LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS

ADMINISTRATIVE RECORD

CHRONOLOGICAL INDEX

Volume 3 of 3

2006

Bate Stamp Numbers

00041317 - 00042208

Prepared for

Department of the Army
Longhorn Army Ammunition Plant

1976 – 2006

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

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2006

A. Title: Report – Final Background Surface Water and Sediment Study Report
Author(s): Shaw
Recipient: All Stakeholders
Date: July 17, 2006
Bate Stamp: 00041317 - 00041721

B. Title: Minutes – Draft Final Minutes Monthly Managers Meeting
Author(s): Shaw
Recipient: All Stakeholders
Date: July 18, 2006
Bate Stamp: 00041722 - 00041725

C. Title: Report – Final Addendum 5 Additional Investigation at LHAAP-59 Final Work Plan Groundwater Data Gaps Investigation Groups 2 and 4
Author(s): Shaw
Recipient: All Stakeholders
Date: July 18, 2006
Bate Stamp: 00041726 - 00041742

D. Title: Report – Addition of Monitored Natural Attenuation to the Recommended Alternative 2 at LHAAP-12, LHAAP
Author(s): Rose Zeiler, Site Manager, LHAAP
Recipient: Fay Duke, TCEQ and Chris Villarreal, USEPA, Dallas, Texas
Date: July 26, 2006
Bate Stamp: 00041743 - 00041758

E. Title: Report – Final Addendum 6 Additional Investigation at LHAAP-29 Former TNT Production Area Final Installation-Wide Work Plan
Author(s): Shaw
Recipient: All Stakeholders
Date: August 16, 2006
Bate Stamp: 00041759 - 00042004

F. Title: Minutes – Draft Final Minutes Monthly Managers Meeting
Author(s): Shaw
Recipient: All Stakeholders
Date: August 22, 2006
Bate Stamp: 00042005 - 00042009

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G. Title: Report –Final Addendum 7 Additional Investigation at LHAAP-35/36 Sumps Waste Rack Sumps, Final Installation-Wide Work Plan
Author(s): Shaw
Recipient: All Stakeholders
Date: September 21, 2006
Bate Stamp: 00042010 - 00042048

H. Title: Minutes – Draft Final Minutes Monthly Managers Meeting
Author(s): Shaw
Recipient: All Stakeholders
Date: September 26, 2006
Bate Stamp: 00042049 - 00042054

I. Title: Minutes – Draft Final Minutes Quarterly Restoration Advisory Board Meeting
Author(s): Shaw
Recipient: All Stakeholders
Date: September 26, 2006
Bate Stamp: 00042055 - 00042060

J. Title: Report – Final Baseline Ecological Risk Assessment Field Sampling Work Plan
Author(s): Shaw
Recipient: All Stakeholders
Date: October 5, 2006
Bate Stamp: 00042061 - 00042151

K. Title: Report – Final Addendum 10 Site Investigation LHAAP-55 (Ten Septic Tanks) Final Installation-Wide Work Plan
Author(s): Shaw
Recipient: All Stakeholders
Date: October 17, 2006
Bate Stamp: 00042152 - 00042177

L. Title: Minutes – Draft Final Minutes Monthly Managers Meeting
Author(s): Shaw
Recipient: All Stakeholders
Date: October 25, 2006
Bate Stamp: 00042178 - 00042183

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KARNACK, TEXAS
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2006

M. Title: Letter – LHAAP Evaluation of the East Further Investigation Area
Author(s): Chris Villarreal, USEPA, Dallas, Texas
Recipient: Rose Zeiler, Site Manager, LHAAP
Date: October 25, 2006
Bate Stamp: 00042184

N. Title: Memo – Update on Baseline Ecological Risk Assessment Field Sampling and Changes from Work Plan, Installation-Wide Ecological Risk Assessment
Author(s): Shaw
Recipient: All Stakeholders
Date: October 30, 2006
Bate Stamp: 00042185 - 00042186

O. Title: Minutes – Draft Final Minutes Monthly Managers Meeting
Author(s): Shaw
Recipient: All Stakeholders
Date: November 16, 2006
Bate Stamp: 00042187 - 00042191

P. Title: Memo – LHAAP-58 Boundary Explanation
Author(s): Cliff Murray, USACE, Tulsa District
Recipient: Longhorn Team Members
Date: November 24, 2006
Bate Stamp: 00042192 - 00042201

Q. Title: Minutes – Draft Final Minutes Monthly Managers Meeting
Author(s): Shaw
Recipient: All Stakeholders
Date: December 12, 2006
Bate Stamp: 00042202 - 00042208

00041317

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

July 17, 2006

DAIM-BD-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
Environmental Cleanup Section II (MC-221)
12100 Park 35 Circle
Austin, TX 78753

Re: Final Background Surface Water and Sediment Study Report,
Longhorn Army Ammunition Plant, Karnack, Texas, July 2006

Dear Ms. Duke,

The above-referenced document is transmitted to you for your files.

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, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
Chris Villarreal, USEPA Region 6, Dallas, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE-Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
P. Srivastav, Shaw, Houston, TX (for project file)

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

July 17, 2006

DAIM-BD-LO

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

Re: Final Background Surface Water and Sediment Study Report,
Longhorn Army Ammunition Plant, Karnack, Texas, July 2006

Dear Mr. Villarreal,

The above-referenced document is transmitted to you for your files.

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, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
Fay Duke, TCEQ, Austin, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE-Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
Praveen Srivastav, Shaw – Houston (for project file)

Comments on
Draft Final Background Surface Water and Sediment Report
Longhorn Army Ammunition Plan
Karnack, Texas
October 2004

Reviewer: Stephen Tzhone, Superfund Remedial Project Manager, U.S. Environmental Protection Agency, Region 6
Respondents: Frank Eidson, Shaw E & I

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 No.	Page	Section/ Paragraph	Comment	C, D[1], E or X	Response	A or D[2]
1		General	Consider integration of EPA'S OWER 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	The guidance referenced in the comment is cited as reference USEPA, 2002b in the draft document (Section 5.3). The methods for calculating the 95% UCLs of data sets with normal distributions by the Student's t Method, and the bootstrapping methods applied to nonparametric distributions are specified in the EPA guidance cited. The ProUCL software is used in this program where it can be applied. However, the current ProUCL Version 3.00.02 does not handle data from samples having no detected concentration of a chemical (nondetects. The software guidance manual suggests use of surrogate concentrations for data sets containing only moderate numbers of nondetects (<15%), but suggests caution when using ProUCL for data having more nondetects, and states that treatment of nondetects using ProUCL is under further investigation. Calculations of UCLs in this program follow EPA guidance documents as described in the *Final Installation-Wide Background Study Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas*, cited as Shaw, 2004a in the draft document. The ProUCL software will be used where applicable in the future and will be cited in the references section in resulting reports.	

FINAL

BACKGROUND SURFACE WATER AND SEDIMENT STUDY REPORT
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.
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Contract Number DACA56-94-D-0020
Task Order No. 0109

July 2006

FINAL
BACKGROUND SURFACE WATER AND SEDIMENT STUDY REPORT
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
JULY 17, 2006

PRAVEEN SRIVASTAV
Name of Texas Professional Geoscientist

1696
License Number

SHAW ENVIRONMENTAL, INC.
Company

3010 BRIARPARK DRIVE, SUITE 4N, HOUSTON, TX 77042
Address

I certify with my signature below, that the written descriptions and graphical depictions of geology and hydrogeology contained within this report were prepared under my supervision, and accurately reflect existing knowledge about the geology and hydrogeology of the referenced site.

Signature

STATE OF TEXAS
PRAVEEN SRIVASTAV
GEOLOGY
1696
LICENSED
PROFESSIONAL GEOSCIENTIST

7/17/06
Date Signed

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Appendix A Geotechnical Analysis Results

Acronyms and Abbreviations

°C	degrees Centigrade
°F	degrees Fahrenheit
atm-m^3/mol	atmospheres cubic meter per mol
CEC	cation exchange capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPEC	Chemicals of Potential Environmental Concern
ERA	ecological risk assessment
GPS	global positioning system
Hg	mercury
K_{oc}	organic carbon partition coefficient
LHAAP	Longhorn Army Ammunition Plant
MDL	method detection limit
mm	millimeter(s)
NAD	North American Datum
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
QA	quality assurance
QC	quality control
RDX	cyclonite
Shaw	Shaw Environmental, Inc.
TCEQ	Texas Commission on Environmental Quality
TNT	trinitrotoluene
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UTL	upper tolerance limit
VOC	volatile organic compound

Executive Summary

This report, prepared by Shaw Environmental, Inc. (Shaw) for the U.S. Army Corps of Engineers, Tulsa District, under Total Environmental Restoration Contract DACA56-94-D-0020, Task Order 0109, describes the procedures and results of a background study performed in order to characterize background chemical concentrations in surface water and sediments at the Longhorn Army Ammunition Plant (LHAAP) located in Harrison County near Karnack, Texas. This study was performed as part of an installation-wide background study of environmental media (soil, surface water, sediment, and groundwater). The analytical results from the study will be used to support installation-wide human health and ecological risk assessments and feasibility studies, and will assist in determining the suitability of transfer of parcels of land to the U.S. Fish and Wildlife Service. This study was conducted under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 in accordance with the *Final Installation-Wide Background Study Work Plan, Longhorn Army Ammunition Plant, Karnack*, *Texas* (Shaw, 2004a). The results of a similar background study for the soil were presented in the document *Final Background Soil Study Report, Longhorn Army Ammunition Plant, Karnack*, *Texas* (Shaw, 2004b). The results of a background study for groundwater will be reported separately.

The LHAAP operated intermittently from 1942 through 1997 and is now inactive. The LHAAP produced explosives, pyrotechnic devices, photoflash bombs, simulators, hand signals, tracer ammunition, and solid-fuel rocket motors and propellant. Previous environmental studies have shown that industrial operation and waste management practices have affected soil, groundwater, surface water, and sediments at the LHAAP. The LHAAP is a part of the Cypress Bayou Basin in the Piney Woods ecological region of Texas and has mixed pine/hardwood forests that cover flat to gently rolling terrain that support an abundant and diverse plant community with a wide range of habitats.

The background surface water and sediment samples were collected at 14 randomly established locations along four streams within LHAAP but upstream of LHAAP operations areas. Surface water and sediment samples were also collected from 14 locations at Clinton Lake, which is upstream from Caddo Lake. Surface water and sediment samples were collected from each of the sampling locations. Samples were analyzed for metals, volatile organic compounds, semivolatile organic compounds, polynuclear aromatic hydrocarbons, pesticides, explosives, polychlorinated biphenyls, dioxins/furans, perchlorate, pH, anions, and percent organic matter. The validation and evaluation of chemical data used in this background report were reported in *Draft Data Quality Summary Report*, *Background Surface Water and Sediment Sampling, Longhorn Army Ammunition Plant, Karnack, Texas* (Shaw, 2004c).

Surface water and sediment data from one LHAAP stream location were disqualified as potential background data and excluded from the study due to the presence of two organic chemicals that could be associated with LHAAP processes. All other data were retained for the evaluation. Based on the results of this study, it is concluded that the majority of the background sampling areas have not been affected by contamination and represent natural conditions. Some background samples contained detectable or trace levels of chemicals associated with plants common to the local ecology, fertilizers or pesticide formulations, and fuels used in farming, logging, or maintenance.

Statistical parameters of the resulting data sets were calculated for each chemical in surface water and sediment, and are summarized in **Tables ES-1** and **ES-2**, respectively.

The intended use of the background data sets for surface water and sediment concentrations is for future comparison with LHAAP site-specific concentrations in each medium. Methods for comparing site-specific data to background data involve comparing the background data set as a whole to the site-specific data set. Because these methods compare the central portions of the distributions with less emphasis on the upper portions, they will be combined with comparisons of the upper confidence limit and upper tolerance limit concentrations of both data sets. These evaluations will provide the comprehensive statistical approach described in the Final Work Plan (Shaw, 2004a).

1.0 Introduction

This report, prepared by Shaw Environmental, Inc. (Shaw) for the U.S. Army Corps of Engineers (USACE), Tulsa District, under Total Environmental Restoration Contract DACA56-94-D-0020, Task Order 0109, describes the procedures and results of a background study performed in order to characterize the background chemical concentrations in surface water and sediment at the Longhorn Army Ammunition Plant (LHAAP) near Karnack, Texas. This surface water and sediment background study was performed as part of an installation-wide background study of environmental media (soil, surface water, sediment, and groundwater). The results of the background study will be used to support an installation-wide ecological risk assessment (ERA), site-specific human health risk assessments and feasibility studies, and will assist in determining the suitability of transfer of parcels of land to the U.S. Fish and Wildlife Service (USFWS) in a phased manner. This background study was conducted under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 in accordance with work plan requirements (Jacobs, 2003; Shaw, 2004a).

Background surface water and sediment samples were collected from March 8 to 16, 2004 at 14 randomly selected locations in the upper reaches of streams on the LHAAP property and at 14 locations in Clinton Lake. Surface water and sediment sample pairs were collected at each location. Surface water samples were analyzed in the laboratory for a suite of chemicals and properties that included metals, volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), explosives, anions including perchlorate, and additional water properties (pH, alkalinity, hardness, total dissolved solids, and total suspended solids). Filtered surface water samples from the streams and from Clinton Lake were analyzed for metals. Sediment samples were analyzed for metals, VOCs, PAHs, pesticides and herbicides, explosives, polychlorinated biphenyls (PCBs), dioxins/furans, anions including perchlorate, and additional sediment properties (pH, percent solids, total organic matter, and cation exchange capacity [CEC]).

Analytical results for surface water and sediment samples were evaluated using statistical methods based on U.S. Environmental Protection Agency (USEPA) guidance (USEPA, 2002a,b) and Texas Commission on Environmental Quality (TCEQ) guidelines (Texas Natural Resource Conservation Commission, 1998; 2000). The analytical data were validated to verify sufficient precision, accuracy, completeness, and comparability, and to provide a representation of background conditions at LHAAP to support comparisons of background and LHAAP-related concentrations.

The sampling and analysis of background surface and subsurface soil have been reported previously (Shaw, 2004b); background groundwater sampling and analysis will be presented separately.

1.1 Site Location and History

The LHAAP is located in northeast Texas in Harrison County. The installation originally occupied nearly 8,500 acres between State Highway 43 at Karnack, Texas and the southwestern shore of Caddo Lake (**Figure 1-1**). The Army transferred approximately 5,032 acres to the USFWS on May 5 with an additional 742 acres transferred in September 2004 for management as the Caddo Lake National Wildlife Refuge. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the east.

The LHAAP was established in December 1941 when the Army issued a contract to build a six-line production facility for manufacturing trinitrotoluene (TNT). The LHAAP was operated intermittently from 1942 through 1997, and was placed on inactive status and the Army issued a contract to remove salvageable property in the following year. The LHAAP installation is now inactive.

The LHAAP produced 414 million pounds of TNT, 3.4 million pyrotechnic devices, photoflash bombs, simulators, hand signals, 40-millimeter (mm) tracers, 200,000 solid-fuel rocket motors, and approximately 50 million pounds of propellant for the U.S. Department of Defense inventory. The 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 between the United States and the former Union of Soviet Socialist Republics.

Soil, groundwater, surface water, and sediments have been contaminated by industrial operations and waste management practices at the LHAAP (Jacobs, 2001a,b; 2002a,b,c). Industrial operations involved the manufacturing or use of secondary explosives, rocket motor propellants, and pyrotechnics. Explosives included cyclonite (RDX), TNT, and black powder. Rocket propellants contain a rubber binder, an oxidizer (ammonium perchlorate), and a powdered metal fuel (aluminum). Pyrotechnics were generally composed of an inorganic oxidizer (sodium nitrate), a metal powder (magnesium), and a binder. Other materials used in LHAAP operations included acids, lubricants, and solvents. Waste management activities included sanitary and industrial waste treatment, construction and use of holding/evaporation ponds, and sanitary- and contaminated-waste landfills, storm water drainage, and operation of demolition/burning grounds.

1.2 Physical Setting

The LHAAP is located in an area of the country characterized by a mild climate, with an average low temperature of 35 degrees Fahrenheit (°F) and an average high of 91ºF. Precipitation averages 46.9 inches per year, with a slight peak in the spring. Mixed pine/hardwood forests that cover flat to gently rolling terrain characterize LHAAP. Most of the terrain has an average slope of 3 percent or less, but slopes as steep as 12 percent can be found in the western and northwestern portions of the installation and along Harrison Bayou.

The LHAAP is a part of the Cypress Bayou Basin in the Piney Woods ecological region of Texas. Its gentle topography and mild climate support an abundant and diverse plant community with a wide range of habitats. This diversity creates the potential for a large variety of animal species to inhabit LHAAP. As the buildings have been demolished, more and more of the facility has been left to nature, as evidenced by the pine trees growing among concrete remnants. Common mammals found at LHAAP include white-tailed deer, red and gray foxes, rabbits, squirrels, opossums, skunks, armadillos, beavers, and raccoons. In addition to mammals, a total of 334 bird species have been documented as inhabiting Caddo Lake's drainage system and potentially inhabiting LHAAP during a portion of the year. A reported 53 different reptile species inhabit the Cypress Bayou Basin.

Surface water at LHAAP drains northeast into Caddo Lake via four drainage systems: Saunders Branch, Harrison Bayou, Central Creek, and Goose Prairie Creek (**Figure 1-2**). Caddo Lake is a part of Big Cypress Bayou. Saunders Branch flows into LHAAP near the southeastern corner of the installation and then northward into Caddo Lake. Approximately 11 percent of the heavily wooded, eastern section of LHAAP is drained by this system. Harrison Bayou enters LHAAP on the southern edge of the installation. The bayou captures approximately 30 percent of the surface drainage of LHAAP and transverses the installation in a northeasterly direction. Central Creek enters LHAAP on its western edge, just south of the town of Karnack. Central Creek accounts for approximately 29 percent of the surface drainage from the installation to Caddo Lake. The headwaters of Goose Prairie Creek are located near the northwestern corner of the plant and consist of one larger creek and several smaller tributaries. Goose Prairie Creek flows across the northern edge of the installation and drains approximately 30 percent of LHAAP. Flow in these drainage systems is intermittent.

The shallow subsurface geology at LHAAP consists of a thin veneer of Quaternary alluvium overlying unconsolidated Tertiary age sediments of the Wilcox Group. The Wilcox Group consists of interbedded sands, silts, and clays. The stratigraphic thickness of the Wilcox Group ranges from a maximum of 350 feet in the northwestern corner of LHAAP to approximately 130 to 140 feet at the eastern side of the facility. Based upon interpretations of boring logs generated

during site investigations at LHAAP, a series of moderately transmissive groundwater zones occur in the unconsolidated sands of the Wilcox.

1.3 Objectives of Background Study

The objective of this background study is to establish background concentrations of compounds in the surface water and sediments at the LHAAP. The background may represent naturally–occurring or anthropogenic sources. The results will be used to: (1) support an installation-wide ERA, (2) support site-specific human health risk assessments and feasibility studies, (3) determine the suitability of transfer of parcels of land to the USFWS in a phased manner, and (4) support future decision-making at LHAAP.

1.4 Scope

This report describes background concentrations of chemicals in surface water and sediment samples taken from the same locations, the application of statistical analysis methodology, the upper confidence limits (UCLs) of mean concentrations, the upper tolerance limits (UTLs) of background chemicals, and a description of the intended use of the background data. Background studies of soil have been reported (Shaw, 2004b) and studies of background chemical concentrations in groundwater will be documented in a future report.

2.0 Background Sample Collection and Analysis

This section describes the random selection of background sampling locations, sample collection techniques, and laboratory analytical methods for the sampling conducted from March 8 to 16, 2004. The sampling procedures applied were described in the Draft Final Work Plan developed by Jacobs Engineering, Inc. (Jacobs, 2003) and amended by stakeholders during meetings in October 2003. Based on review comments for the Draft Final Work Plan and decisions made during the stakeholders' meetings, the Final Work Plan was submitted by Shaw in January 2004 (Shaw, 2004a).

2.1 Selection of Surface Water and Sediment Sampling Locations

Background levels of chemicals in surface water and sediment are being established primarily to support the evaluation of contaminant levels as part of Step 3 of the ERA. The evaluation in Step 3 will be used to revise the Chemicals of Potential Environmental Concern (COPEC) list and may result in elimination of some chemicals from the COPEC list if concentrations in on-site samples are consistent with background concentrations. In addition, background data can support future decisions in the CERCLA process. Two sets of background data have been developed in this study. One set of background data from streams at LHAAP was developed to support comparison to on-site surface water data. The second set of background data from Clinton Lake was developed for future comparison to Caddo Lake surface water data.

A total of 14 random sample locations were identified for background surface water sampling at LHAAP (Shaw, 2004a). Four random locations were identified in background reference areas at Goose Prairie Creek (**Figure 2-1),** three locations at Saunders Branch (**Figure 2-2)**, three locations at Central Creek (**Figure 2-3)**, and four locations at Harrison Bayou (**Figure 2-4)**.

Clinton Lake was sampled as representative of surface water and sediment background for future comparison to Caddo Lake data. Clinton Lake is upstream of Caddo Lake and approximately 3 miles north-northeast of discharge points at LHAAP. Because surface water drainage entering Caddo Lake from the LHAAP moves primarily downgradient in Caddo Lake to the discharge point at the dam, it is very unlikely that the surface water drainage from the LHAAP would affect Clinton Lake. Surface water and sediment were taken at 14 random locations (**Figure 2-5**).

The State Plane (Texas North Central), North American Datum (NAD) 83 geographic coordinates for each surface water and sediment sampling location was transferred to a hand-held global positioning system (GPS) unit, the GeoXT™ Explorer, integrated with data

processing and communication software. In the field, the GPS unit was used to navigate to the sampling locations. Shaw employed ArcGIS™ 8.3 to manage the georeferenced data.

2.2 Surface Water Sample Collection

At each location, surface water samples were collected before sediment samples were taken. Surface water samples BKG-SW01 through BKG-SW014 from LHAAP streams (**Figures 2-1** through **2-4**) and samples from BKG-CL-SW01 through BKG-CL-SW014 from Clinton Lake (**Figure 2-5**) were collected and handled according to work plan requirements (Shaw, 2004a).

For water samples from LHAAP streams, one duplicate, one matrix spike/matrix spike duplicate sample, and four trip blanks were collected as quality control (QC) and quality assurance (QA) samples. For water samples from Clinton Lake, two duplicates, one matrix spike/matrix spike duplicate sample, and four trip blanks were collected as QC and QA samples.

2.3 Sediment Sample Collection

Sediment samples BKG-SD01 through BKG-SD014 from LHAAP streams (**Figures 2-1** through **2-4**) and samples from BKG-CL-SD01 through BKG-CL-SD014 from Clinton Lake (**Figure 2-5**) were collected and handled according to work plan requirements (Shaw, 2004a).

For sediment samples from LHAAP streams, two duplicates, one matrix spike/matrix spike duplicate sample, and four trip blanks were collected as QC and QA samples. The same numbers and kinds of QC and QA samples were collected for Clinton Lake samples.

2.4 Chemical Analysis

Surface water samples were analyzed for VOCs, PAHs, explosives, anions including perchlorate, pH, alkalinity, hardness, total dissolved solids, and total suspended solids. Filtered surface water samples from the streams and Clinton Lake were analyzed for metals. Sediment samples were analyzed for metals, VOCs, PAHs, pesticides and herbicides, explosives, PCBs, dioxins/furans, anions including perchlorate, pH, percent solids, total organic matter, and CEC.

The usability of the analytical data was evaluated in accordance with USEPA requirements and project-imposed requirements specified in the task order, and were validated by the Project Chemist. The analytical data reports and data evaluation reports for the background surface water and sediment samples were presented in the *Draft Data Quality Summary Report, Background Surface Water and Sediment Sampling, Longhorn Army Ammunition Plant, Karnack, Texas* (Shaw, 2004c). Data qualifiers and reason codes were added to the applicable laboratory data packages (Shaw, 2004c). Accutest Laboratories in Orlando, Florida analyzed water and sediment samples for all chemicals except dioxins/furans, which were analyzed by Columbia Analytical Services, Inc. in Houston, Texas. The analytical results are described in **Section 3.0**.

2.5 Geotechnical Analysis

Background sediment samples from streams (samples BKG-SD-01 through BKG-SD-014) and from Clinton Lake (samples BKG-CL-SD-01 through BKG-CL-SD-014) were analyzed for grain size distribution by ETTL Engineers & Consultants, Inc. in Tyler, Texas, using ASTM Method D422. The geotechnical laboratory reports are presented in **Appendix A**.

3.0 Data Review

The surface water and sediment samples evaluated are listed in **Table 3-1**. Analytical results for unfiltered surface water samples from LHAAP streams are shown in **Table 3-2**. Surface water samples from streams were also filtered and analyzed for metals. These results are shown in **Table 3-3**. Chemicals detected in the surface water samples that commonly are not naturally occurring and may be associated with LHAAP operations are shown in **Table 3-4**.

Analytical results for unfiltered and filtered surface water samples from Clinton Lake are shown in **Tables 3-5** and **3-6**, respectively. The filtered samples were analyzed only for metals. Chemicals detected in the Clinton Lake water that commonly are not known to be naturally occurring are shown in **Table 3-7**.

Analytical results for sediment samples from LHAAP streams and Clinton Lake are shown in **Tables 3-8** and **3-9**, respectively. Chemicals detected in the sediment samples that commonly are not naturally occurring are shown in **Tables 3-10** and **3-11** for LHAAP streams and Clinton Lake, respectively.

Certain analytical results were assigned qualifiers by the analytical laboratory or in the data validation process that indicate special circumstances specific to the sample. The data qualifiers specified in the Draft Data Quality Summary Report for Background Surface Water and Sediment Sampling (Shaw, 2004c) are:

U - Not detected. The compound was not detected above the associated reporting limit.

J - Estimated. The compound was identified during analysis; the value reported is the estimated concentration above the method detection limit (MDL) and below the reporting limit.

B - The compound was detected in associated equipment rinse samples and/or laboratory method or trip blanks. The concentration of common laboratory contaminants exceed 10 times the blank concentration, or concentration of other chemicals exceeds 5 times the blank concentration, i.e., the 5x/10x rule was applied (Shaw, 2004c).

R - The reported results were rejected due to severe deficiencies in supporting QC data, anomalies noted in sampling or analysis process, or the presence or absence of the compound could not be verified from available data. The qualifier indicates rejection of value in event of reanalysis.

UJ - The compound was not detected above the associated reporting limit. Evaluation of supporting QC data and/or sampling or analysis processes indicate that the detection limit or reporting limit is less accurate or precise than those for the majority of the samples, and the value should be estimated. Because this qualifier describes the reporting limit and not the reported concentration, it does not indicate that the compound was detected in the sample. Details regarding assignment of the UJ qualifier to the specific samples are given in Appendix B of the Draft Data Quality Summary Report (Shaw, 2004c).

L - Result may be biased low. Details are given in the Draft Data Quality Summary Report (Shaw, 2004c).

H - Result may be biased high. Details are given in the Draft Data Quality Summary Report (Shaw, 2004c).

The qualifier definitions are also provided as footnotes to tables, as applicable.

3.1 Background Chemicals

Background chemicals were designated in the Final Installation-Wide Background Study Work Plan (Shaw, 2004a) for surface water as those chemicals that are either naturally occurring or are likely to be present at low levels due to normal human activities. These chemicals include:

- Metals, including mercury
- Inorganic anions, including cyanide
- PAHs at background levels

For sediments, the background chemicals include:

- Metals, including mercury
- Inorganic anions, including cyanide
- Dioxins/furans, PAHs, pesticides, PCBs, and Silvex™ (a herbicide)

These compounds are referred to as “background chemicals” in the remainder of this report.

Other chemicals may be possible indicators of contamination and therefore could be used to eliminate a background location from the statistical evaluation if detected. These chemicals are explosives, perchlorate, and VOCs, and are referred to as “operations-related chemicals” in this report.

3.2 Detection of Other Chemicals in Background Samples

Detection of certain chemicals known to be associated with industrial or hazardous waste disposal operations could indicate that a background sampling location has been affected by contamination.

3.2.1 Surface Water Samples

Examination of the data for surface water from streams (**Table 3-4**) shows that acetone was detected in sample (BKG-SW08), nitrate was detected in two samples (BKG-SW02 and BKG-SW03), and nitrite was detected in one sample (BKG-SW05). Other samples contained low (J-qualified) levels of these chemicals, and J-qualified concentrations of 1,2,4-trimethylbenzene, toluene, and xylenes were detected in sample BKG-SW03. No explosives, chlorinated hydrocarbons, or cyanide were detected or reported at J-qualified concentrations in surface water samples.

Examination of the data for surface water from Clinton Lake (**Table 3-7**) shows that acetone was detected in one sample (BKD-CL-SW08 duplicate #2) (**Table 3-5**). No explosives, chlorinated hydrocarbons, or other VOCs, perchlorate, or cyanide were detected or reported at J-qualified concentrations in surface water samples from Clinton Lake. Because filtered surface water samples were only analyzed for metals (**Table 3-3** and **Table 3-6**), no similar examination was made for these samples.

3.2.2 Sediment Samples

Examination of the data for sediment from streams (**Table 3-10)** shows that acetone was detected in two samples (BKG-SD04 and BKG-SD12) and was reported at J-qualified concentrations in samples BKG-SD03, BKG-SD07, and BKG-SD10. P-Ipropyltoluene was detected in samples BKG-SD04, BKG-SD07 and BKG-SD10. Nitrate was detected in two samples (BKG-SD02 and BKG-SD03) and was reported at a J-qualified concentration in BKG-SD-09. Nitrite was detected in sample BKG-SD03. No explosives, chlorinated hydrocarbons, perchlorate, or cyanide were detected or reported at J-qualified concentrations in sediment samples from streams.

Examination of the data for sediment from Clinton Lake (**Table 3-11)** shows that acetone was detected in two samples (BKG-CL-SD12 and BKG-CL-SD14) and was reported at J-qualified concentrations in samples BKG-CL-SD03, BKG-CL-SD08, BKG-CL-SD09, and BKG-CL-SD11. Nitrate was detected in sample BKG-CL-SD11 and was reported at J-qualified concentrations in samples BKG-CL-SD01, BKG-CL-SD02, BKG-CL-SD03, BKG-CL-SD04, BKG-CL-SD06, BKG-CL-SD07, BKG-CL-SD07-Duplicate, BKG-CL-SD10, BKG-CL-SD13, and BKG-CL-SD13-Duplicate. Methylene chloride was detected at J-qualified concentrations in

samples BKG-CL-SD07 and BKG-CL-SD13-Duplicate; naphthalene was detected at J-qualified concentrations in sample BKG-CL-SD12.

No explosives, chlorinated hydrocarbons or other VOCs, perchlorate, nitrite, or cyanide were detected or reported at J-qualified concentrations in sediment samples from Clinton Lake.

Some of the chemicals detected or estimated in surface water and sediment from Clinton Lake or background areas of streams are used in industry or agriculture. As such, these chemicals might be expected to occur in the off-LHAAP background sampling areas. The following information regarding these chemicals describes the origins, uses, and environmental fate of these chemicals (U.S. National Library of Medicine, 2004).

Because of the detection of 1,2,4-trimethylbenzene, toluene, and xylenes in BKG-SD/SW03, both surface water and sediment samples from BKG-SD/SW03 were excluded from evaluation. However, analytical data from BKG- SD/SW03 are presented in **Table 3-12**.

Acetone, CAS Registry Number: 67-64-1. Acetone is used as a solvent for fats, oils, waxes, resins, rubbers, and plastics, and in the manufacture of rayon, acrylic fibers, and isoprene. Acetone is used as a nail polish remover and in the manufacture of explosives, airplane dopes, rayon, modacrylic fibers, isoprene, and photographic films. Acetone occurs naturally as a metabolic byproduct of plants and animals, and is released into the atmosphere from wood fires.

Acetone undergoes photodecomposition by sunlight, with an estimated half-life of about 80 days. Acetone is expected to have very high mobility in soils, and volatilization from dry soil surfaces is expected. Volatilization from moist soil surfaces is also expected based upon the measured Henry's Law constant (1.87×10^{-5} atmospheres-cubic meter per mol [atm-m^3/mol]). Acetone is expected to biodegrade under aerobic and anaerobic conditions. In water, acetone is not expected to adsorb to suspended solids or sediment based upon its estimated organic carbon partition coefficient (K_{oc}) value.

Volatilization from water surfaces is expected to be an important environmental fate process given its estimated Henry's Law constant. Estimated half-lives for a model river and model lake are 38 and 333 hours, respectively. Volatilizations half-lives in the range of 8 to18 hours were measured in a shallow stream.

Acetone is ubiquitous in the environment as a result of its occurrence in nature and consumer products, and its extensive use in industry. Therefore, the detection of low levels of acetone in surface water and sediment at these background locations is not sufficient to exclude the samples from the background study.

p-Isopropyltoluene CAS Registry Number: 25155-15-1. p-Isopropyltoluene is used as a solvent and chemical intermediate for the production of p-cresol, thymol and other organic compounds. It is used in the flavor and fragrance industry and is a component of commercial terpene solvent mixtures.

p-Isopropyltoluene occurs naturally in many arboreous plants and trees and is found in the gum terpentines of loblolly pine. p-Isopropyltoluene is emitted from oak species and firs.

Vapor-phase p-isopropyltoluene is degraded in the atmosphere by reaction with photochemically produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 1 day. p-Isopropyltoluene also degrades in the atmosphere by reaction with nighttime nitrate radicals; half-life for this reaction is estimated to be 34 days.

If released to soil, p-isopropyltoluene is expected to have slight mobility based upon an estimated K_{oc} of 4,050. Volatilization from moist soil surfaces is expected to be an important fate process based upon an estimated Henry's Law constant of 0.011 atm-m^3/mol. p-Isopropyltoluene may volatilize from dry soil surfaces based upon its vapor pressure. However, adsorption to soil is expected to attenuate volatilization. p-Isopropyltoluene has been shown to biodegrade in activated sludges and in natural water systems. If released into water, p-isopropyltoluene is expected to adsorb to suspended solids and sediment based upon the estimated K_{oc}.

Volatilization from water surfaces is expected to be an important fate process based upon this compound's estimated Henry's Law constant. Estimated volatilizations half-lives for a model river and model lake are 1 hour and 5 days, respectively. However, volatilization from water surfaces is expected to be attenuated by adsorption to suspended solids and sediment in the water column. The volatilization half-life from a model pond is estimated as 30 days if adsorption is considered.

p-Isopropyltoluene is expected to occur naturally in the environment around LHAAP and in the areas chosen for background sampling. Therefore, the detection of low levels of p-isopropyltoluene in soil at these background locations is not sufficient to exclude the samples from the background study.

Methylene Chloride: CAS Registry Number: 75-09-2. Methylene chloride is used as a solvent in paint removers, metal degreasing fluids and cleaning fluids. It is used as food processing solvent for decaffeination of coffee, spices, and beer hops. Methylene chloride is used in chemical manufacture of polycarbonate plastics, insecticides and herbicides, and pharmaceuticals, and is used as an aerosol propellant for insecticides.

If released to air, a vapor pressure of 435 mm mercury (Hg) at 25 degrees Centigrade (°C) (indicates methylene chloride will exist solely as a vapor in the ambient atmosphere. Vapor-phase methylene chloride degrades in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 119 days. If released to soil, methylene chloride is expected to have very high mobility based upon an estimated K_{oc} of 24. It is strongly bound to peat moss, less strongly to clay, only slightly to dolomite limestone, and not at all to sand.

Volatilization from moist soil surfaces is expected to be an important fate process based upon a estimated Henry's Law constant of 3.25×10^{-3} atm-cu m/mole. If released into water, methylene chloride is not expected to adsorb to suspended solids and sediment in water based upon the estimated K_{oc}. Biodegradation is possible in natural waters but will probably be very slow compared with evaporation. Volatilization from water surfaces is expected to be an important fate process based upon this compound's Henry's Law constant. Estimated volatilizations half-lives for a model river and model lake are 1 hr and 4 days, respectively. An estimated Biological Concentration Factor of 2 suggests the potential for bioconcentration in aquatic organisms is low. Hydrolysis is not an important degradation process under normal environmental conditions.

Methylene chloride is expected to occur in the environment around LHAAP as a result of application of insecticides and herbicides to soil during farming of the areas upstream from sampling locations followed by runoff to surface water bodies. Therefore, the detection of low levels of methylene chloride at these background locations is not sufficient to exclude the samples from the background study.

Naphthalene: CAS Registry Number: 91-20-3. Naphthalene is used in the manufacture of phthalate plasticizers, resins, dyes, pharmaceuticals, insect repellents, and vulcanizates. Naphthalene is an ingredient of some toilet bowl deodorants and is used as a wood preservative and a greenhouse fumigant. If released to air, a vapor pressure of 0.085 mm Hg at 25°C indicates naphthalene will exist primarily as a vapor in the ambient atmosphere. Vapor-phase naphthalene is degraded in the atmosphere by reaction with photochemically-produced hydroxyl and nitrate radicals with an estimated half-life of 18 and 60 hours, respectively. Naphthalene also absorbs light in the environmental UV spectrum and is subject to direct photolysis.

If released into water, naphthalene is expected to adsorb to suspended solids and sediment based upon measured K_{oc} of an average K_{oc} value of 1,300. Naphthalene has been shown to biodegrade in water with half-lives ranging from about 0.8 to 43 days. Photolysis in sunlit surface waters may be an important fate process based upon an aqueous photolysis half-life of 71 hours. Volatilization from water surfaces is expected to be an important fate process based upon this compound's Henry's Law constant (4.4×10^{-4} atm-cu m/mole. Estimated volatilizations half-lives for a model river and model lake are 3 hours and 5 days, respectively.

There is a moderate amount of data concerning the biodegradability of naphthalene, both in standard biodegradability tests and in natural systems. Although there are some conflicting data, the preponderance of data suggest that naphthalene degrades after a relatively short period of acclimation and that degradation can be rapid in oil polluted water, slow in unpolluted water, and that the rate of degradation increases with the concentration of naphthalene.

Naphthalene is found widely in the environment as a result of its use in plasticizers and other commonly used materials and consumer products, and its extensive use in industry. Therefore, the detection of low levels of naphthalene in surface water and sediment at these background locations is not sufficient to exclude the samples from the background study.

Nitrates: CAS Registry Number: 14797-55-8. Nitrates are used in fertilizers for crops such as cotton, tobacco, and vegetables in the United States. Major industrial uses include military explosives and pyrotechnics. The nitrates are found in formulations of herbicides, insecticides, and slow-burning solid rocket propellants. Nitrates are found in natural deposits associated with sodium and potassium chloride, potassium nitrate, sodium sulfate, magnesium chloride, and other salts.

Nitrates are very soluble in water and can contribute to algal blooms in static waters, and affect local species population balance in the aquatic environment. Because of its solubility, nitrate can infiltrate the soil and migrate downward toward the groundwater. Nitrate is somewhat persistent in water but nitrate degradation can occur under anaerobic conditions.

Nitrate is expected to occur in the LHAAP environment as a result of production of TNT and other nitrated toluene compounds. Nitrate is expected to occur in the background areas from fertilizer use also. Because nitrate is expected in both background and operations-related surface water and sediment samples, background samples that contain low nitrate concentrations are not excluded from the background study.

Nitrites: CAS Registry Number: 7632-00-0. Sodium nitrite (CAS Registry Number: 7632-00-0) is used in metal treatment and finishing operations; in the recovery of tin from scrap and as an anticorrosion inhibitor for multipurpose greases. It has minor uses in fertilizers and major uses in the manufacture of dyes and as a food preservative. Potassium nitrite (CAS Registry Number: 7758-09-0) is also used as a food preservative. Sodium nitrite occurs naturally in brines.

Nitrites are soluble in water and are expected to be present in surface water bodies. Nitrite is not believed to occur in the LHAAP environment as a result of production of TNT but is expected to be present as residues from fertilizer use. Because nitrite might be expected in both background

and operations-related surface water and sediment samples, background samples that contain low nitrite concentrations are not excluded from the background study.

Total Xylene Isomers: CAS Registry Number: 1330-20-7. Commercial xylene is a mixture of the three isomers: 2-xylene, 3-xylene, and 4-xylene. Xylenes are used in petroleum products, as a chemical solvent, and as an organic synthesis reagent. Xylenes are used as a solvent in phenoxyalkanoic herbicides. Benzene and xylenes are components of gasoline and can be released to the environment from fuel emissions and exhausts linked with its use in gasoline.

Natural sources of xylene such as petroleum and the volatilization from plants may also account for this compound's presence in the environment. Vapor-phase xylene is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals with an estimated atmospheric lifetime of about 1-2 days. Xylene is expected to have moderate to high mobility in soils depending on the soil pH and organic carbon content, and volatilization from moist soil is expected based on an experimental Henry's Law constant of 7.0×10^{-3} atm-m^3/mol. Biodegradation is an important environmental fate process for xylene. In general, it has been found that xylene is biodegraded in soil and groundwater samples under aerobic conditions and may be degraded under anaerobic denitrifying conditions. In water, xylene is expected to adsorb somewhat to sediment or particulate matter based on its measured K_{oc} values. This compound is expected to volatilize from water surfaces. Estimated half-lives for a model river and model lake are 3 and 99 hours, respectively.

Xylenes are expected to occur naturally in the environment around LHAAP. Because of farming and logging of the areas upstream from sampling locations, xylene concentrations in surface water and sediment are expected to result from the use of gasoline and the application of herbicides to soil followed by runoff to surface water bodies. Therefore, the detection of low levels of xylenes at these background locations is not sufficient to exclude the samples from the background study.

Other Chemicals. Other chemicals detected at low J-qualified levels, such as 1,2,4-trimethylbenzene and toluene might be associated with the manufacture of explosives or other LHAAP operations. It is possible that the location where these chemicals were detected (BKG-SW03) might have been affected by LHAAP operations and should not be considered a background sampling location. Therefore, concentrations of all chemicals measured in surface water sample BKG-SW03 and in sediment samples from that location (BKG-SD03) were excluded from further consideration in the background evaluation. Because Clinton Lake is upstream from both LHAAP and Caddo Lake, low concentrations of acetone, nitrates, methylene chloride, and naphthalene are assumed to be unrelated to industrial operations at LHAAP. These chemicals may be present either naturally (e.g., acetone) or due to human activities such as applications of fertilizers and insecticides (e.g., nitrates, methylene chloride), or wood

preservation (e.g., naphthalene). Therefore, surface water and sediment concentrations from all Clinton Lake sampling locations are included in the background data set.

4.0 Statistical Analysis

The objective of the statistical analysis is to establish background concentrations of compounds in environmental media at the LHAAP. Following the validation and review of analytical data (**Section 3.0**), the statistical analysis consisted of the steps as specified in the Final Installation-Wide Background Study Work Plan (Shaw, 2004a).

4.1 Preparation of the Statistical Data Set

Background surface water and sediment sample analysis data used to calculate statistical background values were prepared as specified in the Final Installation-Wide Background Study Work Plan (Shaw, 2004a).

4.1.1 Field Duplicates

Analytical data from field duplicate records were compared to original sample values. The value used for numerical and statistical analyses was chosen in a conservative manner without compromising the power of statistical methodology (Shaw, 2004a). Specifically, where one of the duplicated samples had a reported detection and the other value was not detected, the detected value was used; where both duplicated samples had detected concentrations, the lower value was used in order to be conservative. When both duplicated values were reported as nondetects, the detection limit was used when both had the same dilution factor. Where one of the duplicated sample detection limits was undiluted, the undiluted value was used.

4.1.2 Analysis by Multiple Methods

Occasionally, background constituents were analyzed by more than one analytical method; usually for PAHs or metals. The laboratory reported results from the most sensitive analytical method when multiple analyses were performed. For example, metals analyzed by graphite furnace method results were reported in preference to results of inductively coupled plasma methods, and gas chromatography-mass spectral method results for PAH analyses were reported in preference to gas chromatography results.

4.1.3 Data Set Distribution Testing

Statistical analyses followed the Final Installation-Wide Background Study Work Plan (Shaw, 2004a) by using either parametric or nonparametric methods, as appropriate, for the distribution type. The types of statistical distributions that describe the LHAAP data were tested according to USEPA (2002a) guidance to determine whether the normal distribution could be used to describe the data sets.

The Shapiro-Wilk test was used to test the normality of data distributions (Gilbert, 1987). The 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). Results of tests are discussed in **Section 5.0** for each chemical in surface water or sediment, or both.

5.0 Background Concentrations

Background concentrations of chemicals are described for surface water and sediment to provide:

- Number of samples, number of detects, number of nondetects, frequency of detection
- Minimum and maximum reporting limits
- Minimum and maximum detected values
- Mean, median, standard deviation, as appropriate for the distribution
- 95 percent UTL with 95 percent coverage, as appropriate for the distribution
- 95 percent UCL of the mean, as appropriate for the distribution.

Statistical properties of background concentrations in surface water and sediment are provided in **Tables 5-1** through **5-6**.

5.1 Handling Nondetects and Frequency of Detection

Certain guidance and regulatory documents (USEPA, 1992a,b; 2002a) allow the use of the simple substitution method for censored data sets with fewer than 15 percent nondetects. However, because surface water and sediment analysis results reported by the laboratory for this background study included MDLs for each sample, the MDL was used in this analysis as the surrogate concentration for all calculations involving nondetected (U-qualified) data. Data reported as analyzed but qualified as UJ-, UJ,L- or UJ,H were counted as nondetects, and the qualified values were used in subsequent calculations. Concentrations reported as detected at estimated concentrations (J-qualified) were counted as detects, and the qualified value was used in calculations (Shaw, 2004a).

5.2 Distribution Analysis

The distribution of each data set was analyzed to determine the appropriate statistical method to describe its properties. Each chemical in each data set was examined using the Shapiro-Wilk W test to determine whether the data are normally or lognormally distributed (Shaw, 2004a). The results of distributional testing of background chemical concentrations in surface water and sediment samples are indicated as a normal, lognormal, or nonparametric distribution. Other distributions (lognormal/nonparametric) that were lognormally distributed were treated as nonparametric distributions in subsequent calculations because of low detection frequency.

5.3 Basic and Summary Statistics

Following data review, preparation, and distribution testing of the data set, basic summary characteristics were determined to include the number of samples, number of detects, number of nondetects, frequency of detection, minimum and maximum reporting limits, and the minimum and maximum detected values. Summary statistics were calculated, as appropriate for the distribution, to include the mean, median, standard deviation, the 95 percent UTL with 95 percent coverage, and the 95 percent UCL of the mean.

Basic characteristics data for unfiltered and filtered surface water samples from LHAAP streams and from Clinton Lake are shown in **Table 5-1**. Summary statistics for these surface water data are shown in **Tables 5-2** and **5-3**.

Basic characteristics for sediment samples from LHAAP streams and from Clinton Lake are shown in **Table 5-4**. Summary statistics for these sediment data are shown in **Tables 5-5** and **5-6**.

5.3.1 Calculation of 95 Percent UCL of the Mean by the Student's t Method

For normal distributions (**Tables 5-1** through **5-6**), the UCL was calculated using the equation (USEPA, 2002a):

$$UCL = \bar{x} + t_{1-\alpha,n-1}\ (s/\sqrt{n})$$

where:

UCL = 95 percent upper confidence limit (α= 0.05) of the arithmetic mean

$\bar{x}$ = sample arithmetic mean

$t_{1-\alpha,n-1}$ = critical value for Student's t distribution

n = number of samples in data set

s = sample standard deviation

5.3.2 Calculation of 95 Percent UCL of the Mean by the Bootstrapping Method

Bootstrapping is a nonparametric statistical technique where the given data set is resampled with replacement, and the mean is calculated (USEPA, 1997, 2002b). When repeated a large number of times, an accurate estimation of the variance of the population may be determined, which allows for the development of confidence limits for a given parameter, such as the mean.

Bootstrapping is considered a robust statistical method for calculating the UCL because it does not place assumptions on the distribution of the data set.

The bootstrap technique was used to generate the 95 percent UCL for lognormal or nonparametric distributions and for lognormal distributions that contain more than 15 percent nondetects. The 95 percent UCLs calculated from 2000 bootstrap replications are shown in **Tables 5-2**, **5-3**, **5-5**, and **5-6**.

5.3.3 Calculation of Upper Tolerance Limit

The 95 percent UTL with 95 percent coverage (95 percent/95 percent UTL) was calculated for all normal and lognormal distributions using the equation:

$$UTL = \bar{x} + k(a)$$

where:

UTL = upper tolerance limit (95 percent confidence and 95 percent coverage)

$\bar{x}$ = arithmetic mean

a = standard deviation

k = tolerance factor (USEPA, 1989).

The tolerance factor (k) required for calculating the 95 percent/95 percent UTL of a data set that has 28 samples was interpolated from values provided in USEPA guidance (Table A-8 of Appendix B, USEPA, 1989). For lognormally distributed data, this equation was applied to natural logarithms of the concentrations and the 95 percent/95 percent UTL concentrations (**Tables 5-2**. **5-3**, **5-5**, and **5-6**) were calculated as the retransformation of the values calculated by the equation.

Nonparametric UTLs were determined for nonparametric distributions and lognormal distributions having more than 15 percent nondetects. Determination of nonparametric UTLs requires a minimum of 60 samples to provide coverage of 95 percent at 95 percent confidence, where the maximum concentration is chosen as the UTL (USEPA, 1992b [Table A-6]). Table A-6 (USEPA, 1992b) also indicates that the maximum concentration among 13 and 14 values provides coverage of approximately 81 percent and 79 percent of the distribution with 95 percent confidence, respectively. Therefore, the maximum concentration of nonparametric data (**Tables 5-2**, **5-3**, **5-5**, and **5-6**) represents the 95 percent/~80 percent UTL of the concentration.

6.0 Summary and Intended Use of Background Data

This study characterizes the background concentrations of naturally occurring chemicals and chemicals that represent anthropogenic background in surface water and sediments at LHAAP and Clinton Lake. The collection of samples, chemical and geotechnical laboratory analyses, and statistical analyses described in this report were performed as described in the Final Installation-Wide Background Study Work Plan (Shaw, 2004a). The LHAAP background surface water and sediment samples were collected from 14 randomly selected locations within four streams (Saunders Branch, Harrison Bayou, Central Creek, and Goose Prairie Creek). Clinton Lake samples represent background surface water and sediment concentrations for Caddo Lake media.

The following conclusions were made in this study:

- Because low (J-qualified) concentrations of 1,2,4-trimethylbenzene and toluene were detected in one surface water sample, both surface water and sediment data related to this location (BKG- SD/SW03) were assumed not to be representative of background and were disqualified from the evaluation of background for the streams. All of the 13 remaining surface water and sediment samples from the streams, and all 14 surface water and sediment samples from Clinton Lake are considered in the evaluation.

- Some samples from the background sampling areas contained detectable or trace levels of VOCs or nitrates and nitrites. VOCs, nitrates, and nitrites are commonly associated with fertilizers, pesticide formulations, and fuels used in farming, logging, and maintenance at upgradient locations off LHAAP property. Some VOCs also occur naturally in plants common to the local ecology. Therefore, none of the surface water or sediment samples that contained these chemicals were disqualified from the study.

- No other VOCs, explosives, chlorinated hydrocarbons, cyanide, or perchlorate were detected or reported at estimated concentrations in surface water or sediment samples from designated background locations for the streams or Clinton Lake. Therefore, the areas sampled are representative of background locations for surface water and sediments.

- The range of detected concentrations, the range of detection limits, mean, median, and standard deviation, UCL, and UTL characteristics of background chemical concentrations in surface water and sediment are summarized in **Tables 5-1** through **5-6.**

- The intended use of the background data sets for surface water (**Tables 5-2** and **5-3**) and sediment concentrations (**Tables 5-5** and **5-6**) is for future comparison with environmental data collected from LHAAP and Caddo Lake. The primary method of

comparing site data to background data involves a comparison of distributions using a parametric Student's t test or the nonparametric Wilcoxon Rank Sum Test, as appropriate. These comparisons use the 13- or 14-point data sets (**Tables 5-2**, **5-3**, **5-5**, and **5-6**) as a whole. These tests compare the central locations and portions of the distributions with less emphasis on the upper and lower ranges of the data, and do not involve the UCL or UTL concentrations. Because the concentrations measured at the upper range of a data set are also important to background comparisons, current USEPA guidance (USEPA, 2002a,b) recommends a parallel statistical evaluation to include comparisons of the UCL and UTL concentrations of both data sets. The data shown in **Tables 5-2**, **5-3**, **5-5**, and **5-6** will be used in this comprehensive statistical approach, as described in the Final Installation-Wide Background Study Work Plan (Shaw, 2004a).

7.0 References

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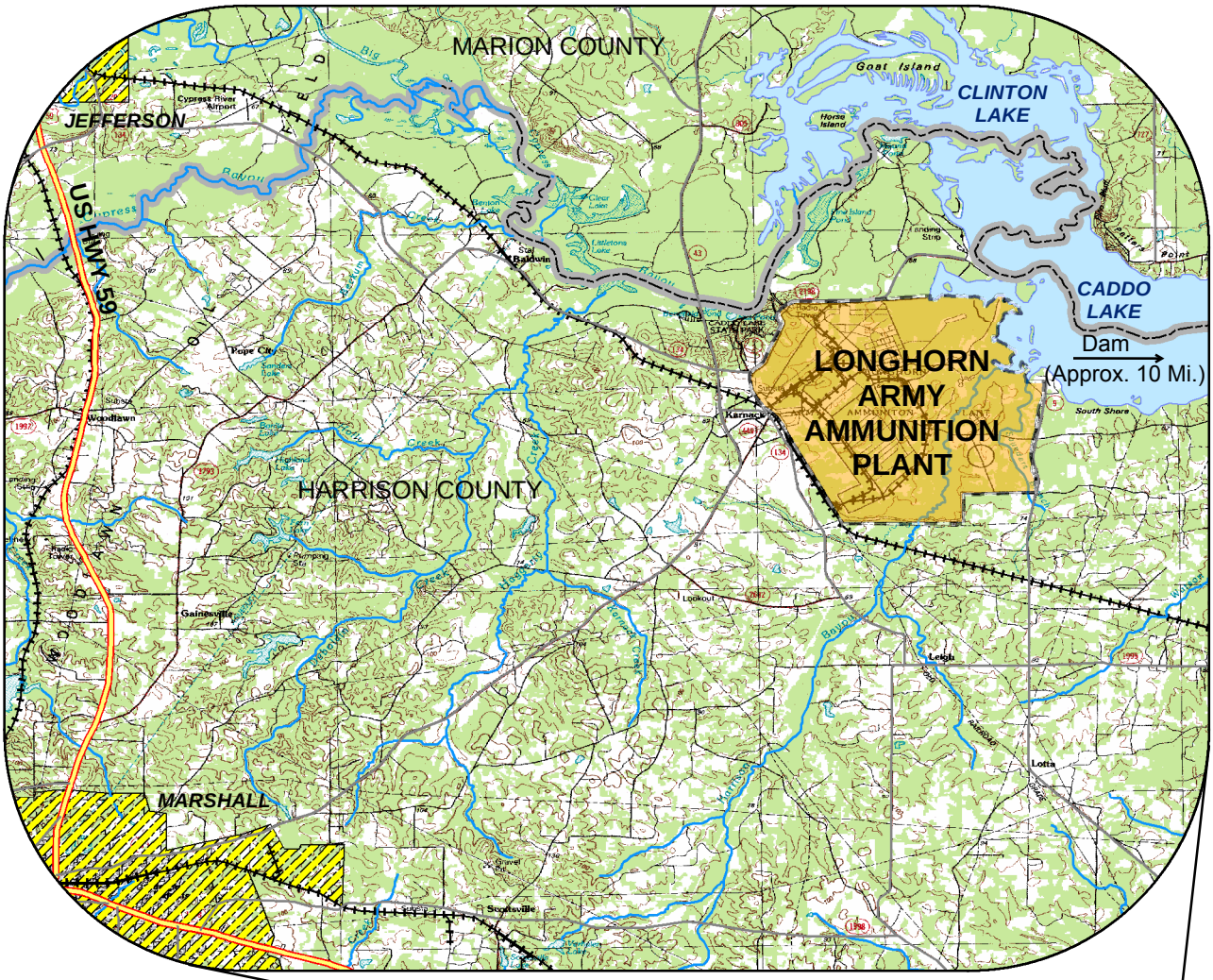
Figure 2-5 **Background Surface Water and Sediment Sampling Locations at Clinton Lake**

00041353



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Miles
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IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	HOUSTON, TX	K. BREAM 12/01/03	B. TEMPLE 12/01/03	P. SRIVASTAV 12/01/03	845714 Fig1_1.pdf

PLOT DATE: 12/01/03
FORMAT REVISION 9/17/02

Legend

- Longhorn AAP Boundary
- Railroad
- City/Municipal Boundary
- County Boundary

N

Shaw

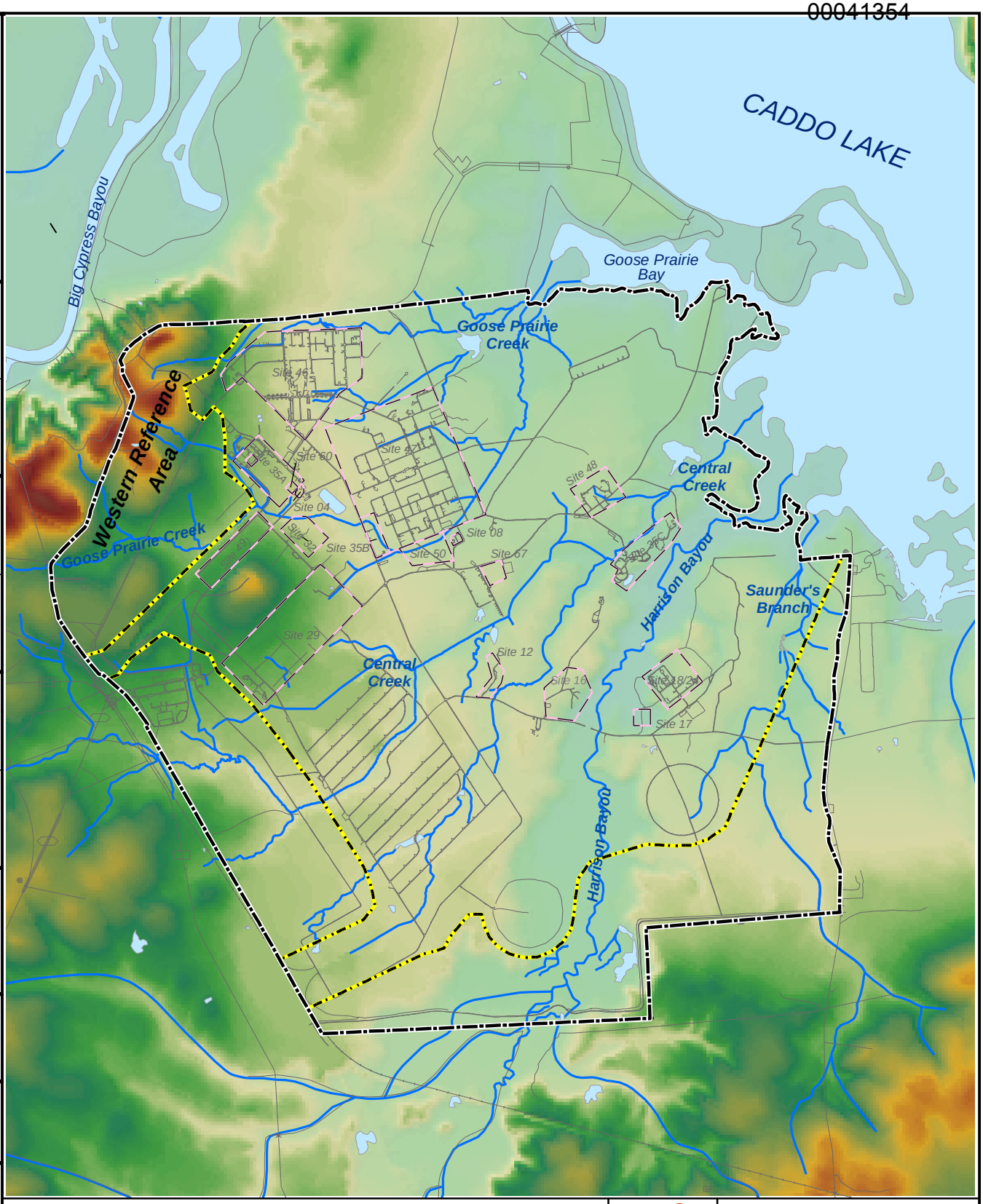
Longhorn Army Ammunition Plant
Karnack, Texas

Figure 1-1

Area Map

Longhorn Army Ammunition Plant
Karnack, Texas

00041354



Legend

- Reference Areas for Background Sampling
- Longhorn AAP Boundary
- Group Sites
- Surface Water

Elevation (meters)

High : 205

Mid : 125

Low : 47

N

2000 1000 0 2000

Feet

Scale 1:48,000

Shaw

Longhorn Army Ammunition Plant
Karnack, Texas

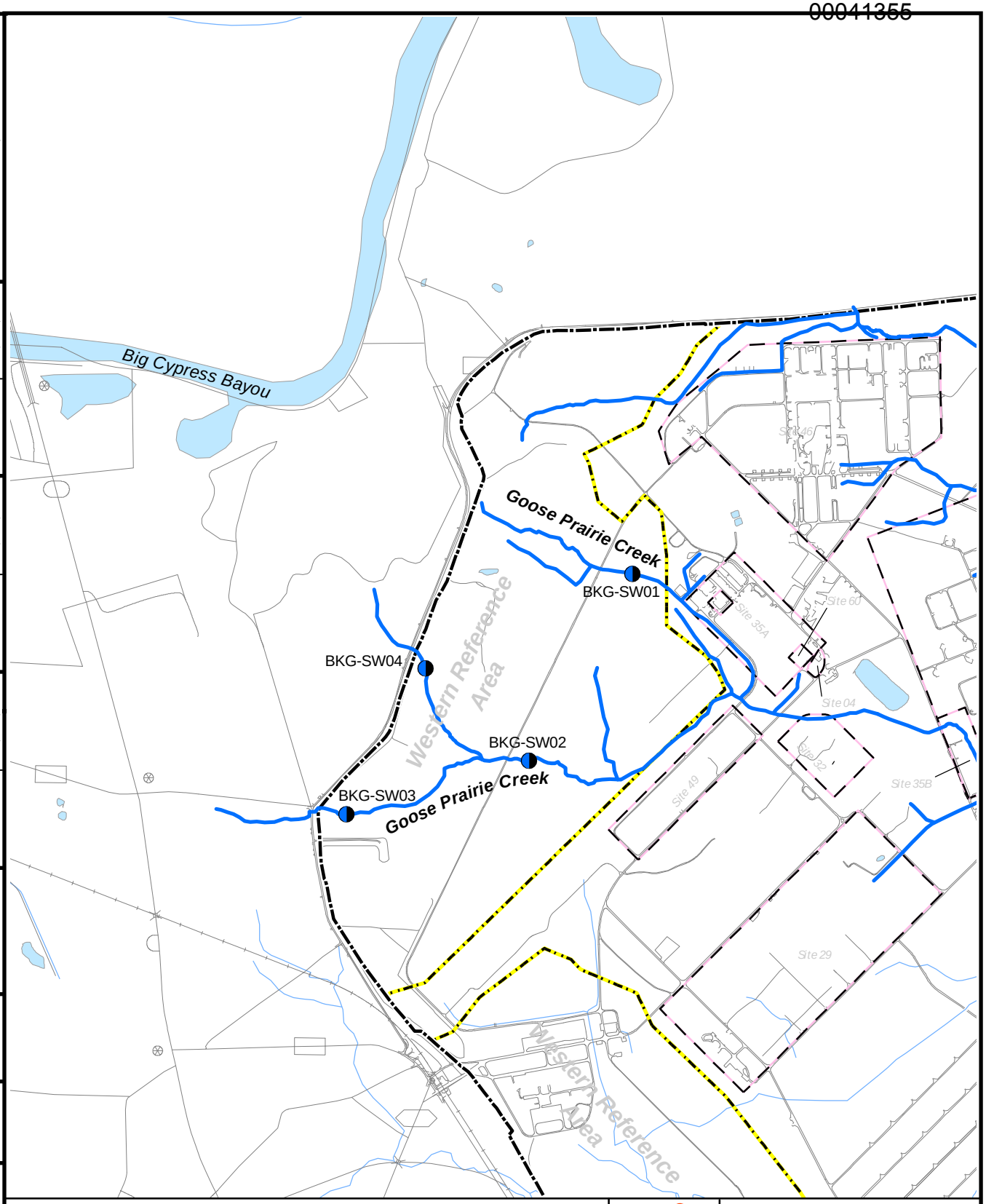
Figure 1-2

Surface Water Drainages

Longhorn Army Ammunition Plant
Karnack, Texas

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	HOUSTON, TX	K. BREAM	12/01/03	B. TEMPLE	12/01/03	P. SRIVASTAV	12/01/03	845714 Fig1_2.pdf

PLOT DATE: 12/01/03
FORMAT REVISION 9/17/02



Legend

- Reference Areas for Background Sampling
- Longhorn AAP Boundary
- Group Sites
- Surface Water
- Goose Prairie Creek
- Surface Water and Sediment Sample Location

N

1000 500 0 1000
Feet
Scale 1:24,000

Shaw

Longhorn Army Ammunition Plant
Karnack, Texas

Figure 2-1
Background Surface Water and Sediment Sampling Locations at Goose Prairie Creek

Longhorn Army Ammunition Plant
Karnack, Texas

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	HOUSTON, TX	BREAM 12/01/03	B. TEMPLE 12/01/03	P. SRIVASTAV 12/01/03	845714 Fig2_1.pdf

PLOT DATE: 12/01/03
FORMAT REVISION 9/17/02

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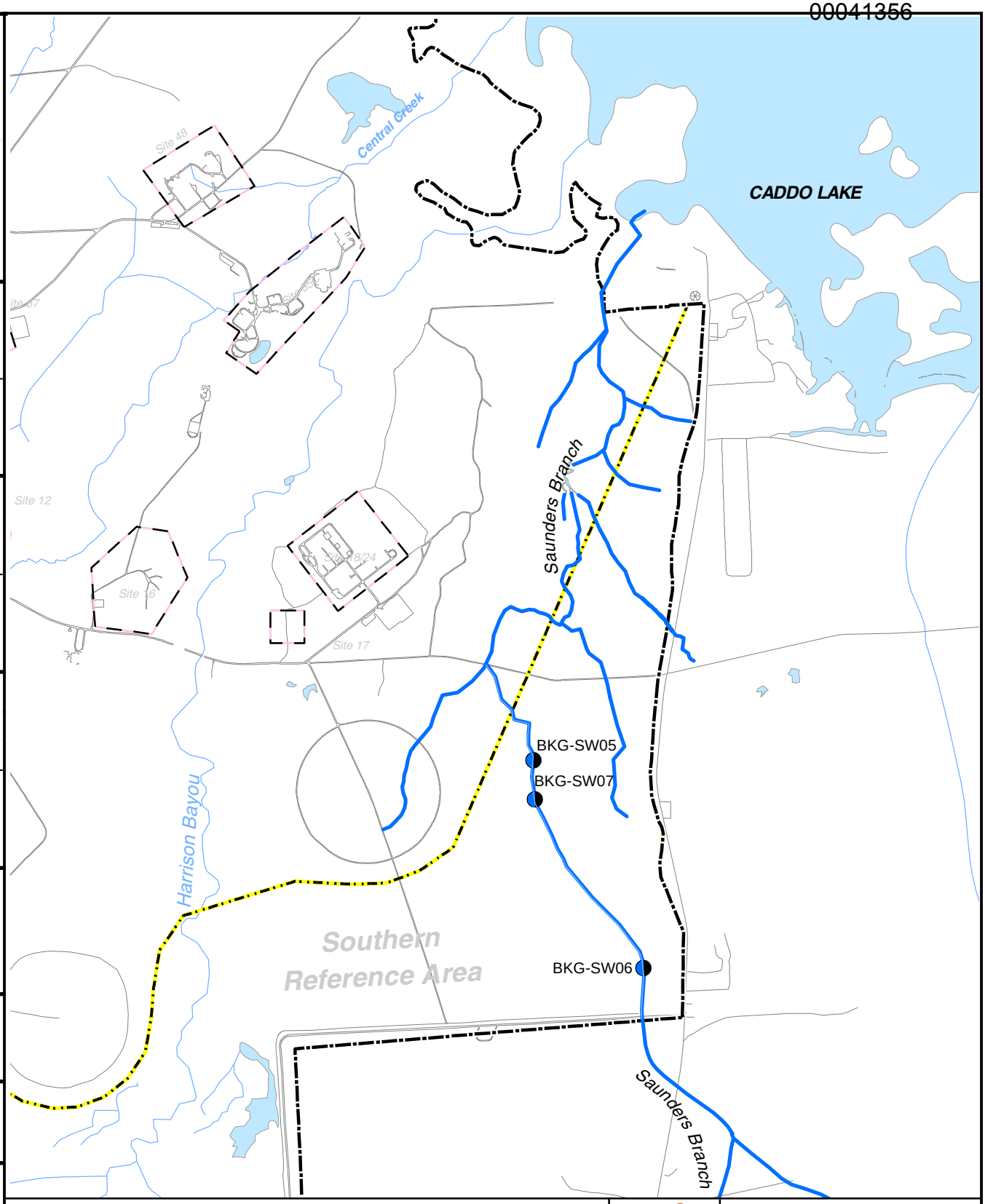

Legend

- Reference Areas for Background Sampling
- Longhorn AAP Boundary
- Group Sites
- Surface Water
- Saunders Branch
- Surface Water and Sediment Sample Location

N

1000 500 0 1000
Feet

Scale 1:24,000

Shaw

Longhorn Army Ammunition Plant
Karnack, Texas

Figure 2-2
Background Surface Water and Sediment Sampling Locations at Saunders Branch

Longhorn Army Ammunition Plant
Karnack, Texas

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	HOUSTON TX	BREAM	12/01/03	B TEMPLE	12/01/03	P SRIVASTAV	12/01/03	845714 Fig2_2.pdf

PLOT DATE: 12/01/03
FORMAT REVISION 9/17/02

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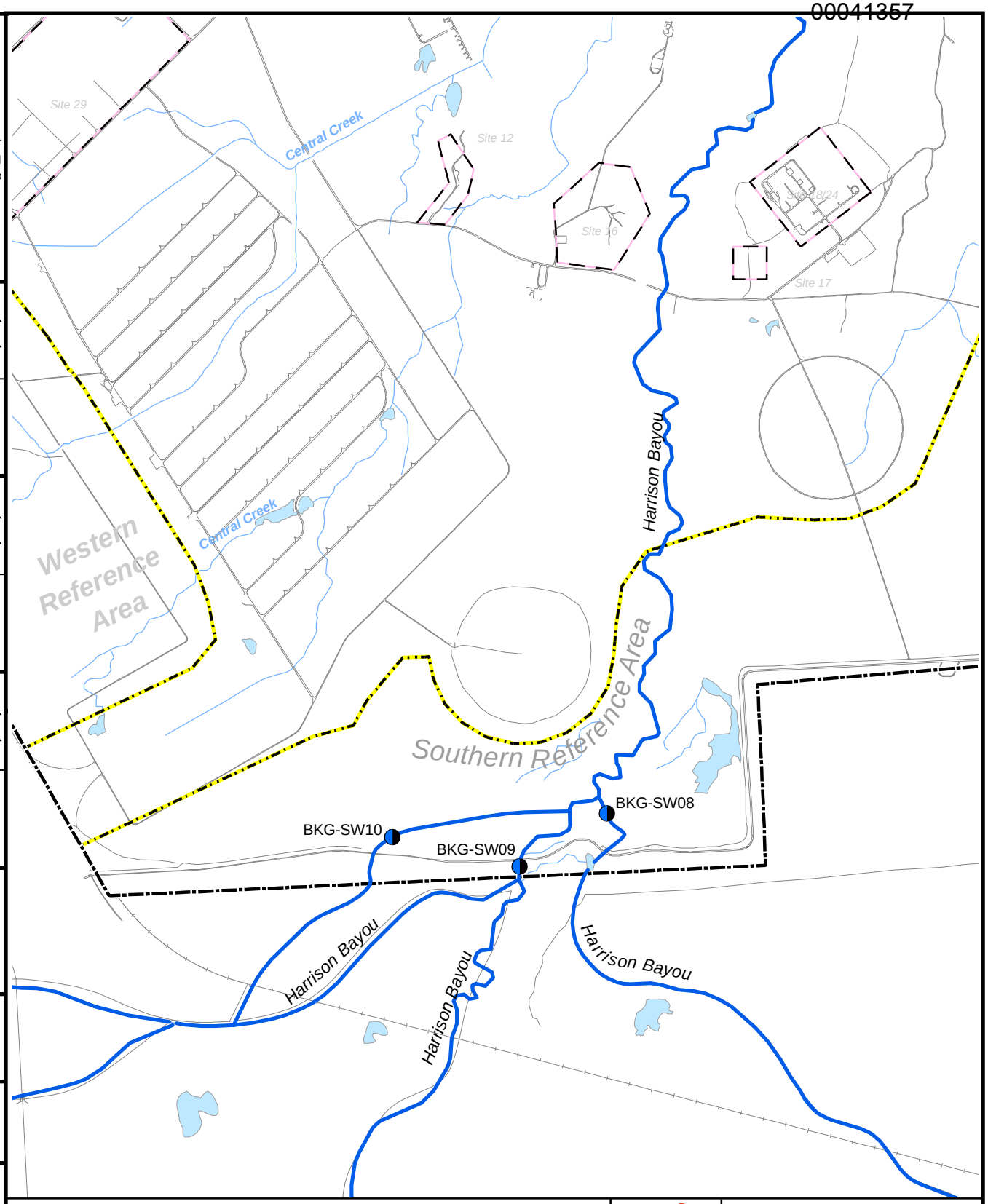

Legend

- Reference Areas for Background Sampling
- Longhorn AAP Boundary
- Group Sites
- Surface Water
- Harrison Bayou
- Surface Water and Sediment Sample Location

N

1000 500 0 1000
Feet

Scale 1:24,000

Shaw

Longhorn Army Ammunition Plant
Karnack, Texas

Figure 2-3
Background Surface Water and Sediment Sampling Locations at Harrison Bayou

Longhorn Army Ammunition Plant
Karnack, Texas

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	HOUSTON TX	BREAM	12/01/03	B TEMPLE	12/01/03	P SRIVASTAV	12/01/03	845714 Fig2_3.pdf

PLOT DATE: 12/01/03
FORMAT REVISION 9/17/02

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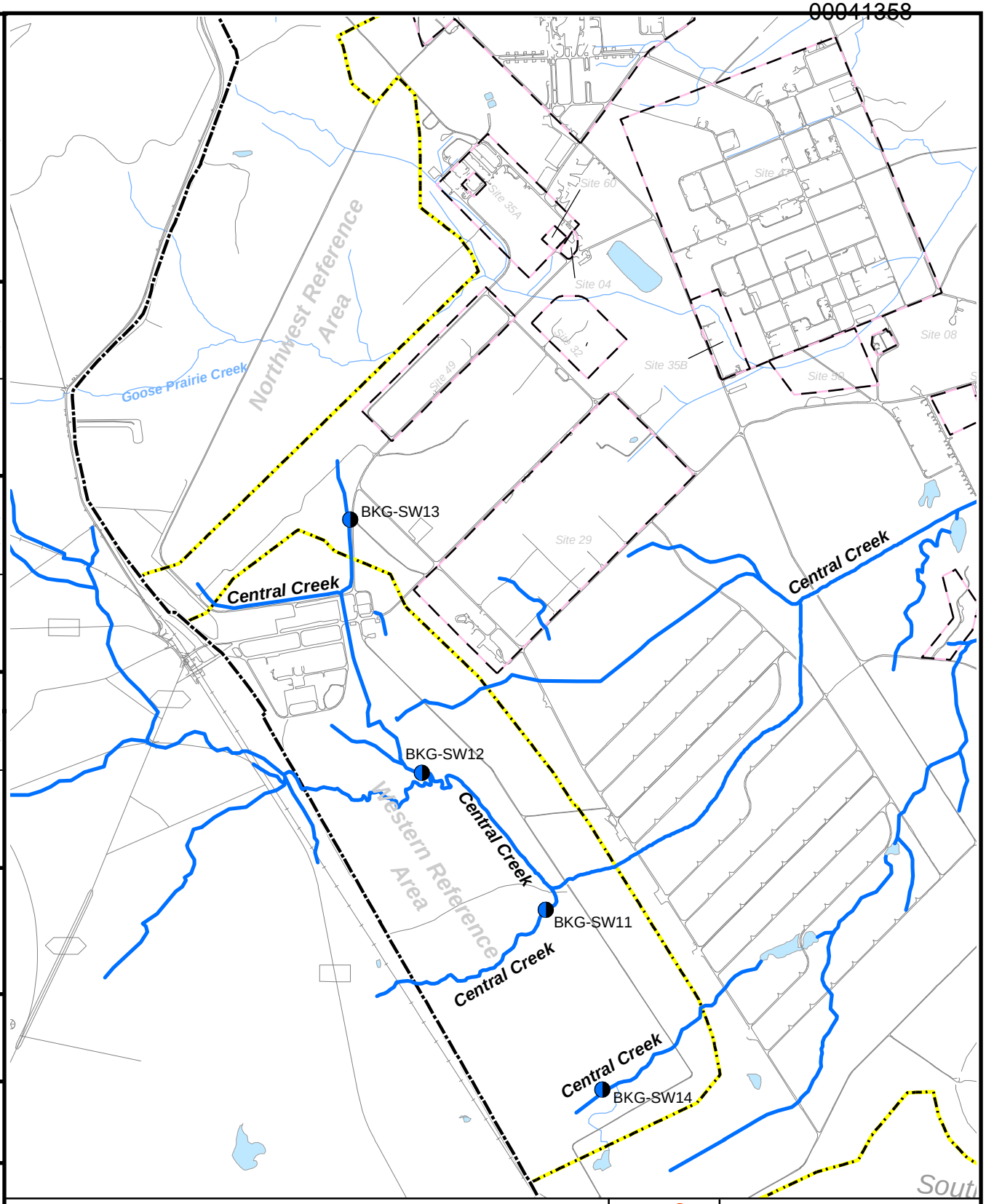


Legend

- Reference Areas for Background Sampling
- Longhorn AAP Boundary
- Group Sites
- Surface Water
- Central Creek
- Surface Water and Sediment Sample Location

N

1000 500 0 1000
Feet

Scale 1:24,000

Shaw

Longhorn Army Ammunition Plant
Karnack, Texas

Figure 2-4
Background Surface Water and Sediment Sampling Locations at Central Creek

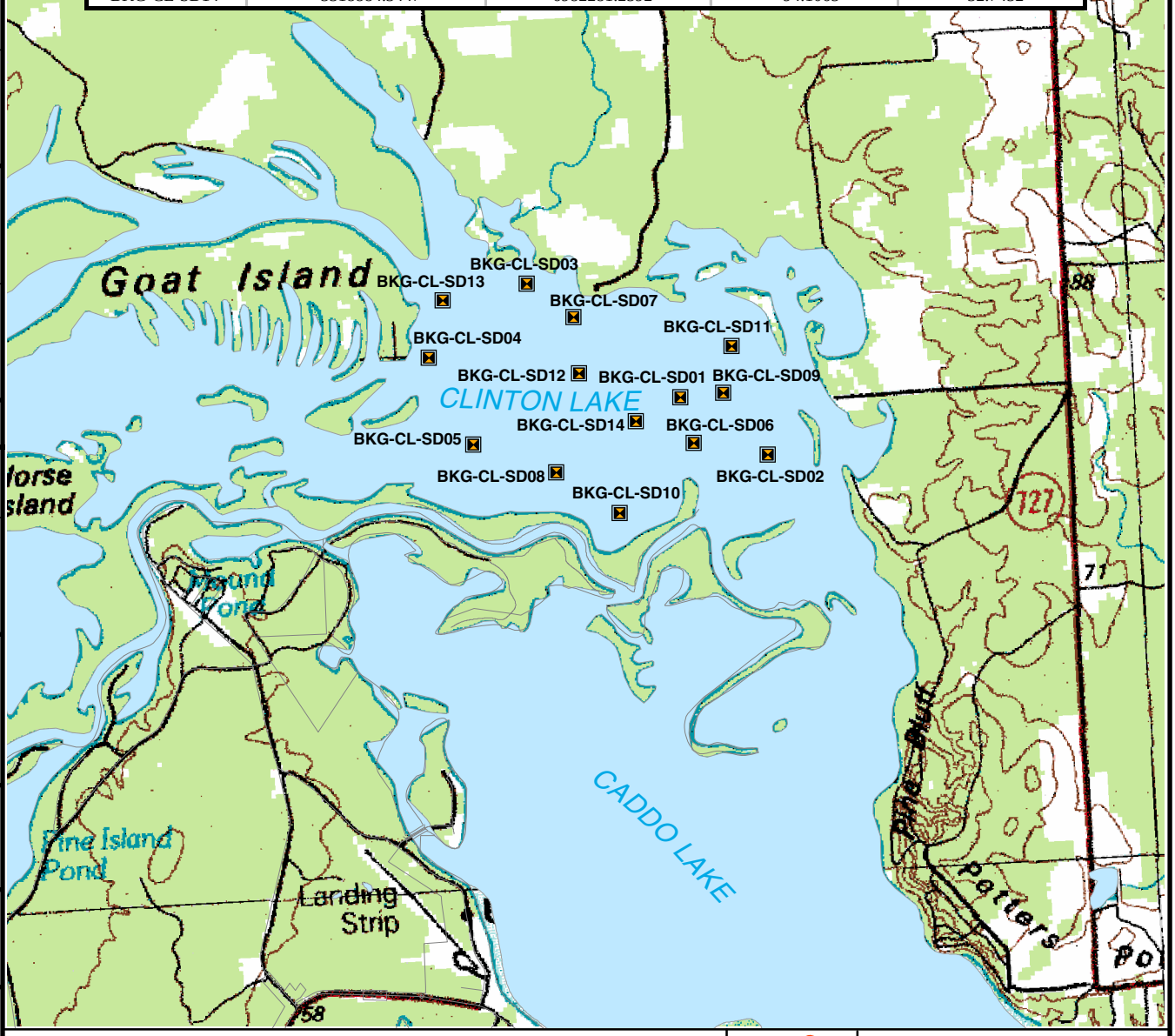
Longhorn Army Ammunition Plant
Karnack, Texas

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	HOUSTON, TX	BREAM	12/01/03	B. TEMPLE	12/01/03	P. SRIVASTAV	12/01/03	845714 Fig2_4.pdf

PLOT DATE: 12/01/03
FORMAT REVISION 9/17/02

00041350

Point ID	Easting (Texas State Plane NAD83)	Northing (Texas State Plane NAD83)	Longitude	Latitude
BKG-CL-SD01	3319954.6219	6982850.8997	-94.1029	32.7466
BKG-CL-SD02	3322058.1330	6981465.8069	-94.0963	32.7426
BKG-CL-SD03	3316258.3838	6985581.0389	-94.1146	32.7545
BKG-CL-SD04	3313899.1652	6983797.7651	-94.1225	32.7499
BKG-CL-SD05	3314976.1894	6981712.2533	-94.1193	32.7441
BKG-CL-SD06	3320274.4923	6981751.3729	-94.1020	32.7436
BKG-CL-SD07	3317384.8173	6984775.5112	-94.1110	32.7522
BKG-CL-SD08	3316968.6415	6981049.2122	-94.1129	32.7420
BKG-CL-SD09	3320991.7594	6982962.0488	-94.0995	32.7468
BKG-CL-SD10	3318488.8444	6980063.6826	-94.1081	32.7391
BKG-CL-SD11	3321185.6311	6984090.5848	-94.0988	32.7499
BKG-CL-SD12	3317514.0199	6983430.5869	-94.1108	32.7485
BKG-CL-SD13	3314228.7291	6985179.4495	-94.1212	32.7537
BKG-CL-SD14	3318884.3447	6982281.2592	-94.1065	32.7452



Legend

Surface Water and Sediment Sample Location

N

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Feet

Scale 1:48,000

Shaw

Longhorn Army Ammunition Plant
Karnack, Texas

Figure 2-5
Background Surface Water and Sediment Sampling Locations at Clinton Lake

Longhorn Army Ammunition Plant
Karnack, Texas

DRAWING NUMBER 845714 fig2_5.pdf
APPROVED BY P SRIVASTAV 12/01/03
CHECKED BY B TEMPLE 12/01/03
DRAWN BY BREAM 12/01/03
OFFICE HOUSTON TX
X-REF ---
IMAGE ---
PLOT DATE: 12/01/03
FORMAT REVISION 9/17/02

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Table 3-2 **Concentrations of Chemicals in Surface Water from Streams**

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Table 3-5 **Concentrations of Chemicals in Surface Water Samples from Clinton Lake**

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Table 3-8 **Concentrations of Chemicals in Sediment Samples from Streams**

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Table 3-10 **Detection of Chemicals Not Related to Background in Sediment Samples from Streams**

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Table 3-12 **Concentrations of Chemicals in Sediment and Background Surface Water Samples at Stream Location BKG-SD/SW03**

Table 5-1 **Summary Statistics for Chemicals in Surface Water Background Data**

Table 5-2 **Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams**

Table 5-3 **Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake**

Table 5-4 **Summary Statistics for Chemicals in Sediment Background Data**

Table 5-5 **Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams**

Table 5-6 **Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Sediment from Clinton Lake**

Table ES-1

Summary Statistics for Detected Analytes in Surface Water Background Data

Chemical	Maximum Detected Concentration (mg/L)	95/95 UTL [b] (mg/L)	95% UCL (mg/L)
BACKGROUND CHEMICALS (STREAMS) [a]			
Inorganics (Filtered)			
Aluminum	1.12	1.44E+00	6.22E-01
Barium	0.084	1.03E-01	6.54E-02
Calcium	11.9	2.54E+01	7.92E+00
Copper	0.0158	1.58E-02	4.10E-03
Iron	1.27	2.75E+00	7.74E-01
Magnesium	6.14	1.21E+01	2.97E+00
Manganese	0.378	2.20E+00	1.14E-01
Mercury	0.000074	7.40E-05	5.69E-05
Nickel	0.0026	5.10E-03	2.13E-03
Potassium	2.86	4.76E+00	1.66E+00
Selenium	0.0038	3.80E-03	2.28E-03
Sodium	23.2	7.62E+01	9.76E+00
Strontium	0.193	3.69E-01	9.24E-02
Vanadium	0.0017	1.70E-03	9.92E-04
Zinc	0.212	2.53E+00	7.86E-02
Inorganics (Unfiltered)			
Aluminum	7.91	7.91E+00	2.61E+00
Antimony	0.005	5.00E-03	2.04E-03
Barium	0.106	1.38E-01	8.68E-02
Calcium	13.1	2.77E+01	8.63E+00
Chromium	0.0088	8.80E-03	2.51E-03
Cobalt	0.0024	2.40E-03	1.23E-03
Copper	0.0046	4.60E-03	2.10E-03
Iron	9.18	2.05E+01	3.41E+00
Lead	0.0052	5.20E-03	2.28E-03
Magnesium	7.06	1.46E+01	3.80E+00
Manganese	0.501	1.39E+00	2.28E-01
Mercury	0.000093	9.30E-05	7.75E-05
Nickel	0.0087	1.62E-02	4.70E-03
Potassium	3.26	3.80E+00	2.08E+00
Selenium	0.0041	4.10E-03	2.32E-03
Sodium	25.4	8.67E+01	1.01E+01
Strontium	0.205	3.92E-01	1.14E-01
Vanadium	0.0172	1.72E-02	4.79E-03
Zinc	0.0258	3.34E-02	1.47E-02
Anions			
Bromide	0.47	4.70E-01	3.24E-01
Chloride	38.5	3.85E+01	2.02E+01
Fluoride, Total	0.16	1.77E-01	1.29E-01
Nitrite	0.05	5.00E-02	5.00E-02
Sulfate	35.5	5.25E+01	2.33E+01
Water Properties			
Total Dissolved Solids	186	2.59E+02	1.39E+02
Total Suspended Solids	270	2.70E+02	5.82E+01
Alkalinity, Total	36.5	4.91E+01	2.56E+01
Bicarbonate (as CaCO3)	36.5	4.91E+01	2.56E+01
Hardness (as CaCO3)	57.7	1.29E+02	3.55E+01

Table ES-1

Summary Statistics for Detected Analytes in Surface Water Background Data

Chemical	Maximum Detected Concentration (mg/L)	95/95 UTL [b] (mg/L)	95% UCL (mg/L)
BACKGROUND CHEMICALS (CLINTON LAKE)			
Inorganics (Filtered)			
Aluminum	0.198	3.81E-01	9.76E-02
Barium	0.0524	5.54E-02	4.79E-02
Cadmium	0.0019	1.90E-03	5.29E-04
Calcium	4.31	4.31E+00	4.07E+00
Copper	0.0064	6.40E-03	1.29E-03
Iron	1.3	1.50E+00	1.10E+00
Magnesium	2.2	2.20E+00	1.95E+00
Manganese	0.14	1.59E-01	9.34E-02
Nickel	0.002	2.29E-03	1.42E-03
Potassium	2.48	2.75E+00	2.18E+00
Sodium	6.98	6.98E+00	6.35E+00
Strontium	0.0621	6.34E-02	5.87E-02
Tin	0.0048	4.80E-03	1.97E-03
Vanadium	0.00081	8.10E-04	5.19E-04
Zinc	0.473	4.73E-01	1.11E-01
Inorganics (Unfiltered)			
Aluminum	0.678	1.03E+00	4.06E-01
Barium	0.0652	6.57E-02	5.27E-02
Calcium	4.59	4.59E+00	4.27E+00
Cobalt	0.0017	1.70E-03	6.71E-04
Copper	0.0015	1.50E-03	5.91E-04
Iron	2.52	2.62E+00	1.63E+00
Magnesium	2.19	2.19E+00	2.05E+00
Manganese	0.232	2.63E-01	1.10E-01
Nickel	0.0025	3.10E-03	1.73E-03
Potassium	2.6	2.60E+00	2.31E+00
Sodium	7.26	7.26E+00	6.75E+00
Strontium	0.0612	6.34E-02	5.85E-02
Thallium	0.004	4.00E-03	1.86E-03
Tin	0.0034	3.40E-03	2.14E-03
Vanadium	0.0022	2.20E-03	9.31E-04
Zinc	0.0394	3.94E-02	1.52E-02
Anions			
Bromide	0.29	2.98E-01	2.77E-01
Chloride	14.7	1.47E+01	1.45E+01
Fluoride, Total	0.13	1.30E-01	1.26E-01
Sulfate	20.8	2.08E+01	2.02E+01
Water Properties			
Alkalinity, Total	10.5	1.11E+01	9.52E+00
Bicarbonate (as CaCO3)	10.5	1.11E+01	9.52E+00
Hardness (as CaCO3)	20	2.00E+01	1.92E+01
Total Dissolved Solids	91	9.41E+01	7.59E+01
Total Suspended Solids	4	4.00E+00	4.00E+00

[a] Stream samples collected from Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Central Creek.
[b] An upper tolerance limit (UTL) with 95% coverage at 95% confidence is calculated for normally or lognormally distributed data with 15% or fewer nondetects. If greater than 15% of the data are nondetects, or if the data distribution is undefined, the maximum detected concentration (MDC) is used as the UTL.
UCL = Upper confidence limit of the mean
mg/L = milligram per liter

Table ES-2

Summary Statistics for Detected Analytes in Sediment Background Data

Chemical	Maximum Detected Concentration (mg/kg)	95/95 UTL [b] (mg/kg)	95% UCL (mg/kg)
BACKGROUND CHEMICALS (STREAMS) [a]			
Inorganics			
Aluminum	12100	6.36E+03	1.38E+04
Antimony	0.49	2.50E-01	4.90E-01
Arsenic	4.7	1.83E+00	6.77E+00
Barium	150	8.54E+01	4.39E+02
Beryllium	0.94	5.20E-01	1.12E+00
Calcium	1350	6.85E+02	3.18E+03
Chromium	42.8	1.24E+01	5.68E+01
Cobalt	15.6	7.65E+00	1.73E+01
Copper	16.6	5.36E+00	4.47E+01
Iron	35600	1.36E+04	1.02E+05
Lead	12.7	9.05E+00	1.64E+01
Magnesium	2610	7.68E+02	7.16E+03
Manganese	921	4.37E+02	5.74E+03
Mercury	0.048	3.13E-02	6.41E-02
Molybdenum	1.6	3.35E-01	1.60E+00
Nickel	37.8	1.01E+01	9.67E+01
Potassium	507	2.87E+02	5.95E+02
Selenium	8.6	3.32E+00	2.04E+01
Sodium	70.2	3.47E+01	7.02E+01
Strontium	32.1	1.41E+01	7.92E+01
Vanadium	55.4	2.22E+01	9.64E+01
Zinc	51.2	2.03E+01	1.31E+02
Anions			
Chloride	48.5	4.13E+01	5.23E+01
Fluoride, Total	3.8	1.99E+00	4.61E+00
Sulfate	84.7	5.20E+01	8.47E+01
Dioxins/Furans			
1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.38E-06	7.05E-07	2.38E-06
1,2,3,4,6,7,8-HpCDD	1.98E-05	8.21E-06	3.66E-05
1,2,3,4,7,8-Hexachlorodibenzofuran	4.87E-07	2.08E-07	5.87E-07
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	8.60E-07	3.85E-07	1.17E-06
1,2,3,6,7,8-Hexachlorodibenzofuran	4.96E-07	1.79E-07	4.96E-07
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	4.15E-07	2.64E-07	4.15E-07
2,3,4,6,7,8-Hexachlorodibenzofuran	8.98E-07	2.36E-07	8.98E-07
Heptachlorodibenzofuran	5.75E-06	1.75E-06	5.75E-06
Heptachlorodibenzo-p-dioxin	5.33E-05	2.14E-05	9.63E-05
Hexachlorodibenzo-p-dioxin	6.41E-06	2.35E-06	2.06E-05
Hexachlorodibenzofuran	1.21E-05	3.18E-06	1.21E-05
Octachlorodibenzofuran	4.46E-06	2.31E-06	1.10E-05
Octachlorodibenzo-p-dioxin	2.10E-03	6.91E-04	6.16E-03
Pentachlorodibenzofuran	1.62E-05	3.90E-06	1.62E-05
Pentachlorodibenzo-p-dioxin	2.33E-07	2.08E-07	2.33E-07
Tetrachlorodibenzofuran, Total	1.29E-06	3.18E-07	1.29E-06
Semivolatile Organics (PAHs)			
Anthracene	0.0232	1.33E-02	2.32E-02
Benzo(a)anthracene	0.0176	9.88E-03	1.76E-02
Benzo(a)pyrene	0.0366	1.28E-02	3.66E-02
Benzo(b)fluoranthene	0.0729	2.33E-02	7.29E-02
Benzo(ghi)perylene	0.102	2.79E-02	1.02E-01
Benzo(k)fluoranthene	0.0347	1.31E-02	3.47E-02
Chrysene	0.0377	1.80E-02	3.77E-02
Dibenzo(a,h)anthracene	0.0057	4.78E-03	5.70E-03
Fluoranthene	0.0736	2.61E-02	7.36E-02
Indeno(1,2,3-cd)pyrene	0.0331	1.34E-02	3.31E-02
Phenanthrene	0.0291	1.43E-02	2.91E-02
Pyrene	0.0565	2.45E-02	5.65E-02
Sediment or Soil Properties			
CATION-EXCHANGE CAPACITY	10100	7.47E+03	1.40E+04
Total Organic Carbon	14300	6.21E+03	5.70E+04

Table ES-2

Summary Statistics for Detected Analytes in Sediment Background Data

Chemical	Maximum Detected Concentration (mg/kg)	95/95 UTL [b] (mg/kg)	95% UCL (mg/kg)
BACKGROUND CHEMICALS (CLINTON LAKE)			
Inorganics			
Aluminum	24700	4.50E+04	1.63E+04
Arsenic	6.3	9.03E+00	2.44E+00
Barium	400	6.80E+02	2.20E+02
Beryllium	3.7	5.98E+00	1.64E+00
Cadmium	0.31	3.10E-01	1.21E-01
Calcium	3150	4.91E+03	1.52E+03
Chromium	25.5	3.81E+01	1.66E+01
Cobalt	21.6	3.74E+01	9.29E+00
Copper	23.7	3.78E+01	1.34E+01
Iron	31400	4.51E+04	1.73E+04
Lead	37.2	5.06E+01	2.13E+01
Magnesium	1410	1.41E+03	8.89E+02
Manganese	435	5.68E+02	1.77E+02
Mercury	0.2	2.45E-01	9.49E-02
Nickel	28.1	4.50E+01	1.26E+01
Potassium	1000	1.75E+03	6.66E+02
Selenium	9.4	1.06E+01	4.14E+00
Sodium	102	1.54E+02	7.60E+01
Strontium	104	1.38E+02	4.42E+01
Vanadium	56.5	8.99E+01	3.68E+01
Zinc	141	1.89E+02	5.21E+01
Anions			
Fluoride, Total	9.4	1.07E+01	3.64E+00
Dioxins/Furans			
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.34E-06	1.34E-06	4.86E-07
1,2,3,4,6,7,8-HpCDD	1.12E-03	1.99E-03	3.89E-04
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	3.75E-06	5.11E-06	1.26E-06
1,2,3,4,7,8-Hexachlorodibenzofuran	4.98E-07	4.98E-07	2.14E-07
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.41E-05	1.41E-05	4.52E-06
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	5.00E-05	9.69E-05	1.64E-05
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.77E-06	1.81E-06	5.00E-07
Heptachlorodibenzofuran	2.74E-06	4.16E-06	8.88E-07
Heptachlorodibenzo-p-dioxin	2.68E-03	6.78E-03	1.08E-03
Hexachlorodibenzo-p-dioxin	1.56E-03	3.42E-03	4.15E-04
Hexachlorodibenzofuran	1.49E-06	1.49E-06	3.56E-07
Octachlorodibenzo-p-dioxin	1.08E-01	4.60E-01	3.61E-02
Pentachlorodibenzo-p-dioxin	2.79E-04	7.56E-04	6.52E-05
Tetrachlorodibenzofuran, Total	3.20E-06	3.67E-06	7.00E-07
Tetrachlorodibenzo-p-dioxin	3.23E-04	2.98E-03	8.00E-05
Polychlorinated Biphenyls (PCBs)			
Aroclor 1260	0.172	1.72E-01	4.42E-02
Semivolatile Organics (PAHs)			
Benzo(b)fluoranthene	0.0065	6.50E-03	1.06E-02
Soil Properties			
Cation-Exchange Capacity	39000	3.90E+04	1.82E+04
Total Organic Carbon	143000	2.45E+05	4.14E+04

[a] Stream samples collected from Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Central Creek.

