678 | 105 | 0.0625 | 0.0677 | 105 | 0.0753 | 75 - 125 | 20 | |

* FAILS %REC LIMIT
# FAILS RPD LIMIT
NOTE: This is an internal quality control sample.

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## MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071751

Loginnum: L0709261 Cal ID: ELAN-ICP - Worknum: WG250414
Instrument ID: ELAN-ICP Contract #: DACA56-94-D-0020 Method: 6020
Parent ID: WG250364-01 File ID: EL.091907.112027 Dil: 10 Matrix: WATER
Sample ID: WG250364-04 MS File ID: EL.091907.112657 Dil: 10 Units: mg/L
Sample ID: WG250364-05 MSD File ID: EL.091907.113328 Dil: 10

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony, Dissolved | 0.00196 | 0.0625 | 0.0649 | 101 | 0.0625 | 0.0669 | 104 | 3.01 | 75 - 125 | 20 | |
| Arsenic, Dissolved | 0.00112 | 0.0625 | 0.0623 | 97.9 | 0.0625 | 0.0639 | 100 | 2.48 | 75 - 125 | 20 | |
| Barium, Dissolved | 0.0195 | 0.0625 | 0.0837 | 103 | 0.0625 | 0.0872 | 108 | 4.14 | 75 - 125 | 20 | |
| Cadmium, Dissolved | 0.000175 | 0.0625 | 0.0618 | 98.6 | 0.0625 | 0.0652 | 104 | 5.36 | 75 - 125 | 20 | |
| Chromium, Dissolved | 0.00356 | 0.0625 | 0.0600 | 90.2 | 0.0625 | 0.0591 | 88.8 | 1.51 | 75 - 125 | 20 | |
| Copper, Dissolved | 0.00367 | 0.0625 | 0.0653 | 98.6 | 0.0625 | 0.0668 | 101 | 2.18 | 75 - 125 | 20 | |
| Lead, Dissolved | 0.000383 | 0.0625 | 0.0655 | 104 | 0.0625 | 0.0669 | 106 | 2.16 | 75 - 125 | 20 | |
| Manganese, Dissolved | 0.148 | 0.0625 | 0.206 | 92.9 | 0.0625 | 0.204 | 90.2 | 0.833 | 75 - 125 | 20 | |
| Nickel, Dissolved | 0.0586 | 0.0625 | 0.119 | 96.0 | 0.0625 | 0.119 | 96.5 | 0.253 | 75 - 125 | 20 | |
| Selenium, Dissolved | ND | 0.0625 | 0.0626 | 100 | 0.0625 | 0.0580 | 92.8 | 7.61 | 75 - 125 | 20 | |
| Silver, Dissolved | ND | 0.0625 | 0.0564 | 90.2 | 0.0625 | 0.0607 | 97.2 | 7.49 | 75 - 125 | 20 | |
| Thallium, Dissolved | 0.00348 | 0.0625 | 0.0620 | 93.7 | 0.0625 | 0.0696 | 106 | 11.5 | 75 - 125 | 20 | |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
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# SERIAL DILUTION REPORT

00071752

Sample Login ID: L0709261 Worknum: WG250211
Instrument ID: ELAN-ICP Method: 6020
Sample ID: L0709261-05 File ID: EL.091707.144326 Dil: 100 Units: ug/L
Serial Dilution ID: WG250211-02 File ID: EL.091707.145631 Dil: 500

| Analyte | Sample | C | Serial Dilution | C | % Difference | Q |
|---|---|---|---|---|---|---|
| Antimony | ND | U | 0 | U | | |
| Arsenic | ND | U | 0 | U | | |
| Barium | 20.6 | F | 0 | U | 100 | E |
| Cadmium | 0 | U | 0 | U | | |
| Chromium | 450 | X | 515 | X | 14.4 | E |
| Copper | 0 | U | 0 | U | | |
| Lead | 0 | U | 0 | U | | |
| Manganese | 550 | X | 562 | X | 2.18 | |
| Nickel | 830 | X | 892 | X | 7.47 | |
| Selenium | ND | U | ND | U | | |
| Silver | ND | U | 0 | U | | |
| Thallium | 2.88 | F | 0 | U | 100 | E |

U = Result is below MDL
F = Result is between MDL and RL
X = Result is greater than RL and less than 100 times the MDL
E = %D exceeds control limit of 10% and initial sample result is greater than or equal to 100 times the MDL

KEMRON FORMS - Modified 02/14/2006
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# SERIAL DILUTION REPORT

00071753

Sample Login ID: L0709261 | Worknum: WG250211
Instrument ID: ELAN-ICP | Method: 6020
Sample ID: L0709261-05 File ID: EL.091707.122448 Dil: 10 | Units: ug/L
Serial Dilution ID: WG250211-02 File ID: EL.091707.123753 Dil: 50

| Analyte | Sample | C | Serial Dilution | C | % Difference | Q |
|---|---|---|---|---|---|---|
| Antimony | ND | U | 0 | U | | |
| Arsenic | 2.12 | F | 0 | U | 100 | E |
| Barium | 19.8 | X | 20.1 | F | 1.52 | |
| Cadmium | 0 | U | 0 | U | | |
| Chromium | 409 | | 427 | X | 4.40 | |
| Copper | 11.5 | X | 12.7 | F | 10.4 | E |
| Lead | 0 | U | 0 | U | | |
| Manganese | 519 | | 534 | X | 2.89 | |
| Nickel | 782 | | 812 | X | 3.84 | |
| Selenium | 7.48 | X | 0 | U | 100 | E |
| Silver | ND | U | 0 | U | | |
| Thallium | 3.42 | X | 6.55 | X | 91.5 | E |

U = Result is below MDL
F = Result is between MDL and RL
X = Result is greater than RL and less than 100 times the MDL
E = %D exceeds control limit of 10% and initial
sample result is greater than or equal to 100 times the MDL

# SERIAL DILUTION REPORT

00071754

Sample Login ID: L0709261 Worknum: WG250414
Instrument ID: ELAN-ICP Method: 6020
Sample ID: L0709261-08 File ID: EL.091907.115304 Dil: 10 Units: ug/L
Serial Dilution ID: WG250414-02 File ID: EL.091907.120609 Dil: 50

| Analyte | Sample | C | Serial Dilution | C | % Difference | Q |
|---|---|---|---|---|---|---|
| Antimony | ND | U | 0 | U | | |
| Arsenic | 0 | U | 0 | U | | |
| Barium | 4.55 | F | 0 | U | 100 | E |
| Cadmium | ND | U | ND | U | | |
| Chromium | 2.11 | F | 0 | U | 100 | E |
| Copper | 0 | U | 0 | U | | |
| Lead | 0 | U | ND | U | | |
| Manganese | 6.00 | F | 0 | U | 100 | E |
| Nickel | 6.97 | F | 0 | U | 100 | E |
| Selenium | 0 | U | 0 | U | | |
| Silver | ND | U | 0 | U | | |
| Thallium | 1.71 | X | 1.28 | F | 25.1 | E |

U = Result is below MDL
F = Result is between MDL and RL
X = Result is greater than RL and less than 100 times the MDL
E = %D exceeds control limit of 10% and initial sample result is greater than or equal to 100 times the MDL

# SERIAL DILUTION REPORT

00071755

Sample Login ID: L0709261
Worknum: WG250151
Instrument ID: ELAN-ICP
Method: 6020
Sample ID: L0709200-01 File ID: EL.091407.144516 Dil: 1
Units: ug/kg
Serial Dilution ID: WG250151-02 File ID: EL.091407.145820 Dil: 5

| Analyte | Sample | C | Serial Dilution | C | % Difference | Q |
|---|---|---|---|---|---|---|
| Lead | 11.0 | X | 11.4 | X | 3.64 | |

U = Result is below MDL
F = Result is between MDL and RL
X = Result is greater than RL and less than 100 times the MDL
E = %D exceeds control limit of 10% and initial
sample result is greater than or equal to 100 times the MDL

KEMRON FORMS - Modified 02/14/2006
Version 1.3 PDF File ID: 875843
Report generated 09/19/2007 14:30

# KEMRON ENVIRONMENTAL SERVICES
## POST SPIKE REPORT

00071756

**Sample Login ID:** L0709261 **Worknum:** WG250414
**Instrument ID:** ELAN-ICP **Method:** 6020
**Post Spike ID:** WG250414-01 **File ID:** EL.091907.115936 **Dil:** 10 **Units:** ug/L
**Sample ID:** L0709261-08 **File ID:** EL.091907.115304 **Dil:** 10 **Matrix:** Water

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| ANTIMONY | 53.8 | | 0 | U | 50 | 107.6 | 75 - 125 | |
| ARSENIC | 53.3 | | 0 | U | 50 | 106.7 | 75 - 125 | |
| BARIUM | 55.3 | | 0.455 | F | 50 | 109.7 | 75 - 125 | |
| CADMIUM | 56.1 | | 0 | U | 50 | 112.3 | 75 - 125 | |
| CHROMIUM | 50.8 | | 0.211 | F | 50 | 101.2 | 75 - 125 | |
| COPPER | 54.3 | | 0 | U | 50 | 108.7 | 75 - 125 | |
| LEAD | 56.3 | | 0 | U | 50 | 112.5 | 75 - 125 | |
| MANGANESE | 52.0 | | 0.600 | F | 50 | 102.8 | 75 - 125 | |
| NICKEL | 54.1 | | 0.697 | F | 50 | 106.8 | 75 - 125 | |
| SELENIUM | 52.4 | | 0 | U | 50 | 104.7 | 75 - 125 | |
| SILVER | 53.8 | | 0 | U | 50 | 107.7 | 75 - 125 | |
| THALLIUM | 56.2 | | 0.171 | | 50 | 112.0 | 75 - 125 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

**KEMRON FORMS - Modified 04/20/2007 - POST_SPIKE**
**Version 2.0 PDF File ID: 875844**
**Report generated 09/19/2007 14:30**

# KEMRON ENVIRONMENTAL SERVICES
## POST SPIKE REPORT

00071757

**Sample Login ID:** L0709261 **Worknum:** WG250211
**Instrument ID:** ELAN-ICP **Method:** 6020
**Post Spike ID:** WG250211-01 **File ID:** EL.091707.123120 **Dil:** 10 **Units:** ug/L
**Sample ID:** L0709261-05 **File ID:** EL.091707.122448 **Dil:** 10 **Matrix:** Water

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| ANTIMONY | 54.9 | | 0 | U | 50 | 109.9 | 75 - 125 | |
| ARSENIC | 54.4 | | 0.212 | F | 50 | 108.4 | 75 - 125 | |
| BARIUM | 56.0 | | 1.98 | | 50 | 108.0 | 75 - 125 | |
| CADMIUM | 53.0 | | 0 | U | 50 | 106.0 | 75 - 125 | |
| CHROMIUM | 97.0 | | 40.9 | | 50 | 112.3 | 75 - 125 | |
| COPPER | 56.1 | | 1.15 | | 50 | 109.8 | 75 - 125 | |
| LEAD | 57.1 | | 0 | U | 50 | 114.1 | 75 - 125 | |
| MANGANESE | 109 | | 51.9 | | 50 | 114.1 | 75 - 125 | |
| NICKEL | 133 | | 78.2 | | 50 | 109.6 | 75 - 125 | |
| SELENIUM | 53.0 | | 0.748 | | 50 | 104.5 | 75 - 125 | |
| SILVER | 49.8 | | 0 | U | 50 | 99.5 | 75 - 125 | |
| THALLIUM | 56.7 | | 0.342 | | 50 | 112.7 | 75 - 125 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

**KEMRON FORMS - Modified 04/20/2007 - POST_SPIKE**
**Version 2.0 PDF File ID: 875844**
**Report generated 09/19/2007 14:30**

# KEMRON ENVIRONMENTAL SERVICES
## POST SPIKE REPORT

**Sample Login ID:** L0709261 **Worknum:** WG250151
**Instrument ID:** ELAN-ICP **Method:** 6020
**Post Spike ID:** WG250151-01 **File ID:** EL.091407.145147 **Dil:** 1 **Units:** ug/L
**Sample ID:** L0709200-01 **File ID:** EL.091407.144516 **Dil:** 1 **Matrix:** Soil

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| LEAD | 69.0 | | 11.0 | | 50 | 116.0 | 75 - 125 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

# KEMRON ENVIRONMENTAL SERVICES
## POST SPIKE REPORT

**Sample Login ID:** L0709261 **Worknum:** WG250211
**Instrument ID:** ELAN-ICP **Method:** 6020
**Post Spike ID:** WG250211-01 **File ID:** EL.091707.144958 **Dil:** 100 **Units:** ug/L
**Sample ID:** L0709261-05 **File ID:** EL.091707.144326 **Dil:** 100 **Matrix:** Water

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| ANTIMONY | 50.6 | | 0 | U | 50 | 101.3 | 75 - 125 | |
| ARSENIC | 49.4 | | 0 | U | 50 | 98.9 | 75 - 125 | |
| BARIUM | 50.2 | | 0.206 | F | 50 | 100.1 | 75 - 125 | |
| CADMIUM | 50.3 | | 0 | U | 50 | 100.6 | 75 - 125 | |
| CHROMIUM | 56.3 | | 4.50 | | 50 | 103.5 | 75 - 125 | |
| COPPER | 51.6 | | 0 | U | 50 | 103.2 | 75 - 125 | |
| LEAD | 51.5 | | 0 | U | 50 | 103.1 | 75 - 125 | |
| MANGANESE | 58.2 | | 5.50 | | 50 | 105.4 | 75 - 125 | |
| NICKEL | 59.6 | | 8.30 | | 50 | 102.7 | 75 - 125 | |
| SELENIUM | 50.1 | | 0 | U | 50 | 100.2 | 75 - 125 | |
| SILVER | 48.8 | | 0 | U | 50 | 97.7 | 75 - 125 | |
| THALLIUM | 50.7 | | 0.0288 | F | 50 | 101.4 | 75 - 125 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

# INITIAL CALIBRATION SUMMARY

00071760

Login Number: L0709261
Analytical Method: 6020
ICAL Worknum: WG250165

Workgroup (AAB#): WG250151
Instrument ID: ELAN-ICP
Initial Calibration Date: 14-SEP-2007 10:00

| Analyte | WG250165-01 | | WG250165-02 | | WG250165-03 | | WG250165-04 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | R | Q |
| Lead | 0 | 429.676 | .4 | 14880.86 | 50 | 1676517.389 | 100 | 3265275.24 | 1.00000 | |

**INT = Instrument intensity**
**R = Coefficient of correlation**
**Q = Data Qualifier**
*** = Out of Compliance; R < 0.995**

KEMRON FORMS - Modified 03/08/2007
Version 1.5 PDF File ID: 875852
Report generated 09/19/2007 14:30

KEMRON Environmental Services

INITIAL CALIBRATION SUMMARY

Login Number: L0709261
Analytical Method: 6020
ICAL Worknum: WG250301

Workgroup (AAB#): WG250211
Instrument ID: ELAN-ICP
Initial Calibration Date: 17-SEP-2007 10:39

00071761

| Analyte | WG250301-01 | | WG250301-02 | | WG250301-03 | | WG250301-04 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | R | Q |
| Antimony | 0 | 21.988 | .4 | 2609.823 | 50 | 290907.774 | 100 | 586465.292 | 0.999898 | |
| Arsenic | 0 | -450.193 | .4 | 555.377 | 50 | 114903.826 | 100 | 227227.782 | 0.999993 | |
| Barium | 0 | 38.667 | .4 | 971.743 | 50 | 116695.367 | 100 | 233528.762 | 0.999986 | |
| Cadmium | 0 | 18.716 | .4 | 796.639 | 50 | 101558.355 | 100 | 205077.946 | 0.999894 | |
| Chromium | 0 | 19008.115 | .4 | 22947.373 | 50 | 627432.041 | 100 | 1286384.491 | 0.999525 | |
| Copper | 0 | 127.002 | .4 | 1475.5 | 50 | 169952.501 | 100 | 331433.479 | 0.999998 | |
| Lead | 0 | 307.672 | .4 | 11048.442 | 50 | 1371350.777 | 100 | 2779230.26 | 0.999971 | |
| Manganese | 0 | 800.053 | .4 | 7456.632 | 50 | 871612.584 | 100 | 1800789.03 | 0.999645 | |
| Nickel | 0 | 42.001 | .4 | 1199.779 | 50 | 145777.138 | 100 | 287794.982 | 0.999993 | |
| Selenium | 0 | 8.035 | .4 | 114.775 | 50 | 9886.496 | 100 | 19717.479 | 0.999952 | |
| Silver | 0 | 29 | .4 | 4507.467 | 50 | 563586.125 | 100 | 1120794.723 | 0.999975 | |
| Thallium | 0 | 27 | .4 | 3238.433 | 50 | 419550.539 | 100 | 849080.541 | 0.999977 | |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 03/08/2007
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# INITIAL CALIBRATION SUMMARY

Login Number: L0709261 | Workgroup (AAB#): WG250414

Analytical Method: 6020 | Instrument ID: ELAN-ICP

00071762

ICAL Worknum: WG250498 | Initial Calibration Date: 19-SEP-2007 10:07

| Analyte | WG250498-01 | | WG250498-02 | | WG250498-03 | | WG250498-04 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | R | Q |
| Antimony | 0 | 23.865 | .4 | 2137.998 | 50 | 249993.276 | 100 | 496623.383 | 0.999947 | |
| Arsenic | 0 | -382.462 | .4 | 323.179 | 50 | 95914.226 | 100 | 187566.441 | 0.999837 | |
| Barium | 0 | 40.001 | .4 | 845.058 | 50 | 108712.639 | 100 | 215299.604 | 0.999791 | |
| Cadmium | 0 | 30.585 | .4 | 722.394 | 50 | 83922.337 | 100 | 168072.886 | 0.999983 | |
| Chromium | 0 | 17017.754 | .4 | 19839.379 | 50 | 511308.558 | 100 | 1020481.316 | 0.999997 | |
| Copper | 0 | 107.669 | .4 | 1169.441 | 50 | 138625.47 | 100 | 271973.67 | 0.999893 | |
| Lead | 0 | 330.006 | .4 | 9956.123 | 50 | 1275485.895 | 100 | 2564510.675 | 0.999985 | |
| Manganese | 0 | 829.723 | .4 | 6004.918 | 50 | 696289.881 | 100 | 1402613.065 | 0.999999 | |
| Nickel | 0 | 53.667 | .4 | 939.738 | 50 | 118253.863 | 100 | 230969.151 | 0.999847 | |
| Selenium | 0 | 5.507 | .4 | 75.866 | 50 | 8288.524 | 100 | 15935.082 | 0.999691 | |
| Silver | 0 | 28.334 | .4 | 3438.863 | 50 | 452444.292 | 100 | 873036.011 | 0.999697 | |
| Thallium | 0 | 31.334 | .4 | 2970.315 | 50 | 394943.66 | 100 | 787322.849 | 0.999952 | |

**INT = Instrument intensity**
**R = Coefficient of correlation**
**Q = Data Qualifier**
*** = Out of Compliance; R < 0.995**

**KEMRON FORMS - Modified 03/08/2007**
**Version 1.5 PDF File ID: 875852**
**Report generated 09/19/2007 14:30**

# INITIAL CALIBRATION BLANK (ICB)



Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250498-06
Instrument ID: ELAN-ICP
Run Time: 10:21
Method: 6020
File ID: EL.091907.102103
Analvst: JYH
Units: ug/L
Workgroup (AAB#): WG250414
Cal ID: ELAN-I - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | -.001 | 1 | U |
| Arsenic | 0.100 | 0.400 | .0173 | 1 | U |
| Barium | 0.200 | 1.20 | .0015 | 1 | U |
| Cadmium | 0.0500 | 0.200 | -.0331 | 1 | U |
| Chromium | 0.200 | 0.800 | .0865 | 1 | U |
| Copper | 0.200 | 0.800 | -.0102 | 1 | U |
| Lead | 0.100 | 0.200 | -.011 | 1 | U |
| Manganese | 0.200 | 0.800 | .0004 | 1 | U |
| Nickel | 0.400 | 1.60 | -.0093 | 1 | U |
| Antimony | 0.100 | 0.400 | .174 | 1 | F |
| Selenium | 0.200 | 0.400 | -.0745 | 1 | U |
| Thallium | 0.0200 | 0.0800 | -.006 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

# INITIAL CALIBRATION BLANK (ICB)

00071764

Login Number: L0709261 | Run Date: 09/17/2007 | Sample ID: WG250301-06
Instrument ID: ELAN-ICP | Run Time: 10:52 | Method: 6020
File ID: EL.091707.105247 | Analyst: JYH | Units: ug/L
Workgroup (AAB#): WG250211 | Cal ID: ELAN-I - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | -.0136 | 1 | U |
| Arsenic | 0.100 | 0.400 | -.0421 | 1 | U |
| Barium | 0.200 | 1.20 | -.0162 | 1 | U |
| Cadmium | 0.0500 | 0.200 | .0124 | 1 | U |
| Chromium | 0.200 | 0.800 | .125 | 1 | U |
| Copper | 0.200 | 0.800 | -.0134 | 1 | U |
| Lead | 0.100 | 0.200 | -.008 | 1 | U |
| Manganese | 0.200 | 0.800 | .0063 | 1 | U |
| Nickel | 0.400 | 1.60 | -.0168 | 1 | U |
| Antimony | 0.100 | 0.400 | .16 | 1 | F |
| Selenium | 0.200 | 0.400 | -.127 | 1 | U |
| Thallium | 0.0200 | 0.0800 | .0017 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