[b] An upper tolerance limit (UTL) with 95% coverage at 95% confidence is calculated for normally or lognormally distributed data with 15% or fewer nondetects. If greater than 15% of the data are nondetects, or if the data distribution is undefined, the maximum detected concentration (MDC) is used as the UTL.

UCL = Upper confidence limit of the mean

mg/kg = milligram per kilogram

Table 3-1
Background Surface Water and Sediment Samples Collected

Location	Sample Number	Sample Date	Analyses
SURFACE WATER SAMPLES			
Stream Samples [a]			
BKG-SW01	BKG-SW01	16-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW02	BKG-SW02	16-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW04	BKG-SW04	16-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW05	BKG-SW05	15-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW06	BKG-SW06	15-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW07	BKG-SW07	15-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW08	BKG-SW08	15-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW09	BKG-SW09	15-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW09	DUPLICATE #5	15-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW10	BKG-SW10	15-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW11	BKG-SW11	14-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW12	BKG-SW12	14-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW13	BKG-SW13	14-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-SW14	BKG-SW14	14-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
Sample Excluded [b]			
BKG-SW03	BKG-SW03	16-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem

Footnotes shown on last page

Table 3-1
Background Surface Water and Sediment Samples Collected

Location	Sample Number	Sample Date	Analyses
Lake Samples [c]			
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	Bio/Alk, Cyanide, Exp, Hardness, Metals (f & uf), PAHs, Perchlorate, TDS, TSS, VOC, Wet Chem

Footnotes shown on last page

Table 3-1
Background Surface Water and Sediment Samples Collected

Location	Sample Number	Sample Date	Analyses
SEDIMENT SAMPLES			
Stream Samples [a]			
BKG-SD01	BKG-SD01	16-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD02	BKG-SD02	16-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD02	DUPLICATE #8	16-Mar-04	Dioxin/Furan (temperature limits were exceeded during shipping)
BKG-SD04	BKG-SD04	16-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD05	BKG-SD05	15-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD06	BKG-SD06	15-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD07	BKG-SD07	15-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD08	BKG-SD08	15-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD09	BKG-SD09	15-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD09	DUPLICATE #7	15-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD10	BKG-SD10	15-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD11	BKG-SD11	14-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD12	BKG-SD12	14-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD13	BKG-SD13	14-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-SD14	BKG-SD14	14-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
Sample Excluded [b]			
BKG-SD03	BKG-SD03	16-Mar-04	Cyanide, Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem

Footnotes shown on last page

Table 3-1
Background Surface Water and Sediment Samples Collected

Location	Sample Number	Sample Date	Analyses
Lake Samples [c]			
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	Dioxin/Furan, Exp, Herb, Metals, PAHs, PCBs, Perchlorate, Pesticides, TOC, VOC, Wet Chem

Footnotes and Abbreviations

[a] *Samples collected from Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Central Creek.*

[b] *Samples from BKG-SW03 were excluded from the background dataset due to J-qualified detection of 1,2,4-trimethylbenzene, toluene and xylenes in surface water at this location.*

[c] *Samples collected from Clinton Lake.*

Bio/Alk - Bicarbonate, Alkalinity

DUPLICATE - Field duplicate sample; the lowest result of the field duplicate and regular sample was chosen and used in the background dataset.

Exp - Explosives

Herb - Herbicides

Metals (f & uf) - Metals analysis included filtered and unfiltered samples.

PAHs - Polynuclear aromatic hydrocarbons

PCBs - Polychlorinated biphenyls

TDS - Total dissolved solids

TOC - Total organic carbon

TSS - Total suspended solids

VOC - Volatile organic compound

Wet Chem includes: bromide, cation-exchange capacity, chloride, fluoride, nitrate, nitrite, pH, and sulfate.

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Aluminum					Antimony					Arsenic				
				mg/L					mg/L					mg/L				
				7429-90-5					7440-36-0					7440-38-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	7.91E+00	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.83E+00	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	4.93E+00	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	6.26E-01	6.60E-03	2.00E-01		J	5.00E-03	1.50E-03	5.00E-03			2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	9.32E-01	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.05E+00	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.60E-01	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	9.34E-01	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.19E+00	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	4.37E-01	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.14E+00	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	6.23E-01	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	4.81E-01	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	8.69E-01	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Barium					Beryllium					Cadmium				
				mg/L					mg/L					mg/L				
				7440-39-3					7440-41-7					7440-43-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.06E-01	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	6.87E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	9.12E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.36E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.04E-01	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	7.15E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	8.63E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.05E-01	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.05E-01	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	7.16E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	8.53E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.45E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	3.98E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	3.82E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Calcium					Chromium					Cobalt				
				mg/L					mg/L					mg/L				
				7440-70-2					7440-47-3					7440-48-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	3.25E+00	3.80E-03	1.00E+00			8.80E-03	4.00E-04	1.00E-02	J	J	2.40E-03	5.00E-04	5.00E-02	J	J
BKG-SW02	BKG-SW02	16-Mar-04	REG	7.72E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.09E+00	3.80E-03	1.00E+00			5.70E-03	4.00E-04	1.00E-02	J	J	2.40E-03	5.00E-04	5.00E-02	J	J
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.88E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	4.52E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	3.73E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.18E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.15E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.14E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	7.88E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.36E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.09E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.31E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	1.20E-03	5.00E-04	5.00E-02	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.60E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Copper					Iron					Lead				
				mg/L					mg/L					mg/L				
				7440-50-8					7439-89-6					7439-92-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	3.60E-03	4.40E-04	2.50E-02	J	J	9.18E+00	7.10E-03	3.00E-01			5.20E-03	1.20E-03	5.00E-03		
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.70E-03	4.40E-04	2.50E-02	J	J	2.59E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	4.60E-03	4.40E-04	2.50E-02	J	J	7.04E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	4.68E-01	7.10E-03	3.00E-01		J	3.20E-03	1.20E-03	5.00E-03	J	J
BKG-SW06	BKG-SW06	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	2.43E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.05E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	2.22E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	2.06E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	4.40E-04	4.40E-04	2.50E-02	U	U	2.30E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.80E-03	4.40E-04	2.50E-02	J	J	1.27E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.90E-03	4.40E-04	2.50E-02	J	J	1.14E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.40E-03	4.40E-04	2.50E-02	J	J	3.86E-01	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.80E-03	4.40E-04	2.50E-02	J	J	7.61E-01	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	5.10E-01	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Magnesium					Manganese					Mercury				
				mg/L					mg/L					mg/L				
				7439-95-4					7439-96-5					7439-97-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	2.16E+00	9.90E-03	5.00E+00	J	J	7.65E-02	1.60E-04	1.50E-02		J	2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	3.45E+00	9.90E-03	5.00E+00	J	J	5.92E-02	1.60E-04	1.50E-02		J	2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	3.27E+00	9.90E-03	5.00E+00	J	J	1.30E-01	1.60E-04	1.50E-02		J	2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	8.67E-01	9.90E-03	5.00E+00	J	J	3.90E-02	1.60E-04	1.50E-02			8.40E-05	2.20E-05	1.00E-03	J	J
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.86E+00	9.90E-03	5.00E+00	J	J	1.05E-01	1.60E-04	1.50E-02			8.40E-05	2.20E-05	1.00E-03	J	J
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.35E+00	9.90E-03	5.00E+00	J	J	1.43E-01	1.60E-04	1.50E-02			9.10E-05	2.20E-05	1.00E-03	J	J
BKG-SW08	BKG-SW08	15-Mar-04	REG	6.76E+00	9.90E-03	5.00E+00			5.01E-01	1.60E-04	1.50E-02			6.20E-05	2.20E-05	1.00E-03	J	J
BKG-SW09	BKG-SW09	15-Mar-04	REG	7.11E+00	9.90E-03	5.00E+00			1.79E-01	1.60E-04	1.50E-02			6.00E-05	2.20E-05	1.00E-03	J	J
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	7.06E+00	9.90E-03	5.00E+00			1.75E-01	1.60E-04	1.50E-02			6.70E-05	2.20E-05	1.00E-03	J	J
BKG-SW10	BKG-SW10	15-Mar-04	REG	4.22E+00	9.90E-03	5.00E+00	J	J	3.10E-01	1.60E-04	1.50E-02			7.30E-05	2.20E-05	1.00E-03	J	J
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.66E+00	9.90E-03	5.00E+00	J	J	4.16E-02	1.60E-04	1.50E-02			7.40E-05	2.20E-05	1.00E-03	J	J
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.14E+00	9.90E-03	5.00E+00	J	J	2.50E-02	1.60E-04	1.50E-02			7.20E-05	2.20E-05	1.00E-03	J	J
BKG-SW13	BKG-SW13	14-Mar-04	REG	2.11E+00	9.90E-03	5.00E+00	J	J	4.77E-01	1.60E-04	1.50E-02			8.50E-05	2.20E-05	1.00E-03	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	8.82E-01	9.90E-03	5.00E+00	J	J	1.15E-01	1.60E-04	1.50E-02			9.30E-05	2.20E-05	1.00E-03	J	J

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Molybdenum					Nickel					Potassium				
				mg/L					mg/L					mg/L				
				7439-98-7					7440-02-0					2023695				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	8.30E-03	1.10E-03	4.00E-02	J	J	1.39E+00	1.40E-02	5.00E+00	J	J
BKG-SW02	BKG-SW02	16-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	3.00E-03	1.10E-03	4.00E-02	J	J	3.26E+00	1.40E-02	5.00E+00	J	J
BKG-SW04	BKG-SW04	16-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	8.70E-03	1.10E-03	4.00E-02	J	J	1.65E+00	1.40E-02	5.00E+00	J	J
BKG-SW05	BKG-SW05	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.20E-03	1.10E-03	4.00E-02	J	J	7.35E-01	1.40E-02	5.00E+00	J	J
BKG-SW06	BKG-SW06	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	3.20E-03	1.10E-03	4.00E-02	J	J	1.33E+00	1.40E-02	5.00E+00	J	J
BKG-SW07	BKG-SW07	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.00E-03	1.10E-03	4.00E-02	J	J	1.30E+00	1.40E-02	5.00E+00	J	J
BKG-SW08	BKG-SW08	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.80E-03	1.10E-03	4.00E-02	J	J	1.82E+00	1.40E-02	5.00E+00	J	J
BKG-SW09	BKG-SW09	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	3.60E-03	1.10E-03	4.00E-02	J	J	2.24E+00	1.40E-02	5.00E+00	J	J
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	7.50E-04	7.50E-04	5.00E-02	U	U	3.40E-03	1.10E-03	4.00E-02	J	J	2.20E+00	1.40E-02	5.00E+00	J	J
BKG-SW10	BKG-SW10	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	4.70E-03	1.10E-03	4.00E-02	J	J	2.63E+00	1.40E-02	5.00E+00	J	J
BKG-SW11	BKG-SW11	14-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.70E-03	1.10E-03	4.00E-02	J	J	2.58E+00	1.40E-02	5.00E+00	J	J
BKG-SW12	BKG-SW12	14-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	7.54E-01	1.40E-02	5.00E+00	J	J
BKG-SW13	BKG-SW13	14-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.40E-03	1.10E-03	4.00E-02	J	J	1.59E+00	1.40E-02	5.00E+00	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	J	J	7.62E-01	1.40E-02	5.00E+00	J	J

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Selenium					Silver					Sodium				
				mg/L					mg/L					mg/L				
				7782-49-2					7440-22-4					7440-23-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	4.10E-03	2.00E-03	1.00E-02	J	J	6.00E-04	6.00E-04	1.00E-02	U	U	4.74E+00	1.50E-01	5.00E+00	J	J
BKG-SW02	BKG-SW02	16-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.39E+01	1.50E-01	5.00E+00		
BKG-SW04	BKG-SW04	16-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.83E+00	1.50E-01	5.00E+00		
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	2.56E+00	1.50E-01	5.00E+00	J	J
BKG-SW06	BKG-SW06	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	8.35E+00	1.50E-01	5.00E+00		
BKG-SW07	BKG-SW07	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.69E+00	1.50E-01	5.00E+00	J	J
BKG-SW08	BKG-SW08	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	2.54E+01	1.50E-01	5.00E+00		
BKG-SW09	BKG-SW09	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.56E+01	1.50E-01	5.00E+00		
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.53E+01	1.50E-01	5.00E+00		
BKG-SW10	BKG-SW10	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.25E+01	1.50E-01	5.00E+00		
BKG-SW11	BKG-SW11	14-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	9.16E+00	1.50E-01	5.00E+00		
BKG-SW12	BKG-SW12	14-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.29E+00	1.50E-01	5.00E+00	J	J
BKG-SW13	BKG-SW13	14-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.04E+00	1.50E-01	5.00E+00	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.84E+00	1.50E-01	5.00E+00	J	J

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Strontium					Thallium					Tin				
				mg/L					mg/L					mg/L				
				7440-24-6					7440-28-0					7440-31-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	4.20E-02	3.00E-04	1.00E-02		J,L	1.50E-02	1.50E-02	2.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	9.30E-02	3.00E-04	1.00E-02		J,L	1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	7.76E-02	3.00E-04	1.00E-02		J,L	1.50E-02	1.50E-02	2.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	3.12E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	6.86E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	3.82E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	2.05E-01	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.96E-01	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.88E-01	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.26E-01	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	4.84E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.63E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	4.01E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.21E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Metals

				Vanadium					Zinc				
				mg/L					mg/L				
				7440-62-2					7440-66-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.72E-02	4.70E-04	5.00E-02	J	J	2.58E-02	5.90E-04	2.00E-02		
BKG-SW02	BKG-SW02	16-Mar-04	REG	4.00E-03	4.70E-04	5.00E-02	J	J	1.49E-02	5.90E-04	2.00E-02	J	J
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.06E-02	4.70E-04	5.00E-02	J	J	2.48E-02	5.90E-04	2.00E-02		
BKG-SW05	BKG-SW05	15-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.90E-04	5.90E-04	2.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.50E-03	4.70E-04	5.00E-02	J	J	7.60E-03	5.90E-04	2.00E-02	J	J
BKG-SW07	BKG-SW07	15-Mar-04	REG	7.90E-04	4.70E-04	5.00E-02	J	J	8.70E-03	5.90E-04	2.00E-02	J	J
BKG-SW08	BKG-SW08	15-Mar-04	REG	6.00E-04	4.70E-04	5.00E-02	J	J	5.20E-03	5.90E-04	2.00E-02	J	J
BKG-SW09	BKG-SW09	15-Mar-04	REG	9.80E-04	4.70E-04	5.00E-02	J	J	5.90E-04	5.90E-04	2.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.20E-03	4.70E-04	5.00E-02	J	J	5.23E-02	5.90E-04	2.00E-02		
BKG-SW10	BKG-SW10	15-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	1.79E-02	5.90E-04	2.00E-02	J	J
BKG-SW11	BKG-SW11	14-Mar-04	REG	8.70E-04	4.70E-04	5.00E-02	J	J	9.80E-03	5.90E-04	2.00E-02	J	J
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.80E-03	5.90E-04	2.00E-02	J	J
BKG-SW13	BKG-SW13	14-Mar-04	REG	6.60E-04	4.70E-04	5.00E-02	J	J	1.39E-02	5.90E-04	2.00E-02	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.90E-04	5.90E-04	2.00E-02	U	U

FD - field duplicate
H - high bias to estimate (see Shaw, 2004c)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory
REG - regular sample
RLimit - analytical reporting limit reported by laboratory
U - undetected concentration
VQ - data qualifier applied during data validation with same meanings as LQ
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Anions

				Bromide					Chloride					Cyanide, Total				
				mg/L					mg/L					mg/L				
				24959-67-9					16887-00-6					57-12-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.00E+01	1.00E+01	2.00E+01	U	U	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	3.00E-01	2.50E-01	5.00E-01	J	J	1.88E+01	1.00E+01	2.00E+01	J	J,H	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.19E+01	1.00E+01	2.00E+01	J	J,H	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.00E+01	1.00E+01	2.00E+01	U	U	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.24E+01	1.00E+01	2.00E+01	J	J,H	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.00E+01	1.00E+01	2.00E+01	U	U	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	4.70E-01	2.50E-01	5.00E-01	J	J	3.85E+01	1.00E+01	2.00E+01		J,H	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	3.50E-01	2.50E-01	5.00E-01	J	J	2.54E+01	1.00E+01	2.00E+01		J,H	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	3.50E-01	2.50E-01	5.00E-01	J	J	2.54E+01	1.00E+01	2.00E+01		J,H	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	3.10E-01	2.50E-01	5.00E-01	J	J	2.00E+01	1.00E+01	2.00E+01		J,H	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.00E+01	1.00E+01	2.00E+01	U	U	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.00E+01	1.00E+01	2.00E+01	U	U	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.00E+01	1.00E+01	2.00E+01	U	U	6.70E-03	6.70E-03	1.00E-02	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.50E-01	2.50E-01	5.00E-01	U	U	1.00E+01	1.00E+01	2.00E+01	U	U	6.70E-03	6.70E-03	1.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Anions

				Fluoride, Total					Nitrate					Nitrite				
				mg/L					mg/L					mg/L				
				16984-48-8					14797-55-8					14797-65-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.20E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.30E-01	1.00E-01	2.00E-01	J	J	3.60E-01	5.00E-02	1.00E-01			5.00E-02	5.00E-02	1.00E-01	J	J
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.30E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	1.00E-01	1.00E-01	2.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.10E-01	1.00E-01	2.00E-01	J	J,H	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.00E-01	1.00E-01	2.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.60E-01	1.00E-01	2.00E-01	J	J,H	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.40E-01	1.00E-01	2.00E-01	J	J,H	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.40E-01	1.00E-01	2.00E-01	J	J,H	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.30E-01	1.00E-01	2.00E-01	J	J,H	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.00E-01	1.00E-01	2.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.00E-01	1.00E-01	2.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.10E-01	1.00E-01	2.00E-01	J	J,H	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	1.00E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Anions

				Perchlorate					Sulfate				
				mg/L					mg/L				
				14797-73-0					14808-79-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.34E+01	1.00E+01	2.00E+01	J	J
BKG-SW02	BKG-SW02	16-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.37E+01	1.00E+01	2.00E+01		
BKG-SW04	BKG-SW04	16-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.88E+01	1.00E+01	2.00E+01	J	J
BKG-SW05	BKG-SW05	15-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.60E+01	1.00E+01	2.00E+01	J	J
BKG-SW06	BKG-SW06	15-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.46E+01	1.00E+01	2.00E+01	J	J
BKG-SW07	BKG-SW07	15-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.13E+01	1.00E+01	2.00E+01	J	J
BKG-SW08	BKG-SW08	15-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	3.55E+01	1.00E+01	2.00E+01		
BKG-SW09	BKG-SW09	15-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	3.29E+01	1.00E+01	2.00E+01		
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	4.00E-03	4.00E-03	1.00E-02	U	U	3.44E+01	1.00E+01	2.00E+01		
BKG-SW10	BKG-SW10	15-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.42E+01	1.00E+01	2.00E+01		
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.43E-02	4.00E-03	5.50E-02	J	R	1.00E+01	1.00E+01	2.00E+01	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.00E+01	1.00E+01	2.00E+01	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.14E+01	1.00E+01	2.00E+01	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.27E+01	1.00E+01	2.00E+01	J	J

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Explosives

				1,3,5-Trinitrobenzene					1,3-Dinitrobenzene					2,4,6-Trinitrotoluene				
				mg/L					mg/L					mg/L				
				99-35-4					99-65-0					118-96-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	UJ	5.20E-05	5.20E-05	2.10E-04	U	UJ	5.20E-05	5.20E-05	2.10E-04	U	UJ
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	UJ	5.00E-05	5.00E-05	2.00E-04	U	UJ	5.00E-05	5.00E-05	2.00E-04	U	UJ
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.90E-05	4.90E-05	2.00E-04	U	U	4.90E-05	4.90E-05	2.00E-04	U	U	4.90E-05	4.90E-05	2.00E-04	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.30E-05	5.30E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.30E-05	5.30E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Explosives

				2,4-Dinitrotoluene					2,6-Dinitrotoluene					2-Amino-4,6-dinitrotoluene				
				mg/L					mg/L					mg/L				
				121-14-2					606-20-2					35572-78-2				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	UJ	5.20E-05	5.20E-05	2.10E-04	U	UJ	5.20E-05	5.20E-05	2.10E-04	U	UJ
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	UJ	5.00E-05	5.00E-05	2.00E-04	U	UJ	5.00E-05	5.00E-05	2.00E-04	U	UJ
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.90E-05	4.90E-05	2.00E-04	U	U	4.90E-05	4.90E-05	2.00E-04	U	U	4.90E-05	4.90E-05	2.00E-04	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.30E-05	5.30E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.30E-05	5.30E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Explosives

				4-Amino-2,6-dinitrotoluene					HMX					Nitrobenzene				
				mg/L					mg/L					mg/L				
				19406-51-0					2691-41-0					98-95-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	UJ	7.80E-05	7.80E-05	2.10E-04	U	UJ	5.20E-05	5.20E-05	2.10E-04	U	UJ
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	UJ	7.50E-05	7.50E-05	2.00E-04	U	UJ	5.00E-05	5.00E-05	2.00E-04	U	UJ
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	U	7.80E-05	7.80E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.20E-05	5.20E-05	2.10E-04	U	U	7.80E-05	7.80E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	7.60E-05	7.60E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.90E-05	4.90E-05	2.00E-04	U	U	7.40E-05	7.40E-05	2.00E-04	U	U	4.90E-05	4.90E-05	2.00E-04	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.30E-05	5.30E-05	2.10E-04	U	U	8.00E-05	8.00E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.30E-05	5.30E-05	2.10E-04	U	U	8.00E-05	8.00E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Explosives

				RDX					Tetryl					m-Nitrotoluene				
				mg/L					mg/L					mg/L				
				121-82-4					479-45-8					99-08-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	7.80E-05	7.80E-05	2.10E-04	U	UJ	7.80E-05	7.80E-05	2.10E-04	U	UJ	5.20E-05	5.20E-05	2.10E-04	U	UJ
BKG-SW04	BKG-SW04	16-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	UJ	7.50E-05	7.50E-05	2.00E-04	U	UJ	5.00E-05	5.00E-05	2.00E-04	U	UJ
BKG-SW05	BKG-SW05	15-Mar-04	REG	7.70E-05	7.70E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	7.80E-05	7.80E-05	2.10E-04	U	U	7.80E-05	7.80E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	7.70E-05	7.70E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	7.80E-05	7.80E-05	2.10E-04	U	U	7.80E-05	7.80E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	7.60E-05	7.60E-05	2.00E-04	U	U	7.60E-05	7.60E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	7.40E-05	7.40E-05	2.00E-04	U	U	7.40E-05	7.40E-05	2.00E-04	U	U	4.90E-05	4.90E-05	2.00E-04	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	8.00E-05	8.00E-05	2.10E-04	U	U	8.00E-05	8.00E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	8.00E-05	8.00E-05	2.10E-04	U	U	8.00E-05	8.00E-05	2.10E-04	U	U	5.30E-05	5.30E-05	2.10E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Explosives

				o-Nitrotoluene					p-Nitrotoluene				
				mg/L					mg/L				
				88-72-2					99-99-0				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	UJ	7.80E-05	7.80E-05	2.10E-04	U	UJ
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	UJ	7.50E-05	7.50E-05	2.00E-04	U	UJ
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	U	7.80E-05	7.80E-05	2.10E-04	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.20E-05	5.20E-05	2.10E-04	U	U	7.80E-05	7.80E-05	2.10E-04	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	7.60E-05	7.60E-05	2.00E-04	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.90E-05	4.90E-05	2.00E-04	U	U	7.40E-05	7.40E-05	2.00E-04	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.30E-05	5.30E-05	2.10E-04	U	U	8.00E-05	8.00E-05	2.10E-04	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.30E-05	5.30E-05	2.10E-04	U	U	8.00E-05	8.00E-05	2.10E-04	U	U

Footnotes:
FD - field duplicate
H - high bias to estimate (see Shaw, 2004b)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory.
REG - regular sample
RLimit - analytical reporting limit reported by laboratory.
U - undetected concentration.
VQ - data qualifier applied during data validation with same meanings as LQ.
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - PAHs

				Acenaphthene					Acenaphthylene					Anthracene				
				mg/L					mg/L					mg/L				
				83-32-9					208-96-8					120-12-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.20E-04	5.20E-04	1.00E-03	U	U	5.20E-04	5.20E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - PAHs

				Benzo(a)anthracene					Benzo(a)pyrene					Benzo(b)fluoranthene				
				mg/L					mg/L					mg/L				
				56-55-3					50-32-8					205-99-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	1.00E-04	1.00E-04	2.10E-04	U	U	1.00E-04	1.00E-04	2.10E-04	U	U	1.00E-04	1.00E-04	2.10E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - PAHs

				Benzo(ghi)perylene					Benzo(k)fluoranthene					Chrysene				
				mg/L					mg/L					mg/L				
				191-24-2					207-08-9					218-01-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	1.00E-04	1.00E-04	2.10E-04	U	U	1.00E-04	1.00E-04	2.10E-04	U	U	1.00E-04	1.00E-04	2.10E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - PAHs

				Dibenzo(a,h)anthracene					Fluoranthene					Fluorene				
				mg/L					mg/L					mg/L				
				53-70-3					206-44-0					86-73-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.60E-04	2.60E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.60E-04	2.60E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	1.00E-04	1.00E-04	2.10E-04	U	U	2.60E-04	2.60E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - PAHs

				Indeno(1,2,3-cd)pyrene					Naphthalene				
				mg/L					mg/L				
				193-39-5					91-20-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	1.00E-04	1.00E-04	2.10E-04	U	U	2.60E-04	2.60E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - PAHs

				Phenanthrene					Pyrene				
				mg/L					mg/L				
				85-01-8					129-00-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	2.60E-04	2.60E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	2.60E-04	2.60E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.60E-04	2.60E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				1,1,1,2-Tetrachloroethane					1,1,1-Trichloroethane					1,1,2,2-Tetrachloroethane				
				mg/L					mg/L					mg/L				
				630-20-6					71-55-6					79-34-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				1,1,2-Trichloroethane					1,1-Dichloroethane					1,1-Dichloroethene				
				mg/L					mg/L					mg/L				
				79-00-5					75-34-3					75-35-4				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				1,1-Dichloropropene					1,2,3-Trichlorobenzene					1,2,3-Trichloropropane				
				mg/L					mg/L					mg/L				
				563-58-6					87-61-6					96-18-4				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	1.00E-03	1.00E-03	1.00E-03	U	UJ,L
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	1.00E-03	1.00E-03	1.00E-03	U	UJ,L
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	1.00E-03	1.00E-03	1.00E-03	U	UJ,L
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				1,2,4-Trichlorobenzene					1,2,4-Trimethylbenzene					1,2-Dibromomethane				
				mg/L					mg/L					mg/L				
				120-82-1					95-63-6					106-93-4				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				1,2-Dichlorobenzene					1,2-Dichloroethane					1,2-Dichloropropane				
				mg/L					mg/L					mg/L				
				95-50-1					107-06-2					78-87-5				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				1,3,5-Trimethylbenzene					1,3-Dichlorobenzene					1,3-Dichloropropane				
				mg/L					mg/L					mg/L				
				108-67-8					541-73-1					142-28-9				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				1,4-Dichlorobenzene					1,4-Dioxane					2,2-Dichloropropane				
				mg/L					mg/L					mg/L				
				106-46-7					123-91-1					594-20-7				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				2-Butanone					2-Chlorotoluene					2-Hexanone				
				mg/L					mg/L					mg/L				
				78-93-3					95-49-8					591-78-6				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				2-Propenal					4-Chlorotoluene					Acetone				
				mg/L					mg/L					mg/L				
				107-02-8					106-43-4					67-64-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	1.23E-02	5.00E-03	5.00E-03		
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Benzene					Bromobenzene					Bromochloromethane				
				mg/L					mg/L					mg/L				
				71-43-2					108-86-1					74-97-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Bromodichloromethane					Bromoform					Carbon disulfide				
				mg/L					mg/L					mg/L				
				75-27-4					75-25-2					75-15-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Carbon tetrachloride					Chlorobenzene					Chloroethane				
				mg/L					mg/L					mg/L				
				56-23-5					108-90-7					75-00-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Chloroform					Chloromethane					Dibromochloromethane				
				mg/L					mg/L					mg/L				
				67-66-3					74-87-3					124-48-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Dichlorodifluoromethane					Ethylbenzene					Hexachlorobutadiene				
				mg/L					mg/L					mg/L				
				75-71-8					100-41-4					87-68-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	UJ
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	UJ
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	UJ
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	UJ,L
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	UJ,L
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	UJ,L
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Iodomethane					Isobutyl alcohol					Isopropylbenzene				
				mg/L					mg/L					mg/L				
				74-88-4					78-83-1					98-82-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Methyl methacrylate					Methyl isobutyl ketone					Methyl tert-butyl ether				
				mg/L					mg/L					mg/L				
				80-62-6					108-10-1					1634-04-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-03	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Methylene chloride					Naphthalene					Styrene				
				mg/L					mg/L					mg/L				
				75-09-2					91-20-3					100-42-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Tetrachloroethene					Toluene					Trichloroethene				
				mg/L					mg/L					mg/L				
				127-18-4					108-88-3					79-01-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Trichlorofluoromethane					Vinyl acetate					Vinyl chloride				
				mg/L					mg/L					mg/L				
				75-69-4					108-05-4					75-01-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				Xylenes, total					cis-1,2-Dichloroethene					cis-1,3-Dichloropropene				
				mg/L					mg/L					mg/L				
				1330-20-7					156-59-2					10061-01-5				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ
BKG-SW14	BKG-SW14	14-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	UJ

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				n-Butylbenzene					n-Propylbenzene					p-Isopropyltoluene				
				mg/L					mg/L					mg/L				
				104-51-8					103-65-1					99-87-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				sec-Butylbenzene					tert-Butylbenzene				
				mg/L					mg/L				
				135-98-8					98-06-6				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Volatile Organic Compounds (VOCs)

				trans-1,2-Dichloroethene					trans-1,3-Dichloropropene				
				mg/L					mg/L				
				156-60-5					10061-02-6				
Location	**Sample**	**Date**	**Type**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**	**Result**	**MDL**	**RLimit**	**LQ**	**VQ**
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Water Properties

				Alkalinity, Total					Bicarbonate as $CaCO_3$					Hardness (as $CaCO_3$)				
				mg/L					mg/L					mg/L				
				11-43-8					40099					10-92-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	9.00E+00	2.50E+00	5.00E+00			9.00E+00	5.00E+00	5.00E+00			1.72E+01	4.00E+00	4.00E+00		
BKG-SW02	BKG-SW02	16-Mar-04	REG	2.60E+01	2.50E+00	5.00E+00			2.60E+01	5.00E+00	5.00E+00			3.35E+01	4.00E+00	4.00E+00		
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.55E+01	2.50E+00	5.00E+00			1.55E+01	5.00E+00	5.00E+00			2.62E+01	4.00E+00	4.00E+00		
BKG-SW05	BKG-SW05	15-Mar-04	REG	4.50E+00	2.50E+00	5.00E+00	J	J	4.50E+00	5.00E+00	5.00E+00	J	J	7.20E+00	4.00E+00	4.00E+00		
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.80E+01	2.50E+00	5.00E+00			1.80E+01	5.00E+00	5.00E+00			1.89E+01	4.00E+00	4.00E+00		
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.10E+01	2.50E+00	5.00E+00			1.10E+01	5.00E+00	5.00E+00			1.49E+01	4.00E+00	4.00E+00		
BKG-SW08	BKG-SW08	15-Mar-04	REG	3.65E+01	2.50E+00	5.00E+00			3.65E+01	5.00E+00	5.00E+00			5.73E+01	4.00E+00	4.00E+00		
BKG-SW09	BKG-SW09	15-Mar-04	REG	3.55E+01	2.50E+00	5.00E+00			3.55E+01	5.00E+00	5.00E+00			5.80E+01	4.00E+00	4.00E+00		
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	3.50E+01	2.50E+00	5.00E+00			3.50E+01	5.00E+00	5.00E+00			5.77E+01	4.00E+00	4.00E+00		
BKG-SW10	BKG-SW10	15-Mar-04	REG	2.25E+01	2.50E+00	5.00E+00			2.25E+01	5.00E+00	5.00E+00			3.70E+01	4.00E+00	4.00E+00		
BKG-SW11	BKG-SW11	14-Mar-04	REG	2.50E+01	2.50E+00	5.00E+00			2.50E+01	5.00E+00	5.00E+00			2.03E+01	4.00E+00	4.00E+00		
BKG-SW12	BKG-SW12	14-Mar-04	REG	2.10E+01	2.50E+00	5.00E+00			2.10E+01	5.00E+00	5.00E+00			3.19E+01	4.00E+00	4.00E+00		
BKG-SW13	BKG-SW13	14-Mar-04	REG	3.35E+01	2.50E+00	5.00E+00			3.35E+01	5.00E+00	5.00E+00			3.76E+01	4.00E+00	4.00E+00		
BKG-SW14	BKG-SW14	14-Mar-04	REG	6.50E+00	2.50E+00	5.00E+00			6.50E+00	5.00E+00	5.00E+00			1.01E+01	4.00E+00	4.00E+00		

Footnotes are provided at the end of each test parameter

Table 3-2
Concentrations of Chemicals in Surface Water from Streams - Water Properties

				pH					Total Dissolved Solids					Total Suspended Solids				
				PH UNITS					mg/L					mg/L				
				39384					10-33-3					10-32-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	6.30E+00		0.00E+00			1.23E+02	1.00E+01	1.00E+01			2.70E+02	4.00E+00	4.00E+00		
BKG-SW02	BKG-SW02	16-Mar-04	REG	7.10E+00		0.00E+00			1.61E+02	1.00E+01	1.00E+01			1.10E+01	4.00E+00	4.00E+00		
BKG-SW04	BKG-SW04	16-Mar-04	REG	6.70E+00		0.00E+00			1.47E+02	1.00E+01	1.00E+01			9.00E+01	4.00E+00	4.00E+00		
BKG-SW05	BKG-SW05	15-Mar-04	REG	6.00E+00		0.00E+00			9.40E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	7.00E+00		0.00E+00			1.30E+02	1.00E+01	1.00E+01			5.00E+00	4.00E+00	4.00E+00		
BKG-SW07	BKG-SW07	15-Mar-04	REG	6.50E+00		0.00E+00			8.80E+01	1.00E+01	1.00E+01			7.00E+00	4.00E+00	4.00E+00		
BKG-SW08	BKG-SW08	15-Mar-04	REG	7.00E+00		0.00E+00			1.86E+02	1.00E+01	1.00E+01			7.00E+00	4.00E+00	4.00E+00		
BKG-SW09	BKG-SW09	15-Mar-04	REG	7.20E+00		0.00E+00			1.81E+02	1.00E+01	1.00E+01			7.00E+00	4.00E+00	4.00E+00		
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	7.20E+00		0.00E+00			1.75E+02	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	6.60E+00		0.00E+00			1.35E+02	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	6.90E+00		0.00E+00			1.02E+02	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	7.10E+00		0.00E+00			7.30E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	6.90E+00		0.00E+00			9.00E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	6.00E+00		0.00E+00			1.06E+02	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Aluminum					Antimony					Arsenic				
				mg/L					mg/L					mg/L				
				7429-90-5					7440-36-0					7440-38-2				
				Result					Result					Result				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	7.74E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	7.74E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.12E+00	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	5.61E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	7.76E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.20E-01	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	6.60E-03	6.60E-03	2.00E-01	U	U	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	3.52E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	3.25E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	4.40E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	2.03E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	3.14E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	3.24E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	4.39E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Barium					Beryllium					Cadmium				
				mg/L					mg/L					mg/L				
				7440-39-3					7440-41-7					7440-43-9				
				Result					Result					Result				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	5.70E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	5.70E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	5.43E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	4.38E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	8.04E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	6.23E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	6.70E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	8.40E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	8.89E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	5.44E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	7.85E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.92E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	2.83E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	3.43E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Calcium					Chromium					Cobalt				
				mg/L					mg/L					mg/L				
				7440-70-2					7440-47-3					7440-48-4				
				Result					Result					Result				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	7.27E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	7.27E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	4.61E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.70E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	4.12E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	3.45E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.05E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	9.98E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.10E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	6.44E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	5.02E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.07E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.19E+01	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.50E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Copper					Iron					Lead				
				mg/L					mg/L					mg/L				
				7440-50-8					7439-89-6					7439-92-1				
				Result					Result					Result				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.60E-03	4.40E-04	2.50E-02	U	U	1.13E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.60E-03	4.40E-04	2.50E-02	J	J	1.13E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	2.00E-03	4.40E-04	2.50E-02	J	J	1.27E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	3.15E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.10E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.70E-03	4.40E-04	2.50E-02	J	J	4.11E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	5.73E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.40E-03	4.40E-04	2.50E-02	J	J	5.99E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	4.40E-04	4.40E-04	2.50E-02	U	U	6.17E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	6.01E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.58E-02	4.40E-04	2.50E-02	J	J	5.32E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	2.02E-01	7.10E-03	3.00E-01	J	J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	3.54E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	2.92E-01	7.10E-03	3.00E-01	J	J	1.20E-03	1.20E-03	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Magnesium					Manganese					Mercury				
				mg/L					mg/L					mg/L				
				7439-95-4					7439-96-5					7439-97-6				
				Result					Result					Result				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.24E+00	9.90E-03	5.00E+00	J	J	4.19E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	3.23E+00	9.90E-03	5.00E+00	J	J	3.45E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	2.63E+00	9.90E-03	5.00E+00	J	J	5.75E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	7.73E-01	9.90E-03	5.00E+00	J	J	3.27E-02	1.60E-04	1.50E-02			6.30E-05	2.20E-05	1.00E-03	J	J
BKG-SW06	BKG-SW06	15-Mar-04	REG	1.65E+00	9.90E-03	5.00E+00	J	J	7.55E-02	1.60E-04	1.50E-02			7.40E-05	2.20E-05	1.00E-03	J	J
BKG-SW07	BKG-SW07	15-Mar-04	REG	1.21E+00	9.90E-03	5.00E+00	J	J	1.16E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	6.05E+00	9.90E-03	5.00E+00			3.78E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	6.14E+00	9.90E-03	5.00E+00			1.15E-01	1.60E-04	1.50E-02			5.20E-05	2.20E-05	1.00E-03	J	J
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	6.76E+00	9.90E-03	5.00E+00			1.24E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	3.40E+00	9.90E-03	5.00E+00	J	J	2.13E-01	1.60E-04	1.50E-02			6.00E-05	2.20E-05	1.00E-03	J	J
BKG-SW11	BKG-SW11	14-Mar-04	REG	1.47E+00	9.90E-03	5.00E+00	J	J	4.78E-02	1.60E-04	1.50E-02			6.50E-05	2.20E-05	1.00E-03	J	J
BKG-SW12	BKG-SW12	14-Mar-04	REG	1.10E+00	9.90E-03	5.00E+00	J	J	1.38E-02	1.60E-04	1.50E-02	J	J	5.60E-05	2.20E-05	1.00E-03	J	J
BKG-SW13	BKG-SW13	14-Mar-04	REG	1.92E+00	9.90E-03	5.00E+00	J	J	1.20E-03	1.60E-04	1.50E-02	J	J	6.20E-05	2.20E-05	1.00E-03	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	8.46E-01	9.90E-03	5.00E+00	J	J	8.27E-02	1.60E-04	1.50E-02			6.00E-05	2.20E-05	1.00E-03	J	J

Footnotes are provided at the end of each test parameter

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Molybdenum					Nickel					Potassium				
				mg/L					mg/L					mg/L				
				7439-98-7					7440-02-0					2023695				
				Result					Result					Result				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.50E-03	1.10E-03	4.00E-02	J	J	7.38E-01	1.40E-02	5.00E+00	J	J
BKG-SW02	BKG-SW02	16-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.80E-03	1.10E-03	4.00E-02	J	J	2.86E+00	1.40E-02	5.00E+00	J	J
BKG-SW04	BKG-SW04	16-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.30E-03	1.10E-03	4.00E-02	J	J	1.25E+00	1.40E-02	5.00E+00	J	J
BKG-SW05	BKG-SW05	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	6.52E-01	1.40E-02	5.00E+00	J	J
BKG-SW06	BKG-SW06	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.50E-03	1.10E-03	4.00E-02	J	J	1.12E+00	1.40E-02	5.00E+00	J	J
BKG-SW07	BKG-SW07	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.20E-03	1.10E-03	4.00E-02	J	J	1.22E+00	1.40E-02	5.00E+00	J	J
BKG-SW08	BKG-SW08	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	8.00E-04	1.10E-03	4.00E-02	J	J	1.70E+00	1.40E-02	5.00E+00	J	J
BKG-SW09	BKG-SW09	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.80E-03	1.10E-03	4.00E-02	J	J	1.97E+00	1.40E-02	5.00E+00	J	J
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	7.50E-04	7.50E-04	5.00E-02	U	U	2.60E-03	1.10E-03	4.00E-02	J	J	2.18E+00	1.40E-02	5.00E+00	J	J
BKG-SW10	BKG-SW10	15-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.60E-03	1.10E-03	4.00E-02	J	J	2.15E+00	1.40E-02	5.00E+00	J	J
BKG-SW11	BKG-SW11	14-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.70E-03	1.10E-03	4.00E-02	J	J	2.13E+00	1.40E-02	5.00E+00	J	J
BKG-SW12	BKG-SW12	14-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	6.93E-01	1.40E-02	5.00E+00	J	J
BKG-SW13	BKG-SW13	14-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	1.34E+00	1.40E-02	5.00E+00	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	8.80E-04	1.10E-03	4.00E-02	J	J	7.36E-01	1.40E-02	5.00E+00	J	J

Footnotes are provided at the end of each test parameter

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Selenium					Silver					Sodium				
				mg/L					mg/L					mg/L				
				7782-49-2					7440-22-4					7440-23-5				
				Result					Result					Result				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	3.80E-03	2.00E-03	1.00E-02	J	J	6.00E-04	6.00E-04	1.00E-02	U	U	4.53E+00	1.50E-01	5.00E+00	J	J
BKG-SW02	BKG-SW02	16-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.35E+01	1.50E-01	5.00E+00		
BKG-SW04	BKG-SW04	16-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.64E+00	1.50E-01	5.00E+00		
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	2.29E+00	1.50E-01	5.00E+00	J	J
BKG-SW06	BKG-SW06	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	7.85E+00	1.50E-01	5.00E+00		
BKG-SW07	BKG-SW07	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.68E+00	1.50E-01	5.00E+00	J	J
BKG-SW08	BKG-SW08	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	2.32E+01	1.50E-01	5.00E+00		
BKG-SW09	BKG-SW09	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.38E+01	1.50E-01	5.00E+00		
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.53E+01	1.50E-01	5.00E+00		
BKG-SW10	BKG-SW10	15-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.01E+01	1.50E-01	5.00E+00		
BKG-SW11	BKG-SW11	14-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	7.64E+00	1.50E-01	5.00E+00		
BKG-SW12	BKG-SW12	14-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.08E+00	1.50E-01	5.00E+00	J	J
BKG-SW13	BKG-SW13	14-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.01E+00	1.50E-01	5.00E+00	J	J
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	1.87E+00	1.50E-01	5.00E+00	J	J

Footnotes are provided at the end of each test parameter

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Strontium					Thallium					Tin				
				mg/L					mg/L					mg/L				
				7440-24-6					7440-28-0					7440-31-5				
				Result					Result					Result				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	3.28E-02	3.00E-04	1.00E-02		JL	1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW02	BKG-SW02	16-Mar-04	REG	9.77E-02	3.00E-04	1.00E-02		JL	1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW04	BKG-SW04	16-Mar-04	REG	6.66E-02	3.00E-04	1.00E-02		JL	1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW05	BKG-SW05	15-Mar-04	REG	2.90E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	6.37E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	3.92E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW08	BKG-SW08	15-Mar-04	REG	1.93E-01	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW09	BKG-SW09	15-Mar-04	REG	1.77E-01	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	1.82E-01	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW10	BKG-SW10	15-Mar-04	REG	1.22E-01	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW11	BKG-SW11	14-Mar-04	REG	4.76E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW12	BKG-SW12	14-Mar-04	REG	5.01E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	4.14E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	2.32E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-3
Concentrations of Chemicals in Filtered Surface Water Samples from Streams - Metals

				Vanadium					Zinc				
				mg/L					mg/L				
				7440-62-2					7440-66-6				
				Result					Result				
Location	Sample	Date	Type	Vanadium	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SW01	BKG-SW01	16-Mar-04	REG	1.70E-03	4.70E-04	5.00E-02	J	J	6.60E-03	5.90E-04	2.00E-02	J	J
BKG-SW02	BKG-SW02	16-Mar-04	REG	1.40E-03	4.70E-04	5.00E-02	J	J	9.00E-03	5.90E-04	2.00E-02	J	J
BKG-SW04	BKG-SW04	16-Mar-04	REG	1.70E-03	4.70E-04	5.00E-02	J	J	1.13E-02	5.90E-04	2.00E-02	J	J
BKG-SW05	BKG-SW05	15-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.90E-04	5.90E-04	2.00E-02	U	U
BKG-SW06	BKG-SW06	15-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.90E-04	5.90E-04	2.00E-02	U	U
BKG-SW07	BKG-SW07	15-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	1.17E-01	5.90E-04	2.00E-02		
BKG-SW08	BKG-SW08	15-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	1.08E-01	5.90E-04	2.00E-02		
BKG-SW09	BKG-SW09	15-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.90E-04	5.90E-04	2.00E-02	U	U
BKG-SW09	DUPLICATE #5	15-Mar-04	FD	4.70E-04	4.70E-04	5.00E-02	U	U	2.12E-01	5.90E-04	2.00E-02		
BKG-SW10	BKG-SW10	15-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	6.30E-03	5.90E-04	2.00E-02	J	J
BKG-SW11	BKG-SW11	14-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	1.44E-02	5.90E-04	2.00E-02	J	J
BKG-SW12	BKG-SW12	14-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.90E-04	5.90E-04	2.00E-02	U	U
BKG-SW13	BKG-SW13	14-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.90E-04	5.90E-04	2.00E-02	U	U
BKG-SW14	BKG-SW14	14-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	4.18E-02	5.90E-04	2.00E-02		

Footnotes:
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).
FD - field duplicate
H - high bias to estimate (see Shaw, 2004b)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory
REG - regular sample
RLimit - analytical reporting limit reported by laboratory
U - undetected concentration
VQ - data qualifier applied during data validation with same meanings as LQ

Table 3-4
Detection of Chemicals Not Related to Background in
Surface Water Samples from Streams

	Chemical Name	Acetone		1,2,4-Trimethylbenzene		Nitrate		Nitrite		Toluene		TOTAL XYLENES	
	CAS No.	95-50-1		95-63-6		142-28-9		7632-00-0		108-88-3		123-91-1	
Location	Sample	Detected	J-Qualified	Detected	J-Qualified	Detected	J-Qualified	Detected	J-Qualified	Detected	J-Qualified	Detected	J-Qualified
BKG-SW01	BKG-SW01												
BKG-SW02	BKG-SW02					X	X						
BKG-SW03	BKG-SW03				X	X					X		X
BKG-SW04	BKG-SW04						X						
BKG-SW05	BKG-SW05							X					
BKG-SW06	BKG-SW06												
BKG-SW07	BKG-SW07												
BKG-SW08	BKG-SW08	X											
BKG-SW09	BKG-SW09												
BKG-SW09	DUPLICATE #5												
BKG-SW10	BKG-SW10												
BKG-SW11	BKG-SW11												
BKG-SW12	BKG-SW12												
BKG-SW13	BKG-SW13												
BKG-SW14	BKG-SW14												

DUPLICATE - field duplicate
J-Qualified - estimated concentration
X - Chemical was reported with detection status indicated.

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Aluminum					Antimony					Arsenic				
				mg/L					mg/L					mg/L				
				7429-90-5					7440-36-0					7440-38-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.36E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.86E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	2.95E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	3.45E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	3.02E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	6.78E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.04E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.83E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.90E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	3.11E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.31E-01	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.12E-01	6.60E-03	2.00E-01		J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	6.01E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	3.90E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	2.71E-01	6.60E-03	2.00E-01		B	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	3.07E-01	6.60E-03	2.00E-01			1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Barium					Beryllium					Cadmium				
				mg/L					mg/L					mg/L				
				7440-39-3					7440-41-7					7440-43-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.74E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.91E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.78E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.83E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	4.80E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.53E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.59E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	6.52E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.38E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.44E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.87E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	4.51E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.22E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.45E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.37E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.70E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Calcium					Chromium					Cobalt				
				mg/L					mg/L					mg/L				
				7440-70-2					7440-47-3					7440-48-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.17E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.28E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.20E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.20E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	4.21E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	4.59E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.27E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	3.55E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	1.70E-03	5.00E-04	5.00E-02	J	B
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	4.45E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	4.46E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.13E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	4.42E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	3.47E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	4.15E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	4.09E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.31E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Copper					Iron					Lead				
				mg/L					mg/L					mg/L				
				7440-50-8					7439-89-6					7439-92-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.14E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.44E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.21E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.40E-04	4.40E-04	2.50E-02	U	U	1.26E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.15E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.52E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.35E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.50E-03	4.40E-04	2.50E-02	J	J	2.52E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.58E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	4.40E-04	4.40E-04	2.50E-02	U	U	1.56E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.43E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.31E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.79E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.87E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.66E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.54E+00	7.10E-03	3.00E-01		J	1.20E-03	1.20E-03	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Magnesium					Manganese					Mercury				
				mg/L					mg/L					mg/L				
				7439-95-4					7439-96-5					7439-97-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.03E+00	9.90E-03	5.00E+00	J	J	5.43E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.06E+00	9.90E-03	5.00E+00	J	J	1.14E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	2.04E+00	9.90E-03	5.00E+00	J	J	7.77E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	2.02E+00	9.90E-03	5.00E+00	J	J	7.88E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	2.06E+00	9.90E-03	5.00E+00	J	J	4.70E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	2.19E+00	9.90E-03	5.00E+00	J	J	1.22E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	2.04E+00	9.90E-03	5.00E+00	J	J	7.57E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.40E+00	9.90E-03	5.00E+00	J	J	2.32E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.09E+00	9.90E-03	5.00E+00	J	J	9.94E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	2.10E+00	9.90E-03	5.00E+00	J	J	8.53E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.99E+00	9.90E-03	5.00E+00	J	J	8.72E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.15E+00	9.90E-03	5.00E+00	J	J	8.77E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.52E+00	9.90E-03	5.00E+00	J	J	1.15E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.96E+00	9.90E-03	5.00E+00	J	J	1.08E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.96E+00	9.90E-03	5.00E+00	J	J	1.33E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	2.05E+00	9.90E-03	5.00E+00	J	J	8.22E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Molybdenum					Nickel					Potassium				
				mg/L					mg/L					mg/L				
				7439-98-7					7440-02-0					2023695				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	2.47E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.40E-03	1.10E-03	4.00E-02	J	J	2.29E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.00E-03	1.10E-03	4.00E-02	J		2.28E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	J	J	2.35E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.00E-03	1.10E-03	4.00E-02	J	J	2.26E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.60E-03	1.10E-03	4.00E-02	J	J	2.38E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.90E-03	1.10E-03	4.00E-02	J	J	2.21E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.50E-03	1.10E-03	4.00E-02	J	J	1.58E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.50E-03	1.10E-03	4.00E-02	J	J	2.34E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	7.50E-04	7.50E-04	5.00E-02	U	U	1.80E-03	1.10E-03	4.00E-02	J	J	2.31E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	2.29E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.00E-03	1.10E-03	4.00E-02	J	J	2.60E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.50E-03	1.10E-03	4.00E-02	J	J	1.73E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.30E-03	1.10E-03	4.00E-02	J	J	2.20E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.10E-03	1.10E-03	4.00E-02	J	J	2.28E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.30E-03	1.10E-03	4.00E-02	J	J	2.20E+00	1.40E-02	5.00E+00	J	J

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Selenium					Silver					Sodium				
				mg/L					mg/L					mg/L				
				7782-49-2					7440-22-4					7440-23-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.86E+00	1.50E-01	5.00E+00		J
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.67E+00	1.50E-01	5.00E+00		J
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.96E+00	1.50E-01	5.00E+00		J
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.82E+00	1.50E-01	5.00E+00		J
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.68E+00	1.50E-01	5.00E+00		J
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.75E+00	1.50E-01	5.00E+00		J
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.49E+00	1.50E-01	5.00E+00		J
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	5.00E+00	1.50E-01	5.00E+00		
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.65E+00	1.50E-01	5.00E+00		J
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.77E+00	1.50E-01	5.00E+00		J
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.67E+00	1.50E-01	5.00E+00		
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	7.26E+00	1.50E-01	5.00E+00		
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	4.85E+00	1.50E-01	5.00E+00	J	J
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.61E+00	1.50E-01	5.00E+00		J
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.65E+00	1.50E-01	5.00E+00		
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.73E+00	1.50E-01	5.00E+00		J

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Strontium					Thallium					Tin				
				mg/L					mg/L					mg/L				
				7440-24-6					7440-28-0					7440-31-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.75E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.98E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.52E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.60E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.72E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	6.08E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.82E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.72E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	6.20E-02	3.00E-04	1.00E-02			4.00E-03	1.50E-03	1.00E-02	J	J	2.70E-03	1.50E-03	5.00E-02	J	J
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	6.12E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	3.00E-03	1.50E-03	5.00E-02	J	J
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.79E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	3.10E-03	1.50E-03	5.00E-02	J	J
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.67E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.20E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.68E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	3.40E-03	1.50E-03	5.00E-02	J	J
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.66E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.62E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemcials in Surface Water Samples from Clinton Lake - Metals

				Vanadium					Zinc				
				mg/L					mg/L				
				7440-62-2					7440-66-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	3.94E-02	5.90E-04	2.00E-02		
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	1.58E-02	5.90E-04	2.00E-02	J	J
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.50E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.70E-04	4.70E-04	5.00E-02	U	U	5.50E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	1.37E-02	5.90E-04	2.00E-02	J	J
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	8.50E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	9.20E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	2.20E-03	4.70E-04	5.00E-02	J	J	9.40E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	6.60E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	4.70E-04	4.70E-04	5.00E-02	U	U	6.50E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.90E-04	5.90E-04	2.00E-02	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	6.90E-04	4.70E-04	5.00E-02	J	J	6.50E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.50E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	1.72E-02	5.90E-04	2.00E-02	J	J
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.10E-03	4.70E-04	5.00E-02	J	J	6.20E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	6.20E-03	5.90E-04	2.00E-02	J	J

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

R - data rejected as a result of matrix interference

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Anions

				Bromide					Chloride					Cyanide, Total				
				mg/L					mg/L					mg/L				
				24959-67-9					16887-00-6					57-12-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.80E-01	2.50E-01	5.00E-01	J	UJ	1.45E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.80E-01	2.50E-01	5.00E-01	J	J,L	1.46E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	2.80E-01	2.50E-01	5.00E-01	J	J,L	1.45E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	2.70E-01	2.50E-01	5.00E-01	J	J	1.45E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	2.70E-01	2.50E-01	5.00E-01	J	J,L	1.46E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	2.80E-01	2.50E-01	5.00E-01	J	J,L	1.43E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	2.80E-01	2.50E-01	5.00E-01	J	J,L	1.47E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	2.60E-01	2.50E-01	5.00E-01	J	J	1.31E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.80E-01	2.50E-01	5.00E-01	J	J,L	1.44E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	2.80E-01	2.50E-01	5.00E-01	J	J,L	1.44E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	2.70E-01	2.50E-01	5.00E-01	J	J	1.45E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ,L
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.90E-01	2.50E-01	5.00E-01	J	J	1.47E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	2.70E-01	2.50E-01	5.00E-01	J	J,L	1.26E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	2.70E-01	2.50E-01	5.00E-01	J	J,L	1.42E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	2.70E-01	2.50E-01	5.00E-01	J	J	1.42E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	2.70E-01	2.50E-01	5.00E-01	J	J,L	1.46E+01	1.00E+01	2.00E+01	J	J	7.00E-03	7.00E-03	1.00E-02	U	UJ

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Anions

				Fluoride, Total					Nitrate					Nitrite				
				mg/L					mg/L					mg/L				
				16984-48-8					14797-55-8					14797-65-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	1.20E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	1.20E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	1.30E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	1.30E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	1.20E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	1.20E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.30E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.10E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	1.30E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	1.30E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.20E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.20E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.10E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.20E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	UJ
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.30E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	U	5.00E-02	5.00E-02	1.00E-01	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.30E-01	1.00E-01	2.00E-01	J	J	5.00E-02	5.00E-02	1.00E-01	U	UJ	5.00E-02	5.00E-02	1.00E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Anions

				Perchlorate					Sulfate				
				mg/L					mg/L				
				14797-73-0					14808-79-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.99E+01	1.00E+01	2.00E+01	J	J
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.06E+01	1.00E+01	2.00E+01		
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.02E+01	1.00E+01	2.00E+01		
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.00E-03	4.00E-03	1.00E-02	U	U	2.01E+01	1.00E+01	2.00E+01		
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.05E+01	1.00E+01	2.00E+01		
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.08E+01	1.00E+01	2.00E+01		
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.03E+01	1.00E+01	2.00E+01		
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.38E+01	1.00E+01	2.00E+01	J	J
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.05E+01	1.00E+01	2.00E+01		
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	4.00E-03	4.00E-03	1.00E-02	U	U	2.04E+01	1.00E+01	2.00E+01		
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.98E+01	1.00E+01	2.00E+01	J	J
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.02E+01	1.00E+01	2.00E+01		
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.55E+01	1.00E+01	2.00E+01	J	J
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.87E+01	1.00E+01	2.00E+01	J	J
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	1.90E+01	1.00E+01	2.00E+01	J	J
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.00E-03	4.00E-03	1.00E-02	U	U	2.02E+01	1.00E+01	2.00E+01		

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

R - data rejected as a result of matrix interference

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Explosives

				1,3,5-Trinitrobenzene					1,3-Dinitrobenzene					2,4,6-Trinitrotoluene				
				mg/L					mg/L					mg/L				
				99-35-4					99-65-0					118-96-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.40E-05	5.40E-05	2.20E-04	U	U	5.40E-05	5.40E-05	2.20E-04	U	U	5.40E-05	5.40E-05	2.20E-04	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Explosives

				2,4-Dinitrotoluene					2,6-Dinitrotoluene					2-Amino-4,6-dinitrotoluene				
				mg/L					mg/L					mg/L				
				121-14-2					606-20-2					35572-78-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.40E-05	5.40E-05	2.20E-04	U	U	5.40E-05	5.40E-05	2.20E-04	U	U	5.40E-05	5.40E-05	2.20E-04	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Explosives

				4-Amino-2,6-dinitrotoluene					HMX					Nitrobenzene				
				mg/L					mg/L					mg/L				
				19406-51-0					2691-41-0					98-95-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.40E-05	5.40E-05	2.20E-04	U	U	8.10E-05	8.10E-05	2.20E-04	U	U	5.40E-05	5.40E-05	2.20E-04	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	U	7.70E-05	7.70E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Explosives

				RDX					Tetryl					m-Nitrotoluene				
				mg/L					mg/L					mg/L				
				121-82-4					479-45-8					99-08-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	8.10E-05	8.10E-05	2.20E-04	U	U	8.10E-05	8.10E-05	2.20E-04	U	U	5.40E-05	5.40E-05	2.20E-04	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	7.70E-05	7.70E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U	5.10E-05	5.10E-05	2.00E-04	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	7.70E-05	7.70E-05	2.10E-04	U	U	7.70E-05	7.70E-05	2.10E-04	U	U	5.20E-05	5.20E-05	2.10E-04	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	7.50E-05	7.50E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U	5.00E-05	5.00E-05	2.00E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Explosives

				o-Nitrotoluene					p-Nitrotoluene				
				mg/L					mg/L				
				88-72-2					99-99-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.40E-05	5.40E-05	2.20E-04	U	U	8.10E-05	8.10E-05	2.20E-04	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.10E-05	5.10E-05	2.00E-04	U	U	7.70E-05	7.70E-05	2.00E-04	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.20E-05	5.20E-05	2.10E-04	U	U	7.70E-05	7.70E-05	2.10E-04	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-05	5.00E-05	2.00E-04	U	U	7.50E-05	7.50E-05	2.00E-04	U	U

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

R - data rejected as a result of matrix interference

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - PAHs

				Acenaphthene					Acenaphthylene					Anthracene				
				mg/L					mg/L					mg/L				
				83-32-9					208-96-8					120-12-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.20E-04	5.20E-04	1.00E-03	U	U	5.20E-04	5.20E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.10E-04	5.10E-04	1.00E-03	U	U	5.10E-04	5.10E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - PAHs

				Benzo(a)anthracene					Benzo(a)pyrene					Benzo(b)fluoranthene				
				mg/L					mg/L					mg/L				
				56-55-3					50-32-8					205-99-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	1.00E-04	1.00E-04	2.10E-04	U	U	1.00E-04	1.00E-04	2.10E-04	U	U	1.00E-04	1.00E-04	2.10E-04	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - PAHs

				Benzo(ghi)perylene					Benzo(k)fluoranthene					Chrysene				
				mg/L					mg/L					mg/L				
				191-24-2					207-08-9					218-01-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	1.00E-04	1.00E-04	2.10E-04	U	U	1.00E-04	1.00E-04	2.10E-04	U	U	1.00E-04	1.00E-04	2.10E-04	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U	1.00E-04	1.00E-04	2.00E-04	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - PAHs

				Dibenzo(a,h)anthracene					Fluoranthene					Fluorene				
				mg/L					mg/L					mg/L				
				53-70-3					206-44-0					86-73-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	1.00E-04	1.00E-04	2.10E-04	U	U	2.60E-04	2.60E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - PAHs

				Indeno(1,2,3-cd)pyrene					Naphthalene				
				mg/L					mg/L				
				193-39-5					91-20-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	1.00E-04	1.00E-04	2.10E-04	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.00E-04	1.00E-04	2.00E-04	U	U	2.50E-04	2.50E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - PAHs

				Phenanthrene					Pyrene				
				mg/L					mg/L				
				85-01-8					129-00-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	2.60E-04	2.60E-04	1.00E-03	U	U	2.60E-04	2.60E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	2.50E-04	2.50E-04	1.00E-03	U	U	2.50E-04	2.50E-04	1.00E-03	U	U

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

R - data rejected as a result of matrix interference

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				1,1,1,2-Tetrachloroethane					1,1,1-Trichloroethane					1,1,2,2-Tetrachloroethane				
				mg/L					mg/L					mg/L				
				630-20-6					71-55-6					79-34-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	3.00E-04	3.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				1,1,2-Trichloroethane					1,1-Dichloroethane					1,1-Dichloroethene				
				mg/L					mg/L					mg/L				
				79-00-5					75-34-3					75-35-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				1,1-Dichloropropene					1,2,3-Trichlorobenzene					1,2,3-Trichloropropane				
				mg/L					mg/L					mg/L				
				563-58-6					87-61-6					96-18-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	1.00E-03	1.00E-03	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				1,2,4-Trichlorobenzene					1,2,4-Trimethylbenzene					1,2-Dibromoethane				
				mg/L					mg/L					mg/L				
				120-82-1					95-63-6					106-93-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				1,2-Dichlorobenzene					1,2-Dichloroethane					1,2-Dichloropropane				
				mg/L					mg/L					mg/L				
				95-50-1					107-06-2					78-87-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				1,3,5-Trimethylbenzene					1,3-Dichlorobenzene					1,3-Dichloropropane				
				mg/L					mg/L					mg/L				
				108-67-8					541-73-1					142-28-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				1,4-Dichlorobenzene					1,4-Dioxane					2,2-Dichloropropane				
				mg/L					mg/L					mg/L				
				106-46-7					123-91-1					594-20-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-02	5.00E-02	2.50E-01	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-02	5.00E-02	2.50E-01	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				2-Butanone					2-Chlorotoluene					2-Hexanone				
				mg/L					mg/L					mg/L				
				78-93-3					95-49-8					591-78-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	2.50E-03	2.50E-03	5.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				2-Propenal					4-Chlorotoluene					Acetone				
				mg/L					mg/L					mg/L				
				107-02-8					106-43-4					67-64-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	8.80E-03	5.00E-03	5.00E-03		
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-03	5.00E-03	5.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-03	5.00E-03	1.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-03	5.00E-03	5.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Benzene					Bromobenzene					Bromochloromethane				
				mg/L					mg/L					mg/L				
				71-43-2					108-86-1					74-97-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Bromodichloromethane					Bromoform					Carbon disulfide				
				mg/L					mg/L					mg/L				
				75-27-4					75-25-2					75-15-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	1.00E-03	1.00E-03	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Carbon tetrachloride					Chlorobenzene					Chloroethane				
				mg/L					mg/L					mg/L				
				56-23-5					108-90-7					75-00-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	1.00E-03	1.00E-03	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	UJ

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Chloroform					Chloromethane					Dibromochloromethane				
				mg/L					mg/L					mg/L				
				67-66-3					74-87-3					124-48-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	1.00E-03	1.00E-03	1.00E-03	U	UJ,L	4.00E-04	4.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	4.00E-04	4.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Dichlorodifluoromethane					Ethylbenzene					Hexachlorobutadiene				
				mg/L					mg/L					mg/L				
				75-71-8					100-41-4					87-68-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	6.00E-04	6.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U	6.00E-04	6.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Iodomethane					Isobutyl alcohol					Isopropylbenzene				
				mg/L					mg/L					mg/L				
				74-88-4					78-83-1					98-82-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	UJ	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	UJ,L	2.00E-02	2.00E-02	5.00E-02	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	2.50E-03	2.50E-03	1.00E-02	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Methyl methacrylate					Methyl isobutyl ketone					Methyl tert-butyl ether				
				mg/L					mg/L					mg/L				
				80-62-6					108-10-1					1634-04-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	not reported	not reported	5.00E-03	U	UJ,L	2.50E-03	2.50E-03	5.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	not reported	not reported	5.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Methylene chloride					Naphthalene					Styrene				
				mg/L					mg/L					mg/L				
				75-09-2					91-20-3					100-42-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	UJ,L	1.00E-03	1.00E-03	1.00E-03	U	UJL	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.00E-03	1.00E-03	2.00E-03	U	U	1.00E-03	1.00E-03	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Tetrachloroethene					Toluene					Trichloroethene				
				mg/L					mg/L					mg/L				
				127-18-4					108-88-3					79-01-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Trichlorofluoromethane					Vinyl acetate					Vinyl chloride				
				mg/L					mg/L					mg/L				
				75-69-4					108-05-4					75-01-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	UJ,L	2.50E-03	2.50E-03	5.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	6.00E-04	6.00E-04	1.00E-03	U	U	2.50E-03	2.50E-03	5.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				Xylenes, Total					cis-1,2-Dichloroethene					cis-1,3-Dichloropropene				
				mg/L					mg/L					mg/L				
				1330-20-7					156-59-2					10061-01-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	3.00E-04	3.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.00E-03	1.00E-03	3.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				n-Butylbenzene					n-Propylbenzene					p-Isopropyltoluene				
				mg/L					mg/L					mg/L				
				104-51-8					103-65-1					99-87-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				sec-Butylbenzene					tert-Butylbenzene				
				mg/L					mg/L				
				135-98-8					98-06-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	5.00E-04	5.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	5.00E-04	5.00E-04	1.00E-03	U	U

Footnotes are provided at the end of each test paramter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - VOCs

				trans-1,2-Dichloroethene					trans-1,3-Dichloropropene				
				mg/L					mg/L				
				156-60-5					10061-02-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	UJ,L	3.00E-04	3.00E-04	1.00E-03	U	UJ,L
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.00E-04	5.00E-04	1.00E-03	U	U	3.00E-04	3.00E-04	1.00E-03	U	U

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

R - data rejected as a result of matrix interference

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Water Properties

				Alkalinity, Total					Bicarbonate as $CaCO_3$					pH				
				mg/L					mg/L					PH UNITS				
				11-43-8					40099					39384				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	9.00E+00	2.50E+00	5.00E+00			9.00E+00	5.00E+00	5.00E+00			6.00E+00		0.00E+00		
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	9.50E+00	2.50E+00	5.00E+00			9.50E+00	5.00E+00	5.00E+00			6.10E+00		0.00E+00		
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	9.00E+00	2.50E+00	5.00E+00			9.00E+00	5.00E+00	5.00E+00			6.10E+00		0.00E+00		
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	9.00E+00	2.50E+00	5.00E+00			9.00E+00	5.00E+00	5.00E+00			6.10E+00		0.00E+00		
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	not reported	not reported	not reported			9.00E+00	5.00E+00	5.00E+00			6.00E+00		0.00E+00		
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	9.00E+00	2.50E+00	5.00E+00			9.00E+00	5.00E+00	5.00E+00			6.10E+00		0.00E+00		
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.05E+01	2.50E+00	5.00E+00			1.05E+01	5.00E+00	5.00E+00			6.00E+00		0.00E+00		
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	7.50E+00	2.50E+00	5.00E+00			7.50E+00	5.00E+00	5.00E+00			5.90E+00		0.00E+00		
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	9.00E+00	2.50E+00	5.00E+00			9.00E+00	5.00E+00	5.00E+00			6.10E+00		0.00E+00		
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	9.50E+00	2.50E+00	5.00E+00			9.50E+00	5.00E+00	5.00E+00			6.10E+00		0.00E+00		
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	8.50E+00	2.50E+00	5.00E+00			8.50E+00	5.00E+00	5.00E+00			6.00E+00		0.00E+00		
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.00E+01	2.50E+00	5.00E+00			1.00E+01	5.00E+00	5.00E+00			6.10E+00		0.00E+00		
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	9.00E+00	2.50E+00	5.00E+00			9.00E+00	5.00E+00	5.00E+00			5.90E+00		0.00E+00		
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	9.00E+00	2.50E+00	5.00E+00			9.00E+00	5.00E+00	5.00E+00			6.00E+00		0.00E+00		
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	9.50E+00	2.50E+00	5.00E+00			9.50E+00	5.00E+00	5.00E+00			6.20E+00		0.00E+00		
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.00E+01	2.50E+00	5.00E+00			1.00E+01	5.00E+00	5.00E+00			6.10E+00		0.00E+00		

Footnotes are provided at the end of each test parameter

Table 3-5
Concentrations of Chemicals in Surface Water Samples from Clinton Lake - Water Properties

				Total Dissolved Solids					Total Suspended Solids				
				mg/L					mg/L				
				10-33-3					10-32-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	6.70E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	7.40E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	7.90E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	7.40E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	7.30E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	7.40E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	6.30E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	J	J
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	7.60E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	7.50E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	J	J
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	7.50E+01	1.00E+01	1.00E+01			9.00E+00	4.00E+00	4.00E+00		
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	7.40E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	7.00E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	9.10E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	8.10E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	7.70E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	6.30E+01	1.00E+01	1.00E+01			4.00E+00	4.00E+00	4.00E+00	U	U

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

R - data rejected as a result of matrix interference

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Aluminum					Antimony					Arsenic				
				mg/L					mg/L					mg/L				
				7429-90-5					7440-36-0					7440-38-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	1.43E-01	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.33E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.24E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	3.17E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	3.48E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.64E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	2.58E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.98E-01	6.60E-03	2.00E-01	J	B	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	7.55E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.11E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	9.49E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	1.09E-01	6.60E-03	2.00E-01	J	B	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	7.67E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	4.57E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.35E-01	6.60E-03	2.00E-01	J	B	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	2.62E-02	6.60E-03	2.00E-01	J	J	1.50E-03	1.50E-03	5.00E-03	U	U	2.80E-03	2.80E-03	1.00E-02	U	U

Footnotes are provided at he end of each test parameter

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Barium					Beryllium					Cadmium				
				mg/L					mg/L					mg/L				
				7440-39-3					7440-41-7					7440-43-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.75E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.62E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.67E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.53E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	4.27E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	5.00E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.22E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.03E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.24E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	4.81E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.11E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	4.22E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	4.64E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	4.79E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	4.90E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	1.90E-03	3.00E-04	5.00E-03	J	J
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.35E-02	5.00E-04	2.00E-01	J	J	3.00E-04	3.00E-04	4.00E-03	U	U	3.00E-04	3.00E-04	5.00E-03	U	U

Footnotes are provided at he end of each test parameter

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Calcium					Chromium					Cobalt				
				mg/L					mg/L					mg/L				
				7440-70-2					7440-47-3					7440-48-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.23E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.04E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	3.77E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.05E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	3.81E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	4.22E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	3.93E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	3.22E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	4.32E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	4.07E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.23E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	4.31E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	3.23E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	3.65E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	4.04E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.09E+00	3.80E-03	1.00E+00			4.00E-04	4.00E-04	1.00E-02	U	U	5.00E-04	5.00E-04	5.00E-02	U	U

Footnotes are provided at he end of each test parameter

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Copper					Iron					Lead				
				mg/L					mg/L					mg/L				
				7440-50-8					7439-89-6					7439-92-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.20E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.10E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	8.41E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.40E-04	4.40E-04	2.50E-02	U	U	9.25E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	7.88E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	8.87E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	9.20E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.12E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	6.40E-03	4.40E-04	2.50E-02	J	J	1.24E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	4.40E-04	4.40E-04	2.50E-02	U	U	1.09E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	7.46E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	8.06E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.21E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.30E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	9.95E-01	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.40E-04	4.40E-04	2.50E-02	U	U	1.22E+00	7.10E-03	3.00E-01			1.20E-03	1.20E-03	5.00E-03	U	U

Footnotes are provided at he end of each test parameter

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Magnesium					Manganese					Mercury				
				mg/L					mg/L					mg/L				
				7439-95-4					7439-96-5					7439-97-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.03E+00	9.90E-03	5.00E+00	J	J	7.63E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	1.92E+00	9.90E-03	5.00E+00	J	J	1.40E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	1.81E+00	9.90E-03	5.00E+00	J	J	7.22E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	1.92E+00	9.90E-03	5.00E+00	J	J	7.66E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	1.84E+00	9.90E-03	5.00E+00	J	J	4.16E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	1.99E+00	9.90E-03	5.00E+00	J	J	1.07E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	1.89E+00	9.90E-03	5.00E+00	J	J	6.98E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	1.31E+00	9.90E-03	5.00E+00	J	J	6.98E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.01E+00	9.90E-03	5.00E+00	J	J	1.28E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	1.89E+00	9.90E-03	5.00E+00	J	J	1.10E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	2.20E+00	9.90E-03	5.00E+00	J	J	2.83E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.09E+00	9.90E-03	5.00E+00	J	J	5.39E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	1.38E+00	9.90E-03	5.00E+00	J	J	1.08E-01	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	1.71E+00	9.90E-03	5.00E+00	J	J	9.96E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	1.92E+00	9.90E-03	5.00E+00	J	J	5.72E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	1.92E+00	9.90E-03	5.00E+00	J	J	7.19E-02	1.60E-04	1.50E-02			2.20E-05	2.20E-05	1.00E-03	U	U

Footnotes are provided at he end of each test parameter

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Molybdenum					Nickel					Potassium				
				mg/L					mg/L					mg/L				
				7439-98-7					7440-02-0					2023695				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	9.50E-04	1.10E-03	4.00E-02	J	J	2.32E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	8.70E-04	1.10E-03	4.00E-02	J	J	2.05E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	2.02E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	J	J	2.16E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	2.05E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.60E-03	1.10E-03	4.00E-02	J	J	2.25E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.00E-03	1.10E-03	4.00E-02	J	J	2.04E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.50E-03	1.10E-03	4.00E-02	J	J	1.49E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.50E-03	1.10E-03	4.00E-02	J	J	2.20E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	7.50E-04	7.50E-04	5.00E-02	U	U	1.30E-03	1.10E-03	4.00E-02	J	J	2.06E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	9.90E-04	1.10E-03	4.00E-02	J	J	2.05E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.60E-03	1.10E-03	4.00E-02	J	J	2.48E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	1.59E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	1.10E-03	1.10E-03	4.00E-02	U	U	1.94E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	2.00E-03	1.10E-03	4.00E-02	J	J	2.35E+00	1.40E-02	5.00E+00	J	J
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	7.50E-04	7.50E-04	5.00E-02	U	U	8.80E-04	1.10E-03	4.00E-02	J	J	2.08E+00	1.40E-02	5.00E+00	J	J

Footnotes are provided at he end of each test parameter

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Selenium					Silver					Sodium				
				mg/L					mg/L					mg/L				
				7782-49-2					7440-22-4					7440-23-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.76E+00	1.50E-01	5.00E+00		
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.31E+00	1.50E-01	5.00E+00		
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	5.87E+00	1.50E-01	5.00E+00		
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.39E+00	1.50E-01	5.00E+00		
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.26E+00	1.50E-01	5.00E+00		
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.58E+00	1.50E-01	5.00E+00		
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.18E+00	1.50E-01	5.00E+00		
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	4.81E+00	1.50E-01	5.00E+00	J	J
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.43E+00	1.50E-01	5.00E+00		
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.00E+00	1.50E-01	5.00E+00		
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.18E+00	1.50E-01	5.00E+00		
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.98E+00	1.50E-01	5.00E+00		
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	4.68E+00	1.50E-01	5.00E+00	J	J
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	5.96E+00	1.50E-01	5.00E+00		
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.51E+00	1.50E-01	5.00E+00		
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	2.00E-03	2.00E-03	1.00E-02	U	U	6.00E-04	6.00E-04	1.00E-02	U	U	6.35E+00	1.50E-01	5.00E+00		

Footnotes are provided at he end of each test parameter

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Strontium					Thallium					Tin				
				mg/L					mg/L					mg/L				
				7440-24-6					7440-28-0					7440-31-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	5.68E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	5.93E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	5.72E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	5.64E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	5.77E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	6.21E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	6.03E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	5.58E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	5.48E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	5.47E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	5.73E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	4.80E-03	1.50E-03	5.00E-02	J	J
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	5.75E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	5.54E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	5.93E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	5.67E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	5.96E-02	3.00E-04	1.00E-02			1.50E-03	1.50E-03	1.00E-02	U	U	1.50E-03	1.50E-03	5.00E-02	U	U

Footnotes are provided at he end of each test parameter

Table 3-6
Concentrations of Chemicals in Filtered Surface Water Samples from Clinton Lake - Metals

				Vanadium					Zinc				
				mg/L					mg/L				
				7440-62-2					7440-66-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SW01	BKG-CL-SW01	8-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	2.77E-02	5.90E-04	2.00E-02		
BKG-CL-SW02	BKG-CL-SW02	8-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	8.90E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW03	BKG-CL-SW03	8-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	7.50E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW03	DUPLICATE #1	8-Mar-04	FD	4.70E-04	4.70E-04	5.00E-02	U	U	5.10E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW04	BKG-CL-SW04	8-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	6.70E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW05	BKG-CL-SW05	9-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	4.39E-02	5.90E-04	2.00E-02		
BKG-CL-SW06	BKG-CL-SW06	9-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	7.10E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW07	BKG-CL-SW07	11-Mar-04	REG	8.10E-04	4.70E-04	5.00E-02	J	J	4.75E-02	5.90E-04	2.00E-02		
BKG-CL-SW08	BKG-CL-SW08	10-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	1.03E-02	5.90E-04	2.00E-02	J	J
BKG-CL-SW08	DUPLICATE #2	10-Mar-04	FD	4.70E-04	4.70E-04	5.00E-02	U	U	3.13E-02	5.90E-04	2.00E-02		
BKG-CL-SW09	BKG-CL-SW09	9-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	2.44E-02	5.90E-04	2.00E-02		
BKG-CL-SW10	BKG-CL-SW10	11-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	5.10E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW11	BKG-CL-SW11	9-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	4.73E-01	5.90E-04	2.00E-02		
BKG-CL-SW12	BKG-CL-SW12	10-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	2.20E-01	5.90E-04	2.00E-02		
BKG-CL-SW13	BKG-CL-SW13	11-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	8.80E-03	5.90E-04	2.00E-02	J	J
BKG-CL-SW14	BKG-CL-SW14	10-Mar-04	REG	4.70E-04	4.70E-04	5.00E-02	U	U	6.40E-03	5.90E-04	2.00E-02	J	J

Footnotes:
FD - field duplicate
H - high bias to estimate (see Shaw, 2004b)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory
R - data rejected as a result of matrix interference
REG - regular sample
RLimit - analytical reporting limit reported by laboratory
U - undetected concentration
VQ - data qualifier applied during data validation with same meanings as LQ
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-7
Detection of Chemicals Not Related to Background
in Surface Water Samples from Clinton Lake

	Chemical Name CAS No.	Acetone 95-50-1	
Location	**Sample**	**Detected**	**J-Qualified**
BKG-CL-SW01	BKG-CL-SW01		
BKG-CL-SW02	BKG-CL-SW02		
BKG-CL-SW03	BKG-CL-SW03		
BKG-CL-SW03	DUPLICATE #1		
BKG-CL-SW04	BKG-CL-SW04		
BKG-CL-SW05	BKG-CL-SW05		
BKG-CL-SW06	BKG-CL-SW06		
BKG-CL-SW07	BKG-CL-SW07		
BKG-CL-SW08	BKG-CL-SW08		
BKG-CL-SW08	DUPLICATE #2	X	
BKG-CL-SW09	BKG-CL-SW09		
BKG-CL-SW10	BKG-CL-SW10		
BKG-CL-SW11	BKG-CL-SW11		
BKG-CL-SW12	BKG-CL-SW12		
BKG-CL-SW13	BKG-CL-SW13		
BKG-CL-SW14	BKG-CL-SW14		

J-Qualified - estimated concentration
X - Chemical was reported with detection status indicated.

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Aluminum					Antimony					Arsenic				
				mg/kg					mg/kg					mg/kg				
				7429-90-5					7440-36-0					7440-38-2				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	7.37E+03	1.00E+00	3.00E+01			2.30E-01	2.30E-01	9.10E+00	U	UJ,L	4.20E-01	4.20E-01	7.60E-01	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.02E+03	9.10E-01	2.70E+01			2.10E-01	2.10E-01	8.20E+00	U	UJ,L	5.40E-01	3.80E-01	6.90E-01	J	J
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	8.38E+03	1.00E+00	3.20E+01			4.90E-01	2.40E-01	9.50E+00	J	J,L	6.50E-01	4.40E-01	7.90E-01	J	J
BKG-SD05	BKG-SD05	15-Mar-04	REG	4.77E+03	7.90E-01	2.40E+01		J,H	1.80E-01	1.80E-01	7.10E+00	U	UJ,L	1.30E+00	3.30E-01	6.00E-01		J
BKG-SD06	BKG-SD06	15-Mar-04	REG	6.56E+02	8.60E-01	2.60E+01		J,H	2.00E-01	2.00E-01	7.80E+00	U	UJ,L	3.60E-01	3.60E-01	6.50E-01	U	UJ
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.39E+02	8.70E-01	2.60E+01		J,H	2.00E-01	2.00E-01	7.90E+00	U	UJ,L	2.30E+00	3.70E-01	6.60E-01		J
BKG-SD08	BKG-SD08	15-Mar-04	REG	6.79E+03	9.30E-01	2.80E+01		J,H	2.10E-01	2.10E-01	8.50E+00	U	UJ,L	6.10E-01	4.00E-01	7.10E-01	J	J
BKG-SD09	BKG-SD09	15-Mar-04	REG	5.21E+03	1.10E+00	3.20E+01		J,H	2.40E-01	2.40E-01	9.70E+00	U	UJ,L	7.70E-01	4.50E-01	8.10E-01	J	J
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	4.91E+03	9.40E-01	2.80E+01		J,H	2.10E-01	2.10E-01	8.50E+00	U	UJ,L	7.90E-01	4.00E-01	7.10E-01		J
BKG-SD10	BKG-SD10	15-Mar-04	REG	4.68E+03	8.90E-01	2.70E+01		J,H	2.00E-01	2.00E-01	8.10E+00	U	UJ,L	6.40E-01	3.80E-01	6.80E-01	J	J
BKG-SD11	BKG-SD11	14-Mar-04	REG	3.69E+03	8.80E-01	2.70E+01		J,H	2.00E-01	2.00E-01	8.00E+00	U	UJ,L	5.60E-01	3.70E-01	6.70E-01	J	J
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.05E+03	1.00E+00	3.00E+01		J,H	2.30E-01	2.30E-01	9.10E+00	U	UJ,L	4.20E-01	4.20E-01	7.60E-01	U	UJ
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.21E+04	9.60E-01	2.90E+01		J,H	2.20E-01	2.20E-01	8.80E+00	U	UJ,L	4.70E+00	4.10E-01	7.30E-01		J
BKG-SD14	BKG-SD14	14-Mar-04	REG	4.54E+03	9.40E-01	2.90E+01		J,H	2.10E-01	2.10E-01	8.60E+00	U	UJ,L	2.10E+00	4.00E-01	7.10E-01		J

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Barium					Beryllium					Cadmium				
				mg/kg					mg/kg					mg/kg				
				7440-39-3					7440-41-7					7440-43-9				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	4.86E+01	7.60E-02	3.00E+01			3.90E-01	4.50E-02	7.60E-01	J	J	4.50E-02	4.50E-02	6.00E-01	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	8.90E+00	6.90E-02	2.70E+01	J	J	4.10E-02	4.10E-02	6.90E-01	U	U	4.10E-02	4.10E-02	5.50E-01	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.50E+02	7.90E-02	3.20E+01			8.00E-01	4.70E-02	7.90E-01			4.70E-02	4.70E-02	6.30E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	5.05E+01	6.00E-02	2.40E+01			2.80E-01	3.60E-02	6.00E-01	J	J	3.60E-02	3.60E-02	4.80E-01	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.85E+01	6.50E-02	2.60E+01	J	J	3.90E-02	3.90E-02	6.50E-01	U	U	3.90E-02	3.90E-02	5.20E-01	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	5.41E+01	6.60E-02	2.60E+01			3.80E-01	3.90E-02	6.60E-01	J	J	3.90E-02	3.90E-02	5.20E-01	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.42E+02	7.10E-02	2.80E+01			5.80E-01	4.20E-02	7.10E-01	J	J	4.20E-02	4.20E-02	5.60E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.19E+02	8.10E-02	3.20E+01			5.20E-01	4.90E-02	8.10E-01	J	J	4.90E-02	4.90E-02	6.50E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.06E+02	7.10E-02	2.80E+01			3.80E-01	4.30E-02	7.10E-01	J	J	4.30E-02	4.30E-02	5.70E-01	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	6.69E+01	6.80E-02	2.70E+01			2.30E-01	4.10E-02	6.80E-01	J	J	4.10E-02	4.10E-02	5.40E-01	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	7.65E+01	6.70E-02	2.70E+01			4.30E-01	4.00E-02	6.70E-01	J	J	4.00E-02	4.00E-02	5.30E-01	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.57E+01	7.60E-02	3.00E+01	J	J	4.50E-02	4.50E-02	7.60E-01	U	U	4.50E-02	4.50E-02	6.00E-01	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	6.50E+01	7.30E-02	2.90E+01			9.40E-01	4.40E-02	7.30E-01			4.40E-02	4.40E-02	5.80E-01	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	5.48E+01	7.10E-02	2.90E+01			4.50E-01	4.30E-02	7.10E-01	J	J	4.30E-02	4.30E-02	5.70E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Calcium					Chromium					Cobalt				
				mg/kg					mg/kg					mg/kg				
				7440-70-2					7440-47-3					7440-48-4				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	6.47E+02	5.70E-01	7.60E+02	J	J	1.51E+01	6.00E-02	1.50E+00		J	5.10E+00	7.60E-02	7.60E+00	J	J
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.20E+02	5.20E-01	6.90E+02	J	J	3.00E+00	5.50E-02	1.40E+00		J	6.70E-01	6.90E-02	6.90E+00	J	J
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.35E+03	6.00E-01	7.90E+02		J	1.58E+01	6.30E-02	1.60E+00		J	1.56E+01	7.90E-02	7.90E+00		
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E+02	4.50E-01	6.00E+02	J	J,H	5.90E+00	4.80E-02	1.20E+00		J,L	7.70E+00	6.00E-02	6.00E+00		J
BKG-SD06	BKG-SD06	15-Mar-04	REG	9.71E+01	4.90E-01	6.50E+02	J	J,H	2.80E+00	5.20E-02	1.30E+00		J,L	8.10E-01	6.50E-02	6.50E+00	J	J
BKG-SD07	BKG-SD07	15-Mar-04	REG	3.83E+02	5.00E-01	6.60E+02	J	J,H	4.90E+00	5.20E-02	1.30E+00		J,L	2.50E+00	6.60E-02	6.60E+00	J	J
BKG-SD08	BKG-SD08	15-Mar-04	REG	7.09E+02	5.40E-01	7.10E+02	J	J,H	8.20E+00	5.60E-02	1.40E+00		J,L	1.05E+01	7.10E-02	7.10E+00		J
BKG-SD09	BKG-SD09	15-Mar-04	REG	8.78E+02	6.20E-01	8.10E+02		J,H	6.50E+00	6.50E-02	1.60E+00		J,L	1.34E+01	8.10E-02	8.10E+00		J
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	9.01E+02	5.40E-01	7.10E+02		J,H	6.00E+00	5.70E-02	1.40E+00		J,L	8.60E+00	7.10E-02	7.10E+00		J
BKG-SD10	BKG-SD10	15-Mar-04	REG	4.49E+02	5.10E-01	6.80E+02	J	J,H	5.50E+00	5.40E-02	1.40E+00		J,L	3.00E+00	6.80E-02	6.80E+00	J	J
BKG-SD11	BKG-SD11	14-Mar-04	REG	3.09E+02	5.10E-01	6.70E+02	J	J,H	4.80E+00	5.30E-02	1.30E+00		J,L	5.40E+00	6.70E-02	6.70E+00	J	J
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.86E+02	5.70E-01	7.60E+02	J	J,H	2.20E+00	6.00E-02	1.50E+00		J,L	5.30E-01	7.60E-02	7.60E+00	J	J
BKG-SD13	BKG-SD13	14-Mar-04	REG	8.21E+02	5.60E-01	7.30E+02		J,H	4.28E+01	5.80E-02	1.50E+00		J,L	7.20E+00	7.30E-02	7.30E+00	J	J
BKG-SD14	BKG-SD14	14-Mar-04	REG	4.73E+02	5.40E-01	7.10E+02	J	J,H	6.40E+00	5.70E-02	1.40E+00		J,L	3.50E+00	7.10E-02	7.10E+00	J	J

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Copper					Iron					Lead				
				mg/kg					mg/kg					mg/kg				
				7440-50-8					7439-89-6					7439-92-1				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	6.40E+00	6.70E-02	3.80E+00			2.31E+04	1.10E+00	1.50E+01			7.40E+00	1.80E-01	1.50E+01	J	J
BKG-SD02	BKG-SD02	16-Mar-04	REG	6.10E-01	6.00E-02	3.40E+00	J	J	2.93E+03	9.80E-01	1.40E+01			2.20E+00	1.60E-01	1.40E+01	J	J
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.66E+01	6.90E-02	3.90E+00			2.88E+04	1.10E+00	1.60E+01			1.02E+01	1.90E-01	1.60E+01	J	J
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.70E+00	5.20E-02	3.00E+00	J	J	5.57E+03	8.40E-01	1.20E+01		J	6.70E+00	1.40E-01	1.20E+01	J	J
BKG-SD06	BKG-SD06	15-Mar-04	REG	4.20E-01	5.70E-02	3.30E+00	J	J	1.84E+03	9.20E-01	1.30E+01		J	2.30E+00	1.60E-01	1.30E+01	J	J
BKG-SD07	BKG-SD07	15-Mar-04	REG	6.10E-01	5.80E-02	3.30E+00	J	J	4.59E+03	9.30E-01	1.30E+01		J	7.80E+00	1.60E-01	1.30E+01	J	J
BKG-SD08	BKG-SD08	15-Mar-04	REG	5.10E+00	6.20E-02	3.50E+00		J	1.14E+04	1.00E+00	1.40E+01		J	1.18E+01	1.70E-01	1.40E+01	J	J
BKG-SD09	BKG-SD09	15-Mar-04	REG	4.20E+00	7.10E-02	4.10E+00		J	1.20E+04	1.20E+00	1.60E+01		J	1.09E+01	1.90E-01	1.60E+01	J	J
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	4.00E+00	6.30E-02	3.60E+00		J	8.31E+03	1.00E+00	1.40E+01		J	9.70E+00	1.70E-01	1.40E+01	J	J
BKG-SD10	BKG-SD10	15-Mar-04	REG	3.00E+00	6.00E-02	3.40E+00	J	J	7.15E+03	9.60E-01	1.40E+01		J	5.90E+00	1.60E-01	1.40E+01	J	J
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.60E+00	5.90E-02	3.30E+00	J	J	4.87E+03	9.50E-01	1.30E+01		J	8.60E+00	1.60E-01	1.30E+01	J	J
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.10E+00	6.70E-02	3.80E+00	J	J	1.30E+03	1.10E+00	1.50E+01		J	3.10E+00	1.80E-01	1.50E+01	J	J
BKG-SD13	BKG-SD13	14-Mar-04	REG	7.80E+00	6.40E-02	3.70E+00		J	3.56E+04	1.00E+00	1.50E+01		J	1.27E+01	1.80E-01	1.50E+01	J	J
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.70E+00	6.30E-02	3.60E+00	J	J	6.60E+03	1.00E+00	1.40E+01		J	7.60E+00	1.70E-01	1.40E+01	J	J

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Magnesium					Manganese					Mercury				
				mg/kg					mg/kg					mg/kg				
				7439-95-4					7439-96-5					7439-97-6				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	8.71E+02	1.50E+00	7.60E+02		J	1.19E+02	2.40E-02	2.30E+00			2.70E-02	2.60E-03	1.20E-01	J	J
BKG-SD02	BKG-SD02	16-Mar-04	REG	7.17E+01	1.40E+00	6.90E+02	J	J	2.58E+01	2.20E-02	2.10E+00			4.80E-03	2.50E-03	1.20E-01	J	J
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	2.61E+03	1.60E+00	7.90E+02		J	5.68E+02	2.50E-02	2.40E+00			2.20E-02	2.80E-03	1.30E-01	J	J
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.82E+02	1.20E+00	6.00E+02	J	J,H	3.20E+02	1.90E-02	1.80E+00		J	1.40E-02	2.40E-03	1.10E-01	J	J
BKG-SD06	BKG-SD06	15-Mar-04	REG	5.99E+01	1.30E+00	6.50E+02	J	J,H	1.88E+01	2.10E-02	2.00E+00		J	2.30E-03	2.30E-03	1.10E-01	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	9.92E+01	1.30E+00	6.60E+02	J	J,H	1.34E+02	2.10E-02	2.00E+00		J	2.20E-02	2.40E-03	1.10E-01	J	J
BKG-SD08	BKG-SD08	15-Mar-04	REG	8.26E+02	1.40E+00	7.10E+02		J,H	9.21E+02	2.30E-02	2.10E+00		J	4.20E-02	2.50E-03	1.10E-01	J	J
BKG-SD09	BKG-SD09	15-Mar-04	REG	8.90E+02	1.60E+00	8.10E+02		J,H	1.10E+03	2.60E-02	2.40E+00		J	4.20E-02	3.00E-03	1.40E-01	J	J
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	8.44E+02	1.40E+00	7.10E+02		J,H	7.13E+02	2.30E-02	2.10E+00		J	3.70E-02	2.50E-03	1.20E-01	J	J
BKG-SD10	BKG-SD10	15-Mar-04	REG	3.86E+02	1.30E+00	6.80E+02	J	J,H	2.20E+02	2.20E-02	2.00E+00		J	8.20E-03	2.30E-03	1.10E-01	J	J
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.43E+02	1.30E+00	6.70E+02	J	J,H	1.78E+02	2.10E-02	2.00E+00		J	4.80E-02	2.50E-03	1.10E-01	J	J
BKG-SD12	BKG-SD12	14-Mar-04	REG	6.88E+01	1.50E+00	7.60E+02	J	J,H	1.69E+01	2.40E-02	2.30E+00		J	1.20E-02	2.80E-03	1.30E-01	J	J
BKG-SD13	BKG-SD13	14-Mar-04	REG	6.39E+02	1.40E+00	7.30E+02	J	J,H	2.82E+02	2.30E-02	2.20E+00		J	4.10E-02	2.80E-03	1.30E-01	J	J
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.99E+02	1.40E+00	7.10E+02	J	J,H	3.22E+02	2.30E-02	2.10E+00		J	2.90E-02	2.50E-03	1.10E-01	J	J

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Molybdenum					Nickel					Potassium				
				mg/kg					mg/kg					mg/kg				
				7439-98-7					7440-02-0					2023695				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.10E-01	1.10E-01	7.60E+00	U	U	1.06E+01	1.70E-01	6.00E+00			3.46E+02	2.10E+00	7.60E+02	J	J
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.00E-01	1.00E-01	6.90E+00	U	U	7.50E-01	1.50E-01	5.50E+00	J	J	4.25E+01	1.90E+00	6.90E+02	J	J
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.20E-01	1.20E-01	7.90E+00	U	U	3.78E+01	1.70E-01	6.30E+00			5.07E+02	2.20E+00	7.90E+02	J	J
BKG-SD05	BKG-SD05	15-Mar-04	REG	8.90E-02	8.90E-02	6.00E+00	U	U	2.50E+00	1.30E-01	4.80E+00	J	J	2.34E+02	1.60E+00	6.00E+02	J	J
BKG-SD06	BKG-SD06	15-Mar-04	REG	9.80E-02	9.80E-02	6.50E+00	U	U	6.80E-01	1.40E-01	5.20E+00	J	J	4.96E+01	1.80E+00	6.50E+02	J	J
BKG-SD07	BKG-SD07	15-Mar-04	REG	9.80E-02	9.80E-02	6.60E+00	U	U	1.00E+00	1.40E-01	5.20E+00	J	J	3.58E+01	1.80E+00	6.60E+02	J	J
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.10E-01	1.10E-01	7.10E+00	U	U	7.70E+00	1.60E-01	5.60E+00			3.09E+02	1.90E+00	7.10E+02	J	J
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.60E+00	1.20E-01	8.10E+00	J	J	8.30E+00	1.80E-01	6.50E+00			3.67E+02	2.20E+00	8.10E+02	J	J
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.10E-01	1.10E-01	7.10E+00	U	U	7.30E+00	1.60E-01	5.70E+00			2.93E+02	2.00E+00	7.10E+02	J	J
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.00E-01	1.00E-01	6.80E+00	U	U	4.20E+00	1.50E-01	5.40E+00	J	J	2.71E+02	1.90E+00	6.80E+02	J	J
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.00E-01	1.00E-01	6.70E+00	U	U	3.70E+00	1.50E-01	5.30E+00	J	J	1.80E+02	1.80E+00	6.70E+02	J	J
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.10E-01	1.10E-01	7.60E+00	U	U	8.10E-01	1.70E-01	6.00E+00	J	J	6.01E+01	2.10E+00	7.60E+02	J	J
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.10E-01	1.10E-01	7.30E+00	U	U	1.10E+01	1.60E-01	5.80E+00			2.83E+02	2.00E+00	7.30E+02	J	J
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.10E-01	1.10E-01	7.10E+00	U	U	4.00E+00	1.60E-01	5.70E+00	J	J	2.13E+02	2.00E+00	7.10E+02	J	J

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Selenium					Silver					Sodium				
				mg/kg					mg/kg					mg/kg				
				7782-49-2					7440-22-4					7440-23-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	4.10E+00	3.00E-01	1.50E+01	J	J	9.10E-02	9.10E-02	1.50E+00	U	U	2.20E+01	2.20E+01	7.60E+02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	7.70E-01	2.70E-01	1.40E+01	J	J	8.20E-02	8.20E-02	1.40E+00	U	U	2.00E+01	2.00E+01	6.90E+02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	4.10E+00	3.20E-01	1.60E+01	J	J	9.50E-02	9.50E-02	1.60E+00	U	U	7.02E+01	2.30E+01	7.90E+02	J	J
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.20E+00	2.40E-01	1.20E+01	J	J	7.10E-02	7.10E-02	1.20E+00	U	U	1.70E+01	1.70E+01	6.00E+02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.60E-01	2.60E-01	1.30E+01	U	U	7.80E-02	7.80E-02	1.30E+00	U	U	1.90E+01	1.90E+01	6.50E+02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.90E-01	2.60E-01	1.30E+01	J	J	7.90E-02	7.90E-02	1.30E+00	U	U	1.90E+01	1.90E+01	6.60E+02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.10E+00	2.80E-01	1.40E+01	J	J	8.50E-02	8.50E-02	1.40E+00	U	U	5.15E+01	2.00E+01	7.10E+02	J	J
BKG-SD09	BKG-SD09	15-Mar-04	REG	2.40E+00	3.20E-01	1.60E+01	J	J	9.70E-02	9.70E-02	1.60E+00	U	U	2.40E+01	2.40E+01	8.10E+02	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.60E+00	2.80E-01	1.40E+01	J	J	8.50E-02	8.50E-02	1.40E+00	U	U	5.84E+01	2.10E+01	7.10E+02	J	J
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.60E+00	2.70E-01	1.40E+01	J	J	8.10E-02	8.10E-02	1.40E+00	U	U	2.00E+01	2.00E+01	6.80E+02	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	9.30E-01	2.70E-01	1.30E+01	J	J	8.00E-02	8.00E-02	1.30E+00	U	U	1.90E+01	1.90E+01	6.70E+02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-01	3.00E-01	1.50E+01	U	U	9.10E-02	9.10E-02	1.50E+00	U	U	2.20E+01	2.20E+01	7.60E+02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	8.60E+00	2.90E-01	1.50E+01	J	J	8.80E-02	8.80E-02	1.50E+00	U	U	2.10E+01	2.10E+01	7.30E+02	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.10E+00	2.90E-01	1.40E+01	J	J	8.60E-02	8.60E-02	1.40E+00	U	U	2.10E+01	2.10E+01	7.10E+02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Strontium					Thallium					Tin				
				mg/kg					mg/kg					mg/kg				
				7440-24-6					7440-28-0					7440-31-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.14E+01	4.30E-02	1.40E+00			4.60E+00	4.60E+00	6.00E+00	U	U	2.30E-01	2.30E-01	7.60E+00	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.40E+00	4.50E-02	1.50E+00	J	J	2.10E-01	2.10E-01	1.40E+00	U	U	2.10E-01	2.10E-01	6.90E+00	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.21E+01	5.10E-02	1.70E+00			4.80E+00	4.80E+00	6.40E+00	U	U	2.40E-01	2.40E-01	7.90E+00	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	6.20E+00	3.80E-02	1.30E+00			7.20E+00	7.20E+00	1.20E+01	U	U	1.80E-01	1.80E-01	6.00E+00	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.20E+00	4.10E-02	1.40E+00			2.00E-01	2.00E-01	1.30E+00	U	U	2.00E-01	2.00E-01	6.50E+00	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	7.80E+00	3.90E-02	1.30E+00			2.00E+00	2.00E+00	2.60E+00	U	U	2.00E-01	2.00E-01	6.60E+00	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.79E+01	4.30E-02	1.40E+00			2.10E-01	2.10E-01	1.40E+00	U	U	2.10E-01	2.10E-01	7.10E+00	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.77E+01	4.90E-02	1.60E+00			2.40E-01	2.40E-01	1.60E+00	U	U	2.40E-01	2.40E-01	8.10E+00	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.96E+01	4.40E-02	1.50E+00			4.20E+00	4.20E+00	5.60E+00	U	U	2.10E-01	2.10E-01	7.10E+00	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.03E+01	4.10E-02	1.40E+00			4.00E+00	4.00E+00	5.60E+00	U	U	2.00E-01	2.00E-01	6.80E+00	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	6.30E+00	4.10E-02	1.40E+00			4.00E+00	4.00E+00	5.20E+00	U	U	2.00E-01	2.00E-01	6.70E+00	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	8.10E+00	4.40E-02	1.50E+00			4.60E+00	4.60E+00	6.00E+00	U	U	2.30E-01	2.30E-01	7.60E+00	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.43E+01	4.40E-02	1.50E+00			4.40E+00	4.40E+00	6.00E+00	U	U	2.20E-01	2.20E-01	7.30E+00	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	6.10E+00	4.10E-02	1.40E+00			4.20E+00	4.20E+00	5.60E+00	U	U	2.10E-01	2.10E-01	7.10E+00	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Metals

				Vanadium					Zinc				
				mg/kg					mg/kg				
				7440-62-2					7440-66-6				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.84E+01	7.10E-02	7.60E+00			3.30E+01	8.90E-02	3.00E+00		
BKG-SD02	BKG-SD02	16-Mar-04	REG	6.00E+00	6.50E-02	6.90E+00	J	J	3.10E+00	8.10E-02	2.70E+00		
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.02E+01	7.40E-02	7.90E+00			5.12E+01	9.30E-02	3.20E+00		
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.31E+01	5.60E-02	6.00E+00		J	9.10E+00	7.00E-02	2.40E+00		
BKG-SD06	BKG-SD06	15-Mar-04	REG	4.20E+00	6.10E-02	6.50E+00	J	J	2.80E+00	7.70E-02	2.60E+00		
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.11E+01	6.20E-02	6.60E+00		J	4.60E+00	7.70E-02	2.60E+00		
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.73E+01	6.60E-02	7.10E+00		J	1.89E+01	8.30E-02	2.80E+00		
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.33E+01	7.60E-02	8.10E+00		J	2.46E+01	9.60E-02	3.20E+00		
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.22E+01	6.70E-02	7.10E+00		J	2.55E+01	8.40E-02	2.80E+00		
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.25E+01	6.40E-02	6.80E+00		J	1.37E+01	8.00E-02	2.70E+00		
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.15E+01	6.30E-02	6.70E+00		J	6.20E+00	7.90E-02	2.70E+00		
BKG-SD12	BKG-SD12	14-Mar-04	REG	4.40E+00	7.10E-02	7.60E+00	J	J	3.10E+00	8.90E-02	3.00E+00		
BKG-SD13	BKG-SD13	14-Mar-04	REG	5.54E+01	6.90E-02	7.30E+00		J	1.74E+01	8.60E-02	2.90E+00		
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.62E+01	6.70E-02	7.10E+00		J	1.04E+01	8.40E-02	2.90E+00		

FD - field duplicate
H - high bias to estimate (see Shaw, 2004b)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory.
REG - regular sample
RLimit - analytical reporting limit reported by laboratory.
U = undetected concentration.
VQ - data qualifier applied during data validation with same meanings as LQ.
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Anions

				Bromide					Chloride					Cyanide, Total				
				mg/kg					mg/kg					mg/kg				
				24959-67-9					16887-00-6					57-12-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	3.70E+00	3.70E+00	7.40E+00	U	U	4.02E+01	1.50E+01	3.00E+01			4.20E-01	4.20E-01	6.20E-01	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	3.60E+00	3.60E+00	7.10E+00	U	U	3.84E+01	1.40E+01	2.90E+01			4.20E-01	4.20E-01	6.20E-01	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.90E+00	3.90E+00	7.90E+00	U	U	4.64E+01	1.60E+01	3.20E+01			4.70E-01	4.70E-01	7.10E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	3.20E+00	3.20E+00	6.40E+00	U	U	3.47E+01	1.30E+01	2.60E+01			3.50E-01	3.50E-01	5.30E-01	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	3.40E+00	3.40E+00	6.80E+00	U	U	3.55E+01	1.40E+01	2.70E+01			4.20E-01	4.20E-01	6.30E-01	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	3.20E+00	3.20E+00	6.40E+00	U	U	3.45E+01	1.30E+01	2.60E+01			4.10E-01	4.10E-01	6.10E-01	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	3.70E+00	3.70E+00	7.30E+00	U	U	4.26E+01	1.50E+01	2.90E+01			4.50E-01	4.50E-01	6.70E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	4.10E+00	4.10E+00	8.10E+00	U	U	4.85E+01	1.60E+01	3.20E+01			5.00E-01	5.00E-01	7.50E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	3.70E+00	3.70E+00	7.40E+00	U	U						4.50E-01	4.50E-01	6.70E-01	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	3.40E+00	3.40E+00	6.80E+00	U	U	3.92E+01	1.40E+01	2.70E+01			3.70E-01	3.70E-01	5.60E-01	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	3.40E+00	3.40E+00	6.80E+00	U	U	3.66E+01	1.40E+01	2.70E+01			3.30E-01	3.30E-01	5.00E-01	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.70E+00	3.70E+00	7.40E+00	U	U	4.12E+01	1.50E+01	3.00E+01			4.30E-01	4.30E-01	6.40E-01	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.70E+00	3.70E+00	7.30E+00	U	U	4.06E+01	1.50E+01	2.90E+01			4.60E-01	4.60E-01	6.80E-01	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	3.50E+00	3.50E+00	7.00E+00	U	U	3.85E+01	1.40E+01	2.80E+01			4.40E-01	4.40E-01	6.50E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Anions

				Fluoride, Total					Nitrate					Nitrite				
				mg/kg					mg/kg					mg/kg				
				16984-48-8					14797-55-8					14797-65-0				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.40E+00	7.40E-01	1.50E+00		J,H	7.40E-01	7.40E-01	1.50E+00	U	U	7.40E-01	7.40E-01	1.50E+00	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.30E+00	7.10E-01	1.40E+00	J	J,H	1.60E+00	7.10E-01	1.40E+00			7.10E-01	7.10E-01	1.40E+00	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.80E+00	7.90E-01	1.60E+00		J,H	7.90E-01	7.90E-01	1.60E+00	U	U	7.90E-01	7.90E-01	1.60E+00	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.70E+00	6.50E-01	1.30E+00		J,H	6.50E-01	6.50E-01	1.30E+00	U	U	6.50E-01	6.50E-01	1.30E+00	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	9.50E-01	6.80E-01	1.40E+00	J	J,H	6.80E-01	6.80E-01	1.40E+00	U	U	6.80E-01	6.80E-01	1.40E+00	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.20E+00	6.40E-01	1.30E+00	J	J,H	7.70E-01	6.40E-01	1.30E+00	J	J	6.40E-01	6.40E-01	1.30E+00	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.60E+00	7.30E-01	1.50E+00		J,H	7.30E-01	7.30E-01	1.50E+00	U	U	7.30E-01	7.30E-01	1.50E+00	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	2.60E+00	8.10E-01	1.60E+00		J,H	8.10E-01	8.10E-01	1.60E+00	U	U	8.10E-01	8.10E-01	1.60E+00	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.20E+00	7.40E-01	1.50E+00		J,H	8.90E-01	7.40E-01	1.50E+00	J	J	7.40E-01	7.40E-01	1.50E+00	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.40E+00	6.80E-01	1.40E+00		J,H	6.80E-01	6.80E-01	1.40E+00	U	U	6.80E-01	6.80E-01	1.40E+00	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.40E+00	6.80E-01	1.40E+00		J,H	6.80E-01	6.80E-01	1.40E+00	U	U	6.80E-01	6.80E-01	1.40E+00	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.30E+00	7.40E-01	1.50E+00	J	J,H	7.40E-01	7.40E-01	1.50E+00	U	U	7.40E-01	7.40E-01	1.50E+00	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	2.60E+00	7.30E-01	1.50E+00		J,H	7.30E-01	7.30E-01	1.50E+00	U	U	7.30E-01	7.30E-01	1.50E+00	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.70E+00	7.00E-01	1.40E+00		J,H	7.00E-01	7.00E-01	1.40E+00	U	U	7.00E-01	7.00E-01	1.40E+00	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Anions

				Perchlorate					Sulfate				
				mg/kg					mg/kg				
				14797-73-0					14808-79-8				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	7.40E-02	7.40E-02	1.50E-01	U	U	3.70E+01	1.50E+01	3.00E+01		
BKG-SD02	BKG-SD02	16-Mar-04	REG	7.10E-02	7.10E-02	1.40E-01	U	U	3.49E+01	1.40E+01	2.90E+01		
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	7.90E-02	7.90E-02	1.60E-01	U	U	4.87E+01	1.60E+01	3.20E+01		
BKG-SD05	BKG-SD05	15-Mar-04	REG	6.40E-02	6.40E-02	1.30E-01	U	U	4.61E+01	1.30E+01	2.60E+01		
BKG-SD06	BKG-SD06	15-Mar-04	REG	6.80E-02	6.80E-02	1.40E-01	U	U	8.47E+01	1.40E+01	2.70E+01		
BKG-SD07	BKG-SD07	15-Mar-04	REG	6.40E-02	6.40E-02	1.30E-01	U	U	3.25E+01	1.30E+01	2.60E+01		
BKG-SD08	BKG-SD08	15-Mar-04	REG	7.30E-02	7.30E-02	1.50E-01	U	U	7.93E+01	1.50E+01	2.90E+01		
BKG-SD09	BKG-SD09	15-Mar-04	REG	8.10E-02	8.10E-02	1.60E-01	U	U	6.35E+01	1.60E+01	3.20E+01		
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	7.40E-02	7.40E-02	1.50E-01	U	U	4.63E+01	1.50E+01	3.00E+01		
BKG-SD10	BKG-SD10	15-Mar-04	REG	6.80E-02	6.80E-02	1.40E-01	U	U	6.11E+01	1.40E+01	2.70E+01		
BKG-SD11	BKG-SD11	14-Mar-04	REG	6.80E-02	6.80E-02	1.40E-01	U	U	4.04E+01	1.40E+01	2.70E+01		
BKG-SD12	BKG-SD12	14-Mar-04	REG	7.40E-02	7.40E-02	1.50E-01	U	U	3.62E+01	1.50E+01	3.00E+01		
BKG-SD13	BKG-SD13	14-Mar-04	REG	7.30E-02	7.30E-02	1.50E-01	U	U	3.66E+01	1.50E+01	2.90E+01		
BKG-SD14	BKG-SD14	14-Mar-04	REG	7.00E-02	7.00E-02	1.40E-01	U	U	3.64E+01	1.40E+01	2.80E+01		

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)					1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)					1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)				
				mg/kg					mg/kg					mg/kg				
				67562-39-4					35822-46-9					55673-89-7				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	0.00000023	0.000000131	0.0000025		J	4.14E-06	2.42E-07	2.50E-06			1.91E-07	1.91E-07	2.50E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	0.000000247	0.000000132	0.0000025		J,H	2.71E-06	1.86E-07	2.50E-06			1.94E-07	1.94E-07	2.50E-06	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	0.000004183	0.00000013	0.0000025			1.45E-05	1.62E-07	2.50E-06			1.90E-07	1.90E-07	2.50E-06	U	U
BKG-SD04	BKG-SD04	16-Mar-04	REG	0.000000114	0.000000114	0.0000025	U	U	6.35E-06	2.30E-07	2.50E-06		J,H	1.67E-07	1.67E-07	2.50E-06	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	0.000000349	0.000000349	0.0000025	U	U	3.15E-06	5.44E-07	2.50E-06			4.88E-07	4.88E-07	2.50E-06	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	0.000000251	0.000000251	0.0000025	U	U	2.14E-06	2.19E-07	2.50E-06		J	3.51E-07	3.51E-07	2.50E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	0.00000022	0.00000022	0.0000025	U	U	1.88E-06	2.38E-07	2.50E-06		J	3.07E-07	3.07E-07	2.50E-06	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	0.000000231	0.000000231	0.0000025	U	U	1.05E-05	3.11E-07	2.50E-06			3.22E-07	3.22E-07	2.50E-06	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	0.000000962	0.000000157	0.0000025		J	2.69E-05	2.83E-07	2.50E-06			2.30E-07	2.30E-07	2.50E-06	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	0.000000271	0.000000113	0.0000025		J	9.04E-06	1.38E-07	2.50E-06			1.65E-07	1.65E-07	2.50E-06	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	0.000000328	0.000000167	0.0000025		J,H	1.03E-05	2.95E-07	2.50E-06			2.44E-07	2.44E-07	2.50E-06	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	0.000000208	0.000000208	0.0000025	U	U	4.31E-06	3.13E-07	2.50E-06			3.16E-07	3.16E-07	2.50E-06	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	0.000000847	0.000000267	0.0000025		J	8.87E-06	3.76E-07	2.50E-06			4.06E-07	4.06E-07	2.50E-06	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	0.000002383	0.000000388	0.0000025		J	1.98E-05	4.13E-07	2.50E-06			5.42E-07	5.42E-07	2.50E-06	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	0.000000267	0.000000267	0.0000025	U	U	2.48E-06	3.20E-07	2.50E-06			4.06E-07	4.06E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)					1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)					1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)				
				mg/kg					mg/kg					mg/kg				
				39227-28-6					70648-26-9					57653-85-7				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.43E-07	1.43E-07	2.50E-06	U	U	7.40E-08	7.40E-08	2.50E-06	U	U	1.43E-07	1.43E-07	2.50E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.90E-08	9.90E-08	2.50E-06	U	U	1.66E-07	6.80E-08	2.50E-06		J,H	9.90E-08	9.90E-08	2.50E-06	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	9.70E-08	9.70E-08	2.50E-06	U	U	1.17E-06	1.02E-07	2.50E-06		J	4.98E-07	9.70E-08	2.50E-06		J
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.22E-07	1.22E-07	2.50E-06	U	U	9.60E-08	9.60E-08	2.50E-06	U	U	1.22E-07	1.22E-07	2.50E-06	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	4.76E-07	4.76E-07	2.50E-06	U	U	1.52E-07	1.52E-07	2.50E-06	U	U	4.21E-07	4.21E-07	2.50E-06	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.64E-07	1.64E-07	2.50E-06	U	U	1.13E-07	1.13E-07	2.50E-06	U	U	1.45E-07	1.45E-07	2.50E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.29E-07	1.29E-07	2.50E-06	U	U	1.22E-07	1.22E-07	2.50E-06	U	U	1.14E-07	1.14E-07	2.50E-06	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.12E-07	2.12E-07	2.50E-06	U	U	1.52E-07	1.52E-07	2.50E-06	U	U	1.88E-07	1.88E-07	2.50E-06	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.85E-07	1.85E-07	2.50E-06	U	U	2.98E-07	9.30E-08	2.50E-06		J	1.85E-07	1.85E-07	2.50E-06	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.19E-07	1.19E-07	2.50E-06	U	U	7.50E-08	7.50E-08	2.50E-06	U	U	1.19E-07	1.19E-07	2.50E-06	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.77E-07	1.77E-07	2.50E-06	U	U	8.60E-08	8.60E-08	2.50E-06	U	U	1.77E-07	1.77E-07	2.50E-06	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.67E-07	2.67E-07	2.50E-06	U	U	1.03E-07	1.03E-07	2.50E-06	U	U	2.36E-07	2.36E-07	2.50E-06	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.54E-07	3.54E-07	2.50E-06	U	U	2.08E-07	2.08E-07	2.50E-06	U	U	3.13E-07	3.13E-07	2.50E-06	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	2.13E-07	2.13E-07	2.50E-06	U	U	4.87E-07	2.05E-07	2.50E-06		J	8.60E-07	1.89E-07	2.50E-06		J
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.23E-07	2.23E-07	2.50E-06	U	U	1.43E-07	1.43E-07	2.50E-06	U	U	1.97E-07	1.97E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)					1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)					1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)				
				mg/kg					mg/kg					mg/kg				
				57117-44-9					19408-74-3					72918-21-9				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	7.50E-08	7.50E-08	2.50E-06	U	U	1.49E-07	1.49E-07	2.50E-06	U	U	9.70E-08	9.70E-08	2.50E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	6.90E-08	6.90E-08	2.50E-06	U	U	1.04E-07	1.04E-07	2.50E-06	U	U	8.80E-08	8.80E-08	2.50E-06	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	1.04E-07	1.04E-07	2.50E-06	U	U	1.01E-07	1.01E-07	2.50E-06	U	U	1.34E-07	1.34E-07	2.50E-06	U	U
BKG-SD04	BKG-SD04	16-Mar-04	REG	9.80E-08	9.80E-08	2.50E-06	U	U	1.27E-07	1.27E-07	2.50E-06	U	U	1.26E-07	1.26E-07	2.50E-06	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.52E-07	1.52E-07	2.50E-06	U	U	4.30E-07	4.30E-07	2.50E-06	U	U	1.95E-07	1.95E-07	2.50E-06	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.13E-07	1.13E-07	2.50E-06	U	U	1.49E-07	1.49E-07	2.50E-06	U	U	1.45E-07	1.45E-07	2.50E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.22E-07	1.22E-07	2.50E-06	U	U	1.17E-07	1.17E-07	2.50E-06	U	U	1.56E-07	1.56E-07	2.50E-06	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.52E-07	1.52E-07	2.50E-06	U	U	4.15E-07	1.92E-07	2.50E-06		J	1.95E-07	1.95E-07	2.50E-06	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	9.40E-08	9.40E-08	2.50E-06	U	U	1.93E-07	1.93E-07	2.50E-06	U	U	1.21E-07	1.21E-07	2.50E-06	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	7.60E-08	7.60E-08	2.50E-06	U	U	1.24E-07	1.24E-07	2.50E-06	U	U	9.80E-08	9.80E-08	2.50E-06	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	8.70E-08	8.70E-08	2.50E-06	U	U	1.85E-07	1.85E-07	2.50E-06	U	U	1.13E-07	1.13E-07	2.50E-06	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.03E-07	1.03E-07	2.50E-06	U	U	2.52E-07	2.52E-07	2.50E-06	U	U	1.36E-07	1.36E-07	2.50E-06	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.07E-07	2.07E-07	2.50E-06	U	U	3.35E-07	3.35E-07	2.50E-06	U	U	2.74E-07	2.74E-07	2.50E-06	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	4.96E-07	2.05E-07	2.50E-06		J	1.93E-07	1.93E-07	2.50E-06	U	U	2.63E-07	2.63E-07	2.50E-06	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.42E-07	1.42E-07	2.50E-06	U	U	2.11E-07	2.11E-07	2.50E-06	U	U	1.88E-07	1.88E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)					1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)					2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)				
				mg/kg					mg/kg					mg/kg				
				40321-76-4					57117-41-6					60851-34-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.78E-07	1.78E-07	2.50E-06	U	U	9.70E-08	9.70E-08	2.50E-06	U	U	8.10E-08	8.10E-08	2.50E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.35E-07	1.35E-07	2.50E-06	U	U	8.60E-08	8.60E-08	2.50E-06	U	U	7.40E-08	7.40E-08	2.50E-06	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	2.69E-07	2.69E-07	2.50E-06	U	U	1.58E-07	1.58E-07	2.50E-06	U	U	1.12E-07	1.12E-07	2.50E-06	U	U
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.50E-07	1.50E-07	2.50E-06	U	U	7.10E-08	7.10E-08	2.50E-06	U	U	1.06E-07	1.06E-07	2.50E-06	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.88E-07	2.88E-07	2.50E-06	U	U	1.88E-07	1.88E-07	2.50E-06	U	U	1.70E-07	1.70E-07	2.50E-06	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.34E-07	1.34E-07	2.50E-06	U	U	1.21E-07	1.21E-07	2.50E-06	U	U	1.26E-07	1.26E-07	2.50E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.61E-07	1.61E-07	2.50E-06	U	U	1.16E-07	1.16E-07	2.50E-06	U	U	1.36E-07	1.36E-07	2.50E-06	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.95E-07	1.95E-07	2.50E-06	U	U	1.16E-07	1.16E-07	2.50E-06	U	U	1.70E-07	1.70E-07	2.50E-06	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.79E-07	1.79E-07	2.50E-06	U	U	1.08E-07	1.08E-07	2.50E-06	U	U	1.02E-07	1.02E-07	2.50E-06	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.50E-07	1.50E-07	2.50E-06	U	U	1.05E-07	1.05E-07	2.50E-06	U	U	8.20E-08	8.20E-08	2.50E-06	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.07E-07	2.07E-07	2.50E-06	U	U	1.14E-07	1.14E-07	2.50E-06	U	U	9.50E-08	9.50E-08	2.50E-06	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.99E-07	1.99E-07	2.50E-06	U	U	1.29E-07	1.29E-07	2.50E-06	U	U	1.14E-07	1.14E-07	2.50E-06	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.29E-07	2.29E-07	2.50E-06	U	U	2.05E-07	2.05E-07	2.50E-06	U	U	2.31E-07	2.31E-07	2.50E-06	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	2.55E-07	2.55E-07	2.50E-06	U	U	1.62E-07	1.62E-07	2.50E-06	U	U	8.98E-07	2.29E-07	2.50E-06		J
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.01E-07	2.01E-07	2.50E-06	U	U	1.50E-07	1.50E-07	2.50E-06	U	U	1.58E-07	1.58E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)					2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)					2,3,7,8-Tetrachlorodibenzofuran (TCDF)				
				mg/kg					mg/kg					mg/kg				
				57117-31-4					1746-01-6					51207-31-9				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.00E-07	1.00E-07	2.50E-06	U	U	1.26E-07	1.26E-07	1.00E-06	U	U	1.31E-07	1.31E-07	1.00E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	8.80E-08	8.80E-08	2.50E-06	U	U	8.50E-08	8.50E-08	1.00E-06	U	U	1.19E-07	1.19E-07	1.00E-06	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	1.62E-07	1.62E-07	2.50E-06	U	U	7.90E-08	7.90E-08	1.00E-06	U	U	7.50E-08	7.50E-08	1.00E-06	U	U
BKG-SD04	BKG-SD04	16-Mar-04	REG	7.30E-08	7.30E-08	2.50E-06	U	U	1.02E-07	1.02E-07	1.00E-06	U	U	9.00E-08	9.00E-08	1.00E-06	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.89E-07	1.89E-07	2.50E-06	U	U	1.95E-07	1.95E-07	1.00E-06	U	U	2.41E-07	2.41E-07	1.00E-06	U	UJ,L
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.22E-07	1.22E-07	2.50E-06	U	U	9.20E-08	9.20E-08	1.00E-06	U	U	1.25E-07	1.25E-07	1.00E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.17E-07	1.17E-07	2.50E-06	U	U	8.80E-08	8.80E-08	1.00E-06	U	U	9.20E-08	9.20E-08	1.00E-06	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.17E-07	1.17E-07	2.50E-06	U	U	1.51E-07	1.51E-07	1.00E-06	U	U	1.39E-07	1.39E-07	1.00E-06	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.11E-07	1.11E-07	2.50E-06	U	U	1.35E-07	1.35E-07	1.00E-06	U	U	1.64E-07	1.64E-07	1.00E-06	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.07E-07	1.07E-07	2.50E-06	U	U	1.02E-07	1.02E-07	1.00E-06	U	U	1.17E-07	1.17E-07	1.00E-06	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.16E-07	1.16E-07	2.50E-06	U	U	1.17E-07	1.17E-07	1.00E-06	U	U	1.26E-07	1.26E-07	1.00E-06	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.27E-07	1.27E-07	2.50E-06	U	U	1.61E-07	1.61E-07	1.00E-06	U	U	1.86E-07	1.86E-07	1.00E-06	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.00E-07	2.00E-07	2.50E-06	U	U	2.17E-07	2.17E-07	1.00E-06	U	U	1.74E-07	1.74E-07	1.00E-06	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.63E-07	1.63E-07	2.50E-06	U	U	1.35E-07	1.35E-07	1.00E-06	U	U	1.05E-07	1.05E-07	1.00E-06	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.46E-07	1.46E-07	2.50E-06	U	U	1.36E-07	1.36E-07	1.00E-06	U	U	1.59E-07	1.59E-07	1.00E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				Heptachlorodibenzo-p-dioxins (HpCDD), Total					Heptachlorodibenzofurans (HpCDF), Total					Hexachlorodibenzo-p-dioxins (HxCDD), Total				
				mg/kg					mg/kg					mg/kg				
				37871-00-4					38998-75-3					34465-46-8				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.06E-05	2.42E-07	2.50E-06			2.30E-07	1.31E-07	2.50E-06			1.43E-07	1.43E-07	2.50E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	7.02E-06	1.86E-07	2.50E-06			4.94E-07	1.32E-07	2.50E-06			7.84E-07	9.90E-08	2.50E-06		
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	2.71E-05	1.62E-07	2.50E-06			1.54E-05	1.30E-07	2.50E-06			1.83E-06	9.70E-08	2.50E-06		
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.34E-05	2.30E-07	2.50E-06			1.14E-07	1.14E-07	2.50E-06	U	U	1.54E-06	1.22E-07	2.50E-06		
BKG-SD05	BKG-SD05	15-Mar-04	REG	7.49E-06	5.44E-07	2.50E-06			3.49E-07	3.49E-07	2.50E-06	U	U	4.76E-07	4.76E-07	2.50E-06	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	5.12E-06	2.19E-07	2.50E-06			2.51E-07	2.51E-07	2.50E-06	U	U	1.64E-07	1.64E-07	2.50E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	4.78E-06	2.38E-07	2.50E-06			2.20E-07	2.20E-07	2.50E-06	U	U	3.53E-07	1.29E-07	2.50E-06		
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.59E-05	3.11E-07	2.50E-06			2.31E-07	2.31E-07	2.50E-06	U	U	2.40E-06	2.12E-07	2.50E-06		
BKG-SD09	BKG-SD09	15-Mar-04	REG	6.90E-05	2.83E-07	2.50E-06			9.62E-07	1.57E-07	2.50E-06			7.43E-06	1.85E-07	2.50E-06		
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.44E-05	1.38E-07	2.50E-06			2.71E-07	1.13E-07	2.50E-06			2.68E-06	1.19E-07	2.50E-06		
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.64E-05	2.95E-07	2.50E-06			1.67E-07	1.67E-07	2.50E-06	U	U	1.06E-06	1.77E-07	2.50E-06		
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.07E-05	3.13E-07	2.50E-06			2.08E-07	2.08E-07	2.50E-06	U	U	1.29E-06	2.67E-07	2.50E-06		
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.38E-05	3.76E-07	2.50E-06			1.99E-06	2.67E-07	2.50E-06			2.46E-06	3.54E-07	2.50E-06		
BKG-SD13	BKG-SD13	14-Mar-04	REG	5.33E-05	4.13E-07	2.50E-06			5.75E-06	3.88E-07	2.50E-06			6.41E-06	2.13E-07	2.50E-06		
BKG-SD14	BKG-SD14	14-Mar-04	REG	6.77E-06	3.20E-07	2.50E-06			2.67E-07	2.67E-07	2.50E-06	U	U	2.23E-07	2.23E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				Hexachlorodibenzofurans (HxCDF), Total					OCDD					Octachlorodibenzofuran (OCDF)				
				mg/kg					mg/kg					mg/kg				
				55684-94-1					3268-87-9					39001-02-0				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	7.40E-08	7.40E-08	2.50E-06	U	U	6.21E-04	3.67E-07	5.00E-06		J,L	4.99E-07	4.99E-07	5.00E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	5.29E-07	6.80E-08	2.50E-06			1.90E-04	5.44E-07	5.00E-06		J,L	6.70E-07	6.70E-07	5.00E-06	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	9.37E-06	1.02E-07	2.50E-06			3.48E-04	4.93E-07	5.00E-06		J,L	4.35E-06	3.77E-07	5.00E-06		J,H
BKG-SD04	BKG-SD04	16-Mar-04	REG	9.60E-08	9.60E-08	2.50E-06	U	U	1.23E-03	3.27E-07	5.00E-06		J,L	3.24E-07	3.24E-07	5.00E-06	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.52E-07	1.52E-07	2.50E-06	U	U	1.23E-04	1.20E-06	5.00E-06		J,L	1.32E-06	1.32E-06	5.00E-06	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.13E-07	1.13E-07	2.50E-06	U	U	8.71E-05	4.92E-07	5.00E-06		J,L	5.23E-07	5.23E-07	5.00E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.22E-07	1.22E-07	2.50E-06	U	U	7.33E-05	4.33E-07	5.00E-06		J,L	4.44E-07	4.44E-07	5.00E-06	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.52E-07	1.52E-07	2.50E-06	U	U	5.37E-04	3.66E-07	5.00E-06		J,L	3.81E-07	3.81E-07	5.00E-06	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.10E-06	9.30E-08	2.50E-06			1.45E-03	3.07E-07	5.00E-06		J	2.42E-06	3.96E-07	5.00E-06		J,H
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	7.50E-08	7.50E-08	2.50E-06	U	U	5.15E-04	3.31E-07	5.00E-06			3.73E-07	3.73E-07	5.00E-06	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	8.60E-08	8.60E-08	2.50E-06	U	U	7.72E-04	4.57E-07	5.00E-06			4.85E-07	4.85E-07	5.00E-06	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.03E-07	1.03E-07	2.50E-06	U	U	2.18E-04	5.43E-07	5.00E-06		J,L	7.02E-07	7.02E-07	5.00E-06	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.06E-06	2.08E-07	2.50E-06			5.80E-04	5.43E-07	5.00E-06		J,L	1.96E-06	7.43E-07	5.00E-06		J
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.21E-05	2.05E-07	2.50E-06			2.10E-03	6.31E-07	5.00E-06		J,L	4.46E-06	6.03E-07	5.00E-06		
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.43E-07	1.43E-07	2.50E-06	U	U	8.25E-05	5.76E-07	5.00E-06		J,L	8.89E-07	8.89E-07	5.00E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				Pentachlorodibenzo-p-dioxin (PeCDD), Total					Pentachlorodibenzofurans (PeCDF), Total				
				mg/kg					mg/kg				
				36088-22-9					30402-15-4				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.78E-07	1.78E-07	2.50E-06	U	U	1.00E-07	1.00E-07	2.50E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.35E-07	1.35E-07	2.50E-06	U	U	8.80E-08	8.80E-08	2.50E-06	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	2.69E-07	2.69E-07	2.50E-06	U	U	9.17E-07	1.62E-07	2.50E-06		
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.50E-07	1.50E-07	2.50E-06	U	U	7.30E-08	7.30E-08	2.50E-06	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.88E-07	2.88E-07	2.50E-06	U	U	1.89E-07	1.89E-07	2.50E-06	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.34E-07	1.34E-07	2.50E-06	U	U	1.22E-07	1.22E-07	2.50E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.61E-07	1.61E-07	2.50E-06	U	U	1.17E-07	1.17E-07	2.50E-06	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.95E-07	1.95E-07	2.50E-06	U	U	1.17E-07	1.17E-07	2.50E-06	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.79E-07	1.79E-07	2.50E-06	U	U	1.11E-07	1.11E-07	2.50E-06	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.50E-07	1.50E-07	2.50E-06	U	U	1.07E-07	1.07E-07	2.50E-06	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.07E-07	2.07E-07	2.50E-06	U	U	1.16E-07	1.16E-07	2.50E-06	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.99E-07	1.99E-07	2.50E-06	U	U	1.27E-07	1.27E-07	2.50E-06	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.33E-07	2.29E-07	2.50E-06			1.60E-06	2.00E-07	2.50E-06		
BKG-SD13	BKG-SD13	14-Mar-04	REG	2.55E-07	2.55E-07	2.50E-06	U	U	1.62E-05	1.63E-07	2.50E-06		
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.01E-07	2.01E-07	2.50E-06	U	U	1.46E-07	1.46E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Dioxins/Furans

				Pentachlorodibenzo-p-dioxin (PeCDD), Total					Pentachlorodibenzofurans (PeCDF), Total				
				mg/kg					mg/kg				
				36088-22-9					30402-15-4				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.78E-07	1.78E-07	2.50E-06	U	U	1.00E-07	1.00E-07	2.50E-06	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.35E-07	1.35E-07	2.50E-06	U	U	8.80E-08	8.80E-08	2.50E-06	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	2.69E-07	2.69E-07	2.50E-06	U	U	9.17E-07	1.62E-07	2.50E-06		
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.50E-07	1.50E-07	2.50E-06	U	U	7.30E-08	7.30E-08	2.50E-06	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.88E-07	2.88E-07	2.50E-06	U	U	1.89E-07	1.89E-07	2.50E-06	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.34E-07	1.34E-07	2.50E-06	U	U	1.22E-07	1.22E-07	2.50E-06	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.61E-07	1.61E-07	2.50E-06	U	U	1.17E-07	1.17E-07	2.50E-06	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.95E-07	1.95E-07	2.50E-06	U	U	1.17E-07	1.17E-07	2.50E-06	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.79E-07	1.79E-07	2.50E-06	U	U	1.11E-07	1.11E-07	2.50E-06	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.50E-07	1.50E-07	2.50E-06	U	U	1.07E-07	1.07E-07	2.50E-06	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.07E-07	2.07E-07	2.50E-06	U	U	1.16E-07	1.16E-07	2.50E-06	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.99E-07	1.99E-07	2.50E-06	U	U	1.27E-07	1.27E-07	2.50E-06	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.33E-07	2.29E-07	2.50E-06			1.60E-06	2.00E-07	2.50E-06		
BKG-SD13	BKG-SD13	14-Mar-04	REG	2.55E-07	2.55E-07	2.50E-06	U	U	1.62E-05	1.63E-07	2.50E-06		
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.01E-07	2.01E-07	2.50E-06	U	U	1.46E-07	1.46E-07	2.50E-06	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Explosives

				1,3,5-Trinitrobenzene					1,3-Dinitrobenzene					2,4,6-Trinitrotoluene				
				mg/kg					mg/kg					mg/kg				
				99-35-4					99-65-0					118-96-7				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.40E-02	9.40E-02	2.30E-01	U	U	9.40E-02	9.40E-02	2.30E-01	U	U	9.40E-02	9.40E-02	2.30E-01	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	9.80E-02	9.80E-02	2.40E-01	U	U	9.80E-02	9.80E-02	2.40E-01	U	U	9.80E-02	9.80E-02	2.40E-01	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	9.20E-02	9.20E-02	2.30E-01	U	U	9.20E-02	9.20E-02	2.30E-01	U	U	9.20E-02	9.20E-02	2.30E-01	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Explosives

				2,4-Dinitrotoluene					2,6-Dinitrotoluene					2-Amino-4,6-dinitrotoluen				
				mg/kg					mg/kg					mg/kg				
				121-14-2					606-20-2					35572-78-2				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	1.20E-01	1.20E-01	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.40E-02	9.40E-02	2.30E-01	U	U	1.20E-01	1.20E-01	2.30E-01	U	U	9.40E-02	9.40E-02	2.30E-01	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.20E-01	1.20E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.30E-01	1.30E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	1.20E-01	1.20E-01	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	1.20E-01	1.20E-01	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-01	1.00E-01	2.50E-01	U	U	1.30E-01	1.30E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	9.80E-02	9.80E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.80E-02	9.80E-02	2.40E-01	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	9.20E-02	9.20E-02	2.30E-01	U	U	1.20E-01	1.20E-01	2.30E-01	U	U	9.20E-02	9.20E-02	2.30E-01	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	1.20E-01	1.20E-01	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Explosives

				4-Amino-2,6-dinitrotoluen					HMX					Nitrobenzene				
				mg/kg					mg/kg					mg/kg				
				19406-51-0					2691-41-0					98-95-3				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.40E-02	9.40E-02	2.30E-01	U	U	9.40E-02	9.40E-02	2.30E-01	U	U	9.40E-02	9.40E-02	2.30E-01	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	9.80E-02	9.80E-02	2.40E-01	U	U	9.80E-02	9.80E-02	2.40E-01	U	U	9.80E-02	9.80E-02	2.40E-01	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	9.20E-02	9.20E-02	2.30E-01	U	U	9.20E-02	9.20E-02	2.30E-01	U	U	9.20E-02	9.20E-02	2.30E-01	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Explosives

				RDX					Tetryl					m-Nitrotoluene				
				mg/kg					mg/kg					mg/kg				
				121-82-4					479-45-8					99-08-1				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.40E-02	9.40E-02	2.30E-01	U	U	9.40E-02	9.40E-02	2.30E-01	U	U	9.40E-02	9.40E-02	2.30E-01	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	9.80E-02	9.80E-02	2.40E-01	U	U	9.80E-02	9.80E-02	2.40E-01	U	U	9.80E-02	9.80E-02	2.40E-01	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	9.20E-02	9.20E-02	2.30E-01	U	U	9.20E-02	9.20E-02	2.30E-01	U	U	9.20E-02	9.20E-02	2.30E-01	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Explosives

				o-Nitrotoluene					p-Nitrotoluene				
				mg/kg					mg/kg				
				88-72-2					99-99-0				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.40E-02	9.40E-02	2.30E-01	U	U	9.40E-02	9.40E-02	2.30E-01	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	9.80E-02	9.80E-02	2.40E-01	U	U	9.80E-02	9.80E-02	2.40E-01	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	9.20E-02	9.20E-02	2.30E-01	U	U	9.20E-02	9.20E-02	2.30E-01	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.90E-02	9.90E-02	2.50E-01	U	U	9.90E-02	9.90E-02	2.50E-01	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U

FD - field duplicate
H - high bias to estimate (see Shaw, 2004b)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory.
REG - regular sample
RLimit - analytical reporting limit reported by laboratory.
U = undetected concentration.
VQ - data qualifier applied during data validation with same meanings as LQ.
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PAHs

				Acenaphthene					Acenaphthylene					Anthracene				
				mg/kg					mg/kg					mg/kg				
				83-32-9					208-96-8					120-12-7				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.40E-02	2.40E-02	9.50E-02	U	U	2.40E-02	2.40E-02	9.50E-02	U	U	1.20E-02	1.20E-02	9.50E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.30E-02	2.30E-02	9.10E-02	U	U	2.30E-02	2.30E-02	9.10E-02	U	U	1.10E-02	1.10E-02	9.10E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	2.50E-02	2.50E-02	1.00E-01	U	U	2.50E-02	2.50E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.10E-02	2.10E-02	8.40E-02	U	U	2.10E-02	2.10E-02	8.40E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.20E-02	2.20E-02	8.60E-02	U	U	2.20E-02	2.20E-02	8.60E-02	U	U	1.10E-02	1.10E-02	8.60E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.00E-02	2.00E-02	8.20E-02	U	U	2.00E-02	2.00E-02	8.20E-02	U	U	1.00E-02	1.00E-02	8.20E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.50E-02	2.50E-02	1.00E-01	U	U	2.50E-02	2.50E-02	1.00E-01	U	U	1.20E-02	1.20E-02	1.00E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	2.60E-02	2.60E-02	1.00E-01	U	U	2.60E-02	2.60E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.40E-02	2.40E-02	9.70E-02	U	U	2.40E-02	2.40E-02	9.70E-02	U	U	1.20E-02	1.20E-02	9.70E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.10E-02	2.10E-02	8.60E-02	U	U	2.10E-02	2.10E-02	8.60E-02	U	U	1.10E-02	1.10E-02	8.60E-02	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.20E-02	2.20E-02	9.00E-02	U	U	2.20E-02	2.20E-02	9.00E-02	U	U	1.10E-02	1.10E-02	9.00E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	2.50E-02	2.50E-02	9.80E-02	U	U	2.50E-02	2.50E-02	9.80E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	2.40E-02	2.40E-02	9.70E-02	U	U	2.40E-02	2.40E-02	9.70E-02	U	U	2.32E-02	1.20E-02	9.70E-02	J	J
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.30E-02	2.30E-02	9.20E-02	U	U	2.30E-02	2.30E-02	9.20E-02	U	U	1.10E-02	1.10E-02	9.20E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PAHs

				Benzo(a)anthracene					Benzo(a)pyrene					Benzo(b)fluoranthene				
				mg/kg					mg/kg					mg/kg				
				56-55-3					50-32-8					205-99-2				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	4.70E-03	4.70E-03	1.90E-02	U	U	4.70E-03	4.70E-03	1.90E-02	U	U	4.70E-03	4.70E-03	1.90E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	4.50E-03	4.50E-03	1.80E-02	U	U	4.50E-03	4.50E-03	1.80E-02	U	U	4.50E-03	4.50E-03	1.80E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	5.00E-03	5.00E-03	2.00E-02	U	U	5.00E-03	5.00E-03	2.00E-02	U	U	5.00E-03	5.00E-03	2.00E-02	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	4.20E-03	4.20E-03	1.70E-02	U	U	4.20E-03	4.20E-03	1.70E-02	U	U	4.20E-03	4.20E-03	1.70E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	4.30E-03	4.30E-03	1.70E-02	U	U	4.30E-03	4.30E-03	1.70E-02	U	U	4.30E-03	4.30E-03	1.70E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	4.10E-03	4.10E-03	1.60E-02	U	U	4.10E-03	4.10E-03	1.60E-02	U	U	4.10E-03	4.10E-03	1.60E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.75E-02	5.00E-03	2.00E-02	J	J	3.66E-02	5.00E-03	2.00E-02		J	7.29E-02	5.00E-03	2.00E-02		J
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.76E-02	5.20E-03	2.10E-02	J	J	1.96E-02	5.20E-03	2.10E-02	J	J	4.43E-02	5.20E-03	2.10E-02		J
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	4.90E-03	4.90E-03	1.90E-02	U	U	6.30E-03	4.90E-03	1.90E-02	J	J	1.54E-02	4.90E-03	1.90E-02	J	J
BKG-SD10	BKG-SD10	15-Mar-04	REG	5.30E-03	4.30E-03	1.70E-02	J	J	6.00E-03	4.30E-03	1.70E-02	J	J	2.78E-02	4.30E-03	1.70E-02		J
BKG-SD11	BKG-SD11	14-Mar-04	REG	4.50E-03	4.50E-03	1.80E-02	U	U	4.50E-03	4.50E-03	1.80E-02	U	U	4.50E-03	4.50E-03	1.80E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	4.90E-03	4.90E-03	2.00E-02	U	U	4.90E-03	4.90E-03	2.00E-02	U	U	4.90E-03	4.90E-03	2.00E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	8.40E-03	4.90E-03	1.90E-02	J	J	2.93E-02	4.90E-03	1.90E-02		J	3.12E-02	4.90E-03	1.90E-02		J
BKG-SD14	BKG-SD14	14-Mar-04	REG	4.60E-03	4.60E-03	1.80E-02	U	U	4.60E-03	4.60E-03	1.80E-02	U	U	4.60E-03	4.60E-03	1.80E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PAHs

				Benzo(ghi)perylene					Benzo(k)fluoranthene					Chrysene				
				mg/kg					mg/kg					mg/kg				
				191-24-2					207-08-9					218-01-9				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	4.70E-03	4.70E-03	1.90E-02	U	UJ,L	4.70E-03	4.70E-03	1.90E-02	U	U	4.70E-03	4.70E-03	1.90E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	4.50E-03	4.50E-03	1.80E-02	U	UJ,L	4.50E-03	4.50E-03	1.80E-02	U	U	4.50E-03	4.50E-03	1.80E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	5.00E-03	5.00E-03	2.00E-02	U	UJ,L	5.00E-03	5.00E-03	2.00E-02	U	U	5.00E-03	5.00E-03	2.00E-02	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	4.20E-03	4.20E-03	1.70E-02	U	UJ,L	4.20E-03	4.20E-03	1.70E-02	U	U	4.20E-03	4.20E-03	1.70E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	4.30E-03	4.30E-03	1.70E-02	U	UJ,L	4.30E-03	4.30E-03	1.70E-02	U	U	4.30E-03	4.30E-03	1.70E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	4.10E-03	4.10E-03	1.60E-02	U	UJ,L	4.10E-03	4.10E-03	1.60E-02	U	U	4.10E-03	4.10E-03	1.60E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.51E-02	5.00E-03	2.00E-02	J	J,L	3.47E-02	5.00E-03	2.00E-02		J	3.18E-02	5.00E-03	2.00E-02		J
BKG-SD09	BKG-SD09	15-Mar-04	REG	8.10E-03	5.20E-03	2.10E-02	J	J,L	2.30E-02	5.20E-03	2.10E-02		J	3.74E-02	5.20E-03	2.10E-02		J
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	4.90E-03	4.90E-03	1.90E-02	U	U	7.20E-03	4.90E-03	1.90E-02	J	J	8.70E-03	4.90E-03	1.90E-02	J	J
BKG-SD10	BKG-SD10	15-Mar-04	REG	4.80E-03	4.30E-03	1.70E-02	J	J,L	1.15E-02	4.30E-03	1.70E-02	J	J	2.06E-02	4.30E-03	1.70E-02		J
BKG-SD11	BKG-SD11	14-Mar-04	REG	4.50E-03	4.50E-03	1.80E-02	U	UJ,L	4.50E-03	4.50E-03	1.80E-02	U	U	4.50E-03	4.50E-03	1.80E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	4.90E-03	4.90E-03	2.00E-02	U	UJ,L	4.90E-03	4.90E-03	2.00E-02	U	U	4.90E-03	4.90E-03	2.00E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.02E-01	4.90E-03	1.90E-02		J,L	1.00E-02	4.90E-03	1.90E-02	J	J	3.77E-02	4.90E-03	1.90E-02		J
BKG-SD14	BKG-SD14	14-Mar-04	REG	4.60E-03	4.60E-03	1.80E-02	U	UJ,H	4.60E-03	4.60E-03	1.80E-02	U	U	4.60E-03	4.60E-03	1.80E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PAHs

				Dibenzo(a,h)anthracene					Fluoranthene					Fluorene				
				mg/kg					mg/kg					mg/kg				
				53-70-3					206-44-0					86-73-7				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	4.70E-03	4.70E-03	1.90E-02	U	U	1.20E-02	1.20E-02	9.50E-02	U	U	1.20E-02	1.20E-02	9.50E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	4.50E-03	4.50E-03	1.80E-02	U	U	1.10E-02	1.10E-02	9.10E-02	U	U	1.10E-02	1.10E-02	9.10E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	5.00E-03	5.00E-03	2.00E-02	U	U	1.30E-02	1.30E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	4.20E-03	4.20E-03	1.70E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	4.30E-03	4.30E-03	1.70E-02	U	U	1.10E-02	1.10E-02	8.60E-02	U	U	1.10E-02	1.10E-02	8.60E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	4.10E-03	4.10E-03	1.60E-02	U	U	1.00E-02	1.00E-02	8.20E-02	U	U	1.00E-02	1.00E-02	8.20E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	5.70E-03	5.00E-03	2.00E-02	J	J	1.28E-02	1.20E-02	1.00E-01	J	J	1.20E-02	1.20E-02	1.00E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	5.20E-03	5.20E-03	2.10E-02	U	U	7.36E-02	1.30E-02	1.00E-01	J	J	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	4.90E-03	4.90E-03	1.90E-02	U	U	1.20E-02	1.20E-02	9.70E-02	U	U	1.20E-02	1.20E-02	9.70E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	4.30E-03	4.30E-03	1.70E-02	U	U	1.60E-02	1.10E-02	8.60E-02	J	J	1.10E-02	1.10E-02	8.60E-02	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	4.50E-03	4.50E-03	1.80E-02	U	U	1.10E-02	1.10E-02	9.00E-02	U	U	1.10E-02	1.10E-02	9.00E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	4.90E-03	4.90E-03	2.00E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	4.90E-03	4.90E-03	1.90E-02	U	U	1.20E-02	1.20E-02	9.70E-02	U	U	1.20E-02	1.20E-02	9.70E-02	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	4.60E-03	4.60E-03	1.80E-02	U	U	1.10E-02	1.10E-02	9.20E-02	U	U	1.10E-02	1.10E-02	9.20E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PAHs

				Indeno(1,2,3-cd)pyrene					Naphthalene				
				mg/kg					mg/kg				
				193-39-5					91-20-3				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	4.70E-03	4.70E-03	1.90E-02	U	UJ,L	1.20E-02	1.20E-02	9.50E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	4.50E-03	4.50E-03	1.80E-02	U	UJ,L	1.10E-02	1.10E-02	9.10E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	5.00E-03	5.00E-03	2.00E-02	U	UJ,L	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	4.20E-03	4.20E-03	1.70E-02	U	UJ,L	1.10E-02	1.10E-02	8.40E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	4.30E-03	4.30E-03	1.70E-02	U	UJ,L	1.10E-02	1.10E-02	8.60E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	4.10E-03	4.10E-03	1.60E-02	U	UJ,L	1.00E-02	1.00E-02	8.20E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.21E-02	5.00E-03	2.00E-02		J,L	1.20E-02	1.20E-02	1.00E-01	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.22E-02	5.20E-03	2.10E-02	J	J,L	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	5.00E-03	4.90E-03	1.90E-02	J	J	1.20E-02	1.20E-02	9.70E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	4.60E-03	4.30E-03	1.70E-02	J	J,L	1.10E-02	1.10E-02	8.60E-02	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	4.50E-03	4.50E-03	1.80E-02	U	UJ,L	1.10E-02	1.10E-02	9.00E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	4.90E-03	4.90E-03	2.00E-02	U	UJ,L	1.20E-02	1.20E-02	9.80E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.31E-02	4.90E-03	1.90E-02		J,L	1.20E-02	1.20E-02	9.70E-02	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	4.60E-03	4.60E-03	1.80E-02	U	UJ,L	1.10E-02	1.10E-02	9.20E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PAHs

				Phenanthrene					Pyrene				
				mg/kg					mg/kg				
				85-01-8					129-00-0				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.20E-02	1.20E-02	9.50E-02	U	U	1.20E-02	1.20E-02	9.50E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.10E-02	1.10E-02	9.10E-02	U	U	1.10E-02	1.10E-02	9.10E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.30E-02	1.30E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.10E-02	1.10E-02	8.40E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.10E-02	1.10E-02	8.60E-02	U	U	1.10E-02	1.10E-02	8.60E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.00E-02	1.00E-02	8.20E-02	U	U	1.00E-02	1.00E-02	8.20E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.20E-02	1.20E-02	1.00E-01	U	U	1.99E-02	1.20E-02	1.00E-01	J	J
BKG-SD09	BKG-SD09	15-Mar-04	REG	2.91E-02	1.30E-02	1.00E-01	J	J	5.65E-02	1.30E-02	1.00E-01	J	J
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.20E-02	1.20E-02	9.70E-02	U	U	1.20E-02	1.20E-02	9.70E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.10E-02	1.10E-02	8.60E-02	U	U	1.38E-02	1.10E-02	8.60E-02	J	J
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.10E-02	1.10E-02	9.00E-02	U	U	1.10E-02	1.10E-02	9.00E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.20E-02	1.20E-02	9.80E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.20E-02	1.20E-02	9.70E-02	U	U	2.99E-02	1.20E-02	9.70E-02	J	J
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.10E-02	1.10E-02	9.20E-02	U	U	1.10E-02	1.10E-02	9.20E-02	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PCBs

				Aroclor 1016					Aroclor 1221					Aroclor 1232				
				mg/kg					mg/kg					mg/kg				
				12674-11-2					11104-28-2					11141-16-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	1.90E-02	1.90E-02	2.40E-02	U	U	1.90E-02	1.90E-02	2.40E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.20E-02	1.20E-02	2.30E-02	U	U	1.80E-02	1.80E-02	2.30E-02	U	U	1.80E-02	1.80E-02	2.30E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.30E-02	1.30E-02	2.60E-02	U	U	2.10E-02	2.10E-02	2.60E-02	U	U	2.10E-02	2.10E-02	2.60E-02	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.70E-02	1.70E-02	2.20E-02	U	U	1.70E-02	1.70E-02	2.20E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.10E-02	1.10E-02	2.10E-02	U	U	1.70E-02	1.70E-02	2.10E-02	U	U	1.70E-02	1.70E-02	2.10E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.70E-02	1.70E-02	2.20E-02	U	U	1.70E-02	1.70E-02	2.20E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	1.90E-02	1.90E-02	2.40E-02	U	U	1.90E-02	1.90E-02	2.40E-02	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	2.20E-02	2.20E-02	2.70E-02	U	U	2.20E-02	2.20E-02	2.70E-02	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.30E-02	1.30E-02	2.50E-02	U	U	2.00E-02	2.00E-02	2.50E-02	U	U	2.00E-02	2.00E-02	2.50E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.80E-02	1.80E-02	2.20E-02	U	U	1.80E-02	1.80E-02	2.20E-02	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.80E-02	1.80E-02	2.20E-02	U	U	1.80E-02	1.80E-02	2.20E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.20E-02	1.20E-02	2.30E-02	U	U	1.90E-02	1.90E-02	2.30E-02	U	U	1.90E-02	1.90E-02	2.30E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.20E-02	1.20E-02	2.50E-02	U	U	2.00E-02	2.00E-02	2.50E-02	U	U	2.00E-02	2.00E-02	2.50E-02	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.10E-02	1.10E-02	2.30E-02	U	U	1.80E-02	1.80E-02	2.30E-02	U	U	1.80E-02	1.80E-02	2.30E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PCBs

				Aroclor 1242					Aroclor 1248				
				mg/kg					mg/kg				
				53469-21-9					12672-29-6				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	1.20E-02	1.20E-02	2.40E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.20E-02	1.20E-02	2.30E-02	U	U	1.20E-02	1.20E-02	2.30E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.30E-02	1.30E-02	2.60E-02	U	U	1.30E-02	1.30E-02	2.60E-02	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.10E-02	1.10E-02	2.20E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.10E-02	1.10E-02	2.10E-02	U	U	1.10E-02	1.10E-02	2.10E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.10E-02	1.10E-02	2.20E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	1.20E-02	1.20E-02	2.40E-02	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	1.40E-02	1.40E-02	2.70E-02	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.30E-02	1.30E-02	2.50E-02	U	U	1.30E-02	1.30E-02	2.50E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.10E-02	1.10E-02	2.20E-02	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.10E-02	1.10E-02	2.20E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.20E-02	1.20E-02	2.30E-02	U	U	1.20E-02	1.20E-02	2.30E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.20E-02	1.20E-02	2.50E-02	U	U	1.20E-02	1.20E-02	2.50E-02	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.10E-02	1.10E-02	2.30E-02	U	U	1.10E-02	1.10E-02	2.30E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - PCBs

				Aroclor 1254					Aroclor 1260				
				mg/kg					mg/kg				
				11097-69-1					11096-82-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	1.20E-02	1.20E-02	2.40E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.20E-02	1.20E-02	2.30E-02	U	U	1.20E-02	1.20E-02	2.30E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.30E-02	1.30E-02	2.60E-02	U	U	1.30E-02	1.30E-02	2.60E-02	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.10E-02	1.10E-02	2.20E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.10E-02	1.10E-02	2.10E-02	U	U	1.10E-02	1.10E-02	2.10E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.10E-02	1.10E-02	2.20E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	1.20E-02	1.20E-02	2.40E-02	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	1.40E-02	1.40E-02	2.70E-02	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.30E-02	1.30E-02	2.50E-02	U	U	1.30E-02	1.30E-02	2.50E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.10E-02	1.10E-02	2.20E-02	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.10E-02	1.10E-02	2.20E-02	U	U	1.10E-02	1.10E-02	2.20E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.20E-02	1.20E-02	2.30E-02	U	U	1.20E-02	1.20E-02	2.30E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.20E-02	1.20E-02	2.50E-02	U	U	1.20E-02	1.20E-02	2.50E-02	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.10E-02	1.10E-02	2.30E-02	U	U	1.10E-02	1.10E-02	2.30E-02	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Pesticides/Herbicides

				4,4'-DDD					4,4'-DDE					4,4'-DDT				
				mg/kg					mg/kg					mg/kg				
				72-54-8					72-55-9					50-29-3				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.40E-04	9.40E-04	4.70E-03	U	UJ	9.40E-04	9.40E-04	4.70E-03	U	UJ	1.40E-03	1.40E-03	4.70E-03	U	UJ
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.20E-04	9.20E-04	4.60E-03	U	UJ	9.20E-04	9.20E-04	4.60E-03	U	U	1.40E-03	1.40E-03	4.60E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.10E-03	1.10E-03	5.30E-03	U	UJ	1.10E-03	1.10E-03	5.30E-03	U	UJ	1.60E-03	1.60E-03	5.30E-03	U	UJ
BKG-SD05	BKG-SD05	15-Mar-04	REG	8.60E-04	8.60E-04	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U	1.30E-03	1.30E-03	4.30E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	8.60E-04	8.60E-04	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U	1.30E-03	1.30E-03	4.30E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.70E-04	8.70E-04	4.40E-03	U	U	8.70E-04	8.70E-04	4.40E-03	U	U	1.30E-03	1.30E-03	4.40E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-04	9.50E-04	4.80E-03	U	U	9.50E-04	9.50E-04	4.80E-03	U	U	1.40E-03	1.40E-03	4.80E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.10E-03	1.10E-03	5.40E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	U	1.60E-03	1.60E-03	5.40E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-03	1.00E-03	5.00E-03	U	U	1.00E-03	1.00E-03	5.00E-03	U	U	1.50E-03	1.50E-03	5.00E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	8.80E-04	8.80E-04	4.40E-03	U	U	8.80E-04	8.80E-04	4.40E-03	U	U	1.30E-03	1.30E-03	4.40E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	8.60E-04	8.60E-04	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U	1.30E-03	1.30E-03	4.30E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.40E-04	9.40E-04	4.70E-03	U	U	9.40E-04	9.40E-04	4.70E-03	U	U	1.40E-03	1.40E-03	4.70E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.80E-04	9.80E-04	4.90E-03	U	U	9.80E-04	9.80E-04	4.90E-03	U	U	1.50E-03	1.50E-03	4.90E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.10E-04	9.10E-04	4.60E-03	U	U	9.10E-04	9.10E-04	4.60E-03	U	U	1.40E-03	1.40E-03	4.60E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Pesticides/Herbicides

				Aldrin					Chlordane (Technical)					Dieldrin				
				mg/kg					mg/kg					mg/kg				
				309-00-2					12789-03-6					60-57-1				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.40E-04	9.40E-04	2.40E-03	U	U	not analyzed					9.40E-04	9.40E-04	2.40E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.20E-04	9.20E-04	2.30E-03	U	U	not analyzed					9.20E-04	9.20E-04	2.30E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	U	not analyzed					1.10E-03	1.10E-03	2.60E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	8.60E-04	8.60E-04	2.20E-03	U	U	1.10E-02	1.10E-02	2.20E-02	U	U	8.60E-04	8.60E-04	2.20E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	8.60E-04	8.60E-04	2.10E-03	U	U	1.10E-02	1.10E-02	2.10E-02	U	U	8.60E-04	8.60E-04	2.10E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.70E-04	8.70E-04	2.20E-03	U	U	1.10E-02	1.10E-02	2.20E-02	U	U	8.70E-04	8.70E-04	2.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-04	9.50E-04	2.40E-03	U	U	1.20E-02	1.20E-02	2.40E-02	U	U	9.50E-04	9.50E-04	2.40E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.40E-02	1.40E-02	2.70E-02	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-03	1.00E-03	2.50E-03	U	U	1.30E-02	1.30E-02	2.50E-02	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	8.80E-04	8.80E-04	2.20E-03	U	U	1.10E-02	1.10E-02	2.20E-02	U	U	8.80E-04	8.80E-04	2.20E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	8.60E-04	8.60E-04	2.10E-03	U	U	1.10E-02	1.10E-02	2.10E-02	U	U	8.60E-04	8.60E-04	2.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.40E-04	9.40E-04	2.30E-03	U	U	1.20E-02	1.20E-02	2.30E-02	U	U	9.40E-04	9.40E-04	2.30E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.80E-04	9.80E-04	2.50E-03	U	U	1.20E-02	1.20E-02	2.50E-02	U	U	9.80E-04	9.80E-04	2.50E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.10E-04	9.10E-04	2.30E-03	U	U	1.10E-02	1.10E-02	2.30E-02	U	U	9.10E-04	9.10E-04	2.30E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Pesticides/Herbicides

				Endosulfan I					Endosulfan II					Endosulfan Sulfate				
				mg/kg					mg/kg					mg/kg				
				959-98-8					33213-65-9					1031-07-8				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.40E-04	9.40E-04	2.40E-03	U	U	9.40E-04	9.40E-04	4.70E-03	U	U	9.40E-04	9.40E-04	4.70E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.20E-04	9.20E-04	2.30E-03	U	U	9.20E-04	9.20E-04	4.60E-03	U	U	9.20E-04	9.20E-04	4.60E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	U	1.10E-03	1.10E-03	5.30E-03	U	U	1.10E-03	1.10E-03	5.30E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	8.60E-04	8.60E-04	2.20E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	8.60E-04	8.60E-04	2.10E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.70E-04	8.70E-04	2.20E-03	U	U	8.70E-04	8.70E-04	4.40E-03	U	U	8.70E-04	8.70E-04	4.40E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-04	9.50E-04	2.40E-03	U	U	9.50E-04	9.50E-04	4.80E-03	U	U	9.50E-04	9.50E-04	4.80E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	5.00E-03	U	U	1.00E-03	1.00E-03	5.00E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	8.80E-04	8.80E-04	2.20E-03	U	U	8.80E-04	8.80E-04	4.40E-03	U	U	8.80E-04	8.80E-04	4.40E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	8.60E-04	8.60E-04	2.10E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.40E-04	9.40E-04	2.30E-03	U	U	9.40E-04	9.40E-04	4.70E-03	U	U	9.40E-04	9.40E-04	4.70E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.80E-04	9.80E-04	2.50E-03	U	U	9.80E-04	9.80E-04	4.90E-03	U	U	9.80E-04	9.80E-04	4.90E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.10E-04	9.10E-04	2.30E-03	U	U	9.10E-04	9.10E-04	4.60E-03	U	U	9.10E-04	9.10E-04	4.60E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Pesticides/Herbicides

				Endrin					Endrin aldehyde					Endrin ketone				
				mg/kg					mg/kg					mg/kg				
				72-20-8					7421-93-4					53494-70-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.40E-04	9.40E-04	4.70E-03	U	UJ	1.90E-03	1.90E-03	4.70E-03	U	U	9.40E-04	9.40E-04	4.70E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.20E-04	9.20E-04	4.60E-03	U	U	1.80E-03	1.80E-03	4.60E-03	U	U	9.20E-04	9.20E-04	4.60E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.10E-03	1.10E-03	5.30E-03	U	UJ	2.10E-03	2.10E-03	5.30E-03	U	U	1.10E-03	1.10E-03	5.30E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	8.60E-04	8.60E-04	4.30E-03	U	U	1.70E-03	1.70E-03	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	8.60E-04	8.60E-04	4.30E-03	U	U	1.70E-03	1.70E-03	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.70E-04	8.70E-04	4.40E-03	U	U	1.70E-03	1.70E-03	4.40E-03	U	U	8.70E-04	8.70E-04	4.40E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-04	9.50E-04	4.80E-03	U	U	1.90E-03	1.90E-03	4.80E-03	U	U	9.50E-04	9.50E-04	4.80E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.10E-03	1.10E-03	5.40E-03	U	U	2.20E-03	2.20E-03	5.40E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-03	1.00E-03	5.00E-03	U	U	2.00E-03	2.00E-03	5.00E-03	U	U	1.00E-03	1.00E-03	5.00E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	8.80E-04	8.80E-04	4.40E-03	U	U	1.80E-03	1.80E-03	4.40E-03	U	U	8.80E-04	8.80E-04	4.40E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	8.60E-04	8.60E-04	4.30E-03	U	U	1.70E-03	1.70E-03	4.30E-03	U	U	8.60E-04	8.60E-04	4.30E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.40E-04	9.40E-04	4.70E-03	U	U	1.90E-03	1.90E-03	4.70E-03	U	U	9.40E-04	9.40E-04	4.70E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.80E-04	9.80E-04	4.90E-03	U	U	2.00E-03	2.00E-03	4.90E-03	U	U	9.80E-04	9.80E-04	4.90E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.10E-04	9.10E-04	4.60E-03	U	U	1.80E-03	1.80E-03	4.60E-03	U	U	9.10E-04	9.10E-04	4.60E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Pesticides/Herbicides

				Heptachlor					Heptachlor epoxide					Methoxychlor				
				mg/kg					mg/kg					mg/kg				
				76-44-8					1024-57-3					72-43-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.40E-04	9.40E-04	2.40E-03	U	UJ	9.40E-04	9.40E-04	2.40E-03	U	U	1.90E-03	1.90E-03	4.70E-03	U	UJ
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.20E-04	9.20E-04	2.30E-03	U	U	9.20E-04	9.20E-04	2.30E-03	U	U	1.80E-03	1.80E-03	4.60E-03	U	UJ
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	UJ	1.10E-03	1.10E-03	2.60E-03	U	U	2.10E-03	2.10E-03	5.30E-03	U	UJ
BKG-SD05	BKG-SD05	15-Mar-04	REG	8.60E-04	8.60E-04	2.20E-03	U	U	8.60E-04	8.60E-04	2.20E-03	U	U	1.70E-03	1.70E-03	4.30E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	8.60E-04	8.60E-04	2.10E-03	U	U	8.60E-04	8.60E-04	2.10E-03	U	U	1.70E-03	1.70E-03	4.30E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.70E-04	8.70E-04	2.20E-03	U	U	8.70E-04	8.70E-04	2.20E-03	U	U	1.70E-03	1.70E-03	4.40E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-04	9.50E-04	2.40E-03	U	U	9.50E-04	9.50E-04	2.40E-03	U	U	1.90E-03	1.90E-03	4.80E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U	2.20E-03	2.20E-03	5.40E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U	2.00E-03	2.00E-03	5.00E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	8.80E-04	8.80E-04	2.20E-03	U	U	8.80E-04	8.80E-04	2.20E-03	U	U	1.80E-03	1.80E-03	4.40E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	8.60E-04	8.60E-04	2.10E-03	U	U	8.60E-04	8.60E-04	2.10E-03	U	U	1.70E-03	1.70E-03	4.30E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.40E-04	9.40E-04	2.30E-03	U	U	9.40E-04	9.40E-04	2.30E-03	U	U	1.90E-03	1.90E-03	4.70E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.80E-04	9.80E-04	2.50E-03	U	U	9.80E-04	9.80E-04	2.50E-03	U	U	2.00E-03	2.00E-03	4.90E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.10E-04	9.10E-04	2.30E-03	U	U	9.10E-04	9.10E-04	2.30E-03	U	U	1.80E-03	1.80E-03	4.60E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Pesticides/Herbicides

				Toxaphene					alpha-BHC					alpha-Chlordane				
				mg/kg					mg/kg					mg/kg				
				8001-35-2					319-84-6					5103-71-9				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.20E-01	1.20E-01	2.40E-01	U	U	9.40E-04	9.40E-04	2.40E-03	U	UJ	9.40E-04	9.40E-04	2.40E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.20E-01	1.20E-01	2.30E-01	U	U	9.20E-04	9.20E-04	2.30E-03	U	U	9.20E-04	9.20E-04	2.30E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.30E-01	1.30E-01	2.60E-01	U	U	1.10E-03	1.10E-03	2.60E-03	U	UJ	1.10E-03	1.10E-03	2.60E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.10E-01	1.10E-01	2.20E-01	U	U	8.60E-04	8.60E-04	2.20E-03	U	U	not analyzed				
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.10E-01	1.10E-01	2.10E-01	U	U	8.60E-04	8.60E-04	2.10E-03	U	U	not analyzed				
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.10E-01	1.10E-01	2.20E-01	U	U	8.70E-04	8.70E-04	2.20E-03	U	U	not analyzed				
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.20E-01	1.20E-01	2.40E-01	U	U	9.50E-04	9.50E-04	2.40E-03	U	U	not analyzed				
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.40E-01	1.40E-01	2.70E-01	U	U	1.10E-03	1.10E-03	2.70E-03	U	U	not analyzed				
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.30E-01	1.30E-01	2.50E-01	U	U	1.00E-03	1.00E-03	2.50E-03	U	U	not analyzed				
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.10E-01	1.10E-01	2.20E-01	U	U	8.80E-04	8.80E-04	2.20E-03	U	U	not analyzed				
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.10E-01	1.10E-01	2.10E-01	U	U	8.60E-04	8.60E-04	2.10E-03	U	U	not analyzed				
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.20E-01	1.20E-01	2.30E-01	U	U	9.40E-04	9.40E-04	2.30E-03	U	U	not analyzed				
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.20E-01	1.20E-01	2.50E-01	U	U	9.80E-04	9.80E-04	2.50E-03	U	U	not analyzed				
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.10E-01	1.10E-01	2.30E-01	U	U	9.10E-04	9.10E-04	2.30E-03	U	U	not analyzed				

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Pesticides/Herbicides

				beta-BHC					delta-BHC					gamma-BHC (Lindane)				
				mg/kg					mg/kg					mg/kg				
				319-85-7					319-86-8					58-89-9				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.40E-04	9.40E-04	2.40E-03	U	U	9.40E-04	9.40E-04	2.40E-03	U	UJ	9.40E-04	9.40E-04	2.40E-03	U	UJ
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.20E-04	9.20E-04	2.30E-03	U	U	9.20E-04	9.20E-04	2.30E-03	U	U	9.20E-04	9.20E-04	2.30E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	U	1.10E-03	1.10E-03	2.60E-03	U	UJ	1.10E-03	1.10E-03	2.60E-03	U	UJ
BKG-SD05	BKG-SD05	15-Mar-04	REG	8.60E-04	8.60E-04	2.20E-03	U	U	8.60E-04	8.60E-04	2.20E-03	U	U	8.60E-04	8.60E-04	2.20E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	8.60E-04	8.60E-04	2.10E-03	U	U	8.60E-04	8.60E-04	2.10E-03	U	U	8.60E-04	8.60E-04	2.10E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.70E-04	8.70E-04	2.20E-03	U	U	8.70E-04	8.70E-04	2.20E-03	U	U	8.70E-04	8.70E-04	2.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	9.50E-04	9.50E-04	2.40E-03	U	U	9.50E-04	9.50E-04	2.40E-03	U	U	9.50E-04	9.50E-04	2.40E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	8.80E-04	8.80E-04	2.20E-03	U	U	8.80E-04	8.80E-04	2.20E-03	U	U	8.80E-04	8.80E-04	2.20E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	8.60E-04	8.60E-04	2.10E-03	U	U	8.60E-04	8.60E-04	2.10E-03	U	U	8.60E-04	8.60E-04	2.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	9.40E-04	9.40E-04	2.30E-03	U	U	9.40E-04	9.40E-04	2.30E-03	U	U	9.40E-04	9.40E-04	2.30E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	9.80E-04	9.80E-04	2.50E-03	U	U	9.80E-04	9.80E-04	2.50E-03	U	U	9.80E-04	9.80E-04	2.50E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	9.10E-04	9.10E-04	2.30E-03	U	U	9.10E-04	9.10E-04	2.30E-03	U	U	9.10E-04	9.10E-04	2.30E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Pesticides/Herbicides

				gamma-Chlordane					2,4,5-TP (Silvex)				
				mg/kg					mg/kg				
				5103-74-2					93-72-1				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	9.40E-04	9.40E-04	2.40E-03	U	UJ	1.00E-03	1.00E-03	4.90E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	9.20E-04	9.20E-04	2.30E-03	U	U	9.90E-04	9.90E-04	4.70E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	UJ	1.10E-03	1.10E-03	5.20E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	not analyzed					9.00E-04	9.00E-04	4.30E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	not analyzed					9.50E-04	9.50E-04	4.50E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	not analyzed					9.00E-04	9.00E-04	4.30E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	not analyzed					1.00E-03	1.00E-03	4.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	not analyzed					1.10E-03	1.10E-03	5.40E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	not analyzed					1.00E-03	1.00E-03	4.90E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	not analyzed					9.50E-04	9.50E-04	4.50E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	not analyzed					9.50E-04	9.50E-04	4.50E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	not analyzed					1.00E-03	1.00E-03	4.90E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	not analyzed					1.00E-03	1.00E-03	4.90E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	not analyzed					9.80E-04	9.80E-04	4.70E-03	U	U