# INITIAL CALIBRATION BLANK (ICB)

00071765

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-06
Instrument ID: ELAN-ICP
Run Time: 10:13
Method: 6020
File ID: EL.091407.101319
Analvst: JYH
Units: ug/L
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Lead | 0.250 | 0.500 | -.0185 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

# CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0709261 Run Date: 09/14/2007 Sample ID: WG250165-10 00071766
Instrument ID: ELAN-ICP Run Time: 10:53 Method: 6020
File ID: EL.091407.105302 Analyst: JYH Units: ug/L
Workgroup (AAB#): WG250151 Cal ID: ELAN-I - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Lead | 0.250 | 0.500 | -0.0178 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-18
00071767
Instrument ID: ELAN-ICP
Run Time: 13:50
Method: 6020
File ID: EL.091407.135018
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Lead | 0.250 | 0.500 | -0.0146 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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## CONTINUING CALIBRATION BLANK (CCB)

00071768

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-20
Instrument ID: ELAN-ICP
Run Time: 15:11
Method: 6020
File ID: EL.091407.151134
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Lead | 0.250 | 0.500 | -0.0129 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

## CONTINUING CALIBRATION BLANK (CCB)



Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-22
Instrument ID: ELAN-ICP
Run Time: 15:44
Method: 6020
File ID: EL.091407.154435
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Lead | 0.250 | 0.500 | -0.0153 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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## CONTINUING CALIBRATION BLANK (CCB)

00071770

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250301-12
Instrument ID: ELAN-ICP
Run Time: 11:32
Method: 6020
File ID: EL.091707.113230
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250211
Cal ID: ELAN-I - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | -0.0135 | 1 | U |
| Arsenic | 0.100 | 0.400 | -0.0478 | 1 | U |
| Barium | 0.200 | 1.20 | -0.0148 | 1 | U |
| Cadmium | 0.0500 | 0.200 | 0.0122 | 1 | U |
| Chromium | 0.200 | 0.800 | 0.164 | 1 | U |
| Copper | 0.200 | 0.800 | -0.0158 | 1 | U |
| Lead | 0.100 | 0.200 | -0.00810 | 1 | U |
| Manganese | 0.200 | 0.800 | 0.00860 | 1 | U |
| Nickel | 0.400 | 1.60 | -0.0188 | 1 | U |
| Antimony | 0.100 | 0.400 | 0.158 | 1 | F |
| Selenium | 0.200 | 0.400 | -0.116 | 1 | U |
| Thallium | 0.0200 | 0.0800 | 0.000900 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0709261 Run Date: 09/17/2007 Sample ID: WG250301-04 00071771
Instrument ID: ELAN-ICP Run Time: 12:51 Method: 6020
File ID: EL.091707.125107 Analyst: JYH Units: ug/L
Workgroup (AAB#): WG250211 Cal ID: ELAN-I - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | 0.0413 | 1 | U |
| Arsenic | 0.100 | 0.400 | -0.0386 | 1 | U |
| Barium | 0.200 | 1.20 | -0.0148 | 1 | U |
| Cadmium | 0.0500 | 0.200 | 0.0119 | 1 | U |
| Chromium | 0.200 | 0.800 | 0.136 | 1 | U |
| Copper | 0.200 | 0.800 | -0.0117 | 1 | U |
| Lead | 0.100 | 0.200 | -0.00740 | 1 | U |
| Manganese | 0.200 | 0.800 | 0.00510 | 1 | U |
| Nickel | 0.400 | 1.60 | -0.0146 | 1 | U |
| Antimony | 0.100 | 0.400 | 0.114 | 1 | F |
| Selenium | 0.200 | 0.400 | -0.168 | 1 | U |
| Thallium | 0.0200 | 0.0800 | 0.00180 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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## CONTINUING CALIBRATION BLANK (CCB)

00071772

Login Number: L0709261
Instrument ID: ELAN-ICP
File ID: EL.091707.140945
Workgroup (AAB#): WG250211

Run Date: 09/17/2007
Run Time: 14:09
Analyst: JYH
Cal ID: ELAN-I - 17-SEP-07

Sample ID: WG250301-16
Method: 6020
Units: ug/L

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | -0.00910 | 1 | U |
| Arsenic | 0.100 | 0.400 | -0.0143 | 1 | U |
| Barium | 0.200 | 1.20 | -0.0157 | 1 | U |
| Cadmium | 0.0500 | 0.200 | 0.00340 | 1 | U |
| Chromium | 0.200 | 0.800 | 0.132 | 1 | U |
| Copper | 0.200 | 0.800 | -0.0112 | 1 | U |
| Lead | 0.100 | 0.200 | -0.00800 | 1 | U |
| Manganese | 0.200 | 0.800 | 0.00480 | 1 | U |
| Nickel | 0.400 | 1.60 | -0.0143 | 1 | U |
| Antimony | 0.100 | 0.400 | 0.108 | 1 | F |
| Selenium | 0.200 | 0.400 | -0.0743 | 1 | U |
| Thallium | 0.0200 | 0.0800 | 0.00320 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)

00071773

| | | |
|---|---|---|
| Login Number: L0709261 | Run Date: 09/17/2007 | Sample ID: WG250301-18 |
| Instrument ID: ELAN-ICP | Run Time: 15:16 | Method: 6020 |
| File ID: EL.091707.151616 | Analyst: JYH | Units: ug/L |
| Workgroup (AAB#): WG250211 | Cal ID: ELAN-I - 17-SEP-07 | |

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | -0.00930 | 1 | U |
| Arsenic | 0.100 | 0.400 | -0.0516 | 1 | U |
| Barium | 0.200 | 1.20 | -0.0152 | 1 | U |
| Cadmium | 0.0500 | 0.200 | 0.00840 | 1 | U |
| Chromium | 0.200 | 0.800 | 0.169 | 1 | U |
| Copper | 0.200 | 0.800 | -0.0107 | 1 | U |
| Lead | 0.100 | 0.200 | -0.00840 | 1 | U |
| Manganese | 0.200 | 0.800 | 0.00310 | 1 | U |
| Nickel | 0.400 | 1.60 | -0.0155 | 1 | U |
| Antimony | 0.100 | 0.400 | 0.126 | 1 | F |
| Selenium | 0.200 | 0.400 | -0.187 | 1 | U |
| Thallium | 0.0200 | 0.0800 | -0.000100 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# CONTINUING CALIBRATION BLANK (CCB)



Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250498-02
Instrument ID: ELAN-ICP
Run Time: 11:00
Method: 6020
File ID: EL.091907.110046
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250414
Cal ID: ELAN-I - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | -0.00180 | 1 | U |
| Arsenic | 0.100 | 0.400 | 0.0208 | 1 | U |
| Barium | 0.200 | 1.20 | -0.00230 | 1 | U |
| Cadmium | 0.0500 | 0.200 | -0.0337 | 1 | U |
| Chromium | 0.200 | 0.800 | 0.0805 | 1 | U |
| Copper | 0.200 | 0.800 | -0.0100 | 1 | U |
| Lead | 0.100 | 0.200 | -0.0111 | 1 | U |
| Manganese | 0.200 | 0.800 | -0.00440 | 1 | U |
| Nickel | 0.400 | 1.60 | -0.00830 | 1 | U |
| Antimony | 0.100 | 0.400 | 0.184 | 1 | F |
| Selenium | 0.200 | 0.400 | -0.0503 | 1 | U |
| Thallium | 0.0200 | 0.0800 | -0.00570 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

# CONTINUING CALIBRATION BLANK (CCB)

00071775

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250498-04
Instrument ID: ELAN-ICP
Run Time: 12:19
Method: 6020
File ID: EL.091907.121923
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250414
Cal ID: ELAN-I - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | -0.00100 | 1 | U |
| Arsenic | 0.100 | 0.400 | 0.0194 | 1 | U |
| Barium | 0.200 | 1.20 | 0.00240 | 1 | U |
| Cadmium | 0.0500 | 0.200 | -0.0351 | 1 | U |
| Chromium | 0.200 | 0.800 | 0.0700 | 1 | U |
| Copper | 0.200 | 0.800 | -0.0117 | 1 | U |
| Lead | 0.100 | 0.200 | -0.0114 | 1 | U |
| Manganese | 0.200 | 0.800 | -0.0107 | 1 | U |
| Nickel | 0.400 | 1.60 | -0.0125 | 1 | U |
| Antimony | 0.100 | 0.400 | 0.143 | 1 | F |
| Selenium | 0.200 | 0.400 | -0.0526 | 1 | U |
| Thallium | 0.0200 | 0.0800 | -0.00610 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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CONTINUING CALIBRATION BLANK (CCB)

00071776

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250498-06
Instrument ID: ELAN-ICP
Run Time: 13:24
Method: 6020
File ID: EL.091907.132459
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250414
Cal ID: ELAN-I - 19-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Silver | 0.100 | 0.400 | 0.000200 | 1 | U |
| Arsenic | 0.100 | 0.400 | 0.0152 | 1 | U |
| Barium | 0.200 | 1.20 | 0.00520 | 1 | U |
| Cadmium | 0.0500 | 0.200 | -0.0190 | 1 | U |
| Chromium | 0.200 | 0.800 | 0.0542 | 1 | U |
| Copper | 0.200 | 0.800 | -0.00680 | 1 | U |
| Lead | 0.100 | 0.200 | -0.0104 | 1 | U |
| Manganese | 0.200 | 0.800 | -0.0113 | 1 | U |
| Nickel | 0.400 | 1.60 | -0.00610 | 1 | U |
| Antimony | 0.100 | 0.400 | 0.110 | 1 | F |
| Selenium | 0.200 | 0.400 | -0.0745 | 1 | U |
| Thallium | 0.0200 | 0.0800 | -0.00510 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

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# INITIAL CALIBRATION VERIFICATION (ICV)

00071777

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-05
Instrument ID: ELAN-ICP
Run Time: 10:06
Method: 6020
File ID: EL.091407.100637
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Lead | | 50 | 49.7 | 99.5 | 90 - 110 | |

* Exceeds LIMITS Limit

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Version 1.5 PDF File ID: 875853
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# INITIAL CALIBRATION VERIFICATION (ICV)



Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250301-05
Instrument ID: ELAN-ICP
Run Time: 10:46
Method: 6020
File ID: EL.091707.104606
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250211
Cal ID: ELAN-I - 17-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Silver | | 50 | 47.7 | 95.4 | 90 - 110 | |
| Arsenic | | 50 | 49.9 | 99.7 | 90 - 110 | |
| Barium | | 50 | 49.4 | 98.7 | 90 - 110 | |
| Cadmium | | 50 | 50.5 | 101 | 90 - 110 | |
| Chromium | | 50 | 49.1 | 98.3 | 90 - 110 | |
| Copper | | 50 | 50.3 | 101 | 90 - 110 | |
| Lead | | 50 | 49.8 | 99.5 | 90 - 110 | |
| Manganese | | 50 | 49.4 | 98.8 | 90 - 110 | |
| Nickel | | 50 | 49.7 | 99.5 | 90 - 110 | |
| Antimony | | 50 | 50.1 | 100 | 90 - 110 | |
| Selenium | | 50 | 51.1 | 102 | 90 - 110 | |
| Thallium | | 50 | 48.8 | 97.6 | 90 - 110 | |

* Exceeds LIMITS Limit

KEMRON FORMS - Modified 09/06/2007 (ICV)
Version 1.5 PDF File ID: 875853
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# INITIAL CALIBRATION VERIFICATION (ICV)

00071779

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250498-05
Instrument ID: ELAN-ICP
Run Time: 10:14
Method: 6020
File ID: EL.091907.101422
Analyst: JYH
Units: ug/L
Workgroup (AAB#): WG250414
Cal ID: ELAN-I - 19-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Silver | | 50 | 48.4 | 96.7 | 90 - 110 | |
| Arsenic | | 50 | 48.7 | 97.4 | 90 - 110 | |
| Barium | | 50 | 49.1 | 98.3 | 90 - 110 | |
| Cadmium | | 50 | 50.6 | 101 | 90 - 110 | |
| Chromium | | 50 | 49.3 | 98.7 | 90 - 110 | |
| Copper | | 50 | 49.0 | 98.1 | 90 - 110 | |
| Lead | | 50 | 50.2 | 100 | 90 - 110 | |
| Manganese | | 50 | 49.8 | 99.7 | 90 - 110 | |
| Nickel | | 50 | 49.3 | 98.5 | 90 - 110 | |
| Antimony | | 50 | 50.6 | 101 | 90 - 110 | |
| Selenium | | 50 | 50.1 | 100 | 90 - 110 | |
| Thallium | | 50 | 49.2 | 98.3 | 90 - 110 | |

* Exceeds LIMITS Limit

KEMRON FORMS - Modified 09/06/2007 (ICV)
Version 1.5 PDF File ID: 875853
Report generated 09/19/2007 14:30

CONTINUING CALIBRATION VERIFICATION (CCV)

00071780

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-01
Instrument ID: ELAN-ICP
Run Time: 10:46
Method: 6020
File ID: EL.091407.104620
Analyst: JYH
QC Key: STD
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Lead | | 50.0 | 50.5 | ug/L | 101 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071781

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-07
Instrument ID: ELAN-ICP
Run Time: 13:43
Method: 6020
File ID: EL.091407.134336
Analyst: JYH
QC Key: STD
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Lead | | 50.0 | 51.0 | ug/L | 102 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-10
00071782
Instrument ID: ELAN-ICP
Run Time: 15:04
Method: 6020
File ID: EL.091407.150452
Analyst: JYH
QC Key: STD
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Lead | | 50.0 | 50.7 | ug/L | 101 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Run Date: 09/14/2007
Sample ID: WG250165-01
Instrument ID: ELAN-ICP
Run Time: 15:37
Method: 6020
File ID: EL.091407.153754
Analyst: JYH
QC Key: STD
Workgroup (AAB#): WG250151
Cal ID: ELAN-I - 14-SEP-07

00071783

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Lead | | 50.0 | 52.4 | ug/L | 105 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071784

| | | |
|---|---|---|
| Login Number: L0709261 | Run Date: 09/17/2007 | Sample ID: WG250301-[illegible] |
| Instrument ID: ELAN-ICP | Run Time: 11:25 | Method: 6020 |
| File ID: EL.091707.112549 | Analyst: JYH | QC Key: STD |
| Workgroup (AAB#): WG250211 | Cal ID: ELAN-I - 17-SEP-07 | |

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Silver | | 50.0 | 47.1 | ug/L | 94.3 | 90 - 110 | | |
| Arsenic | | 50.0 | 50.4 | ug/L | 101 | 90 - 110 | | |
| Barium | | 50.0 | 48.1 | ug/L | 96.3 | 90 - 110 | | |
| Cadmium | | 50.0 | 50.3 | ug/L | 101 | 90 - 110 | | |
| Chromium | | 50.0 | 50.6 | ug/L | 101 | 90 - 110 | | |
| Copper | | 50.0 | 50.6 | ug/L | 101 | 90 - 110 | | |
| Lead | | 50.0 | 52.3 | ug/L | 105 | 90 - 110 | | |
| Manganese | | 50.0 | 50.1 | ug/L | 100 | 90 - 110 | | |
| Nickel | | 50.0 | 50.6 | ug/L | 101 | 90 - 110 | | |
| Antimony | | 50.0 | 50.8 | ug/L | 102 | 90 - 110 | | |
| Selenium | | 50.0 | 51.3 | ug/L | 103 | 90 - 110 | | |
| Thallium | | 50.0 | 52.2 | ug/L | 104 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071785

Login Number: L0709261 | Run Date: 09/17/2007 | Sample ID: WG250301-13
Instrument ID: ELAN-ICP | Run Time: 12:44 | Method: 6020
File ID: EL.091707.124426 | Analyst: JYH | QC Key: STD
Workgroup (AAB#): WG250211 | Cal ID: ELAN-I - 17-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Silver | | 50.0 | 49.6 | ug/L | 99.2 | 90 - 110 | | |
| Arsenic | | 50.0 | 50.4 | ug/L | 101 | 90 - 110 | | |
| Barium | | 50.0 | 50.6 | ug/L | 101 | 90 - 110 | | |
| Cadmium | | 50.0 | 50.8 | ug/L | 102 | 90 - 110 | | |
| Chromium | | 50.0 | 52.4 | ug/L | 105 | 90 - 110 | | |
| Copper | | 50.0 | 51.5 | ug/L | 103 | 90 - 110 | | |
| Lead | | 50.0 | 52.4 | ug/L | 105 | 90 - 110 | | |
| Manganese | | 50.0 | 52.8 | ug/L | 106 | 90 - 110 | | |
| Nickel | | 50.0 | 51.5 | ug/L | 103 | 90 - 110 | | |
| Antimony | | 50.0 | 50.8 | ug/L | 102 | 90 - 110 | | |
| Selenium | | 50.0 | 50.9 | ug/L | 102 | 90 - 110 | | |
| Thallium | | 50.0 | 51.6 | ug/L | 103 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

## CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Instrument ID: ELAN-ICP
File ID: EL.091707.140303
Workgroup (AAB#): WG250211

Run Date: 09/17/2007
Run Time: 14:03
Analyst: JYH
Cal ID: ELAN-I - 17-SEP-07

Sample ID: WG250301-15
Method: 6020
QC Key: STD

00071786

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Silver | | 50.0 | 48.5 | ug/L | 97.1 | 90 - 110 | | |
| Arsenic | | 50.0 | 48.7 | ug/L | 97.3 | 90 - 110 | | |
| Barium | | 50.0 | 49.9 | ug/L | 99.8 | 90 - 110 | | |
| Cadmium | | 50.0 | 50.9 | ug/L | 102 | 90 - 110 | | |
| Chromium | | 50.0 | 51.1 | ug/L | 102 | 90 - 110 | | |
| Copper | | 50.0 | 50.2 | ug/L | 100 | 90 - 110 | | |
| Lead | | 50.0 | 52.1 | ug/L | 104 | 90 - 110 | | |
| Manganese | | 50.0 | 51.2 | ug/L | 102 | 90 - 110 | | |
| Nickel | | 50.0 | 50.5 | ug/L | 101 | 90 - 110 | | |
| Antimony | | 50.0 | 50.1 | ug/L | 100 | 90 - 110 | | |
| Selenium | | 50.0 | 49.3 | ug/L | 98.6 | 90 - 110 | | |
| Thallium | | 50.0 | 51.1 | ug/L | 102 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250301-07
Instrument ID: ELAN-ICP
Run Time: 15:09
Method: 6020
File ID: EL.091707.150934
Analyst: JYH
QC Key: STD
Workgroup (AAB#): WG250211
Cal ID: ELAN-I - 17-SEP-07

00071787

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Silver | | 50.0 | 48.0 | ug/L | 95.9 | 90 - 110 | | |
| Arsenic | | 50.0 | 49.8 | ug/L | 99.6 | 90 - 110 | | |
| Barium | | 50.0 | 49.8 | ug/L | 99.6 | 90 - 110 | | |
| Cadmium | | 50.0 | 50.1 | ug/L | 100 | 90 - 110 | | |
| Chromium | | 50.0 | 52.2 | ug/L | 104 | 90 - 110 | | |
| Copper | | 50.0 | 51.4 | ug/L | 103 | 90 - 110 | | |
| Lead | | 50.0 | 52.8 | ug/L | 106 | 90 - 110 | | |
| Manganese | | 50.0 | 52.4 | ug/L | 105 | 90 - 110 | | |
| Nickel | | 50.0 | 51.4 | ug/L | 103 | 90 - 110 | | |
| Antimony | | 50.0 | 49.2 | ug/L | 98.4 | 90 - 110 | | |
| Selenium | | 50.0 | 51.9 | ug/L | 104 | 90 - 110 | | |
| Thallium | | 50.0 | 52.5 | ug/L | 105 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261 | Run Date: 09/19/2007 | Sample ID: WG250498-01

00071788

Instrument ID: ELAN-ICP | Run Time: 10:54 | Method: 6020

File ID: EL.091907.105405 | Analyst: JYH | QC Key: STD

Workgroup (AAB#): WG250414 | Cal ID: ELAN-I - 19-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Silver | | 50.0 | 46.3 | ug/L | 92.6 | 90 - 110 | | |
| Arsenic | | 50.0 | 48.7 | ug/L | 97.4 | 90 - 110 | | |
| Barium | | 50.0 | 48.6 | ug/L | 97.3 | 90 - 110 | | |
| Cadmium | | 50.0 | 48.3 | ug/L | 96.6 | 90 - 110 | | |
| Chromium | | 50.0 | 49.0 | ug/L | 97.9 | 90 - 110 | | |
| Copper | | 50.0 | 49.8 | ug/L | 99.5 | 90 - 110 | | |
| Lead | | 50.0 | 50.8 | ug/L | 102 | 90 - 110 | | |
| Manganese | | 50.0 | 51.4 | ug/L | 103 | 90 - 110 | | |
| Nickel | | 50.0 | 49.2 | ug/L | 98.4 | 90 - 110 | | |
| Antimony | | 50.0 | 48.5 | ug/L | 97.0 | 90 - 110 | | |
| Selenium | | 50.0 | 51.0 | ug/L | 102 | 90 - 110 | | |
| Thallium | | 50.0 | 50.1 | ug/L | 100 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Run Date: 09/19/2007
Sample ID: WG250498-03
00071789