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				1,1,1,2-Tetrachloroethane					1,1,1-Trichloroethane					1,1,2,2-Tetrachloroethane				
				mg/kg					mg/kg					mg/kg				
				630-20-6					71-55-6					79-34-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				1,1,2-Trichloroethane					1,1-Dichloroethane					1,1-Dichloroethene				
				mg/kg					mg/kg					mg/kg				
				79-00-5					75-34-3					75-35-4				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	4.30E-03	4.30E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	4.10E-03	4.10E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	4.70E-03	4.70E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	4.10E-03	4.10E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	3.60E-03	3.60E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	4.30E-03	4.30E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	4.20E-03	4.20E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U	4.60E-03	4.60E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	3.90E-03	3.90E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	4.30E-03	4.30E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	3.70E-03	3.70E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	4.40E-03	4.40E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U	5.20E-03	5.20E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	3.90E-03	3.90E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				1,1-Dichloropropene					1,2,3-Trichlorobenzene					1,2,3-Trichloropropane				
				mg/kg					mg/kg					mg/kg				
				563-58-6					87-61-6					96-18-4				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	UJ,L
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	UJ,L
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				1,2,4-Trichlorobenzene					1,2,4-Trimethylbenzene					1,2-Dibromoethane				
				mg/kg					mg/kg					mg/kg				
				120-82-1					95-63-6					106-93-4				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				1,2-Dichlorobenzene					1,2-Dichloroethane					1,2-Dichloropropane				
				mg/kg					mg/kg					mg/kg				
				95-50-1					107-06-2					78-87-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				1,3,5-Trimethylbenzene					1,3-Dichlorobenzene					1,3-Dichloropropane				
				mg/kg					mg/kg					mg/kg				
				108-67-8					541-73-1					142-28-9				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				1,4-Dichlorobenzene					1,4-Dioxane					2,2-Dichloropropane				
				mg/kg					mg/kg					mg/kg				
				106-46-7					123-91-1					594-20-7				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	1.40E-01	1.40E-01	3.60E-01	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	1.40E-01	1.40E-01	3.40E-01	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	1.60E-01	1.60E-01	3.90E-01	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	1.40E-01	1.40E-01	3.40E-01	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	1.20E-01	1.20E-01	3.00E-01	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	1.40E-01	1.40E-01	3.60E-01	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	1.40E-01	1.40E-01	3.50E-01	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	1.50E-01	1.50E-01	3.80E-01	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	1.30E-01	1.30E-01	3.20E-01	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	1.40E-01	1.40E-01	3.60E-01	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	1.20E-01	1.20E-01	3.10E-01	U	UJ,L	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	1.50E-01	1.50E-01	3.70E-01	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	1.70E-01	1.70E-01	4.30E-01	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	1.30E-01	1.30E-01	3.20E-01	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				2-Butanone					2-Chlorotoluene					2-Hexanone				
				mg/kg					mg/kg					mg/kg				
				78-93-3					95-49-8					591-78-6				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.40E-02	1.40E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	1.40E-02	1.40E-02	3.60E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.40E-02	1.40E-02	3.40E-02	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	1.40E-02	1.40E-02	3.40E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	1.60E-02	1.60E-02	3.90E-02	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	1.60E-02	1.60E-02	3.90E-02	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.40E-02	1.40E-02	3.40E-02	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	1.40E-02	1.40E-02	3.40E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.20E-02	1.20E-02	3.00E-02	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	1.20E-02	1.20E-02	3.00E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.40E-02	1.40E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	1.40E-02	1.40E-02	3.60E-02	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.40E-02	1.40E-02	3.50E-02	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	1.40E-02	1.40E-02	3.50E-02	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.50E-02	1.50E-02	3.80E-02	U	U	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	1.50E-02	1.50E-02	3.80E-02	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.30E-02	1.30E-02	3.20E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	1.30E-02	1.30E-02	3.20E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.40E-02	1.40E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	1.40E-02	1.40E-02	3.60E-02	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.20E-02	1.20E-02	3.10E-02	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	1.20E-02	1.20E-02	3.10E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.50E-02	1.50E-02	3.70E-02	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	1.50E-02	1.50E-02	3.70E-02	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.70E-02	1.70E-02	4.30E-02	U	U	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	1.70E-02	1.70E-02	4.30E-02	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.30E-02	1.30E-02	3.20E-02	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	1.30E-02	1.30E-02	3.20E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				2-Propenal					4-Chlorotoluene					Acetone				
				mg/kg					mg/kg					mg/kg				
				107-02-8					106-43-4					67-64-1				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.80E-02	1.80E-02	3.60E-02	U	UJ,L	2.90E-03	2.90E-03	7.20E-03	U	U	3.60E-02	3.60E-02	7.20E-02	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	1.70E-02	1.70E-02	3.40E-02	U	UJ,L	2.80E-03	2.80E-03	6.90E-03	U	U	3.40E-02	3.40E-02	6.90E-02	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	2.00E-02	2.00E-02	3.90E-02	U	UJ,L	3.10E-03	3.10E-03	7.80E-03	U	U	9.21E-02	3.90E-02	7.80E-02		
BKG-SD05	BKG-SD05	15-Mar-04	REG	1.70E-02	1.70E-02	3.40E-02	U	UJ,L	2.70E-03	2.70E-03	6.80E-03	U	U	3.40E-02	3.40E-02	6.80E-02	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	1.50E-02	1.50E-02	3.00E-02	U	UJ,L	2.40E-03	2.40E-03	5.90E-03	U	U	3.00E-02	3.00E-02	5.90E-02	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	1.80E-02	1.80E-02	3.60E-02	U	UJ,L	2.90E-03	2.90E-03	7.20E-03	U	U	6.57E-02	3.60E-02	7.20E-02	J	J
BKG-SD08	BKG-SD08	15-Mar-04	REG	1.70E-02	1.70E-02	3.50E-02	U	UJ,L	2.80E-03	2.80E-03	6.90E-03	U	U	3.50E-02	3.50E-02	6.90E-02	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	1.90E-02	1.90E-02	3.80E-02	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.80E-02	3.80E-02	7.70E-02	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	1.60E-02	1.60E-02	3.20E-02	U	UJ,L	2.60E-03	2.60E-03	6.40E-03	U	U	3.20E-02	3.20E-02	6.40E-02	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	1.80E-02	1.80E-02	3.60E-02	U	UJ,L	2.90E-03	2.90E-03	7.10E-03	U	U	3.78E-02	3.60E-02	7.10E-02	J	J
BKG-SD11	BKG-SD11	14-Mar-04	REG	1.50E-02	1.50E-02	3.10E-02	U	UJ,L	2.50E-03	2.50E-03	6.10E-03	U	U	3.10E-02	3.10E-02	6.10E-02	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	1.90E-02	1.90E-02	3.70E-02	U	UJ,L	3.00E-03	3.00E-03	7.40E-03	U	U	1.08E-01	3.70E-02	7.40E-02		
BKG-SD13	BKG-SD13	14-Mar-04	REG	2.20E-02	2.20E-02	4.30E-02	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	4.30E-02	4.30E-02	8.60E-02	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	1.60E-02	1.60E-02	3.20E-02	U	UJ,L	2.60E-03	2.60E-03	6.50E-03	U	U	3.20E-02	3.20E-02	6.50E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Benzene					Bromobenzene					Bromochloromethane				
				mg/kg					mg/kg					mg/kg				
				71-43-2					108-86-1					74-97-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Bromodichloromethane					Bromoform					Carbon disulfide				
				mg/kg					mg/kg					mg/kg				
				75-27-4					75-25-2					75-15-0				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Carbon tetrachloride					Chlorobenzene					Chloroethane				
				mg/kg					mg/kg					mg/kg				
				56-23-5					108-90-7					75-00-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Chloroform					Chloromethane					Dibromochloromethane				
				mg/kg					mg/kg					mg/kg				
				67-66-3					74-87-3					124-48-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Dichlorodifluoromethane					Ethylbenzene					Hexachlorobutadiene				
				mg/kg					mg/kg					mg/kg				
				75-71-8					100-41-4					87-68-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	4.30E-03	4.30E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	4.10E-03	4.10E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	4.70E-03	4.70E-03	7.80E-03	U	UJ	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	4.10E-03	4.10E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	3.60E-03	3.60E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	4.30E-03	4.30E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	4.20E-03	4.20E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	4.60E-03	4.60E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	UJ,L
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	3.90E-03	3.90E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	4.30E-03	4.30E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	3.70E-03	3.70E-03	6.10E-03	U	UJ	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	4.40E-03	4.40E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	5.20E-03	5.20E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	UJ,L
BKG-SD14	BKG-SD14	14-Mar-04	REG	3.90E-03	3.90E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Iodomethane					Isobutyl alcohol					Isopropylbenzene				
				mg/kg					mg/kg					mg/kg				
				74-88-4					78-83-1					98-82-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	3.60E-03	3.60E-03	1.40E-02	U	U	7.20E-02	7.20E-02	1.40E-01	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	3.40E-03	3.40E-03	1.40E-02	U	U	6.90E-02	6.90E-02	1.40E-01	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.90E-03	3.90E-03	1.60E-02	U	U	7.80E-02	7.80E-02	1.60E-01	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	3.40E-03	3.40E-03	1.40E-02	U	U	6.80E-02	6.80E-02	1.40E-01	U	UJ	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	3.00E-03	3.00E-03	1.20E-02	U	U	5.90E-02	5.90E-02	1.20E-01	U	UJ	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	3.60E-03	3.60E-03	1.40E-02	U	U	7.20E-02	7.20E-02	1.40E-01	U	UJ	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	3.50E-03	3.50E-03	1.40E-02	U	U	6.90E-02	6.90E-02	1.40E-01	U	UJ	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.80E-03	3.80E-03	1.50E-02	U	U	7.70E-02	7.70E-02	1.50E-01	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	3.20E-03	3.20E-03	1.30E-02	U	U	6.40E-02	6.40E-02	1.30E-01	U	UJ	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	3.60E-03	3.60E-03	1.40E-02	U	U	7.10E-02	7.10E-02	1.40E-01	U	UJ	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	3.10E-03	3.10E-03	1.20E-02	U	U	6.10E-02	6.10E-02	1.20E-01	U	UJ,L	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.70E-03	3.70E-03	1.50E-02	U	U	7.40E-02	7.40E-02	1.50E-01	U	UJ	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	4.30E-03	4.30E-03	1.70E-02	U	U	8.60E-02	8.60E-02	1.70E-01	U	UJ	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	3.20E-03	3.20E-03	1.30E-02	U	U	6.50E-02	6.50E-02	1.30E-01	U	UJ	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Methyl methacrylate					Methyl isobutyl ketone					Methyl tert-butyl ether				
				mg/kg					mg/kg					mg/kg				
				80-62-6					108-10-1					1634-04-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	7.20E-03	7.20E-03	3.60E-02	U	U	1.40E-02	1.40E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	6.90E-03	6.90E-03	3.40E-02	U	U	1.40E-02	1.40E-02	3.40E-02	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	7.80E-03	7.80E-03	3.90E-02	U	U	1.60E-02	1.60E-02	3.90E-02	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	6.80E-03	6.80E-03	3.40E-02	U	U	1.40E-02	1.40E-02	3.40E-02	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	5.90E-03	5.90E-03	3.00E-02	U	U	1.20E-02	1.20E-02	3.00E-02	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	7.20E-03	7.20E-03	3.60E-02	U	U	1.40E-02	1.40E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	6.90E-03	6.90E-03	3.50E-02	U	U	1.40E-02	1.40E-02	3.50E-02	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	7.70E-03	7.70E-03	3.80E-02	U	U	1.50E-02	1.50E-02	3.80E-02	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	6.40E-03	6.40E-03	3.20E-02	U	U	1.30E-02	1.30E-02	3.20E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	7.10E-03	7.10E-03	3.60E-02	U	U	1.40E-02	1.40E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	6.10E-03	6.10E-03	3.10E-02	U	U	1.20E-02	1.20E-02	3.10E-02	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	7.40E-03	7.40E-03	3.70E-02	U	U	1.50E-02	1.50E-02	3.70E-02	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	8.60E-03	8.60E-03	4.30E-02	U	U	1.70E-02	1.70E-02	4.30E-02	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	6.50E-03	6.50E-03	3.20E-02	U	U	1.30E-02	1.30E-02	3.20E-02	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Methylene chloride					Naphthalene					Styrene				
				mg/kg					mg/kg					mg/kg				
				75-09-2					91-20-3					100-42-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	8.30E-03	7.20E-03	1.40E-02	J	J	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	6.90E-03	6.90E-03	1.40E-02	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	7.80E-03	7.80E-03	1.60E-02	JB	B	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	6.80E-03	6.80E-03	1.40E-02	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	5.90E-03	5.90E-03	1.20E-02	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	7.20E-03	7.20E-03	1.40E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	6.90E-03	6.90E-03	1.40E-02	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	4.67E-02	7.70E-03	1.50E-02			3.10E-03	3.10E-03	7.70E-03	U	UJL	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	6.40E-03	6.40E-03	1.30E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	7.10E-03	7.10E-03	1.40E-02	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	6.40E-03	6.10E-03	1.20E-02	JB	B	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	7.40E-03	7.40E-03	1.50E-02	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	1.00E-02	8.60E-03	1.70E-02	J	J	3.50E-03	3.50E-03	8.60E-03	U	UJL	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	6.50E-03	6.50E-03	1.30E-02	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Tetrachloroethene					Toluene					Trichloroethene				
				mg/kg					mg/kg					mg/kg				
				127-18-4					108-88-3					79-01-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Trichlorofluoromethane					Vinyl acetate					Vinyl chloride				
				mg/kg					mg/kg					mg/kg				
				75-69-4					108-05-4					75-01-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	3.60E-03	3.60E-03	7.20E-03	U	U	3.60E-02	3.60E-02	3.60E-02	U	UJ,L	3.60E-03	3.60E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	3.40E-03	3.40E-03	6.90E-03	U	U	3.40E-02	3.40E-02	3.40E-02	U	UJ,L	3.40E-03	3.40E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.90E-03	3.90E-03	7.80E-03	U	U	3.90E-02	3.90E-02	3.90E-02	U	UJ,L	3.90E-03	3.90E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	3.40E-03	3.40E-03	6.80E-03	U	U	3.40E-02	3.40E-02	3.40E-02	U	UJ,L	3.40E-03	3.40E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	3.00E-03	3.00E-03	5.90E-03	U	U	3.00E-02	3.00E-02	3.00E-02	U	UJ,L	3.00E-03	3.00E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	3.60E-03	3.60E-03	7.20E-03	U	U	3.60E-02	3.60E-02	3.60E-02	U	UJ,L	3.60E-03	3.60E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	3.50E-03	3.50E-03	6.90E-03	U	U	3.50E-02	3.50E-02	3.50E-02	U	UJ,L	3.50E-03	3.50E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.80E-03	3.80E-03	7.70E-03	U	U	3.80E-02	3.80E-02	3.80E-02	U	UJ,L	3.80E-03	3.80E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	3.20E-03	3.20E-03	6.40E-03	U	U	3.20E-02	3.20E-02	3.20E-02	U	UJ,L	3.20E-03	3.20E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	3.60E-03	3.60E-03	7.10E-03	U	U	3.60E-02	3.60E-02	3.60E-02	U	UJ,L	3.60E-03	3.60E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	3.10E-03	3.10E-03	6.10E-03	U	U	3.10E-02	3.10E-02	3.10E-02	U	UJ,L	3.10E-03	3.10E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.70E-03	3.70E-03	7.40E-03	U	U	3.70E-02	3.70E-02	3.70E-02	U	UJ,L	3.70E-03	3.70E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	4.30E-03	4.30E-03	8.60E-03	U	U	4.30E-02	4.30E-02	4.30E-02	U	UJ,L	4.30E-03	4.30E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	3.20E-03	3.20E-03	6.50E-03	U	U	3.20E-02	3.20E-02	3.20E-02	U	UJ,L	3.20E-03	3.20E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				Xylenes, Total					cis-1,2-Dichloroethene					cis-1,3-Dichloropropene				
				mg/kg					mg/kg					mg/kg				
				1330-20-7					156-59-2					10061-01-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	6.50E-03	6.50E-03	2.20E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	6.20E-03	6.20E-03	2.10E-02	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	7.10E-03	7.10E-03	2.40E-02	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	6.20E-03	6.20E-03	2.10E-02	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	5.30E-03	5.30E-03	1.80E-02	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	6.50E-03	6.50E-03	2.20E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	6.20E-03	6.20E-03	2.10E-02	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	6.90E-03	6.90E-03	2.30E-02	U	U	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	5.80E-03	5.80E-03	1.90E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	6.40E-03	6.40E-03	2.10E-02	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	5.50E-03	5.50E-03	1.80E-02	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	6.70E-03	6.70E-03	2.20E-02	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	7.80E-03	7.80E-03	2.60E-02	U	U	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	5.80E-03	5.80E-03	1.90E-02	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				n-Butylbenzene					n-Propylbenzene					p-Isopropyltoluene				
				mg/kg					mg/kg					mg/kg				
				104-51-8					103-65-1					99-87-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.88E-02	3.10E-03	7.80E-03		
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	9.90E-03	2.90E-03	7.20E-03		
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	UJ,L
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U	1.32E-02	2.90E-03	7.10E-03		
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	UJ,L
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				sec-Butylbenzene					tert-Butylbenzene				
				mg/kg					mg/kg				
				135-98-8					98-06-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	UJ,L	3.10E-03	3.10E-03	7.70E-03	U	UJ,L
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	UJ,L	3.50E-03	3.50E-03	8.60E-03	U	UJ,L
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - VOCs

				trans-1,2-Dichloroethene					trans-1,3-Dichloropropene				
				mg/kg					mg/kg				
				156-60-5					10061-02-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD02	BKG-SD02	16-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.70E-03	2.70E-03	6.80E-03	U	U	2.70E-03	2.70E-03	6.80E-03	U	U
BKG-SD06	BKG-SD06	15-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	2.40E-03	2.40E-03	5.90E-03	U	U
BKG-SD07	BKG-SD07	15-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-SD08	BKG-SD08	15-Mar-04	REG	2.80E-03	2.80E-03	6.90E-03	U	U	2.80E-03	2.80E-03	6.90E-03	U	U
BKG-SD09	BKG-SD09	15-Mar-04	REG	3.10E-03	3.10E-03	7.70E-03	U	U	3.10E-03	3.10E-03	7.70E-03	U	U
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-SD10	BKG-SD10	15-Mar-04	REG	2.90E-03	2.90E-03	7.10E-03	U	U	2.90E-03	2.90E-03	7.10E-03	U	U
BKG-SD11	BKG-SD11	14-Mar-04	REG	2.50E-03	2.50E-03	6.10E-03	U	U	2.50E-03	2.50E-03	6.10E-03	U	U
BKG-SD12	BKG-SD12	14-Mar-04	REG	3.00E-03	3.00E-03	7.40E-03	U	U	3.00E-03	3.00E-03	7.40E-03	U	U
BKG-SD13	BKG-SD13	14-Mar-04	REG	3.50E-03	3.50E-03	8.60E-03	U	U	3.50E-03	3.50E-03	8.60E-03	U	U
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.60E-03	2.60E-03	6.50E-03	U	U	2.60E-03	2.60E-03	6.50E-03	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Sediment Properties

				Cation-Exchange Capacity					Percent Solids				
				mg/kg					Percent				
				12-96-4					38992				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	1.01E+04	1.30E+02	1.30E+02			6.75E+01		0.00E+00		
BKG-SD02	BKG-SD02	16-Mar-04	REG	5.39E+03	1.30E+02	1.30E+02			7.00E+01		0.00E+00		
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	9.32E+03	1.30E+02	1.30E+02			6.34E+01		0.00E+00		
BKG-SD05	BKG-SD05	15-Mar-04	REG	2.90E+03	1.30E+02	1.30E+02			7.78E+01		0.00E+00		
BKG-SD06	BKG-SD06	15-Mar-04	REG	3.83E+02	1.30E+02	1.30E+02			7.39E+01		0.00E+00		
BKG-SD07	BKG-SD07	15-Mar-04	REG	8.04E+03	1.30E+02	1.30E+02			7.78E+01		0.00E+00		
BKG-SD08	BKG-SD08	15-Mar-04	REG	8.88E+03	1.30E+02	1.30E+02			6.81E+01		0.00E+00		
BKG-SD09	BKG-SD09	15-Mar-04	REG	4.48E+03	1.30E+02	1.30E+02			6.16E+01		0.00E+00		
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	5.84E+03	1.30E+02	1.30E+02			6.76E+01		0.00E+00		
BKG-SD10	BKG-SD10	15-Mar-04	REG	4.63E+03	1.30E+02	1.30E+02			7.38E+01		0.00E+00		
BKG-SD11	BKG-SD11	14-Mar-04	REG	4.85E+03	1.30E+02	1.30E+02			7.34E+01		0.00E+00		
BKG-SD12	BKG-SD12	14-Mar-04	REG	8.06E+03	1.30E+02	1.30E+02			6.75E+01		0.00E+00		
BKG-SD13	BKG-SD13	14-Mar-04	REG	8.22E+03	1.30E+02	1.30E+02			6.84E+01		0.00E+00		
BKG-SD14	BKG-SD14	14-Mar-04	REG	2.40E+03	1.30E+02	1.30E+02			7.15E+01		0.00E+00		

Footnotes are provided at the end of each test parameter

Table 3-8
Concentrations of Chemicals in Sediment Samples from Streams - Sediment Properties

				pH					Total Organic Carbon				
				PH UNITS					mg/kg				
				39384					10-35-5				
Location	Sample	Date	Pur	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-SD01	BKG-SD01	16-Mar-04	REG	6.10E+00		0.00E+00			2.65E+03	4.10E+01	1.50E+02		
BKG-SD02	BKG-SD02	16-Mar-04	REG	6.80E+00		0.00E+00			6.75E+02	4.00E+01	1.40E+02		
BKG-SD02	DUPLICATE #8	16-Mar-04	FD	not analyzed					not analyzed				
BKG-SD04	BKG-SD04	16-Mar-04	REG	7.10E+00		0.00E+00			1.65E+03	4.40E+01	1.60E+02		
BKG-SD05	BKG-SD05	15-Mar-04	REG	6.10E+00		0.00E+00			3.59E+03	3.60E+01	1.30E+02		
BKG-SD06	BKG-SD06	15-Mar-04	REG	6.90E+00		0.00E+00			3.79E+02	3.80E+01	1.40E+02		
BKG-SD07	BKG-SD07	15-Mar-04	REG	6.10E+00		0.00E+00			1.43E+04	3.60E+01	1.30E+02		
BKG-SD08	BKG-SD08	15-Mar-04	REG	6.10E+00		0.00E+00			6.99E+03	4.10E+01	1.50E+02		
BKG-SD09	BKG-SD09	15-Mar-04	REG	7.20E+00		0.00E+00			5.38E+03	4.50E+01	1.60E+02		
BKG-SD09	DUPLICATE #7	15-Mar-04	FD	6.60E+00		0.00E+00			6.75E+03	4.10E+01	1.50E+02		
BKG-SD10	BKG-SD10	15-Mar-04	REG	6.30E+00		0.00E+00			5.81E+03	3.80E+01	1.40E+02		
BKG-SD11	BKG-SD11	14-Mar-04	REG	6.10E+00		0.00E+00			2.85E+03	3.80E+01	1.40E+02		
BKG-SD12	BKG-SD12	14-Mar-04	REG	7.00E+00		0.00E+00			1.05E+04	4.10E+01	1.50E+02		
BKG-SD13	BKG-SD13	14-Mar-04	REG	6.40E+00		0.00E+00			6.07E+03	4.10E+01	1.50E+02		
BKG-SD14	BKG-SD14	14-Mar-04	REG	6.20E+00		0.00E+00			5.90E+03	3.90E+01	1.40E+02		

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Aluminum					Antimony					Arsenic				
				mg/kg					mg/kg					mg/kg				
				7429-90-5					7440-36-0					7440-38-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.01E+04	1.00E+00	3.20E+01			2.40E-01	2.40E-01	9.50E+00	U	U	8.00E-01	4.40E-01	7.90E-01		
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.03E+04	9.60E-01	2.90E+01			2.20E-01	2.20E-01	8.70E+00	U	U	2.40E+00	4.10E-01	7.30E-01		
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.08E+04	1.10E+00	3.40E+01			2.50E-01	2.50E-01	1.00E+01	U	U	1.10E+00	4.70E-01	8.40E-01		
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.34E+04	1.50E+00	4.40E+01			3.30E-01	3.30E-01	1.30E+01	U	U	1.20E+00	6.20E-01	1.10E+00		
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	3.71E+03	1.40E+00	4.20E+01			3.10E-01	3.10E-01	1.20E+01	U	U	2.10E+00	5.80E-01	1.00E+00		
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	9.19E+03	1.00E+00	3.10E+01			2.30E-01	2.30E-01	9.20E+00	U	U	5.70E-01	4.30E-01	7.70E-01	J	J
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	8.66E+03	9.80E-01	3.00E+01			2.20E-01	2.20E-01	8.90E+00	U	U	1.30E+00	4.10E-01	7.40E-01		
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.08E+04	1.10E+00	3.30E+01			2.50E-01	2.50E-01	1.00E+01	U	U	1.50E+00	4.60E-01	8.30E-01		
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	9.68E+03	8.40E-01	2.50E+01		J	1.90E-01	1.90E-01	7.60E+00	U	UJ,L	5.20E-01	3.50E-01	6.30E-01	J	J
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.96E+04	3.70E+00	1.10E+02			8.30E-01	8.30E-01	3.30E+01	U	U	2.80E+00	1.60E+00	2.80E+00		
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.32E+04	1.10E+00	3.20E+01			2.40E-01	2.40E-01	9.60E+00	U	U	1.00E+00	4.50E-01	8.00E-01		
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	2.47E+04	1.20E+00	3.60E+01			2.70E-01	2.70E-01	1.10E+01	U	U	1.70E+00	5.00E-01	8.90E-01		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.38E+04	5.80E+00	1.70E+02		J	1.30E+00	1.30E+00	5.20E+01	U	UJ,L	6.30E+00	2.40E+00	4.40E+00		
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	9.63E+03	1.20E+00	3.50E+01			2.60E-01	2.60E-01	1.10E+01	U	U	1.40E+00	4.90E-01	8.80E-01		
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	9.87E+03	1.10E+00	3.20E+01			2.40E-01	2.40E-01	9.60E+00	U	U	4.50E-01	4.50E-01	8.00E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	2.15E+04	2.70E+00	8.30E+01		J	6.20E-01	6.20E-01	2.50E+01	U	UJ,L	3.20E+00	1.20E+00	2.10E+00		

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Barium					Beryllium					Cadmium				
				mg/kg					mg/kg					mg/kg				
				7440-39-3					7440-41-7					7440-43-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.38E+02	7.90E-02	3.20E+01			4.60E-01	4.70E-02	7.90E-01	J	J	4.70E-02	4.70E-02	6.30E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	6.74E+01	7.30E-02	2.90E+01			4.90E-01	4.40E-02	7.30E-01	J	J	4.40E-02	4.40E-02	5.80E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.59E+02	8.40E-02	3.40E+01			9.10E-01	5.10E-02	8.40E-01			5.10E-02	5.10E-02	6.80E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.99E+02	1.10E-01	4.40E+01			1.20E+00	6.60E-02	1.10E+00			6.60E-02	6.60E-02	8.80E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.89E+02	1.00E-01	4.20E+01			1.70E+00	6.20E-02	1.00E+00			6.20E-02	6.20E-02	8.30E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	7.35E+01	7.70E-02	3.10E+01			7.10E-01	4.60E-02	7.70E-01	J	J	4.60E-02	4.60E-02	6.20E-01	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.40E+02	7.40E-02	3.00E+01			6.50E-01	4.40E-02	7.40E-01	J	J	4.40E-02	4.40E-02	5.90E-01	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.66E+02	8.30E-02	3.30E+01			9.90E-01	5.00E-02	8.30E-01			5.00E-02	5.00E-02	6.60E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.09E+02	6.30E-02	2.50E+01		J	5.60E-01	3.80E-02	6.30E-01	J	J	3.80E-02	3.80E-02	5.10E-01	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.73E+02	2.80E-01	1.10E+02			2.40E+00	1.70E-01	2.80E+00	J	J	3.10E-01	1.70E-01	2.20E+00	J	J
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.51E+02	8.00E-02	3.20E+01			1.30E+00	4.80E-02	8.00E-01			4.80E-02	4.80E-02	6.40E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	2.24E+02	8.90E-02	3.60E+01			1.30E+00	5.30E-02	8.90E-01			5.30E-02	5.30E-02	7.10E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.00E+02	4.40E-01	1.70E+02		J	3.70E+00	2.60E-01	4.40E+00	J	J	2.60E-01	2.60E-01	3.50E+00	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.43E+02	8.80E-02	3.50E+01			1.10E+00	5.30E-02	8.80E-01			5.30E-02	5.30E-02	7.00E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.77E+02	8.00E-02	3.20E+01			1.20E+00	4.80E-02	8.00E-01			4.80E-02	4.80E-02	6.40E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	3.14E+02	2.10E-01	8.30E+01		J	2.50E+00	1.20E-01	2.10E+00			1.20E-01	1.20E-01	1.70E+00	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Calcium					Chromium					Cobalt				
				mg/kg					mg/kg					mg/kg				
				7440-70-2					7440-47-3					7440-48-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	5.54E+02	6.00E-01	7.90E+02	J	J	8.90E+00	6.30E-02	1.60E+00			2.60E+00	7.90E-02	7.90E+00	J	J
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	4.56E+02	5.50E-01	7.30E+02	J	J	1.19E+01	5.80E-02	1.50E+00			3.60E+00	7.30E-02	7.30E+00	J	J
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.03E+03	6.40E-01	8.40E+02			1.12E+01	6.80E-02	1.70E+00			5.50E+00	8.40E-02	8.40E+00	J	J
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.27E+03	8.40E-01	1.10E+03			1.23E+01	8.80E-02	2.20E+00			4.80E+00	1.10E-01	1.10E+01	J	J
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.16E+03	7.90E-01	1.00E+03			6.80E+00	8.30E-02	2.10E+00			8.80E+00	1.00E-01	1.00E+01	J	J
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	4.89E+02	5.90E-01	7.70E+02	J	J	1.08E+01	6.20E-02	1.50E+00			2.90E+00	7.70E-02	7.70E+00	J	J
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	6.35E+02	5.60E-01	7.40E+02	J	J	8.00E+00	5.90E-02	1.50E+00			2.20E+00	7.40E-02	7.40E+00	J	J
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	9.54E+02	6.30E-01	8.30E+02			9.20E+00	6.60E-02	1.70E+00			4.10E+00	8.30E-02	8.30E+00	J	J
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	6.47E+02	4.80E-01	6.30E+02		J	1.05E+01	5.10E-02	1.30E+00		J	3.10E+00	6.30E-02	6.30E+00	J	J
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.12E+03	2.10E+00	2.80E+03	J	J	2.07E+01	2.20E-01	5.50E+00			2.16E+01	2.80E-01	2.80E+01	J	J
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	6.64E+02	6.10E-01	8.00E+02	J	J	1.26E+01	6.40E-02	1.60E+00			3.90E+00	8.00E-02	8.00E+00	J	J
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.24E+03	6.70E-01	8.90E+02			2.18E+01	7.10E-02	1.80E+00			4.40E+00	8.90E-02	8.90E+00	J	J
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	3.15E+03	3.30E+00	4.40E+03	J	J	2.55E+01	3.50E-01	8.70E+00		J	2.13E+01	4.40E-01	4.40E+01	J	J
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	8.59E+02	6.70E-01	8.80E+02	J	J	1.01E+01	7.00E-02	1.80E+00			6.80E+00	8.80E-02	8.80E+00	J	J
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	9.74E+02	6.10E-01	8.00E+02			9.30E+00	6.40E-02	1.60E+00			5.60E+00	8.00E-02	8.00E+00	J	J
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	2.44E+03	1.60E+00	2.10E+03		J	2.33E+01	1.70E-01	4.10E+00		J	1.18E+01	2.10E-01	2.10E+01	J	J

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Copper					Iron					Lead				
				mg/kg					mg/kg					mg/kg				
				7440-50-8					7439-89-6					7439-92-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	7.00E+00	6.90E-02	3.90E+00			8.21E+03	1.10E+00	1.60E+01			1.05E+01	1.90E-01	1.60E+01	J	J
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	9.00E+00	6.40E-02	3.60E+00			1.90E+04	1.00E+00	1.50E+01			1.13E+01	1.70E-01	1.50E+01	J	J
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	6.60E+00	7.40E-02	4.20E+00			7.43E+03	1.20E+00	1.70E+01			2.91E+01	2.00E-01	1.70E+01		
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	9.50E+00	9.70E-02	5.50E+00			9.34E+03	1.60E+00	2.20E+01			1.56E+01	2.70E-01	2.20E+01	J	J
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	6.50E+00	9.20E-02	5.20E+00			1.11E+04	1.50E+00	2.10E+01			1.22E+01	2.50E-01	2.10E+01	J	J
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	4.70E+00	6.80E-02	3.90E+00			1.13E+04	1.10E+00	1.50E+01			9.00E+00	1.80E-01	1.50E+01	J	J
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	6.20E+00	6.50E-02	3.70E+00			7.23E+03	1.10E+00	1.50E+01			1.16E+01	1.80E-01	1.50E+01	J	J
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	8.30E+00	7.30E-02	4.10E+00			8.51E+03	1.20E+00	1.70E+01			1.86E+01	2.00E-01	1.70E+01		
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	9.30E+00	5.60E-02	3.20E+00			9.04E+03	9.00E-01	1.30E+01		J	1.09E+01	1.50E-01	1.30E+01	J	J
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.80E+01	2.40E-01	1.40E+01			2.65E+04	3.90E+00	5.50E+01			2.56E+01	6.70E-01	5.50E+01	J	J
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.85E+01	7.10E-02	4.00E+00			1.40E+04	1.10E+00	1.60E+01			1.69E+01	1.90E-01	1.60E+01		
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.37E+01	7.80E-02	4.40E+00			1.45E+04	1.30E+00	1.80E+01			1.76E+01	2.10E-01	1.80E+01	J	J
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.37E+01	3.80E-01	2.20E+01			3.14E+04	6.20E+00	8.70E+01		J	3.72E+01	1.00E+00	8.70E+01	J	J
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	6.40E+00	7.70E-02	4.40E+00			1.00E+04	1.20E+00	1.80E+01			1.33E+01	2.10E-01	1.80E+01	J	J
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	6.30E+00	7.00E-02	4.00E+00			1.09E+04	1.10E+00	1.60E+01			1.35E+01	1.90E-01	1.60E+01	J	J
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.79E+01	1.80E-01	1.00E+01			2.30E+04	2.90E+00	4.10E+01		J	2.58E+01	5.00E-01	4.10E+01	J	J

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Magnesium					Manganese					Mercury				
				mg/kg					mg/kg					mg/kg				
				7439-95-4					7439-96-5					7439-97-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	4.53E+02	1.60E+00	7.90E+02	J	J	6.50E+01	2.50E-02	2.40E+00			4.30E-02	3.00E-03	1.30E-01	J	J
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	4.43E+02	1.40E+00	7.30E+02	J	J	7.77E+01	2.30E-02	2.20E+00			6.80E-02	2.90E-03	1.30E-01	J	J
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	6.12E+02	1.70E+00	8.40E+02	J	J	1.40E+02	2.70E-02	2.50E+00			5.30E-02	3.00E-03	1.40E-01	J	J
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	6.58E+02	2.20E+00	1.10E+03	J	J	1.10E+02	3.50E-02	3.30E+00			6.20E-02	4.00E-03	1.80E-01	J	J
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	3.93E+02	2.10E+00	1.00E+03	J	J	1.32E+02	3.30E-02	3.10E+00			5.70E-02	4.00E-03	1.80E-01	J	J
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	5.34E+02	1.50E+00	7.70E+02	J	J	1.13E+02	2.50E-02	2.30E+00			4.80E-02	2.70E-03	1.20E-01	J	J
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	4.00E+02	1.50E+00	7.40E+02	J	J	5.55E+01	2.40E-02	2.20E+00		J	6.80E-02	2.60E-03	1.20E-01	J	J
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	5.11E+02	1.60E+00	8.30E+02	J	J	9.38E+01	2.70E-02	2.50E+00		J	1.10E-01	3.00E-03	1.40E-01	J	J
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	4.52E+02	1.30E+00	6.30E+02	J	J	9.82E+01	2.00E-02	1.90E+00		J	4.40E-02	2.20E-03	1.00E-01	J	J
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.27E+03	5.50E+00	2.80E+03	J	J	2.38E+02	8.90E-02	8.30E+00			1.40E-01	9.80E-03	4.50E-01	J	J
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	5.79E+02	1.60E+00	8.00E+02	J	J	6.34E+01	2.60E-02	2.40E+00		J	8.40E-02	2.80E-03	1.30E-01	J	J
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.13E+03	1.80E+00	8.90E+02			1.00E+02	2.80E-02	2.70E+00			5.70E-02	3.10E-03	1.40E-01	J	J
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.41E+03	8.60E+00	4.40E+03	J	J	4.35E+02	1.40E-01	1.30E+01		J	2.00E-01	1.60E-02	7.10E-01	J	J
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.71E+02	1.70E+00	8.80E+02	J	J	1.12E+02	2.80E-02	2.60E+00		J	1.10E-01	3.10E-03	1.40E-01	J	J
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.79E+02	1.60E+00	8.00E+02	J	J	1.27E+02	2.60E-02	2.40E+00		J	8.70E-02	3.10E-03	1.40E-01	J	J
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.29E+03	4.10E+00	2.10E+03	J	J	2.88E+02	6.60E-02	6.20E+00		J	1.30E-01	7.60E-03	3.40E-01	J	J

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Molybdenum					Nickel					Potassium				
				mg/kg					mg/kg					mg/kg				
				7439-98-7					7440-02-0					2023695				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.20E-01	1.20E-01	7.90E+00	U	U	4.40E+00	1.70E-01	6.30E+00	J	J	3.33E+02	2.20E+00	7.90E+02	J	J
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.10E-01	1.10E-01	7.30E+00	U	U	4.40E+00	1.60E-01	5.80E+00	J	J	4.00E+02	2.00E+00	7.30E+02	J	J
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.30E-01	1.30E-01	8.40E+00	U	U	7.20E+00	1.90E-01	6.80E+00			5.73E+02	2.30E+00	8.40E+02	J	J
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.70E-01	1.70E-01	1.10E+01	U	U	8.20E+00	2.40E-01	8.80E+00	J	J	4.68E+02	3.10E+00	1.10E+03	J	J
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.60E-01	1.60E-01	1.00E+01	U	U	9.50E+00	2.30E-01	8.30E+00			2.01E+02	2.90E+00	1.00E+03	J	J
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.20E-01	1.20E-01	7.70E+00	U	U	4.70E+00	1.70E-01	6.20E+00	J	J	4.34E+02	2.10E+00	7.70E+02	J	J
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.10E-01	1.10E-01	7.40E+00	U	U	3.30E+00	1.60E-01	5.90E+00	J	J	2.99E+02	2.00E+00	7.40E+02	J	J
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.20E-01	1.20E-01	8.30E+00	U	U	5.40E+00	1.80E-01	6.60E+00	J	J	3.98E+02	2.30E+00	8.30E+02	J	J
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	9.50E-02	9.50E-02	6.30E+00	U	U	4.10E+00	1.40E-01	5.10E+00	J	J	3.54E+02	1.70E+00	6.30E+02	J	J
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	4.20E-01	4.20E-01	2.80E+01	U	U	2.28E+01	6.10E-01	2.20E+01			1.00E+03	7.70E+00	2.80E+03	J	J
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.20E-01	1.20E-01	8.00E+00	U	U	5.00E+00	1.80E-01	6.40E+00	J	J	4.13E+02	2.20E+00	8.00E+02	J	J
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.30E-01	1.30E-01	8.90E+00	U	U	9.60E+00	2.00E-01	7.10E+00			8.99E+02	2.50E+00	8.90E+02		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	6.50E-01	6.50E-01	4.40E+01	U	U	2.81E+01	9.60E-01	3.50E+01	J	J	8.99E+02	1.20E+01	4.40E+03	J	J
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.30E-01	1.30E-01	8.80E+00	U	U	8.10E+00	1.90E-01	7.00E+00			3.58E+02	2.40E+00	8.80E+02	J	J
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.20E-01	1.20E-01	8.00E+00	U	U	6.70E+00	1.80E-01	6.40E+00			3.48E+02	2.20E+00	8.00E+02	J	J
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	3.10E-01	3.10E-01	2.10E+01	U	U	1.86E+01	4.60E-01	1.70E+01			9.31E+02	5.70E+00	2.10E+03	J	J

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Selenium					Silver					Sodium				
				mg/kg					mg/kg					mg/kg				
				7782-49-2					7440-22-4					7440-23-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	2.30E+00	3.20E-01	1.60E+01	J	J	9.50E-02	9.50E-02	1.60E+00	U	U	2.30E+01	2.30E+01	7.90E+02	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	4.70E+00	2.90E-01	1.50E+01	J	J	8.70E-02	8.70E-02	1.50E+00	U	U	6.61E+01	2.10E+01	7.30E+02	J	J
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.80E+00	3.40E-01	1.70E+01	J	J	1.00E-01	1.00E-01	1.70E+00	U	U	7.91E+01	2.40E+01	8.40E+02	J	J
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	2.40E+00	4.40E-01	2.20E+01	J	J	1.30E-01	1.30E-01	2.20E+00	U	U	9.90E+01	3.20E+01	1.10E+03	J	J
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	2.90E+00	4.20E-01	2.10E+01	J	J	1.20E-01	1.20E-01	2.10E+00	U	U	3.00E+01	3.00E+01	1.00E+03	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E+00	3.10E-01	1.50E+01	J	J	9.20E-02	9.20E-02	1.50E+00	U	U	2.20E+01	2.20E+01	7.70E+02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.60E+00	3.00E-01	1.50E+01	J	J	8.90E-02	8.90E-02	1.50E+00	U	U	2.10E+01	2.10E+01	7.40E+02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	2.30E+00	3.30E-01	1.70E+01	J	J	1.00E-01	1.00E-01	1.70E+00	U	U	2.40E+01	2.40E+01	8.30E+02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.30E+00	2.50E-01	1.30E+01	J	J	7.60E-02	7.60E-02	1.30E+00	U	U	1.80E+01	1.80E+01	6.30E+02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	5.00E+00	1.10E+00	5.50E+01	J	J	3.30E-01	3.30E-01	5.50E+00	U	U	8.00E+01	8.00E+01	2.80E+03	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	2.90E+00	3.20E-01	1.60E+01	J	J	9.60E-02	9.60E-02	1.60E+00	U	U	6.79E+01	2.30E+01	8.00E+02	J	J
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.40E+00	3.60E-01	1.80E+01	J	J	1.10E-01	1.10E-01	1.80E+00	U	U	1.02E+02	2.60E+01	8.90E+02	J	J
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	9.40E+00	1.70E+00	8.70E+01	J	J	5.20E-01	5.20E-01	8.70E+00	U	U	1.30E+02	1.30E+02	4.40E+03	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	2.50E+00	3.50E-01	1.80E+01	J	J	1.10E-01	1.10E-01	1.80E+00	U	U	2.50E+01	2.50E+01	8.80E+02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	2.30E+00	3.20E-01	1.60E+01	J	J	9.60E-02	9.60E-02	1.60E+00	U	U	2.30E+01	2.30E+01	8.00E+02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	4.70E+00	8.30E-01	4.10E+01	J	J	2.50E-01	2.50E-01	4.10E+00	U	U	6.00E+01	6.00E+01	2.10E+03	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Strontium					Thallium					Tin				
				mg/kg					mg/kg					mg/kg				
				7440-24-6					7440-28-0					7440-31-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	2.48E+01	4.90E-02	1.60E+00			4.80E+00	4.80E+00	6.40E+00	U	U	2.40E-01	2.40E-01	7.90E+00	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	2.08E+01	4.60E-02	1.50E+00			8.80E+00	8.80E+00	1.50E+01	U	U	2.20E-01	2.20E-01	7.30E+00	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.10E+01	4.90E-02	1.60E+00			1.00E+01	1.00E+01	1.70E+01	U	U	2.50E-01	2.50E-01	8.40E+00	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.98E+01	6.30E-02	2.10E+00			6.60E+00	6.60E+00	8.80E+00	U	U	3.30E-01	3.30E-01	1.10E+01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	3.76E+01	6.50E-02	2.20E+00			6.10E+00	6.10E+00	8.40E+00	U	U	3.10E-01	3.10E-01	1.00E+01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.96E+01	4.50E-02	1.50E+00			9.20E+00	9.20E+00	1.50E+01	U	U	2.30E-01	2.30E-01	7.70E+00	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.04E+01	4.50E-02	1.50E+00			4.40E+00	4.40E+00	6.00E+00	U	U	2.20E-01	2.20E-01	7.40E+00	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	2.28E+01	5.00E-02	1.70E+00			5.00E+00	5.00E+00	6.80E+00	U	U	2.50E-01	2.50E-01	8.30E+00	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.28E+01	3.80E-02	1.30E+00			3.80E+00	3.80E+00	5.20E+00	U	U	1.90E-01	1.90E-01	6.30E+00	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.04E+02	1.60E-01	5.40E+00			1.60E+01	1.60E+01	2.20E+01	U	U	8.30E-01	8.30E-01	2.80E+01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.89E+01	4.80E-02	1.60E+00			4.80E+00	4.80E+00	6.40E+00	U	U	2.40E-01	2.40E-01	8.00E+00	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	2.88E+01	5.40E-02	1.80E+00			1.08E+01	1.08E+01	1.80E+01	U	U	2.70E-01	2.70E-01	8.90E+00	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	8.19E+01	2.50E-01	8.40E+00			1.30E+00	1.30E+00	8.70E+00	U	U	1.30E+00	1.30E+00	4.40E+01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.72E+01	5.00E-02	1.70E+00			5.20E+00	5.20E+00	9.00E+00	U	U	2.60E-01	2.60E-01	8.80E+00	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.97E+01	5.10E-02	1.70E+00			4.80E+00	4.80E+00	6.40E+00	U	U	2.40E-01	2.40E-01	8.00E+00	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	4.88E+01	1.20E-01	4.00E+00			1.20E+01	1.20E+01	1.60E+01	U	U	6.20E-01	6.20E-01	2.10E+01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Metals

				Vanadium					Zinc				
				mg/kg					mg/kg				
				7440-62-2					7440-66-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.87E+01	7.40E-02	7.90E+00			1.78E+01	9.30E-02	3.20E+00		
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	4.06E+01	6.80E-02	7.30E+00			2.41E+01	8.60E-02	2.90E+00		
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	2.28E+01	7.90E-02	8.40E+00			2.06E+01	1.00E-01	3.40E+00		
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	2.14E+01	1.00E-01	1.10E+01			3.07E+01	1.30E-01	4.40E+00		
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.97E+01	9.80E-02	1.00E+01			3.77E+01	1.20E-01	4.20E+00		
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.18E+01	7.20E-02	7.70E+00			2.34E+01	9.10E-02	3.10E+00		
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.94E+01	7.00E-02	7.40E+00			1.36E+01	8.70E-02	3.00E+00		J
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	2.09E+01	7.80E-02	8.30E+00			1.85E+01	9.80E-02	3.30E+00		J
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.70E+01	5.90E-02	6.30E+00		J	2.35E+01	7.50E-02	2.50E+00		J
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	5.65E+01	2.60E-01	2.80E+01			8.54E+01	3.30E-01	1.10E+01		
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	2.85E+01	7.50E-02	8.00E+00			2.78E+01	9.50E-02	3.20E+00		J
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	4.21E+01	8.30E-02	8.90E+00			4.52E+01	1.00E-01	3.60E+00		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	5.09E+01	4.10E-01	4.40E+01		J	1.41E+02	5.10E-01	1.70E+01		J
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	2.29E+01	8.20E-02	8.80E+00			1.13E+02	1.00E-01	3.50E+00		J
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.64E+01	7.50E-02	8.00E+00			2.22E+01	9.40E-02	3.20E+00		J
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	5.46E+01	1.90E-01	2.10E+01		J	7.69E+01	2.40E-01	8.30E+00		J

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Anions

				Bromide					Chloride					Cyanide, Total				
				mg/kg					mg/kg					mg/kg				
				24959-67-9					16887-00-6					57-12-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	4.10E+00	4.10E+00	8.20E+00	U	U	1.60E+02	1.60E+02	3.30E+02	U	U	1.60E+00	1.60E+00	3.30E+00	U	UJ,L
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.90E+00	3.90E+00	7.70E+00	U	U	1.50E+02	1.50E+02	3.10E+02	U	U	1.50E+00	1.50E+00	3.10E+00	U	UJ,L
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	4.10E+00	4.10E+00	8.30E+00	U	U	1.70E+02	1.70E+02	3.30E+02	U	U	1.70E+00	1.70E+00	3.30E+00	U	UJ,L
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	5.30E+00	5.30E+00	1.10E+01	U	U	2.10E+02	2.10E+02	4.20E+02	U	U	2.10E+00	2.10E+00	4.20E+00	U	UJ,L
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	5.50E+00	5.50E+00	1.10E+01	U	U	2.20E+02	2.20E+02	4.40E+02	U	U	2.20E+00	2.20E+00	4.40E+00	U	UJ,L
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	3.80E+00	3.80E+00	7.60E+00	U	U	1.50E+02	1.50E+02	3.00E+02	U	U	1.50E+00	1.50E+00	3.00E+00	U	UJ,L
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	3.70E+00	3.70E+00	7.40E+00	U	U	1.50E+02	1.50E+02	3.00E+02	U	U	1.50E+00	1.50E+00	3.00E+00	U	UJ,L
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.10E+00	4.10E+00	8.10E+00	U	U	1.60E+02	1.60E+02	3.30E+02	U	U	1.60E+00	1.60E+00	3.30E+00	U	UJ,L
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	3.20E+00	3.20E+00	6.30E+00	U	U	1.30E+02	1.30E+02	2.50E+02	U	U	1.30E+00	1.30E+00	2.50E+00	U	UJ
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.40E+01	1.40E+01	2.70E+01	U	U	5.40E+02	5.40E+02	1.10E+03	U	U	5.40E+00	5.40E+00	1.10E+01	U	UJ,L
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	4.00E+00	4.00E+00	8.00E+00	U	U	1.60E+02	1.60E+02	3.20E+02	U	U	1.60E+00	1.60E+00	3.20E+00	U	UJ,L
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	4.50E+00	4.50E+00	9.10E+00	U	U	1.80E+02	1.80E+02	3.60E+02	U	U	1.80E+00	1.80E+00	3.60E+00	U	UJ,L
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.10E+01	2.10E+01	4.30E+01	U	U	8.50E+02	8.50E+02	1.70E+03	U	U	8.50E+00	8.50E+00	1.70E+01	U	UJ
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.30E+00	4.30E+00	8.60E+00	U	U	1.70E+02	1.70E+02	3.40E+02	U	U	1.70E+00	1.70E+00	3.40E+00	U	UJ,L
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.20E+00	4.20E+00	8.50E+00	U	U	1.70E+02	1.70E+02	3.40E+02	U	U	1.70E+00	1.70E+00	3.40E+00	U	UJ,L
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.00E+01	1.00E+01	2.00E+01	U	U	4.10E+02	4.10E+02	8.10E+02	U	U	4.10E+00	4.10E+00	8.10E+00	U	UJ

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Anions

				Fluoride, Total					Nitrate					Nitrite				
				mg/kg					mg/kg					mg/kg				
				16984-48-8					14797-55-8					14797-65-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.60E+00	1.60E+00	3.30E+00	U	U	1.10E+00	8.20E-01	1.60E+00	J	J	8.20E-01	8.20E-01	1.60E+00	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.50E+00	1.50E+00	3.10E+00	J	J	1.40E+00	7.70E-01	1.50E+00	J	J	7.70E-01	7.70E-01	1.50E+00	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	2.60E+00	1.70E+00	3.30E+00	J	J	1.50E+00	8.30E-01	1.70E+00	J	J	8.30E-01	8.30E-01	1.70E+00	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	3.00E+00	2.10E+00	4.20E+00	J	J	1.10E+00	1.10E+00	2.10E+00	J	J	1.10E+00	1.10E+00	2.10E+00	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	2.90E+00	2.20E+00	4.40E+00	J	J	1.10E+00	1.10E+00	2.20E+00	U	U	1.10E+00	1.10E+00	2.20E+00	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.50E+00	1.50E+00	3.00E+00	U	U	1.40E+00	7.60E-01	1.50E+00	J	J	7.60E-01	7.60E-01	1.50E+00	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.10E+00	1.50E+00	3.00E+00	J	J,H	7.40E-01	7.40E-01	1.50E+00	J	J,H	7.40E-01	7.40E-01	1.50E+00	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	2.00E+00	1.60E+00	3.30E+00	J	J,H	9.80E-01	8.10E-01	1.60E+00	J	J,H	8.10E-01	8.10E-01	1.60E+00	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.30E+00	1.30E+00	2.50E+00	J	J,H	6.30E-01	6.30E-01	1.30E+00	U	U	6.30E-01	6.30E-01	1.30E+00	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	5.40E+00	5.40E+00	1.10E+01	J	J,H	2.70E+00	2.70E+00	5.40E+00	U	U	2.70E+00	2.70E+00	5.40E+00	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.80E+00	1.60E+00	3.20E+00	J	J,L	8.00E-01	8.00E-01	1.60E+00	J	J,H	8.00E-01	8.00E-01	1.60E+00	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.80E+00	1.80E+00	3.60E+00	J	J	1.80E+00	9.10E-01	1.80E+00			9.10E-01	9.10E-01	1.80E+00	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	9.40E+00	8.50E+00	1.70E+01	J	J,H	4.30E+00	4.30E+00	8.50E+00	U	U	4.30E+00	4.30E+00	8.50E+00	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.90E+00	1.70E+00	3.40E+00	J	J,H	8.60E-01	8.60E-01	1.70E+00	J	J,H	8.60E-01	8.60E-01	1.70E+00	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.70E+00	1.70E+00	3.40E+00	U	U	1.50E+00	8.50E-01	1.70E+00	J	J,H	8.50E-01	8.50E-01	1.70E+00	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	4.10E+00	4.10E+00	8.10E+00	J	J,H	2.00E+00	2.00E+00	4.10E+00	U	U	2.00E+00	2.00E+00	4.10E+00	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Anions

				Perchlorate					Sulfate				
				mg/kg					mg/kg				
				14797-73-0					14808-79-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	8.20E-02	8.20E-02	1.60E-01	U	U	1.60E+02	1.60E+02	3.30E+02	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	7.70E-02	7.70E-02	1.50E-01	U	U	1.50E+02	1.50E+02	3.10E+02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	8.30E-02	8.30E-02	1.70E-01	U	U	1.70E+02	1.70E+02	3.30E+02	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.10E-01	1.10E-01	2.10E-01	U	U	2.10E+02	2.10E+02	4.20E+02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.10E-01	1.10E-01	2.20E-01	U	U	2.20E+02	2.20E+02	4.40E+02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	7.60E-02	7.60E-02	1.50E-01	U	U	1.50E+02	1.50E+02	3.00E+02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	7.40E-03	7.40E-03	1.50E-02	U	U	1.50E+02	1.50E+02	3.00E+02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	8.10E-03	8.10E-03	1.60E-02	U	U	1.60E+02	1.60E+02	3.30E+02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	6.40E-03	6.40E-03	1.30E-02	U	U	1.30E+02	1.30E+02	2.50E+02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.70E-02	2.70E-02	5.40E-02	U	U	5.40E+02	5.40E+02	1.10E+03	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	8.00E-03	8.00E-03	1.60E-02	U	U	1.60E+02	1.60E+02	3.20E+02	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	9.10E-02	9.10E-02	1.80E-01	U	U	1.80E+02	1.80E+02	3.60E+02	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.30E-02	4.30E-02	8.50E-02	U	U	8.50E+02	8.50E+02	1.70E+03	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	8.60E-03	8.60E-03	1.70E-02	U	U	1.70E+02	1.70E+02	3.40E+02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	8.50E-02	8.50E-02	1.70E-01	U	U	1.70E+02	1.70E+02	3.40E+02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	2.00E-02	2.00E-02	4.10E-02	U	U	4.10E+02	4.10E+02	8.10E+02	U	U

Footnotes:
FD - field duplicate
H - high bias to estimate (see Shaw, 2004b)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory.
REG - regular sample
RLimit - analytical reporting limit reported by laboratory.
U = undetected concentration.
VQ - data qualifier applied during data validation with same meanings as LQ.
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)					1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)					1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)				
				mg/kg					mg/kg					mg/kg				
				67562-39-4					35822-46-9					55673-89-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.61E-07	1.61E-07	2.50E-06	U	U	2.07E-04	3.38E-07	2.50E-06		J	2.68E-07	2.68E-07	2.50E-06	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.82E-07	1.82E-07	2.50E-06	U	U	2.49E-04	6.40E-07	2.50E-06			3.03E-07	3.03E-07	2.50E-06	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	2.96E-07	2.96E-07	2.50E-06	U	U	6.84E-05	3.63E-07	2.50E-06			4.94E-07	4.94E-07	2.50E-06	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	5.21E-07	5.21E-07	2.50E-06	U	U	2.39E-04	5.98E-07	2.50E-06			8.67E-07	8.67E-07	2.50E-06	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.64E-07	1.64E-07	2.50E-06	U	U	5.08E-04	1.12E-06	2.50E-06			2.73E-07	2.73E-07	2.50E-06	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.00E-07	2.00E-07	2.50E-06	U	U	6.03E-04	1.48E-06	2.50E-06			3.33E-07	3.33E-07	2.50E-06	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.94E-07	1.94E-07	2.50E-06	U	U	2.91E-04	1.01E-06	2.50E-06			2.70E-07	2.70E-07	2.50E-06	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.34E-06	2.70E-07	2.50E-06		J	3.36E-04	8.65E-07	2.50E-06			4.17E-07	4.17E-07	2.50E-06	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.98E-07	2.98E-07	2.50E-06	U	U	5.74E-05	3.86E-07	2.50E-06		J,H	4.16E-07	4.16E-07	2.50E-06	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.18E-07	3.18E-07	2.50E-06	U	U	5.40E-05	5.50E-07	2.50E-06			4.43E-07	4.43E-07	2.50E-06	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	2.78E-07	2.78E-07	2.50E-06	U	U	1.62E-04	7.14E-07	2.50E-06			3.88E-07	3.88E-07	2.50E-06	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.54E-07	1.54E-07	2.50E-06	U	U	1.37E-04	3.85E-07	2.50E-06			2.56E-07	2.56E-07	2.50E-06	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	7.75E-07	7.75E-07	2.50E-06	U	U	1.12E-03	3.06E-06	2.50E-06		J,H	1.08E-06	1.08E-06	2.50E-06	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.96E-07	2.25E-07	2.50E-06		J	2.18E-04	4.17E-07	2.50E-06			3.14E-07	3.14E-07	2.50E-06	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	2.95E-07	2.37E-07	2.50E-06		J	2.00E-04	6.37E-07	2.50E-06			3.31E-07	3.31E-07	2.50E-06	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	2.62E-07	2.62E-07	2.50E-06	U	U	1.21E-04	5.25E-07	2.50E-06		J,H	3.65E-07	3.65E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)					1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)					1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)				
				mg/kg					mg/kg					mg/kg				
				39227-28-6					70648-26-9					57653-85-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	2.21E-07	2.21E-07	2.50E-06	U	U	8.00E-08	8.00E-08	2.50E-06	U	U	1.85E-06	2.07E-07	2.50E-06		
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.71E-07	1.25E-07	2.50E-06		J	8.60E-08	8.60E-08	2.50E-06	U	U	1.79E-06	1.17E-07	2.50E-06		J
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	4.68E-07	1.71E-07	2.50E-06		J	1.26E-07	1.26E-07	2.50E-06	U	U	1.58E-06	1.60E-07	2.50E-06		J
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.13E-06	2.26E-07	2.50E-06		J	1.69E-07	1.69E-07	2.50E-06	U	U	3.30E-06	2.12E-07	2.50E-06		
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.32E-06	3.04E-07	2.50E-06		J	9.60E-08	9.60E-08	2.50E-06	U	U	5.87E-06	2.85E-07	2.50E-06		
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.06E-06	1.13E-07	2.50E-06		J	1.15E-07	1.15E-07	2.50E-06	U	U	7.61E-06	1.06E-07	2.50E-06		
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.51E-06	2.28E-07	2.50E-06		J	1.36E-07	1.36E-07	2.50E-06	U	U	1.76E-06	2.02E-07	2.50E-06		J
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	2.27E-06	2.10E-07	2.50E-06			4.98E-07	1.17E-07	2.50E-06		J	5.13E-06	1.89E-07	2.50E-06		
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	4.97E-07	2.70E-07	2.50E-06		J	1.77E-07	1.77E-07	2.50E-06	U	U	1.06E-06	2.39E-07	2.50E-06		J,H
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	4.24E-07	4.24E-07	2.50E-06	U	U	2.19E-07	2.19E-07	2.50E-06	U	U	1.41E-06	3.75E-07	2.50E-06		J
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	9.28E-07	2.14E-07	2.50E-06		J	1.19E-07	1.19E-07	2.50E-06	U	U	1.34E-06	1.89E-07	2.50E-06		J
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	7.30E-07	1.17E-07	2.50E-06		J	9.80E-08	9.80E-08	2.50E-06	U	U	2.19E-06	1.09E-07	2.50E-06		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	3.75E-06	8.88E-07	2.50E-06			4.06E-07	4.06E-07	2.50E-06	U	U	1.41E-05	7.85E-07	2.50E-06		J,H
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.84E-06	2.18E-07	2.50E-06			1.24E-07	1.24E-07	2.50E-06	U	U	3.26E-06	1.93E-07	2.50E-06		
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.16E-06	2.54E-07	2.50E-06			1.62E-07	1.62E-07	2.50E-06	U	U	1.86E-06	2.25E-07	2.50E-06		J
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	5.56E-07	2.32E-07	2.50E-06			1.18E-07	1.18E-07	2.50E-06	U	U	2.14E-06	2.05E-07	2.50E-06		J,H

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)					1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)					1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)				
				mg/kg					mg/kg					mg/kg				
				57117-44-9					19408-74-3					72918-21-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	8.00E-08	8.00E-08	2.50E-06	U	U	4.65E-06	2.41E-07	2.50E-06			1.15E-07	1.15E-07	2.50E-06	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	8.60E-08	8.60E-08	2.50E-06	U	U	5.23E-06	1.36E-07	2.50E-06			1.23E-07	1.23E-07	2.50E-06	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.27E-07	1.27E-07	2.50E-06	U	U	2.42E-06	1.86E-07	2.50E-06		J	1.81E-07	1.81E-07	2.50E-06	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.70E-07	1.70E-07	2.50E-06	U	U	2.03E-05	2.46E-07	2.50E-06			2.42E-07	2.42E-07	2.50E-06	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	9.60E-08	9.60E-08	2.50E-06	U	U	5.00E-05	3.31E-07	2.50E-06			1.37E-07	1.37E-07	2.50E-06	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.16E-07	1.16E-07	2.50E-06	U	U	1.92E-05	1.23E-07	2.50E-06			1.65E-07	1.65E-07	2.50E-06	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.36E-07	1.36E-07	2.50E-06	U	U	1.29E-05	2.06E-07	2.50E-06			1.75E-07	1.75E-07	2.50E-06	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.19E-07	1.19E-07	2.50E-06	U	U	2.15E-05	2.03E-07	2.50E-06			1.63E-07	1.63E-07	2.50E-06	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.77E-07	1.77E-07	2.50E-06	U	U	4.49E-06	2.44E-07	2.50E-06		J,H	2.28E-07	2.28E-07	2.50E-06	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.19E-07	2.19E-07	2.50E-06	U	U	1.70E-06	3.83E-07	2.50E-06		J	2.82E-07	2.82E-07	2.50E-06	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.19E-07	1.19E-07	2.50E-06	U	U	4.68E-06	1.93E-07	2.50E-06			1.53E-07	1.53E-07	2.50E-06	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	9.80E-08	9.80E-08	2.50E-06	U	U	1.22E-05	1.27E-07	2.50E-06			1.40E-07	1.40E-07	2.50E-06	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.06E-07	4.06E-07	2.50E-06	U	U	2.32E-05	8.02E-07	2.50E-06		J,H	5.21E-07	5.21E-07	2.50E-06	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.24E-07	1.24E-07	2.50E-06	U	U	7.81E-06	1.97E-07	2.50E-06			1.60E-07	1.60E-07	2.50E-06	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.62E-07	1.62E-07	2.50E-06	U	U	7.54E-06	2.29E-07	2.50E-06			2.08E-07	2.08E-07	2.50E-06	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.18E-07	1.18E-07	2.50E-06	U	U	7.07E-06	2.10E-07	2.50E-06		J,H	1.52E-07	1.52E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)					1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)					2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)				
				mg/kg					mg/kg					mg/kg				
				40321-76-4					57117-41-6					60851-34-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	9.50E-08	9.50E-08	2.50E-06	U	U	6.40E-08	6.40E-08	2.50E-06	U	U	9.30E-08	9.30E-08	2.50E-06	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	2.25E-07	9.40E-08	2.50E-06		J	7.00E-08	7.00E-08	2.50E-06	U	U	9.90E-08	9.90E-08	2.50E-06	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.54E-07	1.54E-07	2.50E-06	U	U	1.39E-07	1.39E-07	2.50E-06	U	U	1.46E-07	1.46E-07	2.50E-06	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	2.45E-07	2.45E-07	2.50E-06	U	U	1.97E-07	1.97E-07	2.50E-06	U	U	1.96E-07	1.96E-07	2.50E-06	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	5.03E-07	1.08E-07	2.50E-06		J	8.00E-08	8.00E-08	2.50E-06	U	U	1.11E-07	1.11E-07	2.50E-06	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.29E-07	1.29E-07	2.50E-06	U	U	9.90E-08	9.90E-08	2.50E-06	U	U	1.34E-07	1.34E-07	2.50E-06	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.98E-07	1.98E-07	2.50E-06	U	U	1.31E-07	1.31E-07	2.50E-06	U	U	1.52E-07	1.52E-07	2.50E-06	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.77E-06	1.75E-07	2.50E-06		J	1.33E-07	1.33E-07	2.50E-06	U	U	1.33E-07	1.33E-07	2.50E-06	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.91E-07	1.91E-07	2.50E-06	U	U	1.53E-07	1.53E-07	2.50E-06	U	U	1.98E-07	1.98E-07	2.50E-06	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.25E-07	3.25E-07	2.50E-06	U	U	2.07E-07	2.07E-07	2.50E-06	U	U	2.45E-07	2.45E-07	2.50E-06	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.82E-07	1.82E-07	2.50E-06	U	U	1.26E-07	1.26E-07	2.50E-06	U	U	1.33E-07	1.33E-07	2.50E-06	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	2.95E-07	1.41E-07	2.50E-06		J	8.00E-08	8.00E-08	2.50E-06	U	U	1.13E-07	1.13E-07	2.50E-06	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.93E-07	4.93E-07	2.50E-06	U	U	4.57E-07	4.57E-07	2.50E-06	U	U	4.54E-07	4.54E-07	2.50E-06	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.88E-07	1.39E-07	2.50E-06		J	1.22E-07	1.22E-07	2.50E-06	U	U	1.39E-07	1.39E-07	2.50E-06	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.65E-07	1.65E-07	2.50E-06	U	U	1.57E-07	1.57E-07	2.50E-06	U	U	1.81E-07	1.81E-07	2.50E-06	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.67E-07	1.67E-07	2.50E-06	U	U	1.27E-07	1.27E-07	2.50E-06	U	U	1.32E-07	1.32E-07	2.50E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)					2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)					2,3,7,8-Tetrachlorodibenzofuran (TCDF)				
				mg/kg					mg/kg					mg/kg				
				57117-31-4					1746-01-6					51207-31-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	5.50E-08	5.50E-08	2.50E-06	U	UJ	6.20E-08	6.20E-08	1.00E-06	U	U	7.50E-08	7.50E-08	1.00E-06	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	5.90E-08	5.90E-08	2.50E-06	U	UJ	6.10E-08	6.10E-08	1.00E-06	U	U	7.60E-08	7.60E-08	1.00E-06	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.18E-07	1.18E-07	2.50E-06	U	UJ	1.15E-07	1.15E-07	1.00E-06	U	U	1.13E-07	1.13E-07	1.00E-06	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.67E-07	1.67E-07	2.50E-06	U	UJ	1.94E-07	1.94E-07	1.00E-06	U	U	2.56E-07	2.56E-07	1.00E-06	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	6.80E-08	6.80E-08	2.50E-06	U	UJ	8.90E-08	8.90E-08	1.00E-06	U	U	9.80E-08	9.80E-08	1.00E-06	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	8.40E-08	8.40E-08	2.50E-06	U	UJ	8.20E-08	8.20E-08	1.00E-06	U	U	1.01E-07	1.01E-07	1.00E-06	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.32E-07	1.32E-07	2.50E-06	U	U	1.42E-07	1.42E-07	1.00E-06	U	U	1.50E-07	1.50E-07	1.00E-06	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.28E-07	1.28E-07	2.50E-06	U	U	1.33E-07	1.33E-07	1.00E-06	U	U	1.39E-07	1.39E-07	1.00E-06	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.54E-07	1.54E-07	2.50E-06	U	U	1.51E-07	1.51E-07	1.00E-06	U	U	2.13E-07	2.13E-07	1.00E-06	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.09E-07	2.09E-07	2.50E-06	U	U	3.25E-07	3.25E-07	1.00E-06	U	U	2.62E-07	2.62E-07	1.00E-06	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.27E-07	1.27E-07	2.50E-06	U	U	1.74E-07	1.74E-07	1.00E-06	U	U	1.80E-07	1.80E-07	1.00E-06	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	6.80E-08	6.80E-08	2.50E-06	U	UJ	7.40E-08	7.40E-08	1.00E-06	U	U	6.70E-08	6.70E-08	1.00E-06	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.61E-07	4.61E-07	2.50E-06	U	U	4.21E-07	4.21E-07	1.00E-06	U	U	6.60E-07	6.60E-07	1.00E-06	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.22E-07	1.22E-07	2.50E-06	U	U	1.62E-07	1.62E-07	1.00E-06	U	U	1.74E-07	1.74E-07	1.00E-06	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.58E-07	1.58E-07	2.50E-06	U	U	1.80E-07	1.80E-07	1.00E-06	U	U	2.36E-07	2.36E-07	1.00E-06	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.28E-07	1.28E-07	2.50E-06	U	U	1.49E-07	1.49E-07	1.00E-06	U	U	1.79E-07	1.79E-07	1.00E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				Heptachlorodibenzo-p-dioxins (HpCDD), Total					Heptachlorodibenzofurans (HpCDF), Total					Hexachlorodibenzo-p-dioxins (HxCDD), Total				
				mg/kg					mg/kg					mg/kg				
				37871-00-4					38998-75-3					34465-46-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	5.78E-04	3.38E-07	2.50E-06			1.61E-07	1.61E-07	2.50E-06	U	U	2.53E-04	2.21E-07	2.50E-06		
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.15E-03	6.40E-07	2.50E-06			1.12E-06	1.82E-07	2.50E-06			3.68E-04	1.25E-07	2.50E-06		
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.57E-04	3.63E-07	2.50E-06			2.96E-07	2.96E-07	2.50E-06	U	U	2.71E-05	1.71E-07	2.50E-06		
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.90E-04	5.98E-07	2.50E-06			5.21E-07	5.21E-07	2.50E-06	U	U	9.46E-05	2.26E-07	2.50E-06		
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.45E-03	5.38E-07	2.50E-06			9.93E-07	1.64E-07	2.50E-06			3.36E-04	3.04E-07	2.50E-06		
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.68E-03	8.66E-07	2.50E-06			2.74E-06	2.00E-07	2.50E-06			1.56E-03	1.13E-07	2.50E-06		
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.64E-03	1.01E-06	2.50E-06			1.94E-07	1.94E-07	2.50E-06	U	U	5.53E-04	2.28E-07	2.50E-06		
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.26E-03	8.65E-07	2.50E-06			1.07E-06	2.70E-07	2.50E-06			2.74E-04	2.10E-07	2.50E-06		
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.52E-04	3.86E-07	2.50E-06			2.98E-07	2.98E-07	2.50E-06	U	U	4.01E-05	2.70E-07	2.50E-06		
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.41E-04	5.50E-07	2.50E-06			3.18E-07	3.18E-07	2.50E-06	U	U	5.84E-05	4.24E-07	2.50E-06		
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	7.39E-04	7.14E-07	2.50E-06			4.09E-07	2.78E-07	2.50E-06			2.26E-04	2.14E-07	2.50E-06		
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.52E-04	3.85E-07	2.50E-06			1.54E-07	1.54E-07	2.50E-06	U	U	8.07E-05	1.17E-07	2.50E-06		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.26E-03	1.60E-06	2.50E-06			7.75E-07	7.75E-07	2.50E-06	U	U	9.15E-04	8.88E-07	2.50E-06		
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	6.60E-04	4.17E-07	2.50E-06			8.21E-07	2.25E-07	2.50E-06			1.15E-04	2.18E-07	2.50E-06		
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	7.43E-04	6.37E-07	2.50E-06			5.10E-07	2.37E-07	2.50E-06			1.68E-04	2.54E-07	2.50E-06		
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	4.37E-04	5.25E-07	2.50E-06			2.62E-07	2.62E-07	2.50E-06	U	U	1.06E-04	2.32E-07	2.50E-06		

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				Hexachlorodibenzofurans (HxCDF), Total					OCDD					Octachlorodibenzofuran (OCDF)				
				mg/kg					mg/kg					mg/kg				
				55684-94-1					3268-87-9					39001-02-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	2.44E-07	8.00E-08	2.50E-06			8.62E-03	2.92E-07	5.00E-06			2.84E-07	2.84E-07	5.00E-06	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.05E-07	8.60E-08	2.50E-06			5.17E-02	4.38E-07	5.00E-06		J	2.14E-07	2.14E-07	5.00E-06	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.26E-07	1.26E-07	2.50E-06	U	U	1.79E-03	6.01E-07	5.00E-06		J	7.01E-07	7.01E-07	5.00E-06	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.69E-07	1.69E-07	2.50E-06	U	U	5.11E-03	7.30E-07	5.00E-06		J	8.18E-07	8.18E-07	5.00E-06	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	9.60E-08	9.60E-08	2.50E-06	U	U	1.26E-02	2.08E-06	5.00E-06		J	2.74E-07	2.74E-07	5.00E-06	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.49E-06	1.15E-07	2.50E-06			5.37E-02	8.16E-07	5.00E-06		J	3.57E-07	3.57E-07	5.00E-06	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	3.61E-07	1.36E-07	2.50E-06			5.76E-02	5.30E-07	5.00E-06		J	4.89E-07	4.89E-07	5.00E-06	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	6.38E-07	1.17E-07	2.50E-06			4.77E-02	5.89E-07	5.00E-06		J	6.58E-07	6.58E-07	5.00E-06	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.77E-07	1.77E-07	2.50E-06	U	U	1.53E-03	4.99E-07	5.00E-06		J	7.21E-07	7.21E-07	5.00E-06	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.19E-07	2.19E-07	2.50E-06	U	U	1.72E-03	8.54E-07	5.00E-06			9.91E-07	9.91E-07	5.00E-06	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.19E-07	1.19E-07	2.50E-06	U	U	2.97E-02	5.33E-07	5.00E-06		J	6.20E-07	6.20E-07	5.00E-06	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	9.80E-08	9.80E-08	2.50E-06	U	U	3.20E-03	7.30E-07	5.00E-06		J	4.39E-07	4.39E-07	5.00E-06	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.06E-07	4.06E-07	2.50E-06	U	U	1.08E-01	2.49E-06	5.00E-06		J	1.47E-06	1.47E-06	5.00E-06	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.24E-07	1.24E-07	2.50E-06	U	U	1.27E-02	4.96E-07	5.00E-06		J	4.27E-07	4.27E-07	5.00E-06	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.62E-07	1.62E-07	2.50E-06	U	U	2.63E-02	4.11E-07	5.00E-06		J	4.61E-07	4.61E-07	5.00E-06	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.18E-07	1.18E-07	2.50E-06	U	U	3.41E-03	5.76E-07	5.00E-06		J	4.99E-07	4.99E-07	5.00E-06	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				Pentachlorodibenzo-p-dioxin (PeCDD), Total					Pentachlorodibenzofurans (PeCDF), Total					Tetrachlorodibenzo-p-dioxins (TCDD), Total				
				mg/kg					mg/kg					mg/kg				
				36088-22-9					30402-15-4					41903-57-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.75E-05	9.50E-08	2.50E-06			5.50E-08	5.50E-08	2.50E-06	U	U	3.79E-05	6.20E-08	1.00E-06		
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	8.49E-05	9.40E-08	2.50E-06			5.90E-08	5.90E-08	2.50E-06	U	U	1.71E-04	6.10E-08	1.00E-06		
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	2.78E-06	1.54E-07	2.50E-06			1.18E-07	1.18E-07	2.50E-06	U	U	1.15E-07	1.15E-07	1.00E-06	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	7.94E-06	2.45E-07	2.50E-06			1.67E-07	1.67E-07	2.50E-06	U	U	3.16E-06	1.94E-07	1.00E-06		
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	3.42E-05	1.08E-07	2.50E-06			6.80E-08	6.80E-08	2.50E-06	U	U	1.06E-05	8.90E-08	1.00E-06		
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.79E-04	1.29E-07	2.50E-06			8.40E-08	8.40E-08	2.50E-06	U	U	3.23E-04	8.20E-08	1.00E-06		
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.03E-04	1.98E-07	2.50E-06			1.32E-07	1.32E-07	2.50E-06	U	U	9.10E-05	1.42E-07	1.00E-06		
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	5.16E-05	1.75E-07	2.50E-06			4.27E-07	1.28E-07	2.50E-06			3.68E-05	1.33E-07	1.00E-06		
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.50E-06	1.91E-07	2.50E-06			1.54E-07	1.54E-07	2.50E-06	U	U	1.24E-06	1.51E-07	1.00E-06		
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	5.72E-06	3.25E-07	2.50E-06			2.09E-07	2.09E-07	2.50E-06	U	U	1.10E-06	3.25E-07	1.00E-06		
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.92E-05	1.82E-07	2.50E-06			1.27E-07	1.27E-07	2.50E-06	U	U	4.18E-05	1.74E-07	1.00E-06		
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.13E-05	1.41E-07	2.50E-06			6.80E-08	6.80E-08	2.50E-06	U	U	4.07E-06	7.40E-08	1.00E-06		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	8.47E-05	4.93E-07	2.50E-06			4.61E-07	4.61E-07	2.50E-06	U	U	5.85E-05	4.21E-07	1.00E-06		
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.45E-05	1.39E-07	2.50E-06			1.22E-07	1.22E-07	2.50E-06	U	U	1.02E-05	1.62E-07	1.00E-06		
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	2.58E-05	1.65E-07	2.50E-06			1.58E-07	1.58E-07	2.50E-06	U	U	1.86E-05	1.80E-07	1.00E-06		
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.24E-05	1.67E-07	2.50E-06			1.28E-07	1.28E-07	2.50E-06	U	U	3.37E-06	1.49E-07	1.00E-06		

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Dioxins and Furans

				Tetrachlorodibenzofurans (TCDF), Total				
				mg/kg				
				55722-27-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	7.50E-08	7.50E-08	1.00E-06	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	7.60E-08	7.60E-08	1.00E-06	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.13E-07	1.13E-07	1.00E-06	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	2.56E-07	2.56E-07	1.00E-06	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	6.35E-07	9.80E-08	1.00E-06		
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.01E-07	1.01E-07	1.00E-06	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.50E-07	1.50E-07	1.00E-06	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.39E-07	1.39E-07	1.00E-06	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.13E-07	2.13E-07	1.00E-06	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.62E-07	2.62E-07	1.00E-06	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.80E-07	1.80E-07	1.00E-06	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.20E-06	6.70E-08	1.00E-06		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	6.60E-07	6.60E-07	1.00E-06	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	5.55E-07	1.74E-07	1.00E-06		
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	2.36E-07	2.36E-07	1.00E-06	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.79E-07	1.79E-07	1.00E-06	U	U

Footnotes :
FD - field duplicate
H - high bias to estimate (see Shaw, 2004b)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory.
REG - regular sample
RLimit - analytical reporting limit reported by laboratory.
U = undetected concentration.
VQ - data qualifier applied during data validation with same meanings as LQ.
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Explosives

				1,3,5-Trinitrobenzene					1,3-Dinitrobenzene					2,4,6-Trinitrotoluene				
				mg/kg					mg/kg					mg/kg				
				99-35-4					99-65-0					118-96-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	9.40E-02	9.40E-02	2.40E-01	U	U	9.40E-02	9.40E-02	2.40E-01	U	U	9.40E-02	9.40E-02	2.40E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	9.10E-02	9.10E-02	2.30E-01	U	U	9.10E-02	9.10E-02	2.30E-01	U	U	9.10E-02	9.10E-02	2.30E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	8.90E-02	8.90E-02	2.20E-01	U	U	8.90E-02	8.90E-02	2.20E-01	U	U	8.90E-02	8.90E-02	2.20E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Explosives

				2,4-Dinitrotoluene					2,6-Dinitrotoluene					2-Amino-4,6-dinitrotoluene				
				mg/kg					mg/kg					mg/kg				
				121-14-2					606-20-2					35572-78-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.20E-01	1.20E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	9.40E-02	9.40E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.40E-02	9.40E-02	2.40E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	9.10E-02	9.10E-02	2.30E-01	U	U	1.10E-01	1.10E-01	2.30E-01	U	U	9.10E-02	9.10E-02	2.30E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	9.70E-02	9.70E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	1.20E-01	1.20E-01	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	8.90E-02	8.90E-02	2.20E-01	U	U	1.10E-01	1.10E-01	2.20E-01	U	U	8.90E-02	8.90E-02	2.20E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	9.60E-02	9.60E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	1.20E-01	1.20E-01	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Explosives

				4-Amino-2,6-dinitrotoluene					HMX					Nitrobenzene				
				mg/kg					mg/kg					mg/kg				
				19406-51-0					2691-41-0					98-95-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	9.40E-02	9.40E-02	2.40E-01	U	U	9.40E-02	9.40E-02	2.40E-01	U	U	9.40E-02	9.40E-02	2.40E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	9.10E-02	9.10E-02	2.30E-01	U	U	9.10E-02	9.10E-02	2.30E-01	U	U	9.10E-02	9.10E-02	2.30E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	8.90E-02	8.90E-02	2.20E-01	U	U	8.90E-02	8.90E-02	2.20E-01	U	U	8.90E-02	8.90E-02	2.20E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Explosives

				RDX					Tetryl					m-Nitrotoluene				
				mg/kg					mg/kg					mg/kg				
				121-82-4					479-45-8					99-08-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	9.40E-02	9.40E-02	2.40E-01	U	U	9.40E-02	9.40E-02	2.40E-01	U	U	9.40E-02	9.40E-02	2.40E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	9.10E-02	9.10E-02	2.30E-01	U	U	9.10E-02	9.10E-02	2.30E-01	U	U	9.10E-02	9.10E-02	2.30E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	8.90E-02	8.90E-02	2.20E-01	U	U	8.90E-02	8.90E-02	2.20E-01	U	U	8.90E-02	8.90E-02	2.20E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Explosives

				o-Nitrotoluene					p-Nitrotoluene				
				mg/kg					mg/kg				
				88-72-2					99-99-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.00E-01	1.00E-01	2.50E-01	U	U	1.00E-01	1.00E-01	2.50E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	9.40E-02	9.40E-02	2.40E-01	U	U	9.40E-02	9.40E-02	2.40E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	9.10E-02	9.10E-02	2.30E-01	U	U	9.10E-02	9.10E-02	2.30E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	9.30E-02	9.30E-02	2.30E-01	U	U	9.30E-02	9.30E-02	2.30E-01	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	8.90E-02	8.90E-02	2.20E-01	U	U	8.90E-02	8.90E-02	2.20E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	9.50E-02	9.50E-02	2.40E-01	U	U	9.50E-02	9.50E-02	2.40E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	9.60E-02	9.60E-02	2.40E-01	U	U	9.60E-02	9.60E-02	2.40E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	9.70E-02	9.70E-02	2.40E-01	U	U	9.70E-02	9.70E-02	2.40E-01	U	U

Footnotes:

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory

REG - regular sample

RLimit - analytical reporting limit reported by laboratory

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a)

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake
Polycyclic Aromatic Hydrocarbons (PAHs)

				Acenaphthene					Acenaphthylene					Anthracene				
				mg/kg					mg/kg					mg/kg				
				83-32-9					208-96-8					120-12-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	2.70E-02	2.70E-02	1.10E-01	U	U	2.70E-02	2.70E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	2.50E-02	2.50E-02	1.00E-01	U	U	2.50E-02	2.50E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	2.70E-02	2.70E-02	1.10E-01	U	U	2.70E-02	2.70E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	3.50E-02	3.50E-02	1.40E-01	U	U	3.50E-02	3.50E-02	1.40E-01	U	U	1.80E-02	1.80E-02	1.40E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	3.70E-02	3.70E-02	1.50E-01	U	U	3.70E-02	3.70E-02	1.50E-01	U	U	1.80E-02	1.80E-02	1.50E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.50E-02	2.50E-02	9.80E-02	U	U	2.50E-02	2.50E-02	9.80E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.40E-02	2.40E-02	9.60E-02	U	U	2.40E-02	2.40E-02	9.60E-02	U	U	1.20E-02	1.20E-02	9.60E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	2.70E-02	2.70E-02	1.10E-01	U	U	2.70E-02	2.70E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.10E-02	2.10E-02	8.40E-02	U	U	2.10E-02	2.10E-02	8.40E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	9.00E-02	9.00E-02	3.60E-01	U	U	9.00E-02	9.00E-02	3.60E-01	U	U	4.50E-02	4.50E-02	3.60E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	2.60E-02	2.60E-02	1.00E-01	U	U	2.60E-02	2.60E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.00E-02	3.00E-02	1.20E-01	U	U	3.00E-02	3.00E-02	1.20E-01	U	U	1.50E-02	1.50E-02	1.20E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.40E-01	1.40E-01	5.70E-01	U	U	1.40E-01	1.40E-01	5.70E-01	U	U	7.10E-02	7.10E-02	5.70E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	2.80E-02	2.80E-02	1.10E-01	U	U	2.80E-02	2.80E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	2.80E-02	2.80E-02	1.10E-01	U	U	2.80E-02	2.80E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	6.70E-02	6.70E-02	2.70E-01	U	U	6.70E-02	6.70E-02	2.70E-01	U	U	3.30E-02	3.30E-02	2.70E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake
Polycyclic Aromatic Hydrocarbons (PAHs)

				Benzo(a)anthracene					Benzo(a)pyrene					Benzo(b)fluoranthene				
				mg/kg					mg/kg					mg/kg				
				56-55-3					50-32-8					205-99-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	5.10E-03	5.10E-03	2.00E-02	U	U	5.10E-03	5.10E-03	2.00E-02	U	U	5.10E-03	5.10E-03	2.00E-02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	7.00E-03	7.00E-03	2.80E-02	U	U	7.00E-03	7.00E-03	2.80E-02	U	U	7.00E-03	7.00E-03	2.80E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	7.30E-03	7.30E-03	2.90E-02	U	U	7.30E-03	7.30E-03	2.90E-02	U	U	7.30E-03	7.30E-03	2.90E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	4.90E-03	4.90E-03	2.00E-02	U	U	4.90E-03	4.90E-03	2.00E-02	U	U	4.90E-03	4.90E-03	2.00E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	4.80E-03	4.80E-03	1.90E-02	U	U	4.80E-03	4.80E-03	1.90E-02	U	U	4.80E-03	4.80E-03	1.90E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	4.20E-03	4.20E-03	1.70E-02	U	U	4.20E-03	4.20E-03	1.70E-02	U	U	4.20E-03	4.20E-03	1.70E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.80E-02	1.80E-02	7.20E-02	U	U	1.80E-02	1.80E-02	7.20E-02	U	U	1.80E-02	1.80E-02	7.20E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	5.20E-03	5.20E-03	2.10E-02	U	U	5.20E-03	5.20E-03	2.10E-02	U	U	5.20E-03	5.20E-03	2.10E-02	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	6.00E-03	6.00E-03	2.40E-02	U	U	6.00E-03	6.00E-03	2.40E-02	U	U	6.00E-03	6.00E-03	2.40E-02	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.80E-02	2.80E-02	1.10E-01	U	U	2.80E-02	2.80E-02	1.10E-01	U	U	2.80E-02	2.80E-02	1.10E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	5.70E-03	5.70E-03	2.30E-02	U	U	5.70E-03	5.70E-03	2.30E-02	U	U	5.70E-03	5.70E-03	2.30E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	5.60E-03	5.60E-03	2.20E-02	U	U	5.60E-03	5.60E-03	2.20E-02	U	U	6.50E-03	5.60E-03	2.20E-02	J	J
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.10E-01	1.10E-01	1.10E-01	U	U	1.30E-02	1.30E-02	5.30E-02	U	U	1.30E-02	1.30E-02	5.30E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake
Polycyclic Aromatic Hydrocarbons (PAHs)

				Benzo(ghi)perylene					Benzo(k)fluoranthene					Chrysene				
				mg/kg					mg/kg					mg/kg				
				191-24-2					207-08-9					218-01-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	5.10E-03	5.10E-03	2.00E-02	U	U	5.10E-03	5.10E-03	2.00E-02	U	U	5.10E-03	5.10E-03	2.00E-02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	7.00E-03	7.00E-03	2.80E-02	U	U	7.00E-03	7.00E-03	2.80E-02	U	U	7.00E-03	7.00E-03	2.80E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	7.30E-03	7.30E-03	2.90E-02	U	U	7.30E-03	7.30E-03	2.90E-02	U	U	7.30E-03	7.30E-03	2.90E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	4.90E-03	4.90E-03	2.00E-02	U	U	4.90E-03	4.90E-03	2.00E-02	U	U	4.90E-03	4.90E-03	2.00E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	4.80E-03	4.80E-03	1.90E-02	U	U	4.80E-03	4.80E-03	1.90E-02	U	U	4.80E-03	4.80E-03	1.90E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U	5.40E-03	5.40E-03	2.20E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	4.20E-03	4.20E-03	1.70E-02	U	U	4.20E-03	4.20E-03	1.70E-02	U	U	4.20E-03	4.20E-03	1.70E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.80E-02	1.80E-02	7.20E-02	U	U	1.80E-02	1.80E-02	7.20E-02	U	U	1.80E-02	1.80E-02	7.20E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	5.20E-03	5.20E-03	2.10E-02	U	U	5.20E-03	5.20E-03	2.10E-02	U	U	5.20E-03	5.20E-03	2.10E-02	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	6.00E-03	6.00E-03	2.40E-02	U	U	6.00E-03	6.00E-03	2.40E-02	U	U	6.00E-03	6.00E-03	2.40E-02	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.80E-02	2.80E-02	1.10E-01	U	U	2.80E-02	2.80E-02	1.10E-01	U	U	2.80E-02	2.80E-02	1.10E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	5.70E-03	5.70E-03	2.30E-02	U	U	5.70E-03	5.70E-03	2.30E-02	U	U	5.70E-03	5.70E-03	2.30E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	5.60E-03	5.60E-03	2.20E-02	U	U	5.60E-03	5.60E-03	2.20E-02	U	U	5.60E-03	5.60E-03	2.20E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.30E-02	1.30E-02	5.30E-02	U	U	1.30E-02	1.30E-02	5.30E-02	U	U	1.10E-01	1.10E-01	1.10E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake
Polycyclic Aromatic Hydrocarbons (PAHs)

				Dibenzo(a,h)anthracene					Fluoranthene					Fluorene				
				mg/kg					mg/kg					mg/kg				
				53-70-3					206-44-0					86-73-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	5.40E-03	5.40E-03	2.20E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	5.10E-03	5.10E-03	2.00E-02	U	U	1.30E-02	1.30E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	5.40E-03	5.40E-03	2.20E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	7.00E-03	7.00E-03	2.80E-02	U	U	1.80E-02	1.80E-02	1.40E-01	U	U	1.80E-02	1.80E-02	1.40E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	7.30E-03	7.30E-03	2.90E-02	U	U	1.80E-02	1.80E-02	1.50E-01	U	U	1.80E-02	1.80E-02	1.50E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	4.90E-03	4.90E-03	2.00E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	4.80E-03	4.80E-03	1.90E-02	U	U	1.20E-02	1.20E-02	9.60E-02	U	U	1.20E-02	1.20E-02	9.60E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	5.40E-03	5.40E-03	2.20E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	4.20E-03	4.20E-03	1.70E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.80E-02	1.80E-02	7.20E-02	U	U	4.50E-02	4.50E-02	3.60E-01	U	U	4.50E-02	4.50E-02	3.60E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	5.20E-03	5.20E-03	2.10E-02	U	U	1.30E-02	1.30E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	6.00E-03	6.00E-03	2.40E-02	U	U	1.50E-02	1.50E-02	1.20E-01	U	U	1.50E-02	1.50E-02	1.20E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.80E-02	2.80E-02	1.10E-01	U	U	7.10E-02	7.10E-02	5.70E-01	U	U	7.10E-02	7.10E-02	5.70E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	5.70E-03	5.70E-03	2.30E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	5.60E-03	5.60E-03	2.20E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.30E-02	1.30E-02	5.30E-02	U	U	3.30E-02	3.30E-02	2.70E-01	U	U	3.30E-02	3.30E-02	2.70E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake
Polycyclic Aromatic Hydrocarbons (PAHs)

				Indeno(1,2,3-cd)pyrene					Naphthalene				
				mg/kg					mg/kg				
				193-39-5					91-20-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	5.40E-03	5.40E-03	2.20E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	5.10E-03	5.10E-03	2.00E-02	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	5.40E-03	5.40E-03	2.20E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	7.00E-03	7.00E-03	2.80E-02	U	U	1.80E-02	1.80E-02	1.40E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	7.30E-03	7.30E-03	2.90E-02	U	U	1.80E-02	1.80E-02	1.50E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	4.90E-03	4.90E-03	2.00E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	4.80E-03	4.80E-03	1.90E-02	U	U	1.20E-02	1.20E-02	9.60E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	5.40E-03	5.40E-03	2.20E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	4.20E-03	4.20E-03	1.70E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.80E-02	1.80E-02	7.20E-02	U	U	4.50E-02	4.50E-02	3.60E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	5.20E-03	5.20E-03	2.10E-02	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	6.00E-03	6.00E-03	2.40E-02	U	U	1.50E-02	1.50E-02	1.20E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.80E-02	2.80E-02	1.10E-01	U	U	7.10E-02	7.10E-02	5.70E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	5.70E-03	5.70E-03	2.30E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	5.60E-03	5.60E-03	2.20E-02	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.30E-02	1.30E-02	5.30E-02	U	U	3.30E-02	3.30E-02	2.70E-01	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake
Polycyclic Aromatic Hydrocarbons (PAHs)

				Phenanthrene					Pyrene				
				mg/kg					mg/kg				
				85-01-8					129-00-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.30E-02	1.30E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.80E-02	1.80E-02	1.40E-01	U	U	1.80E-02	1.80E-02	1.40E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.80E-02	1.80E-02	1.50E-01	U	U	1.80E-02	1.80E-02	1.50E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.20E-02	1.20E-02	9.80E-02	U	U	1.20E-02	1.20E-02	9.80E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.20E-02	1.20E-02	9.60E-02	U	U	1.20E-02	1.20E-02	9.60E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.10E-02	1.10E-02	8.40E-02	U	U	1.10E-02	1.10E-02	8.40E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	4.50E-02	4.50E-02	3.60E-01	U	U	4.50E-02	4.50E-02	3.60E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.30E-02	1.30E-02	1.00E-01	U	U	1.30E-02	1.30E-02	1.00E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.50E-02	1.50E-02	1.20E-01	U	U	1.50E-02	1.50E-02	1.20E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	7.10E-02	7.10E-02	5.70E-01	U	U	7.10E-02	7.10E-02	5.70E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.40E-02	1.40E-02	1.10E-01	U	U	1.40E-02	1.40E-02	1.10E-01	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	3.30E-02	3.30E-02	2.70E-01	U	U	3.30E-02	3.30E-02	2.70E-01	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Polychlorinated Biphenyls

				Aroclor 1016					Aroclor 1221					Aroclor 1232				
				mg/kg					mg/kg					mg/kg				
				12674-11-2					11104-28-2					11141-16-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	2.20E-02	2.20E-02	2.70E-02	U	U	2.20E-02	2.20E-02	2.70E-02	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.30E-02	1.30E-02	2.50E-02	U	U	2.00E-02	2.00E-02	2.50E-02	U	U	2.00E-02	2.00E-02	2.50E-02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	2.20E-02	2.20E-02	2.70E-02	U	U	2.20E-02	2.20E-02	2.70E-02	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.80E-02	1.80E-02	3.50E-02	U	U	2.80E-02	2.80E-02	3.50E-02	U	U	2.80E-02	2.80E-02	3.50E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.80E-02	1.80E-02	3.60E-02	U	U	2.90E-02	2.90E-02	3.60E-02	U	U	2.90E-02	2.90E-02	3.60E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.30E-02	1.30E-02	2.50E-02	U	U	2.00E-02	2.00E-02	2.50E-02	U	U	2.00E-02	2.00E-02	2.50E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	2.00E-02	2.00E-02	2.40E-02	U	U	2.00E-02	2.00E-02	2.40E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.30E-02	1.30E-02	2.60E-02	U	U	2.10E-02	2.10E-02	2.60E-02	U	U	2.10E-02	2.10E-02	2.60E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.00E-02	1.00E-02	2.10E-02	U	U	1.70E-02	1.70E-02	2.10E-02	U	U	1.70E-02	1.70E-02	2.10E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	4.70E-02	4.70E-02	9.30E-02	U	U	7.40E-02	7.40E-02	9.30E-02	U	U	7.40E-02	7.40E-02	9.30E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.30E-02	1.30E-02	2.60E-02	U	U	2.10E-02	2.10E-02	2.60E-02	U	U	2.10E-02	2.10E-02	2.60E-02	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.50E-02	1.50E-02	3.00E-02	U	U	2.40E-02	2.40E-02	3.00E-02	U	U	2.40E-02	2.40E-02	3.00E-02	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	7.00E-02	7.00E-02	1.40E-01	U	U	1.10E-01	1.10E-01	1.40E-01	U	U	1.10E-01	1.10E-01	1.40E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.40E-02	1.40E-02	2.80E-02	U	U	2.20E-02	2.20E-02	2.80E-02	U	U	2.20E-02	2.20E-02	2.80E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.40E-02	1.40E-02	2.80E-02	U	U	2.20E-02	2.20E-02	2.80E-02	U	U	2.20E-02	2.20E-02	2.80E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	3.30E-02	3.30E-02	6.70E-02	U	U	5.30E-02	5.30E-02	6.70E-02	U	U	5.30E-02	5.30E-02	6.70E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Polychlorinated Biphenyls

				Aroclor 1242					Aroclor 1248				
				mg/kg					mg/kg				
				53469-21-9					12672-29-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	1.40E-02	1.40E-02	2.70E-02	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.30E-02	1.30E-02	2.50E-02	U	U	1.30E-02	1.30E-02	2.50E-02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	1.40E-02	1.40E-02	2.70E-02	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.80E-02	1.80E-02	3.50E-02	U	U	1.80E-02	1.80E-02	3.50E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.80E-02	1.80E-02	3.60E-02	U	U	1.80E-02	1.80E-02	3.60E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.30E-02	1.30E-02	2.50E-02	U	U	1.30E-02	1.30E-02	2.50E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	1.20E-02	1.20E-02	2.40E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.30E-02	1.30E-02	2.60E-02	U	U	1.30E-02	1.30E-02	2.60E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.00E-02	1.00E-02	2.10E-02	U	U	1.00E-02	1.00E-02	2.10E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	4.70E-02	4.70E-02	9.30E-02	U	U	4.70E-02	4.70E-02	9.30E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.30E-02	1.30E-02	2.60E-02	U	U	1.30E-02	1.30E-02	2.60E-02	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.50E-02	1.50E-02	3.00E-02	U	U	1.50E-02	1.50E-02	3.00E-02	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	7.00E-02	7.00E-02	1.40E-01	U	U	7.00E-02	7.00E-02	1.40E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.40E-02	1.40E-02	2.80E-02	U	U	1.40E-02	1.40E-02	2.80E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.40E-02	1.40E-02	2.80E-02	U	U	1.40E-02	1.40E-02	2.80E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	3.30E-02	3.30E-02	6.70E-02	U	U	3.30E-02	3.30E-02	6.70E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Polychlorinated Biphenyls

				Aroclor 1254					Aroclor 1260				
				mg/kg					mg/kg				
				11097-69-1					11096-82-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	1.40E-02	1.40E-02	2.70E-02	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.30E-02	1.30E-02	2.50E-02	U	U	1.30E-02	1.30E-02	2.50E-02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.40E-02	1.40E-02	2.70E-02	U	U	1.40E-02	1.40E-02	2.70E-02	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.80E-02	1.80E-02	3.50E-02	U	U	1.80E-02	1.80E-02	3.50E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.80E-02	1.80E-02	3.60E-02	U	U	1.80E-02	1.80E-02	3.60E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.30E-02	1.30E-02	2.50E-02	U	U	1.30E-02	1.30E-02	2.50E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.20E-02	1.20E-02	2.40E-02	U	U	1.20E-02	1.20E-02	2.40E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.30E-02	1.30E-02	2.60E-02	U	U	1.30E-02	1.30E-02	2.60E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.00E-02	1.00E-02	2.10E-02	U	U	1.00E-02	1.00E-02	2.10E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	4.70E-02	4.70E-02	9.30E-02	U	U	1.72E-01	4.70E-02	9.30E-02		
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.30E-02	1.30E-02	2.60E-02	U	U	1.30E-02	1.30E-02	2.60E-02	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.50E-02	1.50E-02	3.00E-02	U	U	1.50E-02	1.50E-02	3.00E-02	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	7.00E-02	7.00E-02	1.40E-01	U	U	7.00E-02	7.00E-02	1.40E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.40E-02	1.40E-02	2.80E-02	U	U	1.40E-02	1.40E-02	2.80E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.40E-02	1.40E-02	2.80E-02	U	U	1.40E-02	1.40E-02	2.80E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	3.30E-02	3.30E-02	6.70E-02	U	U	3.30E-02	3.30E-02	6.70E-02	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Pesticides and Herbicides

				4,4'-DDD					4,4'-DDE					4,4'-DDT				
				mg/kg					mg/kg					mg/kg				
				72-54-8					72-55-9					50-29-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.10E-03	1.10E-03	5.40E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	U	1.60E-03	1.60E-03	5.40E-03	U	UJ
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.00E-03	1.00E-03	5.00E-03	U	U	1.00E-03	1.00E-03	5.00E-03	U	U	1.50E-02	1.50E-02	5.00E-02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.10E-03	1.10E-03	5.40E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	U	1.60E-02	1.60E-02	5.40E-02	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.40E-03	1.40E-03	7.10E-03	U	U	1.40E-03	1.40E-03	7.10E-03	U	U	2.10E-02	2.10E-02	7.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.40E-03	1.40E-03	7.20E-03	U	U	1.40E-03	1.40E-03	7.20E-03	U	U	2.20E-02	2.20E-02	7.20E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.00E-03	1.00E-03	5.00E-03	U	U	1.00E-03	1.00E-03	5.00E-03	U	U	1.50E-03	1.50E-03	5.00E-03	U	UJ
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.80E-04	9.80E-04	4.90E-03	U	U	9.80E-04	9.80E-04	4.90E-03	U	U	1.50E-03	1.50E-03	4.90E-03	U	UJ
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.20E-03	4.20E-03	2.10E-02	U	U	4.20E-03	4.20E-03	2.10E-02	U	U	1.60E-02	1.60E-02	5.30E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	8.40E-04	8.40E-04	4.20E-03	U	U	8.40E-04	8.40E-04	4.20E-03	U	U	1.30E-03	1.30E-03	4.20E-03	U	UJ
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.70E-03	3.70E-03	1.90E-02	U	UJ	3.70E-03	3.70E-03	1.90E-02	U	U	2.80E-01	2.80E-01	9.30E-01	U	UJ
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.10E-03	1.10E-03	5.30E-03	U	U	1.10E-03	1.10E-03	5.30E-03	U	U	1.60E-03	1.60E-03	5.30E-03	U	UJ
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.20E-03	1.20E-03	5.90E-03	U	U	1.20E-03	1.20E-03	5.90E-03	U	U	1.80E-02	1.80E-02	5.90E-02	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.20E-02	2.20E-02	1.10E-01	U	UJ	2.20E-02	2.20E-02	1.10E-01	U	U	8.40E-02	8.40E-02	2.80E-01	U	UJ
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.50E-03	4.50E-03	2.20E-02	U	U	4.50E-03	4.50E-03	2.20E-02	U	U	1.70E-02	1.70E-02	5.60E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.50E-03	4.50E-03	2.30E-02	U	U	4.50E-03	4.50E-03	2.30E-02	U	U	1.70E-02	1.70E-02	5.70E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.10E-02	1.10E-02	5.30E-02	U	UJ	1.10E-02	1.10E-02	5.30E-02	U	U	4.00E-02	4.00E-02	1.30E-01	U	UJ

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Pesticides and Herbicides

				Aldrin					Dieldrin					Endosulfan I				
				mg/kg					mg/kg					mg/kg				
				309-00-2					60-57-1					959-98-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.40E-03	1.40E-03	3.50E-03	U	U	1.40E-03	1.40E-03	3.50E-03	U	U	1.40E-03	1.40E-03	3.50E-03	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.40E-03	1.40E-03	3.60E-03	U	U	1.40E-03	1.40E-03	3.60E-03	U	U	1.40E-03	1.40E-03	3.60E-03	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.80E-04	9.80E-04	2.40E-03	U	U	9.80E-04	9.80E-04	2.40E-03	U	U	9.80E-04	9.80E-04	2.40E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.20E-03	4.20E-03	1.10E-02	U	U	4.20E-03	4.20E-03	1.10E-02	U	U	4.20E-03	4.20E-03	1.10E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	8.40E-04	8.40E-04	2.10E-03	U	U	8.40E-04	8.40E-04	2.10E-03	U	U	8.40E-04	8.40E-04	2.10E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.70E-03	3.70E-03	9.30E-03	U	U	3.70E-03	3.70E-03	9.30E-03	U	UJ	3.70E-03	3.70E-03	9.30E-03	U	UJ
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	U	1.10E-03	1.10E-03	2.60E-03	U	U	1.10E-03	1.10E-03	2.60E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.20E-03	1.20E-03	3.00E-03	U	U	1.20E-03	1.20E-03	3.00E-03	U	U	1.20E-03	1.20E-03	3.00E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.20E-02	2.20E-02	5.60E-02	U	U	2.20E-02	2.20E-02	5.60E-02	U	U	2.20E-02	2.20E-02	5.60E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.50E-03	4.50E-03	1.10E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.50E-03	4.50E-03	1.10E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.10E-02	1.10E-02	2.70E-02	U	U	1.10E-02	1.10E-02	2.70E-02	U	U	1.10E-02	1.10E-02	2.70E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Pesticides and Herbicides

				Endosulfan II					Endosulfan Sulfate					Endrin				
				mg/kg					mg/kg					mg/kg				
				33213-65-9					1031-07-8					72-20-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.10E-03	1.10E-03	5.40E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	UJ	1.10E-03	1.10E-03	5.40E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.00E-03	1.00E-03	5.00E-03	U	U	1.00E-02	1.00E-02	5.00E-02	U	U	1.00E-03	1.00E-03	5.00E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.10E-03	1.10E-03	5.40E-03	U	U	1.10E-02	1.10E-02	5.40E-02	U	U	1.10E-03	1.10E-03	5.40E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.40E-03	1.40E-03	7.10E-03	U	U	1.40E-02	1.40E-02	7.10E-02	U	U	7.10E-03	7.10E-03	7.10E-03	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.40E-03	1.40E-03	7.20E-03	U	U	1.40E-02	1.40E-02	7.20E-02	U	U	7.20E-03	7.20E-03	7.20E-03	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.00E-03	1.00E-03	5.00E-03	U	U	1.00E-03	1.00E-03	5.00E-03	U	UJ	1.00E-03	1.00E-03	5.00E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.80E-04	9.80E-04	4.90E-03	U	U	9.80E-04	9.80E-04	4.90E-03	U	UJ	9.80E-04	9.80E-04	4.90E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.20E-03	4.20E-03	2.10E-02	U	U	1.10E-02	1.10E-02	5.30E-02	U	U	4.20E-03	4.20E-03	2.10E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	8.40E-04	8.40E-04	4.20E-03	U	UJ	8.40E-04	8.40E-04	4.20E-03	U	UJ,L	4.20E-03	4.20E-03	4.20E-03	U	UJ
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.70E-03	3.70E-03	1.90E-02	U	UJ	3.70E-03	3.70E-03	1.90E-02	U	U	3.70E-03	3.70E-03	1.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.10E-03	1.10E-03	5.30E-03	U	U	1.10E-03	1.10E-03	5.30E-03	U	UJ	1.10E-03	1.10E-03	5.30E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.20E-03	1.20E-03	5.90E-03	U	U	1.20E-02	1.20E-02	5.90E-02	U	U	5.90E-03	5.90E-03	5.90E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.20E-02	2.20E-02	1.10E-01	U	U	5.60E-02	5.60E-02	2.80E-01	U	UJ,L	2.20E-02	2.20E-02	1.10E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.50E-03	4.50E-03	2.20E-02	U	U	1.10E-02	1.10E-02	5.60E-02	U	U	4.50E-03	4.50E-03	2.20E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.50E-03	4.50E-03	2.30E-02	U	U	1.10E-02	1.10E-02	5.70E-02	U	U	4.50E-03	4.50E-03	2.30E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.10E-02	1.10E-02	5.30E-02	U	U	2.70E-02	2.70E-02	1.30E-01	U	UJ,L	1.10E-02	1.10E-02	5.30E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Pesticides and Herbicides

				Endrin aldehyde					Endrin ketone					Heptachlor				
				mg/kg					mg/kg					mg/kg				
				7421-93-4					53494-70-5					76-44-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	2.20E-03	2.20E-03	5.40E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	2.00E-03	2.00E-03	5.00E-03	U	U	1.00E-02	1.00E-02	5.00E-02	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	2.20E-03	2.20E-03	5.40E-03	U	U	1.10E-02	1.10E-02	5.40E-02	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	2.80E-03	2.80E-03	7.10E-03	U	U	1.40E-02	1.40E-02	7.10E-02	U	U	1.40E-03	1.40E-03	3.50E-03	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	1.40E-02	1.40E-02	7.20E-02	U	U	1.40E-03	1.40E-03	3.60E-03	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.00E-03	2.00E-03	5.00E-03	U	U	1.00E-03	1.00E-03	5.00E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.00E-03	2.00E-03	4.90E-03	U	U	9.80E-04	9.80E-04	4.90E-03	U	U	9.80E-04	9.80E-04	2.40E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	8.40E-03	8.40E-03	2.10E-02	U	U	4.20E-03	4.20E-03	2.10E-02	U	U	4.20E-03	4.20E-03	1.10E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.70E-03	1.70E-03	4.20E-03	U	UJ	8.40E-04	8.40E-04	4.20E-03	U	U	8.40E-04	8.40E-04	2.10E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	7.40E-03	7.40E-03	1.90E-02	U	UJ	1.90E-01	1.90E-01	9.30E-01	U	U	1.90E-01	1.90E-01	4.70E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	2.10E-03	2.10E-03	5.30E-03	U	U	1.10E-03	1.10E-03	5.30E-03	U	U	1.10E-03	1.10E-03	2.60E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	2.40E-03	2.40E-03	5.90E-03	U	U	1.20E-02	1.20E-02	5.90E-02	U	U	1.20E-03	1.20E-03	3.00E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.50E-02	4.50E-02	1.10E-01	U	U	2.20E-02	2.20E-02	1.10E-01	U	U	2.20E-02	2.20E-02	5.60E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	8.90E-03	8.90E-03	2.20E-02	U	U	4.50E-03	4.50E-03	2.20E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	9.10E-03	9.10E-03	2.30E-02	U	U	4.50E-03	4.50E-03	2.30E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	2.10E-02	2.10E-02	5.30E-02	U	U	1.10E-02	1.10E-02	5.30E-02	U	U	1.10E-02	1.10E-02	2.70E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Pesticides and Herbicides

				Heptachlor epoxide					Methoxychlor					Toxaphene				
				mg/kg					mg/kg					mg/kg				
				1024-57-3					72-43-5					8001-35-2				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	2.20E-03	2.20E-03	5.40E-03	U	UJ	1.40E-01	1.40E-01	2.70E-01	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	2.00E-02	2.00E-02	5.00E-02	U	U	1.30E-01	1.30E-01	2.50E-01	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	2.20E-02	2.20E-02	5.40E-02	U	U	1.40E-01	1.40E-01	2.70E-01	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.40E-03	1.40E-03	3.50E-03	U	U	2.80E-02	2.80E-02	7.10E-02	U	U	1.80E-01	1.80E-01	3.50E-01	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.40E-03	1.40E-03	3.60E-03	U	U	2.90E-02	2.90E-02	7.20E-02	U	U	1.80E-01	1.80E-01	3.60E-01	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	2.00E-03	2.00E-03	5.00E-03	U	UJ	1.30E-01	1.30E-01	2.50E-01	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.80E-04	9.80E-04	2.40E-03	U	U	2.00E-03	2.00E-03	4.90E-03	U	UJ	1.20E-01	1.20E-01	2.40E-01	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.20E-03	4.20E-03	1.10E-02	U	U	2.10E-02	2.10E-02	5.30E-02	U	U	5.30E-01	5.30E-01	1.10E+00	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	8.40E-04	8.40E-04	2.10E-03	U	U	1.70E-03	1.70E-03	4.20E-03	U	UJ	1.00E-01	1.00E-01	2.10E-01	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.70E-03	3.70E-03	9.30E-03	U	U	3.70E-01	3.70E-01	9.30E-01	U	UJ	4.70E-01	4.70E-01	9.30E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	U	2.10E-03	2.10E-03	5.30E-03	U	UJ	1.30E-01	1.30E-01	2.60E-01	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.20E-03	1.20E-03	3.00E-03	U	U	2.40E-02	2.40E-02	5.90E-02	U	U	1.50E-01	1.50E-01	3.00E-01	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.20E-02	2.20E-02	5.60E-02	U	U	1.10E-01	1.10E-01	2.80E-01	U	UJ	2.80E+00	2.80E+00	5.60E+00	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.50E-03	4.50E-03	1.10E-02	U	U	2.20E-02	2.20E-02	5.60E-02	U	U	5.60E-01	5.60E-01	1.10E+00	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.50E-03	4.50E-03	1.10E-02	U	U	2.30E-02	2.30E-02	5.70E-02	U	U	5.70E-01	5.70E-01	1.10E+00	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.10E-02	1.10E-02	2.70E-02	U	U	5.30E-02	5.30E-02	1.30E-01	U	UJ	1.30E+00	1.30E+00	2.70E+00	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Pesticides and Herbicides

				alpha-BHC					alpha-Chlordane					beta-BHC				
				mg/kg					mg/kg					mg/kg				
				319-84-6					5103-71-9					319-85-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.40E-03	1.40E-03	3.50E-03	U	U	1.40E-03	1.40E-03	3.50E-03	U	U	1.40E-03	1.40E-03	3.50E-03	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.40E-03	1.40E-03	3.60E-03	U	U	1.40E-03	1.40E-03	3.60E-03	U	U	1.40E-03	1.40E-03	3.60E-03	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.80E-04	9.80E-04	2.40E-03	U	U	9.80E-04	9.80E-04	2.40E-03	U	U	9.80E-04	9.80E-04	2.40E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.20E-03	4.20E-03	1.10E-02	U	U	4.20E-03	4.20E-03	1.10E-02	U	U	4.20E-03	4.20E-03	1.10E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	8.40E-04	8.40E-04	2.10E-03	U	U	8.40E-04	8.40E-04	2.10E-03	U	U	8.40E-04	8.40E-04	2.10E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.70E-03	3.70E-03	9.30E-03	U	U	3.70E-03	3.70E-03	9.30E-03	U	U	3.70E-03	3.70E-03	9.30E-03	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	U	1.10E-03	1.10E-03	2.60E-03	U	U	1.10E-03	1.10E-03	2.60E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.20E-03	1.20E-03	3.00E-03	U	U	1.20E-03	1.20E-03	3.00E-03	U	U	1.20E-03	1.20E-03	3.00E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.20E-02	2.20E-02	5.60E-02	U	U	2.20E-02	2.20E-02	5.60E-02	U	U	2.20E-02	2.20E-02	5.60E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.50E-03	4.50E-03	1.10E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.50E-03	4.50E-03	1.10E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.10E-02	1.10E-02	2.70E-02	U	U	1.10E-02	1.10E-02	2.70E-02	U	U	1.10E-02	1.10E-02	2.70E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Pesticides and Herbicides

				delta-BHC					gamma-BHC (Lindane)				
				mg/kg					mg/kg				
				319-86-8					58-89-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	2.70E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.40E-03	1.40E-03	3.50E-03	U	U	1.40E-03	1.40E-03	3.50E-03	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.40E-03	1.40E-03	3.60E-03	U	U	1.40E-03	1.40E-03	3.60E-03	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	1.00E-03	1.00E-03	2.50E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.80E-04	9.80E-04	2.40E-03	U	U	9.80E-04	9.80E-04	2.40E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.10E-02	1.10E-02	2.60E-02	U	U	4.20E-03	4.20E-03	1.10E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	8.40E-04	8.40E-04	2.10E-03	U	UJ	8.40E-04	8.40E-04	2.10E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.70E-03	3.70E-03	9.30E-03	U	U	3.70E-03	3.70E-03	9.30E-03	U	UJ
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	U	1.10E-03	1.10E-03	2.60E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.20E-03	1.20E-03	3.00E-03	U	U	1.20E-03	1.20E-03	3.00E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	5.60E-02	5.60E-02	1.40E-01	U	UJ	2.20E-02	2.20E-02	5.60E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.10E-02	1.10E-02	2.80E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.10E-02	1.10E-02	2.80E-02	U	U	4.50E-03	4.50E-03	1.10E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	2.70E-02	2.70E-02	6.70E-02	U	UJ	1.10E-02	1.10E-02	2.70E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Pesticides and Herbicides

				gamma-Chlordane					2,4,5-TP (Silvex)				
				mg/kg					mg/kg				
				5103-74-2					93-72-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	5.40E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	1.10E-03	1.10E-03	5.10E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.10E-03	1.10E-03	2.70E-03	U	U	1.10E-03	1.10E-03	5.50E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.40E-03	1.40E-03	3.50E-03	U	U	1.50E-03	1.50E-03	7.00E-03	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.40E-03	1.40E-03	3.60E-03	U	U	1.50E-03	1.50E-03	7.30E-03	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.00E-03	1.00E-03	2.50E-03	U	U	1.10E-03	1.10E-03	5.00E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	9.80E-04	9.80E-04	2.40E-03	U	U	1.00E-03	1.00E-03	4.90E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.20E-03	4.20E-03	1.10E-02	U	U	1.10E-03	1.10E-03	5.40E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	8.40E-04	8.40E-04	2.10E-03	U	U	8.80E-04	8.80E-04	4.20E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.70E-03	3.70E-03	9.30E-03	U	U	3.80E-03	3.80E-03	1.80E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.10E-03	1.10E-03	2.60E-03	U	U	1.10E-03	1.10E-03	5.30E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.20E-03	1.20E-03	3.00E-03	U	U	1.30E-03	1.30E-03	6.00E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.20E-02	2.20E-02	5.60E-02	U	U	5.90E-03	5.90E-03	2.80E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.50E-03	4.50E-03	1.10E-02	U	U	1.20E-03	1.20E-03	5.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.50E-03	4.50E-03	1.10E-02	U	U	1.20E-03	1.20E-03	5.70E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.10E-02	1.10E-02	2.70E-02	U	U	2.80E-03	2.80E-03	1.40E-02	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				1,1,1,2-Tetrachloroethane					1,1,1-Trichloroethane					1,1,2,2-Tetrachloroethane				
				mg/kg					mg/kg					mg/kg				
				630-20-6					71-55-6					79-34-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJ,L
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				1,1,2-Trichloroethane					1,1-Dichloroethane					1,1-Dichloroethene				
				mg/kg					mg/kg					mg/kg				
				79-00-5					75-34-3					75-35-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	4.80E-03	4.80E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	4.70E-03	4.70E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	4.90E-03	4.90E-03	8.20E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	6.40E-03	6.40E-03	1.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	6.60E-03	6.60E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	4.40E-03	4.40E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	4.30E-03	4.30E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	4.90E-03	4.90E-03	8.20E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	3.80E-03	3.80E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.80E-02	1.80E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	4.70E-03	4.70E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	5.30E-03	5.30E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	2.50E-02	2.50E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	5.20E-03	5.20E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	5.00E-03	5.00E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	1.10E-02	1.10E-02	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				1,1-Dichloropropene					1,2,3-Trichlorobenzene					1,2,3-Trichloropropane				
				mg/kg					mg/kg					mg/kg				
				563-58-6					87-61-6					96-18-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	UJ,L
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	UJ	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	UJ	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	UJ	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	UJ	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	UJ	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	UJ	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	UJ	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				1,2,4-Trichlorobenzene					1,2,4-Trimethylbenzene					1,2-Dibromoethane				
				mg/kg					mg/kg					mg/kg				
				120-82-1					95-63-6					106-93-4				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	UJ	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	UJ	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	UJ	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	UJ	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	UJ	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	UJ	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	UJ	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				1,2-Dichlorobenzene					1,2-Dichloroethane					1,2-Dichloropropane				
				mg/kg					mg/kg					mg/kg				
				95-50-1					107-06-2					78-87-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				1,3,5-Trimethylbenzene					1,3-Dichlorobenzene					1,3-Dichloropropane				
				mg/kg					mg/kg					mg/kg				
				108-67-8					541-73-1					142-28-9				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				1,4-Dichlorobenzene					1,4-Dioxane					2,2-Dichloropropane				
				mg/kg					mg/kg					mg/kg				
				106-46-7					123-91-1					594-20-7				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	1.60E-01	1.60E-01	4.00E-01	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	1.60E-01	1.60E-01	3.90E-01	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	1.60E-01	1.60E-01	4.10E-01	U	U	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	2.10E-01	2.10E-01	5.40E-01	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	2.20E-01	2.20E-01	5.50E-01	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	1.50E-01	1.50E-01	3.70E-01	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	1.40E-01	1.40E-01	3.60E-01	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	1.60E-01	1.60E-01	4.10E-01	U	U	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	1.30E-01	1.30E-01	3.20E-01	U	UJ	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	5.90E-01	5.90E-01	1.50E+00	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	1.60E-01	1.60E-01	4.00E-01	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	1.80E-01	1.80E-01	4.40E-01	U	UJ,L	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	8.40E-01	8.40E-01	2.10E+00	U	UJ	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	1.70E-01	1.70E-01	4.30E-01	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	1.70E-01	1.70E-01	4.10E-01	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	3.80E-01	3.80E-01	9.50E-01	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				2-Butanone					2-Chlorotoluene					2-Hexanone				
				mg/kg					mg/kg					mg/kg				
				78-93-3					95-49-8					591-78-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	1.60E-02	1.60E-02	4.00E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	1.60E-02	1.60E-02	4.00E-02	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.60E-02	1.60E-02	3.90E-02	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	1.60E-02	1.60E-02	3.90E-02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.90E-02	1.60E-02	4.10E-02	J	J	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	1.60E-02	1.60E-02	4.10E-02	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	2.10E-02	2.10E-02	5.40E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	2.10E-02	2.10E-02	5.40E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	2.37E-02	2.20E-02	5.50E-02	J	J	4.40E-03	4.40E-03	1.10E-02	U	U	2.20E-02	2.20E-02	5.50E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.50E-02	1.50E-02	3.70E-02	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	1.50E-02	1.50E-02	3.70E-02	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.40E-02	1.40E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	1.40E-02	1.40E-02	3.60E-02	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.62E-02	1.60E-02	4.10E-02	J	J	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	1.60E-02	1.60E-02	4.10E-02	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.30E-02	1.30E-02	3.20E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	1.30E-02	1.30E-02	3.20E-02	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	5.90E-02	5.90E-02	1.50E-01	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	5.90E-02	5.90E-02	1.50E-01	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	1.98E-02	1.60E-02	4.00E-02	J	J	3.20E-03	3.20E-03	7.90E-03	U	U	1.60E-02	1.60E-02	4.00E-02	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.80E-02	1.80E-02	4.40E-02	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	1.80E-02	1.80E-02	4.40E-02	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.81E-01	8.40E-02	2.10E-01	J	J	1.70E-02	1.70E-02	4.20E-02	U	U	8.40E-02	8.40E-02	2.10E-01	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	1.70E-02	1.70E-02	4.30E-02	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	1.70E-02	1.70E-02	4.30E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.90E-02	1.70E-02	4.10E-02	J	J	3.30E-03	3.30E-03	8.30E-03	U	U	1.70E-02	1.70E-02	4.10E-02	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	5.16E-02	3.80E-02	9.50E-02	J	J	7.60E-03	7.60E-03	1.90E-02	U	U	3.80E-02	3.80E-02	9.50E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				2-Propenal					4-Chlorotoluene					Acetone				
				mg/kg					mg/kg					mg/kg				
				107-02-8					106-43-4					67-64-1				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	2.00E-02	2.00E-02	4.00E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	4.09E-02	4.00E-02	7.90E-02	J	B
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	1.90E-02	1.90E-02	3.90E-02	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.90E-02	3.90E-02	7.80E-02	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	2.10E-02	2.10E-02	4.10E-02	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	6.47E-02	4.10E-02	8.20E-02	J	J
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	2.70E-02	2.70E-02	5.40E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	5.75E-02	5.40E-02	1.10E-01	J	B
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	2.70E-02	2.70E-02	5.50E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	1.07E-01	5.50E-02	1.10E-01	J	B
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	1.80E-02	1.80E-02	3.70E-02	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	4.25E-02	3.70E-02	7.30E-02	J	B
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	1.80E-02	1.80E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	4.10E-02	3.60E-02	7.20E-02	J	B
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	2.10E-02	2.10E-02	4.10E-02	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	6.65E-02	4.10E-02	8.20E-02	J	B
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.60E-02	1.60E-02	3.20E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	4.09E-02	3.20E-02	6.40E-02	J	J
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	7.30E-02	7.30E-02	1.50E-01	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	2.25E-01	1.50E-01	2.90E-01	J	J
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	2.00E-02	2.00E-02	4.00E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	7.00E-02	4.00E-02	7.90E-02	J	B
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	2.20E-02	2.20E-02	4.40E-02	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	6.75E-02	4.40E-02	8.80E-02	J	J
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.00E-01	1.00E-01	2.10E-01	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	7.14E-01	2.10E-01	4.20E-01		
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	2.20E-02	2.20E-02	4.30E-02	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	4.30E-02	4.30E-02	8.70E-02	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	2.10E-02	2.10E-02	4.10E-02	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	7.47E-02	4.10E-02	8.30E-02	J	B
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	4.70E-02	4.70E-02	9.50E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	1.97E-01	9.50E-02	1.90E-01		

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Benzene					Bromobenzene					Bromochloromethane				
				mg/kg					mg/kg					mg/kg				
				71-43-2					108-86-1					74-97-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Bromodichloromethane					Bromoform					Carbon disulfide				
				mg/kg					mg/kg					mg/kg				
				75-27-4					75-25-2					75-15-0				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJ	4.30E-03	4.30E-03	1.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	UJ	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	UJ	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	UJ	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	UJ	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	UJ	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	UJ	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	UJ	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Carbon Tetrachloride					Chlorobenzene					Chloroethane				
				mg/kg					mg/kg					mg/kg				
				56-23-5					108-90-7					75-00-3				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJ
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	UJ
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	UJ
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	UJ
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	UJ
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	UJ
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	UJ
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	UJ

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Chloroform					Chloromethane					Dibromochloromethane					
				mg/kg					mg/kg					mg/kg					
				67-66-3					74-87-3					124-48-1					
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	4.80E-03
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	4.70E-03
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	4.90E-03
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	6.40E-03
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	6.60E-03
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	4.40E-03
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	4.30E-03
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	4.90E-03
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	3.80E-03
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.80E-02
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	4.70E-03
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	5.30E-03
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	2.50E-02
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	5.20E-03
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	5.00E-03
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	1.10E-02

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Dichlorodifluoromethane				Ethylbenzene					Hexachlorobutadiene					
				mg/kg				mg/kg					mg/kg					
				75-71-8				100-41-4					87-68-3					
Location	Sample	Date	Type	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	4.80E-03	7.90E-03	U	UJ	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	4.00E-03
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	4.70E-03	7.80E-03	U	UJ	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.90E-03
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	4.90E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	4.10E-03
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	6.40E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	5.40E-03
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	6.60E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	UJ	5.50E-03
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	4.40E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	3.70E-03
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	4.30E-03	7.20E-03	U	UJ	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	3.60E-03
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.90E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	4.10E-03
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	3.80E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	3.20E-03
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.80E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.50E-02
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	4.70E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	UJ	4.00E-03
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	5.30E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	UJ	4.40E-03
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.50E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	UJ	2.10E-02
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	5.20E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	UJ	4.30E-03
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	5.00E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	UJ	4.10E-03
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.10E-02	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	UJ	9.50E-03

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Iodomethane					Isobutyl alcohol					Isopropylbenzene					
				mg/kg					mg/kg					mg/kg					
				74-88-4					78-83-1					98-82-8					
Location	Sample	Date	Type	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	4.00E-03	1.60E-02	U	U	7.90E-02	7.90E-02	1.60E-01	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	7.90E-03
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.90E-03	1.60E-02	U	U	7.80E-02	7.80E-02	1.60E-01	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	7.80E-03
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	4.10E-03	1.60E-02	U	U	8.20E-02	8.20E-02	1.60E-01	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	8.20E-03
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	5.40E-03	2.10E-02	U	U	1.10E-01	1.10E-01	2.10E-01	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	U	1.10E-02
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	5.50E-03	2.20E-02	U	U	1.10E-01	1.10E-01	2.20E-01	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	1.10E-02
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	3.70E-03	1.50E-02	U	U	7.30E-02	7.30E-02	1.50E-01	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	7.30E-03
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	3.60E-03	1.40E-02	U	U	7.20E-02	7.20E-02	1.40E-01	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	7.20E-03
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.10E-03	1.60E-02	U	U	8.20E-02	8.20E-02	1.60E-01	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	8.20E-03
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	3.20E-03	1.30E-02	U	U	6.40E-02	6.40E-02	1.30E-01	U	UJ	2.60E-03	2.60E-03	6.40E-03	U	U	6.40E-03
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.50E-02	5.90E-02	U	U	2.90E-01	2.90E-01	5.90E-01	U	UJ	1.20E-02	1.20E-02	2.90E-02	U	U	2.90E-02
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	4.00E-03	1.60E-02	U	U	7.90E-02	7.90E-02	1.60E-01	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	7.90E-03
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	4.40E-03	1.80E-02	U	U	8.80E-02	8.80E-02	1.80E-01	U	UJ,L	3.50E-03	3.50E-03	8.80E-03	U	U	8.80E-03
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.10E-02	8.40E-02	U	U	4.20E-01	4.20E-01	8.40E-01	U	UJ	1.70E-02	1.70E-02	4.20E-02	U	U	4.20E-02
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.30E-03	1.70E-02	U	U	8.70E-02	8.70E-02	1.70E-01	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	8.70E-03
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.10E-03	1.70E-02	U	U	8.30E-02	8.30E-02	1.70E-01	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	8.30E-03
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	9.50E-03	3.80E-02	U	U	1.90E-01	1.90E-01	3.80E-01	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	1.90E-02

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Methyl methacrylate					Methyl isobutyl ketone					Methyl tert-butyl ether					
				mg/kg					mg/kg					mg/kg					
				80-62-6					108-10-1					1634-04-4					
Location	Sample	Date	Type	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	7.90E-03	4.00E-02	U	U	1.60E-02	1.60E-02	4.00E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	7.90E-03
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	7.80E-03	3.90E-02	U	U	1.60E-02	1.60E-02	3.90E-02	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	7.80E-03
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	8.20E-03	4.10E-02	U	U	1.60E-02	1.60E-02	4.10E-02	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	8.20E-03
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.10E-02	5.40E-02	U	U	2.10E-02	2.10E-02	5.40E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	1.10E-02
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.10E-02	5.50E-02	U	U	2.20E-02	2.20E-02	5.50E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	1.10E-02
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	7.30E-03	3.70E-02	U	U	1.50E-02	1.50E-02	3.70E-02	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	7.30E-03
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	7.20E-03	3.60E-02	U	U	1.40E-02	1.40E-02	3.60E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	1.12E-02
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	8.20E-03	4.10E-02	U	U	1.60E-02	1.60E-02	4.10E-02	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	8.20E-03
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	6.40E-03	3.20E-02	U	U	1.30E-02	1.30E-02	3.20E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	6.40E-03
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.90E-02	1.50E-01	U	U	5.90E-02	5.90E-02	1.50E-01	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	2.90E-02
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	7.90E-03	4.00E-02	U	U	1.60E-02	1.60E-02	4.00E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	7.90E-03
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	8.80E-03	4.40E-02	U	U	1.80E-02	1.80E-02	4.40E-02	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	8.80E-03
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.20E-02	2.10E-01	U	UJ	8.40E-02	8.40E-02	2.10E-01	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	4.20E-02
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	8.70E-03	4.30E-02	U	U	1.70E-02	1.70E-02	4.30E-02	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	8.70E-03
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	8.30E-03	4.10E-02	U	U	1.70E-02	1.70E-02	4.10E-02	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	1.14E-02
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.90E-02	9.50E-02	U	UJ	3.80E-02	3.80E-02	9.50E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	1.90E-02

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Methylene chloride				Naphthalene					Styrene					
				mg/kg				mg/kg					mg/kg					
				75-09-2				91-20-3					100-42-5					
Location	Sample	Date	Type	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	7.90E-03	1.60E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	7.80E-03	1.60E-02	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	8.20E-03	1.60E-02	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJL	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	1.10E-02	2.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	UJL	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.10E-02	2.20E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	UJ	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	7.30E-03	1.50E-02	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	7.20E-03	1.40E-02	J	J	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	8.20E-03	1.60E-02	U	U	3.30E-03	3.30E-03	8.20E-03	U	UJL	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	6.40E-03	1.30E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.90E-02	5.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	7.90E-03	1.60E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	UJ	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	8.80E-03	1.80E-02	U	U	3.50E-03	3.50E-03	8.80E-03	U	UJ	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	4.20E-02	8.40E-02	U	U	2.39E-02	1.70E-02	4.20E-02	J	J	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	8.70E-03	1.70E-02	U	U	3.50E-03	3.50E-03	8.70E-03	U	UJ	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	8.30E-03	1.70E-02	J	J	3.30E-03	3.30E-03	8.30E-03	U	UJ	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.90E-02	3.80E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	UJ	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Tetrachloroethene					Toluene					Trichloroethene					
				mg/kg					mg/kg					mg/kg					
				127-18-4					108-88-3					79-01-6					
Location	Sample	Date	Type	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	4.00E-03
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.90E-03
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	4.10E-03
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	5.40E-03
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	5.50E-03
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	3.70E-03
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	3.60E-03
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	4.10E-03
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	3.20E-03
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.50E-02
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	4.00E-03
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	4.40E-03
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	4.20E-02	U	UJ	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	2.10E-02
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	4.30E-03
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	4.10E-03
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	1.90E-02	U	UJ	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	9.50E-03

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Trichlorofluoromethane					Vinyl acetate					Vinyl chloride					
				mg/kg					mg/kg					mg/kg					
				75-69-4					108-05-4					75-01-4					
Location	Sample	Date	Type	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	4.00E-03	7.90E-03	U	U	4.00E-02	4.00E-02	4.00E-02	U	U	4.00E-03	4.00E-03	7.90E-03	U	U	7.10E-03
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.90E-03	7.80E-03	U	U	3.90E-02	3.90E-02	3.90E-02	U	U	3.90E-03	3.90E-03	7.80E-03	U	U	7.00E-03
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	4.10E-03	8.20E-03	U	U	4.10E-02	4.10E-02	4.10E-02	U	U	4.10E-03	4.10E-03	8.20E-03	U	U	7.40E-03
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	5.40E-03	1.10E-02	U	U	5.40E-02	5.40E-02	5.40E-02	U	U	5.40E-03	5.40E-03	1.10E-02	U	U	9.70E-03
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	5.50E-03	1.10E-02	U	U	5.50E-02	5.50E-02	5.50E-02	U	U	5.50E-03	5.50E-03	1.10E-02	U	U	9.90E-03
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	3.70E-03	7.30E-03	U	U	3.70E-02	3.70E-02	3.70E-02	U	U	3.70E-03	3.70E-03	7.30E-03	U	U	6.60E-03
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	3.60E-03	7.20E-03	U	U	3.60E-02	3.60E-02	3.60E-02	U	U	3.60E-03	3.60E-03	7.20E-03	U	U	6.50E-03
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	4.10E-03	8.20E-03	U	U	4.10E-02	4.10E-02	4.10E-02	U	U	4.10E-03	4.10E-03	8.20E-03	U	U	7.40E-03
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	3.20E-03	6.40E-03	U	U	3.20E-02	3.20E-02	3.20E-02	U	U	3.20E-03	3.20E-03	6.40E-03	U	U	5.70E-03
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.50E-02	2.90E-02	U	U	1.50E-01	1.50E-01	1.50E-01	U	U	1.50E-02	1.50E-02	2.90E-02	U	U	2.60E-02
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	4.00E-03	7.90E-03	U	U	4.00E-02	4.00E-02	4.00E-02	U	U	4.00E-03	4.00E-03	7.90E-03	U	U	7.10E-03
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	4.40E-03	8.80E-03	U	U	4.40E-02	4.40E-02	4.40E-02	U	U	4.40E-03	4.40E-03	8.80E-03	U	U	7.90E-03
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	2.10E-02	4.20E-02	U	U	2.10E-01	2.10E-01	2.10E-01	U	U	2.10E-02	2.10E-02	4.20E-02	U	U	3.80E-02
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	4.30E-03	8.70E-03	U	U	4.30E-02	4.30E-02	4.30E-02	U	U	4.30E-03	4.30E-03	8.70E-03	U	U	7.80E-03
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	4.10E-03	8.30E-03	U	U	4.10E-02	4.10E-02	4.10E-02	U	U	4.10E-03	4.10E-03	8.30E-03	U	U	7.40E-03
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	9.50E-03	1.90E-02	U	U	9.50E-02	9.50E-02	9.50E-02	U	U	9.50E-03	9.50E-03	1.90E-02	U	U	1.70E-02

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				Xylenes, Total				cis-1,2-Dichloroethene					cis-1,3-Dichloropropene					
				mg/kg				mg/kg					mg/kg					
				1330-20-7				156-59-2					10061-01-5					
Location	Sample	Date	Type	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	7.10E-03	2.40E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	7.00E-03	2.30E-02	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	7.40E-03	2.50E-02	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	9.70E-03	3.20E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	9.90E-03	3.30E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	6.60E-03	2.20E-02	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	6.50E-03	2.20E-02	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	7.40E-03	2.50E-02	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	5.70E-03	1.90E-02	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	2.60E-02	8.80E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	7.10E-03	2.40E-02	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	7.90E-03	2.60E-02	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	3.80E-02	1.30E-01	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	7.80E-03	2.60E-02	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	7.40E-03	2.50E-02	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	1.70E-02	5.70E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				n-Butylbenzene				n-Propylbenzene				
				mg/kg				mg/kg				
				104-51-8				103-65-1				
Location	Sample	Date	Type	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	UJ,L
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				p-Isopropyltoluene					sec-Butylbenzene				
				mg/kg					mg/kg				
				99-87-6					135-98-8				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	UJ,L
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	UJ,L
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Volatile Organic Compounds

				tert-Butylbenzene					trans-1,2-Dichloroethene					trans-1,3-Dichloropropene				
				mg/kg					mg/kg					mg/kg				
				98-06-6					156-60-5					10061-02-6				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U	3.10E-03	3.10E-03	7.80E-03	U	U
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.30E-03	4.30E-03	1.10E-02	U	UJ,L	4.30E-03	4.30E-03	1.10E-02	U	U	4.30E-03	4.30E-03	1.10E-02	U	U
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U	4.40E-03	4.40E-03	1.10E-02	U	U
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U	2.90E-03	2.90E-03	7.30E-03	U	U
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U	2.90E-03	2.90E-03	7.20E-03	U	U
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	3.30E-03	3.30E-03	8.20E-03	U	UJ,L	3.30E-03	3.30E-03	8.20E-03	U	U	3.30E-03	3.30E-03	8.20E-03	U	U
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U	2.60E-03	2.60E-03	6.40E-03	U	U
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U	1.20E-02	1.20E-02	2.90E-02	U	U
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U	3.20E-03	3.20E-03	7.90E-03	U	U
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U	3.50E-03	3.50E-03	8.80E-03	U	U
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U	1.70E-02	1.70E-02	4.20E-02	U	U
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U	3.50E-03	3.50E-03	8.70E-03	U	U
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U	3.30E-03	3.30E-03	8.30E-03	U	U
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U	7.60E-03	7.60E-03	1.90E-02	U	U

Footnotes :

FD - field duplicate

H - high bias to estimate (see Shaw, 2004b)

J - estimated concentration

L - low bias to estimate

LQ - data qualifier reported by laboratory

MDL - analytical method detection limit reported by laboratory.

REG - regular sample

RLimit - analytical reporting limit reported by laboratory.

U = undetected concentration.

VQ - data qualifier applied during data validation with same meanings as LQ.

Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a).

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Sediment Properties

				Cation-Exchange Capacity					Percent Solids					pH				
				mg/kg					Percent					PH UNITS				
				12-96-4					38992					39384				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	6.95E+03	1.30E+02	1.30E+02			6.09E+01		0.00E+00			6.40E+00		0.00E+00		
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	6.40E+03	1.30E+02	1.30E+02			6.49E+01		0.00E+00			6.50E+00		0.00E+00		
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	1.01E+04	1.30E+02	1.30E+02			6.04E+01		0.00E+00			6.50E+00		0.00E+00		
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	9.71E+03	1.30E+02	1.30E+02			4.71E+01		0.00E+00			6.10E+00		0.00E+00		
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	1.70E+04	1.30E+02	1.30E+02			4.53E+01		0.00E+00			6.50E+00		0.00E+00		
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	6.23E+03	1.30E+02	1.30E+02			6.62E+01		0.00E+00			6.70E+00		0.00E+00		
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	7.47E+03	1.30E+02	1.30E+02		J	6.76E+01		0.00E+00			6.30E+00		0.00E+00		
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	6.39E+03	1.30E+02	1.30E+02		J	6.15E+01		0.00E+00			5.90E+00		0.00E+00		
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	4.83E+03	1.30E+02	1.30E+02			7.90E+01		0.00E+00			6.90E+00		0.00E+00		
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	3.76E+04	1.30E+02	1.30E+02			1.84E+01		0.00E+00			6.20E+00		0.00E+00		
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	4.85E+03	1.30E+02	1.30E+02		J	6.24E+01		0.00E+00			6.50E+00		0.00E+00		
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	8.74E+03	1.30E+02	1.30E+02			5.52E+01		0.00E+00			6.50E+00		0.00E+00		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	3.90E+04	1.30E+02	1.30E+02			1.17E+01		0.00E+00			6.60E+00		0.00E+00		
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	6.28E+03	1.30E+02	1.30E+02		J	5.82E+01		0.00E+00			5.90E+00		0.00E+00		
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	1.18E+04	1.30E+02	1.30E+02		J	5.89E+01		0.00E+00			5.90E+00		0.00E+00		
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	2.06E+04	1.30E+02	1.30E+02			2.46E+01		0.00E+00			6.50E+00		0.00E+00		

Footnotes are provided at the end of each test parameter

Table 3-9
Concentrations of Chemicals in Sediment Samples from Clinton Lake - Sediment Properties

				Total Organic Carbon					Total Organic Carbon				
				mg/kg					mg/kg				
				10-35-5					10-35-5				
Location	Sample	Date	Type	Result	MDL	RLimit	LQ	VQ	Result	MDL	RLimit	LQ	VQ
BKG-CL-SD01	BKG-CL-SD01	12-Mar-04	REG	2.08E+04	4.60E+01	1.60E+02			2.08E+04	4.60E+01	1.60E+02		
BKG-CL-SD02	BKG-CL-SD02	12-Mar-04	REG	6.35E+03	4.30E+01	1.50E+02			6.35E+03	4.30E+01	1.50E+02		
BKG-CL-SD03	BKG-CL-SD03	12-Mar-04	REG	3.61E+04	4.60E+01	1.70E+02			3.61E+04	4.60E+01	1.70E+02		
BKG-CL-SD04	BKG-CL-SD04	12-Mar-04	REG	4.14E+04	5.90E+01	2.10E+02			4.14E+04	5.90E+01	2.10E+02		
BKG-CL-SD05	BKG-CL-SD05	12-Mar-04	REG	2.91E+04	6.20E+01	2.20E+02			2.91E+04	6.20E+01	2.20E+02		
BKG-CL-SD06	BKG-CL-SD06	12-Mar-04	REG	5.68E+03	4.20E+01	1.50E+02			5.68E+03	4.20E+01	1.50E+02		
BKG-CL-SD07	BKG-CL-SD07	11-Mar-04	REG	6.15E+03	4.10E+01	1.50E+02		J	6.15E+03	4.10E+01	1.50E+02		J
BKG-CL-SD07	DUPLICATE #3	11-Mar-04	FD	1.44E+04	4.60E+01	1.60E+02		J	1.44E+04	4.60E+01	1.60E+02		J
BKG-CL-SD08	BKG-CL-SD08	10-Mar-04	REG	1.23E+04	3.50E+01	1.30E+02			1.23E+04	3.50E+01	1.30E+02		
BKG-CL-SD09	BKG-CL-SD09	9-Mar-04	REG	4.43E+04	1.50E+02	5.40E+02			4.43E+04	1.50E+02	5.40E+02		
BKG-CL-SD10	BKG-CL-SD10	11-Mar-04	REG	2.16E+04	4.50E+01	1.60E+02		J	2.16E+04	4.50E+01	1.60E+02		J
BKG-CL-SD11	BKG-CL-SD11	12-Mar-04	REG	1.74E+04	5.10E+01	1.80E+02			1.74E+04	5.10E+01	1.80E+02		
BKG-CL-SD12	BKG-CL-SD12	10-Mar-04	REG	1.43E+05	2.40E+02	8.50E+02			1.43E+05	2.40E+02	8.50E+02		
BKG-CL-SD13	BKG-CL-SD13	11-Mar-04	REG	7.55E+03	4.80E+01	1.70E+02		J	7.55E+03	4.80E+01	1.70E+02		J
BKG-CL-SD13	DUPLICATE #4	11-Mar-04	FD	7.02E+03	4.80E+01	1.70E+02		J	7.02E+03	4.80E+01	1.70E+02		J
BKG-CL-SD14	BKG-CL-SD14	10-Mar-04	REG	4.55E+04	1.10E+02	4.10E+02			4.55E+04	1.10E+02	4.10E+02		

Footnotes :
FD - field duplicate
H - high bias to estimate (see Shaw, 2004b)
J - estimated concentration
L - low bias to estimate
LQ - data qualifier reported by laboratory
MDL - analytical method detection limit reported by laboratory
REG - regular sample
RLimit - analytical reporting limit reported by laboratory
U = undetected concentration.
VQ - data qualifier applied during data validation with same meanings as LQ
Shading indicates chemical evaluated as potential background chemical (Shaw, 2004a)

Table 3-10
Detection of Chemicals Not Related to Background in Sediment Samples from Streams

	Chemical Name	Acetone		p-Isopropyl Toluene		Nitrate		Nitrite	
	CAS No.	95-50-1		95-63-6		142-28-9		14797-65-0	
Location	Sample	Detected	J-Qualified	Detected	J-Qualified	Detected	J-Qualified	Detected	J-Qualified
BKG-SD01	BKG-SD01								
BKG-SD02	BKG-SD02					X			
BKG-SD02	DUPLICATE #8								
BKG-SD03	BKG-SD03		X			X		X	
BKG-SD04	BKG-SD04	X		X					
BKG-SD05	BKG-SD05								
BKG-SD06	BKG-SD06								
BKG-SD07	BKG-SD07		X	X					
BKG-SD08	BKG-SD08								
BKG-SD09	BKG-SD09								
BKG-SD09	DUPLICATE #7						X		
BKG-SD10	BKG-SD10		X	X					
BKG-SD11	BKG-SD11								
BKG-SD12	BKG-SD12	X							
BKG-SD13	BKG-SD13								
BKG-SD14	BKG-SD14								

Notes:

DUPLICATE - field duplicate

J-Qualified - estimated concentration

X - Chemical was reported with detection status indicated.

Table 3-11
Detection of Chemicals Not Related to Background in Sediment Samples from Clinton Lake

	Chemical Name	Acetone		Methylene Chloride		Naphthalene		Nitrate	
	CAS No.	95-50-1		75-09-2		91-20-3		142-28-9	
Location	Sample	Detected	J-Qualified	Detected	J-Qualified	Detected	J-Qualified	Detected	J-Qualified
BKG-CL-SD01	BKG-CL-SD01								X
BKG-CL-SD02	BKG-CL-SD02								X
BKG-CL-SD03	BKG-CL-SD03		X						X
BKG-CL-SD04	BKG-CL-SD04								X
BKG-CL-SD05	BKG-CL-SD05								
BKG-CL-SD06	BKG-CL-SD06								X
BKG-CL-SD07	BKG-CL-SD07				X				X
BKG-CL-SD07	DUPLICATE #3								X
BKG-CL-SD08	BKG-CL-SD08		X						
BKG-CL-SD09	BKG-CL-SD09		X						
BKG-CL-SD10	BKG-CL-SD10								X
BKG-CL-SD11	BKG-CL-SD11		X					X	
BKG-CL-SD12	BKG-CL-SD12	X					X		
BKG-CL-SD13	BKG-CL-SD13								X
BKG-CL-SD13	DUPLICATE #4				X				X
BKG-CL-SD14	BKG-CL-SD14	X							

Notes:

DUPLICATE - field duplicate

J-Qualified - estimated concentration

X - Chemical was reported with detection status indicated.

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Sediment

	Cyanide, Total			1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)			1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)			1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)			1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)			1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)			1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.61	U	U	1E-06			6E-06			3E-06	U	U	3E-06	U	U	3E-06	U	U	4E-07		J

	Copper			Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	2.2	J	J	2,320			11.6	J	J	173	J	J	14.8			0.019	J	J	7.1	U	U

	Endrin			Dieldrin			Endosulfan I			Endosulfan II			Endosulfan Sulfate			Endrin			Endrin aldehyde		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0047	U	U	0.0023	U	U	0.0023	U	U	0.0047	U	U	0.0047	U	U	0.0047	U	U	0.0047	U	U

	Bromodichloromethane			Bromoform			Carbon disulfide			Carbon tetrachloride						Chloroethane			Chloroform		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U

Footnotes are provided on last page.

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Sediment

	1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)			1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)			1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)			1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)			2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)			1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	3E-06	U	U	3E-06	U	U	3E-06	U	U	3E-06	U	U	3E-06	U	U	3E-06	U	U	3E-06	U	U

	Nickel			Potassium			Selenium			Silver			Sodium			Strontium			Thallium		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	1.6	J	J	130	J	J	0.63	J	J	1.4	U	U	56.7	J	J	8.2			5.6	U	U

	Endrin ketone			Heptachlor			Heptachlor epoxide			Methoxychlor			Toxaphene			alpha-BHC			alpha-Chlordane		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0047	U	U	0.0023	U	U	0.0023	U	U	0.0047	U	UJ	0.23	U	U	0.0023	U	U	0.0023	U	U

	Chloromethane			Dibromo-chloro-methane			Dichloro-difluoro-methane			Ethylbenzene			Hexachlorobutadiene			Iodomethane			Isobutyl Alcohol		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.0075	U	U	0.0075	U	UJ	0.0075	U	U	0.0075	U	U	0.015	U	U	0.15	U	U

Footnotes are provided on last page.

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Sediment

	2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)			2,3,7,8-Tetrachlorodibenzofuran (TCDF)			Heptachlorodibenzo-p-dioxins (HpCDD), Total			Heptachlorodibenzofurans (HpCDF), Total			Hexachlorodibenzo-p-dioxins (HxCDD), Total			Hexachlorodibenzofurans (HxCDF), Total			OCDD		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	1E-06	U	U	1E-06	U	U	1E-05			4E-06			2E-06			9E-07			0.0002		J,

	Tin			Vanadium			Zinc			Acenaphthene			Acenaphthylene			Anthracene			Benzo(a)-anthra-cene		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	7.1	U	U	7.8			16.8			0.4	U	U	0.4	U	U	0.4	U	U	0.08	U	U

	beta-BHC			delta-BHC			gamma-BHC			gamma-Chlordane			Percent Solids			Total Organic Carbon			1,1,1,2-Tetrachloroethane		
	mg/kg			mg/kg			mg/kg			mg/kg			Percent			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0023	U	U	0.0023	U	U	0.0023	U	U	0.0023	U	U	68			6590			0.0075	U	U

	Isopropylbenzene			Methyl methacrylate			Methyl isobutyl ketone			Methyl tert-butyl ether			Methylene chloride			Naphthalene			Styrene		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.038	U	U	0.038	U	U	0.0075	U	U	0.0081	JB	B	0.0075	U	U	0.0075	U	U

Footnotes are provided on last page.

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Sediment

	Octachloro-dibenzofuran (OCDF)			Pentachloro-dibenzo-p-dioxin (PeCDD), Total			Pentachlorodibenzofurans (PeCDF), Total			Tetrachloro-dibenzo-p-dioxins (TCDD), Total			Tetrachloro-dibenzofurans (TCDF), Total			1,3,5-Trinitrobenzene			1,3-Dinitrobenzene		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	4E-06		J,	4E-07			3E-07			4E-07			1E-06	U	U	0.25	U	U	0.25	U	U

	Benzo(a)pyrene			Benzo(b)fluoranthene			Benzo(ghi)perylene			Benzo(k)fluoranthene			Chrysene			Dibenzo(a,h)-anthracene			Fluoranthene		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.08	U	U	0.08	U	U	0.08	U	UJ,	0.0345	J	J	0.08	U	U	0.08	U	U	0.4	U	U

	1,1,1-Trichloroethane			1,1,2,2-Tetrachloroethane			1,1,2-Trichloroethane			1,1-Dichloroethane			1,1-Dichloroethene			1,1-Dichloropropene			1,2,3-Trichlorobenzene		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U

	Tetrachloroethene			Toluene			Trichloroethene			Trichlorofluoromethane			Vinyl acetate			Vinyl chloride			Xylenes, Total		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.038	U	UJ,	0.0075	U	U	0.023	U	U

Footnotes are provided on last page.

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW0

Sediment

	2,4,6-Trinitrotoluene			2,4-Dinitrotoluene			2,6-Dinitrotoluene			2-Amino-4,6-dinitrotoluen			4-Amino-2,6-dinitrotoluen			HMX			Nitrobenzene		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.25	U	U	0.25	U	U	0.25	U	U	0.25	U	U	0.25	U	U	0.25	U	U	0.25	U	U

	Fluorene			Indeno(1,2,3-cd)pyrene			Naphthalene			Phenanthrene			Pyrene			PCB-1016			PCB-1221		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.4	U	U	0.08	U	UJ,	0.4	U	U	0.4	U	U	0.4	U	U	0.024	U	U	0.024	U	U

	1,2,3-Trichloropropane			1,2,4-Trichlorobenzene			1,2,4-Trimethylbenzene			1,2-Dibromoethane			1,2-Dichlorobenzene			1,2-Dichloroethane			1,2-Dichloropropane		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U

	cis-1,2-Dichloroethene			cis-1,3-Dichloropropene			n-Butylbenzene			n-Propylbenzene			p-Isopropyl-toluene			sec-Butylbenzene			tert-Butylbenzene		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U

Footnotes are provided on last page.

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW0

Sediment

	RDX			Tetryl			m-Nitrotoluene			o-Nitrotoluene			p-Nitrotoluene			2,4,5-TP			Aluminum		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.25	U	U	0.25	U	U	0.25	U	U	0.25	U	U	0.25	U	U	0.0049	U	U	2520		

	PCB-1232			PCB-1242			PCB-1248			PCB-1254			PCB-1260			Perchlorate			4,4'-DDD		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.024	U	U	0.024	U	U	0.024	U	U	0.024	U	U	0.024	U	U	0.15	U	U	0.0047	U	UJ

	1,3,5-Trimethylbenzene			1,3-Dichlorobenzene			1,3-Dichloropropane			1,4-Dichlorobenzene			1,4-Dioxane			2,2-Dichloropropane			2-Butanone		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.0075	U	U	0.38	U	U	0.0075	U	U	0.038	U	U

	trans-1,2-Dichloro-ethene			trans-1,3-Dichloropropene			Bromide			Cation-Exchange Capacity			Chlorine			Fluoride, Total			Nitrate		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.0075	U	U	7.4	U	U	9080			59.3			1.8		JH	20.1		

Footnotes are provided on last page.

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Sediment

	Antimony			Arsenic			Barium			Beryllium			Cadmium			Calcium			Chromium			Cobalt		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	8.5	U	UJ,	0.71	U	U	21.4	J	J	0.71	U	U	0.15	J	J	576	J	J	4.6		J	0.63	J	J

	4,4'-DDE			4,4'-DDT			Aldrin			Chlordane (Technical)			Dieldrin			Endosulfan I			Endosulfan II			Endosulfan Sulfate		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0047	U	U	0.0047	U	U	0.0023	U	U				0.0023	U	U	0.0023	U	U	0.0047	U	U	0.0047	U	U

	2-Chlorotoluene			2-Hexanone			2-Propenal			4-Chlorotoluene			Acetone			Benzene			Bromobenzene			Bromochloromethane		
	mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg			mg/kg		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	0.0075	U	U	0.038	U	U	0.038	U	UJ,	0.0075	U	U	0.0446	J	J	0.0075	U	U	0.0075	U	U	0.0075	U	U

	Nitrite			Sulfate			pH		
	mg/kg			mg/kg			PH UNITS		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SD03	1.6			53.8			7.2		

Footnotes are provided on last page.

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Surface Water

	Alkalinity, Total			Bicarbonate as CACO3			Cyanide, Total			1,3,5-Trinitrobenzene			1,3-Dinitrobenzene			2,4,6-Trinitrotoluene			2,4-Dinitrotoluene		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	39.5			39.5			0.01	U	U	0.0002	U	UJ	0.0002	U	UJ	0.0002	U	UJ	0.0002	U	UJ

	Benzo(ghi)perylene			Benzo(k)fluoranthene			Chrysene			Dibenzo(a,h)anthracene			Fluoranthene			Fluorene			Indeno(1,2,3-cd)pyrene		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.0002	U	U	0.0002	U	U	0.0002	U	U	0.0002	U	U	0.001	U	U	0.001	U	U	0.0002	U	U

	Chloromethane			Dibromochloromethane			Dichlorodifluoromethane			Ethylbenzene			Hexachlorobutadiene			Iodomethane			Isobutyl Alcohol		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	UJ	0.01	U	U	0.05	U	U

Footnotes are provided on last page

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Surface Water

	2,6-Dinitrotoluene			2-Amino-4,6-dinitrotoluen			4-Amino-2,6-dinitrotoluen			HMX			Nitrobenzene			RDX			Tetryl		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.0002	U	UJ	0.0002	U	UJ	0.0002	U	UJ	0.0002	U	UJ	0.0002	U	UJ	0.0002	U	UJ	0.0002	U	UJ

	Naphthalene			Phenanthrene			Pyrene			Perchlorate			Total Dissolved Solids			Total Suspended Solids			1,1,1,2-Tetrachloroethane		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.001	U	U	0.001	U	U	0.01	U	U	188			54			0.001	U	U

	Isopropylbenzene			Methyl methacrylate			Methyl isobutyl ketone			Methyl tert-butyl ether			Methylene chloride			Naphthalene			Styrene		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.005	U	U	0.005	U	U	0.001	U	U	0.002	U	U	0.001	U	U	0.001	U	U

Footnotes are provided on last page

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Surface Water

	m-Nitrotoluene			o-Nitrotoluene			p-Nitrotoluene			Hardness (as CaCO3)			Aluminum			Antimony			Arsenic		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.0002	U	UJ	0.0002	U	UJ	0.0002	U	UJ	48.3			1.9			0.005	U	U	0.01	U	U

	1,1,1-Trichloroethane			1,1,2,2-Tetrachloroethane			1,1,2-Trichloroethane			1,1-Dichloroethane			1,1-Dichloroethene			1,1-Dichloropropene			1,2,3-Trichlorobenzene		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U

	Tetrachloroethene			Toluene			Trichloroethene			Trichlorofluoromethane			Vinyl acetate			Vinyl chloride			Xylenes, Total		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.0006	J	J	0.001	U	U	0.001	U	U	0.005	U	U	0.001	U	U	0.0017	J	J

Footnotes are provided on last page

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Surface Water

	Barium			Beryllium			Cadmium			Calcium			Chromium			Cobalt			Copper		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.11	J	J	0.004	U	U	0.005	U	U	11.2			0.01	U	U	0.0023	J	J	0.0046	J	J

	1,2,3-Trichloropropane			1,2,4-Trichlorobenzene			1,2,4-Trimethylbenzene			1,2-Dibromoethane			1,2-Dichlorobenzene			1,2-Dichloroethane			1,2-Dichloropropane		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.001	U	U	0.0006	J	J	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U

	cis-1,2-Dichloroethene			cis-1,3-Dichloropropene			n-Butylbenzene			n-Propylbenzene			p-Isopropyltoluene			sec-Butylbenzene			tert-Butylbenzene		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U

Footnotes are provided on last page

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Surface Water

	Iron			Lead			Magnesium			Manganese			Mercury			Molybdenum			Nickel		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	6.29			0.0303			4.93	J	J	0.276		J	6E-05	J	J	0.05	U	U	0.0033	J	J

	1,3,5-Trimethylbenzene			1,3-Dichlorobenzene			1,3-Dichloropropane			1,4-Dichlorobenzene			1,4-Dioxane			2,2-Dichloropropane			2-Butanone		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.25	U	U	0.001	U	U	0.005	U	U

	trans-1,2-Dichloroethene			trans-1,3-Dichloropropene			Bromide			Chlorine			Fluoride, Total			Nitrate			Nitrite		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.001	U	U	0.36	J	J	26.3		JH	0.12	J	J	0.43			0.05	J	J

Footnotes are provided on last page

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Surface Water

	Potassium			Selenium			Silver			Sodium			Strontium			Thallium			Tin		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	3.76	J	J	0.01	U	U	0.01	U	U	22.4			0.154		JL	0.01	U	U	0.05	U	U

	2-Chlorotoluene			2-Hexanone			2-Propenal			4-Chlorotoluene			Acetone			Benzene			Bromobenzene		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.005	U	U	0.01	U	U	0.001	U	U	0.005	U	U	0.001	U	U	0.001	U	U

	Sulfate			pH		
	mg/L			PH UNITS		
Sample	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	28.3			6.8		

Footnotes are provided on last page

Table 3-12
Concentrations of Chemicals in Background Sediment and Surface Water Samples at Stream Location BKG-SD/SW03

Surface Water

	Vanadium			Zinc			Acenaphthene			Acenaphthylene			Anthracene			Benzo(a)anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.0073	J	J	0.124			0.001	U	U	0.001	U	U	0.001	U	U	0.0002	U	U	0.0002	U	U	0.0002	U	U

	Bromochloromethane			Bromodichloromethane			Bromoform			Carbon disulfide			Carbon tetrachloride			Chlorobenzene			Chloroethane			Chloroform		
	mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L			mg/L		
Sample	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BKG-SW03	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U

Notes:

J - estimated concentration

LQ - data qualifier reported by laboratory

U - undetected concentration

VQ - data qualifier applied during data validation with same meanings as LQ

Table 5-1

Summary Statistics for Chemicals in Surface Water[a] Background Data

Chemical	Detection Frequency	Range of Values, mg/L: Detected Concentrations Minimum - Maximum	Range of Values, mg/L: Reporting Limits Minimum - Maximum	Statistical Distribution [b]
BACKGROUND CHEMICALS (STREAMS) [a]				
Inorganics (Filtered)				
Aluminum	12 / 13	0.0325 - 1.12	0.2 - 0.2	N
Barium	13 / 13	0.0283 - 0.084	0.2 - 0.2	N
Calcium	13 / 13	2.45 - 11.9	1 - 1	L
Copper	5 / 13	0.0014 - 0.0158	0.025 - 0.025	NP
Iron	13 / 13	0.202 - 1.27	0.3 - 0.3	L
Magnesium	13 / 13	0.773 - 6.14	5 - 5	L
Manganese	13 / 13	0.0012 - 0.378	0.015 - 0.015	L
Mercury	8 / 13	0.000052 - 0.000074	0.001 - 0.001	NP
Nickel	10 / 13	0.0008 - 0.0026	0.04 - 0.04	L
Potassium	13 / 13	0.652 - 2.86	5 - 5	L
Selenium	1 / 13	0.0038 - 0.0038	0.01 - 0.01	NP
Sodium	13 / 13	1.01 - 23.2	5 - 5	L
Strontium	13 / 13	0.0232 - 0.193	0.01 - 0.01	L
Vanadium	3 / 13	0.0014 - 0.0017	0.05 - 0.05	NP
Zinc	9 / 13	0.0063 - 0.212	0.02 - 0.02	L
Inorganics (Unfiltered)				
Aluminum	13 / 13	0.437 - 7.91	0.2 - 0.2	NP
Antimony	1 / 13	0.005 - 0.005	0.005 - 0.005	NP
Barium	13 / 13	0.0382 - 0.106	0.2 - 0.2	N
Calcium	13 / 13	2.6 - 13.1	1 - 1	L
Chromium	2 / 13	0.0057 - 0.0088	0.01 - 0.01	NP
Cobalt	3 / 13	0.0012 - 0.0024	0.05 - 0.05	NP
Copper	7 / 13	0.0014 - 0.0046	0.025 - 0.025	NP
Iron	13 / 13	0.386 - 9.18	0.3 - 0.3	L
Lead	2 / 13	0.0032 - 0.0052	0.005 - 0.005	NP
Magnesium	13 / 13	0.867 - 7.06	5 - 5	L
Manganese	13 / 13	0.025 - 0.501	0.015 - 0.015	L
Mercury	10 / 13	0.00006 - 0.000093	0.001 - 0.001	NP
Nickel	12 / 13	0.0011 - 0.0087	0.04 - 0.04	L
Potassium	13 / 13	0.735 - 3.26	5 - 5	N
Selenium	1 / 13	0.0041 - 0.0041	0.01 - 0.01	NP
Sodium	13 / 13	1.04 - 25.4	5 - 5	L
Strontium	13 / 13	0.0221 - 0.205	0.01 - 0.01	L
Vanadium	9 / 13	0.0006 - 0.0172	0.05 - 0.05	NP
Zinc	10 / 13	0.0052 - 0.0258	0.02 - 0.02	N
Anions				
Bromide	4 / 13	0.3 - 0.47	0.5 - 0.5	NP
Chloride	6 / 13	11.9 - 38.5	20 - 20	NP
Fluoride, Total	9 / 13	0.1 - 0.16	0.2 - 0.2	L
Nitrite	1 / 13	0.05 - 0.05	0.1 - 0.1	NP
Sulfate	11 / 13	11.3 - 35.5	20 - 20	L
Water Properties				
Total Dissolved Solids	13 / 13	73 - 186	10 - 10	L
Total Suspended Solids	6 / 13	5 - 270	4 - 4	NP
Alkalinity, Total	13 / 13	4.5 - 36.5	5 - 5	N
Bicarbonate (as CaCO3)	13 / 13	4.5 - 36.5	5 - 5	N
Hardness (as CaCO3)	13 / 13	7.2 - 57.7	4 - 4	L

Table 5-1

Summary Statistics for Chemicals in Surface Water[a] Background Data

Chemical	Detection Frequency	Range of Values, mg/L: Detected Concentrations Minimum - Maximum	Range of Values, mg/L: Reporting Limits Minimum - Maximum	Statistical Distribution [b]
BACKGROUND CHEMICALS (CLINTON LAKE)				
Inorganics (Filtered)				
Aluminum	14 / 14	0.0233 - 0.198	0.2 - 0.2	L
Barium	14 / 14	0.0411 - 0.0524	0.2 - 0.2	N
Cadmium	1 / 14	0.0019 - 0.0019	0.005 - 0.005	NP
Calcium	14 / 14	3.22 - 4.31	1 - 1	NP
Copper	1 / 14	0.0064 - 0.0064	0.025 - 0.025	NP
Iron	14 / 14	0.746 - 1.3	0.3 - 0.3	N
Magnesium	14 / 14	1.31 - 2.2	5 - 5	NP
Manganese	14 / 14	0.0283 - 0.14	0.015 - 0.015	N
Nickel	11 / 14	0.00087 - 0.002	0.04 - 0.04	L
Potassium	14 / 14	1.49 - 2.48	5 - 5	N
Sodium	14 / 14	4.68 - 6.98	5 - 5	NP
Strontium	14 / 14	0.0547 - 0.0621	0.01 - 0.01	L
Tin	1 / 14	0.0048 - 0.0048	0.05 - 0.05	NP
Vanadium	1 / 14	0.00081 - 0.00081	0.05 - 0.05	NP
Zinc	14 / 14	0.0051 - 0.473	0.02 - 0.02	NP
Inorganics (Unfiltered)				
Aluminum	14 / 14	0.131 - 0.678	0.2 - 0.2	L
Barium	14 / 14	0.0451 - 0.0652	0.2 - 0.2	L
Calcium	14 / 14	3.47 - 4.59	1 - 1	NP
Cobalt	1 / 14	0.0017 - 0.0017	0.05 - 0.05	NP
Copper	1 / 14	0.0015 - 0.0015	0.025 - 0.025	NP
Iron	14 / 14	1.14 - 2.52	0.3 - 0.3	L
Magnesium	14 / 14	1.4 - 2.19	5 - 5	NP
Manganese	14 / 14	0.047 - 0.232	0.015 - 0.015	L
Nickel	12 / 14	0.001 - 0.0025	0.04 - 0.04	L
Potassium	14 / 14	1.58 - 2.6	5 - 5	NP
Sodium	14 / 14	4.85 - 7.26	5 - 5	NP
Strontium	14 / 14	0.052 - 0.0612	0.01 - 0.01	N
Thallium	1 / 14	0.004 - 0.004	0.01 - 0.01	NP
Tin	3 / 14	0.0027 - 0.0034	0.05 - 0.05	NP
Vanadium	3 / 14	0.00069 - 0.0022	0.05 - 0.05	NP
Zinc	13 / 14	0.0055 - 0.0394	0.02 - 0.02	NP
Anions				
Bromide	13 / 14	0.26 - 0.29	0.5 - 0.5	N
Chloride	14 / 14	12.6 - 14.7	20 - 20	NP
Fluoride, Total	14 / 14	0.11 - 0.13	0.2 - 0.2	NP
Sulfate	14 / 14	13.8 - 20.8	20 - 20	NP
Water Properties				
Alkalinity, Total	14 / 14	7.5 - 10.5	5 - 5	N
Bicarbonate (as CaCO3)	14 / 14	7.5 - 10.5	5 - 5	N
Hardness (as CaCO3)	14 / 14	14.6 - 20	4 - 4	NP
Total Dissolved Solids	14 / 14	63 - 91	10 - 10	L
Total Suspended Solids	2 / 14	4 - 4	4 - 4	NP

Footnotes:

[a] Stream samples collected from Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Central Creek.

[b] L = Lognormal distribution; N = Normal distribution; NP = Nonparametric distibution for those samples that fail normal and lognormal distribution tests.

mg/L = milligram per liter

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Aluminum (Filtered) Concentration (mg/L)	Barium (Filtered) Concentration (mg/L)	Calcium (Filtered) Concentration (mg/L)	Copper (Filtered) Concentration (mg/L)
	0.0325	0.0283	2.45	0.0014
	0.044	0.0343	2.5	0.0016
	0.12	0.0438	2.7	0.0017
	0.203	0.0448	3.45	0.002
	0.314	0.0492	4.12	0.0158
	0.324	0.0543	4.61	0.00044
	0.439	0.0544	5.02	0.00044
	0.561	0.057	6.44	0.00044
	0.774	0.0623	7.27	0.00044
	0.776	0.067	9.98	0.00044
	0.969	0.0785	10.5	0.00044
	1.12	0.0804	10.7	0.00044
	0.0066	0.084	11.9	0.00044
Mean (mg/L)	**4.37E-01**	**5.68E-02**	**6.28E+00**	**2.00E-03**
Standard Deviation of Mean (SD) (mg/L)	**3.74E-01**	**1.73E-02**	**3.45E+00**	**4.19E-03**
Median (mg/L)	**3.24E-01**	**5.44E-02**	**5.02E+00**	**4.40E-04**
Distribution Type	**Normal**	**Normal**	**Lognormal**	**Nonparametric**
95% UCL (mg/L)- Bootstrapping [b]	**NA**	**NA**	**7.92E+00**	**4.10E-03**
95% UCL (mg/L)- T-test [c]	**6.22E-01**	**6.54E-02**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**1.44E+00**	**1.03E-01**	**2.54E+01**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**1.12E+00**	**8.40E-02**	**1.19E+01**	**1.58E-02**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Iron (Filtered) Concentration (mg/L)	Magnesium (Filtered) Concentration (mg/L)	Manganese (Filtered) Concentration (mg/L)	Mercury (Filtered) Concentration (mg/L)
	0.202	0.773	0.0012	0.000052
	0.292	0.846	0.0138	0.000056
	0.315	1.1	0.0327	0.00006
	0.354	1.21	0.0345	0.00006
	0.411	1.24	0.0419	0.000062
	0.532	1.47	0.0478	0.000063
	0.573	1.65	0.0575	0.000065
	0.599	1.92	0.0755	0.000074
	0.601	2.63	0.0827	0.000022
	1.1	3.23	0.115	0.000022
	1.13	3.4	0.116	0.000022
	1.15	6.05	0.213	0.000022
	1.27	6.14	0.378	0.000022
Mean (mg/L)	**6.56E-01**	**2.44E+00**	**9.30E-02**	**4.63E-05**
Standard Deviation of Mean (SD) (mg/L)	**3.74E-01**	**1.83E+00**	**1.02E-01**	**2.06E-05**
Median (mg/L)	**5.73E-01**	**1.65E+00**	**5.75E-02**	**5.60E-05**
Distribution Type	**Lognormal**	**Lognormal**	**Lognormal**	**Nonparametric**
T value (normal distributions only)	**NA**	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**7.74E-01**	**2.97E+00**	**1.14E-01**	**5.69E-05**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**2.75E+00**	**1.21E+01**	**2.20E+00**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**1.27E+00**	**6.14E+00**	**3.78E-01**	**7.40E-05**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Nickel (Filtered) Concentration (mg/L)	Potassium (Filtered) Concentration (mg/L)	Selenium (Filtered) Concentration (mg/L)
	0.0008	0.652	0.0038
	0.00088	0.693	0.002
	0.0012	0.736	0.002
	0.0017	0.738	0.002
	0.0018	1.12	0.002
	0.0023	1.22	0.002
	0.0025	1.25	0.002
	0.0025	1.34	0.002
	0.0026	1.7	0.002
	0.0026	1.97	0.002
	0.0011	2.13	0.002
	0.0011	2.15	0.002
	0.0011	2.86	0.002
Mean (mg/L)	**1.71E-03**	**1.43E+00**	**2.14E-03**
Standard Deviation of Mean (SD) (mg/L)	**7.12E-04**	**6.90E-01**	**4.99E-04**
Median (mg/L)	**1.70E-03**	**1.25E+00**	**2.00E-03**
Distribution Type	**Lognormal**	**Lognormal**	**Nonparametric**
T value (normal distributions only)	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**2.13E-03**	**1.66E+00**	**2.28E-03**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**5.10E-03**	**4.76E+00**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**2.60E-03**	**2.86E+00**	**3.80E-03**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Sodium (Filtered) Concentration (mg/L)	Strontium (Filtered) Concentration (mg/L)	Vanadium (Filtered) Concentration (mg/L)	Zinc (Filtered) Concentration (mg/L)
	1.01	0.0232	0.0014	0.0063
	1.08	0.029	0.0017	0.0066
	1.68	0.0328	0.0017	0.009
	1.87	0.0392	0.00047	0.0113
	2.29	0.0414	0.00047	0.0144
	4.53	0.0476	0.00047	0.0418
	6.64	0.0501	0.00047	0.108
	7.64	0.0637	0.00047	0.117
	7.85	0.0666	0.00047	0.212
	10.1	0.0977	0.00047	0.00059
	13.5	0.122	0.00047	0.00059
	13.8	0.177	0.00047	0.00059
	23.2	0.193	0.00047	0.00059
Mean (mg/L)	**7.32E+00**	**7.56E-02**	**7.31E-04**	**4.07E-02**
Standard Deviation of Mean (SD) (mg/L)	**6.55E+00**	**5.60E-02**	**5.01E-04**	**6.52E-02**
Median (mg/L)	**6.64E+00**	**5.01E-02**	**4.70E-04**	**9.00E-03**
Distribution Type	**Lognormal**	**Lognormal**	**Nonparametric**	**Lognormal**
T value (normal distributions only)	**NA**	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**9.76E+00**	**9.24E-02**	**9.92E-04**	**7.86E-02**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**7.62E+01**	**3.69E-01**	**Nonparametric distribution; use MDC**	**2.53E+00**
Maximum detected concentration (MDC) (mg/L) [e]	**2.32E+01**	**1.93E-01**	**1.70E-03**	**2.12E-01**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Aluminum (Unfiltered) Concentration (mg/L)	Antimony (Unfiltered) Concentration (mg/L)	Barium (Unfiltered) Concentration (mg/L)
	0.437	0.005	0.0382
	0.481	0.0015	0.0398
	0.56	0.0015	0.0536
	0.623	0.0015	0.0545
	0.626	0.0015	0.0687
	0.869	0.0015	0.0715
	0.932	0.0015	0.0716
	0.934	0.0015	0.0853
	1.05	0.0015	0.0863
	1.14	0.0015	0.0912
	1.83	0.0015	0.104
	4.93	0.0015	0.105
	7.91	0.0015	0.106
Mean (mg/L)	**1.72E+00**	**1.77E-03**	**7.51E-02**
Standard Deviation of Mean (SD) (mg/L)	**2.20E+00**	**9.71E-04**	**2.37E-02**
Median (mg/L)	**9.32E-01**	**1.50E-03**	**7.16E-02**
Distribution Type	**Nonparametric**	**Nonparametric**	**Normal**
T value (normal distributions only)	**NA**	**NA**	**1.78E+00**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**2.61E+00**	**2.04E-03**	**NA**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**8.68E-02**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**1.38E-01**
Maximum detected concentration (MDC) (mg/L) [e]	**7.91E+00**	**5.00E-03**	**1.06E-01**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Calcium (Unfiltered) Concentration (mg/L)	Chromium (Unfiltered) Concentration (mg/L)	Cobalt (Unfiltered) Concentration (mg/L)
	2.6	0.0057	0.0012
	2.88	0.0088	0.0024
	3.25	0.0004	0.0024
	3.73	0.0004	0.0005
	4.52	0.0004	0.0005
	5.09	0.0004	0.0005
	5.36	0.0004	0.0005
	7.72	0.0004	0.0005
	7.88	0.0004	0.0005
	10.9	0.0004	0.0005
	11.4	0.0004	0.0005
	11.8	0.0004	0.0005
	13.1	0.0004	0.0005
Mean (mg/L)	**6.94E+00**	**1.45E-03**	**8.46E-04**
Standard Deviation of Mean (SD) (mg/L)	**3.76E+00**	**2.65E-03**	**7.16E-04**
Median (mg/L)	**5.36E+00**	**4.00E-04**	**5.00E-04**
Distribution Type	**Lognormal**	**Nonparametric**	**Nonparametric**
T value (normal distributions only)	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**8.63E+00**	**2.51E-03**	**1.23E-03**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**2.77E+01**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**1.31E+01**	**8.80E-03**	**2.40E-03**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Copper (Unfiltered) Concentration (mg/L)	Iron (Unfiltered) Concentration (mg/L)	Lead (Unfiltered) Concentration (mg/L)
	0.0014	0.386	0.0032
	0.0017	0.468	0.0052
	0.0018	0.51	0.0012
	0.0018	0.761	0.0012
	0.0019	1.05	0.0012
	0.0036	1.14	0.0012
	0.0046	1.27	0.0012
	0.00044	2.06	0.0012
	0.00044	2.22	0.0012
	0.00044	2.43	0.0012
	0.00044	2.59	0.0012
	0.00044	7.04	0.0012
	0.00044	9.18	0.0012
Mean (mg/L)	**1.50E-03**	**2.39E+00**	**1.66E-03**
Standard Deviation of Mean (SD) (mg/L)	**1.33E-03**	**2.68E+00**	**1.20E-03**
Median (mg/L)	**1.40E-03**	**1.27E+00**	**1.20E-03**
Distribution Type	**Nonparametric**	**Lognormal**	**Nonparametric**
T value (normal distributions only)	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**2.10E-03**	**3.41E+00**	**2.28E-03**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**2.05E+01**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**4.60E-03**	**9.18E+00**	**5.20E-03**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Copper (Unfiltered) Concentration (mg/L)	Iron (Unfiltered) Concentration (mg/L)	Lead (Unfiltered) Concentration (mg/L)
	0.0014	0.386	0.0032
	0.0017	0.468	0.0052
	0.0018	0.51	0.0012
	0.0018	0.761	0.0012
	0.0019	1.05	0.0012
	0.0036	1.14	0.0012
	0.0046	1.27	0.0012
	0.00044	2.06	0.0012
	0.00044	2.22	0.0012
	0.00044	2.43	0.0012
	0.00044	2.59	0.0012
	0.00044	7.04	0.0012
	0.00044	9.18	0.0012
Mean (mg/L)	**1.50E-03**	**2.39E+00**	**1.66E-03**
Standard Deviation of Mean (SD) (mg/L)	**1.33E-03**	**2.68E+00**	**1.20E-03**
Median (mg/L)	**1.40E-03**	**1.27E+00**	**1.20E-03**
Distribution Type	**Nonparametric**	**Lognormal**	**Nonparametric**
T value (normal distributions only)	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**2.10E-03**	**3.41E+00**	**2.28E-03**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**2.05E+01**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**4.60E-03**	**9.18E+00**	**5.20E-03**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Magnesium (Unfiltered) Concentration (mg/L)	Manganese (Unfiltered) Concentration (mg/L)	Mercury (Unfiltered) Concentration (mg/L)	Nickel (Unfiltered) Concentration (mg/L)
	0.867	0.025	0.00006	0.0011
	0.882	0.039	0.000062	0.0014
	1.14	0.0416	0.000072	0.002
	1.35	0.0592	0.000073	0.0022
	1.66	0.0765	0.000074	0.0027
	1.86	0.105	0.000084	0.0028
	2.11	0.115	0.000084	0.003
	2.16	0.13	0.000085	0.0032
	3.27	0.143	0.000091	0.0034
	3.45	0.175	0.000093	0.0047
	4.22	0.31	0.000022	0.0083
	6.76	0.477	0.000022	0.0087
	7.06	0.501	0.000022	0.0011
Mean (mg/L)	**2.83E+00**	**1.69E-01**	**6.49E-05**	**3.43E-03**
Standard Deviation of Mean (SD) (mg/L)	**2.08E+00**	**1.60E-01**	**2.64E-05**	**2.46E-03**
Median (mg/L)	**2.11E+00**	**1.15E-01**	**7.30E-05**	**2.80E-03**
Distribution Type	**Lognormal**	**Lognormal**	**Nonparametric**	**Lognormal**
T value (normal distributions only)	**NA**	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**3.80E+00**	**2.28E-01**	**7.75E-05**	**4.70E-03**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**1.46E+01**	**1.39E+00**	**Nonparametric distribution; use MDC**	**1.62E-02**
Maximum detected concentration (MDC) (mg/L) [e]	**7.06E+00**	**5.01E-01**	**9.30E-05**	**8.70E-03**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Potassium (Unfiltered) Concentration (mg/L)	Selenium (Unfiltered) Concentration (mg/L)	Sodium (Unfiltered) Concentration (mg/L)
	0.735	0.0041	1.04
	0.754	0.002	1.29
	0.762	0.002	1.69
	1.3	0.002	1.84
	1.33	0.002	2.56
	1.39	0.002	4.74
	1.59	0.002	6.83
	1.65	0.002	8.35
	1.82	0.002	9.16
	2.2	0.002	12.5
	2.58	0.002	13.9
	2.63	0.002	15.3
	3.26	0.002	25.4
Mean (mg/L)	**1.69E+00**	**2.16E-03**	**8.05E+00**
Standard Deviation of Mean (SD) (mg/L)	**7.88E-01**	**5.82E-04**	**7.22E+00**
Median (mg/L)	**1.59E+00**	**2.00E-03**	**6.83E+00**
Distribution Type	**Normal**	**Nonparametric**	**Lognormal**
T value (normal distributions only)	**1.78E+00**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**NA**	**2.32E-03**	**1.01E+01**
95% UCL (mg/L)- T-test [c]	**2.08E+00**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**3.80E+00**	**Nonparametric distribution; use MDC**	**8.67E+01**
Maximum detected concentration (MDC) (mg/L) [e]	**3.26E+00**	**4.10E-03**	**2.54E+01**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Strontium (Unfiltered) Concentration (mg/L)	Vanadium (Unfiltered) Concentration (mg/L)	Zinc (Unfiltered) Concentration (mg/L)
	0.0221	0.0006	0.0052
	0.0312	0.00066	0.0058
	0.0382	0.00079	0.0076
	0.0401	0.00087	0.0087
	0.042	0.00098	0.0098
	0.0463	0.0015	0.0139
	0.0484	0.004	0.0149
	0.0686	0.0106	0.0179
	0.0776	0.0172	0.0248
	0.093	0.00047	0.0258
	0.126	0.00047	0.00059
	0.188	0.00047	0.00059
	0.205	0.00047	0.00059
Mean (mg/L)	**7.90E-02**	**3.01E-03**	**1.05E-02**
Standard Deviation of Mean (SD) (mg/L)	**5.94E-02**	**5.11E-03**	**8.57E-03**
Median (mg/L)	**4.84E-02**	**7.90E-04**	**8.70E-03**
Distribution Type	**Lognormal**	**Nonparametric**	**Normal**
T value (normal distributions only)	**NA**	**NA**	**1.78E+00**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**1.14E-01**	**4.79E-03**	**NA**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**1.47E-02**
95%, 95% UTL (mg/L) [d]	**3.92E-01**	**Nonparametric distribution; use MDC**	**3.34E-02**
Maximum detected concentration (MDC) (mg/L) [e]	**2.05E-01**	**1.72E-02**	**2.58E-02**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Bromide Concentration (mg/L)	Chloride Concentration (mg/L)	Fluoride, Total Concentration (mg/L)
	0.3	11.9	0.1
	0.31	12.4	0.11
	0.35	18.8	0.11
	0.47	20	0.12
	0.25	25.4	0.13
	0.25	38.5	0.13
	0.25	10	0.13
	0.25	10	0.14
	0.25	10	0.16
	0.25	10	0.1
	0.25	10	0.1
	0.25	10	0.1
	0.25	10	0.1
Mean (mg/L)	**2.83E-01**	**1.52E+01**	**1.18E-01**
Standard Deviation of Mean (SD) (mg/L)	**6.47E-02**	**8.62E+00**	**1.92E-02**
Median (mg/L)	**2.50E-01**	**1.00E+01**	**1.10E-01**
Distribution Type	**Nonparametric**	**Nonparametric**	**Lognormal**
T value (normal distributions only)	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**3.24E-01**	**2.02E+01**	**1.29E-01**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**1.77E-01**
Maximum detected concentration (MDC) (mg/L) [e]	**4.70E-01**	**3.85E+01**	**1.60E-01**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams[a]

	Nitrite Concentration (mg/L)	Sulfate Concentration (mg/L)	Total Dissolved Solids Concentration (mg/L)
	0.05	11.3	73
	0.05	11.4	88
	0.05	12.7	90
	0.05	13.4	94
	0.05	14.6	102
	0.05	16	106
	0.05	18.8	123
	0.05	23.7	130
	0.05	24.2	135
	0.05	32.9	147
	0.05	35.5	161
	0.05	10	175
	0.05	10	186
Mean (mg/L)	**5.00E-02**	**1.80E+01**	**1.24E+02**
Standard Deviation of Mean (SD) (mg/L)	**1.08E-09**	**8.57E+00**	**3.57E+01**
Median (mg/L)	**5.00E-02**	**1.46E+01**	**1.23E+02**
Distribution Type	**Nonparametric**	**Lognormal**	**Lognormal**
T value (normal distributions only)	**NA**	**NA**	**NA**
Sample size (N)	**13**	**13**	**13**
K (for UTL; sample size = 13)	**2.67E+00**	**2.67E+00**	**2.67E+00**
95% UCL (mg/L)- Bootstrapping [b]	**5.00E-02**	**2.33E+01**	**1.39E+02**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**5.25E+01**	**2.59E+02**
Maximum detected concentration (MDC) (mg/L) [e]	**5.00E-02**	**3.55E+01**	**1.86E+02**

See footnotes at end of table

Table 5-2
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Streams [a]

	Barium (Filtered) Concentration (mg/L)	Total Suspended Solids Concentration (mg/L)	Alkalinity, Total Concentration (mg/L)	Bicarbonate as CaCO3 Concentration (mg/L)	Hardness (as CaCO3) Concentration (mg/L)
	0.0283	5	4.5	4.5	7.2
	0.0343	7	6.5	6.5	10.1
	0.0438	7	9	9	14.9
	0.0448	11	11	11	17.2
	0.0492	90	15.5	15.5	18.9
	0.0543	270	18	18	20.3
	0.0544	4	21	21	26.2
	0.057	4	22.5	22.5	31.9
	0.0623	4	25	25	33.5
	0.067	4	26	26	37
	0.0785	4	33.5	33.5	37.6
	0.0804	4	35	35	57.3
	0.084	4	36.5	36.5	57.7
Mean (mg/L)	**5.68E-02**	**3.22E+01**	**2.03E+01**	**2.03E+01**	**2.84E+01**
Standard Deviation of Mean (SD) (mg/L)	**1.73E-02**	**7.52E+01**	**1.08E+01**	**1.08E+01**	**1.62E+01**
Median (mg/L)	**5.44E-02**	**4.00E+00**	**2.10E+01**	**2.10E+01**	**2.62E+01**
Distribution Type	**Normal**	**Nonparametric**	**Normal**	**Normal**	**Lognormal**
95% UCL (mg/L)- Bootstrapping [b]	**NA**	**5.82E+01**	**NA**	**NA**	**3.55E+01**
95% UCL (mg/L)- T-test [c]	**6.54E-02**	**NA**	**2.56E+01**	**2.56E+01**	**NA**
95%, 95% UTL (mg/L) [d]	**1.03E-01**	**Nonparametric distribution; use MDC**	**4.91E+01**	**4.91E+01**	**1.29E+02**
Maximum detected concentration (MDC) (mg/L) [e]	**8.40E-02**	**2.70E+02**	**3.65E+01**	**3.65E+01**	**5.77E+01**

Footnotes:
[a] Surface water includes all background surface water samples from Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Central Creek.
[b] 95% upper confidence limit determined using bootstrapping (2000 replications).
[c] 95% upper confidence limit determined using the Student's T method. This UCL calculation is only performed for data with normal distributions.
[d] A UTL with 95% coverage at 95% confidence is calculated for normally or lognormally distributed data with 15% or fewer nondetects. If greater than 15% of the data are nondetects, or if the data distribution is undefined, the maximum detected concentration is used as the UTL. The maximum detected concentration for a data set with 13 samples has 79% coverage with 95% confidence (USEPA, 2004b).
[e] The value presented is the highest quantified detection for the chemical. In some cases, the surrogate value for nondetected samples was greater than the maximum detected concentration.