Instrument ID: ELAN-ICP
Run Time: 12:12
Method: 6020

File ID: EL.091907.121242
Analyst: JYH
QC Key: STD

Workgroup (AAB#): WG250414
Cal ID: ELAN-I - 19-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Silver | | 50.0 | 47.5 | ug/L | 95.1 | 90 - 110 | | |
| Arsenic | | 50.0 | 48.6 | ug/L | 97.3 | 90 - 110 | | |
| Barium | | 50.0 | 50.0 | ug/L | 99.9 | 90 - 110 | | |
| Cadmium | | 50.0 | 50.8 | ug/L | 102 | 90 - 110 | | |
| Chromium | | 50.0 | 45.7 | ug/L | 91.3 | 90 - 110 | | |
| Copper | | 50.0 | 48.1 | ug/L | 96.2 | 90 - 110 | | |
| Lead | | 50.0 | 51.7 | ug/L | 103 | 90 - 110 | | |
| Manganese | | 50.0 | 45.8 | ug/L | 91.6 | 90 - 110 | | |
| Nickel | | 50.0 | 48.9 | ug/L | 97.8 | 90 - 110 | | |
| Antimony | | 50.0 | 50.0 | ug/L | 100 | 90 - 110 | | |
| Selenium | | 50.0 | 49.8 | ug/L | 99.6 | 90 - 110 | | |
| Thallium | | 50.0 | 50.3 | ug/L | 101 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Instrument ID: ELAN-ICP
File ID: EL.091907.131817
Workgroup (AAB#): WG250414

Run Date: 09/19/2007
Run Time: 13:18
Analyst: JYH
Cal ID: ELAN-I - 19-SEP-07

Sample ID: WG250498-05
Method: 6020
QC Key: STD

00071790

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Silver | | 50.0 | 48.9 | ug/L | 97.8 | 90 - 110 | | |
| Arsenic | | 50.0 | 47.5 | ug/L | 94.9 | 90 - 110 | | |
| Barium | | 50.0 | 50.0 | ug/L | 100 | 90 - 110 | | |
| Cadmium | | 50.0 | 50.9 | ug/L | 102 | 90 - 110 | | |
| Chromium | | 50.0 | 47.8 | ug/L | 95.6 | 90 - 110 | | |
| Copper | | 50.0 | 48.1 | ug/L | 96.2 | 90 - 110 | | |
| Lead | | 50.0 | 51.9 | ug/L | 104 | 90 - 110 | | |
| Manganese | | 50.0 | 50.0 | ug/L | 100 | 90 - 110 | | |
| Nickel | | 50.0 | 48.2 | ug/L | 96.3 | 90 - 110 | | |
| Antimony | | 50.0 | 49.6 | ug/L | 99.2 | 90 - 110 | | |
| Selenium | | 50.0 | 48.3 | ug/L | 96.7 | 90 - 110 | | |
| Thallium | | 50.0 | 50.8 | ug/L | 102 | 90 - 110 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 875856
Report generated 09/19/2007 14:30

# INTERFERENCE CHECK SAMPLES

00071791

**Login number:** L0709261 **Workgroup (AAB#):** WG250151
**Instrument ID:** ELAN-ICP **Method:** 6020
**Sol. A :** WG250165-09 **File ID:** EL.091407.103313 **Units:** ug/L
**Sol. AB :** WG250165-10 **File ID:** EL.091407.103947

| | Sol. A | | | Sol. AB | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Lead | NS | 0.0435 | NS | 100 | 106 | 106 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

**KEMRON FORMS - Modified 03/05/2007**
**Version 1.3 PDF File ID: 875855**
**Report generated 09/19/2007 14:30**

KEMRON ENVIRONMENTAL SERVICES

INTERFERENCE CHECK SAMPLES

00071792

**Login number:** L0709261
**Instrument ID:** ELAN-ICP
**Sol. A :** WG250301-09 **File ID:** EL.091707.111241
**Sol. AB :** WG250301-10 **File ID:** EL.091707.111915

**Workgroup (AAB#):** WG250211
**Method:** 6020
**Units:** ug/L

| | Sol. A | | | Sol. AB | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Antimony | NS | 0.00180 | NS | 100 | 108 | 108 | |
| Arsenic | NS | -0.0497 | NS | 100 | 107 | 107 | |
| Barium | NS | 0.00740 | NS | 100 | 103 | 103 | |
| Cadmium | NS | 0.0731 | NS | 100 | 108 | 108 | |
| Chromium | NS | 0.188 | NS | 100 | 108 | 108 | |
| Copper | NS | 0.247 | NS | 100 | 103 | 103 | |
| Lead | NS | 0.0622 | NS | 100 | 107 | 107 | |
| Manganese | NS | 0.375 | NS | 100 | 108 | 108 | |
| Nickel | NS | 0.753 | NS | 100 | 104 | 104 | |
| Selenium | NS | -0.274 | NS | 100 | 106 | 106 | |
| Silver | NS | -0.00940 | NS | 100 | 99.8 | 99.8 | |
| Thallium | NS | 0.0332 | NS | 100 | 106 | 106 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

KEMRON FORMS - Modified 03/05/2007
Version 1.3 PDF File ID: 875855
Report generated 09/19/2007 14:30

00071793

**Login number:** L0709261
**Instrument ID:** ELAN-ICP
**Sol. A :** WG250498-09 **File ID:** EL.091907.104057
**Sol. AB :** WG250498-10 **File ID:** EL.091907.104731

**Workgroup (AAB#):** WG250414
**Method:** 6020
**Units:** ug/L

| | **Sol. A** | | | **Sol. AB** | | | |
|---|---|---|---|---|---|---|---|
| ANALYTE | True | Found | %Recovery | True | Found | %Recovery | Q |
| Antimony | NS | 0.0314 | NS | 100 | 103 | 103 | |
| Arsenic | NS | 0.00480 | NS | 100 | 101 | 101 | |
| Barium | NS | 0.0259 | NS | 100 | 100 | 100 | |
| Cadmium | NS | 0.0283 | NS | 100 | 102 | 102 | |
| Chromium | NS | 0.107 | NS | 100 | 103 | 103 | |
| Copper | NS | 0.249 | NS | 100 | 101 | 101 | |
| Lead | NS | 0.0559 | NS | 100 | 104 | 104 | |
| Manganese | NS | 0.363 | NS | 100 | 106 | 106 | |
| Nickel | NS | 0.775 | NS | 100 | 102 | 102 | |
| Selenium | NS | -0.0954 | NS | 100 | 103 | 103 | |
| Silver | NS | 0.00440 | NS | 100 | 95.4 | 95.4 | |
| Thallium | NS | 0.0222 | NS | 100 | 103 | 103 | |

**NS = Not spiked**
*** = Recovery of spiked element is outside acceptance limit of 80% - 120% of true value.**
**# = Result for unspiked element is outside the acceptance limits of (+/-) the project reporting limit (RL).**

# CRI SAMPLE



Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250301-08
Instrument ID: ELAN-ICP
Run Time: 11:06
Prep Method: 3015
File ID: EL.091707.110606
Analyst: JYH
Method: 6020
Workgroup (AAB#): WG250301
Matrix: Water
Units: ug/L
Contract #: DACA56-94-D-0020
Cal ID: ELAN-ICP - 17-SEP-2007 10:39

| Analytes | Expected | Found | % Rec | Limits | Q |
|---|---|---|---|---|---|
| Cadmium | 0.200 | 0.229 | 114 | 50 - 150 | |
| Thallium | 0.0800 | 0.0916 | 115 | 50 - 150 | |

KEMRON FORMS - Modified 02/14/2006
Version 1.5 PDF File ID: 875851
Report generated 09/19/2007 14:30

# CRI SAMPLE

00071795

Login Number: L0709261 | Run Date: 09/19/2007 | Sample ID: WG250498-08
Instrument ID: ELAN-ICP | Run Time: 10:34 | Prep Method: 3015
File ID: EL.091907.103422 | Analyst: JYH | Method: 6020
Workgroup (AAB#): WG250498 | Matrix: Water | Units: ug/L
Contract #: DACA56-94-D-0020 | Cal ID: ELAN-ICP - 19-SEP-2007 10:07

| Analytes | Expected | Found | % Rec | Limits | Q |
|---|---|---|---|---|---|
| Cadmium | 0.200 | 0.174 | 86.8 | 50 - 150 | |
| Thallium | 0.0800 | 0.0795 | 99.4 | 50 - 150 | |

KEMRON FORMS - Modified 02/14/2006
Version 1.5 PDF File ID: 875851
Report generated 09/19/2007 14:30

# LINEAR RANGE (QUARTERLY)

00071796

**Login Number:** L0709261 **Date:** 09/07/2007
**Insturment ID:** ELAN-ICP **Method:** 6020

| Analyte | Integration Time (Sec.) | Concentration (ug/L) |
|---|---|---|
| Antimony | 1.00 | 100.0 |
| Arsenic | 1.00 | 100.0 |
| Barium | 1.00 | 100.0 |
| Cadmium | 1.00 | 100.0 |
| Chromium | 1.00 | 100.0 |
| Cobalt | 1.00 | 100.0 |
| Copper | 1.00 | 100.0 |
| Lead | 1.00 | 100.0 |
| Manganese | 1.00 | 100.0 |
| Nickel | 1.00 | 100.0 |
| Selenium | 1.00 | 100.0 |
| Silver | 1.00 | 100.0 |
| Thallium | 1.00 | 100.0 |
| Vanadium | 1.00 | 100.0 |
| Zinc | 1.00 | 100.0 |

**Comments:**

KEMRON FORMS - Modified 02/14/2006
Version 1.5 PDF File ID: 875850
Report generated 09/19/2007 14:30

# LINEAR RANGE (QUARTERLY)

00071797

**Login Number:** L0709261 **Date:** 09/07/2007
**Insturment ID:** ELAN-ICP **Method:** 6020

| Analyte | Integration Time (Sec.) | Concentration (ug/L) |
|---|---|---|
| Antimony | 1.00 | 100.0 |
| Arsenic | 1.00 | 100.0 |
| Barium | 1.00 | 100.0 |
| Cadmium | 1.00 | 100.0 |
| Chromium | 1.00 | 100.0 |
| Cobalt | 1.00 | 100.0 |
| Copper | 1.00 | 100.0 |
| Lead | 1.00 | 100.0 |
| Manganese | 1.00 | 100.0 |
| Nickel | 1.00 | 100.0 |
| Selenium | 1.00 | 100.0 |
| Silver | 1.00 | 100.0 |
| Thallium | 1.00 | 100.0 |
| Vanadium | 1.00 | 100.0 |
| Zinc | 1.00 | 100.0 |

**Comments:**

KEMRON FORMS - Modified 02/14/2006
Version 1.5 PDF File ID: 875850
Report generated 09/19/2007 14:30

# 2.1.3 Metals CVAA Data (Mercury)

# 2.1.3.1 Summary Data

# LABORATORY REPORT

**L0709261**

**09/26/07 14:09**

00071800

**Submitted By**

**KEMRON Environmental Services**
**156 Starlite Drive**
**Marietta , OH 45750**
**( 740 ) 373 - 4071**

**For**

Account Name: Shaw E & I, Inc.
ABB Lummus Biulding
3010 Briarpark Drive Suite 4N
Houston, TX 77042
Attention: Larry Duty

Account Number: 2773
Work ID: LHAAP-46

P.O. Number: 200328

## Sample Analysis Summary

| Client ID | Lab ID | Method | Dilution | Date Received |
|---|---|---|---|---|
| 46WW02-090707 | L0709261-01 | 7470A | 1 | 13-SEP-07 |
| 46WW02-090707 | L0709261-02 | 7470A | 1 | 13-SEP-07 |
| 46WW04-090707 | L0709261-03 | 7470A | 1 | 13-SEP-07 |
| 46WW04-090707 | L0709261-04 | 7470A | 1 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-05 | 7470A | 1 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-06 | 7470A | 1 | 13-SEP-07 |
| LHSMW14-090707 | L0709261-07 | 7470A | 1 | 13-SEP-07 |
| LHSMW14-090707 | L0709261-08 | 7470A | 1 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-09 | 7470A | 1 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-10 | 7470A | 1 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-11 | 7470A | 1 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-12 | 7470A | 1 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-13 | 7470A | 1 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-14 | 7470A | 1 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-15 | 7470A | 1 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-16 | 7470A | 1 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-17 | 7470A | 1 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-18 | 7470A | 1 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-19 | 7470A | 1 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-20 | 7470A | 1 | 13-SEP-07 |

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071801

| | | |
|---|---|---|
| Sample Number: **L0709261-01** | PrePrep Method: **NONE** | Instrument: **HYDRA** |
| Client ID: **46WW02-090707** | Prep Method: **METHOD** | Prep Date: **09/14/2007 08:30** |
| Matrix: **Water** | Analytical Method: **7470A** | Cal Date: **09/17/2007 09:25** |
| Workgroup Number: **WG250149** | Analyst: **ED** | Run Date: **09/17/2007 09:49** |
| Collect Date: **09/07/2007 08:30** | Dilution: **1** | File ID: **HY.091707.094919** |
| Sample Tag: **01** | Units: **mg/L** | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

**1 of 20**

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-02** | PrePrep Method: | **NONE** | Instrument: | **HYDRA** |
| Client ID: | **46WW02-090707** | Prep Method: | **METHOD** | Prep Date: | **09/17/2007 09:10** |
| Matrix: | **Water** | Analytical Method: | **7470A** | Cal Date: | **09/18/2007 10:46** |
| Workgroup Number: | **WG250283** | Analyst: | **ED** | Run Date: | **09/18/2007 11:04** |
| Collect Date: | **09/07/2007 08:30** | Dilution: | **1** | File ID: | **HY.091807.110447** |
| Sample Tag: | **01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Mercury, Dissolved** | **7439-97-6** | | **U** | **0.000200** | **0.000100** |

**U Not detected at or above adjusted sample detection limit**

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071803

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-03** | PrePrep Method: | **NONE** | Instrument: | **HYDRA** |
| Client ID: | **46WW04-090707** | Prep Method: | **METHOD** | Prep Date: | **09/14/2007 08:30** |
| Matrix: | **Water** | Analytical Method: | **7470A** | Cal Date: | **09/17/2007 09:25** |
| Workgroup Number: | **WG250149** | Analyst: | **ED** | Run Date: | **09/17/2007 09:52** |
| Collect Date: | **09/07/2007 10:10** | Dilution: | **1** | File ID: | **HY.091707.095229** |
| Sample Tag: | **01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Mercury** | **7439-97-6** | | **U** | **0.000200** | **0.000100** |

**U Not detected at or above adjusted sample detection limit**

Sample Number: L0709261-04
Client ID: 46WW04-090707
Matrix: Water
Workgroup Number: WG250283
Collect Date: 09/07/2007 10:10
Sample Tag: 01

PrePrep Method: NONE
Prep Method: METHOD
Analytical Method: 7470A
Analyst: ED
Dilution: 1
Units: mg/L

Instrument: HYDRA
Prep Date: 09/17/2007 09:10
Cal Date: 09/18/2007 10:46
Run Date: 09/18/2007 11:10
File ID: HY.091807.111047

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury, Dissolved | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

00071805

Sample Number: L0709261-05
Client ID: LHSMW11-090707
Matrix: Water
Workgroup Number: WG250149
Collect Date: 09/07/2007 12:20
Sample Tag: 01

PrePrep Method: NONE
Prep Method: METHOD
Analytical Method: 7470A
Analyst: ED
Dilution: 1
Units: mg/L

Instrument: HYDRA
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 09:25
Run Date: 09/17/2007 09:54
File ID: HY.091707.095406

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | | U | 0.000200 | 0.000100 |

U Not detected at or above adjusted sample detection limit

00071806

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-06** | PrePrep Method: | **NONE** | Instrument: | **HYDRA** |
| Client ID: | **LHSMW11-090707** | Prep Method: | **METHOD** | Prep Date: | **09/17/2007 09:10** |
| Matrix: | **Water** | Analytical Method: | **7470A** | Cal Date: | **09/18/2007 10:46** |
| Workgroup Number: | **WG250283** | Analyst: | **ED** | Run Date: | **09/18/2007 11:16** |
| Collect Date: | **09/07/2007 12:20** | Dilution: | **1** | File ID: | **HY.091807.111645** |
| Sample Tag: | **01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury, Dissolved | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

00071807

Sample Number: L0709261-07
Client ID: LHSMW14-090707
Matrix: Water
Workgroup Number: WG250149
Collect Date: 09/10/2007 13:30
Sample Tag: 01

PrePrep Method: NONE
Prep Method: METHOD
Analytical Method: 7470A
Analyst: ED
Dilution: 1
Units: mg/L

Instrument: HYDRA
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 09:25
Run Date: 09/17/2007 09:55
File ID: HY.091707.095543

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

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00071808

Sample Number: **L0709261-08**
Client ID: **LHSMW14-090707**
Matrix: **Water**
Workgroup Number: **WG250283**
Collect Date: **09/10/2007 13:30**
Sample Tag: **01**

PrePrep Method: **NONE**
Prep Method: **METHOD**
Analytical Method: **7470A**
Analyst: **ED**
Dilution: **1**
Units: **mg/L**

Instrument: **HYDRA**
Prep Date: **09/17/2007 09:10**
Cal Date: **09/18/2007 10:46**
Run Date: **09/18/2007 11:18**
File ID: **HY.091807.111834**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury, Dissolved | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-09 | PrePrep Method: | NONE | Instrument: | HYDRA |
| Client ID: | LHSMW15-090707 | Prep Method: | METHOD | Prep Date: | 09/14/2007 08:30 |
| Matrix: | Water | Analytical Method: | 7470A | Cal Date: | 09/17/2007 09:25 |
| Workgroup Number: | WG250149 | Analyst: | ED | Run Date: | 09/17/2007 09:57 |
| Collect Date: | 09/10/2007 15:45 | Dilution: | 1 | File ID: | HY.091707.095732 |
| Sample Tag: | 01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | 0.000193 | J | 0.000200 | 0.000100 |

**J The analyte was positively identified, but the quantitation was below the RL**

00071810

Sample Number: L0709261-10
Client ID: LHSMW15-090707
Matrix: Water
Workgroup Number: WG250283
Collect Date: 09/10/2007 15:45
Sample Tag: 01

PrePrep Method: NONE
Prep Method: METHOD
Analytical Method: 7470A
Analyst: ED
Dilution: 1
Units: mg/L

Instrument: HYDRA
Prep Date: 09/17/2007 09:10
Cal Date: 09/18/2007 10:46
Run Date: 09/18/2007 11:20
File ID: HY.091807.112032

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury, Dissolved | 7439-97-6 | 0.000165 | J | 0.000200 | 0.000100 |

J The analyte was positively identified, but the quantitation was below the RL

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-11 | PrePrep Method: | NONE | Instrument: | HYDRA |
| Client ID: | LHSMW19-090707 | Prep Method: | METHOD | Prep Date: | 09/14/2007 08:30 |
| Matrix: | Water | Analytical Method: | 7470A | Cal Date: | 09/17/2007 09:25 |
| Workgroup Number: | WG250149 | Analyst: | ED | Run Date: | 09/17/2007 09:59 |
| Collect Date: | 09/11/2007 08:20 | Dilution: | 1 | File ID: | HY.091707.095928 |
| Sample Tag: | 01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

**11 of 20**

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071812

| | | |
|---|---|---|
| Sample Number: **L0709261-12** | PrePrep Method: **NONE** | Instrument: **HYDRA** |
| Client ID: **LHSMW19-090707** | Prep Method: **METHOD** | Prep Date: **09/17/2007 09:10** |
| Matrix: **Water** | Analytical Method: **7470A** | Cal Date: **09/18/2007 10:46** |
| Workgroup Number: **WG250283** | Analyst: **ED** | Run Date: **09/18/2007 11:27** |
| Collect Date: **09/11/2007 08:20** | Dilution: **1** | File ID: **HY.091807.112717** |
| Sample Tag: **01** | Units: **mg/L** | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury, Dissolved | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

00071813

Sample Number: L0709261-13
Client ID: LHSMW22-090707
Matrix: Water
Workgroup Number: WG250149
Collect Date: 09/11/2007 09:50
Sample Tag: 01

PrePrep Method: NONE
Prep Method: METHOD
Analytical Method: 7470A
Analyst: ED
Dilution: 1
Units: mg/L

Instrument: HYDRA
Prep Date: 09/14/2007 08:30
Cal Date: 09/17/2007 09:25
Run Date: 09/17/2007 10:01
File ID: HY.091707.100117

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | | U | 0.000200 | 0.000100 |

U Not detected at or above adjusted sample detection limit

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071814

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-14** | PrePrep Method: | **NONE** | Instrument: | **HYDRA** |
| Client ID: | **LHSMW22-090707** | Prep Method: | **METHOD** | Prep Date: | **09/17/2007 09:10** |
| Matrix: | **Water** | Analytical Method: | **7470A** | Cal Date: | **09/18/2007 10:46** |
| Workgroup Number: | **WG250283** | Analyst: | **ED** | Run Date: | **09/18/2007 11:29** |
| Collect Date: | **09/11/2007 09:50** | Dilution: | **1** | File ID: | **HY.091807.112910** |
| Sample Tag: | **01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury, Dissolved | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-15 | PrePrep Method: | NONE | Instrument: | HYDRA |
| Client ID: | LHSMW23-090707 | Prep Method: | METHOD | Prep Date: | 09/14/2007 08:30 |
| Matrix: | Water | Analytical Method: | 7470A | Cal Date: | 09/17/2007 09:25 |
| Workgroup Number: | WG250149 | Analyst: | ED | Run Date: | 09/17/2007 10:06 |
| Collect Date: | 09/11/2007 13:35 | Dilution: | 1 | File ID: | HY.091707.100631 |
| Sample Tag: | 01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | | U | 0.000200 | 0.000100 |