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Aluminum (Filtered) Concentration (mg/L)	Barium (Filtered) Concentration (mg/L)	Cadmium (Filtered) Concentration (mg/L)	Calcium (Filtered) Concentration (mg/L)
	0.0233	0.0411	0.0019	3.22
	0.0258	0.0422	0.0003	3.23
	0.0262	0.0422	0.0003	3.65
	0.0317	0.0427	0.0003	3.77
	0.0348	0.0435	0.0003	3.81
	0.0457	0.0453	0.0003	3.93
	0.0511	0.0462	0.0003	4.04
	0.0564	0.0464	0.0003	4.04
	0.0767	0.0475	0.0003	4.07
	0.0949	0.0479	0.0003	4.09
	0.109	0.049	0.0003	4.22
	0.135	0.05	0.0003	4.23
	0.143	0.0503	0.0003	4.23
	0.198	0.0524	0.0003	4.31
Mean (mg/L)	**7.51E-02**	**4.62E-02**	**4.14E-04**	**3.92E+00**
Standard Deviation of Mean (SD) (mg/L)	**5.38E-02**	**3.51E-03**	**4.28E-04**	**3.50E-01**
Median (mg/L)	**5.38E-02**	**4.63E-02**	**3.00E-04**	**4.04E+00**
Distribution Type	**Lognormal**	**Normal**	**Nonparametric**	**Nonparametric**
95% UCL (mg/L)- Bootstrapping [b]	**9.76E-02**	**NA**	**5.29E-04**	**4.07E+00**
95% UCL (mg/L)- T-test [c]	**NA**	**4.79E-02**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**3.81E-01**	**5.54E-02**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**1.98E-01**	**5.24E-02**	**1.90E-03**	**4.31E+00**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Copper (Filtered) Concentration (mg/L)	Iron (Filtered) Concentration (mg/L)	Magnesium (Filtered) Concentration (mg/L)	Manganese (Filtered) Concentration (mg/L)
	0.0064	0.746	1.31	0.0283
	0.00044	0.788	1.38	0.0416
	0.00044	0.806	1.71	0.0539
	0.00044	0.841	1.81	0.0572
	0.00044	0.887	1.84	0.0698
	0.00044	0.92	1.89	0.0698
	0.00044	0.995	1.89	0.0719
	0.00044	1.09	1.92	0.0722
	0.00044	1.1	1.92	0.0763
	0.00044	1.12	1.92	0.0996
	0.00044	1.2	1.99	0.107
	0.00044	1.21	2.03	0.108
	0.00044	1.22	2.09	0.11
	0.00044	1.3	2.2	0.14
Mean (mg/L)	**8.66E-04**	**1.02E+00**	**1.85E+00**	**7.90E-02**
Standard Deviation of Mean (SD) (mg/L)	**1.59E-03**	**1.85E-01**	**2.46E-01**	**3.05E-02**
Median (mg/L)	**4.40E-04**	**1.04E+00**	**1.91E+00**	**7.21E-02**
Distribution Type	**Nonparametric**	**Normal**	**Nonparametric**	**Normal**
95% UCL (mg/L)- Bootstrapping [b]	**1.29E-03**	**NA**	**1.95E+00**	**NA**
95% UCL (mg/L)- T-test [c]	**NA**	**1.10E+00**	**NA**	**9.34E-02**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**1.50E+00**	**Nonparametric distribution; use MDC**	**1.59E-01**
Maximum detected concentration (MDC) (mg/L) [e]	**6.40E-03**	**1.30E+00**	**2.20E+00**	**1.40E-01**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits
for Background Concentrations in Surface Water from Clinton Lake [a]

	Nickel (Filtered) Concentration (mg/L)	Potassium (Filtered) Concentration (mg/L)	Sodium (Filtered) Concentration (mg/L)	Strontium (Filtered) Concentration (mg/L)
	0.00087	1.49	4.68	0.0547
	0.00088	1.59	4.81	0.0554
	0.00095	1.94	5.87	0.0558
	0.00099	2.02	5.96	0.0564
	0.001	2.04	6	0.0567
	0.0011	2.05	6.18	0.0568
	0.0013	2.05	6.18	0.0573
	0.0015	2.05	6.26	0.0575
	0.0016	2.06	6.31	0.0577
	0.0016	2.08	6.35	0.0593
	0.002	2.25	6.51	0.0593
	0.0011	2.32	6.58	0.0596
	0.0011	2.35	6.76	0.0603
	0.0011	2.48	6.98	0.0621
Mean (mg/L)	**1.22E-03**	**2.06E+00**	**6.10E+00**	**5.78E-02**
Standard Deviation of Mean (SD) (mg/L)	**3.34E-04**	**2.67E-01**	**6.51E-01**	**2.08E-03**
Median (mg/L)	**1.10E-03**	**2.05E+00**	**6.22E+00**	**5.74E-02**
Distribution Type	**Lognormal**	**Normal**	**Nonparametric**	**Lognormal**
95% UCL (mg/L)- Bootstrapping [b]	**1.42E-03**	**NA**	**6.35E+00**	**5.87E-02**
95% UCL (mg/L)- T-test [c]	**NA**	**2.18E+00**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**2.29E-03**	**2.75E+00**	**Nonparametric distribution; use MDC**	**6.34E-02**
Maximum detected concentration (MDC) (mg/L) [e]	**2.00E-03**	**2.48E+00**	**6.98E+00**	**6.21E-02**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Tin (Filtered) Concentration (mg/L)	Vanadium (Filtered) Concentration (mg/L)	Zinc (Filtered) Concentration (mg/L)
	0.0048	0.00081	0.0051
	0.0015	0.00047	0.0051
	0.0015	0.00047	0.0064
	0.0015	0.00047	0.0067
	0.0015	0.00047	0.0071
	0.0015	0.00047	0.0088
	0.0015	0.00047	0.0089
	0.0015	0.00047	0.0103
	0.0015	0.00047	0.0244
	0.0015	0.00047	0.0277
	0.0015	0.00047	0.0439
	0.0015	0.00047	0.0475
	0.0015	0.00047	0.22
	0.0015	0.00047	0.473
Mean (mg/L)	**1.74E-03**	**4.94E-04**	**6.39E-02**
Standard Deviation of Mean (SD) (mg/L)	**8.82E-04**	**9.09E-05**	**1.30E-01**
Median (mg/L)	**1.50E-03**	**4.70E-04**	**9.60E-03**
Distribution Type	**Nonparametric**	**Nonparametric**	**Nonparametric**
95% UCL (mg/L)- Bootstrapping [b]	**1.97E-03**	**5.19E-04**	**1.11E-01**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**4.80E-03**	**8.10E-04**	**4.73E-01**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Aluminum (Unfiltered) Concentration (mg/L)	Barium (Unfiltered) Concentration (mg/L)	Calcium (Unfiltered) Concentration (mg/L)	Cobalt (Unfiltered) Concentration (mg/L)
	0.131	0.0451	3.47	0.0017
	0.212	0.0459	3.55	0.0005
	0.236	0.047	4.09	0.0005
	0.271	0.0474	4.13	0.0005
	0.286	0.0478	4.15	0.0005
	0.29	0.048	4.17	0.0005
	0.295	0.0487	4.2	0.0005
	0.302	0.0491	4.21	0.0005
	0.307	0.0522	4.27	0.0005
	0.39	0.0537	4.28	0.0005
	0.404	0.0538	4.31	0.0005
	0.583	0.0545	4.42	0.0005
	0.601	0.0553	4.45	0.0005
	0.678	0.0652	4.59	0.0005
Mean (mg/L)	**3.56E-01**	**5.10E-02**	**4.16E+00**	**5.86E-04**
Standard Deviation of Mean (SD) (mg/L)	**1.59E-01**	**5.31E-03**	**3.09E-01**	**3.21E-04**
Median (mg/L)	**2.99E-01**	**4.89E-02**	**4.21E+00**	**5.00E-04**
Distribution Type	**Lognormal**	**Lognormal**	**Nonparametric**	**Nonparametric**
95% UCL (mg/L)- Bootstrapping [b]	**4.06E-01**	**5.27E-02**	**4.27E+00**	**6.71E-04**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**1.03E+00**	**6.57E-02**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**6.78E-01**	**6.52E-02**	**4.59E+00**	**1.70E-03**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Copper (Unfiltered) Concentration (mg/L)	Iron (Unfiltered) Concentration (mg/L)	Magnesium (Unfiltered) Concentration (mg/L)	Manganese (Unfiltered) Concentration (mg/L)
	0.0015	1.14	1.4	0.047
	0.00044	1.15	1.52	0.0543
	0.00044	1.21	1.96	0.0757
	0.00044	1.31	1.96	0.0777
	0.00044	1.35	1.99	0.0822
	0.00044	1.43	2.02	0.0853
	0.00044	1.44	2.03	0.0872
	0.00044	1.52	2.04	0.0877
	0.00044	1.54	2.05	0.108
	0.00044	1.56	2.06	0.114
	0.00044	1.66	2.06	0.115
	0.00044	1.79	2.09	0.122
	0.00044	1.87	2.15	0.133
	0.00044	2.52	2.19	0.232
Mean (mg/L)	**5.16E-04**	**1.54E+00**	**1.97E+00**	**1.02E-01**
Standard Deviation of Mean (SD) (mg/L)	**2.83E-04**	**3.59E-01**	**2.25E-01**	**4.50E-02**
Median (mg/L)	**4.40E-04**	**1.48E+00**	**2.04E+00**	**8.75E-02**
Distribution Type	**Nonparametric**	**Lognormal**	**Nonparametric**	**Lognormal**
95% UCL (mg/L)- Bootstrapping [b]	**5.91E-04**	**1.63E+00**	**2.05E+00**	**1.10E-01**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**2.62E+00**	**Nonparametric distribution; use MDC**	**2.63E-01**
Maximum detected concentration (MDC) (mg/L) [e]	**1.50E-03**	**2.52E+00**	**2.19E+00**	**2.32E-01**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Nickel (Unfiltered) Concentration (mg/L)	Potassium (Unfiltered) Concentration (mg/L)	Sodium (Unfiltered) Concentration (mg/L)	Strontium (Unfiltered) Concentration (mg/L)
	0.001	1.58	4.85	0.052
	0.001	1.73	5	0.0552
	0.0013	2.2	6.49	0.0562
	0.0013	2.2	6.61	0.0566
	0.0014	2.21	6.65	0.0567
	0.0015	2.26	6.65	0.0568
	0.0015	2.28	6.67	0.0572
	0.0016	2.28	6.67	0.0572
	0.0019	2.29	6.68	0.0575
	0.002	2.29	6.73	0.0579
	0.0021	2.31	6.75	0.0582
	0.0025	2.38	6.82	0.0598
	0.0011	2.47	6.86	0.0608
	0.0011	2.6	7.26	0.0612
Mean (mg/L)	**1.52E-03**	**2.22E+00**	**6.48E+00**	**5.74E-02**
Standard Deviation of Mean (SD) (mg/L)	**4.54E-04**	**2.65E-01**	**6.82E-01**	**2.31E-03**
Median (mg/L)	**1.45E-03**	**2.28E+00**	**6.67E+00**	**5.72E-02**
Distribution Type	**Lognormal**	**Nonparametric**	**Nonparametric**	**Normal**
95% UCL (mg/L)- Bootstrapping [b]	**1.73E-03**	**2.31E+00**	**6.75E+00**	**NA**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**	**5.85E-02**
95%, 95% UTL (mg/L) [d]	**3.10E-03**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**6.34E-02**
Maximum detected concentration (MDC) (mg/L) [e]	**2.50E-03**	**2.60E+00**	**7.26E+00**	**6.12E-02**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Thallium (Unfiltered) Concentration (mg/L)	Tin (Unfiltered) Concentration (mg/L)	Vanadium (Unfiltered) Concentration (mg/L)
	0.004	0.0027	0.00069
	0.0015	0.0031	0.0011
	0.0015	0.0034	0.0022
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
	0.0015	0.0015	0.00047
Mean (mg/L)	**1.68E-03**	**1.84E-03**	**6.54E-04**
Standard Deviation of Mean (SD) (mg/L)	**6.68E-04**	**6.81E-04**	**4.77E-04**
Median (mg/L)	**1.50E-03**	**1.50E-03**	**4.70E-04**
Distribution Type	**Nonparametric**	**Nonparametric**	**Nonparametric**
95% UCL (mg/L)- Bootstrapping [b]	**1.86E-03**	**2.14E-03**	**9.31E-04**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**4.00E-03**	**3.40E-03**	**2.20E-03**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Zinc (Unfiltered) Concentration (mg/L)	Bromide Concentration (mg/L)	Chloride Concentration (mg/L)
	0.0055	0.26	12.6
	0.0055	0.27	13.1
	0.0062	0.27	14.2
	0.0062	0.27	14.2
	0.0065	0.27	14.3
	0.0065	0.27	14.4
	0.0085	0.27	14.5
	0.0092	0.27	14.5
	0.0094	0.28	14.5
	0.0137	0.28	14.6
	0.0158	0.28	14.6
	0.0172	0.28	14.6
	0.0394	0.29	14.7
	0.00059	0.25	14.7
Mean (mg/L)	**1.07E-02**	**2.72E-01**	**1.43E+01**
Standard Deviation of Mean (SD) (mg/L)	**9.37E-03**	**9.75E-03**	**6.22E-01**
Median (mg/L)	**7.50E-03**	**2.70E-01**	**1.45E+01**
Distribution Type	**Nonparametric**	**Normal**	**Nonparametric**
95% UCL (mg/L)- Bootstrapping [b]	**1.52E-02**	**NA**	**1.45E+01**
95% UCL (mg/L)- T-test [c]	**NA**	**2.77E-01**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**2.98E-01**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**3.94E-02**	**2.90E-01**	**1.47E+01**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Fluoride, Total Concentration (mg/L)	Sulfate Concentration (mg/L)	Total Dissolved Solids Concentration (mg/L)
	0.11	13.8	63
	0.11	15.5	63
	0.12	18.7	67
	0.12	19	70
	0.12	19.8	73
	0.12	19.9	74
	0.12	20.1	74
	0.12	20.2	74
	0.12	20.2	74
	0.13	20.3	75
	0.13	20.4	76
	0.13	20.5	77
	0.13	20.6	81
	0.13	20.8	91
Mean (mg/L)	**1.22E-01**	**1.93E+01**	**7.37E+01**
Standard Deviation of Mean (SD) (mg/L)	**6.99E-03**	**2.07E+00**	**7.12E+00**
Median (mg/L)	**1.20E-01**	**2.02E+01**	**7.40E+01**
Distribution Type	**Nonparametric**	**Nonparametric**	**Lognormal**
95% UCL (mg/L)- Bootstrapping [b]	**1.26E-01**	**2.02E+01**	**7.59E+01**
95% UCL (mg/L)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**9.41E+01**
Maximum detected concentration (MDC) (mg/L) [e]	**1.30E-01**	**2.08E+01**	**9.10E+01**

See footnotes at end of table

Table 5-3
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Concentrations in Surface Water from Clinton Lake [a]

	Total Suspended Solids Concentration (mg/L)	Alkalinity, Total Concentration (mg/L)	Bicarbonate as CaCO3 Concentration (mg/L)	Hardness (as CaCO3) Concentration (mg/L)
	4	7.5	7.5	14.6
	4	8.5	8.5	15
	4	9	9	18.3
	4	9	9	18.6
	4	9	9	18.8
	4	9	9	18.8
	4	9	9	19
	4	9	9	19.1
	4	9	9	19.2
	4	9.5	9.5	19.2
	4	9.5	9.5	19.6
	4	10	10	19.7
	4	10	10	19.9
	4	10.5	10.5	20
Mean (mg/L)	**4.00E+00**	**9.18E+00**	**9.18E+00**	**1.86E+01**
Standard Deviation of Mean (SD) (mg/L)	**0.00E+00**	**7.23E-01**	**7.23E-01**	**1.67E+00**
Median (mg/L)	**4.00E+00**	**9.00E+00**	**9.00E+00**	**1.91E+01**
Distribution Type	**Nonparametric**	**Normal**	**Normal**	**Nonparametric**
95% UCL (mg/L)- Bootstrapping [b]	**4.00E+00**	**NA**	**NA**	**1.92E+01**
95% UCL (mg/L)- T-test [c]	**NA**	**9.52E+00**	**9.52E+00**	**NA**
95%, 95% UTL (mg/L) [d]	**Nonparametric distribution; use MDC**	**1.11E+01**	**1.11E+01**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/L) [e]	**4.00E+00**	**1.05E+01**	**1.05E+01**	**2.00E+01**

Footnotes:

[a] *Surface water includes all background surface water samples from Clinton Lake.*

[b] *95% upper confidence limit determined using bootstrapping (2000 replications).*

[c] *95% upper confidence limit determined using the Student's T method. This UCL calculation is only performed for data with normal distributions.*

[d] *A UTL with 95% coverage at 95% confidence is calculated for normally or lognormally distributed data with 15% or fewer nondetects. If greater than 15% of the data are nondetects, or if the data distribution is undefined, the maximum detected concentration is used as the UTL. The maximum detected concentration for a data set with 14 samples has 80% coverage with 95% confidence (USEPA, 2004b).*

[e] *The value presented is the highest quantified detection for the chemical. In some cases, the surrogate value for nondetected samples was greater than the maximum detected concentration.*

Table 5-4
Summary Statistics for Chemicals in Sediment [a] Background Data

Chemical	Detection Frequency	Range of Values, mg/kg: Detected Concentrations Minimum - Maximum	Range of Values, mg/kg: Reporting Limits Minimum - Maximum	Statistical Distribution [b]
BACKGROUND CHEMICALS (STREAMS) [a]				
Inorganics				
Aluminum	13 / 13	656 - 12100	24 - 32	N
Antimony	1 / 13	0.49 - 0.49	7.1 - 9.5	NP
Arsenic	10 / 13	0.54 - 4.7	0.6 - 0.81	L
Barium	13 / 13	8.9 - 150	24 - 32	L
Beryllium	10 / 13	0.23 - 0.94	0.6 - 0.79	N
Calcium	13 / 13	97.1 - 1350	600 - 810	L
Chromium	13 / 13	2.2 - 42.8	1.2 - 1.6	L
Cobalt	13 / 13	0.53 - 15.6	6 - 7.9	N
Copper	13 / 13	0.42 - 16.6	3 - 3.9	L
Iron	13 / 13	1300 - 35600	12 - 16	L
Lead	13 / 13	2.2 - 12.7	12 - 16	N
Magnesium	13 / 13	59.9 - 2610	600 - 790	L
Manganese	13 / 13	16.9 - 921	1.8 - 2.4	L
Mercury	12 / 13	0.0048 - 0.048	0.11 - 0.13	N
Molybdenum	1 / 13	1.6 - 1.6	6 - 8.1	NP
Nickel	13 / 13	0.68 - 37.8	4.8 - 6.3	L
Potassium	13 / 13	35.8 - 507	600 - 790	N
Selenium	11 / 13	0.77 - 8.6	12 - 16	L
Sodium	3 / 13	51.5 - 70.2	600 - 790	NP
Strontium	13 / 13	1.4 - 32.1	1.3 - 1.7	L
Vanadium	13 / 13	4.2 - 55.4	6 - 7.9	L
Zinc	13 / 13	2.8 - 51.2	2.4 - 3.2	L
Anions				
Chloride	13 / 13	34.5 - 48.5	26 - 32	L
Fluoride, Total	13 / 13	0.95 - 3.8	1.3 - 1.6	L
Sulfate	13 / 13	32.5 - 84.7	26 - 32	NP
Dioxins/Furans				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	6 / 13	2.30E-07 - 2.38E-06	2.50E-06 - 2.50E-06	NP
1,2,3,4,6,7,8-HpCDD	13 / 13	1.88E-06 - 1.98E-05	2.50E-06 - 2.50E-06	L
1,2,3,4,7,8-Hexachlorodibenzofuran	3 / 13	1.66E-07 - 4.87E-07	2.50E-06 - 2.50E-06	L
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	2 / 13	4.98E-07 - 8.60E-07	2.50E-06 - 2.50E-06	L
1,2,3,6,7,8-Hexachlorodibenzofuran	1 / 13	4.96E-07 - 4.96E-07	2.50E-06 - 2.50E-06	L/NP
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1 / 13	4.15E-07 - 4.15E-07	2.50E-06 - 2.50E-06	L/NP
2,3,4,6,7,8-Hexachlorodibenzofuran	1 / 13	8.98E-07 - 8.98E-07	2.50E-06 - 2.50E-06	NP
Heptachlorodibenzofuran	5 / 13	2.30E-07 - 5.75E-06	2.50E-06 - 2.50E-06	NP
Heptachlorodibenzo-p-dioxin	13 / 13	4.78E-06 - 5.33E-05	2.50E-06 - 2.50E-06	L
Hexachlorodibenzo-p-dioxin	9 / 13	3.53E-07 - 6.41E-06	2.50E-06 - 2.50E-06	L
Hexachlorodibenzofuran	4 / 13	5.29E-07 - 1.21E-05	2.50E-06 - 2.50E-06	NP
Octachlorodibenzofuran	4 / 13	1.96E-06 - 4.46E-06	5.00E-06 - 5.00E-06	L
Octachlorodibenzo-p-dioxin	13 / 13	7.33E-05 - 2.10E-03	5.00E-06 - 5.00E-06	L

Footnotes are at end of table

Table 5-4
Summary Statistics for Chemicals in Sediment [a] Background Data

Chemical	Detection Frequency	Range of Values, mg/kg: Detected Concentrations Minimum - Maximum	Range of Values, mg/kg: Reporting Limits Minimum - Maximum	Statistical Distribution [b]
Pentachlorodibenzofuran	3 / 13	9.17E-07 - 1.62E-05	2.50E-06 - 2.50E-06	NP
Pentachlorodibenzo-p-dioxin	1 / 13	2.33E-07 - 2.33E-07	2.50E-06 - 2.50E-06	L/NP
Tetrachlorodibenzofuran, Total	1 / 13	1.29E-06 - 1.29E-06	1.00E-06 - 1.00E-06	NP
Semivolatile Organics (PAHs)				
Anthracene	1 / 13	0.0232 - 0.0232	0.082 - 0.1	NP
Benzo(a)anthracene	4 / 13	0.0053 - 0.0176	0.016 - 0.021	NP
Benzo(a)pyrene	4 / 13	0.006 - 0.0366	0.016 - 0.02	NP
Benzo(b)fluoranthene	4 / 13	0.0154 - 0.0729	0.016 - 0.02	NP
Benzo(ghi)perylene	4 / 13	0.0048 - 0.102	0.016 - 0.021	NP
Benzo(k)fluoranthene	4 / 13	0.0072 - 0.0347	0.016 - 0.02	NP
Chrysene	4 / 13	0.0087 - 0.0377	0.016 - 0.02	NP
Dibenzo(a,h)anthracene	1 / 13	0.0057 - 0.0057	0.016 - 0.02	L/NP
Fluoranthene	3 / 13	0.0128 - 0.0736	0.082 - 0.1	NP
Indeno(1,2,3-cd)pyrene	4 / 13	0.0046 - 0.0331	0.016 - 0.02	NP
Phenanthrene	1 / 13	0.0291 - 0.0291	0.082 - 0.1	NP
Pyrene	4 / 13	0.0138 - 0.0565	0.082 - 0.1	NP
Water Properties				
CATION-EXCHANGE CAPACITY	13 / 13	383 - 10100	130 - 130	N
Total Organic Carbon	13 / 13	379 - 14300	130 - 160	L
BACKGROUND CHEMICALS (CLINTON LAKE)				
Inorganics				
Aluminum	14 / 14	3710 - 24700	25 - 170	L
Arsenic	14 / 14	0.52 - 6.3	0.63 - 4.4	L
Barium	14 / 14	67.4 - 400	25 - 170	L
Beryllium	14 / 14	0.46 - 3.7	0.63 - 4.4	L
Cadmium	1 / 14	0.31 - 0.31	0.51 - 3.5	NP
Calcium	14 / 14	456 - 3150	630 - 4400	L
Chromium	14 / 14	6.8 - 25.5	1.3 - 8.7	L
Cobalt	14 / 14	2.2 - 21.6	6.3 - 44	L
Copper	14 / 14	4.7 - 23.7	3.2 - 22	L
Iron	14 / 14	7230 - 31400	13 - 87	L
Lead	14 / 14	9 - 37.2	13 - 87	L
Magnesium	14 / 14	393 - 1410	630 - 4400	NP
Manganese	14 / 14	55.5 - 435	1.9 - 13	L
Mercury	14 / 14	0.043 - 0.2	0.1 - 0.71	L
Nickel	14 / 14	3.3 - 28.1	5.1 - 35	L
Potassium	14 / 14	201 - 1000	630 - 4400	L
Selenium	14 / 14	1.6 - 9.4	13 - 87	L
Sodium	5 / 14	66.1 - 102	630 - 4400	N
Strontium	14 / 14	12.8 - 104	1.3 - 8.4	L
Vanadium	14 / 14	16.4 - 56.5	6.3 - 44	L
Zinc	14 / 14	13.6 - 141	2.5 - 17	L
Anions				
Fluoride, Total	12 / 14	1.3 - 9.4	2.5 - 17	L
Dioxins/Furans				

Footnotes are at end of table

Table 5-4
Summary Statistics for Chemicals in Sediment [a] Background Data

Chemical	Detection Frequency	Range of Values, mg/kg: Detected Concentrations Minimum - Maximum	Range of Values, mg/kg: Reporting Limits Minimum - Maximum	Statistical Distribution [b]
1,2,3,4,6,7,8-Heptachlorodibenzofuran	2 / 14	2.95E-07 - 1.34E-06	2.50E-06 - 2.50E-06	NP
1,2,3,4,6,7,8-HpCDD	14 / 14	5.40E-05 - 1.12E-03	2.50E-06 - 2.50E-06	L
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	12 / 14	3.71E-07 - 3.75E-06	2.50E-06 - 2.50E-06	L
1,2,3,4,7,8-Hexachlorodibenzofuran	1 / 14	4.98E-07 - 4.98E-07	2.50E-06 - 2.50E-06	NP
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	14 / 14	1.06E-06 - 1.41E-05	2.50E-06 - 2.50E-06	NP
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	14 / 14	1.70E-06 - 5.00E-05	2.50E-06 - 2.50E-06	L
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	5 / 14	2.25E-07 - 1.77E-06	2.50E-06 - 2.50E-06	L
Heptachlorodibenzofuran	6 / 14	4.09E-07 - 2.74E-06	2.50E-06 - 2.50E-06	L
Heptachlorodibenzo-p-dioxin	14 / 14	1.52E-04 - 2.68E-03	2.50E-06 - 2.50E-06	L
Hexachlorodibenzo-p-dioxin	14 / 14	2.71E-05 - 1.56E-03	2.50E-06 - 2.50E-06	L
Hexachlorodibenzofuran	4 / 14	2.44E-07 - 1.49E-06	2.50E-06 - 2.50E-06	NP
Octachlorodibenzo-p-dioxin	14 / 14	1.53E-03 - 1.08E-01	5.00E-06 - 5.00E-06	L
Pentachlorodibenzo-p-dioxin	14 / 14	2.50E-06 - 2.79E-04	2.50E-06 - 2.50E-06	L
Tetrachlorodibenzofuran, Total	3 / 14	5.55E-07 - 3.20E-06	1.00E-06 - 1.00E-06	L
Tetrachlorodibenzo-p-dioxin	13 / 14	1.10E-06 - 3.23E-04	1.00E-06 - 1.00E-06	L
Polychlorinated Biphenyls (PCBs)				
Aroclor 1260	1 / 14	0.172 - 0.172	0.021 - 0.14	NP
Semivolatile Organics (PAHs)				
Benzo(b)fluoranthene	1 / 14	0.0065 - 0.0065	0.017 - 0.11	NP
Soil Properties				
Cation-Exchange Capacity	14 / 14	4830 - 39000	130 - 130	NP
Total Organic Carbon	14 / 14	5680 - 143000	130 - 850	L

Footnotes:

[a] *Stream samples collected from Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Central Creek.*

[b] *L = Lognormal distribution; N = Normal distribution; NP = Nonparametric distibution for those samples that fail normal and lognormal distribution.*

PAH = Polynuclear aromatic hydrocarbon

mg/kg = milligram per kilogram

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	1,2,3,4,6,7,8-Heptachlorodibenzofuran Concentration (mg/kg)	1,2,3,4,6,7,8-HpCDD Concentration (mg/kg)	1,2,3,4,7,8-Hexachlorodibenzofuran Concentration (mg/kg)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Concentration (mg/kg)
	0.00000023	0.000001876	0.000000166	0.000000498
	0.000000247	0.000002139	0.000000298	0.00000086
	0.000000271	0.000002482	0.000000487	0.000000143
	0.000000328	0.000002711	0.000000074	0.000000122
	0.000000847	0.000003145	0.000000096	0.000000421
	0.000002383	0.000004135	0.000000152	0.000000145
	0.000000114	0.000004307	0.000000113	0.000000114
	0.000000349	0.000006353	0.000000122	0.000000188
	0.000000251	0.000008873	0.000000152	0.000000119
	0.00000022	0.000009043	0.000000086	0.000000177
	0.000000231	0.000010295	0.000000103	0.000000236
	0.000000208	0.000010509	0.000000208	0.000000313
	0.000000267	0.000019776	0.000000143	0.000000197
Mean (mg/kg)	**4.57E-07**	**6.59E-06**	**1.69E-07**	**2.72E-07**
Standard Deviation of Mean (SD) (mg/kg)	**6.05E-07**	**5.09E-06**	**1.12E-07**	**2.14E-07**
Median (mg/kg)	**2.51E-07**	**4.31E-06**	**1.43E-07**	**1.88E-07**
Distribution Type	**Nonparametric**	**Lognormal**	**Lognormal**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**7.05E-07**	**8.21E-06**	**2.08E-07**	**3.85E-07**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**	**3.66E-05**	**5.87E-07**	**1.17E-06**
Maximum detected concentration (MDC) (mg/kg) [e]	**2.38E-06**	**1.98E-05**	**4.87E-07**	**8.60E-07**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	1,2,3,6,7,8-Hexachlorodibenzofuran Concentration (mg/kg)	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Concentration (mg/kg)	2,3,4,6,7,8-Hexachlorodibenzofuran Concentration (mg/kg)	Heptachlorodibenzofuran Concentration (mg/kg)
	0.000000496	0.000000415	0.000000898	0.00000023
	0.000000075	0.000000149	0.000000081	0.000000271
	0.000000069	0.000000101	0.000000074	0.000000494
	0.000000098	0.000000127	0.000000106	0.000001993
	0.000000152	0.00000043	0.00000017	0.000005745
	0.000000113	0.000000149	0.000000126	0.000000114
	0.000000122	0.000000117	0.000000136	0.000000349
	0.000000152	0.000000124	0.00000017	0.000000251
	0.000000076	0.000000185	0.000000082	0.00000022
	0.000000087	0.000000252	0.000000095	0.000000231
	0.000000103	0.000000335	0.000000114	0.000000167
	0.000000207	0.000000193	0.000000231	0.000000208
	0.000000142	0.000000211	0.000000158	0.000000267
Mean (mg/kg)	**1.46E-07**	**2.14E-07**	**1.88E-07**	**8.11E-07**
Standard Deviation of Mean (SD) (mg/kg)	**1.12E-07**	**1.12E-07**	**2.18E-07**	**1.56E-06**
Median (mg/kg)	**1.13E-07**	**1.85E-07**	**1.26E-07**	**2.51E-07**
Distribution Type	**Lognormal / Nonparametric**	**Lognormal / Nonparametric**	**Nonparametric**	**Nonparametric**
95% UCL (mg/kg)- Bootstrapping [b]	**1.79E-07**	**2.64E-07**	**2.36E-07**	**1.75E-06**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**>15% Nondetects; use MDC**	**>15% Nondetects; use MDC**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/kg) [e]	**4.96E-07**	**4.15E-07**	**8.98E-07**	**5.75E-06**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Heptachlorodibenzo-p-dioxin Concentration (mg/kg)	Hexachlorodibenzo-p-dioxin Concentration (mg/kg)	Hexachlorodibenzofuran Concentration (mg/kg)	Octachlorodibenzofuran Concentration (mg/kg)
	0.000004777	0.000000353	0.000000529	0.000001959
	0.00000512	0.000000784	0.000001101	0.000002423
	0.00000677	0.000001063	0.000002057	0.000004346
	0.00000702	0.000001288	0.000012121	0.000004459
	0.000007493	0.000001539	0.000000074	0.000000499
	0.0000106	0.000002404	0.000000096	0.000000324
	0.000010666	0.000002459	0.000000152	0.000001316
	0.000013366	0.00000268	0.000000113	0.000000523
	0.000023824	0.000006405	0.000000122	0.000000444
	0.000024435	0.000000143	0.000000152	0.000000381
	0.000025917	0.000000476	0.000000086	0.000000485
	0.000026427	0.000000164	0.000000103	0.000000702
	0.000053269	0.000000223	0.000000143	0.000000889
Mean (mg/kg)	**1.69E-05**	**1.54E-06**	**1.30E-06**	**1.44E-06**
Standard Deviation of Mean (SD) (mg/kg)	**1.37E-05**	**1.72E-06**	**3.30E-06**	**1.46E-06**
Median (mg/kg)	**1.07E-05**	**1.06E-06**	**1.43E-07**	**7.02E-07**
Distribution Type	**Lognormal**	**Lognormal**	**Nonparametric**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**2.14E-05**	**2.35E-06**	**3.18E-06**	**2.31E-06**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**9.63E-05**	**2.06E-05**	**Nonparametric distribution; use MDC**	**1.10E-05**
Maximum detected concentration (MDC) (mg/kg) [e]	**5.33E-05**	**6.41E-06**	**1.21E-05**	**4.46E-06**

See footnotes at end of table

	Octachlorodibenzo-p-dioxin Concentration (mg/kg)
	0.000073255
	0.000082476
	0.00008707
	0.000123344
	0.000189918
	0.000217745
	0.000514822
	0.00053746
	0.000580156
	0.000620538
	0.000772143
	0.001230562
	0.002097615
Mean (mg/kg)	**5.48E-04**
Standard Deviation of Mean (SD) (mg/kg)	**5.77E-04**
Median (mg/kg)	**5.15E-04**
Distribution Type	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**6.91E-04**
95% UCL (mg/kg)- T-test [c]	**NA**
95%, 95% UTL (mg/kg) [d]	**6.16E-03**
Maximum detected concentration (MDC) (mg/kg) [e]	**2.10E-03**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Pentachlorodibenzofuran Concentration (mg/kg)	Pentachlorodibenzo-p-dioxin Concentration (mg/kg)	Tetrachlorodibenzofuran, Total Concentration (mg/kg)	Aluminum Concentration (mg/kg)
	0.000000917	0.000000233	0.000001287	656
	0.000001603	0.000000178	0.000000131	839
	0.000016199	0.000000135	0.000000075	1020
	0.0000001	0.00000015	0.00000009	1050
	0.000000073	0.000000288	0.000000241	3690
	0.000000189	0.000000134	0.000000125	4540
	0.000000122	0.000000161	0.000000092	4680
	0.000000117	0.000000195	0.000000139	4770
	0.000000117	0.00000015	0.000000117	4910
	0.000000107	0.000000207	0.000000126	6790
	0.000000116	0.000000199	0.000000186	7370
	0.000000127	0.000000255	0.000000174	8380
	0.000000146	0.000000201	0.000000159	12100
Mean (mg/kg)	**1.53E-06**	**1.91E-07**	**2.26E-07**	**4.68E+03**
Standard Deviation of Mean (SD) (mg/kg)	**4.43E-06**	**4.70E-08**	**3.22E-07**	**3.40E+03**
Median (mg/kg)	**1.22E-07**	**1.95E-07**	**1.31E-07**	**4.68E+03**
Distribution Type	**Nonparametric**	**Lognormal / Nonparametric**	**Nonparametric**	**Normal**
95% UCL (mg/kg)- Bootstrapping [b]	**3.90E-06**	**2.08E-07**	**3.18E-07**	**NA**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**6.36E+03**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**	**>15% Nondetects; use MDC**	**Nonparametric distribution; use MDC**	**1.38E+04**
Maximum detected concentration (MDC) (mg/kg) [e]	**1.62E-05**	**2.33E-07**	**1.29E-06**	**1.21E+04**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Antimony Concentration (mg/kg)	Arsenic Concentration (mg/kg)	Barium Concentration (mg/kg)	Beryllium Concentration (mg/kg)	Calcium Concentration (mg/kg)
	0.49	0.54	8.9	0.23	97.1
	0.23	0.56	18.5	0.28	120
	0.21	0.61	25.7	0.38	270
	0.18	0.64	48.6	0.38	309
	0.2	0.65	50.5	0.39	383
	0.2	0.77	54.1	0.43	386
	0.21	1.3	54.8	0.45	449
	0.21	2.1	65	0.58	473
	0.2	2.3	66.9	0.8	647
	0.2	4.7	76.5	0.94	709
	0.23	0.42	106	0.041	821
	0.22	0.36	142	0.039	878
	0.21	0.42	150	0.045	1350
Mean (mg/kg)	**2.30E-01**	**1.18E+00**	**6.67E+01**	**3.83E-01**	**5.30E+02**
Standard Deviation of Mean (SD) (mg/kg)	**7.93E-02**	**1.23E+00**	**4.33E+01**	**2.76E-01**	**3.47E+02**
Median (mg/kg)	**2.10E-01**	**6.40E-01**	**5.48E+01**	**3.80E-01**	**4.49E+02**
Distribution Type	**Nonparametric**	**Lognormal**	**Lognormal**	**Normal**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**2.50E-01**	**1.83E+00**	**8.54E+01**	**NA**	**6.85E+02**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**5.20E-01**	**NA**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**	**6.77E+00**	**4.39E+02**	**1.12E+00**	**3.18E+03**
Maximum detected concentration (MDC) (mg/kg) [e]	**4.90E-01**	**4.70E+00**	**1.50E+02**	**9.40E-01**	**1.35E+03**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Chromium Concentration (mg/kg)	Cobalt Concentration (mg/kg)	Copper Concentration (mg/kg)	Iron Concentration (mg/kg)	Lead Concentration (mg/kg)	Magnesium Concentration (mg/kg)
	2.2	0.53	0.42	1300	2.2	59.9
	2.8	0.67	0.61	1840	2.3	68.8
	3	0.81	0.61	2930	3.1	71.7
	4.8	2.5	1.1	4590	5.9	99.2
	4.9	3	1.7	4870	6.7	243
	5.5	3.5	1.7	5570	7.4	282
	5.9	5.1	2.6	6600	7.6	299
	6	5.4	3	7150	7.8	386
	6.4	7.2	4	8310	8.6	639
	8.2	7.7	5.1	11400	9.7	826
	15.1	8.6	6.4	23100	10.2	844
	15.8	10.5	7.8	28800	11.8	871
	42.8	15.6	16.6	35600	12.7	2610
Mean (mg/kg)	**9.49E+00**	**5.47E+00**	**3.97E+00**	**1.09E+04**	**7.38E+00**	**5.62E+02**
Standard Deviation of Mean (SD) (mg/kg)	**1.09E+01**	**4.41E+00**	**4.45E+00**	**1.10E+04**	**3.37E+00**	**6.88E+02**
Median (mg/kg)	**5.90E+00**	**5.10E+00**	**2.60E+00**	**6.60E+03**	**7.60E+00**	**2.99E+02**
Distribution Type	**Lognormal**	**Normal**	**Lognormal**	**Lognormal**	**Normal**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**1.24E+01**	**NA**	**5.36E+00**	**1.36E+04**	**NA**	**7.68E+02**
95% UCL (mg/kg)- T-test [c]	**NA**	**7.65E+00**	**NA**	**NA**	**9.05E+00**	**NA**
95%, 95% UTL (mg/kg) [d]	**5.68E+01**	**1.73E+01**	**4.47E+01**	**1.02E+05**	**1.64E+01**	**7.16E+03**
Maximum detected concentration (MDC) (mg/kg) [e]	**4.28E+01**	**1.56E+01**	**1.66E+01**	**3.56E+04**	**1.27E+01**	**2.61E+03**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Manganese Concentration (mg/kg)	Mercury Concentration (mg/kg)	Molybdenum Concentration (mg/kg)	Nickel Concentration (mg/kg)	Potassium Concentration (mg/kg)
	16.9	0.0048	1.6	0.68	35.8
	18.8	0.0082	0.11	0.75	42.5
	25.8	0.012	0.1	0.81	49.6
	119	0.014	0.12	1	60.1
	134	0.022	0.089	2.5	180
	178	0.022	0.098	3.7	213
	220	0.027	0.098	4	234
	282	0.029	0.11	4.2	271
	320	0.037	0.1	7.3	283
	322	0.041	0.1	7.7	293
	568	0.042	0.11	10.6	309
	713	0.048	0.11	11	346
	921	0.0023	0.11	37.8	507
Mean (mg/kg)	**2.95E+02**	**2.38E-02**	**2.20E-01**	**7.08E+00**	**2.17E+02**
Standard Deviation of Mean (SD) (mg/kg)	**2.81E+02**	**1.51E-02**	**4.15E-01**	**9.91E+00**	**1.41E+02**
Median (mg/kg)	**2.20E+02**	**2.20E-02**	**1.10E-01**	**4.00E+00**	**2.34E+02**
Distribution Type	**Lognormal**	**Normal**	**Nonparametric**	**Lognormal**	**Normal**
95% UCL (mg/kg)- Bootstrapping[b]	**4.37E+02**	**NA**	**3.35E-01**	**1.01E+01**	**NA**
95% UCL (mg/kg)- T-test[c]	**NA**	**3.13E-02**	**NA**	**NA**	**2.87E+02**
95%, 95% UTL (mg/kg)[d]	**5.74E+03**	**6.41E-02**	**Nonparametric distribution; use MDC**	**9.67E+01**	**5.95E+02**
Maximum detected concentration (MDC) (mg/kg)[e]	**9.21E+02**	**4.80E-02**	**1.60E+00**	**3.78E+01**	**5.07E+02**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Selenium Concentration (mg/kg)	Sodium Concentration (mg/kg)	Strontium Concentration (mg/kg)	Vanadium Concentration (mg/kg)	Zinc Concentration (mg/kg)
	0.77	51.5	1.4	4.2	2.8
	0.89	58.4	2.2	4.4	3.1
	0.93	70.2	6.1	6	3.1
	1.2	22	6.2	11.1	4.6
	1.6	20	6.3	11.5	6.2
	1.6	17	7.8	12.2	9.1
	2.1	19	8.1	12.5	10.4
	2.1	19	10.3	13.1	13.7
	4.1	20	11.4	16.2	17.4
	4.1	19	14.3	17.3	18.9
	8.6	22	17.7	28.4	24.6
	0.26	21	17.9	30.2	33
	0.3	21	32.1	55.4	51.2
Mean (mg/kg)	**2.20E+00**	**2.92E+01**	**1.09E+01**	**1.71E+01**	**1.52E+01**
Standard Deviation of Mean (SD) (mg/kg)	**2.29E+00**	**1.80E+01**	**8.20E+00**	**1.40E+01**	**1.42E+01**
Median (mg/kg)	**1.60E+00**	**2.10E+01**	**8.10E+00**	**1.25E+01**	**1.04E+01**
Distribution Type	**Lognormal**	**Nonparametric**	**Lognormal**	**Lognormal**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping[b]	**3.32E+00**	**3.47E+01**	**1.41E+01**	**2.22E+01**	**2.03E+01**
95% UCL (mg/kg)- T-test[c]	**NA**	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg)[d]	**2.04E+01**	**Nonparametric distribution; use MDC**	**7.92E+01**	**9.64E+01**	**1.31E+02**
Maximum detected concentration (MDC) (mg/kg)[e]	**8.60E+00**	**7.02E+01**	**3.21E+01**	**5.54E+01**	**5.12E+01**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Anthracene Concentration (mg/kg)	Benzo(a)anthracene Concentration (mg/kg)	Benzo(a)pyrene Concentration (mg/kg)	Benzo(b)fluoranthene Concentration (mg/kg)
	0.0232	0.0053	0.006	0.0154
	0.012	0.0084	0.0063	0.0278
	0.011	0.0175	0.0293	0.0312
	0.013	0.0176	0.0366	0.0729
	0.011	0.0047	0.0047	0.0047
	0.011	0.0045	0.0045	0.0045
	0.01	0.005	0.005	0.005
	0.012	0.0042	0.0042	0.0042
	0.012	0.0043	0.0043	0.0043
	0.011	0.0041	0.0041	0.0041
	0.011	0.0045	0.0045	0.0045
	0.012	0.0049	0.0049	0.0049
	0.011	0.0046	0.0046	0.0046
Mean (mg/kg)	**1.23E-02**	**6.89E-03**	**9.15E-03**	**1.45E-02**
Standard Deviation of Mean (SD) (mg/kg)	**3.36E-03**	**4.85E-03**	**1.07E-02**	**1.99E-02**
Median (mg/kg)	**1.10E-02**	**4.70E-03**	**4.70E-03**	**4.70E-03**
Distribution Type	**Nonparametric**	**Nonparametric**	**Nonparametric**	**Nonparametric**
95% UCL (mg/kg)- Bootstrapping [b]	**1.33E-02**	**9.88E-03**	**1.28E-02**	**2.33E-02**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/kg) [e]	**2.32E-02**	**1.76E-02**	**3.66E-02**	**7.29E-02**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Benzo(ghi)perylene Concentration (mg/kg)	Benzo(k)fluoranthene Concentration (mg/kg)	Chrysene Concentration (mg/kg)	Dibenzo(a,h)anthracene Concentration (mg/kg)
	0.0048	0.0072	0.0087	0.0057
	0.0081	0.01	0.0206	0.0047
	0.0151	0.0115	0.0318	0.0045
	0.102	0.0347	0.0377	0.005
	0.0047	0.0047	0.0047	0.0042
	0.0045	0.0045	0.0045	0.0043
	0.005	0.005	0.005	0.0041
	0.0042	0.0042	0.0042	0.0049
	0.0043	0.0043	0.0043	0.0043
	0.0041	0.0041	0.0041	0.0045
	0.0045	0.0045	0.0045	0.0049
	0.0049	0.0049	0.0049	0.0049
	0.0046	0.0046	0.0046	0.0046
Mean (mg/kg)	**1.31E-02**	**8.02E-03**	**1.07E-02**	**4.66E-03**
Standard Deviation of Mean (SD) (mg/kg)	**2.69E-02**	**8.36E-03**	**1.16E-02**	**4.29E-04**
Median (mg/kg)	**4.70E-03**	**4.70E-03**	**4.70E-03**	**4.60E-03**
Distribution Type	**Nonparametric**	**Nonparametric**	**Nonparametric**	**Lognormal / Nonparametric**
95% UCL (mg/kg)- Bootstrapping[b]	**2.79E-02**	**1.31E-02**	**1.80E-02**	**4.78E-03**
95% UCL (mg/kg)- T-test[c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg)[d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**>15% Nondetects; use MDC**
Maximum detected concentration (MDC) (mg/kg)[e]	**1.02E-01**	**3.47E-02**	**3.77E-02**	**5.70E-03**

See footnotes at end of table

	Fluoranthene Concentration (mg/kg)
	0.0128
	0.016
	0.0736
	0.012
	0.011
	0.013
	0.011
	0.011
	0.01
	0.011
	0.012
	0.012
	0.011
Mean (mg/kg)	**1.66E-02**
Standard Deviation of Mean (SD) (mg/kg)	**1.72E-02**
Median (mg/kg)	**1.20E-02**
Distribution Type	**Nonparametric**
95% UCL (mg/kg)- Bootstrapping [b]	**2.61E-02**
95% UCL (mg/kg)- T-test [c]	**NA**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/kg) [e]	**7.36E-02**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams[a]

	Indeno(1,2,3-cd)pyrene Concentration (mg/kg)	Phenanthrene Concentration (mg/kg)	Pyrene Concentration (mg/kg)	Total Organic Carbon Concentration (mg/kg)
	0.0046	0.0291	0.0138	379
	0.005	0.012	0.0199	675
	0.0221	0.011	0.0299	1650
	0.0331	0.013	0.0565	2650
	0.0047	0.011	0.012	2850
	0.0045	0.011	0.011	3590
	0.005	0.01	0.013	5380
	0.0042	0.012	0.011	5810
	0.0043	0.011	0.011	5900
	0.0041	0.011	0.01	6070
	0.0045	0.012	0.011	6990
	0.0049	0.012	0.012	10500
	0.0046	0.011	0.011	14300
Mean (mg/kg)	**8.12E-03**	**1.28E-02**	**1.71E-02**	**5.13E+03**
Standard Deviation of Mean (SD) (mg/kg)	**8.94E-03**	**4.96E-03**	**1.30E-02**	**3.94E+03**
Median (mg/kg)	**4.60E-03**	**1.10E-02**	**1.20E-02**	**5.38E+03**
Distribution Type	**Nonparametric**	**Nonparametric**	**Nonparametric**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**1.34E-02**	**1.43E-02**	**2.45E-02**	**6.21E+03**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**5.70E+04**
Maximum detected concentration (MDC) (mg/kg) [e]	**3.31E-02**	**2.91E-02**	**5.65E-02**	**1.43E+04**

See footnotes at end of table

Table 5-5
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits of Background Concentrations in Sediment from Streams [a]

	Cation-Exchange Capacity Concentration (mg/kg)	Chloride Concentration (mg/kg)	Fluoride, Total Concentration (mg/kg)	Nitrate Concentration (mg/kg)
	383	34.5	0.95	0.77
	2400	34.7	1.2	0.89
	2900	35.5	1.3	1.6
	4480	36.6	1.3	0.74
	4630	38.4	1.4	0.79
	4850	38.5	1.4	0.65
	5390	39.2	1.6	0.68
	8040	40.2	1.7	0.73
	8060	40.6	1.7	0.68
	8220	41.2	2.2	0.68
	8880	42.6	2.4	0.74
	9320	46.4	2.6	0.73
	10100	48.5	3.8	0.7
Mean (mg/kg)	**5.97E+03**	**3.98E+01**	**1.81E+00**	**7.98E-01**
Standard Deviation of Mean (SD) (mg/kg)	**3.02E+03**	**4.25E+00**	**7.70E-01**	**2.49E-01**
Median (mg/kg)	**5.39E+03**	**3.92E+01**	**1.60E+00**	**7.30E-01**
Distribution Type	**Normal**	**Lognormal**	**Lognormal**	**Nonparametric**
95% UCL (mg/kg)- Bootstrapping [b]	**NA**	**4.13E+01**	**1.99E+00**	**9.37E-01**
95% UCL (mg/kg)- T-test [c]	**7.47E+03**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**1.40E+04**	**5.23E+01**	**4.61E+00**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/kg) [e]	**1.01E+04**	**4.85E+01**	**3.80E+00**	**1.60E+00**

Footnotes :

[a] *Sediment includes all background sediment samples from Goose Prairie Creek, Saunder's Branch, Harrison Bayou, and Central Creek.*

[b] *95% upper confidence limit determined using bootstrapping (2000 replications).*

[c] *95% upper confidence limit determined using the Student's T method. This UCL calculation is only performed for data with normal distributions.*

[d] *A UTL with 95% coverage at 95% confidence is calculated for normally or lognormally distributed data with 15% or fewer nondetects. If greater than 15% of the data are nondetects, or if the data distribution is undefined, the maximum detected concentration is used as the UTL. The maximum detected concentration for a data set with 13 samples has 79% coverage with 95% confidence (USEPA, 2004b).*

[e] *The value presented is the highest quantified detection for the chemical. In some cases, the surrogate value for nondetected samples was greater than the maximum detected concentration.*

Table 5-6
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits
for Background Sediment from Clinton Lake [a]

	Aluminum Concentration (mg/kg)	Arsenic Concentration (mg/kg)	Barium Concentration (mg/kg)	Beryllium Concentration (mg/kg)	Cadmium Concentration (mg/kg)	Calcium Concentration (mg/kg)
	3710	0.52	67.4	0.46	0.038	456
	8660	0.57	73.5	0.49	0.044	489
	9190	0.8	109	0.56	0.044	554
	9630	1	138	0.65	0.046	635
	9680	1.1	140	0.71	0.047	647
	10100	1.2	143	0.91	0.048	664
	10300	1.3	151	1.1	0.048	859
	10800	1.4	159	1.2	0.051	1030
	13200	1.7	189	1.3	0.053	1160
	13400	2.1	199	1.3	0.062	1240
	19600	2.4	224	1.7	0.066	1270
	21500	2.8	314	2.4	0.12	2120
	23800	3.2	373	2.5	0.26	2440
	24700	6.3	400	3.7	0.31	3150
Mean (mg/kg)	**1.34E+04**	**1.89E+00**	**1.91E+02**	**1.36E+00**	**8.84E-02**	**1.19E+03**
Standard Deviation of Mean (SD) (mg/kg)	**6.38E+03**	**1.51E+00**	**1.03E+02**	**9.37E-01**	**8.62E-02**	**8.19E+02**
Median (mg/kg)	**1.06E+04**	**1.35E+00**	**1.55E+02**	**1.15E+00**	**4.95E-02**	**9.45E+02**
Distribution Type	**Lognormal**	**Lognormal**	**Lognormal**	**Lognormal**	**Nonparametric**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**1.63E+04**	**2.44E+00**	**2.20E+02**	**1.64E+00**	**1.21E-01**	**1.52E+03**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**4.50E+04**	**9.03E+00**	**6.80E+02**	**5.98E+00**	**Nonparametric distribution; use MDC**	**4.91E+03**
Maximum detected concentration (MDC) (mg/kg) [e]	**2.47E+04**	**6.30E+00**	**4.00E+02**	**3.70E+00**	**3.10E-01**	**3.15E+03**

See footnotes at end of table

Table 5-6
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Sediment from Clinton Lake

	Chromium Concentration (mg/kg)	Cobalt Concentration (mg/kg)	Copper Concentration (mg/kg)	Iron Concentration (mg/kg)	Lead Concentration (mg/kg)	Magnesium Concentration (mg/kg)	Manganese Concentration (mg/kg)
	6.8	2.2	4.7	7230	9	393	55.5
	8	2.6	6.2	7430	10.5	400	63.4
	8.9	2.9	6.3	8210	10.9	443	65
	9.3	3.1	6.5	9040	11.3	452	77.7
	10.5	3.6	6.6	9340	11.6	453	98.2
	10.8	3.9	7	10000	12.2	471	100
	11.2	4.4	9	11100	13.3	534	110
	11.9	4.8	9.3	11300	15.6	579	112
	12.3	5.5	9.5	14000	16.9	612	113
	12.6	5.6	13.7	14500	17.6	658	132
	20.7	8.8	17.9	19000	25.6	1130	140
	21.8	11.8	18	23000	25.8	1270	238
	23.3	21.3	18.5	26500	29.1	1290	288
	25.5	21.6	23.7	31400	37.2	1410	435
Mean (mg/kg)	**1.38E+01**	**7.29E+00**	**1.12E+01**	**1.44E+04**	**1.76E+01**	**7.21E+02**	**1.45E+02**
Standard Deviation of Mean (SD) (mg/kg)	**6.20E+00**	**6.53E+00**	**6.02E+00**	**7.66E+03**	**8.52E+00**	**3.75E+02**	**1.06E+02**
Median (mg/kg)	**1.16E+01**	**4.60E+00**	**9.15E+00**	**1.12E+04**	**1.45E+01**	**5.57E+02**	**1.11E+02**
Distribution Type	**Lognormal**	**Lognormal**	**Lognormal**	**Lognormal**	**Lognormal**	**Nonparametric**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**1.66E+01**	**9.29E+00**	**1.34E+01**	**1.73E+04**	**2.13E+01**	**8.89E+02**	**1.77E+02**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**3.81E+01**	**3.74E+01**	**3.78E+01**	**4.51E+04**	**5.06E+01**	**Nonparametric distribution; use MDC**	**5.68E+02**
Maximum detected concentration (MDC) (mg/kg) [e]	**2.55E+01**	**2.16E+01**	**2.37E+01**	**3.14E+04**	**3.72E+01**	**1.41E+03**	**4.35E+02**

See footnotes at end of table

Table 5-6
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Sediment from Clinton Lake

	Mercury Concentration (mg/kg)	Nickel Concentration (mg/kg)	Potassium Concentration (mg/kg)	Selenium Concentration (mg/kg)	Sodium Concentration (mg/kg)	Strontium Concentration (mg/kg)	Vanadium Concentration (mg/kg)	Zinc Concentration (mg/kg)
	0.043	3.3	201	1.6	18	12.8	16.4	13.6
	0.044	4.1	299	1.8	21	17.2	18.7	17.8
	0.048	4.4	333	2.3	22	18.9	19.4	20.6
	0.053	4.4	348	2.3	23	19.6	19.7	22.2
	0.057	4.7	354	2.3	23	19.8	21.4	23.4
	0.057	5	400	2.4	30	20.4	21.8	23.5
	0.062	6.7	413	2.9	60	20.8	22.8	24.1
	0.068	7.2	434	2.9	66.1	24.8	27	27.8
	0.068	8.2	468	2.9	67.9	28.8	28.5	30.7
	0.084	9.5	573	3.4	79.1	31	40.6	37.7
	0.087	9.6	899	4.7	80	37.6	42.1	45.2
	0.13	18.6	899	4.7	99	48.8	50.9	76.9
	0.14	22.8	931	5	102	81.9	54.6	85.4
	0.2	28.1	1000	9.4	130	104	56.5	141
Mean (mg/kg)	**8.15E-02**	**9.76E+00**	**5.39E+02**	**3.47E+00**	**5.87E+01**	**3.47E+01**	**3.15E+01**	**4.21E+01**
Standard Deviation of Mean (SD) (mg/kg)	**4.53E-02**	**7.76E+00**	**2.72E+02**	**2.02E+00**	**3.66E+01**	**2.67E+01**	**1.44E+01**	**3.56E+01**
Median (mg/kg)	**6.50E-02**	**6.95E+00**	**4.24E+02**	**2.90E+00**	**6.31E+01**	**2.28E+01**	**2.49E+01**	**2.60E+01**
Distribution Type	**Lognormal**	**Lognormal**	**Lognormal**	**Lognormal**	**Normal**	**Lognormal**	**Lognormal**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**9.49E-02**	**1.26E+01**	**6.66E+02**	**4.14E+00**	**NA**	**4.42E+01**	**3.68E+01**	**5.21E+01**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**	**7.60E+01**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**2.45E-01**	**4.50E+01**	**1.75E+03**	**1.06E+01**	**1.54E+02**	**1.38E+02**	**8.99E+01**	**1.89E+02**
Maximum detected concentration (MDC) (mg/kg) [e]	**2.00E-01**	**2.81E+01**	**1.00E+03**	**9.40E+00**	**1.02E+02**	**1.04E+02**	**5.65E+01**	**1.41E+02**

See footnotes at end of table

	Fluoride, Total Concentration (mg/kg)
	1.3
	1.5
	1.5
	1.6
	1.8
	1.8
	1.9
	2
	2.6
	2.9
	3
	4.1
	5.4
	9.4
Mean (mg/kg)	**2.91E+00**
Standard Deviation of Mean (SD) (mg/kg)	**2.19E+00**
Median (mg/kg)	**1.95E+00**
Distribution Type	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**3.64E+00**
95% UCL (mg/kg)- T-test [c]	**NA**
95%, 95% UTL (mg/kg) [d]	**1.07E+01**
Maximum detected concentration (MDC) (mg/kg) [e]	**9.40E+00**

See footnotes at end of table

Table 5-6
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Sediment from Clinton Lake

	1,2,3,4,6,7,8-Heptachlorodibenzofuran Concentration (mg/kg)	1,2,3,4,6,7,8-HpCDD Concentration (mg/kg)	,3,4,7,8-Hexachlorodibenzo-p-dic Concentration (mg/kg)	1,2,3,4,7,8-Hexachlorodibenzofuran Concentration (mg/kg)
	0.000000154	0.000054037	0.000000221	0.00000008
	0.000000161	0.000057389	0.000000371	0.000000086
	0.000000164	0.000068399	0.000000424	0.000000096
	0.000000182	0.000120836	0.000000468	0.000000098
	0.0000002	0.000137147	0.000000497	0.000000115
	0.000000262	0.000161848	0.000000556	0.000000118
	0.000000278	0.000200213	0.00000073	0.000000119
	0.000000295	0.000206757	0.000000928	0.000000124
	0.000000296	0.000238779	0.00000106	0.000000126
	0.000000298	0.000249271	0.000001134	0.000000169
	0.000000318	0.000291038	0.000001163	0.000000177
	0.000000521	0.000507595	0.000001322	0.000000219
	0.000000775	0.000602942	0.000001511	0.000000406
	0.000001338	0.001124753	0.000003752	0.000000498
Mean (mg/kg)	**3.74E-07**	**2.87E-04**	**1.01E-06**	**1.74E-07**
Standard Deviation of Mean (SD) (mg/kg)	**3.23E-07**	**2.89E-04**	**8.83E-07**	**1.25E-07**
Median (mg/kg)	**2.87E-07**	**2.03E-04**	**8.29E-07**	**1.22E-07**
Distribution Type	**Nonparametric**	**Lognormal**	**Lognormal**	**Nonparametric**
95% UCL (mg/kg)- Bootstrapping [b]	**4.86E-07**	**3.89E-04**	**1.26E-06**	**2.14E-07**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**	**1.99E-03**	**5.11E-06**	**Nonparametric distribution; use MDC**
Maximum detected concentration (MDC) (mg/kg) [e]	**1.34E-06**	**1.12E-03**	**3.75E-06**	**4.98E-07**

See footnotes at end of table

Table 5-6
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Sediment from Clinton Lake

	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Concentration (mg/kg)	2,3,7,8,9-Hexachlorodibenzo-p-diox Concentration (mg/kg)	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Concentration (mg/kg)	Heptachlorodibenzofuran Concentration (mg/kg)
	0.000001061	0.000001702	0.000000095	0.000000154
	0.000001344	0.000002423	0.000000129	0.000000161
	0.000001413	0.000004491	0.000000154	0.000000262
	0.000001575	0.000004652	0.000000167	0.000000296
	0.00000176	0.000004678	0.000000182	0.000000298
	0.000001785	0.000005229	0.000000191	0.000000318
	0.000001854	0.000007069	0.000000225	0.000000409
	0.000001856	0.000007544	0.000000245	0.00000051
	0.000002135	0.000012227	0.000000295	0.000000521
	0.000002193	0.000012851	0.000000325	0.000000775
	0.0000033	0.000019175	0.000000388	0.000000993
	0.000005865	0.000020291	0.000000493	0.000001069
	0.000007607	0.000023173	0.000000503	0.000001118
	0.000014107	0.000049979	0.00000177	0.000002737
Mean (mg/kg)	**3.42E-06**	**1.25E-05**	**3.69E-07**	**6.87E-07**
Standard Deviation of Mean (SD) (mg/kg)	**3.60E-06**	**1.28E-05**	**4.23E-07**	**6.77E-07**
Median (mg/kg)	**1.86E-06**	**7.31E-06**	**2.35E-07**	**4.60E-07**
Distribution Type	**Nonparametric**	**Lognormal**	**Lognormal**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**4.52E-06**	**1.64E-05**	**5.00E-07**	**8.88E-07**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**	**9.69E-05**	**1.81E-06**	**4.16E-06**
Maximum detected concentration (MDC) (mg/kg) [e]	**1.41E-05**	**5.00E-05**	**1.77E-06**	**2.74E-06**

See footnotes at end of table

Table 5-6
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Sediment from Clinton Lake

	Heptachlorodibenzo-p-dioxin Concentration (mg/kg)	Hexachlorodibenzo-p-dioxin Concentration (mg/kg)	Hexachlorodibenzofuran Concentration (mg/kg)	Octachlorodibenzo-p-dioxin Concentration (mg/kg)
	0.000151629	0.000027143	0.000000096	0.001525037
	0.000156516	0.000040122	0.000000098	0.001722849
	0.000241257	0.000058439	0.000000118	0.001791352
	0.000351693	0.000080672	0.000000119	0.003201937
	0.000436809	0.000094609	0.000000124	0.003407115
	0.000490048	0.000105982	0.000000126	0.005107087
	0.000578115	0.000114801	0.000000169	0.008622872
	0.000660435	0.000225903	0.000000177	0.01263403
	0.000738517	0.000253035	0.000000219	0.012659585
	0.001154496	0.000274443	0.000000244	0.029662548
	0.001260699	0.000336356	0.000000305	0.047663883
	0.001450302	0.000368353	0.000000361	0.051699107
	0.002261625	0.000915487	0.000000406	0.05370814
	0.002683211	0.001564561	0.000001491	0.10823691
Mean (mg/kg)	**9.01E-04**	**3.19E-04**	**2.90E-07**	**2.44E-02**
Standard Deviation of Mean (SD) (mg/kg)	**7.82E-04**	**4.25E-04**	**3.60E-07**	**3.11E-02**
Median (mg/kg)	**6.19E-04**	**1.70E-04**	**1.73E-07**	**1.06E-02**
Distribution Type	**Lognormal**	**Lognormal**	**Nonparametric**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**1.08E-03**	**4.15E-04**	**3.56E-07**	**3.61E-02**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**6.78E-03**	**3.42E-03**	**Nonparametric distribution; use MDC**	**4.60E-01**
Maximum detected concentration (MDC) (mg/kg) [e]	**2.68E-03**	**1.56E-03**	**1.49E-06**	**1.08E-01**

See footnotes at end of table

Table 5-6
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Sediment from Clinton Lake [a]

	Pentachlorodibenzo-p-dioxin Concentration (mg/kg)	Tetrachlorodibenzofuran, Total Concentration (mg/kg)	Tetrachlorodibenzo-p-dioxin Concentration (mg/kg)
	0.000002497	0.000000075	0.000000115
	0.000002783	0.000000076	0.000001095
	0.00000572	0.000000101	0.000001238
	0.000007944	0.000000113	0.000003162
	0.000011335	0.000000139	0.000003373
	0.000012373	0.000000179	0.000004069
	0.00001451	0.00000018	0.000010193
	0.000034215	0.000000213	0.000010599
	0.000037506	0.000000256	0.000036811
	0.000039189	0.000000262	0.000037932
	0.000051644	0.000000555	0.000041812
	0.000084714	0.000000635	0.000058506
	0.000084904	0.00000066	0.000170925
	0.000278594	0.000003201	0.000322803
Mean (mg/kg)	**4.77E-05**	**4.75E-07**	**5.02E-05**
Standard Deviation of Mean (SD) (mg/kg)	**7.21E-05**	**8.10E-07**	**9.05E-05**
Median (mg/kg)	**2.44E-05**	**1.97E-07**	**1.04E-05**
Distribution Type	**Lognormal**	**Lognormal**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**6.52E-05**	**7.00E-07**	**8.00E-05**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**7.56E-04**	**3.67E-06**	**2.98E-03**
Maximum detected concentration (MDC) (mg/kg) [e]	**2.79E-04**	**3.20E-06**	**3.23E-04**

See footnotes at end of table

Table 5-6
Mean, Standard Deviation, Median, Upper Confidence Limits, and Upper Tolerance Limits for Background Sediment from Clinton Lake [a]

	Aroclor 1260 Concentration (mg/kg)	Benzo(b)fluoranthene Concentration (mg/kg)	Cation-Exchange Capacity Concentration (mg/kg)	Total Organic Carbon Concentration (mg/kg)
	0.01	0.0042	4830	5680
	0.012	0.0048	4850	6150
	0.013	0.0049	6230	6350
	0.013	0.0051	6280	7020
	0.013	0.0052	6390	12300
	0.014	0.0054	6400	17400
	0.014	0.0054	6950	20800
	0.014	0.006	8740	21600
	0.015	0.0065	9710	29100
	0.018	0.007	10100	36100
	0.018	0.0073	17000	41400
	0.033	0.013	20600	44300
	0.07	0.018	37600	45500
	0.172	0.028	39000	143000
Mean (mg/kg)	**3.06E-02**	**8.63E-03**	**1.32E+04**	**3.12E+04**
Standard Deviation of Mean (SD) (mg/kg)	**4.35E-02**	**6.74E-03**	**1.16E+04**	**3.53E+04**
Median (mg/kg)	**1.40E-02**	**5.70E-03**	**7.85E+03**	**2.12E+04**
Distribution Type	**Nonparametric**	**Nonparametric**	**Nonparametric**	**Lognormal**
95% UCL (mg/kg)- Bootstrapping [b]	**4.42E-02**	**1.06E-02**	**1.82E+04**	**4.14E+04**
95% UCL (mg/kg)- T-test [c]	**NA**	**NA**	**NA**	**NA**
95%, 95% UTL (mg/kg) [d]	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**Nonparametric distribution; use MDC**	**2.45E+05**
Maximum detected concentration (MDC) (mg/kg) [e]	**1.72E-01**	**6.50E-03**	**3.90E+04**	**1.43E+05**

Footnotes:

[a] *Sediment samples include all samples from Clinton Lake*

[b] *95% upper confidence limit determined using bootstrapping (2000 replications).*

[c] *95% upper confidence limit determined using the Student's T method. This UCL calculation is only performed for data with normal distributions.*

[d] *A UTL with 95% coverage at 95% confidence is calculated for normally or lognormally distributed data with 15% or fewer nondetects. If greater than 15% of the data are nondetects, or if the data distribution is undefined, the maximum detected concentration is used as the UTL. The maximum detected concentration for a data set with 14 samples has 80% coverage with 95% confidence (USEPA, 2004b).*

[e] *The value presented is the highest quantified detection for the chemical. In some cases, the surrogate value for nondetected samples was greater than the maximum detected concentration.*

Appendix A

Geotechnical Analysis Results

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Project: Longhorn Army Ammunition Plant
Client: Shaw Environmental, Houston, Texas
Contractor: not given
Job No.: C 1653 - 031
Report No.: 4-30
Date Sampled: See Chain of Custody
Sampled by: Client

Date Tested: 3/19 thru 4/05/2004 Technician: M. Thompson

Location	Sample #	USCS Classification		Liquid Limit	Plastic Limit	Plasticity Index PI	% moisture content	-200 Sieve
BKG	SD 01	Tan Poorly Graded Sand	SP	x	x	non plastic	28	5.1
BKG	SD 02	Tan Poorly Graded Sand	SP	x	x	non plastic	26	5.4
BKG	SD 03	Gray & Tan Silty Sand w/ Organics	SM	x	x	non plastic	32	31.9
BKG	SD 04	Reddish Tan Lean Clay w/ Sand	CL	40	20	20	43	49.2
BKG	SD 05	Tan Sandy Silt	ML	19	16	3	26	54.4
BKG	SD 06	Gray & Tan Poorly Graded Sand w/ Organics	SP	x	x	non plastic	36	3.8
BKG	SD 07	Gray & Tan Sandy Silty Clay	CL-ML	24	18	6	32	48.8
BKG	SD 08	Tan Lean Clay w/ Sand & w/ Organics	CL	34	20	14	36	82.9
BKG	SD 09	Gray & Tan Lean Clay w/ Sand & w/ Organics	CL	35	13	22	48	77.4
BKG	SD 10	Brown Clayey Sand w/ Organics	SC	23	19	4	34	41.5
BKG	SD 11	Tan Sandy Silt w/ Organics	ML	x	x	non plastic	29	75.7
BKG	SD 12	Gray & Tan Silty Sand w/ Organics	SM	x	x	non plastic	46	35.0
BKG	SD 13	Reddish Tan Sandy Lean Clay w/ Organics	CL	41	20	21	36	70.6
BKG	SD 14	Tan Silty Sand w/ Organics	SM	x	x	non plastic	45	54.0

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 01
JOB No. : C 1653 - 031
SAMPLE No. : BKG SD 01 — **DATE SAMPLED:** 3/13/04
DESCRIPTION: Tan Poorly Graded Sand (SP) — **REPORT No.:** 4-16
TECHNICIAN: H. Walka — **DATE:** 3/26/04

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.67
PERCENT RETAINED ON # 10	0.14
SPECIFIC GRAVITY	2.651

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	14.85	15.02	0.250	84.98
100	68.83	69.10	0.150	30.90
140	89.47	89.78	0.105	10.22
200	94.54	94.86	0.075	5.14

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	11.0	6.4	15.3	0.0135	1.00	0.5	0.0746	6.41
25.0	4.6	10.0	5.4	15.5	0.0135	1.00	1	0.0531	5.40
25.0	4.6	9.5	4.9	15.6	0.0135	1.00	2	0.0377	4.90
25.0	4.6	9.2	4.6	15.6	0.0135	1.00	5	0.0238	4.60
25.0	4.6	9.0	4.4	15.6	0.0135	1.00	15	0.0138	4.40
25.5	4.4	8.8	4.4	15.6	0.0135	1.00	30	0.0097	4.36
25.5	4.4	8.5	4.1	15.6	0.0135	1.00	60	0.0069	4.06
26.0	4.3	8.0	3.7	15.8	0.0133	1.00	250	0.0034	3.72
25.5	4.4	8.0	3.6	15.8	0.0135	1.00	1440	0.0014	3.56

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 02
JOB No. : C 1653 - 031
SAMPLE No. : **BKG SD 02**
DESCRIPTION: Tan Poorly Graded Sand (SP)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/13/04
REPORT No.: 4-17
DATE: 3/26/04

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.69
PERCENT RETAINED ON # 10	1.52
SPECIFIC GRAVITY	2.639

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	28.73	29.90	0.250	70.10
100	81.83	82.36	0.150	17.64
140	91.71	92.12	0.105	7.88
200	94.18	94.56	0.075	5.44

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	10.0	5.4	15.5	0.0135	1.01	0.5	0.0751	5.38
25.0	4.6	9.0	4.4	15.6	0.0135	1.01	1	0.0533	4.38
25.0	4.6	8.7	4.1	15.6	0.0135	1.01	2	0.0377	4.09
25.0	4.6	8.4	3.8	15.8	0.0135	1.01	5	0.0240	3.79
25.0	4.6	8.2	3.6	15.8	0.0135	1.01	15	0.0138	3.59
25.5	4.4	8.0	3.6	15.8	0.0135	1.01	30	0.0098	3.55
25.5	4.4	7.9	3.5	15.8	0.0135	1.01	60	0.0069	3.45
26.0	4.3	7.3	3.0	15.8	0.0133	1.01	250	0.0034	3.01
25.5	4.4	7.0	2.6	16	0.0135	1.01	1440	0.0014	2.55

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 03
JOB No. : C 1653 - 031
SAMPLE No. : BKG SD 03 — **DATE SAMPLED:** 3/13/04
DESCRIPTION: Gray & Tan Silty Sand w/ Organics (SM) — **REPORT No.:** 4-18
TECHNICIAN: H. Walka — **DATE:** 3/26/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.76
PERCENT RETAINED ON # 10	0.51
SPECIFIC GRAVITY	2.622

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	1.42	3.35	0.250	96.65
100	11.14	22.78	0.150	77.22
140	23.73	47.96	0.105	52.04
200	33.83	68.15	0.075	31.85

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.5	4.4	20.0	15.6	13.8	0.0135	1.01	0.5	0.0709	31.41
25.5	4.4	18.5	14.1	14	0.0135	1.01	1	0.0505	28.38
25.5	4.4	11.5	7.1	15.2	0.0135	1.01	2	0.0372	14.25
25.5	4.4	9.8	5.4	15.5	0.0135	1.01	5	0.0238	10.81
25.5	4.4	9.0	4.6	15.6	0.0135	1.01	15	0.0138	9.20
25.5	4.4	8.5	4.1	15.6	0.0135	1.01	30	0.0097	8.19
25.5	4.4	8.0	3.6	15.8	0.0135	1.01	60	0.0069	7.18
26.0	4.3	7.5	3.2	15.8	0.0133	1.01	250	0.0034	6.49
25.5	4.4	7.5	3.1	15.8	0.0135	1.01	1440	0.0014	6.17

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 04
JOB No. : C 1653 - 031
SAMPLE No. : **BKG SD 04** **DATE SAMPLED:** 3/13/04
DESCRIPTION: Reddish Tan Lean Clay w/ Sand (CL) **REPORT No.:** 4-19
TECHNICIAN: H. Walka **DATE:** 3/26/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	48.24
PERCENT RETAINED ON # 10	7.15
SPECIFIC GRAVITY	2.747

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	6.45	19.56	0.250	80.44
100	15.70	37.37	0.150	62.63
140	20.34	46.30	0.105	53.70
200	22.70	50.84	0.075	49.16

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.5	4.4	29.5	25.1	12.2	0.0135	0.99	0.5	0.0666	47.74
25.5	4.4	26.5	22.1	12.7	0.0135	0.99	1	0.0481	42.03
25.5	4.4	23.2	18.8	13.3	0.0135	0.99	2	0.0348	35.74
25.5	4.4	21.5	17.1	13.5	0.0135	0.99	5	0.0222	32.50
25.5	4.4	19.8	15.4	13.8	0.0135	0.99	15	0.0129	29.26
25.5	4.4	18.8	14.4	14	0.0135	0.99	30	0.0092	27.35
25.5	4.4	17.7	13.3	14.2	0.0135	0.99	60	0.0066	25.26
26.0	4.3	15.7	11.4	14.5	0.0133	0.99	250	0.0032	21.75
25.5	4.4	14.5	10.1	14.7	0.0135	0.99	1440	0.0014	19.16

Submitted by: Hermann Walka, P.E.
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 05
JOB No. : C 1653 - 031
SAMPLE No. : BKG SD 05
DESCRIPTION: Tan Sandy Silt (ML)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/15/04
REPORT No.: 4-20
DATE: 3/26/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.48
PERCENT RETAINED ON # 10	0.24
SPECIFIC GRAVITY	2.655

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	4.44	9.19	0.250	90.81
100	10.52	21.45	0.150	78.55
140	17.09	34.70	0.105	65.30
200	22.49	45.58	0.075	54.42

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.5	4.4	30.0	25.6	12.2	0.0135	1.00	0.5	0.0666	51.52
25.5	4.4	25.5	21.1	12.9	0.0135	1.00	1	0.0485	42.45
25.5	4.4	22.2	17.8	13.5	0.0135	1.00	2	0.0350	35.80
25.5	4.4	19.5	15.1	13.8	0.0135	1.00	5	0.0224	30.35
25.5	4.4	16.5	12.1	14.3	0.0135	1.00	15	0.0132	24.30
25.5	4.4	14.5	10.1	14.7	0.0135	1.00	30	0.0094	20.27
25.5	4.4	13.3	8.9	15	0.0135	1.00	60	0.0067	17.85
26.0	4.3	11.5	7.2	15.2	0.0133	1.00	250	0.0033	14.55
25.5	4.4	10.2	5.8	15.5	0.0135	1.00	1440	0.0014	11.60

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 06
JOB No. : C 1653 - 031
SAMPLE No. : **BKG SD 06** **DATE SAMPLED:** 3/15/04
DESCRIPTION: Gray & Tan Poorly Graded Sand w/ Organics (SP) **REPORT No.:** 4-21
TECHNICIAN: H. Walka **DATE:** 3/26/04

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.72
PERCENT RETAINED ON # 10	0.24
SPECIFIC GRAVITY	2.664

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	31.89	32.14	0.250	67.86
100	86.60	86.87	0.150	13.13
140	94.36	94.64	0.105	5.36
200	95.95	96.23	0.075	3.77

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a: SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.5	4.4	8.0	3.6	15.8	0.0135	1.00	0.5	0.0758	3.56
25.5	4.4	7.8	3.4	15.8	0.0135	1.00	1	0.0536	3.36
25.5	4.4	7.5	3.1	15.8	0.0135	1.00	2	0.0379	3.06
25.5	4.4	7.3	2.9	16	0.0135	1.00	5	0.0241	2.86
25.5	4.4	7.1	2.7	16	0.0135	1.00	15	0.0139	2.66
25.5	4.4	7.0	2.6	16	0.0135	1.00	30	0.0099	2.56
25.5	4.4	6.8	2.4	16	0.0135	1.00	60	0.0070	2.36
26.0	4.3	6.5	2.2	16	0.0133	1.00	250	0.0034	2.22
25.5	4.4	6.2	1.8	16.1	0.0135	1.00	1440	0.0014	1.76

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 07
JOB No. : C 1653 - 031
SAMPLE No. : BKG SD 07 — **DATE SAMPLED:** 3/15/04
DESCRIPTION: Gray & Tan Sandy Silty Clay (CL - ML) — **REPORT No.:** 4-22
TECHNICIAN: H. Walka — **DATE:** 3/26/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.05
PERCENT RETAINED ON # 10	0.04
SPECIFIC GRAVITY	2.616

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	5.51	11.27	0.250	88.73
100	15.87	32.38	0.150	67.62
140	21.64	44.14	0.105	55.86
200	25.09	51.17	0.075	48.83

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.5	4.4	27.0	22.6	12.7	0.0135	1.01	0.5	0.0680	46.42
25.5	4.4	25.0	20.6	13	0.0135	1.01	1	0.0486	42.31
25.5	4.4	23.2	18.8	13.3	0.0135	1.01	2	0.0348	38.60
25.5	4.4	21.2	16.8	13.7	0.0135	1.01	5	0.0223	34.49
25.5	4.4	18.0	13.6	14.2	0.0135	1.01	15	0.0131	27.90
25.5	4.4	16.5	12.1	14.3	0.0135	1.01	30	0.0093	24.81
25.5	4.4	14.5	10.1	14.7	0.0135	1.01	60	0.0067	20.70
26.0	4.3	12.5	8.2	15	0.0133	1.01	250	0.0033	16.91
25.0	4.6	11.5	6.9	15.3	0.0135	1.01	1440	0.0014	14.19

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 08
JOB No. : C 1653 - 031
SAMPLE No. : **BKG SD 08**
DESCRIPTION: Tan Lean Clay w/ Sand & w/ Organics (CL)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/15/04
REPORT No.: 4-23
DATE: 3/30/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.28
PERCENT RETAINED ON # 10	0.04
SPECIFIC GRAVITY	2.491

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	0.40	0.85	0.250	99.15
100	2.32	4.75	0.150	95.25
140	5.33	10.85	0.105	89.15
200	8.41	17.10	0.075	82.90

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	40.5	35.9	10.6	0.0135	1.05	0.5	0.0621	76.45
25.0	4.6	37.2	32.6	11.1	0.0135	1.05	1	0.0449	69.42
25.0	4.6	34.5	29.9	11.5	0.0135	1.05	2	0.0323	63.67
25.0	4.6	31.2	26.6	12	0.0135	1.05	5	0.0209	56.64
25.0	4.6	27.0	22.4	12.7	0.0135	1.05	15	0.0124	47.70
25.0	4.6	24.7	20.1	13	0.0135	1.05	30	0.0089	42.80
25.5	4.4	22.2	17.8	13.5	0.0135	1.05	60	0.0064	37.81
26.0	4.3	18.5	14.2	14	0.0133	1.05	250	0.0032	30.28
25.5	4.4	15.0	10.6	14.7	0.0135	1.05	1440	0.0014	22.48

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 09
JOB No.: C 1653 - 031
SAMPLE No.: BKG SD 09 — **DATE SAMPLED:** 3/15/04
DESCRIPTION: Gray & Tan Lean Clay w/ Sand & w/ Organics (CL) — **REPORT No.:** 4-24
TECHNICIAN: H. Walka — **DATE:** 3/30/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.23
PERCENT RETAINED ON # 10	0.02
SPECIFIC GRAVITY	2.526

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	0.56	1.16	0.250	98.84
100	4.32	8.79	0.150	91.21
140	8.26	16.80	0.105	83.20
200	11.10	22.56	0.075	77.44

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	38.0	33.4	10.9	0.0135	1.03	0.5	0.0630	69.86
25.0	4.6	35.0	30.4	11.4	0.0135	1.03	1	0.0455	63.58
25.0	4.6	32.5	27.9	11.9	0.0135	1.03	2	0.0329	58.35
25.0	4.6	29.2	24.6	12.4	0.0135	1.03	5	0.0212	51.45
25.0	4.6	26.5	21.9	12.9	0.0135	1.03	15	0.0125	45.80
25.0	4.6	24.0	19.4	13.2	0.0135	1.03	30	0.0089	40.57
25.5	4.4	22.0	17.6	13.5	0.0135	1.03	60	0.0064	36.72
26.0	4.3	18.2	13.9	14.2	0.0133	1.03	250	0.0032	29.11
25.5	4.4	15.5	11.1	14.5	0.0135	1.03	1440	0.0014	23.12

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 10
JOB No. : C 1653 - 031
SAMPLE No. : **BKG SD 10** **DATE SAMPLED:** 3/15/04
DESCRIPTION: Brown Clayey Sand w/ Organics (SC) **REPORT No.:** 4-25
TECHNICIAN: H. Walka **DATE:** 3/30/04

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.30
PERCENT RETAINED ON # 10	0.55
SPECIFIC GRAVITY	2.587

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	8.24	8.80	0.250	91.20
100	27.45	28.04	0.150	71.96
140	45.35	45.97	0.105	54.03
200	57.89	58.53	0.075	41.47

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	43.5	38.9	10.1	0.0135	1.02	0.5	0.0606	39.73
25.0	4.6	34.5	29.9	11.5	0.0135	1.02	1	0.0457	30.54
25.0	4.6	27.5	22.9	12.7	0.0135	1.02	2	0.0340	23.39
25.0	4.6	23.5	18.9	13.3	0.0135	1.02	5	0.0220	19.30
25.0	4.6	20.5	15.9	13.8	0.0135	1.02	15	0.0129	16.24
25.0	4.6	18.5	13.9	14.2	0.0135	1.02	30	0.0093	14.19
25.5	4.4	17.5	13.1	14.2	0.0135	1.02	60	0.0066	13.34
26.0	4.3	15.2	10.9	14.7	0.0133	1.02	250	0.0032	11.15
25.5	4.4	13.0	8.6	15	0.0135	1.02	1440	0.0014	8.74

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 11
JOB No. : C 1653 - 031
SAMPLE No. : BKG SD 11 — **DATE SAMPLED:** 3/14/04
DESCRIPTION: Tan Sandy Silt w/ Organics (ML) — **REPORT No.:** 4-26
TECHNICIAN: H. Walka — **DATE:** 3/30/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.68
PERCENT RETAINED ON # 10	0.01
SPECIFIC GRAVITY	2.598

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	0.21	0.43	0.250	99.57
100	2.57	5.18	0.150	94.82
140	7.04	14.18	0.105	85.82
200	12.09	24.34	0.075	75.66

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	37.5	32.9	11.1	0.0135	1.02	0.5	0.0636	67.53
25.0	4.6	32.0	27.4	11.9	0.0135	1.02	1	0.0465	56.24
25.0	4.6	26.5	21.9	12.9	0.0135	1.02	2	0.0343	44.95
25.0	4.6	22.0	17.4	13.5	0.0135	1.02	5	0.0222	35.71
25.0	4.6	17.0	12.4	14.3	0.0135	1.02	15	0.0132	25.45
25.0	4.6	15.2	10.6	14.7	0.0135	1.02	30	0.0094	21.75
25.5	4.4	14.0	9.6	14.8	0.0135	1.02	60	0.0067	19.62
26.0	4.3	11.7	7.4	15.2	0.0133	1.02	250	0.0033	15.22
25.5	4.4	10.2	5.8	15.5	0.0135	1.02	1440	0.0014	11.81

Submitted by: Hermann Walka, P.E.
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 12
JOB No. : C 1653 - 031
SAMPLE No. : BKG SD 12 — **DATE SAMPLED:** 3/14/04
DESCRIPTION: Gray & Tan Silty Sand w/ Organics (SM) — **REPORT No.:** 4-27
TECHNICIAN: H. Walka — **DATE:** 3/30/04

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.73
PERCENT RETAINED ON # 10	0.23
SPECIFIC GRAVITY	2.629

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	1.27	1.50	0.250	98.50
100	19.65	19.89	0.150	80.11
140	46.52	46.77	0.105	53.23
200	64.79	65.05	0.075	34.95

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	33.5	28.9	11.7	0.0135	1.01	0.5	0.0653	29.20
25.0	4.6	22.0	17.4	13.5	0.0135	1.01	1	0.0496	17.58
25.0	4.6	16.0	11.4	14.5	0.0135	1.01	2	0.0363	11.51
25.0	4.6	13.0	8.4	15	0.0135	1.01	5	0.0234	8.48
25.0	4.6	11.5	6.9	15.3	0.0135	1.01	15	0.0136	6.97
25.5	4.4	10.5	6.1	15.3	0.0135	1.01	30	0.0096	6.12
25.5	4.4	10.0	5.6	15.5	0.0135	1.01	60	0.0069	5.61
26.0	4.3	9.2	4.9	15.6	0.0133	1.01	250	0.0033	4.97
25.5	4.4	8.2	3.8	15.8	0.0135	1.01	1440	0.0014	3.79

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 13
JOB No. : C 1653 - 031
SAMPLE No. : **BKG SD 13** **DATE SAMPLED:** 3/14/04
DESCRIPTION: Reddish Tan Sandy Lean Clay w/ Organics (CL) **REPORT No.:** 4-28
TECHNICIAN: H. Walka **DATE:** 3/30/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	49.08
PERCENT RETAINED ON # 10	0.13
SPECIFIC GRAVITY	2.657

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	3.00	6.23	0.250	93.77
100	6.44	13.23	0.150	86.77
140	10.60	21.70	0.105	78.30
200	14.37	29.37	0.075	70.63

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	36.5	31.9	11.2	0.0135	1.00	0.5	0.0638	64.90
25.0	4.6	32.5	27.9	11.9	0.0135	1.00	1	0.0465	56.76
25.0	4.6	28.5	23.9	12.5	0.0135	1.00	2	0.0337	48.62
25.0	4.6	25.5	20.9	13	0.0135	1.00	5	0.0218	42.52
25.0	4.6	22.5	17.9	13.5	0.0135	1.00	15	0.0128	36.41
25.0	4.6	21.2	16.6	13.7	0.0135	1.00	30	0.0091	33.77
25.5	4.4	19.8	15.4	13.8	0.0135	1.00	60	0.0065	31.24
26.0	4.3	17.8	13.5	14.2	0.0133	1.00	250	0.0032	27.50
25.5	4.4	16.5	12.1	14.3	0.0135	1.00	1440	0.0013	24.53

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG SD 14
JOB No. : C 1653 - 031
SAMPLE No. : **BKG SD 14**
DESCRIPTION: Tan Silty Sand w/ Organics (SM)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/14/04
REPORT No.: 4-29
DATE: 3/30/04

WEIGHT OF SAMPLE (AIR DRY)	100.00
WEIGHT OF SAMPLE (OVEN DRY)	99.26
PERCENT RETAINED ON # 10	0.02
SPECIFIC GRAVITY	2.628

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	20.12	20.29	0.250	79.71
100	19.28	19.44	0.150	80.56
140	39.00	39.30	0.105	60.70
200	45.63	45.98	0.075	54.02

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	28.5	23.9	12.5	0.0135	1.01	0.5	0.0675	24.31
25.0	4.6	22.5	17.9	13.5	0.0135	1.01	1	0.0496	18.20
25.0	4.6	18.2	13.6	14.2	0.0135	1.01	2	0.0359	13.83
25.0	4.6	16.5	11.9	14.5	0.0135	1.01	5	0.0230	12.10
25.0	4.6	15.2	10.6	14.7	0.0135	1.01	15	0.0134	10.78
25.0	4.6	13.5	8.9	15	0.0135	1.01	30	0.0095	9.05
25.5	4.4	12.5	8.1	15	0.0135	1.01	60	0.0067	8.19
26.0	4.3	11.2	6.9	15.3	0.0133	1.01	250	0.0033	7.03
25.5	4.4	9.5	5.1	15.5	0.0135	1.01	1440	0.0014	5.14

Submitted by: Hermann Walka, P.E.
Project Manager

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Project: Longhorn Army Ammunition Plant
Client: Shaw Environmental, Houston, Texas
Contractor: not given
Job No.: C 1653 - 031
Report No.: 4-15
Date Sampled: See Chain of Custody
Sampled by: Client

Date Tested: 3/19 thru 4/05/2004 Technician: M. Thompson

Location	Sample #	USCS Classification		Liquid Limit	Plastic Limit	Plasticity Index PI	% moisture content	-200 Sieve
BKG -CL	SD 01	Tan & Gray Sandy Silty Clay w/ Organics	CL-ML	27	23	**4**	65	54.6
BKG -CL	SD 02	Tan & Gray Fat Clay w/ Organics	CH	62	26	**36**	69	93.0
BKG -CL	SD 03	Lt. Gray Fat Clay w/ Organics	CH	52	27	**25**	45	93.4
BKG -CL	SD 04	Gray Sandy Fat Clay w/ Organics	CH	60	34	**26**	210	79.6
BKG -CL	SD 05	Dk Gray Fat Clay w/ Organics	CH	79	37	**42**	115	84.5
BKG -CL	SD 06	Tan Lean Clay w/ Sand & w/ Organics	CL	49	24	**25**	66	81.7
BKG -CL	SD 07	Gray Fat Clay w/ Organics	CH	69	33	**36**	86	91.6
BKG -CL	SD 08	Dk Gray Sandy Fat Clay w/ Organics	CH	59	25	**34**	58	70.0
BKG -CL	SD 09	Gray Silty Sand w/ Organics	SM	x	x	**non plastic**	374	74.4
BKG -CL	SD 10	Gray & Tan Fat Clay w/ Sand & w/ Organics	CH	76	33	**43**	214	94.6
BKG -CL	SD 11	Gray & Tan Fat Clay w/ Sand & w/ Organics	CH	72	36	**36**	93	77.2
BKG -CL	SD 12	Gray Sandy Fat Clay w/ Organics	CH	62	39	**23**	348	59.8
BKG -CL	SD 13	Gray & Tan Fat Clay w/ Sand & w/ Organics	CH	61	44	**17**	103	76.6
BKG -CL	SD 14	Gray & Tan Fat Clay w/ Sand & w/ Organics	CH	73	29	**44**	133	77.0

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 01
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 01** **DATE SAMPLED:** 3/16/04
DESCRIPTION: Tan & Gray Sandy Silty Clay w/ Organics (CL - ML) **REPORT No.:** 4-1
TECHNICIAN: H. Walka **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	47.42
PERCENT RETAINED ON # 10	0.01
SPECIFIC GRAVITY	2.618

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	7.39	15.59	0.250	84.41
100	16.61	35.03	0.150	64.97
140	20.06	42.31	0.105	57.69
200	21.53	45.41	0.075	54.59

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
24.5	4.8	29.0	24.2	12.4	0.0137	1.01	0.5	0.0680	51.61
24.5	4.8	28.0	23.2	12.5	0.0137	1.01	1	0.0483	49.48
24.5	4.8	27.5	22.7	12.7	0.0137	1.01	2	0.0344	48.42
24.5	4.8	27.0	22.2	12.7	0.0137	1.01	5	0.0218	47.35
25.0	4.6	26.5	21.9	12.9	0.0135	1.01	15	0.0125	46.63
25.0	4.6	25.5	20.9	13	0.0135	1.01	30	0.0089	44.50
25.0	4.6	25.0	20.4	13	0.0135	1.01	60	0.0063	43.44
26.0	4.3	23.2	18.9	13.3	0.0133	1.01	250	0.0031	40.28
25.0	4.6	21.0	16.4	13.7	0.0135	1.01	1440	0.0013	34.92

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 02
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 02**
DESCRIPTION: Tan & Gray Fat Clay w/ Organics (CH)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/12/04
REPORT No.: 4-2
DATE: 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	46.50
PERCENT RETAINED ON # 10	0.19
SPECIFIC GRAVITY	2.659

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	0.33	0.90	0.250	99.10
100	1.09	2.53	0.150	97.47
140	2.19	4.89	0.105	95.11
200	3.17	6.99	0.075	93.01

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	45.0	40.4	9.7	0.0135	1.00	0.5	0.0594	86.71
25.0	4.6	43.5	38.9	10.1	0.0135	1.00	1	0.0429	83.49
25.0	4.6	42.5	37.9	10.2	0.0135	1.00	2	0.0305	81.34
25.0	4.6	41.0	36.4	10.4	0.0135	1.00	5	0.0195	78.12
25.0	4.6	40.0	35.4	10.6	0.0135	1.00	15	0.0113	75.97
25.0	4.6	38.5	33.9	10.9	0.0135	1.00	30	0.0081	72.75
25.0	4.6	37.5	32.9	11.1	0.0135	1.00	60	0.0058	70.61
26.5	4.1	34.5	30.4	11.4	0.0133	1.00	250	0.0028	65.20
25.0	4.6	31.2	26.6	12	0.0135	1.00	1440	0.0012	57.08

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 03
JOB No. : C 1653 - 031
SAMPLE No. : BKG - CL SD 03
DESCRIPTION: Lt. Gray Fat Clay w/ Organics (CH)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/12/04
REPORT No.: 4-3
DATE: 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	48.92
PERCENT RETAINED ON # 10	0.07
SPECIFIC GRAVITY	2.608

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	0.39	0.87	0.250	99.13
100	1.00	2.11	0.150	97.89
140	1.99	4.14	0.105	95.86
200	3.22	6.65	0.075	93.35

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	47.0	42.4	9.4	0.0135	1.01	0.5	0.0585	87.47
25.0	4.6	44.5	39.9	9.9	0.0135	1.01	1	0.0424	82.31
25.0	4.6	42.5	37.9	10.2	0.0135	1.01	2	0.0305	78.18
25.0	4.6	40.0	35.4	10.6	0.0135	1.01	5	0.0196	73.02
25.0	4.6	36.5	31.9	11.2	0.0135	1.01	15	0.0117	65.80
25.0	4.6	32.5	27.9	11.9	0.0135	1.01	30	0.0085	57.55
25.0	4.6	30.5	25.9	12.2	0.0135	1.01	60	0.0061	53.42
26.5	4.1	24.0	19.9	13.2	0.0133	1.01	250	0.0031	41.00
25.0	4.6	19.2	14.6	14	0.0135	1.01	1440	0.0013	30.11

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 04
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 04**
DESCRIPTION: Gray Sandy Fat Clay w/ Organics (CH)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/12/04
REPORT No.: 4-4
DATE: 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	48.83
PERCENT RETAINED ON # 10	0.19
SPECIFIC GRAVITY	2.453

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	2.79	5.89	0.250	94.11
100	4.97	10.35	0.150	89.65
140	7.71	15.95	0.105	84.05
200	9.88	20.38	0.075	79.62

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
26.0	4.3	36.0	31.7	11.2	0.0133	1.05	0.5	0.0631	68.06
26.0	4.3	34.5	30.2	11.4	0.0133	1.05	1	0.0450	64.84
26.0	4.3	33.5	29.2	11.5	0.0133	1.05	2	0.0320	62.70
26.0	4.3	32.5	28.2	11.7	0.0133	1.05	5	0.0204	60.55
26.0	4.3	31.0	26.7	12	0.0133	1.05	15	0.0119	57.33
26.0	4.3	29.5	25.2	12.2	0.0133	1.05	30	0.0085	54.11
26.5	4.1	27.0	22.9	12.7	0.0133	1.05	60	0.0061	49.09
26.5	4.1	24.5	20.4	13	0.0133	1.05	250	0.0030	43.73
26.5	4.1	20.5	16.4	13.7	0.0133	1.05	1440	0.0013	35.14

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 05
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 05** **DATE SAMPLED:** 3/12/04
DESCRIPTION: Dk. Gray Fat Clay w/ Organics (CH) **REPORT No.:** 4-5
TECHNICIAN: H. Walka **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	45.94
PERCENT RETAINED ON # 10	0.66
SPECIFIC GRAVITY	2.573

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	1.18	3.21	0.250	96.79
100	3.28	7.75	0.150	92.25
140	5.43	12.40	0.105	87.60
200	6.88	15.54	0.075	84.46

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	41.0	36.4	10.4	0.0135	1.02	0.5	0.0615	80.27
25.0	4.6	38.5	33.9	10.9	0.0135	1.02	1	0.0445	74.76
25.0	4.6	36.5	31.9	11.2	0.0135	1.02	2	0.0319	70.35
25.0	4.6	35.2	30.6	11.4	0.0135	1.02	5	0.0204	67.48
25.0	4.6	33.5	28.9	11.7	0.0135	1.02	15	0.0119	63.73
25.0	4.6	32.0	27.4	11.9	0.0135	1.02	30	0.0085	60.42
25.0	4.6	29.5	24.9	12.4	0.0135	1.02	60	0.0061	54.91
26.5	4.1	26.5	22.4	12.7	0.0133	1.02	250	0.0030	49.35
25.0	4.6	23.0	18.4	13.3	0.0135	1.02	1440	0.0013	40.57

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 06
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 06** **DATE SAMPLED:** 3/12/04
DESCRIPTION: Tan Lean Clay w/Sand & w/ Organics (CL) **REPORT No.:** 4-6
TECHNICIAN: H. Walka **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	48.28
PERCENT RETAINED ON # 10	0.08
SPECIFIC GRAVITY	2.628

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	0.22	0.54	0.250	99.46
100	1.05	2.25	0.150	97.75
140	4.37	9.12	0.105	90.88
200	8.83	18.35	0.075	81.65

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	39.5	34.9	10.7	0.0135	1.01	0.5	0.0624	72.94
25.0	4.6	35.5	30.9	11.4	0.0135	1.01	1	0.0455	64.58
25.0	4.6	33.5	28.9	11.7	0.0135	1.01	2	0.0326	60.40
25.0	4.6	31.5	26.9	12	0.0135	1.01	5	0.0209	56.22
25.0	4.6	30.0	25.4	12.2	0.0135	1.01	15	0.0122	53.08
25.0	4.6	28.2	23.6	12.5	0.0135	1.01	30	0.0087	49.32
25.0	4.6	26.8	22.2	12.7	0.0135	1.01	60	0.0062	46.39
26.5	4.1	24.0	19.9	13.2	0.0133	1.01	250	0.0031	41.54
25.0	4.6	21.8	17.2	13.5	0.0135	1.01	1440	0.0013	35.94

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 07
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 07** **DATE SAMPLED:** 3/11/04
DESCRIPTION: Gray Fat Clay w/ Organics (CH) **REPORT No.:** 4-7
TECHNICIAN: H. Walka **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	46.44
PERCENT RETAINED ON # 10	0.15
SPECIFIC GRAVITY	2.589

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	0.22	0.62	0.250	99.38
100	0.97	2.24	0.150	97.76
140	2.35	5.20	0.105	94.80
200	3.83	8.38	0.075	91.62

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	42.5	37.9	10.2	0.0135	1.02	0.5	0.0609	83.11
25.0	4.6	40.5	35.9	10.6	0.0135	1.02	1	0.0439	78.72
25.0	4.6	39.0	34.4	10.7	0.0135	1.02	2	0.0312	75.43
25.0	4.6	37.0	32.4	11.1	0.0135	1.02	5	0.0201	71.04
25.0	4.6	33.5	28.9	11.7	0.0135	1.02	15	0.0119	63.37
25.0	4.6	32.0	27.4	11.9	0.0135	1.02	30	0.0085	60.08
25.5	4.4	30.0	25.6	12.2	0.0135	1.02	60	0.0061	56.04
26.5	4.1	26.5	22.4	12.7	0.0133	1.02	250	0.0030	49.07
25.0	4.6	23.0	18.4	13.3	0.0135	1.02	1440	0.0013	40.34

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 08
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 08**
DESCRIPTION: Dk. Gray Sandy Fat Clay w/ Organics (CH)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/11/04
REPORT No.: 4-8
DATE: 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	45.56
PERCENT RETAINED ON # 10	0.17
SPECIFIC GRAVITY	2.577

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	4.40	9.81	0.250	90.19
100	9.74	21.51	0.150	78.49
140	12.46	27.47	0.105	72.53
200	13.62	30.01	0.075	69.99

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
25.0	4.6	35.0	30.4	11.4	0.0135	1.02	0.5	0.0644	67.93
25.0	4.6	33.5	28.9	11.7	0.0135	1.02	1	0.0461	64.58
25.0	4.6	33.0	28.4	11.7	0.0135	1.02	2	0.0326	63.46
25.0	4.6	32.5	27.9	11.9	0.0135	1.02	5	0.0208	62.34
25.0	4.6	31.5	26.9	12	0.0135	1.02	15	0.0121	60.11
25.0	4.6	30.5	25.9	12.2	0.0135	1.02	30	0.0086	57.87
25.5	4.4	29.0	24.6	12.4	0.0135	1.02	60	0.0061	54.88
26.5	4.1	26.8	22.7	12.7	0.0133	1.02	250	0.0030	50.68
25.0	4.6	24.0	19.4	13.2	0.0135	1.02	1440	0.0013	43.35

Submitted by: Hermann Walka, P.E.
Project Manager

Hermann Walka
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 09
JOB No. : C 1653 - 031
SAMPLE No. : BKG - CL SD 09 — **DATE SAMPLED:** 3/9/04
DESCRIPTION: Gray Silty Sand w/ Organics (SM) — **REPORT No.** 4-9
TECHNICIAN: H. Walka — **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	47.91
PERCENT RETAINED ON # 10	3.09
SPECIFIC GRAVITY	2.451

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	8.15	19.58	0.250	80.42
100	9.27	21.84	0.150	78.16
140	10.45	24.23	0.105	75.77
200	11.15	25.64	0.075	74.36

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
26.5	4.1	31.0	26.9	12	0.0133	1.05	0.5	0.0654	57.08
26.5	4.1	30.0	25.9	12.2	0.0133	1.05	1	0.0466	54.95
26.5	4.1	29.5	25.4	12.2	0.0133	1.05	2	0.0329	53.89
26.5	4.1	28.5	24.4	12.4	0.0133	1.05	5	0.0210	51.77
27.0	4.0	27.5	23.5	12.5	0.0132	1.05	15	0.0120	49.98
27.0	4.0	26.5	22.5	12.7	0.0132	1.05	30	0.0086	47.86
27.0	4.0	25.0	21.0	12.9	0.0132	1.05	60	0.0061	44.67
26.5	4.1	23.0	18.9	13.3	0.0133	1.05	250	0.0031	40.09
26.5	4.1	19.5	15.4	13.8	0.0133	1.05	1440	0.0013	32.65

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 10
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 10** **DATE SAMPLED:** 3/11/04
DESCRIPTION: Gray & Tan Fat Clay w/ Sand & w/ Organics (CH) **REPORT No.:** 4-10
TECHNICIAN: H. Walka **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	46.85
PERCENT RETAINED ON # 10	0.12
SPECIFIC GRAVITY	2.526

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	0.72	1.66	0.250	98.34
100	1.66	3.66	0.150	96.34
140	2.15	4.70	0.105	95.30
200	2.46	5.36	0.075	94.64

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
27.0	4.0	46.5	42.5	9.4	0.0132	1.03	0.5	0.0572	93.41
27.0	4.0	45.0	41.0	9.6	0.0132	1.03	1	0.0409	90.11
27.0	4.0	44.0	40.0	9.7	0.0132	1.03	2	0.0290	87.92
27.0	4.0	42.5	38.5	10.1	0.0132	1.03	5	0.0187	84.62
27.0	4.0	41.0	37.0	10.2	0.0132	1.03	15	0.0109	81.33
27.0	4.0	38.5	34.5	10.7	0.0132	1.03	30	0.0079	75.84
27.0	4.0	37.0	33.0	10.9	0.0132	1.03	60	0.0056	72.54
26.5	4.1	34.2	30.1	11.4	0.0133	1.03	250	0.0028	66.04
26.5	4.1	30.5	26.4	12	0.0133	1.03	1440	0.0012	57.92

Submitted by: Hermann Walka, P.E.
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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 11
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 11** **DATE SAMPLED:** 3/12/04
DESCRIPTION: Gray & Tan Fat Clay w/ Sand & w/ Organics (CH) **REPORT No.:** 4-11
TECHNICIAN: H. Walka **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	47.96
PERCENT RETAINED ON # 10	0.03
SPECIFIC GRAVITY	2.542

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	6.93	14.48	0.250	85.52
100	9.69	20.23	0.150	79.77
140	10.31	21.52	0.105	78.48
200	10.93	22.81	0.075	77.19

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
27.0	4.0	39.5	35.5	10.6	0.0132	1.03	0.5	0.0607	76.30
27.0	4.0	38.0	34.0	10.7	0.0132	1.03	1	0.0431	73.08
27.0	4.0	37.0	33.0	10.9	0.0132	1.03	2	0.0308	70.93
27.0	4.0	36.0	32.0	11.1	0.0132	1.03	5	0.0197	68.78
27.0	4.0	34.2	30.2	11.4	0.0132	1.03	15	0.0115	64.92
27.0	4.0	33.2	29.2	11.5	0.0132	1.03	30	0.0082	62.77
27.0	4.0	32.2	28.2	11.7	0.0132	1.03	60	0.0058	60.62
26.5	4.1	29.5	25.4	12.2	0.0133	1.03	250	0.0029	54.48
26.5	4.1	26.0	21.9	12.9	0.0133	1.03	1440	0.0013	46.97

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 12
JOB No. : C 1653 - 031
SAMPLE No. : **BKG - CL SD 12** **DATE SAMPLED:** 3/12/04
DESCRIPTION: Gray Sandy Fat Clay & w/ Organics (CH) **REPORT No.:** 4-12
TECHNICIAN: H. Walka **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	48.58
PERCENT RETAINED ON # 10	0.61
SPECIFIC GRAVITY	2.451

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	7.84	16.65	0.250	83.35
100	15.20	31.71	0.150	68.29
140	18.18	37.80	0.105	62.20
200	19.34	40.18	0.075	59.82

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
27.0	4.0	28.5	24.5	12.4	0.0132	1.05	0.5	0.0657	52.70
27.0	4.0	26.5	22.5	12.7	0.0132	1.05	1	0.0470	48.41
27.0	4.0	25.5	21.5	12.9	0.0132	1.05	2	0.0335	46.26
27.0	4.0	24.5	20.5	13	0.0132	1.05	5	0.0213	44.11
27.0	4.0	23.0	19.0	13.2	0.0132	1.05	15	0.0124	40.89
27.0	4.0	21.8	17.8	13.5	0.0132	1.05	30	0.0088	38.31
27.0	4.0	20.0	16.0	13.7	0.0132	1.05	60	0.0063	34.45
26.5	4.1	18.5	14.4	14	0.0133	1.05	250	0.0032	30.88
26.5	4.1	16.0	11.9	14.5	0.0133	1.05	1440	0.0013	25.51

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 13
JOB No. : C 1653 - 031
SAMPLE No. : BKG - CL SD 13
DESCRIPTION: Gray & Tan Fat Clay w/ Sand & w/ Organics (CH)
TECHNICIAN: H. Walka

DATE SAMPLED: 3/11/04
REPORT No.: 4-13
DATE: 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	48.12
PERCENT RETAINED ON # 10	0.17
SPECIFIC GRAVITY	2.518

SIEVE	WEIGHT	%RETAIN	GRAIN DIA.	%PASSING
60	1.80	3.90	0.250	96.10
100	5.77	12.14	0.150	87.86
140	9.20	19.26	0.105	80.74
200	11.21	23.42	0.075	76.58

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
27.0	4.0	38.5	34.5	10.7	0.0132	1.03	0.5	0.0610	73.79
27.0	4.0	37.0	33.0	10.9	0.0132	1.03	1	0.0435	70.59
27.0	4.0	36.2	32.2	11.1	0.0132	1.03	2	0.0311	68.88
27.0	4.0	35.5	31.5	11.2	0.0132	1.03	5	0.0197	67.38
27.0	4.0	34.0	30.0	11.4	0.0132	1.03	15	0.0115	64.18
27.0	4.0	32.2	28.2	11.7	0.0132	1.03	30	0.0082	60.33
27.0	4.0	31.5	27.5	11.9	0.0132	1.03	60	0.0059	58.83
26.5	4.1	27.8	23.7	12.5	0.0133	1.03	250	0.0030	50.59
26.5	4.1	23.2	19.1	13.2	0.0133	1.03	1440	0.0013	40.76

Submitted by: Hermann Walka, P.E.
Project Manager

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HYDROMETER AND MECHANICAL ANALYSIS OF SOIL BINDER, ASTM D422

PROJECT: Longhorn Army Ammunition Plant, Karnack, Texas
CLIENT: Shaw Environmental, Houston, Texas
CONTRACTOR: not given
SAMPLED BY: Client
LOCATION: BKG - CL SD 14
JOB No. : C 1653 - 031
SAMPLE No. : BKG - CL SD 14 — **DATE SAMPLED:** 3/10/04
DESCRIPTION: Gray & Tan Fat Clay w/ Sand & w/ Organics (CH) — **REPORT No.:** 4-14
TECHNICIAN: H. Walka — **DATE:** 3/22/04

WEIGHT OF SAMPLE (AIR DRY)	50.00
WEIGHT OF SAMPLE (OVEN DRY)	47.68
PERCENT RETAINED ON # 10	0.10
SPECIFIC GRAVITY	2.559

SIEVE	WEIGHT	%RETAIN	GRAIN DIA	%PASSING
60	1.73	3.72	0.250	96.28
100	4.59	9.72	0.150	90.28
140	8.48	17.87	0.105	82.13
200	10.93	23.00	0.075	77.00

TEMP (C)	HYDROMETER CORRECTION	HYDROMETER READING	CORRECTED READING	L.Hydrom FACTOR	K. Diam. FACTOR	a. SP.GR. FACTOR	TIME (MIN)	GRAIN DIA (MM)	% SOIL PASSING
27.0	4.0	36.5	32.5	11.1	0.0132	1.02	0.5	0.0621	69.53
27.0	4.0	35.5	31.5	11.2	0.0132	1.02	1	0.0441	67.39
27.0	4.0	34.5	30.5	11.4	0.0132	1.02	2	0.0315	65.25
27.0	4.0	34.0	30.0	11.4	0.0132	1.02	5	0.0199	64.18
27.0	4.0	32.8	28.8	11.7	0.0132	1.02	15	0.0116	61.62
27.0	4.0	31.5	27.5	11.9	0.0132	1.02	30	0.0083	58.84
26.5	4.1	30.5	26.4	12	0.0133	1.02	60	0.0060	56.36
26.5	4.1	28.2	24.1	12.4	0.0133	1.02	250	0.0030	51.45
26.0	4.3	25.0	20.7	13	0.0133	1.02	1440	0.0013	44.27

Submitted by: Hermann Walka, P.E.
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Shaw Environmental, Inc.

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

Location of Meeting: Teleconference

Date of Meeting: **July 18, 2006, 2:00 – 4:00 AM**

Meeting Participants:

BRAC:	Rose M. Zeiler
USACE-Tulsa:	Cliff Murray
USACE-Fort Worth	Harmon Slappy
USFWS:	Paul Bruckwicki
Shaw Environmental:	Praveen Srivastav, Van Vangala, Kay Everett, Frank Eidson
USEPA Region 6:	Chris Villarreal, Stephen Tzhone, Raji Josiam
TCEQ:	Fay Duke
Cape, Inc.	Rich Norton

Prior to the meeting Shaw and Army had distributed copies of the meeting agenda, minutes of June 27, 2006 Monthly Managers' Meeting, and document status tables for the TERC and PBC work via e-mail.

Rose Zeiler went through the list of action items from the previous monthly managers' meeting. Below are the highlights of this discussion:

- **Army – Resolve Future Use Issue for MMRP Sites:** Rose Zeiler indicated that a decision has been made regarding future use of these sites and it will be communicated to the contractor soon.
- **Army – Send Site 12 letter to regulators regarding change in alternatives**: The letter has not gone out yet but will be sent soon. (The letter was sent to regulators 7/26/06.)
- **Army – Check requirements for demolition documentation to be in the administrative record:** Pending
- **TCEQ – Provide comments on LHAAP-48/53 report, LHAAP-29 and 35/36 work plans: (**Comments on LHAAP-48/53 report and LHAAP-29 work plan were provided 7/5/06 and 7/7/06, respectively.) Still working on LHAAP-35/36 work plan review.
- **EPA – Provide comments on LHAAP-29 and 35/36 work plans:** Raji Josiam is reviewing the LHAAP-29 work plan addendum. (Comments were provided 7/17/06). LHAAP-35/36 work plan in review.

Defense Environmental Restoration Program (DERP) PBC Update (Praveen Srivastav)

Field Update. No field work planned for the next 3-4 weeks under the PBC.

GWTP. Van Vangala provided an update on the GWTP operation. There were no problems encountered during the past month other than regular maintenance activities. The water is low in extraction wells due to dry conditions; extraction is around 15 gpm. This has required the fluidized bioreactor (FBR) to be put in a recirculation mode. Last quarter approximately 1 million gallons of water were treated from LHAAP-18/24 ICTs and approximately 67,000 gallons from LHAAP-16. Shaw is sprinkling the water at LHAAP-16 landfill to alleviate discharge problems due to low stream flow and INF pond being near capacity. Also the grass at LHAAP-16 landfill is drying out and needs some irrigation. The filter cake is being processed and another shipment will have to be scheduled soon, probably in a month.

Document Status. PBC document status table was provided to the participants. Fay Duke is still reviewing LHAAP-35/36 work plan. Chris Villarreal indicated that Raji Josiam of EPA is the primary reviewer of LHAAP-35/36 work plan. EPA has provided comments on LHAAP-29 work plan to the Army. Army will forward comments to Shaw.

Military Munitions Response Program
Rich Norton of Cape provided an update on the MMRP sites. Following are the highlights:

- Cape has finished all non-intrusive work at Site 27. All intrusive work at the site is expected to be finished today (7/18/06)
- Cape has destroyed 21 photoflash cartridges to-date.
- Photoflash bomb disposal was near the center of Site 27 with firing points in the north. The OB/OD area was 900 feet in diameter
- The survey team will come after all intrusive work is complete
- At Site 54, a mortar pit existed between lanes 4 and 5. Cape has put another lane in between these lanes to outline the boundary of the pit.
- Cape has started on Site 53 intrusive work with 3 teams. They expect to be finished by next week.
- Survey teams are expected on Monday, 7/24/06 to survey boundaries of mortar pit, OB/OD areas, and UXO survey lanes
- There was some discussion of when Cape collects soil samples. Rose Zeiler made an observation that HTRW RODs are in place for Sites 27 and 54. With respect to MEC, only white phosphorus, which was considered a data gap not addressed under the HTRW investigation. Therefore, soil sampling is critical to show whether or not white phosphorus is an environmental issue at these sites. Rich Norton indicated that Cape is collecting data with a view that the regulators have enough data for their review. He indicated that Cape is collecting soil samples for each class of item when they detonate it. They make a notation in field notes when an item appears to be degraded. Cape collected one soil sample at Site 27 where an item had leaked.
- Harmon Slappy mentioned that they have not seen any sign at Site 27 that white phosphorus was used. They have not seen any signs of white phosphorus use at Site 53 yet but will know for sure when they are finished with the site.

- Fay Duke asked when would be a good time to visit the sites. Harmon Slappy replied that next week Monday – Tuesday (24-25 July) would be a good time because they expect to be done soon. Fay Duke to provide information to Harmon for security clearance.

Defense Environmental Restoration Program (DERP) TERC Update (P. Srivastav)

Document Status. TERC document status table was provided to the participants. Highlights of discussion are:

- Chris Villarreal indicated that the LHAAP-12 ROD signatures are in the final phase.
- Rose Zeiler mentioned that BRAC legal is reviewing the remedial design addendum for LHAAP-12
- Rose Zeiler mentioned that proposed plans for sites LHAAP-08, -32, -37, and -48, -53 and -67 were milestones for last year in the Annual Report to Congress. Now they are FY06 goals and it will be good to meet them this year. She further mentioned that Sites 08 and 32 are NFA sites and Sites 37 and 67 are MNA sites
- Shaw is revising the modeling report and will be producing the final report in August 2006. Praveen Srivastav requested any further comments from EPA on the response so that their comments are incorporated in the report.
- Shaw plans to mobilize for sampling at LHAAP-59 on July 31.

DERP Corps of Engineers Update (Cliff Murray)

Perimeter Well Sampling
USACE preparing response to Shaw's letter.

Other (Rose Zeiler)

Transfer Update. Rose Zeiler informed that funds for ECOP IV and other transfer issues are expected in FY07.

Demolition. Rose Zeiler informed the group that she received several calls the previous week regarding spill of mercury near the demolition contractor's office trailer. She elaborated that the contractor found a mercury switch at one of the buildings. They wanted the Army to take possession of it. When the Army refused to take possession, they took the switch to their office where the switch accidentally broke near the steps of the trailer. Paul Bruckwicki mentioned that the contractor had accumulated mercury in a bottle from other places and they were trying to pour mercury from the newly found switch into the bottle when mercury from the switch spilled to the ground. The contractor then used a vacuum to remove the spilled mercury. He wasn't sure what happened to mercury after that. Rose Zeiler mentioned that the events reported to her by the contractor are different from those mentioned by Paul Bruckwicki.
Rose Zeiler also mentioned that she was visiting LHAAP-53, where a contractor was filling pits, when a bat flew out of one of the pits. There was some discussion on the location of the

pit. After consultation with USFWS, Rose told the workers to leave the pit unfilled until further notice.

Electricity

- Rose Zeiler to attempt to resolve the electricity issue.

Schedule. Next monthly managers' meeting is scheduled for Aug 22 at 1:30 pm at Shaw's office in Houston.

Meeting Adjourned.

Action Items:

Army – Inform the team about future use of MMRP sites
- Send Site 12 letter to regulators re change in alternatives
- Check AR for demolition documents
- Resolve electricity issue

TCEQ – Provide comments on LHAAP-29 and 35/36 work plans
EPA – Provide comments on work plans for LHAAP-29, and 35/36

00041726
Shaw Environmental, Inc.
3010 Briarpark Drive, Suite 4N
Houston, Texas 77042
713.996.4400
Fax: 713.996.4401

Shaw® Shaw Environmental, Inc.

July 18, 2006

Mr. Cliff Murray
U.S. Army Corps of Engineers – Tulsa District
1645 South 101st – East Avenue
Tulsa, Oklahoma 74128-4529

RE: **Task Order No. 109**
Total Environmental Restoration Contract (TERC)
Contract No. DACA56-94-D-0020
Environmental Investigation and Remediation at
Longhorn Army Ammunition Plant, Karnack, Texas
Final Addendum 5 Additional Investigation at LHAAP-59 to the Final Work Plan Groundwater Data Gaps Investigation Groups 2 and 4
Longhorn Army Ammunition Plant, Karnack, Texas

Dear Mr. Murray:

Shaw Environmental, Inc. is pleased to submit the attached *Final Addendum 5 Additional Investigation at LHAAP-59 to the Final Work Plan Groundwater Data Gaps Investigation Groups 2 and 4* for your file. We are also sending copies of the document directly to individuals on the attached project document distribution list.

Please contact me if you have any questions or require additional information.

Sincerely,

Praveen Srivastav, Ph.D., P.G.
Project Manager

Longhorn Distribution List

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Fay Duke	Texas Commission of Environmental Quality	Texas Commission on Environmental Quality TCEQ Environmental Cleanup Section II, Team 2 (MC-221) 12100 Park 35 Circle, Bldg D Austin, TX 78753	Office: 512-239-2443 fduke@tceq.state.tx.us	2 - most 4-eco
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Paul Bruckwicki	US Fish and Wildlife Service	US Fish and Wildlife Service PO Box 230 Karnack, TX 75661 *OR* Caddo Lake NWR Hwy 134 & Spur 449 Karnack, TX 75661	Office: 903-679-4536 Cell: 903-407-0852 paul_bruckwicki@fws.gov	1

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

July 18, 2006

DAIM-BD- LO

Ms. Fay Duke
Texas Commission on Environmental Quality
Environmental Cleanup Section II (MC-221)
12100 Park 35 Circle
Austin, TX 78753

Re: Final Addendum 5 Additional Investigation at LHAAP-59, Final Work Plan Groundwater Data Gaps Investigation, Groups 2 and 4, Longhorn Army Ammunition Plant, Karnack, Texas, July 2006

Dear Ms. Duke,

The above-referenced document is transmitted to you for your file.

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, Ph.D.
Longhorn AAP Site Manager

Enclosure: Final Addendum 5 Additional Investigation at LHAAP-59, Final Work Plan Groundwater Data Gaps Investigation, Groups 2 and 4, Longhorn Army Ammunition Plant, Karnack, Texas, July 2006

Copies furnished:
Chris Villarreal, USEPA Region 6, Dallas, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE – Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
Praveen Srivastav, Shaw Environmental, Inc., Houston, TX

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

July 18, 2006

DAIM-BD-LO

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

Re: Final Addendum 5 Additional Investigation at LHAAP-59, Final Work Plan Groundwater Data Gaps Investigation, Groups 2 and 4, Longhorn Army Ammunition Plant, Karnack, Texas, July 2006

Dear Mr. Villarreal,

The above-referenced document is transmitted to you for your file.

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, Ph.D.
Longhorn AAP Site Manager

Enclosure: Final Addendum 5 Additional Investigation at LHAAP-59, Final Work Plan Groundwater Data Gaps Investigation, Groups 2 and 4, Longhorn Army Ammunition Plant, Karnack, Texas, July 2006

Copies furnished:
Fay Duke, TCEQ, Austin, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE– Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
Praveen Srivastav, Shaw Environmental, Inc., Houston, TX

Comments on Draft Final Addendum 5 Additional Investigation at LHAAP-59 Work Plan
Longhorn Army Ammunition Plan

July 2006

Reviewer: Stephen Tzhone, Superfund Remedial Project Manager, U.S. Environmental Protection Agency, Region 6
Reviewer: Fay Duke, Project Manager, Texas Commission on Environmental Quality
Respondents: Kay Everett and Praveen Srivastav, Shaw E & I

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.

EPA Comments (Stephen Tzhone)

Comment No.	Page	Section/ Paragraph	Comment	C, D[1], E or X	Response	A or D[2]
1	Pg 1-1	Section 1.2 (Site Description and History)	If available, please provide additional information regarding the "two nearby sumps" (SUMP119 and SUMP120). For example, did they discharge or were they contained. Have they been investigated, sampled or removed?	C	The two sumps were inventoried during an installation-wide inventory in 1993 and were found to be closed and filled with concrete. Subsequently, four soil samples were collected during the Phase III investigation, according to a report submitted by the Jacobs Engineering Group, Inc., January 2002, entitled Final Remedial Investigation Report. The following sentence was added to the first paragraph in Section 1.2: "The historical use and operation of the sumps in association with Building 725 is not clearly known."	
2	Pg 2-1	Section 2.1 (Sampling Locations)	Potential sample locations intended to reflect the influences of the two sumps should be evaluated in relation to known, suspected or potential site conditions as described in comment #1, with that evaluation noted in the proposal.	C	See response to Comment 4 below from Fay Duke.	
3	Pg 2-1	Section 2.2 (Sampling Methods and Procedures)	Please discuss the rationale for excluding the 1-3 foot interval	C	The following has been added to the last paragraph in Section 2.2: "Surface samples in the 0 to 1 foot interval are needed to determine if a spill or release had occurred during loading or unloading operations and subsequently carried from the paved areas to the adjacent soils through runoff. The 3 to 4 foot sample interval is needed to determine the extent of any vertical contamination. The results will be interpolated between the two sampling depths."	

TCEQ Comments (Fay Duke)

Comments on Draft Final Addendum 5 Additional Investigation at LHAAP-59 Work Plan
Longhorn Army Ammunition Plan

July 2006

Reviewer: Stephen Tzhone, Superfund Remedial Project Manager, U.S. Environmental Protection Agency, Region 6
Reviewer: Fay Duke, Project Manager, Texas Commission on Environmental Quality
Respondents: Kay Everett and Praveen Srivastav, Shaw E & I

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 No.	Page	Section/ Paragraph	Comment	C, D[1], E or X	Response	A or D[2]
4	NA	NA	I have also review the *Draft Final Addendum 5, Additional Investigation at LHAAP-59, Final Work Plan, Groundwater Data Gaps Investigations, Groups 2 and 4,* (Shaw Environmental, Inc., March 2006). I have also review EPA's comments on this report. I have no additional substantives comments and one minor one. It is my understanding that some of the proposed borings are to evaluate the impact the sumps have on the surrounding soils. Therefore, please verify the sump locations and previous soil boring locatioans. The locations of the sumps on Figure 1 seem to be different from those shown in the old reports (specifically, the 1993 Waste Sump Inventory Report by the US Army Corp of Engineer. Depending on the location of the sump, one may need to change the locations of some of the propose soil boring. The comment letter is in route for approval. But I thought I give you a heads up.	C	There is a discrepancy in the sump locations shown in the database versus those shown in the 1993 Waste Sump Inventory. The sump locations in Figure 1 will be revised to replicate the sump locations shown in the 1993 Waste Sump Inventory diagram. Two samples were previously collected from each sump location during sump closure activities as reported by Jacobs, but were not analyzed for pesticides. Proposed boring 59SB03 has been moved closer to SUMP119 and proposed boring 59SB06 has been moved closer to SUMP120. Revised Figure 1 will reflect these changes.	

FINAL

ADDENDUM 5
ADDITIONAL INVESTIGATION AT LHAAP-59

FINAL WORK PLAN
GROUNDWATER DATA GAPS INVESTIGATION
GROUPS 2 AND 4
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 Drive, Suite 4N
Houston, Texas 77042

Contract Number DACA56-94-D-0020
Task Order No. 0109

July 2006

FINAL ADDENDUM 5 ADDITIONAL INVESTIGATION AT LHAAP-59
FINAL WORK PLAN TO THE DATA GAPS INVESTIGATION
GROUPS 2 AND 4
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
JULY 2006

PRAVEEN SRIVASTAV
Name of Texas Professional Geoscientist

1696
License Number

SHAW ENVIRONMENTAL, INC.
Company

3010 BRIARPARK DRIVE, SUITE 4N, HOUSTON, TX 77042
Address

I certify with my signature below, that the written descriptions and graphical depictions of geology and hydrogeology contained within this report were prepared under my supervision, and accurately reflect existing knowledge about the geology and hydrogeology of the referenced site.

Signature

STATE OF TEXAS
PRAVEEN SRIVASTAV
GEOLOGY
1696
LICENSED
PROFESSIONAL GEOSCIENTIST

7/18/06
Date Signed

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Acronyms and Abbreviations

bgs	below ground surface
CDAP	Chemical Data Acquisition Plan
COC	chain-of-custody
DPT	direct push technology
GPS	global positioning system
ID	identifier
LHAAP	Longhorn Army Ammunition Plant
OVA	organic vapor analyzer
PID	photoionization detector
pH	potential of hydrogen
QC	quality control
Shaw	Shaw Environmental, Inc.
SVOC	semivolatile organic compound
TERC	Total Environmental Restoration Contract
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 Introduction

The U.S. Army Corps of Engineers (USACE), Tulsa District, contracted Shaw Environmental, Inc. (Shaw), under Total Environmental Restoration Contract (TERC) Number DACA56-94-D-0020, Task Order 0109, to perform an additional investigation at site LHAAP-59 (Building 725) at Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas. The site is a former pesticide storage building, Building 725, and is located near LHAAP-35A(58).

1.1 Project Objectives

This document is an addendum to the *Final Work Plan, Groundwater Data Gaps Investigation, Groups 2 and 4, Longhorn Army Ammunition Plant, Karnack, Texas* (Final Work Plan) (Shaw, 2004). The objective of the soil sampling described in this addendum is to collect soil samples from each side of Building 725 to confirm the presence or absence of pesticide compounds that may have been released. Field conditions encountered during the work may warrant a change in the number or location of the samples. The USACE will be informed and such changes will be documented in the field log book.

1.2 Site Description and History

LHAAP-59 (Building 725) is described as a former pesticide storage building with a concrete floor and floor drains. The drains likely discharged to two nearby sumps (SUMP119 and SUMP120). The historical use and operation of the sumps in association with Building 725 is not clearly known (Jacobs Engineering Group, Inc., 2002). The building has since been removed leaving a concrete slab measuring approximately 25 by 50 feet (see **Figure 1**).

Between 1993 and 1998, a remedial investigation for Group 4 sites included the collection of soil and groundwater in areas located near Building 725. A total of 14 soil samples from eight locations were collected in the vicinity of LHAAP-59 (Building 725). Samples were analyzed for metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and dioxins and furans (Jacobs Engineering Group, Inc., 2002). The samples were not analyzed for pesticides/herbicides, which are the site-related chemicals.

2.0 Field Investigation at LHAAP-59 (Building 725)

This section identifies the specific sample locations that are proposed at LHAAP-59 (Building 725). Additional samples are possible, based on future coordination with the USACE. The sample identifiers (IDs), as presented in this addendum, differ from the nomenclature presented in the Final Work Plan (Shaw, 2004). The IDs presented here were selected to continue the numbering sequences that are currently in use at each site.

2.1 Sampling Locations

At LHAAP-59 (Building 725), Shaw proposes to collect the following samples (excluding quality control [QC] samples) for pesticide and herbicide analysis. Soil sample locations will be next to the building foundation slab, drive areas where pesticides would typically be loaded and unloaded, and drain lines from two former sumps located in the vicinity of Building 725.

- A sample pair on each side of the driveway designated "A" on Figure 1 and facing 6th Street (59SB01 and 59SB02)
- A sample near the former SUMP119 drain lines (59SB03)
- A sample pair on each side of the driveway designated "B" on Figure 1, and facing 6th Street to the northeast (59SB04 and 59SB05)
- One sample to the southwest of Building 725 adjacent to the former sump drain line, SUMP120 (59SB06)
- One sample southwest of drive "C" (59SB07)
- One sample about 35 feet to the northwest of Building 725 and driveway "C" (59SB08)

Table 2-1 provides a listing of proposed soil samples. The proposed sampling locations are depicted in **Figure 1**.

2.2 Sampling Methods and Procedures

Soil sampling will be advanced using a hand auger. Borings will be advanced to approximately 4 feet. Two soil samples will be collected from each boring location. One sample will be from the surface interval, 0 to 1 foot below ground surface (bgs), and one sample will be from 3 to 4 feet bgs. Boring locations will be marked with a stake, where practical, and location coordinates will be obtained using a global positioning system device.

The procedures for sampling each boring are summarized as follows:

1. Set up work area with plastic sheeting.
2. Calibrate field analytical and health and safety instruments.
3. Don a new pair of disposable sample gloves between sampling intervals to prevent cross-contamination.
4. Decontaminate the sampling equipment as described in Section 4.5 in the Chemical Data Acquisition Plan, Appendix C of the Final Work Plan (Shaw, 2004).
5. Using a clean, decontaminated hand auger, select location for sample. Use the hand auger to auger 1 foot bgs.
6. Carefully place auger over plastic and using clean sampling gloves, collect sample and place in laboratory-supplied jar by removing soil from auger bucket.
7. Record the location, soil color, odor, texture, sample depth, and any field measurements obtained, including global positioning system readings, in the field logbook.
8. Label each sample container as described in Section 4.6.2 of Appendix C of the Final Work Plan (Shaw, 2004), enclose each container in a sealable plastic bag, and place in a cooler containing ice.
9. Record the sampling procedures on a Field Sampling Report or logbook.
10. Complete chain-of-custody documentation.
11. Maintain a photographic record of sample locations.
12. Dispose excess soil cuttings into the same bore hole.

Soil samples will be screened using an organic vapor analyzer or photoionization detector, and headspace readings will be taken and entered on the Field Sampling Report or logbook. Generally, samples collected for laboratory analysis will be from the surface (0 to 1 foot bgs interval) and from the 3 to 4 feet bgs. Surface samples in the 0 to 1 foot interval are needed to determine if a spill or release had occurred during loading or unloading operations and subsequently carried from the paved areas to the adjacent soils through runoff. The 3 to 4 foot sample interval is needed to determine the extent of any vertical contamination. The results will be interpolated between the two sampling depths.

Table 2-1
LHAAP-59 (Building 725) Soil Sampling for Pesticides and Herbicides

Sample ID	Approximate Location	Depth (feet bgs)	Purpose
59SB01-001	Approximately 10 feet from southeast corner of Building 725	0-1	Determine the presence or absence of contamination
59SB01-002		3-4	Determine the presence or absence of contamination
59SB02-001	Approximately 10 feet from east side of Building 725	0-1	Determine the presence or absence of contamination
59SB02-002		3-4	Determine the presence or absence of contamination
59SB03-001	Approximately 10 feet from east side of Building 725 adjacent to former Sump 119	0-1	Determine the presence or absence of contamination
59SB03-002		3-4	Determine the presence or absence of contamination
59SB04-001	Approximately 10 feet from northeast side of Building 725	0-1	Determine the presence or absence of contamination
59SB04-002		3-4	Determine the presence or absence of contamination
59SB05-001	Approximately 10 feet from northeast corner of Building 725	0-1	Determine the presence or absence of contamination
59SB05-002		3-4	Determine the presence or absence of contamination
59SB06-001	Approximately 10 feet from west side of Building 725 near former Sump 120	0-1	Determine the presence or absence of contamination
59SB06-002		3-4	Determine the presence or absence of contamination
59SB07-001	Approximately 10 feet from northwest corner of Building 725	0-1	Determine the presence or absence of contamination
59SB07-002		3-4	Determine the presence or absence of contamination
59SB08-001	Approximately 35 feet from north side of Building 725	0-1	Determine the presence or absence of contamination
59SB08-002		3-4	Determine the presence or absence of contamination

Note:
bgs below ground surface

2.3 Analytical Sampling

This section describes the analytical procedures applicable to soil samples to be collected according to this addendum. Samples will be collected and handled in accordance with Shaw standard operating procedures (Shaw, 2005). Samples are to be analyzed with 14-day turnaround time. Health and safety procedures, including screening methods, are described in the Site Safety and Health Plan, Appendix A of the Final Work Plan (Shaw, 2004).

The methods, containers, and holding times for the soil samples are presented in **Table 2-2**.

Table 2-2
Soil Analytical Method, Container, Preservative, and Holding Time

Site	Analysis	Method	Container	Preservative	Maximum Holding Time
LHAAP-59 (Building 725)	Pesticides/Herbicides	SW 8081A/8851A	4 oz Glass jar with Teflon-lined cap	$4^{o}C$	14 days to extraction 40 days to analysis

Note:
SW Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), latest edition (U.S. Environmental Protection Agency).

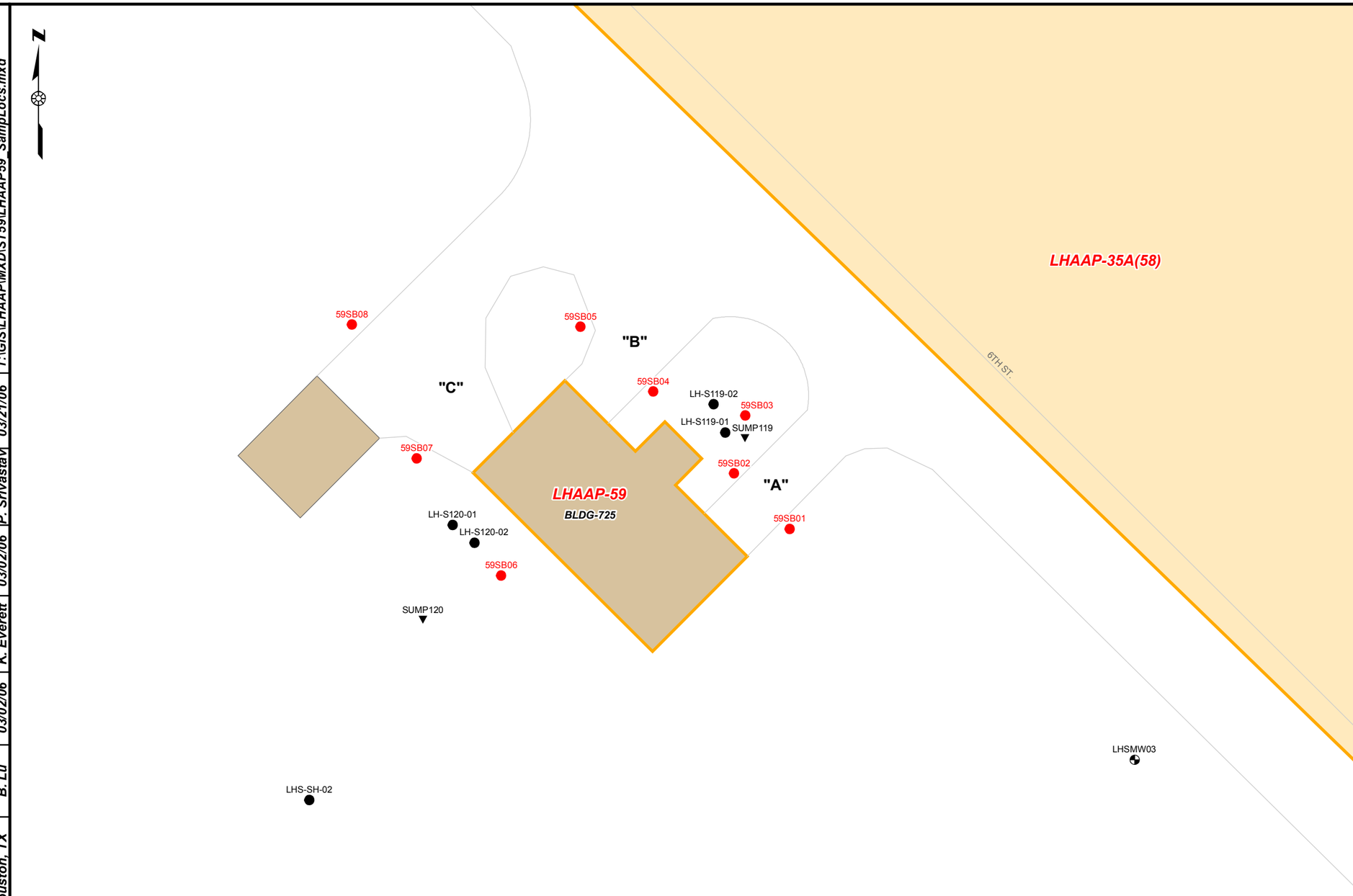
3.0 References

Jacobs Engineering Group, Inc. (Jacobs), 2002, *Remedial Investigation Volume 1: Report for the Group 4 Sites, Site 35A, 35B, 35C, 46, 47, 48, 50, 60, & Goose Prairie Creek*, Final, Oak Ridge, Tennessee, January.

Shaw Environmental & Infrastructure, Inc., 2005, *Standard Operating Procedures – Technical* (Intranet), Baton Rouge, Louisiana, December.

Shaw Environmental, Inc., 2004, *Work Plan Groundwater Data Gaps Investigation Groups 2 and 4 Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas*, Final, prepared for the U.S. Army Corps of Engineers, Tulsa District, by Shaw Environmental, Inc., Houston, Texas, February.

U.S. Environmental Protection Agency (USEPA), 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)*, 3rd Edition, Update IIIA (June 1999) or most recent update, Office of Solid Waste and Emergency Response, Washington, D.C., <http://www.epa.gov/epaoswer/hazwaste/test/main.htm> (March 2006).



Legend

- Proposed Soil Boring Location
- Shallow Monitoring Well
- Soil Boring
- Sump
- Road
- Building or Concrete Slab
- Site
- "A" Drive Area Identification

0 10 20 40 Feet

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

FIGURE 1

SAMPLE LOCATION MAP
LHAAP-59

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	03/02/06	K. Everett	03/02/06	P. Srivastav	03/21/06	T:\GIS\LHAAP\MXD\ST59\LHAAP59_SampLocs.mxd

Plot Date: 03/06

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

July 26, 2006

DAIM-BD-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
Superfund Investigation (MC-143)
12100 Park 35 Circle, Bldg D
Austin, TX 78753

Re: Addition of Monitored Natural Attenuation to the Recommended Alternative 2 at LHAAP-12, Longhorn Army Ammunition Plant, Karnack, Texas

Dear Ms. Duke,

During public review of the Draft Final ROD for LHAAP 12, additional comments were received from USEPA and TCEQ stating their concern that the remedy, Alternative 2 as set forth in the Proposed Plan, did not address the expectation that the groundwater remedy would reduce the contaminant level to MCL within a reasonable timeframe. Alternative 2 included maintenance of the existing landfill cap to hydraulically isolate the landfill, monitoring to ensure that nearby surface water bodies are protected, and land use controls to protect the existing remedy and prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health. In response to regulators' concerns, the U.S. Army added Monitored Natural Attenuation (MNA) as part of the selected remedy. The MNA remedy embodies natural biological, chemical, and physical processes that act to reduce the mass and concentration of groundwater COCs under favorable conditions. These natural attenuation processes include biodegradation, dispersion, dilution, adsorption, volatilization, and abiotic destruction of contaminants. Due to the potential for TCE-contaminated groundwater to migrate, MNA will be implemented to assure that the plume will not migrate to nearby surface water at levels that may present an unacceptable risk to human health and the environment. The monitoring and reporting associated with this remedy will continue until applicable or relevant and appropriate requirements (ARARs) are achieved.

To support the MNA remedy and to estimate the time required until ARARs are met, groundwater modeling was conducted. Based on the results of this modeling, groundwater ARARs are expected to be met through natural attenuation in 23 to 261 years. This effort is presented in the *Draft Final Results of Modeling for Natural Attenuation of Trichloroethene at LHAAP-12*, May 2006, previously transmitted electronically, and attached hereto in hard copy.

The addition of MNA to the remedy changes the comparative analysis of alternatives presented in the Feasibility Study. Specifically, there is a change in the compliance with ARARs criterion in that MNA results in the compliance with chemical specific ARARs. There are no other substantive changes to the threshold criteria evaluation, including little impact to cost. Based on

the information currently available, the U. S. Army believes the addition of MNA provides the best balance of tradeoffs among the other alternatives with respect to the CERCLA criteria.

As agreed by EPA, TCEQ and Army, the public has been informed of the addition of MNA to Alternative 2 through a Public Notice, published in the Shreveport Times and the Marshall News-Messenger on 25 June, 2006, the text of which is enclosed. Additionally, a presentation of the change was made to the Restoration Advisory Board during the June 2006 quarterly meeting.

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, Ph.D.
Longhorn AAP Site Manager

Enclosures
1. Draft Final Result of Modeling for Natural Attenuation of Trichloroethene at LHAAP-12, Longhorn Army Ammunition Plant, Karnack, Texas, May 2006
2. Public Notice of Change in Remedy

Copies furnished:
Chris Villarreal, USEPA Region 6, Dallas, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE-Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
Praveen Srivastav, Shaw Environmental, Inc., Houston, TX

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

July 26, 2006

DAIM-BD-LO

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

Re: Addition of Monitored Natural Attenuation to the Recommended Alternative 2 at LHAAP-12, Longhorn Army Ammunition Plant, Karnack, Texas

Dear Mr. Villarreal,

During public review of the Draft Final ROD for LHAAP 12, additional comments were received from USEPA and TCEQ stating their concern that the remedy, Alternative 2 as set forth in the Proposed Plan, did not address the expectation that the groundwater remedy would reduce the contaminant level to MCL within a reasonable timeframe. Alternative 2 included maintenance of the existing landfill cap to hydraulically isolate the landfill, monitoring to ensure that nearby surface water bodies are protected, and land use controls to protect the existing remedy and prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health. In response to regulators' concerns, the U.S. Army added Monitored Natural Attenuation (MNA) as part of the selected remedy. The MNA remedy embodies natural biological, chemical, and physical processes that act to reduce the mass and concentration of groundwater COCs under favorable conditions. These natural attenuation processes include biodegradation, dispersion, dilution, adsorption, volatilization, and abiotic destruction of contaminants. Due to the potential for TCE-contaminated groundwater to migrate, MNA will be implemented to assure that the plume will not migrate to nearby surface water at levels that may present an unacceptable risk to human health and the environment. The monitoring and reporting associated with this remedy will continue until applicable or relevant and appropriate requirements (ARARs) are achieved.

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Fay Duke, TCEQ – Cleanup Section, Austin, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE-Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
Praveen Srivastav, Shaw Environmental, Inc., Houston, TX

DRAFT FINAL

RESULTS OF MODELING FOR NATURAL ATTENUATION OF TRICHLOROETHENE AT LHAAP-12 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

TERC No. DACA56-94-D-0020
Task Order No. 109

May 2006

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Table 1 Estimation Time for TCE Concentration at the Source to be Reduced to the MCL (5 μg/L)

Acronyms and Abbreviations

μg/L	micrograms per liter
COC	chemicals of concern
DCE	dichloroethylene
foc	fraction of organic carbon
Kd	distribution coefficient
Koc	carbon-water sorption coefficient
LHAAP	Longhorn Army Ammunition Plant
MCL	maximum contaminant level
Shaw	Shaw Environmental, Inc.
TCE	trichloroethene

1.0 Introduction

LHAAP-12 is located approximately at the center of Longhorn Army Ammunition Plant (LHAAP) with LHAAP-67 to the north and LHAAP-16 to the southeast. The chemicals of concern (COCs) in groundwater are trichloroethene (TCE) and its daughter products cis-1,2-dichloroethylene (DCE) and vinyl chloride at maximum concentrations of 508, 110, and 2.1 micrograms per liter (µg/L), respectively. The COC concentrations are higher than the maximum contaminant levels (MCL) of 5, 70, and 2 µg/L respectively.

Modeling was performed to calculate the time required for the maximum TCE concentration of 508 µg/L detected at the "source" (monitoring well 12WW12) during the winter 2004 sampling event (U.S. Army Corps of Engineers and ALL Consulting, 2006) to naturally attenuate to the MCL level of 5 µg/L. The computer program, AT123D, was utilized to calculate the time for the natural attenuation of TCE.

This document discusses the modeling results.

2.0 Input Parameters

Groundwater modeling was based on the following assumptions and considerations:

- *Contaminant source*. Placement of a multilayer cap isolated the waste in Landfill 12 and minimized the leaching of contaminants to groundwater. The source is considered to be instantaneous, but a continuous source was also modeled to present a conservative comparison.
- *Aquifer parameters*. The aquifer parameters, including the hydraulic conductivity, effective porosity, and hydraulic gradient at LHAAP-12 were obtained from the most recent site groundwater monitoring report (U.S. Army Corps of Engineers and ALL Consulting, 2006). These parameters are consistent with the values used in the *Draft Final Modeling Report – Derivation of Soil and Groundwater Concentrations Protective of Surface Water and Sediment, Longhorn Army Ammunition Plant* (Shaw Environmental, Inc. [Shaw], 2005). These values are:
  - Average hydraulic conductivity (K) was estimated to be 7.55×10^{-4} cm/sec = 781.1 feet/year
  - Hydraulic gradient: 0.016 feet/feet
  - Effective porosity assumed at 0.25
  - The thickness of the shallow water-bearing zone is 12.5 feet

- *Chemical properties*. The distribution coefficient, Kd is the partition coefficient for a chemical to be distributed to soil and groundwater (Kd = Koc × foc). For TCE, the carbon-water sorption coefficient (Koc) obtained from literature values (Montgomery, 2000) is 100 cm^3/g and the fraction of organic carbon (foc) is assumed to be 0.1 percent (consistent with the Draft Final Modeling Report mentioned above). The Kd value is used to calculate the retardation factor.

- *Degradation rates*. Although recent investigations showed that TCE concentrations have slightly increased at the source area from 400 μg/L in 2002 to 508 μg/L in 2004, the presence of daughter products; cis-1,2-DCE and vinyl chloride in groundwater indicates that TCE has undergone some degree of degradation. Because a decreasing trend in TCE concentration is not clearly evident, a range of degradation rates for TCE were assumed during the current modeling; from a half-life of 4.5 years (Howard, et. al, 1991) to conservative 45 years, and to no degradation at all. The results are expected to be a wide range of the time period for TCE to naturally attenuate to the MCL.

3.0 Computer Code and Modeling Results

AT123D was chosen to evaluate the time for the recent TCE concentrations to naturally attenuate to the MCL of 5 μg/L. A pseudo three-dimensional grid was constructed such that the contaminant source is located 100 feet from the origin of the grid. This allows the change of concentration over time at the source to be recorded. The horizontal longitudinal axis extends to the potential receptor, which is at Central Creek, approximately 588 feet from the source. The horizontal transverse axis extends 60 feet on both sides of the longitudinal axis. The vertical axis extends to 12.5 feet, which is the thickness of the shallow water-bearing zone.

The modeling results are presented in **Table 1**.

4.0 Discussion

The type of the contaminant source (instantaneous or continuous) and the degradation rate of TCE are the major factors that influence the time for TCE to attenuate to the MCL at the source. Without consideration of degradation rate, the time for TCE to attenuate to the MCL for the instantaneous source is 486 years, whereas, it takes 2651 years for the continuous source option. The time for TCE to attenuate to the MCL is reduced dramatically if both cases are simulated with a half-life of 4.5 years (literature value from Howard et al., 1991). However, assuming a value of degradation with a half-life of 45 years, the time for TCE to attenuate to the MCL for the instantaneous and continuous sources increases to 118 years and 261 years, respectively. As evidenced by the presence of daughter products, there is some TCE degradation taking place at

the source; therefore, it is concluded that the values of 118 years and 261 years are more realistic.

5.0 References

Howard, P.H., R.S. Boethling, W.F. Jarvis, W.M., Meylan, and E.M. Michalenko, 1991, *Environmental Degradation Rates*, Lewis Publishers, Inc.

Montgomery, J.H., 2000, *Groundwater Chemicals Desk Reference*, 3rd Edition, Lewis Publisher.

Shaw Environmental, Inc., 2005, *Draft Final Modeling Report – Derivation of Soil and Groundwater Concentrations Protective of Surface Water and Sediment, Longhorn Army Ammunition Plant, Karnack, Texas*, prepared for U.S. Army Corps of Engineers, Tulsa District, Houston, Texas, March.

U.S. Army Corps of Engineers and ALL Consulting, 2006, *Groundwater Monitoring Report, Sites 12 and 16 – Spring 2003, Spring 2004, and Winter 2004, Longhorn Army Ammunition Plant, Karnack, Texas*, January.

Table 1
Estimation Time for TCE Concentration at the Source to be Reduced to the MCL (5 μg/L)

	Attenuation Period Assuming an Instantaneous Source (years)	Attenuation Period Assuming a Continuous Source for 10 years (years)
No Degradation	486	2,651
Half-life = 45 years	118	261
Half-life = 4.5 years	23	40

Notes:

μg/L micrograms per liter

MCL maximum contaminant level

TCE trichloroethene

Notification of Enhancement in the Selected Remedy for Site LHAAP-12 (Landfill 12) at the Former Longhorn Army Ammunition Plant

In March 2005, the United States Army prepared and submitted for public review a Proposed Plan document for LHAAP-12 (Landfill 12), Longhorn Army Ammunition Plant, Karnack, Texas. The Proposed Plan documented the recommended alternative for remedial action and implementation. The Proposed Plan identified Alternative 2 as the preferred remedial alternative. Alternative 2 includes maintenance of the existing landfill cap to hydraulically isolate the landfill, alternate concentration limit development to ensure that nearby surface water bodies are protected, and land use controls to protect the existing remedy and prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health.

During the public review of the Draft Final Record of Decision (ROD) for LHAAP-12, additional comments were received from the regulatory agencies (USEPA and TCEQ) stating the concern that the selected remedy did not address the expectation that the groundwater remedy would reduce the contaminant level to the maximum contaminant level within a reasonable timeframe. In response, the U.S. Army has added monitored natural attenuation (MNA) as part of the selected remedy. MNA remedy relies on natural biological, chemical, and physical processes that act to reduce the mass and concentration of groundwater chemicals of concern under favorable conditions. These natural attenuation processes include biodegradation, dispersion, dilution, adsorption, volatilization, and abiotic destruction of contaminants. Due to the potential for TCE-contaminated groundwater to migrate, MNA will be implemented to assure that the plume will not migrate to nearby surface water at levels that may present an unacceptable risk to human health and the environment. The monitoring and reporting associated with this remedy will continue until applicable or relevant and appropriate requirements (ARARs) are achieved. Based on groundwater modeling, groundwater ARARs are expected to be met through natural attenuation in 23 to 261 years.

The change in the selected remedy to include the added MNA has been included in the text of the Final ROD document and in the Responsiveness Summary. Copies of the Final ROD and supporting documentation will be available to the public at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670.

Aging: Hurricanes forced state to trim some allocations

■ Continued from 1A

Some senior adults in Red River Parish are not so lucky and that's the driving force behind Mary Wailes' desire to make sure the 24 programs offered by the Council on Aging continue uninterrupted.

Wailes

State budget cuts last year forced Wailes, the agency's executive director for the past 31 years, to reduce one employee's workweek and to lay off three workers. That meant homemaking service and delivered meals to 35 disabled people had to end.

"These people are not getting anything at all right now," Wailes said.

And while she doesn't like having to go to the public for help, Wailes is doing just that by asking for support of a 1-mill property tax on the Sept. 30 ballot. The approximately $27,000 that would be generated from the tax will be used to shore up the nutrition program and make sure every eligible senior or disabled adult is served.

The Red River Council on Aging is not the only group to look to the community for financial help. And it likely won't be the last.

Godfrey White, executive director of the Governor's Office of Elderly Affairs, said the councils on aging across the state are in similar financial situations as the cost of doing business, especially in labor and transportation costs, continues to creep past stagnant state and federal funding sources.

Last year's back-to-back hurricanes forced the state to trim some of its allocations, White said. But all monies have been restored for the fiscal year beginning Saturday.

The Caddo Council on Aging lost about $100,000 to budget cuts following hurricanes Katrina and Rita. The organization started looking for businesses that would help deliver meals so it could pay less for drivers. In March, the organization used its annual March for Meals on Wheels to raise awareness about the overall financial situation as well as help secure funding for the program that serves homebound senior citizens.

"There won't be any cuts as we have first stated," White said Friday.

Still, he supports those councils on aging that are looking to their communities via tax requests to boost the bottom line. Local communities or parish governments should be

With an annual budget of about $700,000, the extra funding is not available for major improvements, Baker said, and one of the goals is to eventually build a senior center that the Council on Aging would own.

The Natchitoches Parish Council on Aging, which has undergone a leadership change, could get additional money if voters approve a half-cent sales tax that the Natchitoches Parish Police Jury is putting on the July 15 ballot. A percentage of the funds would be directed to the agency.

A recent audit of the agency's funds — a standard practice when an executive director resigns — indicates that it will finish the year in the black. "I just got a report on that," White said.

The Natchitoches council recorded revenue of just over $1 million as of June 30, 2005.

White said he was pleased to learn the troubled DeSoto Council on Aging appears to have turned the tide and its financial picture "is not as bleak as first thought."

Budget issues and personnel squabbles have haunted the DeSoto council for several months. It started when Director Sharon Procell eliminated meal site manager positions and cut back on the transportation program to overcome what was thought to be a deficit estimated at more than $100,000. In the midst of the financial uncertainty, Procell and seven members of the Board of Directors resigned.

However, on June 15, former Executive Director Kim Forcinel told the recently formed board — seven new members were added during a special meeting — that she didn't believe the council was the victim of missing money. Instead, she questioned whether billing problems contributed to the shortfall.

Forcinel provided a printout of revenue versus expenses and also volunteered her services to assist in getting the ailing agency back on track.

"We've found that some services had not been billed, so once we get that straightened out everything should be OK," White said.

A representative of his office will remain on site for the next week or so to work with the recently trained co-directors to ensure a smooth transition, he added

"So far, we're doing pretty good," said Carletta Johnson, assistant director of the Bossier Council on Aging. "When Katrina and Rita hit and we heard some cuts might be coming down, we tightened our belts."

That included not filling positions as people resigned and doing without

Johnson said.

The Bossier Council on Aging serves up to 4,000 elderly residents each month with services ranging from exercise programs at senior sites to housekeeping assistance.

Webster Parish Council on Aging Executive Director Dathene Brown was out of town and unavailable for comment, but according to the most recent audit, the agency did not have a deficit fund balance for the year ending June 30, 2005. The Webster council recorded revenue of $611,711, with 88 percent of that reportedly coming from federal, state and local grants.

Tax works for one agency

It was a lack of a meal site manager, not money problems that temporarily shut down a gathering place for senior adults in the Sabine Parish village of Converse. Harold Brumley, whose father ate at the site regularly, was concerned when he learned it closed, and he was quick to start asking questions.

"We passed a sales tax to increase services and then the site closes. I did have some concern as to why the center closed," Brumley said. "It gives my father and the others a place to go and see each other."

Sabine Council on Aging Executive Director Linda Rigsby said the site was re-opened early this month when a new manager was hired. Attendance has yet to pick up, but Rigsby expects that to change.

The Sabine council is fortunate to have the public's backing with a one-quarter of one-cent sales tax — approved in July 2003 — that in 2005 added $597,811 to the $1 million budget. The extra revenue helped to fund construction of a newly opened senior center.

Operating as a business

Wailes, 85, believes she's run the Red River Council on Aging as tight as she can. A former bookkeeper and business owner, Wailes created her own bookkeeping system that allows her to track every penny passing through the agency.

"I can tell that it costs us 32 cents per serving of green beans," she quipped as she pulled receipt slips from her desk drawer that gives her the total of the day's donations that are destined for the bank. "We consider it a business and we run it like one."

Wailes believes the Red River agency is serving the public as efficiently as it can through the $843,000 annual budget. One of the biggest savings is in the food program.

typically sees more than 150 people pass through each day.

"We do not have a waiting list and we can serve all of the seniors that need a meal," Wailes said. "We home deliver over 85 percent of the parish."

Arrangements with two local farms allow fresh vegetables to be served. That same arrangement fosters a separate program whereby 333 seniors can use coupons to get fresh vegetables. Another 320 people are enrolled in a Catholic charity program that provides them with 40-pound boxes of food every other month.

"We touch a large percentage of the parish on a daily basis," Wailes said. "And we save the state an awful lot of money by doing things ourselves."

Of the parish's approximate 9,600 residents, about 1,760 are over age 60 and 1,281 over 65. Another 657 are classified as disabled.

"We and the board are working real hard," Wailes said. Transportation Director Katherine Braswell added: "And we have a lot of people who come in and help us."

Wailes' goal is to continue to offer services that help the elderly and disabled live as independently as possible at home, rather than in a nursing home. The Red River council has one of only three adult health day care programs located north of Alexandria.

"If it closed, I don't know what I'd do. It's one of the best things this town has known," Watson said of the Red River Council on Aging.

■

Times reporter Melody Brumble contributed to this report.

Notification of Enhancement in the Selected Remedy for Site LHAAP-12 (Landfill 12) at the Former Longhorn Army Ammunition Plant

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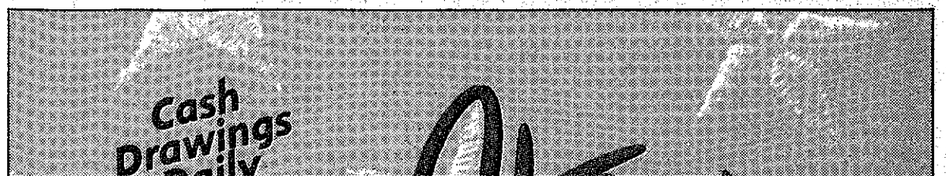

The Times

PROOF OF PUBLICATION

STATE OF LOUISIANA
PARISH OF CADDO

Before me, the undersigned authority, personally came and appeared

Adrian Soyars, personally known to

me, who being duly sworn, deposes and says that she/he is the Assistant to the Retail Advertising Manager of The Times, and that the attached Advertisement entitled: Notification of Enhancement... Longhorn Army Ammunition Plant.

As per copy of advertisement hereto annexed, was published in The Times on the following dates to wit:

Date(s): Sunday June 25, 2006

(Signed) A Soyars

Sworn to and subscribed before me this 28th day of June, 2006

Judy A. Maloney
Notary

JUDY A. MALONEY, NOTARY PUBLIC
CADDO PARISH, LOUISIANA
MY COMMISSION IS FOR LIFE

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00041758

Proof of Publication

from

MARSHALL NEWS MESSENGER

P.O. BOX 730 MARSHALL, TX. 75670 (903) 935-7914

STATE OF TEXAS
COUNTY OF HARRISON

On this 27th day of June, 20 06 personally appeared before me the undersigned, a Notary Public in and for said county and state.

Deborah M Green

of the MARSHALL NEWS MESSENGER, a daily newspaper published at MARSHALL, County of HARRISON, State of TEXAS, who, being by me duly sworn, states that the attached advertisement, a true copy of which is hereto annexed, was published in said newspaper in its issues thereof on the following dates:

25th	day of	June	20	06
	day of		20	
	day of		20	
	day of		20	
	day of		20	
	day of		20	

Deborah M Green

Subscribed and sworn to before me this 27th day of June 20 06.

Jacqueline V. English

Notary Public, Harrison County, Texas

My Commission expires 11-8-2008

NOTARY PUBLIC STATE OF TEXAS

JACQUELINE V. ENGLISH
Notary Public
STATE OF TEXAS
My Commission
Expires 11/08/2008

00041759

Shaw® Shaw Environmental, Inc.

Date: ***August 16, 2006***

Project No.:117591

TRANSMITTAL LETTER:

To: Mr. Cliff Murray

Address: US Army Corps of Engineers - Tulsa

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

Re: **Final Addendum 6 Additional Investigation at LHAAP-29 Former TNT Production Area**
Final Installation-Wide Work Plan
Longhorn Army Ammunition Plant - Karnack, Texas

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	3	August 2006	**Final Addendum 6 Additional Investigation at LHAAP-29 Former TNT Production Area, Final Installation-Wide Work Plan**

Enclosed are three copies of the above-named document for your use. Please distribute to interested parties. Copies have also been sent as indicated on distribution list below.

Please call if any questions or comments.

Sincerely:

David P. Cobb

CC: See attached page

100 Technology Center Drive Stoughton, MA 02072 Phone: (617) 589-8000/Fax: (617) 589-2160

Distribution List:

Mr. Rick Smith, USACE, Tulsa (sent to C. Murray for distribution)
Mr. Ken Kebbel, USACE, Tulsa (sent to C. Murray for distribution)
Mr. Chris Villearreal, USEPA, Dallas
Ms. Fay Duke, TCEQ, Austin
Mr. Tom Erny, TCEQ, Tyler
Mr. Paul Bruckwicke, USFWL
Mr. Jeff Armstrong - AEC
Ms. Rose Zeiler – BRAC-LHAAP

00041760

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

August 16, 2006

DAIM-BD-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
TCEQ Environmental Cleanup Section II MC-221
12100 Park 35 Circle
Austin, TX 78753

Re: Final Addendum 6 Additional Investigation at LHAAP-29 Former TNT Production Area, Longhorn Army Ammunition Plant, Karnack, Texas, August 2006

Dear Ms. Duke,

The above-referenced document is being transmitted to you for your review. 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 David Cobb, 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, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
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Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE – Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
David P. Cobb, Shaw – Stoughton, MA
P. Srivastav, Shaw – Houston, TX (for project files)

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

August 16, 2006

DAIM-BD-LO

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

Re: Final Addendum 6 Additional Investigation at LHAAP-29 Former TNT Production Area, Longhorn Army Ammunition Plant, Karnack, Texas, August 2006

Dear Mr. Villarreal,

The above-referenced document is being transmitted to you for your review. 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 David Cobb, 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, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
Fay Duke, TCEQ, Austin, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE – Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
David Cobb, Shaw – Stoughton, MA
P. Srivastav, Shaw – Houston, TX (for project files)

Response to Comments on
Draft Final Addendum 6, Additional Investigation at LHAAP-29, Former TNT Production Area
Longhorn Army Ammunition Plant, Karnack, Texas (May 2006)

August 2006

Reviewer: Fay Duke, TCEQ; Raji Josiam, U.S. EPA, Region 6
Respondent: 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 #	Reference	Comment	C, D[1], E or X	Response	A or D[2]
TCEQ Comments: Fay Duke					
1	Section 1.1, Project Objectives, Contents Remaining in Former Transite Wastewater Line	It is stated that "while the transite line, located adjacent to the existing wood TNT wastewater line, is reported to be in good condition, it content have never been sample." Please provide the rational for why the wastewater line content will only be analyzed for explosives.	C	The transite line, like the wood line, is reported to be a TNT wastewater line. As noted in the Data Summary report, both explosives and metals were detected in samples of the wood line contents or samples of soil beneath the lines. Those results were included in the 2002 human health risk assessment (Jacobs, 2002), but the risk assessment did not identify metals as a major contributor to risk in soil or groundwater. In addition, metals are not part of the TNT production process. Since contents of the transite line would be similar to the wood line, analyses of samples from the transite will focus on the compounds with the potential to contribute risk (i.e., the explosives).	
2	Section 1.1, Project Objectives, Groundwater Samples and Section 1.4, Extent of Contamination	Based on our review of the data collected to date, the TCEQ recommend additional investigations for the possible presence of DNAPL in area affected by high concentration of methlyene chloride. Our recommendation is based on the following observations: • Methylene chloride has been detected in 29WW 16 as high as 8,600,000 microgram per liter, which is more than 50% of the solubility of the compound. • Concentrations have increased in this well over time. The specific gravity of methylene chloride is denser than water which suggests the likelihood of downward migration. • Review of the well completion log for 29WW15 and 29WW16 suggests that these wells are not screened at the bottom of the saturated zone. We recommend that additional wells, to be installed in this area, have screen intervals across the interface of the saturated zone and the confining layer so that the presence of DNAPL, if any, could be detected.	C	Given the high concentration of methylene chloride in 29WW16, Shaw already assumes that there is DNAPL in this vicinity; therefore, the purpose of the proposed additional wells and sampling is not to detect the presence of DNAPL, but rather to delineate horizontal and vertical extent of methylene chloride in the groundwater to ensure that any future response action addresses the full region of impact. Regarding the screen interval, please see response to Comment #7.	

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Respondent: Shaw Environmental, Inc.

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Comment #	Reference	Comment	C, D[1], E or X	Response	A or D[2]
		Additional Comments (8-14-06): Please be aware that given the fate and transport behavior of DNAPL may be different from the dissolve phase plume, placement of wells based on groundwater gradient could result in an incomplete delineation of the extent of contamination.		Comment has been noted.	
3	Section 1.1, Project Objectives, Groundwater Samples, Figure 1-4 and Figure 1-6.	It appears that the extents of nitrotoluene and perchlorate contaminations in the shallow groundwater are not well defined in the northwest direction. Please consider adding additional wells in this area to delineate the extent of nitrotoluene and perchlorate contamination. Additional Comments (8-14-06): We would like to clarify that our data gap concern is in the vicinity "east" of 29WW05. It is also our understanding that a well may not be necessary in this area because, based on Shaw's interpretation, a groundwater divide exists in the vicinity of 29WW05. Please note that Figure 2-44 of the Plant-Wide Perchlorate Investigation Report by Solution To Environmental Problems, Inc (STEP) the groundwater elevation map had a slight different interpretation. We notice that the interpretation in the STEP report is based on data from many more well points than the Shaw's Data Gap report. Therefore, we request that water level be collected from all existing wells to confirm the groundwater anomaly.	D	For perchlorate, well 29WW36 is proposed to address the need for further delineation to the northwest. For nitrotoluene, the one significant detection (29WW05) is bounded by non-detects to the north (29WW11), west (29WW12), and southwest (29WW07). Since the shallow groundwater flows toward the east and southeast, Shaw feels that there is sufficient coverage to the northwest. Comment has been noted. Shaw is planning to collect a round of water levels across the entire site prior to sampling. See Section 2.5.	

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4	Section 1.1, Project Objectives	It is stated in Section 4.2.1.1 (Foundation) of the *Site Data Summary Report* that "area of stained soil require further investigation and evaluation for explosive. Lack of VOC analysis near well 29WW15 and 29WW16 is considered a data gap." Please clarify why these data gaps are not being address in this round of sampling.	C	Foundations of process buildings and soil around them were examined and screened for TNT and related compounds during field investigations conducted by USACE and Plexus in 2003 - 2005. TNT is known to oxidize if exposed to the atmosphere and create a characteristic red staining of the soil. The staining was observed in certain areas around foundations. In other areas, field screening indicated the presence of low levels of TNT or related explosives. This indicates that some TNT may have been spilled or leaked near the foundations in certain areas but it does not represent pervasive contamination. Shaw plans to remove the stained soil during the response action at the site. Therefore, further characterization is not considered necessary. It is also expected that confirmation sampling will be required to indicate if soils left behind after an excavation meet the remedial goals. A membrane interface probe (MIP) investigation was conducted subsequent to the investigation with data presented in Appendix A along with the June 2005 Draft Data Summary Report. The MIP investigation was conducted to find the source of methylene chloride in the vadose zone at LHAAP-29. At location 29MIP-10, which is located in the vicinity of 29WW15, no methylene chloride was detected in the 12- to 16 feet interval below ground surface interval although concentrations of trichloroethylene (TCE) and 1,2-dichloroethane (1,2-DCA) were detected. Other MIP location results indicated VOCs are present in the shallow zone. A source of methylene chloride contamination was not confirmed with this survey. The addendum will be modified to indicate that during the installation of 29WW40, soil cores from the vadose zone will be screened with the PID. The field lead will	

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				select at least two samples from cores exhibiting the highest PID readings to be submitted to the laboratory for VOCs analysis in the shallow vadose zone. The following will be inserted under Section 2.3, Task 3 as a new paragraph: "At well 29WW40, two soil samples will be collected from the vadose zone core exhibiting the highest PID readings and submitted for laboratory analysis. The samples will be analyzed for VOCs to determine if there is a residual source in the soil."	
5	Figure 2-1	Base on our review of the groundwater elevation contour maps for the shallow zone (Figure 3-4 of the *Data Gap Investigation Report* and Figure *4-2* of the *Site Data Summary Report,* the proposed monitoring well 29WW38 does not appear to be located downgradient of 29WW15 (area suspected to contain high concentration of methylene chloride and perchlorate). Therefore, we recommend that the proposed well be moved or an additional well be installed at the corner of 18th Street and Avenue N.	C	The location of shallow well 29WW38 and 29WW39 will be shifted northeast approximately 600 feet.	
6	Section 2.3 1.1-Bench-Scale Chemical Oxidation Testing	It is stated that soil will be collected form the intermediate zone sands from an area "representatives of the contaminated zone" for the bench-scale testing. Please clarify and elaborate the method the sampling crew will use to determine "representative" samples.	C	To clarify this, the 2nd sentence of the 2nd paragraph of Section 2.3.1 will be replaced with the following: "The soil will be collected from the intermediate zone during installation of Well 29WW40. The field geologist will select the soil from within the depth interval between the top of screen zone for 29WW16 and the saturated zone/confining zone interface. PID readings and visual observations will be used to select a heavily contaminated sample from within that interval."	
7	Section 2.3, Monitoring Well Installation	It is stated shallow monitoring wells will be installed at a depth of 45 feet bgs and intermediate wells will be installed at a depth of 88 feet bgs. Please ensure that in area suspected to have DNAPL, the bottom of the	C	The following information will be inserted into the first paragraph of Section 2.3 on page 2-4: "The bottom of the screens of shallow and	

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		screens for the wells are set below the interface between the saturated zone and the confining layer.		intermediate wells will be set either at the top of the confining clay layer below these zones or a few inches into the confining layer, where allowed by the drilling method, so that any DNAPL present may be detected. The depth of installation of the proposed three intermediate and one deep well and associated isolation casings will be determined based on lithologic information obtained from split spoon or continuous sampler run ahead of the hollow stem auger or mud rotary bit. Lithological sampling will begin approximately 10 feet above the anticipated depths of confining layers below shallow/intermediate zones, based on drilling log data from existing wells at the site. In the event that the sampler extends below the confining layer, the borehole will be plugged back to the zone of interest with a bentonite seal."	
8	Section 2.5, Groundwater Sampling	In accordance with section 3.2.4 of the *Data Gap Investigation Report,* other VOCs were not detected due to high reporting limits. Additionally, the May 2005 Membrane Interface Probe Investigation suggests that other chlorinated VOC may also be present. Please include other VOC analysis in the groundwater sampling.	C	While methylene chloride will likely be the focus of the investigation, the VOC suite will provide additional useful information. Therefore, analyses that are indicated as methylene chloride in the draft final addendum will be revised to VOCs in the final.	
9	Appendix A – Draft Site Data Summary Report for LHAAP-29	This report is a compilation and summary of the numerous investigation conducted previously at this site. We commend Shaw for preparing this report to facilitate our review of the work plan. However, we have concerns that certain conclusions made in this report are based on the Modeling Report that have not been approved. Additionally, we were unable to locate a soil to groundwater pathway evaluation which eliminates soil as a source of contamination.	C	Shaw is currently resolving comments on the Modeling Report and anticipates that the document will soon be finalized. Army used the TERC to compile the Site 29 data into the Summary Report as a measure to reduce the uncertainty associated with Site 29 for the PBC bidders. The document was intended for informational purposes only – not review. The Army does not intend to finalize the document. The results presented within the Data Summary Report include data that indicate that soil contaminated with perchlorate exists in the	

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				northeastern part of the site and explosive-contaminated sediments exist in the drainage ditch in the eastern part of the site. These areas will be addressed during the remedial action at the site. Further, there is contamination of groundwater with perchlorate in the northern part of the site and with explosives compounds in the vicinity of the drainage ditch. The pathway from soil to groundwater is thus known and does not warrant any further evaluation.	
EPA Comments: Raji Josiam					
1	Page 1-1 Section 1.0	A brief explanation of the background why this additional sampling is being done would help and make this a stand alone document.	C	The following text will be added as the third paragraph of Section 1.0: "LHAAP-29 was a TNT production area during World War II. In subsequent years, a building (801-F) in the northern tip of the site was used in rocket motor cleaning. Past investigations have demonstrated that various media at the site are contaminated with explosives compounds, volatile organic compounds (VOCs), and/or perchlorate. This addendum presents a program for collecting and analyzing additional samples that will help delineate the extent of contamination."	
2	Page 1-3 1st Paragraph	"The collection of these additional sediment samples from the wastewater lines will help…" Shouldn't the "wastewater lines" be actually "cooling water outfall ditch"?	C	The entire sentence will be reworded to read as follows: "The collection of these additional sediment samples from the cooling water outfall ditch will help delineate the extent of TNT contamination along the northern 800 feet of the ditch."	
3	Page 2-4 2nd Paragraph	"A 3-foot thick bentonite seal (pellets or chips) will be placed above the sand filter pack and hydrated with portable water". Should "portable" water be "potable" water?	C	The word "portable" will be changed to "potable."	

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Comment #	Reference	Comment	C, D[1], E or X	Response	A or D[2]
4	Page 2-6 Section 2.3.2 Well Development	"The volume of groundwater removed form each well will be calculated…" Shouldn't "form" be "from"?	C	The word "form" will be changed to "from."	
5	Sections 2.5, 2.6, and 2.7	These sections give the procedure how groundwater samples will be collected. Please add something in these sections indicating where the samples will be sent for analysis.	C	A sentence will be added to each section that states, "Analytical samples will be submitted to Kemron Laboratories in Marietta, Ohio."	
6	Page 2-10 Table 2-3	Not sure what the station numbers 1+00, 15+50, 16+00, 44+00 mean. Maybe because I have not seen the original document I may be missing something.	C	The station numbers will be removed from Table 2-3.	
7	Page 2-13 Section 2.8.2 Wastewater	"Containers will be transported to the GWTP at LHAAP-18/24 for disposal…" Will this be sent for "disposal" or "treatment" at the GWTP?	C	The second sentence in section 2.8.2 will be revised to read: "Containers will be transported to the GWTP at LHAAP-18/24. Container contents consisting of fluids generated by equipment decontamination, well development, sampling and purging activities will be released in the influent stream of the GWTP for treatment; however, any free product that is removed from the wastewater lines or monitoring wells as part of this investigation will remain containerized, will be sampled for disposal options, and transported off site for disposal if not considered acceptable to be treated at the GWTP."	
8	Page 2-13 Section 2.8.2	Wastewater last line GTWP should be GWTP.	C	The acronym "GTWP" will be changed to "GWTP".	

FINAL
ADDENDUM 6
ADDITIONAL INVESTIGATION AT LHAAP-29
FORMER TNT PRODUCTION AREA
TO
FINAL INSTALLATION-WIDE WORK PLAN
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 Drive, Suite 4N
Houston, Texas 77042

Contract Number W912QR-04-D-0027
Task Order No. DS02

August 2006

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Appendix A
1. Draft Site Data Summary Report LHAAP-29 (unreviewed), Shaw 2005 (on CD)
2. Membrane Interface Probe Report, LHAAP-29, Shaw 2005 (on CD)

Acronyms and Abbreviations

µg/L	micrograms per liter
AST	aboveground storage tank
ASTM	ASTM International (formerly American Society for Testing and Materials)
bgs	below ground surface
CDAP	Chemical Data Acquisition Plan
COC	chain-of-custody
DNT	dintrotoluene
FID	flame-ionization detector
GWTP	groundwater treatment plant
HASP	Health and Safety Plan
HDPE	high-density polyethylene
LHAAP	Longhorn Army Ammunition Plant
MARC	Multiple Award Remediation Contract
MIP	Membrane Interface Probe
pH	hydrogen ion concentration
PID	photo-ionization detector
PPE	personal protective equipment
PVC	polyvinyl chloride
Shaw	Shaw Environmental, Inc.
TNT	trinitrotoluene
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 Introduction

The U.S. Army Corps of Engineers (USACE), Tulsa District, contracted Shaw Environmental, Inc. (Shaw), under the Louisville District's Multiple Award Remediation Contract (MARC) No. W912QR-04-D-0027, Task Order DS02, to attain remedy-in-place, operating properly and successfully, or response complete at 28 sites at the Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas. This document is an addendum to the *Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas* (Shaw, 2006a) and presents the proposed approach for a focused investigation of soil and groundwater at the former Trinitrotoluene (TNT) Production Area designated as LHAAP-29.

The LHAAP is located in central-east Texas in the northeastern corner of Harrison County **(Figure 1-1)**. The facility occupies 8,493 acres between State Highway 42 in Karnack, Texas, and the western shore of Caddo Lake. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the east. 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.

LHAAP-29 was a TNT production area during World War II. In subsequent years, a building (801-F) in the northern tip of the site was used in rocket motor cleaning. Past investigations have demonstrated that various media at the site are contaminated with explosives compounds, volatile organic compounds (VOCs), and/or perchlorate. This addendum presents a program for collecting and analyzing additional samples that will help delineate the extent of contamination.

1.1 Project Objectives

The objective of this sampling event is to collect samples of the transite line contents, sediment samples along the former cooling water ditch, and groundwater at LHAAP-29 to further delineate the extent of contamination at the site. The sample data will be used in conjunction with existing environmental media data from the site to prepare a Focused Feasibility Study and Proposed Plan for LHAAP-29. This sampling work plan summarizes Shaw's approach to collecting additional samples. The objective can be described more specifically as follows:

- **Contents Remaining in Former Transite Wastewater Line** – Five wastewater line content grab samples, including one duplicate sample, will be collected from the transite TNT wastewater line at LHAAP-29. While the transite line, located adjacent to the existing wood TNT wastewater line, is reported to be in good condition, its contents have never been sampled (Shaw, 2005a). The wastewater line content samples will be analyzed for explosives to characterize any contents remaining in the wastewater line.

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PLOT DATE: 2/09/06
FORMAT REVISION 5/13/02

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
TYLER(250_000)	---	Houston, Texas	J. RDZ	2/09/06	--	--	--	--	117591-A2

M I L E S

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REFERENCE:
U.S.G.S. QUADRANGLE OF
TYLER, TEXAS; LOUISIANA 1956, REVISED 1977
SCALE 1:250,000

Shaw

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

FIGURE 1-1

LHAAP LOCATION MAP
LHAAP-29 SAMPLING WORK PLAN
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

- **Sediment Samples along the Former Cooling Water Outfall Ditch** – Four sediment grab samples, including one duplicate sample, are proposed to be collected along the former cooling water outfall ditch. These samples will be situated hydraulically downgradient from the location of a previous sediment sample, which exhibited elevated concentrations of the explosives compounds TNT and dinitrotoluene (DNT). These sediment samples will be analyzed for explosives (Shaw, 2005a). The collection of these additional sediment samples from the cooling water outfall ditch will help delineate the extent of TNT contamination along the northern 800 feet of the ditch.

- **Groundwater Samples** – A total of nine groundwater samples, including a duplicate sample, will be collected from seven wells (six shallow and one deep) to be installed as part of this investigation and one existing monitoring well. Previous analytical data have identified concentrations of explosives, perchlorate and VOCs, consisting primarily of methylene chloride, in shallow groundwater at LHAAP-29. Elevated concentrations of methylene chloride were also detected in the intermediate and deep groundwater zones. The additional groundwater samples from the wells to be installed will further delineate the vertical and lateral extent of perchlorate and methylene chloride in the shallow groundwater zone, and methylene chloride in the intermediate and deep groundwater zones. Prior to groundwater sampling, groundwater levels will be measured in all the wells at the site.

Field conditions encountered during the work may warrant a change in the planned number of samples and the type and number of wells installed. Such changes will be documented in the field log book and the USACE will be informed in a timely manner.

1.2 Site Description and History

LHAAP-29, known as the former TNT Production Area, is a heavily wooded, 85-acre site in the western-central portion of the LHAAP installation **(Figure 1-2)**. The site is bounded by Avenue E on the southwest, Zeugner Drive (also known as 1st Street) on the northwest, 18th Street on the southeast, and Avenue D, the northeastern boundary of LHAAP-29. LHAAP-29 includes the Bulk Toluene Storage Area, which is a wooded area that extends for approximately 500 feet northeast of Avenue D. LHAAP-29 is currently inactive, but once contained five active and one standby TNT production lines. The foundations for the former production facilities and the underground pipe lines that were originally constructed for cooling water drainage and TNT wastewater conveyance still remain at the site.

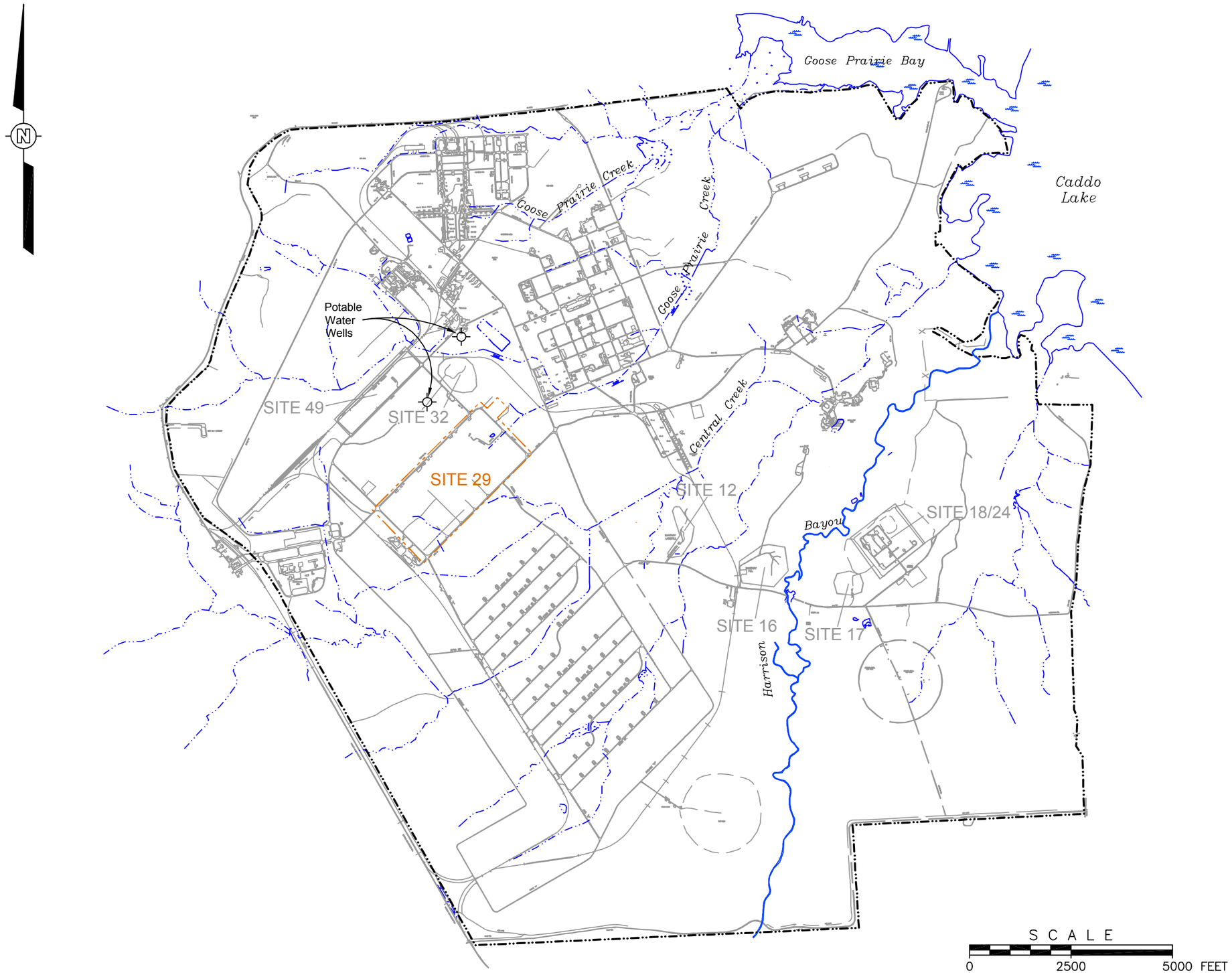
The former production facilities at LHAAP-29 were served by a network of underground pipelines. Two underground wastewater line systems are well defined – the TNT wastewater lines and the cooling water (blue water) drain line. The gravity portion of the wooden TNT wastewater line terminates in the pump house area near the intersection of 16th Street and Avenue D. During TNT production, the wastewater was collected here and pumped through the pressure portion of the TNT wastewater line into storage tanks across Avenue D. The tanks were

00041776

LEGEND:

WATER SUPPLY WELLS

STREAMS



LHAAP GROUP 2 SITES

SITE 12	LANDFILL 12
SITE 16	LANDFILL 16
SITE 17	BURNING GROUND No. 2 AND FLASHING AREA
SITE 18/24	BURNING GROUND No. 3/ UNLINED EVAPORATION POND
SITE 29	FORMER TNT PRODUCTION AREA
SITE 32	FORMER TNT WASTE DISPOSAL AREA
SITE 49	ACID STORAGE AREA

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

FIGURE 1–2
SITE LOCATION MAP–GROUP 2 SITES
LHAAP–29 SAMPLING WORK PLAN
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X–REF	IMAGE
117591–B3	--	--	2/23/06	Houston, Texas	BASE	---

PLOT DATE: 2/23/06
FORMAT REVISION 3/25/99

part of a treatment facility at what is now LHAAP-32. Following the removal of the pump house, the soil beneath it was excavated. The excavated area subsequently filled with water, and a pond now exists at the former pump house location. The cooling water lines discharged to an open ditch in the eastern part of the site.