U Not detected at or above adjusted sample detection limit

00071816

Sample Number: **L0709261-16**
Client ID: **LHSMW23-090707**
Matrix: **Water**
Workgroup Number: **WG250283**
Collect Date: **09/11/2007 13:35**
Sample Tag: **01**

PrePrep Method: **NONE**
Prep Method: **METHOD**
Analytical Method: **7470A**
Analyst: **ED**
Dilution: **1**
Units: **mg/L**

Instrument: **HYDRA**
Prep Date: **09/17/2007 09:10**
Cal Date: **09/18/2007 10:46**
Run Date: **09/18/2007 11:31**
File ID: **HY.091807.113149**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury, Dissolved | 7439-97-6 | | U | 0.000200 | 0.000100 |

**U Not detected at or above adjusted sample detection limit**

00071817

Sample Number:**L0709261-17**
Client ID:**LHSMW24-090707**
Matrix:**Water**
Workgroup Number:**WG250149**
Collect Date:**09/11/2007 15:35**
Sample Tag:**01**

PrePrep Method:**NONE**
Prep Method:**METHOD**
Analytical Method:**7470A**
Analyst:**ED**
Dilution:**1**
Units:**mg/L**

Instrument:**HYDRA**
Prep Date:**09/14/2007 08:30**
Cal Date:**09/17/2007 09:25**
Run Date:**09/17/2007 10:08**
File ID:**HY.091707.100808**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | 0.00146 | | 0.000200 | 0.000100 |

00071818

Sample Number:**L0709261-18**
Client ID:**LHSMW24-090707**
Matrix:**Water**
Workgroup Number:**WG250283**
Collect Date:**09/11/2007 15:35**
Sample Tag:**01**

PrePrep Method:**NONE**
Prep Method:**METHOD**
Analytical Method:**7470A**
Analyst:**ED**
Dilution:**1**
Units:**mg/L**

Instrument:**HYDRA**
Prep Date:**09/17/2007 09:10**
Cal Date:**09/18/2007 10:46**
Run Date:**09/18/2007 11:33**
File ID:**HY.091807.113326**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury, Dissolved | 7439-97-6 | 0.00115 | | 0.000200 | 0.000100 |

00071819

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | L0709261-19 | PrePrep Method: | NONE | Instrument: | HYDRA |
| Client ID: | LHSMW24-090707-FD | Prep Method: | METHOD | Prep Date: | 09/14/2007 08:30 |
| Matrix: | Water | Analytical Method: | 7470A | Cal Date: | 09/17/2007 09:25 |
| Workgroup Number: | WG250149 | Analyst: | ED | Run Date: | 09/17/2007 10:09 |
| Collect Date: | 09/11/2007 15:35 | Dilution: | 1 | File ID: | HY.091707.100957 |
| Sample Tag: | 01 | Units: | mg/L | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Mercury | 7439-97-6 | 0.00142 | | 0.000200 | 0.000100 |

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Report Number: **L0709261**

Report Date : **September 26, 2007**

00071820

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-20** | PrePrep Method: | **NONE** | Instrument: | **HYDRA** |
| Client ID: | **LHSMW24-090707-FD** | Prep Method: | **METHOD** | Prep Date: | **09/17/2007 09:10** |
| Matrix: | **Water** | Analytical Method: | **7470A** | Cal Date: | **09/18/2007 10:46** |
| Workgroup Number: | **WG250283** | Analyst: | **ED** | Run Date: | **09/18/2007 11:35** |
| Collect Date: | **09/11/2007 15:35** | Dilution: | **1** | File ID: | **HY.091807.113515** |
| Sample Tag: | **01** | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Mercury, Dissolved** | **7439-97-6** | **0.000988** | | **0.000200** | **0.000100** |

# 2.1.3.2 QC Summary Data

**1.0 Initial Calibration (ICAL) Parameters**
The system performs linear regression from data consisting of a blank and five standards.

**2.0 Calculating the concentration (C) of an element in water using data from run log and quantitation report (note:the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Vi} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (ug/L) | 0.1 |
| $Vf$ = Diluted to Volume (mL) | 40 |
| $Vi$ = Aliquot Volume (mL) | 40 |
| $D$ = Manual dilution factor, if required (10X = 10) | 1 |
| | |
| $Cx$ = Concentration of element in ppb (ug/L) | 0.1 |

**3.0 Calculating the concentration (C) of an element in soil using data from prep log and quantitation report (note: the data system performs this calculation automatically when correction factors have been entered):**

$$Cx = Cs \times \frac{Vf}{Ws} \times D$$

| Where: | **Example:** |
|---|---|
| $Cs$ = Concentration computed by the data system (ug/L) | 0.1 |
| $Vf$ = Diluted to volume (mL) | 40 |
| $Ws$ = Aliquot weight (g) | 0.6 |
| $D$ = Manual dilution factor | 1 |
| | |
| $Cx$ = Concentration of element in ug/kg | 6.67 |

**4.0 Adjusting the concentration to dry weight:**

$$Cdry = \frac{Cx \times 100}{Px}$$

| | |
|---|---|
| 1 $Cx$ = Concentration calculated as received (wet basis) | 6.67 |
| $Px$ = Percent solids of sample (%wt) | 80 |
| | |
| $Cdry$ = Concentration calculated as dry weight (ug/kg) | 8.33 |

**8.33 ug/kg = 0.00833 mg/kg**

# Mercury Digestion Log

Analyst(s): Pdl
Date: 9/14/07
LCS: 4ml STD 21885
MS/MSD: 4ml STD 21885
Witness: VC
$H_2SO_4$ Lot #: CNO 12284
$K_2S_2O_8$ Lot #: ACT 11993
$KMNO_4$ Lot #: ACT 12044
$HNO_3$ Lot #: CNO 12526
Digest Tube Lot #: CNO 12521
Aqua Regia: N/D
Earliest Sample Due Date: 9/19/07
ICV / CCV: STD 21887
Stds: 0, 0.2, 1, 2, 5, 10: STD 21888 → 21893

Box: 68

Digestion Work Group: WG 250107

**ME404 Revision #** 10 - Method 7470A-Water
**ME405 Revision #** ____ - Method 7471A-Soil

Hot Block Temperature at start: 96.6 °C @ 0830

Hot Block Temperature at end: 97.9 °C @ 1030

Relinquished By: VC / PA
Digest Received By: VChu Date: 9/14/07

| | KEMRON # | Initial Wt/Vol | Final Volume | Comments | Due Date |
|---|---|---|---|---|---|
| 1 | PBW | 40ml | 40ml | -02 | |
| 2 | LCSW | | | -03 | |
| 3 | 09-261-01 | | | | 9/24 |
| 4 | -03 | | | | |
| 5 | -05 | | | | |
| 6 | -07 | | | | |
| 7 | -09 | | | | |
| 8 | -11 | | | | |
| 9 | -13 | | | | |
| 10 | -15 | | | | |
| 11 | -17 | | | | |
| 12 | -19 | | | | |
| 13 | TCBLK 9/13 | 4ml | | WG 250058 @ 1400 | |
| 14 | 08-230-01 | | | -01 | 9/19 |
| 15 | -01MS | | | -04 | |
| 16 | -01MSD | | | -05 | 9/14 PA |
| 17 | 09-248-01 | | | | 9/21 |
| 18 | | | | | |
| 19 | | | | | |
| 20 | | | | | |
| 21 | | | | | |
| 22 | | | | | |
| 23 | | | | | |
| 24 | | | | | |
| 25 | | | | | |

Pdl 9/14/07

Comments: ______

Primary Review: Pdl 9/14/07 Secondary Review: Vicki Collins 9/14/07

00071824

# Mercury Digestion Log

Analyst(s): [initials]
Date: 9/17/07
LCS: 4ml STD 21924
MS/MSD: 4ml STD 21924
Witness: JV
$H_2SO_4$ Lot #: COD 12284
$K_2S_2O_8$ Lot #: RET 11993
$KMNO_4$ Lot #: RET 12044
$HNO_3$ Lot #: COD 12526
Digest Tube Lot #: COD 12400
Aqua Regia: N/A
Earliest Sample Due Date: 9/24/07
ICV / CCV: STD 21926
Stds: 0, 0.2, 1, 2, 5, 10: STD 21927 - 21932

Box: 89

Digestion Work Group: WG 250231

**ME404 Revision #** 10 - Method 7470A-Water
**ME405 Revision #** ____ - Method 7471A-Soil

Hot Block Temperature at start: 94.3 @ 0910

Hot Block Temperature at end: 95.0 @ 1110

Relinquished By: [initials]
Digest Received By: VYH Date: 9/17/07

| | KEMRON # | Initial Wt/Vol | Final Volume | Comments | | Due Date |
|---|---|---|---|---|---|---|
| 1 | MBW | 40ml | 40ml | 110 FILT 9/14 | -02 | |
| 2 | LCSW | | | | -03 | |
| 3 | 09-261-02 | | | | -01 | 9/24 |
| 4 | -02MS | 36ml | | | -04 | |
| 5 | -02MSD | | | | -05 | |
| 6 | -04 | 40ml | | | | |
| 7 | -06 | | | | | |
| 8 | -08 | | | | | |
| 9 | -10 | | | | | |
| 10 | -12 | | | | | |
| 11 | -14 | | | | | |
| 12 | -16 | | | | | |
| 13 | -18 | | | | | |
| 14 | -20 | | | | | |
| 15 | | | | | | |
| 16 | | | | | | |
| 17 | | | | | | |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |
| 21 | | | | | | |
| 22 | [initials] 9/17/07 | | | | | |
| 23 | | | | | | |
| 24 | | | | | | |
| 25 | | | | | | |

Comments: ______

Primary Review: [signature] 9/17/07 Secondary Review: [signature] 9/17/07

**KEMRON Environmental Services**

Instrument Run Log

00071825

Instrument: HYDRA  Dataset: 091707C.PRN
Analyst1: ED  Analyst2: NA
Method: 7470A  SOP: 404  Rev: 10
Maintenance Log ID: 20843

Calibration Std: STD21893  ICV/CCV Std: STD21885  Post Spike: STD21893
ICSA: N/A  ICSAB: N/A

Workgroups: WG250149

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | HY.091707.091612 | WG250296-01 | Calibration Point | | 1 | | 09/17/07 09:16 |
| 2 | HY.091707.091803 | WG250296-02 | Calibration Point | | 1 | | 09/17/07 09:18 |
| 3 | HY.091707.091945 | WG250296-03 | Calibration Point | | 1 | | 09/17/07 09:19 |
| 4 | HY.091707.092124 | WG250296-04 | Calibration Point | | 1 | | 09/17/07 09:21 |
| 5 | HY.091707.092313 | WG250296-05 | Calibration Point | | 1 | | 09/17/07 09:23 |
| 6 | HY.091707.092500 | WG250296-06 | Calibration Point | | 1 | | 09/17/07 09:25 |
| 7 | HY.091707.092829 | WG250296-07 | Initial Calibration Verification | | 1 | | 09/17/07 09:28 |
| 8 | HY.091707.093006 | WG250296-08 | Initial Calib Blank | | 1 | | 09/17/07 09:30 |
| 9 | HY.091707.093149 | WG250296-09 | CCV | | 1 | | 09/17/07 09:31 |
| 10 | HY.091707.093348 | WG250296-10 | CCB | | 1 | | 09/17/07 09:33 |
| 11 | HY.091707.094507 | WG250107-02 | Method/Prep Blank | 40/40 | 1 | | 09/17/07 09:45 |
| 12 | HY.091707.094713 | WG250107-03 | Laboratory Control S | | 1 | | 09/17/07 09:47 |
| 13 | HY.091707.094919 | L0709261-01 | 46WW02-090707 | 40/40 | 1 | | 09/17/07 09:49 |
| 14 | HY.091707.095055 | WG250149-01 | Post Digestion Spike | | 1 | L0709261-01 | 09/17/07 09:50 |
| 15 | HY.091707.095229 | L0709261-03 | 46WW04-090707 | 40/40 | 1 | WG250098-01 | 09/17/07 09:52 |
| 16 | HY.091707.095406 | L0709261-05 | LHSMW11-090707 | 40/40 | 1 | | 09/17/07 09:54 |
| 17 | HY.091707.095543 | L0709261-07 | LHSMW14-090707 | 40/40 | 1 | WG250078-04 | 09/17/07 09:55 |
| 18 | HY.091707.095732 | L0709261-09 | LHSMW15-090707 | 40/40 | 1 | | 09/17/07 09:57 |
| 19 | HY.091707.095928 | L0709261-11 | LHSMW19-090707 | 40/40 | 1 | | 09/17/07 09:59 |
| 20 | HY.091707.100117 | L0709261-13 | LHSMW22-090707 | 40/40 | 1 | | 09/17/07 10:01 |
| 21 | HY.091707.100254 | WG250296-11 | CCV | | 1 | | 09/17/07 10:02 |
| 22 | HY.091707.100453 | WG250296-12 | CCB | | 1 | | 09/17/07 10:04 |
| 23 | HY.091707.100631 | L0709261-15 | LHSMW23-090707 | 40/40 | 1 | | 09/17/07 10:06 |
| 24 | HY.091707.100808 | L0709261-17 | LHSMW24-090707 | 40/40 | 1 | | 09/17/07 10:08 |
| 25 | HY.091707.100957 | L0709261-19 | LHSMW24-090707-FD | 40/40 | 1 | | 09/17/07 10:09 |
| 26 | HY.091707.101138 | WG250058-01 | Fluid Blank | | 1 | | 09/17/07 10:11 |
| 27 | HY.091707.101326 | WG250107-01 | Reference Sample | | 1 | L0709230-01 | 09/17/07 10:13 |
| 28 | HY.091707.101502 | WG250149-02 | Post Digestion Spike | | 1 | L0709230-01 | 09/17/07 10:15 |
| 29 | HY.091707.101715 | WG250107-04 | Matrix Spike | 4/40 | 1 | | 09/17/07 10:17 |
| 30 | HY.091707.101903 | WG250107-05 | Matrix Spike Duplica | 4/40 | 1 | | 09/17/07 10:19 |
| 31 | HY.091707.102040 | L0709248-01 | COLD MILL TANK DIKE | 4/40 | 1 | | 09/17/07 10:20 |
| 32 | HY.091707.102228 | WG250296-13 | CCV | | 1 | | 09/17/07 10:22 |
| 33 | HY.091707.102405 | WG250296-14 | CCB | | 1 | | 09/17/07 10:24 |
| 34 | HY.091707.103104 | WG250107-03 | Laboratory Control S | 40/40 | 1 | | 09/17/07 10:31 |
| 35 | HY.091707.103241 | WG250296-15 | CCV | | 1 | | 09/17/07 10:32 |
| 36 | HY.091707.103418 | WG250296-16 | CCB | | 1 | | 09/17/07 10:34 |



Approved: September 17, 2007

Maren Beery

**KEMRON Environmental Services**

Instrument Run Log

00071826

Instrument: HYDRA  Dataset: 091807C.PRN

Analyst1: ED  Analyst2: NA

Method: 7470A  SOP: 404  Rev: 10

Maintenance Log ID: 20871

Calibration Std: STD21932  ICV/CCV Std: STD21924  Post Spike: STD21932

ICSA: N/A  ICSAB: N/A

Workgroups: WG250283

Comments:

| Seq. | File ID | Sample | ID | Prep | Dil | Reference | Date/Time |
|---|---|---|---|---|---|---|---|
| 1 | HY.091807.103632 | WG250401-01 | Calibration Point | | 1 | | 09/18/07 10:36 |
| 2 | HY.091807.103811 | WG250401-02 | Calibration Point | | 1 | | 09/18/07 10:38 |
| 3 | HY.091807.104000 | WG250401-03 | Calibration Point | | 1 | | 09/18/07 10:40 |
| 4 | HY.091807.104143 | WG250401-04 | Calibration Point | | 1 | | 09/18/07 10:41 |
| 5 | HY.091807.104427 | WG250401-05 | Calibration Point | | 1 | | 09/18/07 10:44 |
| 6 | HY.091807.104607 | WG250401-06 | Calibration Point | | 1 | | 09/18/07 10:46 |
| 7 | HY.091807.104747 | WG250401-07 | Initial Calibration Verification | | 1 | | 09/18/07 10:47 |
| 8 | HY.091807.105135 | WG250401-08 | Initial Calibration Verification | | 1 | | 09/18/07 10:51 |
| 9 | HY.091807.105311 | WG250401-09 | Initial Calib Blank | | 1 | | 09/18/07 10:53 |
| 10 | HY.091807.105517 | WG250401-10 | CCV | | 1 | | 09/18/07 10:55 |
| 11 | HY.091807.105654 | WG250401-11 | CCB | | 1 | | 09/18/07 10:56 |
| 12 | HY.091807.110103 | WG250231-02 | Method/Prep Blank | 40/40 | 1 | | 09/18/07 11:01 |
| 13 | HY.091807.110311 | WG250231-03 | Laboratory Control S | 40/40 | 1 | | 09/18/07 11:03 |
| 14 | HY.091807.110447 | WG250231-01 | Reference Sample | | 1 | L0709261-02 | 09/18/07 11:04 |
| 15 | HY.091807.110626 | WG250231-04 | Matrix Spike | 36/40 | 1 | | 09/18/07 11:06 |
| 16 | HY.091807.110807 | WG250231-05 | Matrix Spike Duplica | 36/40 | 1 | | 09/18/07 11:08 |
| 17 | HY.091807.111047 | L0709261-04 | 46WW04-090707 | 40/40 | 1 | WG250200-01 | 09/18/07 11:10 |
| 18 | HY.091807.111316 | WG250283-01 | Post Digestion Spike | | 1 | L0709261-04 | 09/18/07 11:13 |
| 19 | HY.091807.111645 | L0709261-06 | LHSMW11-090707 | 40/40 | 1 | | 09/18/07 11:16 |
| 20 | HY.091807.111834 | L0709261-08 | LHSMW14-090707 | 40/40 | 1 | | 09/18/07 11:18 |
| 21 | HY.091807.112032 | L0709261-10 | LHSMW15-090707 | 40/40 | 1 | | 09/18/07 11:20 |
| 22 | HY.091807.112241 | WG250401-12 | CCV | | 1 | | 09/18/07 11:22 |
| 23 | HY.091807.112458 | WG250401-13 | CCB | | 1 | | 09/18/07 11:24 |
| 24 | HY.091807.112717 | L0709261-12 | LHSMW19-090707 | 40/40 | 1 | | 09/18/07 11:27 |
| 25 | HY.091807.112910 | L0709261-14 | LHSMW22-090707 | 40/40 | 1 | | 09/18/07 11:29 |
| 26 | HY.091807.113149 | L0709261-16 | LHSMW23-090707 | 40/40 | 1 | | 09/18/07 11:31 |
| 27 | HY.091807.113326 | L0709261-18 | LHSMW24-090707 | 40/40 | 1 | | 09/18/07 11:33 |
| 28 | HY.091807.113515 | L0709261-20 | LHSMW24-090707-FD | 40/40 | 1 | | 09/18/07 11:35 |
| 29 | HY.091807.113652 | WG250401-14 | CCV | | 1 | | 09/18/07 11:36 |
| 30 | HY.091807.113844 | WG250401-15 | CCB | | 1 | | 09/18/07 11:38 |



Approved:

KEMRON Environmental Services
Data Checklist

00071827

Date: 17-SEP-2007
Analyst: ED
Analyst: NA
Method: 7470A
Instrument: HYDRA
Curve Workgroup: WG250296
Runlog ID: 18243
Analytical Workgroups: WG250149

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | |
| CRI | |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | X |
| Case Narrative | 261,230,248 |
| Client Forms | |
| Level X | |
| Level 3 | 261 |
| Level 4 | |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | ED |
| Secondary Reviewer | MMB |
| | |
| Comments | |

Primary Reviewer:
17-SEP-2007
Emily Decker

Secondary Reviewer:
17-SEP-2007
Maren Beery

Generated: SEP-17-2007 16:11:22

Checklist ID: 21339

KEMRON Environmental Services
Data Checklist

00071828

Date: 18-SEP-2007
Analyst: ED
Analyst: NA
Method: 7470A
Instrument: HYDRA
Curve Workgroup: WG250401
Runlog ID: 18283
Analytical Workgroups: WG250283

| | |
|---|---|
| Calibration/Linearity | X |
| ICV/CCV | X |
| ICB/CCB | X |
| ICSA/ICSAB | |
| CRI | |
| Blank/LCS | X |
| MS/MSD | X |
| Post Spike/Serial Dilution | X |
| Upload Results | X |
| Data Qualifiers | |
| Generate PDF Instrument Data | X |
| Sign/Annotate PDF Data | X |
| Upload Curve Data | X |
| Workgroup Forms | X |
| Case Narrative | 261 |
| Client Forms | |
| Level X | |
| Level 3 | 261 |
| Level 4 | |
| Check for compliance with method and project specific requirements | |
| Check the completeness of reported information | |
| Check the information for the report narrative | |
| Primary Reviewer | ED |
| Secondary Reviewer | |
| | |
| Comments | |

Primary Reviewer: 18-SEP-2007
Emily Decker

Secondary Reviewer:

Generated: SEP-18-2007 15:10:52

# KEMRON Environmental Services
# HOLDING TIMES
# EQUIVALENT TO AFCEE FORM 9

00071829

Analytical Method: 7470A

AAB#: WG250149

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| LHSMW14-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 28 | 3.79 | 09/17/07 | 28 | 3.06 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 28 | 6.84 | 09/17/07 | 28 | 3.06 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 28 | 2.70 | 09/17/07 | 28 | 3.07 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 28 | 2.94 | 09/17/07 | 28 | 3.06 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/14/07 | 28 | 2.70 | 09/17/07 | 28 | 3.07 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 28 | 2.79 | 09/17/07 | 28 | 3.07 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 28 | 3.01 | 09/17/07 | 28 | 3.06 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 28 | 3.70 | 09/17/07 | 28 | 3.06 | |
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 28 | 7.00 | 09/17/07 | 28 | 3.06 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 28 | 6.93 | 09/17/07 | 28 | 3.06 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS

*ANAL = SEE PROJECT QAPP REQUIREMENTS

KEMRON FORMS - Modified 11/20/2006
Version 1.5 PDF File ID: 876708
Report generated 09/17/2007 14:46

KEMRON Environmental Services
HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

00071830

Analytical Method: 7470A

AAB#: WG250283

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 28 | 6.03 | 09/18/07 | 28 | 1.10 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 28 | 5.82 | 09/18/07 | 28 | 1.10 | |
| LHSMW14-090707 | 09/10/07 | 09/13/07 | 09/17/07 | 28 | 6.82 | 09/18/07 | 28 | 1.09 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 28 | 5.97 | 09/18/07 | 28 | 1.10 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 28 | 9.87 | 09/18/07 | 28 | 1.09 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 28 | 9.96 | 09/18/07 | 28 | 1.08 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/17/07 | 28 | 6.73 | 09/18/07 | 28 | 1.09 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/17/07 | 28 | 5.73 | 09/18/07 | 28 | 1.10 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/17/07 | 28 | 5.73 | 09/18/07 | 28 | 1.10 | |
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/17/07 | 28 | 10.0 | 09/18/07 | 28 | 1.08 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS
*ANAL = SEE PROJECT QAPP REQUIREMENTS

KEMRON FORMS - Modified 11/20/2006
Version 1.5 PDF File ID: 877817
Report generated 09/18/2007 14:58

# METHOD BLANK SUMMARY

00071831

Login Number: L0709261
Work Group: WG250149
Blank File ID: HY.091707.094507
Blank Sample ID: WG250107-02
Prep Date: 09/14/07 08:30
Instrument ID: HYDRA
Analyzed Date: 09/17/07 09:45
Method: 7470A
Analyst: ED

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| 46WW02-090707 | L0709261-01 | HY.091707.094919 | 09/17/07 09:49 | 01 |
| 46WW04-090707 | L0709261-03 | HY.091707.095229 | 09/17/07 09:52 | 01 |
| LHSMW11-090707 | L0709261-05 | HY.091707.095406 | 09/17/07 09:54 | 01 |
| LHSMW14-090707 | L0709261-07 | HY.091707.095543 | 09/17/07 09:55 | 01 |
| LHSMW15-090707 | L0709261-09 | HY.091707.095732 | 09/17/07 09:57 | 01 |
| LHSMW19-090707 | L0709261-11 | HY.091707.095928 | 09/17/07 09:59 | 01 |
| LHSMW22-090707 | L0709261-13 | HY.091707.100117 | 09/17/07 10:01 | 01 |
| LHSMW23-090707 | L0709261-15 | HY.091707.100631 | 09/17/07 10:06 | 01 |
| LHSMW24-090707 | L0709261-17 | HY.091707.100808 | 09/17/07 10:08 | 01 |
| LHSMW24-090707-FD | L0709261-19 | HY.091707.100957 | 09/17/07 10:09 | 01 |
| LCS | WG250107-03 | HY.091707.103104 | 09/17/07 10:31 | 01 |

KEMRON FORMS - Modified 01/31/2007
Version 1.5 PDF File ID: 876709
Report generated 09/17/2007 14:46

# METHOD BLANK SUMMARY

00071832

Login Number: L0709261
Work Group: WG250283
Blank File ID: HY.091807.110103
Blank Sample ID: WG250231-02
Prep Date: 09/17/07 09:10
Instrument ID: HYDRA
Analyzed Date: 09/18/07 11:01
Method: 7470A
Analyst: ED

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG250231-03 | HY.091807.110311 | 09/18/07 11:03 | 01 |
| 46WW02-090707 | L0709261-02 | HY.091807.110447 | 09/18/07 11:04 | 01 |
| 46WW04-090707 | L0709261-04 | HY.091807.111047 | 09/18/07 11:10 | 01 |
| LHSMW11-090707 | L0709261-06 | HY.091807.111645 | 09/18/07 11:16 | 01 |
| LHSMW14-090707 | L0709261-08 | HY.091807.111834 | 09/18/07 11:18 | 01 |
| LHSMW15-090707 | L0709261-10 | HY.091807.112032 | 09/18/07 11:20 | 01 |
| LHSMW19-090707 | L0709261-12 | HY.091807.112717 | 09/18/07 11:27 | 01 |
| LHSMW22-090707 | L0709261-14 | HY.091807.112910 | 09/18/07 11:29 | 01 |
| LHSMW23-090707 | L0709261-16 | HY.091807.113149 | 09/18/07 11:31 | 01 |
| LHSMW24-090707 | L0709261-18 | HY.091807.113326 | 09/18/07 11:33 | 01 |
| LHSMW24-090707-FD | L0709261-20 | HY.091807.113515 | 09/18/07 11:35 | 01 |

KEMRON FORMS - Modified 01/31/2007
Version 1.5 PDF File ID: 877818
Report generated 09/18/2007 14:58

# METHOD BLANK REPORT

00071833

Login Number: L0709261
Prep Date: 09/14/07 08:30
Sample ID: WG250107-02
Instrument ID: HYDRA
Run Date: 09/17/07 09:45
Prep Method: METHOD
File ID: HY.091707.094507
Analyst: ED
Method: 7470A
Workgroup (AAB#): WG250149
Matrix: Water
Units: mg/L
Contract #: DACA56-94-D-0020
Cal ID: HYDRA - 17-SEP-07

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.000100 | 0.000200 | 0.000100 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

KEMRON FORMS - Modified 12/07/2006
Version 1.5 PDF File ID: 876710
Report generated 09/17/2007 14:46

# METHOD BLANK REPORT



Login Number: L0709261 Prep Date: 09/17/07 09:10 Sample ID: WG250231-02
Instrument ID: HYDRA Run Date: 09/18/07 11:01 Prep Method: METHOD
File ID: HY.091807.110103 Analyst: ED Method: 7470A
Workgroup (AAB#): WG250283 Matrix: Water Units: mg/L
Contract #: DACA56-94-D-0020 Cal ID: HYDRA-18-SEP-07

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury, Dissolved | 0.000100 | 0.000200 | 0.000100 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

KEMRON FORMS - Modified 12/07/2006
Version 1.5 PDF File ID: 877819
Report generated 09/18/2007 14:58

## LABORATORY CONTROL SAMPLE (LCS)

00071835

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250107-03
Instrument ID: HYDRA
Run Time: 10:31
Prep Method: METHOD
File ID: HY.091707.103104
Analyst: ED
Method: 7470A
Workgroup (AAB#): WG250149
Matrix: Water
Units: mg/L
QC Key: STD
Lot#: MI-7470-01
Cal ID: HYDRA-17-SEP-07

| Analytes | Expected | Found | % Rec | LCS Limits | Q |
|---|---|---|---|---|---|
| Mercury | 0.00400 | 0.00446 | 112 | 85 - 115 | |

KEMRON FORMS - Modified 09/06/2007
Version 1.5 PDF File ID: 876711
Report generated 09/17/2007 14:46

# LABORATORY CONTROL SAMPLE (LCS)

00071836

Login Number: L0709261 Run Date: 09/18/2007 Sample ID: WG250231-03
Instrument ID: HYDRA Run Time: 11:03 Prep Method: METHOD
File ID: HY.091807.110311 Analyst: ED Method: 7470A
Workgroup (AAB#): WG250283 Matrix: Water Units: mg/L
QC Key: STD Lot#: MI-7470-01 Cal ID: HYDRA-18-SEP-07

| Analytes | Expected | Found | % Rec | LCS Limits | Q |
|---|---|---|---|---|---|
| Mercury, Dissolved | 0.00400 | 0.00451 | 113 | 85 - 115 | |

KEMRON FORMS - Modified 09/06/2007
Version 1.5 PDF File ID: 877820
Report generated 09/18/2007 14:59

# MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071837

Loginnum: L0709261 Cal ID: HYDRA - Worknum: WG250149
Instrument ID: HYDRA Contract #: DACA56-94-D-0020 Method: 7470A
Parent ID: WG250107-01 File ID: HY.091707.101326 Dil: 1 Matrix: WATER
Sample ID: WG250107-04 MS File ID: HY.091707.101715 Dil: 1 Units: mg/L
Sample ID: WG250107-05 MSD File ID: HY.091707.101903 Dil: 1

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury | ND | 0.0400 | 0.0479 | 120 | 0.0400 | 0.0478 | 120 | 0.209 | 85 - 115 | 20 | * |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
Version 1.5 PDF File ID: 876712
Report generated 09/17/2007 14:46

## MATRIX SPIKE AND MATRIX SPIKE DUP (MS/MSD)

00071838

Loginnum: L0709261    Cal ID: HYDRA -    Worknum: WG250283
Instrument ID: HYDRA    Contract #: DACA56-94-D-0020    Method: 7470A
Parent ID: WG250231-01    File ID: HY.091807.110447    Dil: 1    Matrix: WATER
Sample ID: WG250231-04 MS    File ID: HY.091807.110626    Dil: 1    Units: mg/L
Sample ID: WG250231-05 MSD    File ID: HY.091807.110807    Dil: 1

| Analyte | Parent | MS Spiked | MS Found | MS %Rec | MSD Spiked | MSD Found | MSD %Rec | %RPD | %Rec Limits | RPD Limit | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury, Dissolved | ND | 0.00444 | 0.00493 | 111 | 0.00444 | 0.00493 | 111 | 0 | 85 - 115 | 20 | |

* FAILS %REC LIMIT

# FAILS RPD LIMIT

NOTE: This is an internal quality control sample.

KEMRON FORMS - Modified 12/08/2006
Version 1.5    PDF File ID: 877821
Report generated 09/18/2007 14:59

KEMRON ENVIRONMENTAL SERVICES

POST SPIKE REPORT

00071839

**Sample Login ID:** L0709261 **Worknum:** WG250149

**Instrument ID:** HYDRA **Method:** 7470A

**Post Spike ID:** WG250149-01 **File ID:** HY.091707.095055 **Dil:** 1 **Units:** ug/L

**Sample ID:** L0709261-01 **File ID:** HY.091707.094919 **Dil:** 1 **Matrix:** Water

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| MERCURY | 1.09 | | 0 | U | 1 | 109.0 | 85 - 115 | |

**N = % Recovery exceeds control limits**

**F = Result is between MDL and RL**

**U = Sample result is below MDL. A value of zero is used in the calculation**

KEMRON ENVIRONMENTAL SERVICES
POST SPIKE REPORT

00071840

Sample Login ID: L0709261 Worknum: WG250283
Instrument ID: HYDRA Method: 7470A
Post Spike ID: WG250283-01 File ID: HY.091807.111316 Dil: 1 Units: ug/L
Sample ID: L0709261-04 File ID: HY.091807.111047 Dil: 1 Matrix: Water

| Analyte | Post Spike Result | C | Sample Result | C | Spike Added(SA) | % R | Control Limit %R | Q |
|---|---|---|---|---|---|---|---|---|
| MERCURY | 1.04 | | 0 | U | 1 | 104.0 | 85 - 115 | |

**N = % Recovery exceeds control limits**
**F = Result is between MDL and RL**
**U = Sample result is below MDL. A value of zero is used in the calculation**

KEMRON FORMS - Modified 04/20/2007 - POST_SPIKE
Version 2.0 PDF File ID: 877816
Report generated 09/18/2007 14:58

# INITIAL CALIBRATION SUMMARY

00071841

Login Number: L0709261
Analytical Method: 7470A
ICAL Worknum: WG250296

Workgroup (AAB#): WG250149
Instrument ID: HYDRA
Initial Calibration Date: 09/17/2007 09:25

| Analyte | WG250296-01 | | WG250296-02 | | WG250296-03 | | WG250296-04 | | WG250296-05 | | WG250296-06 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT |
| Mercury | 0 | 1702 | 0.200 | 15246 | 1.00 | 63875 | 2.00 | 114367 | 5.00 | 290334 | 10.0 | 575368 |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 02/02/2007
Version 1.5 PDF File ID: 876713
Report generated 09/17/2007 14:46

# INITIAL CALIBRATION SUMMARY

00071842

Login Number: L0709261
Analytical Method: 7470A
ICAL Worknum: WG250296

Workgroup (AAB#): WG250149
Instrument ID: HYDRA
Initial Calibration Date: 09/17/2007 09:25

| Analyte | R | Q |
|---|---|---|
| Mercury | 0.9999 | |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 02/02/2007
Version 1.5 PDF File ID: 876713
Report generated 09/17/2007 14:46

# INITIAL CALIBRATION SUMMARY

00071843

Login Number: L0709261
Analytical Method: 7470A
ICAL Worknum: WG250401

Workgroup (AAB#): WG250283
Instrument ID: HYDRA
Initial Calibration Date: 09/18/2007 10:46

| Analyte | WG250401-01 | | WG250401-02 | | WG250401-03 | | WG250401-04 | | WG250401-05 | | WG250401-06 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT | STD | INT |
| Mercury | 0 | 1451 | 0.200 | 12800 | 1.00 | 58653 | 2.00 | 115931 | 5.00 | 291848 | 10.0 | 559686 |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 02/02/2007
Version 1.5 PDF File ID: 877822
Report generated 09/18/2007 14:59

# INITIAL CALIBRATION SUMMARY

Login Number: L0709261
Analytical Method: 7470A
ICAL Worknum: WG250401

Workgroup (AAB#): WG250283 00071844
Instrument ID: HYDRA
Initial Calibration Date: 09/18/2007 10:46

| Analyte | R | Q |
|---|---|---|
| Mercury | 0.9998 | |

INT = Instrument intensity
R = Coefficient of correlation
Q = Data Qualifier
* = Out of Compliance; R < 0.995

KEMRON FORMS - Modified 02/02/2007
Version 1.5 PDF File ID: 877822
Report generated 09/18/2007 14:59

# INITIAL CALIBRATION BLANK (ICB)

00071845

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250296-08
Instrument ID: HYDRA
Run Time: 09:30
Method: 7470A
File ID: HY.091707.093006
Analvst: ED
Units: ug/L
Workgroup (AAB#): WG250149
Cal ID: HYDRA - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | -.086 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 10/02/2006
Version 1.5 PDF File ID: 876715
Report generated 09/17/2007 14:46

# INITIAL CALIBRATION BLANK (ICB)



Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250401-09
Instrument ID: HYDRA
Run Time: 10:53
Method: 7470A
File ID: HY.091807.105311
Analyst: ED
Units: ug/L
Workgroup (AAB#): WG250283
Cal ID: HYDRA - 18-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | -.121 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

# CONTINUING CALIBRATION BLANK (CCB)

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250296-10
00071847
Instrument ID: HYDRA
Run Time: 09:33
Method: 7470A
File ID: HY.091707.093348
Analyst: ED
Units: ug/L
Workgroup (AAB#): WG250149
Cal ID: HYDRA - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | -0.0550 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 876717
Report generated 09/17/2007 14:46

# CONTINUING CALIBRATION BLANK (CCB)

00071848

Login Number: L0709261
Instrument ID: HYDRA
File ID: HY.091707.100453
Workgroup (AAB#): WG250149

Run Date: 09/17/2007
Run Time: 10:04
Analyst: ED
Cal ID: HYDRA - 17-SEP-07

Sample ID: WG250296-02
Method: 7470A
Units: ug/L

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | 0.00800 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 876717
Report generated 09/17/2007 14:46

# CONTINUING CALIBRATION BLANK (CCB)

00071849

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250296-04
Instrument ID: HYDRA
Run Time: 10:24
Method: 7470A
File ID: HY.091707.102405
Analyst: ED
Units: ug/L
Workgroup (AAB#): WG250149
Cal ID: HYDRA - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | -0.109 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

## CONTINUING CALIBRATION BLANK (CCB)

00071850

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250296-16
Instrument ID: HYDRA
Run Time: 10:34
Method: 7470A
File ID: HY.091707.103418
Analyst: ED
Units: ug/L
Workgroup (AAB#): WG250149
Cal ID: HYDRA - 17-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | -0.125 | 1 | F |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON Environmental Services

CONTINUING CALIBRATION BLANK (CCB)

00071851

| | | | | | |
|---|---|---|---|---|---|
| Login Number: | L0709261 | Run Date: | 09/18/2007 | Sample ID: | WG250401-11 |
| Instrument ID: | HYDRA | Run Time: | 10:56 | Method: | 7470A |
| File ID: | HY.091807.105654 | Analyst: | ED | Units: | ug/L |
| Workgroup (AAB#): | WG250283 | Cal ID: | HYDRA - 18-SEP-07 | | |

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | -0.0850 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 877826
Report generated 09/18/2007 14:59

# CONTINUING CALIBRATION BLANK (CCB)

00071852

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250401-18
Instrument ID: HYDRA
Run Time: 11:24
Method: 7470A
File ID: HY.091807.112458
Analyst: ED
Units: ug/L
Workgroup (AAB#): WG250283
Cal ID: HYDRA - 18-SEP-07

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | 0.0320 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 877826
Report generated 09/18/2007 14:59

KEMRON Environmental Services

CONTINUING CALIBRATION BLANK (CCB)

00071853

| | | |
|---|---|---|
| Login Number: L0709261 | Run Date: 09/18/2007 | Sample ID: WG250401-05 |
| Instrument ID: HYDRA | Run Time: 11:38 | Method: 7470A |
| File ID: HY.091807.113844 | Analyst: ED | Units: ug/L |
| Workgroup (AAB#): WG250283 | Cal ID: HYDRA - 18-SEP-07 | |

| Analytes | MDL | RDL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Mercury | 0.100 | 0.200 | 0.0100 | 1 | U |

U = Result is less than MDL
F = Result is between MDL and RL
* = Result is above RL

KEMRON FORMS - Modified 09/27/2006
Version 2.0 PDF File ID: 877826
Report generated 09/18/2007 14:59

# INITIAL CALIBRATION VERIFICATION (ICV)

00071854

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250296-07
Instrument ID: HYDRA
Run Time: 09:28
Method: 7470A
File ID: HY.091707.092829
Analyst: ED
Units: ug/L
Workgroup (AAB#): WG250149
Cal ID: HYDRA - 17-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Mercury | | 2 | 2.08 | 104 | 90 - 110 | |

* Exceeds LIMITS Limit

KEMRON FORMS - Modified 09/06/2007 (ICV)
Version 1.5 PDF File ID: 876714
Report generated 09/17/2007 14:46

# INITIAL CALIBRATION VERIFICATION (ICV)

00071855

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250401-08
Instrument ID: HYDRA
Run Time: 10:51
Method: 7470A
File ID: HY.091807.105135
Analyst: ED
Units: ug/L
Workgroup (AAB#): WG250283
Cal ID: HYDRA - 18-SEP-07
QC Key: STD

| Analyte | | Expected | Found | %REC | LIMITS | Q |
|---|---|---|---|---|---|---|
| Mercury | | 2 | 2.05 | 103 | 90 - 110 | |

* Exceeds LIMITS Limit

KEMRON FORMS - Modified 09/06/2007 (ICV)
Version 1.5 PDF File ID: 877823
Report generated 09/18/2007 14:59

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071856

Login Number: L0709261 Run Date: 09/17/2007 Sample ID: WG250296-09
Instrument ID: HYDRA Run Time: 09:31 Method: 7470A
File ID: HY.091707.093149 Analyst: ED QC Key: STD
Workgroup (AAB#): WG250149 Cal ID: HYDRA - 17-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Mercury, Total | | 0.00200 | 0.00205 | mg/L | 103 | 80 - 120 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876716
Report generated 09/17/2007 14:46

# CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250296-01
Instrument ID: HYDRA
Run Time: 10:02
Method: 7470A
File ID: HY.091707.100254
Analyst: ED
QC Key: STD
Workgroup (AAB#): WG250149
Cal ID: HYDRA - 17-SEP-07

00071857

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Mercury, Total | | 0.00200 | 0.00202 | mg/L | 101 | 80 - 120 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876716
Report generated 09/17/2007 14:46

## CONTINUING CALIBRATION VERIFICATION (CCV)



Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250296-18
Instrument ID: HYDRA
Run Time: 10:22
Method: 7470A
File ID: HY.091707.102228
Analyst: ED
QC Key: STD
Workgroup (AAB#): WG250149
Cal ID: HYDRA - 17-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Mercury, Total | | 0.00200 | 0.00204 | mg/L | 102 | 80 - 120 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876716
Report generated 09/17/2007 14:46

## CONTINUING CALIBRATION VERIFICATION (CCV)

00071859

Login Number: L0709261
Run Date: 09/17/2007
Sample ID: WG250296-05
Instrument ID: HYDRA
Run Time: 10:32
Method: 7470A
File ID: HY.091707.103241
Analyst: ED
QC Key: STD
Workgroup (AAB#): WG250149
Cal ID: HYDRA - 17-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Mercury, Total | | 0.00200 | 0.00191 | mg/L | 95.5 | 80 - 120 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 876716
Report generated 09/17/2007 14:46

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071860

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250401-10
Instrument ID: HYDRA
Run Time: 10:55
Method: 7470A
File ID: HY.091807.105517
Analyst: ED
QC Key: STD
Workgroup (AAB#): WG250283
Cal ID: HYDRA - 18-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Mercury, Total | | 0.00200 | 0.00212 | mg/L | 106 | 80 - 120 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 877825
Report generated 09/18/2007 14:59

# CONTINUING CALIBRATION VERIFICATION (CCV)

00071861

Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250401-02
Instrument ID: HYDRA
Run Time: 11:22
Method: 7470A
File ID: HY.091807.112241
Analyst: ED
QC Key: STD
Workgroup (AAB#): WG250283
Cal ID: HYDRA - 18-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Mercury, Total | | 0.00200 | 0.00210 | mg/L | 105 | 80 - 120 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 877825
Report generated 09/18/2007 14:59

# CONTINUING CALIBRATION VERIFICATION (CCV)



Login Number: L0709261
Run Date: 09/18/2007
Sample ID: WG250401-04
Instrument ID: HYDRA
Run Time: 11:36
Method: 7470A
File ID: HY.091807.113652
Analyst: ED
QC Key: STD
Workgroup (AAB#): WG250283
Cal ID: HYDRA - 18-SEP-07

| Analyte | | Expected | Found | UNITS | %REC | LIMITS | | Q |
|---|---|---|---|---|---|---|---|---|
| Mercury, Total | | 0.00200 | 0.00193 | mg/L | 96.5 | 80 - 120 | | |

* Exceeds LIMITS Criteria

KEMRON FORMS - Modified 09/06/2007 - (CCV)
Version 1.5 PDF File ID: 877825
Report generated 09/18/2007 14:59

# 2.2 General Chemistry Data

# 2.2.1 Percent Solids Data

# 2.2.1.1 Raw Data

**1.0 Calculating the percent solids of a sample.**

$$\%Solids = \frac{WT3 - WT1}{WT2 - WT1} \times F$$

| | |
|---|---|
| Where: | |
| WT1 = Weight, in grams, of the empty container | 1.30 g |
| WT2 = Weight, in grams, of the container and wet sample | 21.274 g |
| WT3 = Weight, in grams, of the container and dried sample | 5.21 g |
| F = Factor to get units as percent weight | 100 |
| %Solids = Percent solids present in sample. | 19.58% |

**2.0 Calculating the percent moisture of a sample.**

**% Moisture = 100 - % Solids from 1.0 calculation**

WORKGROUP: WG250297 00071867

**PERCENT SOLIDS**

SOP K0003 Rev: 9

Balance: OHAUS EIRW60/Other

| Sample | Empty Pan WT 1 | WET WT2 | DRY WT 3A | WET WT 3B | DRY WT 3C |
|---|---|---|---|---|---|
| L0709321-5,7,8 | 1.35 | 22.86 | 20.25 | | |
| 06 | 1.31 | 27.29 | 24.05 | | |
| L0709261-21 | 1.34 | 17.59 | 13.16 | | |
| 22 | 1.32 | 18.76 | 14.95 | | |
| 23 | 1.27 | 19.03 | 15.32 | | |
| L0709291-01 | 1.33 | 20.12 | 18.26 | | |
| 02 | 1.29 | 18.03 | 16.36 | | |
| 03 | 1.34 | 17.65 | 16.31 | | |
| 04 | 1.34 | 18.56 | 16.64 | | |
| 05 | 1.34 | 25.67 | 22.86 | | |
| 06 | 1.32 | 19.31 | 18.21 | | |
| 07 | 1.34 | 20.27 | 18.07 | | |
| 8,9,10 | 1.29 | 19.75 | 17.62 | | |
| 11 | 1.32 | 17.97 | 15.60 | | |
| 12 | 1.34 | 17.36 | 15.32 | | |
| 13 | 1.31 | 20.56 | 17.76 | | |
| 14 | 1.32 | 28.17 | 23.32 | | |
| 15 | 1.37 | 16.70 | 14.51 | | |
| 16 | 1.38 | 30.25 | 25.09 | | |
| 17 | 1.33 | 18.24 | 17.68 | | |
| Duplicate: ~~L0709291~~ JH 9/17/07 L0709291-17 | 1.38 | 21.08 | 15.50 | | |

Analyst: Justin V. Hesson
Tammy Morris

ADT (on): 9/17/2007 @ ~~[illegible]~~ 1451 JH 9/17/07
ADT (off): 9/18/2007 @ 945
ADT (off): ______

DCN#71011

Donna Hesson
Approved: September 20, 2007

KEMRON ENVIRONMENTAL SERVICES
PERCENT SOLID REPORT

Workgroup (AAB#): WG250297  Run Date: 09/17/2007
Method: D2216-90  Run Time: 14:51
Analyst: TMM

| SAMPLE NUMBER | Pan WT. | Int WT. | Fnl WT. | % Solid | % Moist | UNITS |
|---|---|---|---|---|---|---|
| L0709261-21 | 1.340 | 17.59 | 13.16 | 72.74 | | % |
| L0709261-22 | 1.320 | 18.76 | 14.95 | 78.15 | | % |
| L0709261-23 | 1.270 | 19.03 | 15.32 | 79.11 | | % |
| L0709291-01 | 1.330 | 20.12 | 18.26 | 90.10 | | % |
| L0709291-02 | 1.290 | 18.03 | 16.36 | 90.02 | | % |
| L0709291-03 | 1.340 | 17.65 | 16.31 | 91.78 | | % |
| L0709291-04 | 1.340 | 18.56 | 16.64 | 88.85 | | % |
| L0709291-05 | 1.340 | 25.67 | 22.86 | 88.45 | | % |
| L0709291-06 | 1.320 | 19.31 | 18.21 | 93.89 | | % |
| L0709291-07 | 1.340 | 20.27 | 18.07 | 88.38 | | % |
| L0709291-08 | 1.290 | 19.75 | 17.62 | 88.46 | | % |
| L0709291-09 | 1.290 | 19.75 | 17.62 | 88.46 | | % |
| L0709291-10 | 1.290 | 19.75 | 17.62 | 88.46 | | % |
| L0709291-11 | 1.320 | 17.97 | 15.60 | 85.77 | | % |
| L0709291-12 | 1.340 | 17.36 | 15.32 | 87.27 | | % |
| L0709291-13 | 1.310 | 20.56 | 17.76 | 85.45 | | % |
| L0709291-14 | 1.320 | 28.17 | 23.32 | 81.94 | | % |
| L0709291-15 | 1.370 | 16.70 | 14.51 | 85.71 | | % |
| L0709291-16 | 1.380 | 30.25 | 25.09 | 82.13 | | % |
| L0709291-17 | 1.330 | 18.24 | 17.68 | 96.69 | | % |
| L0709321-05 | 1.350 | 22.86 | 20.25 | 87.87 | | % |
| L0709321-06 | 1.310 | 27.29 | 24.05 | 87.53 | | % |
| L0709321-07 | 1.350 | 22.86 | 20.25 | 87.87 | | % |
| L0709321-08 | 1.350 | 22.86 | 20.25 | 87.87 | | % |
| WG250297-01 | 1.330 | 18.24 | 17.68 | 96.69 | 3.312 | % |
| WG250297-02 | 1.380 | 21.08 | 15.50 | 71.68 | 28.32 | % |

KEMRON FORMS - Modified 02/25/2007
Version 1.2
Report generated 09/18/2007 10:59

Donna Eidsson

Approved: September 20, 2007

# 2.2.2 Total Dissolved Solids Data

# 2.2.2.1 Summary Data

# LABORATORY REPORT

**L0709261**

**09/26/07 14:09**

00071871

**Submitted By**

**KEMRON Environmental Services**
**156 Starlite Drive**
**Marietta , OH 45750**
**( 740 ) 373 - 4071**

**For**

Account Name: Shaw E & I, Inc.
ABB Lummus Biulding
3010 Briarpark Drive Suite 4N
Houston, TX 77042
Attention: Larry Duty

Account Number: 2773
Work ID: LHAAP-46

P.O. Number: 200328

## Sample Analysis Summary

| Client ID | Lab ID | Method | Dilution | Date Received |
|---|---|---|---|---|
| 46WW02-090707 | L0709261-01 | 160.1 | 1 | 13-SEP-07 |
| 46WW04-090707 | L0709261-03 | 160.1 | 1 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-05 | 160.1 | 1 | 13-SEP-07 |
| LHSMW14-090707 | L0709261-07 | 160.1 | 1 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-09 | 160.1 | 1 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-11 | 160.1 | 1 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-13 | 160.1 | 1 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-15 | 160.1 | 1 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-17 | 160.1 | 1 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-19 | 160.1 | 1 | 13-SEP-07 |

00071872

Sample Number: **L0709261-01**
Client ID: **46WW02-090707**
Matrix: **Water**
Workgroup Number: **WG250079**
Collect Date: **09/07/2007 08:30**

PrePrep Method: **NONE**
Prep Method: **160.1**
Analytical Method: **160.1**
Analyst: **TMM**
Dilution: **1**
Units: **mg/L**

Instrument: **OVEN**
Prep Date: **09/14/2007 08:20**
Cal Date:
Run Date: **09/14/2007 08:20**
File ID: **EN.0709140820-04**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 372 | | 20.0 | 10.0 |

Report Number: **L0709261**
Report Date : **September 26, 2007**

00071873

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-03** | PrePrep Method: | **NONE** | Instrument: | **OVEN** |
| Client ID: | **46WW04-090707** | Prep Method: | **160.1** | Prep Date: | **09/14/2007 08:20** |
| Matrix: | **Water** | Analytical Method: | **160.1** | Cal Date: | |
| Workgroup Number: | **WG250079** | Analyst: | **TMM** | Run Date: | **09/14/2007 08:20** |
| Collect Date: | **09/07/2007 10:10** | Dilution: | **1** | File ID: | **EN.0709140820-10** |
| | | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 2760 | | 20.0 | 10.0 |

00071874

Sample Number:L0709261-05
Client ID:LHSMW11-090707
Matrix:Water
Workgroup Number:WG250079
Collect Date:09/07/2007 12:20

PrePrep Method:NONE
Prep Method:160.1
Analytical Method:160.1
Analyst:TMM
Dilution:1
Units:mg/L

Instrument:OVEN
Prep Date:09/14/2007 08:20
Cal Date:
Run Date:09/14/2007 08:20
File ID:EN.0709140820-05

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 2990 | | 20.0 | 10.0 |

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-07** | PrePrep Method: | **NONE** | Instrument: | **OVEN** |
| Client ID: | **LHSMW14-090707** | Prep Method: | **160.1** | Prep Date: | **09/14/2007 08:20** |
| Matrix: | **Water** | Analytical Method: | **160.1** | Cal Date: | |
| Workgroup Number: | **WG250079** | Analyst: | **TMM** | Run Date: | **09/14/2007 08:20** |
| Collect Date: | **09/10/2007 13:30** | Dilution: | **1** | File ID: | **EN.0709140820-08** |
| | | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Total Dissolved Solids** | | **122** | | **20.0** | **10.0** |

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071876

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-09** | PrePrep Method: | **NONE** | Instrument: | **OVEN** |
| Client ID: | **LHSMW15-090707** | Prep Method: | **160.1** | Prep Date: | **09/14/2007 08:20** |
| Matrix: | **Water** | Analytical Method: | **160.1** | Cal Date: | |
| Workgroup Number: | **WG250079** | Analyst: | **TMM** | Run Date: | **09/14/2007 08:20** |
| Collect Date: | **09/10/2007 15:45** | Dilution: | **1** | File ID: | **EN.0709140820-07** |
| | | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 3830 | | 20.0 | 10.0 |

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071877

Sample Number: **L0709261-11**
Client ID: **LHSMW19-090707**
Matrix: **Water**
Workgroup Number: **WG250079**
Collect Date: **09/11/2007 08:20**

PrePrep Method: **NONE**
Prep Method: **160.1**
Analytical Method: **160.1**
Analyst: **TMM**
Dilution: **1**
Units: **mg/L**

Instrument: **OVEN**
Prep Date: **09/14/2007 08:20**
Cal Date:
Run Date: **09/14/2007 08:20**
File ID: **EN.0709140820-12**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 870 | | 20.0 | 10.0 |

6 of 10

00071878

Sample Number: L0709261-13
Client ID: LHSMW22-090707
Matrix: Water
Workgroup Number: WG250079
Collect Date: 09/11/2007 09:50

PrePrep Method: NONE
Prep Method: 160.1
Analytical Method: 160.1
Analyst: TMM
Dilution: 1
Units: mg/L

Instrument: OVEN
Prep Date: 09/14/2007 08:20
Cal Date:
Run Date: 09/14/2007 08:20
File ID: EN.0709140820-13

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 3760 | | 20.0 | 10.0 |

00071879

Sample Number: L0709261-15
Client ID: LHSMW23-090707
Matrix: Water
Workgroup Number: WG250079
Collect Date: 09/11/2007 13:35

PrePrep Method: NONE
Prep Method: 160.1
Analytical Method: 160.1
Analyst: TMM
Dilution: 1
Units: mg/L

Instrument: OVEN
Prep Date: 09/14/2007 08:20
Cal Date:
Run Date: 09/14/2007 08:20
File ID: EN.0709140820-14

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 3280 | | 20.0 | 10.0 |

00071880

Sample Number: L0709261-17
Client ID: LHSMW24-090707
Matrix: Water
Workgroup Number: WG250079
Collect Date: 09/11/2007 15:35

PrePrep Method: NONE
Prep Method: 160.1
Analytical Method: 160.1
Analyst: TMM
Dilution: 1
Units: mg/L

Instrument: OVEN
Prep Date: 09/14/2007 08:20
Cal Date:
Run Date: 09/14/2007 08:20
File ID: EN.0709140820-15

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 3990 | | 20.0 | 10.0 |

00071881

Sample Number: L0709261-19
Client ID: LHSMW24-090707-FD
Matrix: Water
Workgroup Number: WG250079
Collect Date: 09/11/2007 15:35

PrePrep Method: NONE
Prep Method: 160.1
Analytical Method: 160.1
Analyst: TMM
Dilution: 1
Units: mg/L

Instrument: OVEN
Prep Date: 09/14/2007 08:20
Cal Date:
Run Date: 09/14/2007 08:20
File ID: EN.0709140820-16

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Dissolved Solids | | 3980 | | 20.0 | 10.0 |

# 2.2.2.2 QC Summary Data

**Example Total Dissolved Solids Calculations**



[(WT2 - WT1) * 1000000]/volume = mg/L

where:

WT1 = weight (grams) of empty container.
WT2 = weight (grams) of dried sample and container.
1000000 = factor to get to mg/L.
volume = mL of sample used.

Checklist ID: 21303

KEMRON Environmental Services
Data Checklist

00071884

Date: 14-SEP-2007
Analyst: HJR
Analyst: NA
Method: TDS
Instrument: OVEN
Curve Workgroup: NA
Runlog ID:
Analytical Workgroups: WG250079

| | |
|---|---|
| Calibration/Linearity | 9/14/07 |
| Second Source Check | |
| ICV/CCV (std) | |
| ICB/CCB | |
| Blank | X |
| LCS/LCS Dup | X |
| MS/MSD | |
| Duplicate | X |
| Upload Results | X |
| Client Forms | X |
| QC Violation Sheet | |
| Case Narratives | X |
| Signed Raw Data | X |
| STD/LCS on benchsheet | X |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | HJR |
| Secondary Reviewer | DIH |
| | |
| Comments | |

Primary Reviewer:
17-SEP-2007
H J Reed

Secondary Reviewer:
18-SEP-2007
Deanna Hesson

Generated: SEP-18-2007 14:42:14

# HOLDING TIMES
## EQUIVALENT TO AFCEE FORM 9

00071885

Analytical Method: 160.1 AAB#: WG250079

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.94 | 09/14/07 | 7 | 2.94 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.70 | 09/14/07 | 7 | 2.70 | |
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 7 | 6.99 | 09/14/07 | 7 | 6.99 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 7 | 6.83 | 09/14/07 | 7 | 6.83 | |
| LHSMW14-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 7 | 3.78 | 09/14/07 | 7 | 3.78 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 3.00 | 09/14/07 | 7 | 3.00 | |
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 7 | 6.92 | 09/14/07 | 7 | 6.92 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.70 | 09/14/07 | 7 | 2.70 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 7 | 3.69 | 09/14/07 | 7 | 3.69 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.78 | 09/14/07 | 7 | 2.78 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS
*ANAL = SEE PROJECT QAPP REQUIREMENTS

## METHOD BLANK SUMMARY

00071886

Login Number: L0709261
Blank File ID: EN.0709140820-01
Prep Date: 09/14/07 08:20
Analyzed Date: 09/14/07 08:20
Analyst: TMM

Work Group: WG250079
Blank Sample ID: WG250079-01
Instrument ID: OVEN
Method: 160.1

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG250079-02 | EN.0709140820-02 | 09/14/07 08:20 | |
| LCS2 | WG250079-03 | EN.0709140820-03 | 09/14/07 08:20 | |
| 46WW02-090707 | L0709261-01 | EN.0709140820-04 | 09/14/07 08:20 | |
| LHSMW11-090707 | L0709261-05 | EN.0709140820-05 | 09/14/07 08:20 | |
| LHSMW15-090707 | L0709261-09 | EN.0709140820-07 | 09/14/07 08:20 | |
| LHSMW14-090707 | L0709261-07 | EN.0709140820-08 | 09/14/07 08:20 | |
| 46WW04-090707 | L0709261-03 | EN.0709140820-10 | 09/14/07 08:20 | |
| LHSMW19-090707 | L0709261-11 | EN.0709140820-12 | 09/14/07 08:20 | |
| LHSMW22-090707 | L0709261-13 | EN.0709140820-13 | 09/14/07 08:20 | |
| LHSMW23-090707 | L0709261-15 | EN.0709140820-14 | 09/14/07 08:20 | |
| LHSMW24-090707 | L0709261-17 | EN.0709140820-15 | 09/14/07 08:20 | |
| LHSMW24-090707-FD | L0709261-19 | EN.0709140820-16 | 09/14/07 08:20 | |
| DUP | WG250079-05 | EN.0709140820-24 | 09/14/07 08:20 | |

KEMRON FORMS - Modified 01/31/2007
Version 1.5 PDF File ID: 877708
Report generated 09/18/2007 14:26

# METHOD BLANK REPORT

00071887

Login Number: L0709261 Prep Date: 09/14/07 08:20 Sample ID: WG250079-01
Instrument ID: OVEN Run Date: 09/14/07 08:20 Prep Method: 160.1
File ID: EN.0709140820-01 Analyst: TMM Method: 160.1
Workgroup (AAB#): WG250079 Matrix: Water Units: mg/L
Contract #: DACA56-94-D-0020 Cal ID: OVEN-

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Total Dissolved Solids | 5.00 | 10.0 | 5.00 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

KEMRON FORMS - Modified 12/07/2006
Version 1.5 PDF File ID: 877709
Report generated 09/18/2007 14:26

## LABORATORY CONTROL SAMPLE (LCS)

00071888

Login Number: L0709261 Analyst: TMM Prep Method: 160.1
Instrument ID: OVEN Matrix: Water Method: 160.1
Workgroup (AAB#): WG250079 Units: mg/L
QC Key: STD Lot #: STD19758

Sample ID: WG250079-02 LCS File ID: EN.0709140820-02 Run Date: 09/14/2007 08:20
Sample ID: WG250079-03 LCS2 File ID: EN.0709140820-03 Run Date: 09/14/2007 08:20

| Analytes | LCS | | | LCS2 | | | %RPD | %Rec Limits | RPD Lmt | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| | Known | Found | % REC | Known | Found | % REC | | | | |
| Total Dissolved Solids | 500 | 490 | 98.0 | 500 | 500 | 100 | 2.02 | 80 - 120 | 25 | |

KEMRON FORMS - Modified 02/08/2007
Version 1.5 PDF File ID: 877710
Report generated 09/18/2007 14:26

# 2.2.2.3 Raw Data

KEMRON ENVIRONMENTAL SERVICES

# TOTAL DISSOLVED SOLIDS

SOP K1601 Revision #: ________ Workgroup #: ____________
☐ EPA 160.1/ SM2540C Balance: AND GR-202 / Other
☐ Other:
LCS: Std 19758 Matrix Spike: ________
Daily Dilution: ________ Daily Dilution: ________

| SAMPLE | # | VOLUME (mL) | INITIAL WEIGHT WT1 (g) | DRY WEIGHT WT2A (g) | DRY WEIGHT WT2B (g) | DRY WEIGHT WT2C (g) |
|---|---|---|---|---|---|---|
| BLANK | B8 | 100 | 67.2281 | 67.2280 | 67.2281 | |
| LCS: ______mg/L | K4 | 50 | 82.1629 | 82.1875 | 82.1874 | |
| LCSDUP: _____mg/L | B7 | 50 | 64.5838 | 64.6088 | 64.6088 | |
| 09-261-01 | 10 | 50 | 54.0611 | 54.0198 | 54.0197 | |
| -05 | 19 | | 53.0009 | 53.1506 | 53.1506 | |
| 09-192-01 | 5 | | 51.5415 | 51.6683 | 51.6680 | |
| 09-261-09 | 17 | | 54.1810 | 54.3724 | 54.3723 | |
| -07 | F9 | | 58.8554 | 58.8613 | 58.8615 | |
| 09-192-02 | J2 | | 54.4692 | 54.4389 | 54.4390 | |
| 09-261-03 | 12 | | 53.3105 | 53.4488 | 53.4485 | |
| 09-212-01 | N2 | | 48.7144 | 48.7282 | 48.7281 | |
| 09-261-11 | J1 | | 56.9080 | 56.9514 | 56.9515 | |
| -13 | 14 | | 55.4111 | 55.5990 | 55.5990 | |
| -15 | X2 | | 53.4819 | 53.6461 | 53.6460 | |
| -17 | TA | | 48.8674 | 49.0670 | 49.0669 | |
| -19 | ☺ | | 45.1891 | 45.8882 | 45.8879 | |
| 09-212-02 | B11 | | 51.6543 | 51.6704 | 51.6704 | |
| -03 | F4 | | 59.8776 | 59.8873 | 59.8870 | |
| -04 | K6 | 9-14-07 | 51.0611 | 51.0705 | 51.0704 | |
| -05 | Y6 | | 46.9739 | 46.9835 | 46.9835 | |
| 09-267-01 | ~~X7~~ ~~J7~~ X7 | | 49.5607 | 49.5825 | 49.5824 | |
| -02 | ~~J7~~ ~~X7~~ J7 | | 54.8011 | 54.8091 | 54.8090 | |
| -03 | M3 | | 59.7652 | 59.7774 | 59.7773 | |
| DUP 09-267-03 | 20 | | 53.9169 | 53.9300 | 53.9300 | |

ANALYST: Doann Hoss

DATE/TIME: (on) 9-14-07 0820
DATE/TIME: (off) 9-17-07 0910
DATE/TIME: (off) 9-17-07 1130
DATE/TIME: (off)

DCN#70980

Donna Hesson
Approved: September 18, 2007

KEMRON ENVIRONMENTAL SERVICES
GRAVIMETRIC REPORT

00071891

Workgroup (AAB#): WG250079
Product: 160.1
Analyte: TOTAL DISSOLVED SOLIDS

Analyst: TMM
Run Date: 09/14/2007 08:20

| SAMPLE NUMBER | INITIAL VOL | INITIAL WT | FINAL WT | Anal. Conc | Rep. Conc. | Units |
|---|---|---|---|---|---|---|
| WG250079-01 | 100 | 67.2281 | 67.2281 | 0 | 0 | mg/L |
| WG250079-02 | 50 | 82.1629 | 82.1874 | 490.0 | 490.0 | mg/L |
| WG250079-03 | 50 | 64.5838 | 64.6088 | 500.0 | 500.0 | mg/L |
| L0709261-01 | 50 | 54.0011 | 54.0197 | 372.0 | 372.0 | mg/L |
| L0709261-05 | 50 | 53.0009 | 53.1506 | 2994 | 2994 | mg/L |
| L0709192-01 | 50 | 51.5415 | 51.668 | 2530 | 2530 | mg/L |
| L0709261-09 | 50 | 54.181 | 54.3723 | 3826 | 3826 | mg/L |
| L0709261-07 | 50 | 58.8554 | 58.8615 | 122.0 | 122.0 | mg/L |
| L0709192-02 | 50 | 54.4092 | 54.439 | 596.0 | 596.0 | mg/L |
| L0709261-03 | 50 | 53.3105 | 53.4485 | 2760 | 2760 | mg/L |
| L0709212-01 | 50 | 48.7144 | 48.7281 | 274.0 | 274.0 | mg/L |
| L0709261-11 | 50 | 56.908 | 56.9515 | 870.0 | 870.0 | mg/L |
| L0709261-13 | 50 | 55.4111 | 55.599 | 3758 | 3758 | mg/L |
| L0709261-15 | 50 | 53.4819 | 53.646 | 3282 | 3282 | mg/L |
| L0709261-17 | 50 | 48.8674 | 49.0669 | 3990 | 3990 | mg/L |
| L0709261-19 | 50 | 45.6891 | 45.8879 | 3976 | 3976 | mg/L |
| L0709212-02 | 50 | 51.6543 | 51.6704 | 322.0 | 322.0 | mg/L |
| L0709212-03 | 50 | 59.8776 | 59.887 | 188.0 | 188.0 | mg/L |
| L0709212-04 | 50 | 51.0611 | 51.0704 | 186.0 | 186.0 | mg/L |
| L0709212-05 | 50 | 46.9739 | 46.9835 | 192.0 | 192.0 | mg/L |
| L0709267-01 | 50 | 49.5607 | 49.5824 | 434.0 | 434.0 | mg/L |
| L0709267-02 | 50 | 54.8011 | 54.809 | 158.0 | 158.0 | mg/L |
| L0709267-03 | 50 | 59.7652 | 59.7773 | 242.0 | 242.0 | mg/L |
| WG250079-04 | 50 | 59.7652 | 59.7773 | 242.0 | 242.0 | mg/L |
| WG250079-05 | 50 | 53.9169 | 53.93 | 262.0 | 262.0 | mg/L |

KEMRON FORMS - Modified 02/26/2007
Version 1.3
Report generated 09/17/2007 15:38

Donna Eisson

Approved: September 18, 2007

# 2.2.3 Total Suspended Solids Data

# 2.2.3.1 Summary Data

# LABORATORY REPORT

**L0709261**

**09/26/07 14:09** 00071894

**Submitted By**

**KEMRON Environmental Services**
**156 Starlite Drive**
**Marietta , OH 45750**
**( 740 ) 373 - 4071**

**For**

Account Name: Shaw E & I, Inc.
ABB Lummus Biulding
3010 Briarpark Drive Suite 4N
Houston, TX 77042
Attention: Larry Duty

Account Number: 2773
Work ID: LHAAP-46

P.O. Number: 200328

## Sample Analysis Summary

| Client ID | Lab ID | Method | Dilution | Date Received |
|---|---|---|---|---|
| 46WW02-090707 | L0709261-01 | 160.2 | 1 | 13-SEP-07 |
| 46WW04-090707 | L0709261-03 | 160.2 | 1 | 13-SEP-07 |
| LHSMW11-090707 | L0709261-05 | 160.2 | 1 | 13-SEP-07 |
| LHSMW14-090707 | L0709261-07 | 160.2 | 1 | 13-SEP-07 |
| LHSMW15-090707 | L0709261-09 | 160.2 | 1 | 13-SEP-07 |
| LHSMW19-090707 | L0709261-11 | 160.2 | 1 | 13-SEP-07 |
| LHSMW22-090707 | L0709261-13 | 160.2 | 1 | 13-SEP-07 |
| LHSMW23-090707 | L0709261-15 | 160.2 | 1 | 13-SEP-07 |
| LHSMW24-090707 | L0709261-17 | 160.2 | 1 | 13-SEP-07 |
| LHSMW24-090707-FD | L0709261-19 | 160.2 | 1 | 13-SEP-07 |

00071895

Sample Number:**L0709261-01**
Client ID:**46WW02-090707**
Matrix:**Water**
Workgroup Number:**WG250078**
Collect Date:**09/07/2007 08:30**

PrePrep Method:**NONE**
Prep Method:**160.2**
Analytical Method:**160.2**
Analyst:**TMM**
Dilution:**1**
Units:**mg/L**

Instrument:**OVEN**
Prep Date:**09/14/2007 08:00**
Cal Date:
Run Date:**09/14/2007 08:00**
File ID:**EN.0709140800-04**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Suspended Solids | | 4.50 | J | 5.00 | 2.50 |

**J The analyte was positively identified, but the quantitation was below the RL**

Report Number: **L0709261**

Report Date : **September 26, 2007**

00071896

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-03** | PrePrep Method: | **NONE** | Instrument: | **OVEN** |
| Client ID: | **46WW04-090707** | Prep Method: | **160.2** | Prep Date: | **09/14/2007 08:00** |
| Matrix: | **Water** | Analytical Method: | **160.2** | Cal Date: | |
| Workgroup Number: | **WG250078** | Analyst: | **TMM** | Run Date: | **09/14/2007 08:00** |
| Collect Date: | **09/07/2007 10:10** | Dilution: | **1** | File ID: | **EN.0709140800-05** |
| | | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Total Suspended Solids** | | **13.0** | | **5.00** | **2.50** |

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-05** | PrePrep Method: | **NONE** | Instrument: | **OVEN** |
| Client ID: | **LHSMW11-090707** | Prep Method: | **160.2** | Prep Date: | **09/14/2007 08:00** |
| Matrix: | **Water** | Analytical Method: | **160.2** | Cal Date: | |
| Workgroup Number: | **WG250078** | Analyst: | **TMM** | Run Date: | **09/14/2007 08:00** |
| Collect Date: | **09/07/2007 12:20** | Dilution: | **1** | File ID: | **EN.0709140800-06** |
| | | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Total Suspended Solids** | | **25.5** | | **5.00** | **2.50** |

Sample Number: **L0709261-07**
Client ID: **LHSMW14-090707**
Matrix: **Water**
Workgroup Number: **WG250078**
Collect Date: **09/10/2007 13:30**

PrePrep Method: **NONE**
Prep Method: **160.2**
Analytical Method: **160.2**
Analyst: **TMM**
Dilution: **1**
Units: **mg/L**

Instrument: **OVEN**
Prep Date: **09/14/2007 08:00**
Cal Date:
Run Date: **09/14/2007 08:00**
File ID: **EN.0709140800-07**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Suspended Solids | | 23.5 | | 5.00 | 2.50 |

Sample Number:L0709261-09
Client ID:LHSMW15-090707
Matrix:Water
Workgroup Number:WG250078
Collect Date:09/10/2007 15:45

PrePrep Method:NONE
Prep Method:160.2
Analytical Method:160.2
Analyst:TMM
Dilution:1
Units:mg/L

Instrument:OVEN
Prep Date:09/14/2007 08:00
Cal Date:
Run Date:09/14/2007 08:00
File ID:EN.0709140800-08

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Suspended Solids | | 6.50 | | 5.00 | 2.50 |

00071900

Sample Number: L0709261-11
Client ID: LHSMW19-090707
Matrix: Water
Workgroup Number: WG250078
Collect Date: 09/11/2007 08:20

PrePrep Method: NONE
Prep Method: 160.2
Analytical Method: 160.2
Analyst: TMM
Dilution: 1
Units: mg/L

Instrument: OVEN
Prep Date: 09/14/2007 08:00
Cal Date:
Run Date: 09/14/2007 08:00
File ID: EN.0709140800-09

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Suspended Solids | | 9.50 | | 5.00 | 2.50 |

| | | | | | |
|---|---|---|---|---|---|
| Sample Number: | **L0709261-13** | PrePrep Method: | **NONE** | Instrument: | **OVEN** |
| Client ID: | **LHSMW22-090707** | Prep Method: | **160.2** | Prep Date: | **09/14/2007 08:00** |
| Matrix: | **Water** | Analytical Method: | **160.2** | Cal Date: | |
| Workgroup Number: | **WG250078** | Analyst: | **TMM** | Run Date: | **09/14/2007 08:00** |
| Collect Date: | **09/11/2007 09:50** | Dilution: | **1** | File ID: | **EN.0709140800-10** |
| | | Units: | **mg/L** | | |

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Total Suspended Solids** | | | **U** | **5.00** | **2.50** |

**U Not detected at or above adjusted sample detection limit**

00071902

Sample Number: **L0709261-15**
Client ID: **LHSMW23-090707**
Matrix: **Water**
Workgroup Number: **WG250078**
Collect Date: **09/11/2007 13:35**

PrePrep Method: **NONE**
Prep Method: **160.2**
Analytical Method: **160.2**
Analyst: **TMM**
Dilution: **1**
Units: **mg/L**

Instrument: **OVEN**
Prep Date: **09/14/2007 08:00**
Cal Date:
Run Date: **09/14/2007 08:00**
File ID: **EN.0709140800-11**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Suspended Solids | | 13.5 | | 5.00 | 2.50 |

Sample Number: **L0709261-17**
Client ID: **LHSMW24-090707**
Matrix: **Water**
Workgroup Number: **WG250078**
Collect Date: **09/11/2007 15:35**

PrePrep Method: **NONE**
Prep Method: **160.2**
Analytical Method: **160.2**
Analyst: **TMM**
Dilution: **1**
Units: **mg/L**

Instrument: **OVEN**
Prep Date: **09/14/2007 08:00**
Cal Date:
Run Date: **09/14/2007 08:00**
File ID: **EN.0709140800-12**

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| **Total Suspended Solids** | | **5.00** | | **5.00** | **2.50** |

00071904

Sample Number: L0709261-19
Client ID: LHSMW24-090707-FD
Matrix: Water
Workgroup Number: WG250078
Collect Date: 09/11/2007 15:35

PrePrep Method: NONE
Prep Method: 160.2
Analytical Method: 160.2
Analyst: TMM
Dilution: 1
Units: mg/L

Instrument: OVEN
Prep Date: 09/14/2007 08:00
Cal Date:
Run Date: 09/14/2007 08:00
File ID: EN.0709140800-13

| Analyte | CAS. Number | Result | Qual | PQL | SQL |
|---|---|---|---|---|---|
| Total Suspended Solids | | 6.00 | | 5.00 | 2.50 |

# 2.2.3.2 QC Summary Data

**Example Total Suspended Solids Calculations**

$$[(WT2 - WT1) * 1000000]/volume = mg/L$$

where:

WT1 = weight (grams) of empty container.
WT2 = weight (grams) of dried sample and container.
1000000 = factor to get to mg/L.
volume = mL of sample used.

Checklist ID: 21319

KEMRON Environmental Services
Data Checklist

00071907

Date: 14-SEP-2007
Analyst: HJR
Analyst: NA
Method: TSS
Instrument: OVEN
Curve Workgroup: NA
Runlog ID:
Analytical Workgroups: WG250078

| | |
|---|---|
| Calibration/Linearity | 9/14/07 |
| Second Source Check | |
| ICV/CCV (std) | |
| ICB/CCB | |
| Blank | X |
| LCS/LCS Dup | X |
| MS/MSD | |
| Duplicate | X |
| Upload Results | X |
| Client Forms | X |
| QC Violation Sheet | |
| Case Narratives | X |
| Signed Raw Data | X |
| STD/LCS on benchsheet | X |
| Check for compliance with method and project specific requirements | X |
| Check the completeness of reported information | X |
| Check the information for the report narrative | X |
| Primary Reviewer | HJR |
| Secondary Reviewer | DIH |
| | |
| Comments | |

Primary Reviewer:
18-SEP-2007
H J Reed

Secondary Reviewer:
18-SEP-2007
Deanna Hesson

Generated: SEP-18-2007 14:42:17

KEMRON Environmental Services

HOLDING TIMES

EQUIVALENT TO AFCEE FORM 9

00071908

Analytical Method: 160.2

AAB#: WG250078

Login Number: L0709261

| Client ID | Date Collected | Date Received | Date Extracted | Max Hold Time Ext. | Time Held Ext. | Date Analyzed | Max Hold Time Anal | Time Held Anal. | Q |
|---|---|---|---|---|---|---|---|---|---|
| 46WW04-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 7 | 6.91 | 09/14/07 | 7 | 6.91 | |
| LHSMW14-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 7 | 3.77 | 09/14/07 | 7 | 3.77 | |
| 46WW02-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 7 | 6.98 | 09/14/07 | 7 | 6.98 | |
| LHSMW23-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.77 | 09/14/07 | 7 | 2.77 | |
| LHSMW11-090707 | 09/07/07 | 09/13/07 | 09/14/07 | 7 | 6.82 | 09/14/07 | 7 | 6.82 | |
| LHSMW15-090707 | 09/10/07 | 09/13/07 | 09/14/07 | 7 | 3.68 | 09/14/07 | 7 | 3.68 | |
| LHSMW22-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.92 | 09/14/07 | 7 | 2.92 | |
| LHSMW24-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.68 | 09/14/07 | 7 | 2.68 | |
| LHSMW24-090707-FD | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.68 | 09/14/07 | 7 | 2.68 | |
| LHSMW19-090707 | 09/11/07 | 09/13/07 | 09/14/07 | 7 | 2.99 | 09/14/07 | 7 | 2.99 | |

* EXT = SEE PROJECT QAPP REQUIREMENTS

*ANAL = SEE PROJECT QAPP REQUIREMENTS

KEMRON FORMS - Modified 11/20/2006
Version 1.5 PDF File ID: 877737
Report generated 09/18/2007 14:29

## METHOD BLANK SUMMARY

00071909

Login Number: L0709261
Blank File ID: EN.0709140800-01
Prep Date: 09/14/07 08:00
Analyzed Date: 09/14/07 08:00
Analyst: TMM

Work Group: WG250078
Blank Sample ID: WG250078-01
Instrument ID: OVEN
Method: 160.2

This Method Blank Applies To The Following Samples:

| Client ID | Lab Sample ID | Lab File ID | Time Analyzed | TAG |
|---|---|---|---|---|
| LCS | WG250078-02 | EN.0709140800-02 | 09/14/07 08:00 | |
| LCS2 | WG250078-03 | EN.0709140800-03 | 09/14/07 08:00 | |
| 46WW02-090707 | L0709261-01 | EN.0709140800-04 | 09/14/07 08:00 | |
| 46WW04-090707 | L0709261-03 | EN.0709140800-05 | 09/14/07 08:00 | |
| LHSMW11-090707 | L0709261-05 | EN.0709140800-06 | 09/14/07 08:00 | |
| LHSMW14-090707 | L0709261-07 | EN.0709140800-07 | 09/14/07 08:00 | |
| LHSMW15-090707 | L0709261-09 | EN.0709140800-08 | 09/14/07 08:00 | |
| LHSMW19-090707 | L0709261-11 | EN.0709140800-09 | 09/14/07 08:00 | |
| LHSMW22-090707 | L0709261-13 | EN.0709140800-10 | 09/14/07 08:00 | |
| LHSMW23-090707 | L0709261-15 | EN.0709140800-11 | 09/14/07 08:00 | |
| LHSMW24-090707 | L0709261-17 | EN.0709140800-12 | 09/14/07 08:00 | |
| LHSMW24-090707-FD | L0709261-19 | EN.0709140800-13 | 09/14/07 08:00 | |
| DUP | WG250078-05 | EN.0709140800-21 | 09/14/07 08:00 | |

# METHOD BLANK REPORT



Login Number: L0709261 Prep Date: 09/14/07 08:00 Sample ID: WG250078-01
Instrument ID: OVEN Run Date: 09/14/07 08:00 Prep Method: 160.2
File ID: EN.0709140800-01 Analyst: TMM Method: 160.2
Workgroup (AAB#): WG250078 Matrix: Water Units: mg/L
Contract #: DACA56-94-D-0020 Cal ID: OVEN-

| Analytes | SQL | PQL | Concentration | Dilution | Qualifier |
|---|---|---|---|---|---|
| Total Suspended Solids | 2.50 | 5.00 | 2.50 | 1 | U |

SQL Method Detection Limit
PQL Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* Analyte concentration > RL

# LABORATORY CONTROL SAMPLE (LCS)

00071911

Login Number: L0709261 Analyst: TMM Prep Method: 160.2
Instrument ID: OVEN Matrix: Water Method: 160.2
Workgroup (AAB#): WG250078 Units: mg/L
QC Key: STD Lot #: STD21832

Sample ID: WG250078-02 LCS File ID: EN.0709140800-02 Run Date: 09/14/2007 08:00
Sample ID: WG250078-03 LCS2 File ID: EN.0709140800-03 Run Date: 09/14/2007 08:00

| Analytes | LCS | | | LCS2 | | | %RPD | %Rec Limits | RPD Lmt | Q |
|---|---|---|---|---|---|---|---|---|---|---|
| | Known | Found | % REC | Known | Found | % REC | | | | |
| Total Suspended Solids | 50.0 | 54.0 | 108 | 50.0 | 55.0 | 110 | 1.83 | 75 - 125 | 25 | |

# 2.2.3.3 Raw Data

Kemron
ENVIRONMENTAL SERVICES

Tray 6

# TOTAL SUSPENDED SOLIDS

LCS: Std 21832 Workgroup #: ____________
MS: ________ mL LCS & ________ mL sample Balance: AND GR-202 / Other
Method: EPA 160.2 / SM2540D SOP #: K1602 Revision #: 11

| SAMPLE | # | VOLUME (mL) | INITIAL WEIGHT WT1 (g) | DRY WEIGHT WT2A (g) | DRY WEIGHT WT2B (g) | DRY WEIGHT WT2C (g) |
|---|---|---|---|---|---|---|
| BLANK | Blk | 200 | 0.0903 | 0.0909 | 0.0908 | |
| LCS: 50 mg/L | LCS | 100 | 0.0909 | 0.0964 | 0.0963 | |
| LCSDUP: 50 mg/L | LCS2 | 100 | 0.0909 | 0.0963 | 0.0964 | |
| 09-261-01 | 1 | 200 | 0.0898 | 0.0967 | 0.0907 | |
| -03 | 2 | | 0.0901 | 0.0927 | 0.0927 | |
| -05 | 3 | | 0.0911 | 0.0964 | 0.0962 | |
| -07 | 4 | 200 | 0.0896 | 0.0946 | 0.0943 | |
| -09 | 5 | | 0.0912 | 0.0926 | 0.0925 | |
| -11 | 6 | | 0.0897 | 0.0918 | 0.0916 | |
| -13 | 7 | | 0.0911 | 0.0913 | 0.0912 | |
| -15 | 8 | | 0.0910 | 0.0939 | 0.0937 | |
| -17 | 9 | | 0.0896 | 0.0907 | 0.0906 | |
| -19 | 10 | | 0.0899 | 0.0910 | 0.0911 | |
| 09-260-01 | 11 | | 0.0902 | 0.0935 | 0.0935 | |
| 09-271-02 | 12 | | 0.0878 | 0.0890 | 0.0889 | |
| -04 | 13 | | 0.0904 | 0.0906 | 0.0905 | |
| 09-259-01 | 14 | | 0.0893 | 0.0900 | 0.0899 | |
| -04 | 15 | | 0.0910 | 0.0911 | 0.0911 | |
| -06 | 16 | | 0.0903 | 0.0906 | 0.0905 | |
| 09-277-01 | 17 | | 0.0889 | 0.0903 | 0.0903 | |
| | 18 | | 0.0907 | | | |
| | 19 | | 0.0910 | | | |
| | 20 | | 0.0903 | | | |
| DUP: 09-261-07 | DUP | 200 | 0.0885 | 0.0915 | ~~0.0916~~ | 0.0936 |

HK 9-14-07

HK 9-17-07

ANALYST: [signature] [signature]

DATE/TIME: (on) 9-14-07 0800

DATE/TIME: (off) 9-17-07 0855

DATE/TIME: (off) 9-17-07 1115

DATE/TIME: (off) ____________

DCN#70979

[signature]

Approved: September 18, 2007

KEMRON ENVIRONMENTAL SERVICES
GRAVIMETRIC REPORT

00071914

Workgroup (AAB#): WG250078 Analyst: TMM
Product: 160.2 Run Date: 09/14/2007 08:00
Analyte: TOTAL SUSPENDED SOLIDS

| SAMPLE NUMBER | INITIAL VOL | INITIAL WT | FINAL WT | Anal. Conc | Rep. Conc. | Units |
|---|---|---|---|---|---|---|
| WG250078-01 | 200 | 0.0908 | 0.0908 | 0 | 0 | mg/L |
| WG250078-02 | 100 | 0.0909 | 0.0963 | 54.00 | 54.00 | mg/L |
| WG250078-03 | 100 | 0.0909 | 0.0964 | 55.00 | 55.00 | mg/L |
| L0709261-01 | 200 | 0.0898 | 0.0907 | 4.500 | 4.500 F | mg/L |
| L0709261-03 | 200 | 0.0901 | 0.0927 | 13.00 | 13.00 | mg/L |
| L0709261-05 | 200 | 0.0911 | 0.0962 | 25.50 | 25.50 | mg/L |
| L0709261-07 | 200 | 0.0896 | 0.0943 | 23.50 | 23.50 | mg/L |
| WG250078-04 | 200 | 0.0896 | 0.0943 | 23.50 | 23.50 | mg/L |
| L0709261-09 | 200 | 0.0912 | 0.0925 | 6.500 | 6.500 | mg/L |
| L0709261-11 | 200 | 0.0897 | 0.0916 | 9.500 | 9.500 | mg/L |
| L0709261-13 | 200 | 0.0911 | 0.0912 | 0.5000 | ND | mg/L |
| L0709261-15 | 200 | 0.091 | 0.0937 | 13.50 | 13.50 | mg/L |
| L0709261-17 | 200 | 0.0896 | 0.0906 | 5.000 | 5.000 | mg/L |
| L0709261-19 | 200 | 0.0899 | 0.0911 | 6.000 | 6.000 | mg/L |
| L0709260-01 | 200 | 0.0902 | 0.0935 | 16.50 | 16.50 | mg/L |
| L0709271-02 | 200 | 0.0878 | 0.0889 | 5.500 | 5.500 | mg/L |
| L0709271-04 | 200 | 0.0904 | 0.0905 | 0.5000 | ND | mg/L |
| L0709259-01 | 200 | 0.0893 | 0.0899 | 3.000 | ND | mg/L |
| L0709259-04 | 200 | 0.091 | 0.0911 | 0.5000 | ND | mg/L |
| L0709259-06 | 200 | 0.0903 | 0.0905 | 1.000 | ND | mg/L |
| L0709277-01 | 200 | 0.0889 | 0.0903 | 7.000 | 7.000 | mg/L |
| WG250078-05 | 200 | 0.0885 | 0.0936 | 25.50 | 25.50 | mg/L |

KEMRON FORMS - Modified 02/26/2007
Version 1.3
Report generated 09/18/2007 12:07

Donna Eisson

Approved: September 18, 2007

# 3.0 Attachments

Kemron Environmental Services
Analyst Listing
September 26, 2007

00071916

---

| | | |
|---|---|---|
| AJF - AMANDA J. FICKIESEN | ALB - ANNIE L. BOCK | AML - ANTHONY M. LONG |
| ARA - ADRIAN R. ACHTERMANN | ASP - AARON S. PETRIE | BRG - BRENDA R. GREGORY |
| CAA - CASSIE A. AUGENSTEIN | CAF - CHERYL A. FLOWERS | CEB - CHAD E. BARNES |
| CLC - CHRYS L. CRAWFORD | CLW - CHARISSA L. WINTERS | CM - CHARLIE MARTIN |
| CMS - CRYSTAL M. STEPHENS | CPD - CHAD P. DAVIS | CSH - CHRIS S. HILL |
| DD - DIANE M. DENNIS | DDE - DEBRA D. ELLIOTT | DEL - DON E. LIGHTFRITZ |
| DEV - DAVID E. VANDENBERG | DGB - DOUGLAS G. BUTCHER | DIH - DEANNA I. HESSON |
| DLB - DAVID L. BUMGARNER | DLP - DOROTHY L. PAYNE | DLR - DIANNA L. RAUCH |
| DR - DEANNA ROBERTS | DRP - DAVE R. PITZER | DSF - DEBRA S. FREDERICK |
| DST - DENNIS S. TEPE | ECL - ERIC C. LAWSON | ED - EMILY E. DECKER |
| ERE - ERIN R. ELDER | FJB - FRANCES J. BOLDEN | HAV - HEMA VILASAGAR |
| HJR - HOLLY J. REED | JAB - JUANITA A. BECKER | JAL - JOHN A. LENT |
| JBK - JEREMY B. KINNEY | JCO - JOE C. OWENS | JDH - JUSTIN D. HESSON |
| JKP - JACQUELINE K. PARSONS | JKT - JANE K. THOMPSON | JWR - JOHN W. RICHARDS |
| JWS - JACK W. SHEAVES | JYH - JI Y. HU | KCZ - KEVIN C. ZUMBRO |
| KEB - KATHRYN E. BARNES | KHR - KIM H. RHODES | KJW - KATIE J. WIEFERICH |
| KRA - KATHY R. ALBERTSON | KRV - KATHRINE R. VICKERS | LKN - LINDA K. NEDEFF |
| LSB - LESLIE S. BUCINA | MDA - MIKE D. ALBERTSON | MDC - MICHAEL D. COCHRAN |
| MES - MARY E. SCHILLING | MKZ - MARILYN K. ZUMBRO | MLR - MARY L. ROCHOTTE |
| MMB - MAREN M. BEERY | MRT - MICHELLE R. TAYLOR | MSW - MATT S. WILSON |
| NJB - NATALIE J. BOOTH | PJM - PAUL J. MILLER | RAH - ROY A. HALSTEAD |
| RB - ROBERT BUCHANAN | REK - ROBERT E. KYER | RLF - RACHEL L. FRYE |
| RLK - ROBIN L. KLINGER | RNP - RICK N. PETTY | RWC - RODNEY W. CAMPBELL |
| SLM - STEPHANIE L. MOSSBURG | SLP - SHERI L. PFALZGRAF | SMH - SHAUNA M. HYDE |
| TDH - TRICIA D. HUCK | TMB - TIFFANY M. BAILEY | TMM - TAMMY M. MORRIS |
| VC - VICKI COLLIER | WFM - WALTER F. MARTIN | |

**KEMRON Environmental Services**

List of Valid Qualifiers

September 26, 2007

00071917

Qualkey: STD

| Qualifier | Description |
|---|---|
| * | Surrogate or spike compound out of range |
| + | Correlation coefficient for the MSA is less than 0.995 |
| < | Result is less than the associated numerical value. |
| > | Result is greater than the associated numerical value. |
| A | See the report narrative |
| B | Analyte present in method blank |
| C | Confirmed by GC/MS |
| CG | Confluent growth |
| DL | Surrogate or spike compound was diluted out |
| E | Estimated concentration due to sample matrix interference |
| EDL | Elevated sample reporting limits, presence of non-target analytes |
| EMPC | Estimated Maximum Possible Concentration |
| FL | Free Liquid |
| I | Semiquantitative result (out of instrument calibration range) |
| J | The analyte was positively identified, but the quantitation was below the RL |
| J,B | Analyte detected in both the method blank and sample above the MDL. |
| J,P | Estimate; columns don't agree to within 40% |
| J,S | Estimated concentration; analyzed by method of standard addition (MSA) |
| L | Sample reporting limits elevated due to matrix interference |
| M | Matrix effect; the concentration is an estimate due to matrix effect. |
| N | Tentatively identified compound(TIC) |
| NA | Not applicable |
| ND | Not detected at or above the reporting limit |
| ND,L | Not detected; sample reporting limit (RL) elevated due to interference |
| ND,S | Not detected; analyzed by method of standard addition (MSA) |
| NF | Not found by library search |
| NFL | No free liquid |
| NI | Non-ignitable |
| NR | Analyte is not required to be analyzed |
| NS | Not spiked |
| P | Concentrations >40% difference between the two GC columns |
| Q | One or more quality control criteria fail. See narrative. |
| QNS | Quantity of sample not sufficient to perform analysis |
| RA | Reanalysis confirms reported results |
| RE | Reanalysis confirms sample matrix interference |
| S | Analyzed by method of standard addition (MSA) |
| SMI | Sample matrix interference on surrogate |
| SP | Reported results are for spike compounds only |
| TIC | Library Search Compound |
| TNTC | Too numerous to count |
| U | Undetected; the concentration is below the reported MDL. |
| UJ | Undetected; the MDL and RL are estimated due to quality control discrepancies. |
| W | Post-digestion spike for furnace AA out of control limits |
| X | Exceeds regulatory limit |
| X, S | Exceeds regulatory limit; method of standard additions (MSA) |
| Z | Cannot be resolved from isomer - see below |

*****Special Notes for Organic Analytes**

1. Acrolein and acrylonitrile by method 624 are semi-quantitative screens only.
2. 1,2-Diphenylhydrazine is unstable and is reported as azobenzene.
3. N-nitrosodiphenylamine cannot be separated from diphenylamine.
4. 3-Methylphenol and 4-Methylphenol are unresolvable compounds.
5. m-Xylene and p-Xylene are unresolvable compounds.
6. The reporting limits for Appendix II/IX compounds by method 8270 are based on EPA estimated PQLs referenced in 40 CFR Part 264, Appendix IX. They are not always achievable for every compound an are matrix dependent.

00071918
NO. 10225

# Chain of Custody

Shaw® Shaw Environmental & Infrastructure, Inc.
3010 Briarpark Drive, Suite 400
Houston, TX 77042
(713) 996-4400

Laboratory Name: Kemron  Address: ~~156~~ 156 Starlite Marrietta, Ohio  Contact: Stephanie Mossburgh

Project Name: LONGHORN - PBC  Project Location: LHAAP-46

Project No.: 117591.  Project Contact: ALLEN WILLMORE  Project Telephone No.: (713) 247-9292

Point of Contact: LARRY DUTY  Project Manager/Supervisor: Praveen Srivastav

Telephone No. (713) 996-4547

Analysis and Method Desired (Indicate separate containers)

| Item No. | ~~Telephone Number~~ SAMPLE ID | Date | Time | Comp | Grab | Matrix | Sample Description, Location | Number of Containers | TAL metals (HNO3 unfiltered) | TAL metals (to be filtered) | Total Dissolved solids | Total Suspended solids | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 46WW02-090707 | 9/7/07 | 8:30 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | |
| 2 | 46WW04-090707 | 9/7/07 | 10:10 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | |
| 3 | LHSMW11-090707 | 9/7/07 | 12:20 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | |
| 4 | LHSMW14-091007 | 9/10/07 | 13:30 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | |
| 5 | LHSMW15-091007 | 9/10/07 | 1545 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | |
| 6 | LHSMW19-091107 | 9/11/07 | 0820 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | |
| 7 | LHSMW22-091107 | 9/11/07 | 09:50 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | Time Sampled = 09:50 |
| 8 | LHSMW23-091107 | 9/11/07 | ~~09:50~~ 13:35 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | Time Sampled = 13:35 |
| 9 | LHSMW 24-091107-FD | 9/11/07 | 15:35 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | Time Sampled = 15:35 |
| 10 | LHSSMW 24-091107 | 9/11/07 | 15:35 | | ✓ | W | Groundwater, Site 46 | 4 | 1 | 1 | 1 | 1 | | | | |

| Transfers Relinquished By (signature) | Date/Time | Transfers Accepted By (signature) | Date/Time | Special Instructions |
|---|---|---|---|---|
| Scott Reesinger | 9/7/07 16:00 | M. Allen | 9/7/07 16:00 | |
| M. Allen | 9/12/07 1030 | | | |
| | | | | FedEx Airbill No.: |
| | | Laboratory Erin Ebler | 9-13-07 1100 | Sampler's Signature M. Allen |

TAT: _____ Standard _____ Rush Date _____  Seals Intact? _____ Y _____ N  Received Good Condition _____ Y _____ N _____ Cold

White - Lab Copy  Canary - Field Copy  Pink - File Copy

Form Number: 433_1
Rev. 03-19-07

00071919

Shaw® Shaw Environmental, Inc.

3010 Briarpark Drive, Suite 4N
Houston, TX 77042 (713) 996-4400

# CHAIN-OF-CUSTODY

No. 10749

Laboratory Name: Kemron | Address: 156 Starlite Marrietta, Ohio | Contact: Stephanie Mossburg

Project Name: Longhorn - PBC | Project Location: LHAAP-46

Project No.: 117591.009C400 | Project Contact: Allen Willmore | Project Telephone No.: (713) 247-9292

Point of contact: Larry Daly | Telephone No. (713) 996-4547

Project Manager/Supervisor: Praveen Srivastav

Analysis and Method Desired (Indicate separate containers)

| Item No. | Sample Number | Date | Time | Comp | Grab | Matrix | Sample Description, Location | Number of Containers | LEAD | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PRSB01 (9-10) | 9/5/07 | 10:35 | | ✓ | S | Soil, Pistol Range | 1 | X | | | | | | |
| 2 | PRSB01 (14-15) | 9/5/07 | 10:50 | | ✓ | S | Soil, Pistol Range | 1 | X | | | | | | |
| 3 | PRSB01 (19-20) | 9/5/07 | 11:15 | | ✓ | S | Soil, Pistol Range | 1 | X | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | |

| Transfers Relinquished By (Signature) | Date/Time | Transfers Accepted By (Signature) | Date/Time |
|---|---|---|---|
| [signature] | 9/12/07 / 1030 | | |
| | | | |
| | | | |
| | | Laboratory [signature] | 9-13-07 1100 |

Special Instructions

FedEx Airbill No.:

Sampler's Signature [signature]

TAT: _____ Standard _____ Rush Due: ___ Seals Intact? _____ Y _____ N Received Good Condition _____ Y _____ N _____ Cold

White - Lab Copy Canary - Field Copy Pink - File Copy

**SAMPLE RECEIPT FORM**

00071920

156 Starlite Drive
Marietta, OH 45750
(740) 373-4071

| | |
|---|---|
| Client: SHAW Houston (Longhorn) | |
| Workorder Number: B — | |
| Date Received: 9-13-07 | |
| Delivered by: ( ) Fedx (✓) UPS ( ) Client ( ) Courier | Time: 1100 |
| Opened by: EE | |
| IR Temp Gun: ( ) D (✓) G | |
| Logged by: Blg | L 9.261 |

**Cooler Information**

| Cooler ID | Temp C | Airbill# | COC# | Other |
|---|---|---|---|---|
| 1822 | 3 | 1240166322100 63107 | | waters |
| 563 | 2 | 1240166322/0063116 | | NOTE: sid 9/7/07 |
| | | | | TDS/TSS Runs out |
| | | | | 9/14/07 |
| | | | | |

| Inspection Checklist | Y | N | NA | Discrepancy ID |
|---|---|---|---|---|
| Were shipping coolers sealed? | ✓ | | | |
| Were custody seals intact? | ✓ | | | |
| Were cooler temperatures in range of 0 - 6? | ✓ | | | |
| Was ice present? | ✓ | | | |
| Were COC's received/information complete/signed/dated? | ✓ | | | |
| Were sample containers and labels intact? | ✓ | | | |
| Were correct containers used? | ✓ | | | |
| Were correct preservatives used (water only)? | ✓ | | | |
| Were pH ranges acceptable? | | ✓ | | 1 |
| Were VOA samples free of headspace? | | | ✓ | |
| Were samples received within EPA hold times? | ✓ | | | |

**Discrepancy/Comments/Other Problems**

1 PH 6 on TAl Metal bottle ID 15-091007 @ 1545

**Distribution**

| | |
|---|---|
| Name of KEMRON representative | |
| Client/Company: | |
| Person Contacted: | |
| Date contacted: | |

**Resolution/other comments:**

**KEMRON Environmental Services**
Internal Chain of Custody Report

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

00071921

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-07** | 372864 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-M |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:37 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-13** | 372875 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-03** | 372855 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-11** | 372870 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

00071922

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-17** | 372882 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-21** | 372890 | PCT-S |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:27 | REK | ERE |
| 3 | STORE | DIG | W1 | 14-SEP-2007 14:00 | RLK | REK |
| 4 | ANALYZ | W1 | WET | 14-SEP-2007 16:05 | JDH | RLK |
| 5 | STORE | WET | A1 | 18-SEP-2007 07:26 | ERE | DIH |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-14** | 372877 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-02** | 372853 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report

00071923

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-16** | 372881 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-18** | 372885 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:55 | ERE | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-11** | 372872 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-M |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:37 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-11** | 372871 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:38 | ERE | HJR |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

00071924

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-09** | 372867 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-19** | 372887 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-05** | 372859 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-13** | 372874 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report

00071925

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-09** | 372866 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-01** | 372850 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-05** | 372858 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-22** | 372891 | PCT-S |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:27 | REK | ERE |
| 3 | STORE | DIG | W1 | 14-SEP-2007 14:00 | RLK | REK |
| 4 | ANALYZ | W1 | WET | 14-SEP-2007 16:06 | JDH | RLK |
| 5 | STORE | WET | A1 | 18-SEP-2007 07:26 | ERE | DIH |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report
**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

00071926

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-06** | 372861 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-07** | 372863 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-19** | 372886 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-10** | 372869 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report
**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

00071927

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-13** | 372876 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-M |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:37 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-17** | 372883 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-12** | 372873 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-20** | 372889 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report

00071928

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-15** | 372880 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-M |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:38 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-19** | 372888 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-M |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:37 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-15** | 372879 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| Samplenum | Container ID | Products |
|---|---|---|
| **L0709261-23** | 372892 | PCT-S |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:27 | REK | ERE |
| 3 | STORE | DIG | W1 | 14-SEP-2007 14:00 | RLK | REK |
| 4 | ANALYZ | W1 | WET | 14-SEP-2007 16:06 | JDH | RLK |
| 5 | STORE | WET | A1 | 18-SEP-2007 07:26 | ERE | DIH |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**

Internal Chain of Custody Report

00071929

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-08** | 372865 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-04** | 372857 | AG-MSD AL-D AS-MS-D BA-MS-D BE-AX-D CA-D CD-MS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 07:26 | REK | ERE |
| 3 | STORE | DIG | A1 | 18-SEP-2007 13:54 | ERE | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-17** | 372884 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-M |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:54 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:37 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-01** | 372852 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-M |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:37 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

00071930

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-01** | 372851 | TSS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-09** | 372868 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-N |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:38 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-03** | 372856 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-N |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:37 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-05** | 372860 | AG-MS AL AS-MS BA-MS BE-AX CA CD-MS CO-AX CR-N |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | PREP | W1 | DIG | 14-SEP-2007 06:37 | REK | ERE |
| 3 | STORE | DIG | A1 | 14-SEP-2007 13:57 | RLK | REK |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

**KEMRON Environmental Services**
Internal Chain of Custody Report

00071931

**Login:** L0709261
**Account:** 2773
**Project:** 2773.025
**Samples:** 23
**Due Date:** 24-SEP-2007

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-15** | 372878 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-03** | 372854 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:50 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

| **Samplenum** | **Container ID** | **Products** |
|---|---|---|
| **L0709261-07** | 372862 | TDS |

Bottle: 1

| Seq. | Purpose | From | To | Date/Time | Accept | Relinquish |
|---|---|---|---|---|---|---|
| 1 | LOGIN | COOLER | W1 | 13-SEP-2007 12:53 | BRG | |
| 2 | ANALYZ | W1 | WET | 14-SEP-2007 07:49 | HJR | ERE |
| 3 | STORE | WET | A1 | 17-SEP-2007 09:39 | ERE | HJR |

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login