Reportedly, a 6-inch diameter transite pipeline runs parallel to the wooden TNT wastewater pipeline. The transite material is a combination of concrete and asbestos. This pipeline was in good condition when it was unearthed in 1993 at a location approximately 400 feet northwest of the pond. This line was not sampled during previous investigations.

The TNT production facility was inactive from August 1945 to 1959. In 1959, most of the buildings and aboveground storage tanks (ASTs) were removed. The debris was burned or flashed at LHAAP-17. What remains are concrete foundations, open-top concrete-lined pits, and most of the abandoned underground utilities (Shaw, 2005a).

Since the end of World War II, the only activity that has been documented to have occurred at LHAAP-29 is the "soak out" of out-of-specification rocket motors. This took place from 1959 to the mid-1970s and involved the use of Turco®, a methylene chloride-based industrial solvent, at Building 801-F. Waste from this operation was sent to LHAAP-18/24 (Jacobs, 2001).

1.3 Previous Investigations

LHAAP-29 has been the subject of numerous investigations that have included the collection of samples from residual wastes, soil, sediment, surface water and groundwater. These include the investigations by Environmental Protection Systems in 1982 and 1987; the Phase I, Phase II, and Phase III Remedial Investigations conducted by Jacobs in 1993, 1995, and 1998, respectively; the Site-Wide Perchlorate Investigation conducted by Solutions To Environmental Problems, Inc. in 2002; the Environmental Site Assessment activities performed by Plexus in 2003; the Data Gaps Investigation by Shaw in the spring and summer of 2004; additional explosives and perchlorate sampling by Shaw in December 2004 and February 2005; and explosives sampling by USACE at a building foundation in February 2005. Detailed discussions of these field investigations, analytical results and sample locations can be found in the *Draft Site Data Summary Report for LHAAP-29*, prepared by Shaw (Shaw, 2005a). In addition to these previous investigations, Shaw conducted a Membrane Interface Probe (MIP) Investigation for chlorinated VOCs in shallow groundwater at LHAAP-29 in May 2005 (Shaw, 2005b). Copies of these reports (Shaw, 2005a and b) are included in **Appendix A**.

1.4 Extent of Contamination

Explosive compound releases resulting from the manufacturing process of TNT as well as releases from process tanks and process waste pipelines are the suspected contamination sources at LHAAP-29. Most source areas, including buildings and ASTs, were removed in 1959 and the

debris burned at LHAAP-17. The remaining potential sources of contamination at the site are the transite wastewater line located adjacent to the wooden "red and yellow liquor", the "blue water" pipeline, explosives compounds in stained soils around the foundation of Buildings 806-A and –D, isolated perchlorate-containing soils in the northeastern portion of LHAAP-29, and explosive compounds in sediment in the cooling water outfall ditch, (Jacobs, 2001; Shaw, 2005a). These potential source areas, with the exception of the residual contents within the transite wastewater line and sediments in the cooling water ditch, are not being sampled since adequate data have already been collected during previous investigations. The potential remaining onsite source areas are presented in **Figure 1-3**.

Metals above background levels are present in sediments and surface water at LHAAP-29. Of these metals, chromium and lead sediment values exceeded background at many locations (Jacobs, 2002). The Group 2 Feasibility Study stated that "no unacceptable risks to current or future receptors were found in soil" at LHAAP-29. On-site sediment was included in that assessment (Shaw, 2005a).

Contamination in the form of explosive compounds, VOCs, and perchlorate is present in groundwater at LHAAP-29. Explosive compounds (m-nitrotoluene and o-nitrotoluene) in the shallow groundwater at LHAAP-29 are found primarily in shallow groundwater at the northern portion of the site. Concentrations of VOCs were detected in the shallow and intermediate groundwater zones, the most significant contaminant result being methylene chloride in the intermediate zone. Perchlorate concentrations have been detected consistently throughout the shallow groundwater zone in the eastern portion of the site. Concentrations in the intermediate and deep groundwater zones indicate a slow vertical migration of perchlorate through the confining layers between the groundwater zones (Shaw, 2005a; 2005b). The approximate limits of the explosive compounds, methylene chloride and perchlorate groundwater contamination plumes as detected in their respective groundwater zones are presented in **Figures 1-4**, **1-5**, and **1-6**, respectively.

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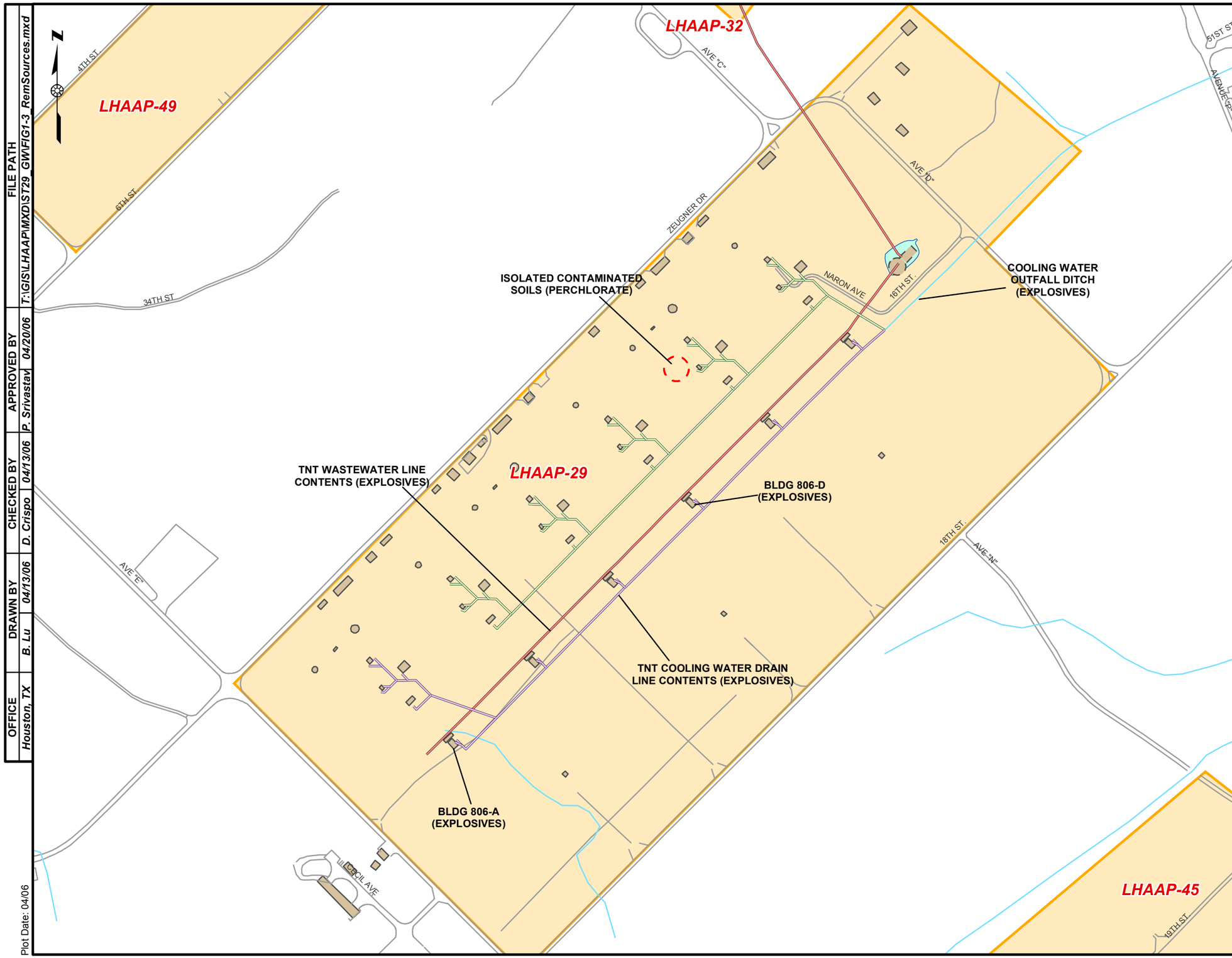

Legend

- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

0 200 400 800 Feet

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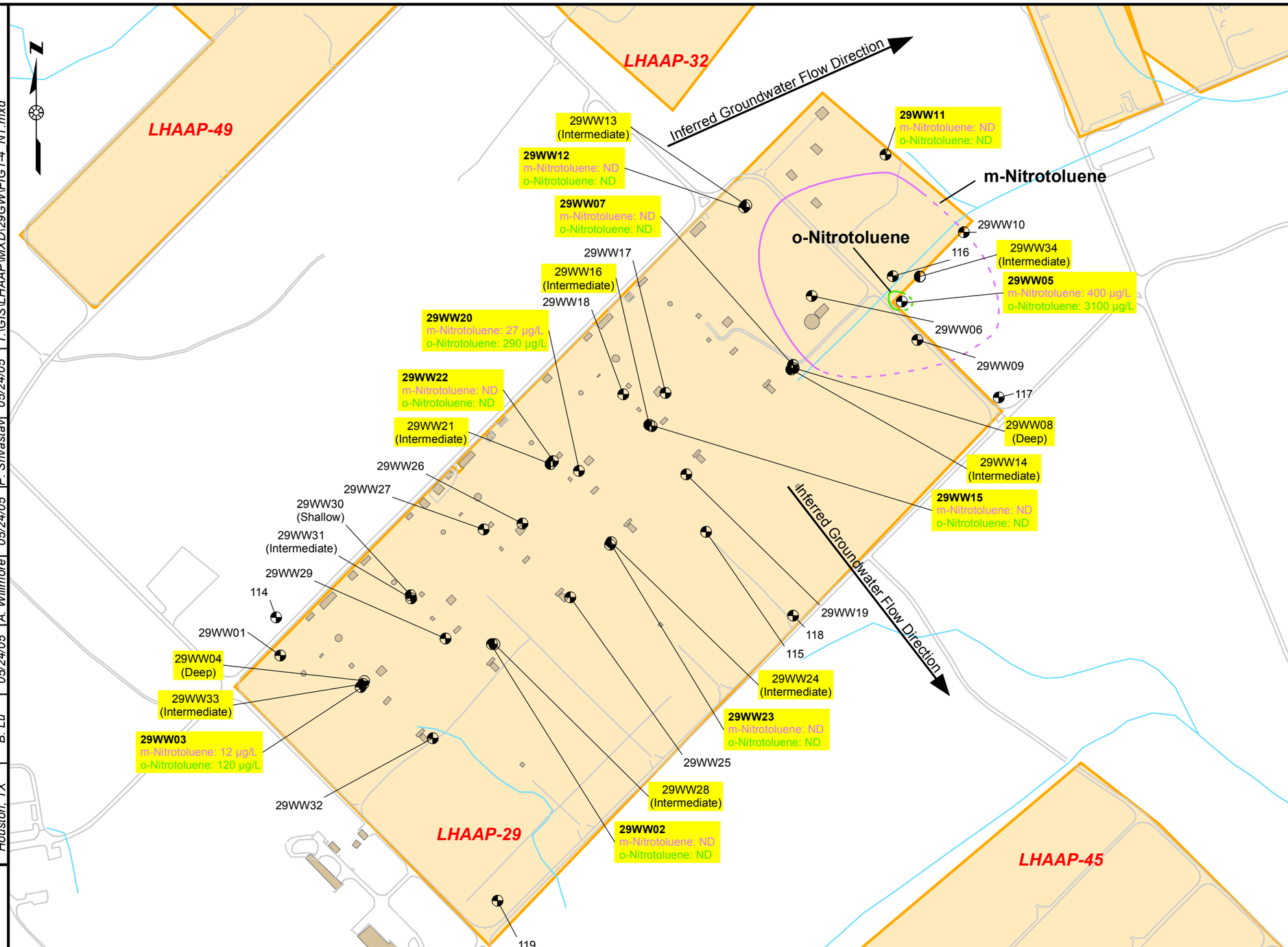
FIGURE 1-3
REMAINING POTENTIAL ONSITE SOURCE AREAS
LHAAP-29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	04/13/06	D. Crispo	04/13/06	P. Srivastav	04/20/06	T:\GIS\LHAAP\MXD\ST29_GW\FIG1-3_RemSources.mxd

Plot Date: 04/06



		29WW04	29WW08	29WW13	29WW14	29WW16	29WW21	29WW24	29WW28	29WW33	29WW34
PARAMETER	UNITS	DEEP	DEEP	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE
m-Nitrotoluene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Nitrotoluene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Legend

Groundwater Monitoring Well

- Shallow
- Intermediate
- Deep
- ND Not Detected
- m-Nitrotoluene contamination extent at concentration = 365 µg/L
- Estimated m-Nitrotoluene contamination extent at concentration = 365 µg/L
- o-Nitrotoluene contamination extent at concentration = 368 µg/L
- Estimated o-Nitrotoluene contamination extent at concentration = 368 µg/L
- Stream
- Road
- Former Building or Tank Location
- Site

Notes:
1. Extent of contamination plumes are based on TCEQ's Medium Specific Concentrations, updated March 31, 2004 or EPA Maximum Contaminant Levels.
2. Yellow highlighted groundwater monitoring wells were sampled in August - September, 2004 during data gaps investigation (Shaw, 2005).

0 250 500 1,000 Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

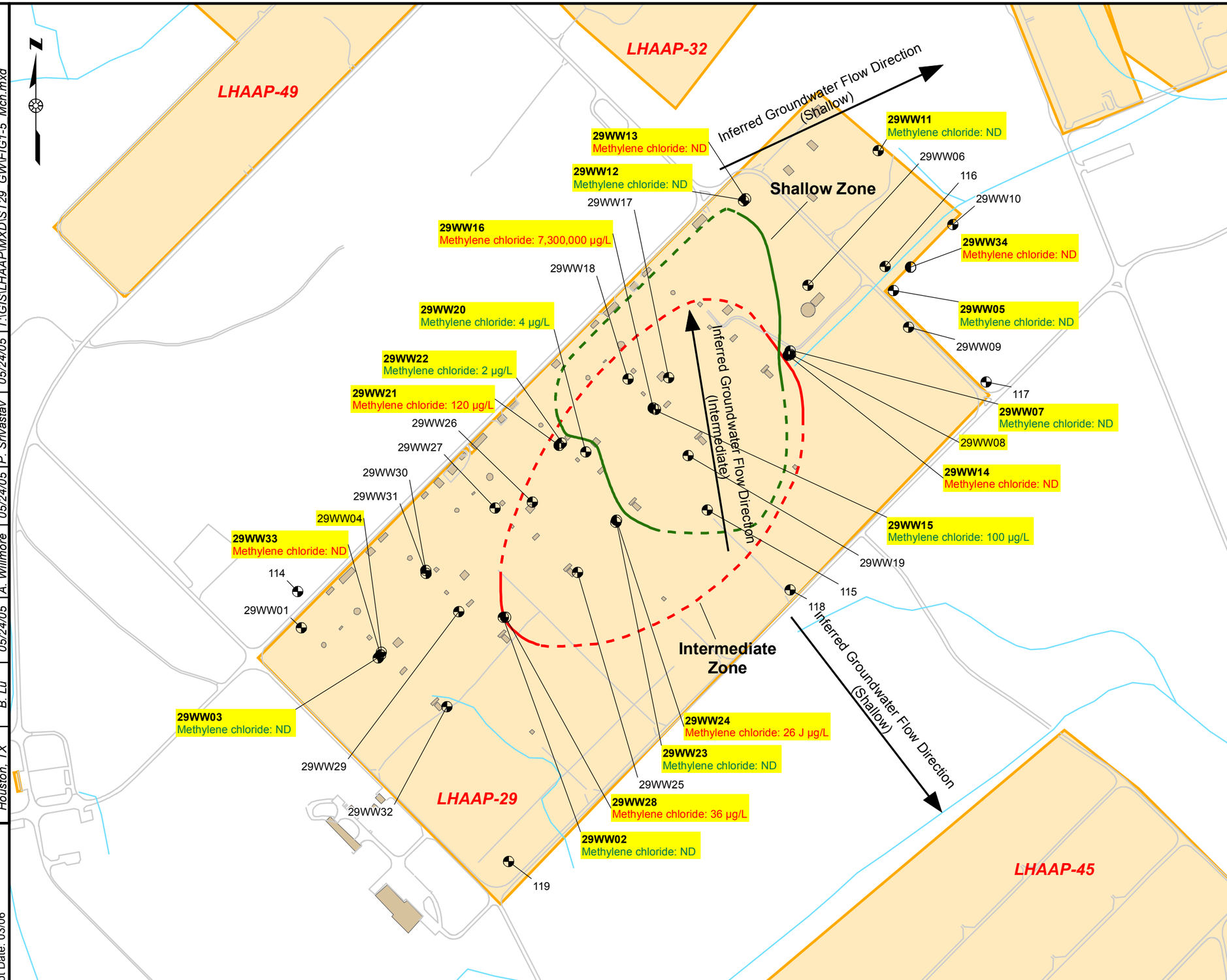
FIGURE 1-4

NITROTOLUENE IN SHALLOW GROUNDWATER
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	05/24/05	A. Willmore	05/24/05	P. Srivastav	05/24/05	T:\GIS\LHAAP\MXD\29GW\FIG1-4_NT.mxd

Plot Date: 03/06



Legend

Groundwater Monitoring Well

- Shallow
- Intermediate
- Deep
- ND Not Detected
- Methylene chloride contamination extent in shallow zone, at concentration = 5 µg/L
- Estimated methylene chloride contamination extent in shallow zone, at concentration = 5 µg/L
- Methylene chloride contamination extent in intermediate zone, at concentration = 5 µg/L
- Estimated methylene chloride contamination extent in intermediate zone, at concentration = 5 µg/L
- Stream
- Road
- Former Building or Tank Location
- Site

Notes:
1. Extent of contamination plumes are based on TCEQ's Medium Specific Concentrations, updated March 31, 2004 or EPA Maximum Contaminant Levels.
2. Yellow highlighted groundwater monitoring wells were sampled in August - September, 2004 during data gaps investigation (Shaw, 2005).

0 250 500 1,000 Feet

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TULSA, OKLAHOMA

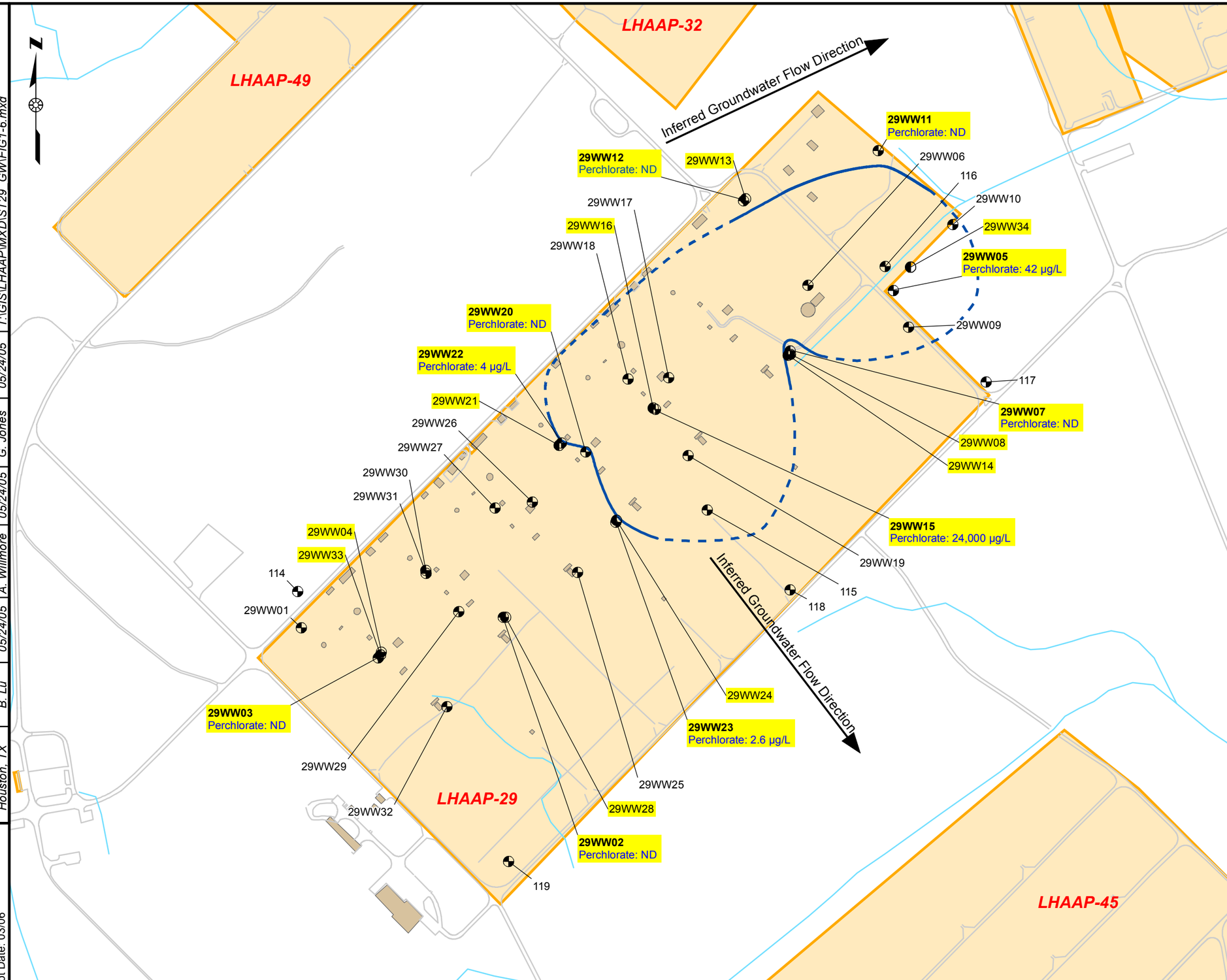
FIGURE 1-5

METHYLENE CHLORIDE IN SHALLOW AND INTERMEDIATE GROUNDWATER
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	05/24/05	A. Willmore	05/24/05	P. Srivastav	05/24/05	T:\GIS\LHAAP\MXD\ST29_GW\FIG1-5_Mch.mxd

Plot Date: 03/06



Legend

Groundwater Monitoring Well

- Shallow
- Intermediate
- Deep
- ND Not Detected
- Perchlorate contamination extent at concentration =4 µg/L
- Estimated perchlorate contamination extent at concentration =4 µg/L
- Stream
- Road
- Former Building or Tank Location
- Site

Notes:
1. Extent of contamination plume is based on TCEQ's Medium Specific Concentrations, updated March 31, 2004 or EPA Maximum Contaminant Levels.
2. Yellow highlighted groundwater monitoring wells were sampled in August - September, 2004 during data gaps investigation (Shaw, 2005).

0 250 500 1,000 Feet

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TULSA, OKLAHOMA

FIGURE 1-6

PERCHLORATE IN SHALLOW GROUNDWATER
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 05/24/05	A. Willmore 05/24/05	G. Jones 05/24/05	T:\GIS\LHAAP\MXD\ST29_GW\FIG1-6.mxd

Plot Date: 03/06

2.0 Field Activities

Field activities planned at LHAAP-29 are divided into the following major tasks. Each task is described in the subsequent sections.

Task 1	Mobilization and Site Setup
Task 2	Utility Clearance
Task 3	Monitoring Well Installation
Task 4	Survey of Monitoring Well Locations
Task 5	Groundwater Sampling
Task 6	Transite Wastewater Line Content Sampling
Task 7	Sediment Sampling
Task 8	Investigation-Derived Waste Management

Additional information regarding these tasks can be found in Appendix C, *Chemical Data Acquisition Plan* (*CDAP*), and Appendix D, Field Procedures of the *Final Installation-Wide Work Plan* (Shaw, 2006a). Field procedures described in this document are consistent with those employed previously at the site (Shaw, 2004a; 2004b).

2.1 Task 1— Mobilization and Site Setup

Prior to the mobilization of subcontractors to the installation, Shaw will notify the Texas Commission on Environmental Quality, the U.S. Environmental Protection Agency (USEPA), LHAAP facility and Army personnel a minimum of ten business days in advance. Once mobilized and prior to commencing construction activities, Shaw will inspect the proposed drilling and excavation locations for overhead and ground level accessibility. In areas that have excessive vegetation and/or tree growth, a backhoe will be used to clear these areas to allow rig and equipment access.

Shaw anticipates mobilizing the appropriate personnel, subcontractors, and equipment necessary for the specific task(s). A temporary decontamination pad will be constructed at an appropriate onsite location to decontaminate drilling equipment. A 15-foot x 15-foot decontamination cell will be constructed and covered with high-density polyethylene (HDPE) sheeting. This can be constructed in a staging area that can be used between sites. A permanent decontamination station is located at the on-site groundwater treatment plant (GWTP) at LHAAP-18/24 and can accommodate large equipment.

2.2 Task 2 — Utility Clearance

The field team leader will adhere to Shaw safety procedure HS308, Underground/Overhead Utility Contact Prevention (Shaw, 2006b), for clearance of each proposed well location prior to

commencement of drilling activities. All applicable forms shall be completed and included in the project files. In addition to various identified former wastewater lines present at LHAAP-29, the potential exists for active utility lines. Historic site maps and drawings will be consulted to ensure the drilling locations are not in close proximity of buried lines. Each well and trench location will be excavated by hand to 5 feet below ground surface (bgs), as required by Shaw safety procedure HS308 (Shaw, 2006b), unless a waiver is obtained.

2.3 Task 3 — Monitoring Well Installation

To address regulatory concerns and to better delineate the extent of methylene chloride in the shallow, intermediate and deep groundwater zones and perchlorate in the shallow groundwater zone at LHAAP-29, Shaw will install three shallow wells at 45 feet bgs, three intermediate wells at depths of 88 feet bgs and one deep well at 155 feet bgs. The deep well will be installed near existing intermediate zone well 29WW16, where methylene chloride was detected at concentrations up to 8,600,000 micrograms per liter (µg/L) to determine if the contaminant has moved to the deeper zone. A cluster of shallow and intermediate monitoring wells (29WW34 and 29WW35) will be installed hydraulically downgradient (north) of 29WW16 to define the extent of contamination in that direction (Shaw, 2005c). The second cluster of shallow and intermediate wells (29WW36 and 29WW37) will be installed to the northwest of the site, across Zeugner Drive, to address a second area of methylene chloride contamination identified in the shallow groundwater zone at that portion of the property during the May 2005 MIP Investigation (Shaw, 2005b). The third cluster of shallow and intermediate monitoring wells (29WW38 and 29WW39) will be installed approximately 1,000 feet southeast of well 29WW16. This location is considered hydraulically downgradient of well 29WW16 in the shallow groundwater zone but is hydraulically upgradient in the intermediate zone. Installation of the third well cluster at this location will assess the extent of contamination in both groundwater zones in that direction. Proposed well locations are presented in **Figure 2-1**.

Monitoring wells will be drilled and installed using a high-torque-stem auger or mud rotary drill rig. Each well will be constructed with 4-inch diameter, flush-joint threaded, schedule 40, polyvinyl chloride (PVC). Soil will be collected continuously using a 5-foot long, 2-inch diameter, split barrel core sampler advanced ahead of the drill bit. The soil in the samplers will be field screened using a photo-ionization detector (PID) or flame-ionization detector (FID), and soil stratigraphy will be described according to ASTM D2488-00, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)* (ASTM International, 2003), and logged on USACE Engineering Form 1836 (Drilling Log) or equivalent.

At Well 29WW40, two soil samples will be collected from the vadose zone core exhibiting the highest PID readings and submitted for laboratory analysis. The samples will be analyzed for VOCs to determine if there is a residual source in the soil.

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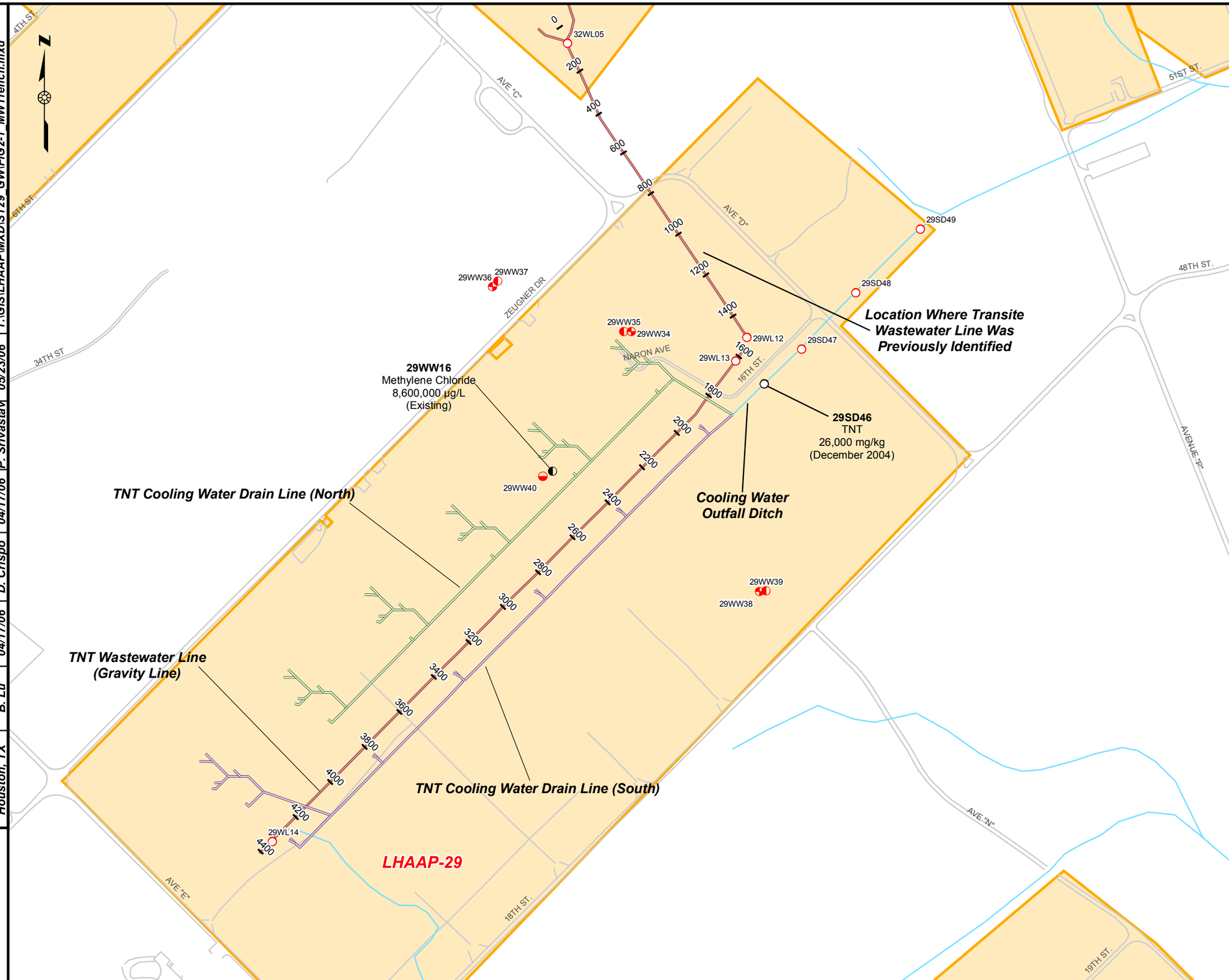

Legend

- Proposed Shallow Monitoring Well
- Proposed Intermediate Monitoring Well
- Proposed Deep Monitoring Well
- Proposed Sediment Sample Location
- 200 — Distance Scale
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Site
- µg/L — Micrograms per liter
- mg/kg — Milligrams per kilogram

0 200 400 800 Feet

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TULSA, OKLAHOMA

FIGURE 2-1
PROPOSED MONITORING WELL AND SAMPLE LOCATIONS
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	04/17/06	D. Crispo	04/17/06	P. Srivastav	05/23/06	T:\GIS\LHAAP\MXD\ST29_GW\FIG2-1_MWTrench.mxd

The bottom of the screens of shallow and intermediate wells will be set either at the top of the confining clay layer below these zones or a few inches into the confining layer, where allowed by the drilling method, so that any DNAPL present may be detected. The depth of installation of the proposed three intermediate and one deep well and associated isolation casings will be determined based on lithologic information obtained from split spoon or continuous sampler run ahead of the hollow stem auger or mud rotary bit. Lithological sampling will begin approximately 10 feet above the anticipated depths of confining layers below shallow/intermediate zones, based on drilling log data from existing wells at the site. In the event that the sampler extends below the confining layer, the borehole will be plugged back to the zone of interest with a bentonite seal. Additional details for well installation are found in Appendix D, Field Procedures of the *Final Installation-Wide Work Plan* (Shaw, 2006a).

The 4-inch diameter monitoring wells will be installed in the annulus of hollow-stem augers. The PVC well screen for each well will be 0.01-inch slotted and 10 feet in length. A threaded PVC bottom cap will be secured to the bottom of the screen interval. Solid PVC casing will be installed from the top of the screen interval to approximately 3 feet above surface grade.

Where mud rotary methods are used for drilling intermediate wells, the wells screen will be installed at the approximate depth of the base of the intermediate zone known from nearby existing wells.

A filter pack consisting of clean silica sand (20-40 size) will be placed in the auger-well annulus from approximately 0.5 feet below the well bottom to approximately 2 feet above the screen interval. A 3-foot thick bentonite seal (pellets or chips) will be placed above the sand filter pack and hydrated with potable water. The annular space from the top of the bentonite seal to the surface will be filled with a bentonite-cement grout.

Procedures will be followed to ensure that contamination in each of the groundwater zones remain isolated and do not have the potential to migrate to the other zones. For the wells installed in the intermediate groundwater zone, the shallow groundwater zone will be isolated using 12-inch or suitable diameter, schedule 40 steel casing. The casing will be installed from near surface grade to the top of the first confining layer. Upon grouting and setting of the isolation casing, drilling will proceed into the intermediate zone. For the well installed in the deep groundwater zone, both the shallow and intermediate groundwater zones will be isolated using 16-inch or suitable diameter steel casing and 12-inch or suitable diameter steel casing, respectively.

The drilling equipment will be decontaminated prior to arrival at the site and between well installations. Additional information on decontamination procedures can be found in Appendix D, Attachment 9 of the *Final Installation-Wide Work Plan* (Shaw, 2006a). Core samplers will be washed between sampling intervals in a detergent/water solution and double

rinsed with tap water in clean buckets. The decontamination wastewater and drill cuttings will be placed in 55-gallon drums and handled as described in **Section 2.8**.

Aboveground surface completions will be constructed for each monitoring well installed as described in Appendix D of the *Final Installation-Wide Work Plan* (Shaw, 2006a). The surface completion will consist of a 6-inch-square protective steel casing, 5-feet long with a hinged, lockable lid set at a minimum of 2 feet into a 4-foot-square by 6-inch-thick concrete pad. Concrete-filled steel bollards will be installed at the corners of the concrete pad.

The monitoring wells and surface completions will be installed in general accordance with USACE and State of Texas requirements by a drilling subcontractor licensed in the State of Texas. At the end of the field work, a State of Texas Well Report will be submitted to the Texas Department of Licensing and Regulations for construction of each well.

2.3.1 Bench-Scale Chemical Oxidation Testing

Due to the elevated levels of methylene chloride contamination in the intermediate zone, soil and groundwater samples will be collected during the installation of monitoring wells for bench-scale testing of activated persulfate formulations. Persulfate is a chemical oxidant capable of oxidizing methylene chloride to innocuous mineral products. The objective of the bench-scale testing is to identify the necessary activation methods and concentration of persulfate that would be required to oxidize the levels of methylene chloride present in the intermediate groundwater, should such treatment be deemed necessary. The results of the bench-scale testing are expected to facilitate the evaluation of remedial alternatives during the feasibility study process for LHAAP-29.

Approximately 5 kilograms of soil and 10 liters of groundwater will be collected for the bench-scale testing. The soil will be collected from the intermediate zone during installation of well 29WW40. The field geologist will select the soil from within the depth interval between the top of screen zone for 29WW16 and the saturated zone/confining zone interface. PID readings and visual observations will be used to select a heavily contaminated sample from within that interval. The groundwater will be collected from monitoring well 29WW16, which represents the methylene chloride plume hot spot. Soil and groundwater samples will be stored on ice and shipped via overnight carrier to Shaw's Technology Development Laboratory in Knoxville, Tennessee.

Upon sample receipt, batch experiments will be established to evaluate the following activation methods for persulfate oxidation of methylene chloride: chelated ferrous iron, heat, and caustic pH adjustments. Activated persulfate is likely more effective at treating elevated levels of methylene chloride when compared to other chemical oxidants such as permanganate and Fenton's Reagent, or when compared to bioremediation approaches. Nevertheless, a detailed

evaluation of potential in situ remedial technologies will be evaluated during the feasibility study process.

2.3.2 Well Development

The newly installed monitoring wells will be developed to remove drilling fines and enhance hydraulic communication between the well and the groundwater zone. The wells will be developed no sooner than 48 hours and no later than 7 days after installation of the well. Well development will be performed by pumping and gentle surging of the screened interval using a rubber-lined surge block. A minimum of three well borehole volumes of water will be pumped (including the diameter of the well borehole and assumed 30-percent filter pack porosity). The volume of groundwater removed from each well will be calculated from the static water level measurement referenced from the top-of-casing. An electronic interface probe will be used to measure the water levels. As an alternative to pumping, a bottom-filling bailer may be used to remove water from low-yielding wells. Water quality parameters (temperature, pH, conductivity, and turbidity) of the development discharge water will be monitored. Development will continue until the water quality parameters have stabilized to within 10 percent and the water is visually clear. Additional guidance on well development is provided in Appendix D, Attachment 3 of the *Final Installation-Wide Work Plan* (Shaw, 2006a).

A Shaw hydrogeologist will supervise well development, and document the development process and measurements in a Well Development Record specific to each well. Downhole development equipment will be decontaminated prior to and following use at each well location by cleaning in a detergent/water solution and double rinsing with tap water in clean buckets. The development and decontamination wastewater will be placed in 55-gallon drums and handled as described in **Section 2.8**.

2.4 Task 4 — Survey of Monitoring Well Locations

A State of Texas-licensed professional land surveyor will survey the locations and elevations of the newly installed monitoring wells. The horizontal coordinates (northing and easing) of the wells will be surveyed to the nearest foot and will be based on the North American Datum of 1983. The vertical elevations of the top of the wells (top-of-casing) will be surveyed to nearest 0.01 feet. The ground surface elevation at each well location will be surveyed to the nearest 0.1 feet. To ensure compatibility with pre-existing well elevations, the top-of-casing for one of the existing wells at each site will be surveyed. If discrepancies are noted, the USACE will be consulted for resolution.

2.5 Task 5 — Groundwater Sampling

Shaw will collect one round of groundwater samples from the seven newly installed wells and existing well 29WW16, as depicted on **Figure 2-1**. Prior to commencement of groundwater sampling, groundwater levels will be measured in all the wells at LHAAP-29. In all, a total of

nine groundwater samples, including a duplicate sample, will be collected during this sampling event. The three samples from the shallow groundwater zone will be analyzed for perchlorate using USEPA Method 314 (USEPA, 1983) and VOCs using USEPA Method 8260B (USEPA, 1997). The four samples collected from the intermediate and one sample from the deep groundwater zone will be analyzed for VOCs only. The location of the duplicate sample will be determined in the field. **Table 2-1** provides a description of the proposed sample location, types of samples required and the purpose of the sampling at the proposed locations. Analytical samples will be submitted to Kemron Laboratories in Marietta, Ohio.

Groundwater samples will be collected as follows:

- Monitoring wells will be sampled using the low flow method. The only exceptions would be a slow recharging well that goes dry or proceeds to drawdown significantly whereby equilibrium can not be maintained. Procedures for purging and sampling the monitoring wells for low flow or using alternative means are detailed in the Appendix D of the *Final Installation-Wide Work Plan* (Shaw, 2006a).
- Prepare sampling site by laying out plastic sheeting on adjacent ground.
- Calibrate field equipment and instruments and verify they are in proper working order and record calibration in logbook.
- Don required personal protective equipment (PPE) as specified in the *Health and Safety Plan* (*HASP*), Appendix A of the *Final Installation-Wide Work Plan* (Shaw, 2006a). At a minimum, a fresh pair of non-powdered disposable gloves must be donned prior to initiating sampling activities and between each sample point.
- Perform groundwater sampling in accordance with the *CDAP*, Appendix C of the *Final Installation-Wide Work Plan* (Shaw, 2006a).
- Record the sampling procedures on a Field Sampling Report or logbook.
- Measure general water quality parameters (e.g., pH, conductivity, temperature, oxidation/reduction potential, turbidity) using field instrument(s) and record measurements on a Field Sampling Report or logbook. Water quality parameters will be measured intermittently throughout the sampling process.
- Complete chain-of-custody (COC) documentation.

The method, container, preservative and holding times for the groundwater samples are presented in **Table 2-2**.

2.6 Task 6 —Transite Wastewater Line Content Sampling

Shaw will conduct an investigation of the former transite wastewater line at LHAAP-29 to characterize the contents of the line. A total of five grab samples from solids content within the

Table 2-1
Groundwater and Soil Sampling at Monitoring Wells

Well Location	Well Sample Depth (ft bgs)	Groundwater Zone	Analysis	Purpose
Groundwater				
29WW16	88	Intermediate	VOCs	Further delineate the vertical and horizontal extent of MC in groundwater, and delineate the horizontal extent of MC and perchlorate in the shallow groundwater zone.
29WW34	45	Shallow	VOCs, Perchlorate	
29WW35	88	Intermediate	VOCs	
29WW36	45	Shallow	VOCs, Perchlorate	
29WW37	88	Intermediate	VOCs	
29WW38	45	Shallow	VOCs, Perchlorate	
29WW39	88	Intermediate	VOCs	
29WW40	155	Deep	VOCs	
29WW##-QC[a]				Field duplicate
Soil				
29WW40	TBD	Vadose zone	VOCs	Soil samples from vadose zone to determine if residual source exists.

Notes and Abbreviations:

[a] *The "##" should be replaced to match the ID of the sample that is being duplicated.*

ft bgs *feet below ground surface*
QC *quality control*
TBD *to be determined*
VOCs *volatile organic compounds*
WW *water well location*

Table 2-2
Groundwater and Soil Analytical Method, Container, Preservative and Holding Time

Analysis	Method	Container	Preservative	Maximum Holding Time
Groundwater				
Perchlorate	USEPA 314[a]	250 mL HDPE bottle	4°C	28 days
VOCs	SW-846 8260B[b]	30 x 40 mL vial with PTFE septa cap	HCl to pH<2 4°C No headspace	14 days
Soil				
VOCs	SW-846 8260B	3 encore samplers	4°C	14 days

Notes and Abbreviations:

[a] *USEPA, 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020. Environmental Monitoring and Support Laboratory, Office of Research and Development, Cincinnati, Ohio.*

[b] *USEPA, 1997. Test Methods for Evaluating Solid Waste, Physical Chemical Methods (SW-846), Update III. Office of Solid Waste and Emergency Response, Washington, D.C.*

°C *degrees Celsius*
USEPA *U.S. Environmental Protection Agency*
HCl *hydrochloric acid*
HDPE *high-density polyethylene*
mL *milliliter*
PTFE *polytetrafluoroethylene*
SW *solid waste*
VOCs *volatile organic compounds*

wastewater line, including a duplicate sample will be collected and submitted for analysis of explosive compounds using USEPA Method 8330 (USEPA, 1997). Samples will be collected at four proposed locations where the interior of the transite line is expected to be exposed to avoid having to impact the line. Samples will be collected at each end of the gravity portion of the line that extends from the southern portion of the site to the former pump house at the northern portion of the site. Samples will also be collected at each end of the wastewater line that extends from the former pump house location to LHAAP-32, located to the northwest of LHAAP-29 (**Figure 2-1**). Any liquids encountered during sampling of the wastewater line contents will be contained as best possible, collected and drummed. Waste characterization analysis of the liquid contents will be conducted in accordance with the procedures for wastewater as described in **Section 2.8**. **Table 2-3** provides a description of the proposed sample locations, types of samples required, and the purpose of the sampling at the proposed locations.

At each proposed sample location, trenches will be excavated down to the depth of the former wastewater line which is a minimum of 3 feet bgs throughout the site. Once the wastewater line is exposed, the field sampling lead shall collect a sample from within the line. The transite pipe will not be fractured due to the potential of releasing asbestos fibers. The grab samples will be collected from the waste line using trowels. If the wastewater lines are sealed at the proposed sample locations or removal of caps or covers will require breaking the transite pipe, then it will be assumed that the pipe is not a contaminant source at that sample location and a sample will not be collected. The procedures for sampling each excavation trench location are summarized as follows:

- Execute work in accordance with Shaw and other applicable site-specific HASP.
- Ensure that all excavation locations have been appropriately cleared of all underground utilities and buried objects.
- Set up portable sample table and cover with plastic sheeting.
- Calibrate field analytical and health and safety instruments.
- Waste line content samples will be screened using a PID or FID and headspace readings will be taken and entered on a Field Sampling Report or logbook.
- Don a new pair of disposable sample gloves and appropriate PPE between sampling intervals to prevent cross-contamination.
- Decontaminate the sampling equipment as described in Section 4.5 in the *CDAP*, Appendix C of the *Final Installation-Wide Work Plan* (Shaw, 2006a).
- Collect one grab sample using a clean trowel instrument from each of the wastewater lines at each trench excavation for laboratory analysis by filling the appropriate number and types of sample containers specified by the laboratory.

Table 2-3
Transite Wastewater Line Content Sampling for Explosives

Sample ID	Sample Location	Purpose
32WL05	Contents of northwest end of transite wastewater line at LHAAP-32 that extends from former pump house location	Characterize the contents within the former transite wastewater line.
29WL12	Contents of terminated transite wastewater line at former pump house location	
29WL13	Contents of north end of terminated transite wastewater line (gravity portion) at former pump house location	
29WL14	Contents of south end of transite wastewater line (gravity portion) at south portion of site	

Abbreviations

WL wastewater line sample

- Label each sample container as described in Section 4.6.2 of Appendix C of the *Final Installation-Wide Work Plan* (Shaw, 2006a) and enclose each container in a sealable plastic bag, and place in a cooler containing ice.
- Repeat the above sequence of procedures for each trench excavation location.
- Record the investigation activities and sampling procedures on a Field Sampling Report or logbook.
- Complete COC documentation.
- Maintain a photographic record of sample locations.

The method, container, preservative and holding times for the wastewater line content samples are presented in **Table 2-4**. Analytical samples will be submitted to Kemron Laboratories in Marietta, Ohio.

2.7 Task 7 — Sediment Sampling

Shaw will collect a total of four grab sediment samples, including a duplicate sample, from three locations along the cooling water outfall ditch located at the northern portion of the site. These samples will be situated hydraulically downgradient (northeast) of sediment sample 29SD46, collected by Shaw in December 2004, which exhibited elevated concentrations of TNT and DNT (**Figure 2-1**). The samples will be collected and submitted for analysis for explosive compounds using USEPA Method 8330 (USEPA, 1997). These locations were chosen to better define the horizontal extent of explosives contamination in surface soils located hydraulically downgradient of the cooling water outfall ditch. **Table 2-5** provides a description of the proposed sample location, types of samples required, and the purpose of the sampling at the proposed locations.

Table 2-4
Transite Wastewater Line Content Analytical Method, Container, Preservative and Holding Time

Analysis	Method	Container	Preservative	Maximum Holding Time
Explosives	SW-846 8330[a]	1 x 4 ounce, CWM glass jar with Teflon-lined cap	4°C	14 days to extraction 40 days to analysis

Notes and Abbreviations:

[a] *USEPA, 1997. Test Methods for Evaluating Solid Waste, Physical Chemical Methods (SW-846), Update III. Office of Solid Waste and Emergency Response, Washington, D.C.*

°C *degrees Celsius*
CWM *clear wide-mouthed*
SW *solid waste*

Table 2-5
Sediment Sampling for Explosives

Sample ID	Sample Locations	Purpose
29SD47	Intermediate locations between the cooling water outfall ditch and the northeast property boundary.	Define the horizontal extent of contamination downgradient of the cooling water outfall ditch.
29SD48		
29SD49		
29SD##-00#-QC[a]	One of the above soil sample (SS) locations as selected by the field sampling lead.	Field duplicate

Notes and Abbreviations:

[a] *The "##" should be replaced to match the ID of the sample that is being duplicated.*

ft bgs *feet below ground surface*
QC *quality control*
SD *sediment sample*

The maximum depth of the grab sediment samples will be from 0 to 0.5 feet bgs. The grab sediment samples will be collected at the sample locations using trowels. The procedures for sediment sampling are summarized as follows:

- Execute work in accordance with Shaw and other applicable site-specific HASP.
- Set up portable sample table and cover with plastic sheeting.
- Calibrate field analytical and health and safety instruments.
- Sediment samples will be screened using a PID or FID and headspace readings will be taken and entered on a Field Sampling Report or logbook.
- Don a new pair of disposable sample gloves and appropriate PPE between sampling intervals to prevent cross-contamination.
- Decontaminate the sampling equipment as described in Section 4.5 in the *CDAP*, Appendix C of the *Final Installation-Wide Work Plan* (Shaw, 2006a).

- Collect one grab sample using a clean trowel instrument from each of the sediment sample locations for laboratory analysis by filling the appropriate number and types of sample containers specified by the laboratory.
- Label each sample container as described in Section 4.6.2 of Appendix C of the *Final Installation-Wide Work Plan* (Shaw, 2006a) and enclose each container in a sealable plastic bag, and place in a cooler containing ice.
- Repeat the above sequence of procedures for each sample location.
- Record the investigation activities and sampling procedures on a Field Sampling Report or logbook.
- Complete COC documentation.
- Maintain a photographic record of sample locations.

The method, container, preservative and holding times for the sediment samples are the same as for the wastewater line content samples as presented in **Table 2-4**. Analytical samples will be submitted to Kemron Laboratories in Marietta, Ohio.

2.8 Task 8 — Investigation-Derived Waste Management

Wastes generated during the proposed activities will include drill cuttings; wastewater from equipment decontamination, well development, or purging; free product encountered in TNT wastewater lines, and miscellaneous wastes (PPE, etc.). Management of the waste streams is described below.

2.8.1 Drill Cuttings

Drill cuttings will be placed in 55-gallon drums or similar container initially, or placed in roll-off boxes. Upon completion of each well, the drums will be sealed and transported to a staging area. The drill cuttings will be removed from the drums and placed in an HDPE-lined roll-off container. The drums will be reused at the next drilling location. A composite sample will consist of equal parts of five samples collected at evenly spaced locations within the roll-off. The procedures for sampling the drill cuttings in the roll-off are detailed in the *CDAP*, Appendix C of the *Final Installation-Wide Work Plan* (Shaw, 2006a). A procedure for handling of investigation-derived waste is presented in Appendix D of the *Final Installation-Wide Work Plan* (Shaw, 2006a).

Following characterization, drill cuttings will be disposed on site if they are determined to be non-hazardous. The cuttings will be transported to a permitted landfill if they are determined to be hazardous.

2.8.2 Wastewater

Wastewater generated from equipment decontamination, well development, sampling, and purging activities will be stored in 55-gallon drums or larger containers. Containers will be transported to the GWTP at LHAAP-18/24. Container contents consisting of fluids generated by equipment decontamination, well development, sampling and purging activities will be released in the influent stream of the GWTP for treatment; however, any free product that is removed from the wastewater lines or monitoring wells as part of this investigation will remain containerized, will be sampled for disposal options, and transported off site for disposal if not considered acceptable to be treated at the GWTP.

2.8.3 Miscellaneous Wastes

Miscellaneous wastes include spent personnel protective equipment, HDPE sheeting, rags, paper towels, etc. These wastes will not be characterized and will be placed in plastic bags for disposal as non-hazardous waste.

3.0 References

ASTM International, 2003, ASTM D2488-00, *Standard Practice for Description and Identification of Soils*, West Conshohocken, PA 19428-2959.

Jacobs Engineering Corporation (Jacobs), 2001, *Remedial Investigation Report for the Group 2 Sites Remedial Investigation (Sites 12, 17, 18/24, 29, and 32) at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas*, Final, St. Louis, MO, April.

Jacobs, 2002, *Draft Final Feasibility Study for the Group 2 Sites Remedial Investigation (Sites 12, 17, 18/24, 29 and 32) at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas*, St. Louis, MO, May.

Shaw Environmental, Inc. (Shaw), 2004a, *Final Work Plan, Groundwater Data Gaps Investigation, Groups 2 and 4, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas, February.

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Shaw, 2005a, *Draft Site Data Summary Report, LHAAP-29, Former TNT Production Area, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas, June.

Shaw, 2005b, Membrane Interface Probe Investigation at LHAAP-29, Former TNT Production Area, Longhorn Army Ammunition Plant, Karnack, Texas, Houston, June.

Shaw, 2005c, *Draft Project Management Plan for Site Closure of Multiple Sites, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas.

Shaw, 2006a, *Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas, November.

Shaw, 2006b, Health & Safety Program, Volumes I & II.

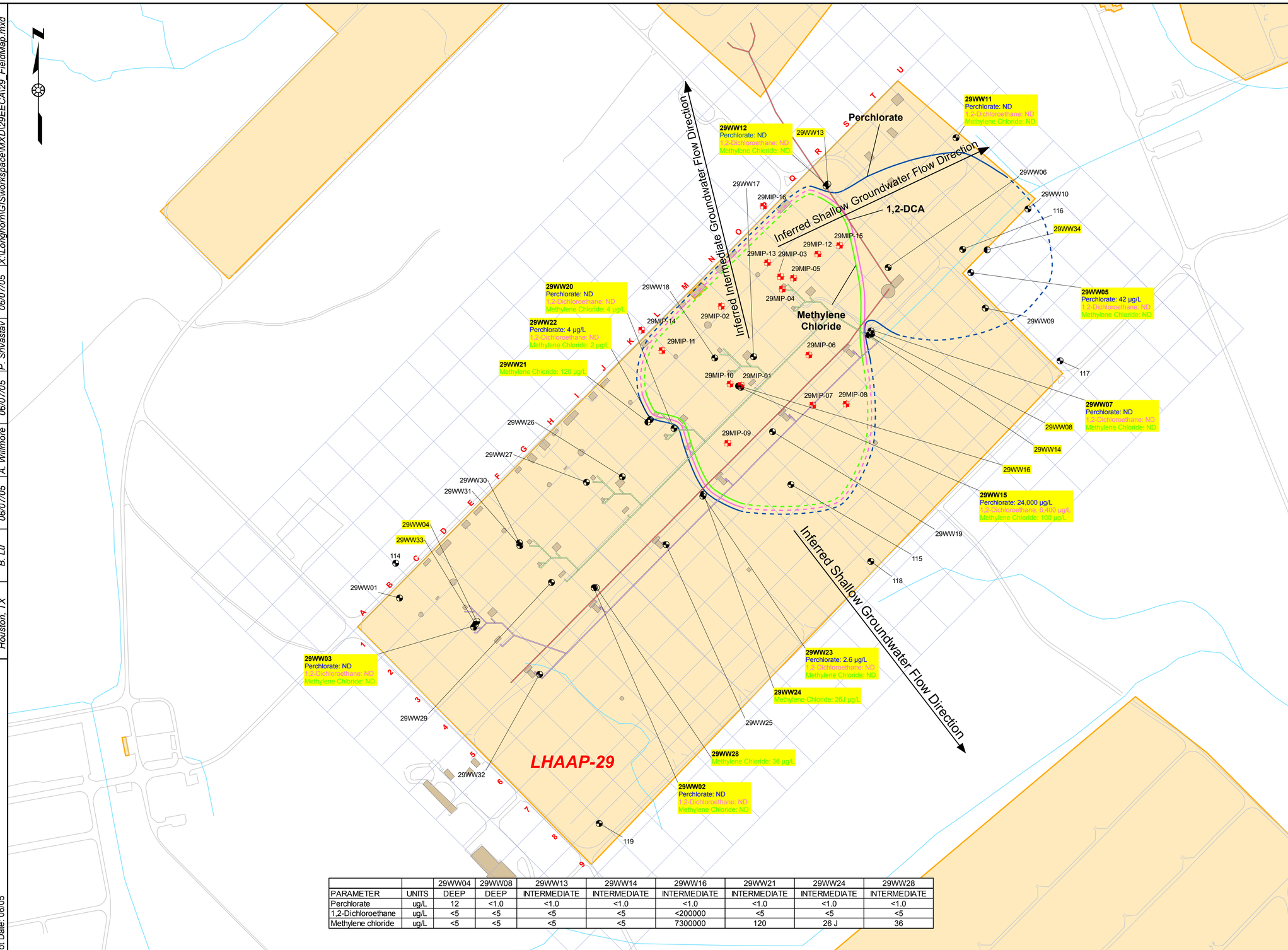
U. S. Environmental Protection Agency (USEPA), 1983, *Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020*, Environmental Monitoring and Support Laboratory, Office of Research and Development, Cincinnati, Ohio.

USEPA, 1997, *Test Methods for Evaluating Solid Waste, Physical Chemical Methods (SW-846)*, Update III, Office of Solid Waste and Emergency Response, Washington, D.C.

Appendix A

1. Draft Site Data Summary Report LHAAP-29 (unreviewed), Shaw 2005 (on CD)

2. Membrane Interface Probe Report, LHAAP-29, Shaw 2005 (on CD)



		29WW04	29WW08	29WW13	29WW14	29WW16	29WW21	29WW24	29WW28
PARAMETER	UNITS	DEEP	DEEP	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE
Perchlorate	ug/L	12	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	ug/L	<5	<5	<5	<5	<200000	<5	<5	<5
Methylene chloride	ug/L	<5	<5	<5	<5	7300000	120	26 J	36

Legend

- Shallow Groundwater Monitoring Well
- Intermediate Groundwater Monitoring Well
- Deep Groundwater Monitoring Well
- Membrane Interface Probe (MIP) Location
- ND Not Detected
- TNT Red/Yellow Liquor Line (Wood)
- TNT Cooling Water Drain Line (North)
- TNT Cooling Water Drain Line (South)
- 1,2- Dichloroethane Contamination Extent At Concentration = 5 µg/L
- Estimated 1,2- Dichloroethane Contamination Extent At Concentration = 5 µg/L
- Methylene Chloride Contamination Extent At Concentration = 5 µg/L
- Estimated Methylene Chloride Contamination Extent At Concentration = 5 µg/L
- Perchlorate Contamination Extent At Concentration =4 µg/L
- Estimated Perchlorate Contamination Extent At Concentration =4 µg/L
- Stream
- Road
- Former Building or Tank Location
- Site

Notes:
1. Contamination plume extents are based on TCEQ's edium Specific Concentrations, updated March 31, 2004 or EPA Maximum Contaminant Levels.
2. Yellow highlighted groundwater monitoring wells were sampled in August - September, 2004 during data gaps investigation.

0 250 500 1,000 Feet

Shaw®

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

FIGURE 1

MEMBRANE INTERFACE PROBE INVESTIGATION LOCATIONS

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 06/07/05	A. Willmore 06/07/05	P. Srivastav 06/07/05	X:\Longhorn\GIS\workspace\MXD\29EECA\29_FieldMap.mxd

Plot Date: 06/05

Site ID Shaw_Houston_Longhorn_20059520
Client-OnSite Allen Willmore
Trap Operator Morgan Aycock/Nikki Auth
Results in mVs (milli volt seconds)

Location ID	Depth	TCE	1,2DCA	MeCl
29MIP-01	20-22	1935	511	ND
	24-28	1354	4077	ND
29MIP-10	12-16	5181	1019	ND
	16-20	2910	441	29
	20-24	6493	1262	ND
	24-28	4266	396	ND
29MIP-02	26-30	ND	49	ND
29MIP-03	22-26	174	ND	35721
	26-30	ND	1078	63096
29MIP-05	14-18	863	377	5370
	18-22	362	170	5370
	22-26	113	ND	5370
	26-30	261	ND	19807
	30-34	6091	255	27049
29MIP-06	26-30	126	ND	2188
29MIP-07	26-30	ND	ND	1241
29MIP-09	22-30	54	40	403
29MIP-11	22-30	ND	ND	155
	30-34	ND	ND	813
29MIP-12	9-17	2217	108	10826
	17-25	5990	336	20520
	25-30	6846	737	35421
29MIP-13	12-20	891	150	2250
	20-28	994	ND	4102
29MIP-14	7-15	186	ND	907
	15-23	69	ND	976
	23-36	564	ND	2808
29MIP-08	14-22	36	ND	479
	22-29	105	ND	1741
29MIP-15	10-18	631	ND	6877
	18-26	6718	ND	24936
	26-34	6952	36	8816
29MIP-16	8-16	ND	ND	170
	16-24	270	ND	2343
	24-30	3009	ND	2670

DRAFT

SITE DATA SUMMARY REPORT
LHAAP-29, FORMER TNT PRODUCTION 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.
1430 Enclave Parkway
Houston, Texas 77077

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

June 2005

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Appendix A Investigation Results – December 2004 and February 2005

Acronyms and Abbreviations

°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
Army	U.S. Department of the Army
bgs	below ground surface
COCs	contaminants of concern
FS	feasibility study
HI	hazard index
Jacobs	Jacobs Engineering Group, Inc.
LHAAP	Longhorn Army Ammunition Plant
MCLs	maximum contaminant levels
mg/kg	milligrams per kilogram
msl	mean sea level
Plexus	Plexus Scientific Corporation
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
Shaw	Shaw Environmental, Inc.
STEP	Solutions To Environmental Problems, Inc.
Sverdrup	Sverdrup Environmental, Inc.
SVOC	semivolatile organic compound
TCE	trichloroethene
TNRCC	Texas Natural Resources Conservation Commission
TNT	2,4,6-trinitrotoluene
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound

1.0 Introduction

This Data Summary Report was prepared by Shaw Environmental, Inc. (Shaw), for the U.S. Army Corps of Engineers (USACE), Tulsa District, under Total Environmental Restoration Contract DACA56-94-D-0020, Task Order 0109, and presents a compilation of past and current environmental data for the former 2,4,6-trinitrotoluene (TNT) Production Area (now designated LHAAP-29) at the former Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas.

1.1 Facility and Site Description

LHAAP is located in central-east Texas in the northeastern corner of Harrison County. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the southeast. The former U.S. Department of the Army (Army) installation occupies nearly 8,500 acres between State Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake, as shown in **Figure 1-1**.

LHAAP is an inactive, government-owned, formerly contractor-operated and maintained Department of Defense facility. Extensive demolition and salvaging of materials has occurred at LHAAP, but there are still many buildings or portions of buildings remaining. The groundwater, surface water, sediment, and soil at LHAAP have been contaminated by past operations. Studies conducted at LHAAP identified contaminants such as volatile organic compounds (VOCs), heavy metals, perchlorate, and explosives in on-site media. Several areas of contamination are subject to investigation and cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

The entire installation was under the control of the Army until May 5, 2004, when approximately 5,032 acres of the property were transferred to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge. Approximately 800 acres have been transferred to the USFWS since the initial transfer and the process will continue as environmental response is completed at individual sites. The remaining land is under the Army's control and includes the Group 2 and 4 sites currently undergoing the remedial investigation (RI)/feasibility study (FS) process. The U.S. Army Environmental Center has the responsibility for the environmental restoration activities at LHAAP, with the management of the Army's property provided by the Base Realignment and Closure Office.

The TNT Production Area at LHAAP operated from 1942 to 1945 as a six-line plant with a supporting acid plant. The plant produced approximately 400 million pounds of flake TNT during its period of operation. LHAAP-29 encompasses approximately 85 acres that include the area of the former production lines and an associated bulk toluene storage area that was located adjacent to the production area. Wastewater from the production of TNT was conveyed through

a wooden pipeline to a storage tank and pump house. Cooling water from the production area was collected by a separate vitrified clay pipe drainage system and discharged to an open ditch. Most of the aboveground structures were removed down to the foundations in 1959. A portion of the site was later used to wash rocket motor casings; this process included the use of a methylene chloride-based organic solvent. The underground lines and the foundations at the former TNT production area are generally considered potential sources of contamination at LHAAP-29.

1.2 Document Organization

This document consists of the following sections:

- **Section 1**, "Introduction," presents a general description of the facility and describes how the Data Summary Report is organized.
- **Section 2**, "Site Description and Background," summarizes past operations, physical setting, and anticipated future use of LHAAP-29.
- **Section 3**, "Environmental Investigations," provides a brief description of field activities that have taken place at LHAAP-29.
- **Section 4**, "Evaluation of Results," presents the overall analytical results from samples collected at LHAAP-29 for each of the environmental media.
- **Section 5**, "Summary," provides a brief summary of the results presented in the previous section.
- **Section 6**, "References," provides a list of those documents cited within this report.

Appendix A supports the sections described above by providing the full results of recent field investigations (December 2004 and February 2005). Tables and figures are provided at the end of the section in which they are first referenced.

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PLOT DATE: 5/17/05
FORMAT REVISION 5/13/02

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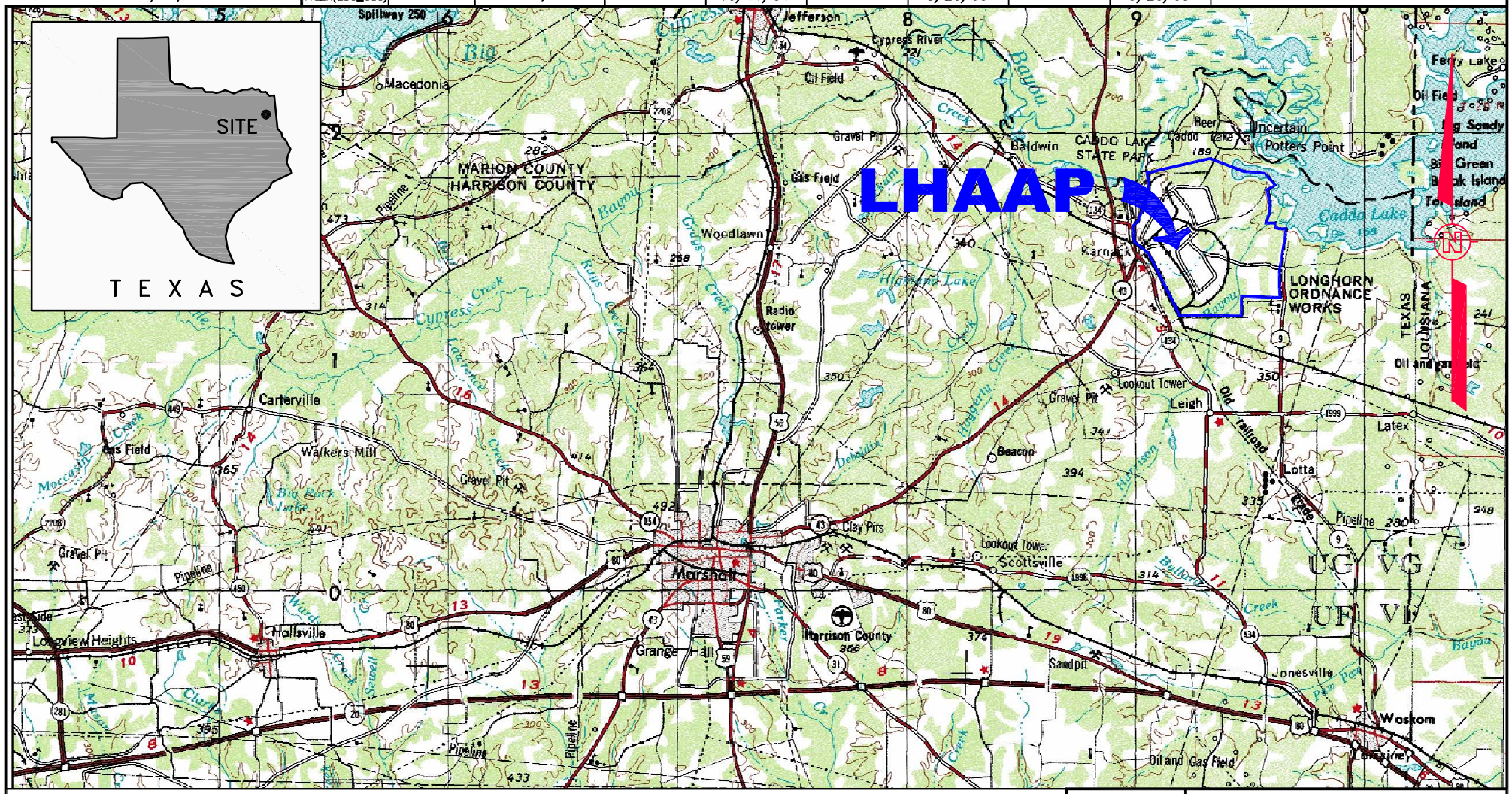

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TULSA, OKLAHOMA

FIGURE 1-1

LHAAP LOCATION MAP

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

2.0 Background

LHAAP was originally established as an explosives production facility during World War II. The scope of this report is the former TNT production area, now designated as LHAAP-29, which was the center of those early operations. This section summarizes the historical and physical setting of LHAAP-29. Information in this section is based on data obtained primarily from the following references:

- Group 2 Sites Remedial Investigation Report (Jacobs Engineering Group, Inc. [Jacobs], 2001)
- Group 2 Sites Baseline Human Health Risk Assessment (Jacobs, 2002a)
- Group 2 Sites Feasibility Study (Jacobs, 2002b)
- Environmental Site Assessment, Phase I and II Report (Plexus Scientific Corporation [Plexus], 2004)

2.1 Installation History

LHAAP was established in December 1941 when the Army issued a contract to build a six-line production facility for manufacturing 2,4,6-TNT (Plant 1 area). TNT was first produced in October 1942. LHAAP ultimately produced 414 million pounds of TNT before production was halted in August 1945, near the end of World War II, when the facility was placed on standby status.

In 1952, during the Korean War, the government undertook two initiatives at LHAAP:

- Plant 2 (a partially constructed facility) was reactivated and refitted for pyrotechnics production. Plant 2 produced 3.4 million pyrotechnic devices (e.g., photoflash bombs, simulators, hand signals, and 40-millimeter tracers) before production was discontinued in April 1956.

- Plant 3 was designed and built for producing solid-fuel rocket motors for tactical missiles. Actual rocket motor production began in December 1954. The last major propellant-loading activity in Plant 3 occurred in 1980. Between 1954 and 1980, LHAAP manufactured over 50 million pounds of composite propellant and delivered over 200,000 rocket motors.

The production of rocket motors at Plant 3 was the primary operation at LHAAP until 1965 when Plant 2 was reactivated for the production of pyrotechnic and illuminating ammunition for use in the Vietnam War. In the years following the Vietnam War, 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 Force Treaty in effect between the United States and the former Union of Soviet Socialist Republics.

Various media have been contaminated in certain areas by past industrial operations and waste management practices at LHAAP. Industrial operations involved the use of secondary explosives, rocket motor propellants, and various pyrotechnics such as illuminating and signal flares and ammunition. Explosives included TNT and black powder. Typical composite propellants were composed of a binding agent, an oxidizer such as ammonium perchlorate, and a powdered metal fuel such as aluminum. Pyrotechnics were generally composed of an inorganic oxidizer such as sodium nitrate, a metal powder such as magnesium, and a binding agent. Other materials used in the industrial operations included acids, lubricants, and solvents; particularly trichloroethene (TCE) and methylene chloride. Waste management included sanitary wastewater treatment, industrial wastewater treatment, holding/evaporation ponds, storm water drainage, sanitary and industrial waste landfills, and demolition/burning grounds. Discharges and releases to surface water, groundwater, and other secondary media occurred from the historical operations.

LHAAP was placed on the National Priorities List on August 9, 1990. A Federal Facility Agreement among the U.S. Environmental Protection Agency (USEPA), the Army, and the Texas Natural Resources Conservation Commission (TNRCC), now the Texas Commission on Environmental Quality, became effective December 30, 1991. LHAAP became inactive in July 1997, and a year later the Army issued a contract to remove salvageable property. On May 5, 2004, the Army transferred control of approximately 5,032 acres of land to the USFWS, with an additional 800 acres transferred since then.

The property that has not been transferred encompasses a number of sites that are undergoing the RI/FS process while the land is still under the Army's control. These sites have been organized into two groups (Group 2 and Group 4). LHAAP-29 is included in Group 2, along with LHAAP-12, -16, -17, -18/24, -32, and -49, all of which are depicted in **Figure 2-1**.

2.2 LHAAP-29 History

LHAAP-29, known as the former TNT Production Area, is a heavily wooded, 85-acre site in the western-central portion of the LHAAP installation **(Figure 2-1)**. The site is bounded by Avenue E on the southwest, Zeugner Drive (also known as 1st Street) on the northwest, and 18th Street on the southeast **(Figure 2-2).** Avenue D serves as a portion of the northeastern boundary of LHAAP-29. However, LHAAP-29 includes the Bulk Toluene Storage Area, which is a wooded area that extends for approximately 500 feet northeast of Avenue D. LHAAP-29 is currently inactive, but once contained five active and one standby TNT production lines. The area still contains the foundations for the former production facilities and the underground pipe

lines that were originally constructed for cooling water drainage and TNT wastewater conveyance.

The production facilities at LHAAP-29 manufactured TNT from October 1942 to August 1945. Wastewaters, known as "red liquor" and "yellow liquor" were generated at the Wash Houses when the TNT liquid was neutralized, purified, and cooled. These TNT wastewaters were collected in a gravity pipeline that emptied into a storage tank adjacent to 16th Street (618-B). The wastewater was then pumped through a 6-inch underground wooden pipeline to the TNT Waste Disposal Plant (LHAAP-32). Cooling water ("blue water") drain lines from the various nitration houses within the production facility emptied into an open ditch alongside 16th Street. The cooling water was conveyed to the Neutralization House (Building 612-A) for neutralization and discharged to surface water.

The TNT production facility was inactive from August 1945 to 1959. In 1959, most of the buildings and aboveground storage tanks were removed. The debris was burned or flashed at Burning Ground No. 2/Flashing Area (LHAAP-17). What remains are concrete foundations, open-top concrete-lined pits, and most of the underground utilities.

The former production facilities at LHAAP-29 were served by a network of underground pipelines. Two underground waste line systems are well defined – the TNT Wastewater Line and the Cooling Water Drain Line. Each has distinct segments that are itemized in **Table 2-1**. The location of these lines is depicted on **Figure 2-2**. The gravity portion of the TNT wastewater line terminates in the pump house area near the intersection of 16th Street with Avenue D. During TNT production, the wastewater was collected here and pumped through the pressure portion of the TNT wastewater line into storage tanks across Avenue D. The tanks were part of a treatment facility at what is now LHAAP-32. Following the removal of the pump house, the soil beneath it was excavated. The excavated area subsequently filled with water, and a pond now exists at the former pump house location.

There are also reports of two additional underground waste line systems (AEC, 1996). A 6-inch diameter transite pipeline is said to run parallel to the wooden TNT wastewater pipeline. The transite material is a combination of concrete and asbestos. This pipeline was in good condition when it was unearthed in 1993 at a location approximately 400 feet northwest of the pond. It was not sampled. The other waste line system is a set of lines from the washing areas to the wastewater line. The lines were reported to be 288 feet in length at each washing area and have a diameter of 10 inches. These lines are thought to be vitrified clay pipe with asbestos wicking. These lines have not been sampled.

Since the end of World War II, the only activity that has been documented to have occurred at LHAAP-29 is the "soak out" of out-of-specification rocket motors. This took place from 1959 to

the mid-1970s and involved the use of Turco®, a methylene chloride-based industrial solvent, at tank 801-F. Waste from this operation was sent to LHAAP-18/24 (Jacobs, 2001).

The TNT production process at LHAAP from 1942 to 1945 is described in detail in the Environmental Site Assessment (Plexus, 2004). That discussion is summarized below to provide background on the processes and chemicals that were utilized in specific areas of LHAAP-29.

TNT Manufacture. In each of the six production lines, TNT was manufactured by the successive nitrating of toluene in three separate batch operations in three separate buildings. The TNT manufacturing was essentially a countercurrent process in which toluene entered one end while the acid entered the other. The primary raw materials were toluene, nitric acid (the source of the nitrogen dioxide [NO_2] that was added to the toluene), and sulfuric acid. The sulfuric acid served as a catalyst and dehydrant. As a dehydrant, the sulfuric acid tied up excess water, thereby maintaining the necessary concentration of nitric acid.

During the manufacturing, the addition of the NO_2 group to the toluene molecule becomes more difficult with each successive nitrating step. To add the third and final NO_2 group, concentrated nitric acid (98 percent), oleum (108 percent sulfuric acid), and increased temperatures are required. These reactions, especially the final nitrating step, are inherently dangerous. They generate a great deal of heat. If the final nitration proceeds without sufficient cooling, the nitrated organics can explode. Therefore, a number of precautions were taken at the production facilities:

- Temperature control was essential
- Each nitration was performed in a separate reactor in a separate building
- A considerable distance separated each building from the others
- Barricades were installed to minimize damage from flying debris and to direct and dissipate the force of any explosion

The first nitration (toluene to nitrotoluene) was performed in the Mono-Nitrating Houses (801 Series Buildings), where the toluene was added to a mixture of sulfuric and nitric acid, and combined in an agitation tank. The second nitration was performed at the Bi-Nitrating House (803 Series Buildings). A mixture containing the nitrotoluene from Building 801 was treated with a stronger acid mixture to produce a dinitrotoluene mixture. The last nitration was performed at the Tri-Nitrating House (802 Series Building). The dinitrotoluene mixture from Building 803 was sent to Building 802 to be combined with more concentrated acids to make a crude TNT mixture. The approximate locations of the nitrating houses within LHAAP-29 are presented on **Figure 2-2**.

The crude TNT mixture was transported to the Wash House (806 Series Buildings). The mixture was washed with soda ash and then water to neutralize its acidity. The acidic wash water generated at this step was known as "yellow liquor." The TNT was then washed with sellite (aqueous sodium sulfite) to remove impurities consisting of asymmetrical TNT isomers. Sellite is a chemical compound made from soda ash and sulfur. The sellite production area was southwest of LHAAP-29 near Buildings 814 and 815. The sellite-treated TNT received a final series of countercurrent extractions with cold water to crystallize the TNT. Water from these extractions, combined with the sellite solution, was known as "red liquor." The purified TNT was slurried with water and pumped to a melt tank where it was reheated and then dried. The dehydrated product was then solidified on a drum or stainless steel belt. The solidified TNT was scraped from the belt or drum with a beryllium blade. Finally, the flake TNT was emptied into boxes. Once boxed, the TNT was moved to the Nail House (808 Series Building). Each Nail House served two production lines. At the Nail House, the TNT was sealed in boxes and prepared for shipment.

During nitration, the reaction temperature was monitored. If temperatures rose too fast, the contents of a reactor were dumped into a large tank of water, a procedure referred to as "drowning a charge." When a charge was to be drowned, alarms sounded and personnel evacuated the building. When the reactor contents entered the water, red nitrogen oxide fumes were produced and the organic fraction settled to the bottom of the tank. The water fraction, which was very acidic, was decanted and discharged to the central wastewater treatment facility. The organic fraction was disposed by burning at the burning grounds.

Process waste from the TNT plant was carried through separate waste lines (0.8 miles) to a wooden storage tank (618B) and pump house (Building 618A), and subsequently to an incinerator at the TNT Waste Disposal Plant. In early 1943, construction of separate systems for the collection of red and yellow TNT waste liquors began. On January 12, 1943, the wooden pipe carrying waste liquors from the TNT area to the waste disposal plant broke, shutting down operations for 12 hours. Wastewaters generated from the three nitration buildings include leaks and spills of acids, toluene and nitrated toluene, wash-down waters, and waters from drowning tanks. These wastewaters were very acidic and contained high concentrations of organics diluted by once-through cooling water.

Spent acid from the Mono-Nitrating Houses and acid fumes from other steps in the process were conveyed to the acid fume recovery (AFR) unit in the Recovery House (812 series buildings). Nitric and sulfuric acids were recovered, concentrated, and ultimately returned to the process.

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 and hardwood forests that cover a flat to gently rolling terrain with an average slope of 3 percent or less, though slopes as steep as 12 percent can be found in the western and northwestern portions of the installation and along Harrison Bayou. Surface water at LHAAP drains to the northeast into Caddo Lake via four drainage systems: Goose Prairie Creek, Central Creek, Harrison Bayou, and Saunders Branch. Caddo Lake is a part of the Big Cypress Bayou, and LHAAP is a part of the Cypress Bayou Basin occurring in the Piney Woods ecological region of Texas.

The surface topography at LHAAP-29 varies from a high of approximately 244 feet above mean sea level (msl) near the northwestern end of former Production Line B (near 817-B) to a low of approximately 205 feet msl in the centerline of the Cooling Water Outfall Ditch at the northeastern end of the site. The terrain generally slopes away from the high point toward the north, east, and south. However, surface runoff is largely intercepted by ditches constructed in 1942 when the production facility was built. Separate ditches were constructed for each production line, and these drain roughly 70 percent of the site to Central Creek toward the southeast. Surface runoff from the remaining 30 percent of the site (the northwestern halves of lines D, E, and F, plus the former bulk toluene storage area) enters Goose Prairie Creek which flows north and east of the site. Via these two creeks, the runoff from LHAAP-29 enters Caddo Lake. Goose Prairie and Central Creeks, like all drainage systems at LHAAP, are intermittent.

One of the features that drains into a tributary of Goose Prairie Creek is the Cooling Water Outfall Ditch. It is notable that this ditch was constructed so it drains very little surface area at the site. The ditch receives water from the following:

- The cooling water lines
- Rainfall into the ditch itself and immediately adjacent areas (approximately 2.64 acres)
- Overflow from the pond and immediately adjacent areas (approximately 0.37 acres) via a 16-inch clay pipe

The gentle topography and mild climate of LHAAP support an abundant and diverse plant community with a diversity of habitats, which suggests the potential for a large variety of animal species to inhabit the installation. As the buildings have been demolished, more and more of the facility has been left to nature with pine trees growing among concrete remnants. Common mammals found at LHAAP include the white-tailed deer, red and gray fox, rabbit, squirrel, opossum, skunk, armadillo, beaver, and raccoon.

2.4 Regional Geology/Hydrogeology

A thin veneer of Quaternary alluvium mantles the Tertiary age Wilcox and Midway Groups at 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 group consists of interbedded fine to medium-grained sand, silt, and clay. Underlying the Wilcox and Midway Groups are Cretaceous age formations of the Navarro and Taylor Groups. The Wilcox Group constitutes the majority of the unconsolidated sediments underlying LHAAP.

The uppermost portion of the Wilcox consists of medium plastic sandy silts and clays. The top silt and clay zone is followed by a shallow silty fine sand zone containing some silt and clay. A medium to highly plastic silty clay sand underlies the shallow sand zone. An intermediate sand zone is beneath the middle clay zone and consists of fine to medium silty sand. Beneath the intermediate sand zone is another silt to silty clay layer. This deep sand zone extends to the top of the Midway Formation, which is a thick, calcareous to non-calcareous clay containing some sand.

The Wilcox is the most important hydrogeologic unit at LHAAP. The unconsolidated sediments of the Wilcox Group are interpreted as consisting of a series of three active groundwater zones separated by silty or clayey layers. The first groundwater zone is within the shallow sand zone of the Wilcox Group. 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 Group. The clayey Midway Formation is considered the base of the active groundwater flow system at LHAAP.

Because of the high degree of stratigraphic heterogeneity, the level of interconnection between the shallow, intermediate, and deep water-bearing zones in the Wilcox Group deposits at LHAAP is highly variable. The depth to shallow groundwater across the facility ranges from 1 to 70 feet below ground surface (bgs), with the typical depth at 12 to 16 feet. The regional groundwater flow direction is generally east-northeast towards Caddo Lake, but varies by site location. Additional geologic and hydrogeologic information is included in the RI report (Jacobs, 2001).

2.5 Current and Future Site Use

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 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 LHAAP-29 are considered below.

2.5.1 Land

LHAAP has been an industrial facility since 1942. Large production activities continued until the facility was determined to be in excess of the Army's needs. The plant area is now inactive and approximately two-thirds of the former plant area is now controlled by the USFWS. LHAAP is surrounded by a fence (except on the border with Caddo Lake), and current security measures at LHAAP preclude unlimited public access to areas within the fence. Approved access for hunters is very limited. It is expected that a trespasser also occasionally enters the fenced area.

The anticipated future use of the entire facility is as a wildlife refuge. Another potential, though less likely, future use is industrial. There is currently no plan to develop LHAAP for residential use.

2.5.2 Surface Water

Streams on LHAAP currently support wildlife and aquatic life. While humans may have limited access to some streams during the annual hunts, there is no routine use of any streams on LHAAP by humans. The streams do not carry adequate numbers and size of fish to support either sport or subsistence fishing. 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 also 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.

2.5.3 Groundwater

Groundwater under and 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 situated north of LHAAP. 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 approximately 4,000 to 5,000 feet north and northwest of LHAAP. These three wells are identified as Caddo Lake Water Supply Corporation Wells 1, 2, and 3 and are all hydraulically upgradient to LHAAP. Water removal from these wells is not expected to affect groundwater flow at the site because of the remote locations of these wells from LHAAP and their depths of completion. In addition, there are several livestock and domestic wells located in the vicinity of LHAAP with depths averaging approximately 250 feet.

There are three water supply wells located on LHAAP **(Figure 2-1)**, and they supply water to the buildings currently in use on the installation. One well is located at the Fire Station/Security Office (north of LHAAP-32 and 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 (southwest of LHAAP-32) 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. None of the potable water supply wells are associated with or are in imminent danger from the localized contaminated groundwater at any of the Group 2 sites, including LHAAP-29.

Based on the anticipated future use of the facility as a wildlife refuge, the groundwater will not be used in the future as a drinking water source. However, to be conservative, it is assumed that another potential, though less likely, future use is industrial use. The future industrial scenario for LHAAP assumes limited use of groundwater as a drinking water source.

Table 2-1
Underground Waste Lines

Underground Line	Other Common Names	Start Point	End Point	Construction Material	Diameter	Estimated Total Length (feet)	Typical Cover Depth (feet)
TNT Wastewater Gravity Line	Red Liquor Pipeline	Just north of 818-A	Pump station area (vicinity of 618-A and –B)	Wood stave with 2-inch-wide metal bands spaced at 6-inch intervals; asphaltic coating	12 inches	2,850	3 to 3.5
TNT Wastewater Pressure Line	Red/Yellow Liquor Pipeline	Pump station area (vicinity of 618-A and –B)	LHAAP-32	Wood stave with 2-inch-wide metal bands spaced at 6-inch intervals; asphaltic coating	6 inches	1,730	3 to 3.5
Northern Cooling Water Drain Line	Blue Water Line	Former location of 803-B	Intersection with South Line at head of outfall ditch	Vitrified clay pipe	8 to 18 inches	2,465	9
Southern Cooling Water Drain Line	Blue Water Line	Former location of 806-A	Open outfall ditch just south of 16th Street	vitrified clay pipe	8 to 18 inches	2,790	5 to 6
Laterals to Cooling Water Drain Lines	- - -	Various production buildings	Various points along Cooling Water Drain Line	vitrified clay pipe	Not documented	5,150	3 to 9

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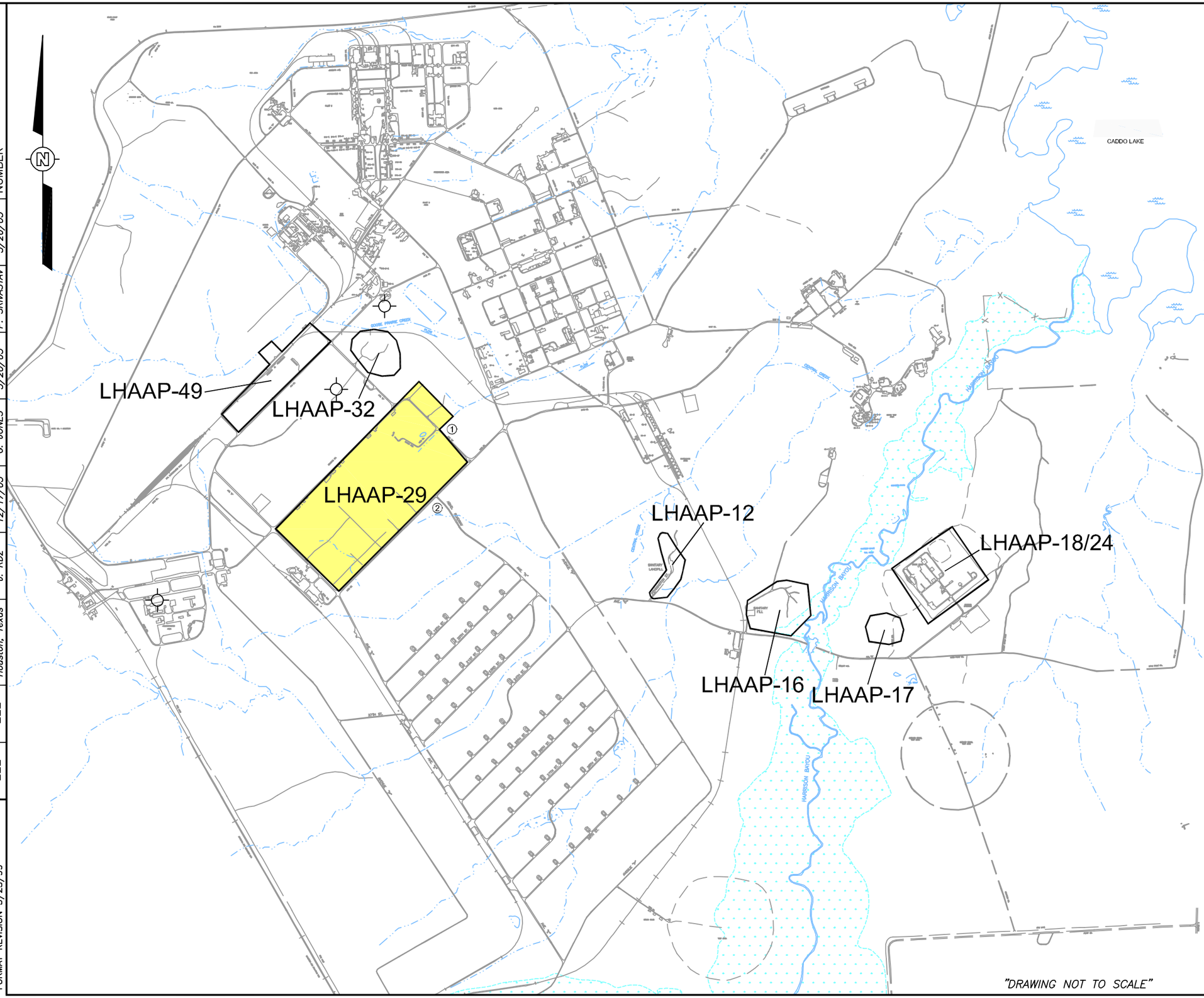
LHAAP Group 2 Sites

LHAAP-12	Landfill 12
LHAAP-16	Landfill 16
LHAAP-17	Burning Ground No. 2 and Flushing Area
LHAAP-18/24	Burning Ground No. 3/ Unlined Evaporation Pond
LHAAP-29	Former TNT Production Area
LHAAP-32	Former TNT Waste Disposal Area
LHAAP-49	Former Acid Storage Area



Legend:

- STREAM
- CREEK/BAYOU
- INTERMITTENT WETLAND AREA
- LHAAP WATER SUPPLY WELLS
- ① DRAINAGE FROM LHAAP-29 TO GOOSE PRAIRIE CREEK
- ② DRAINAGE FROM LHAAP-29 TO CENTRAL CREEK

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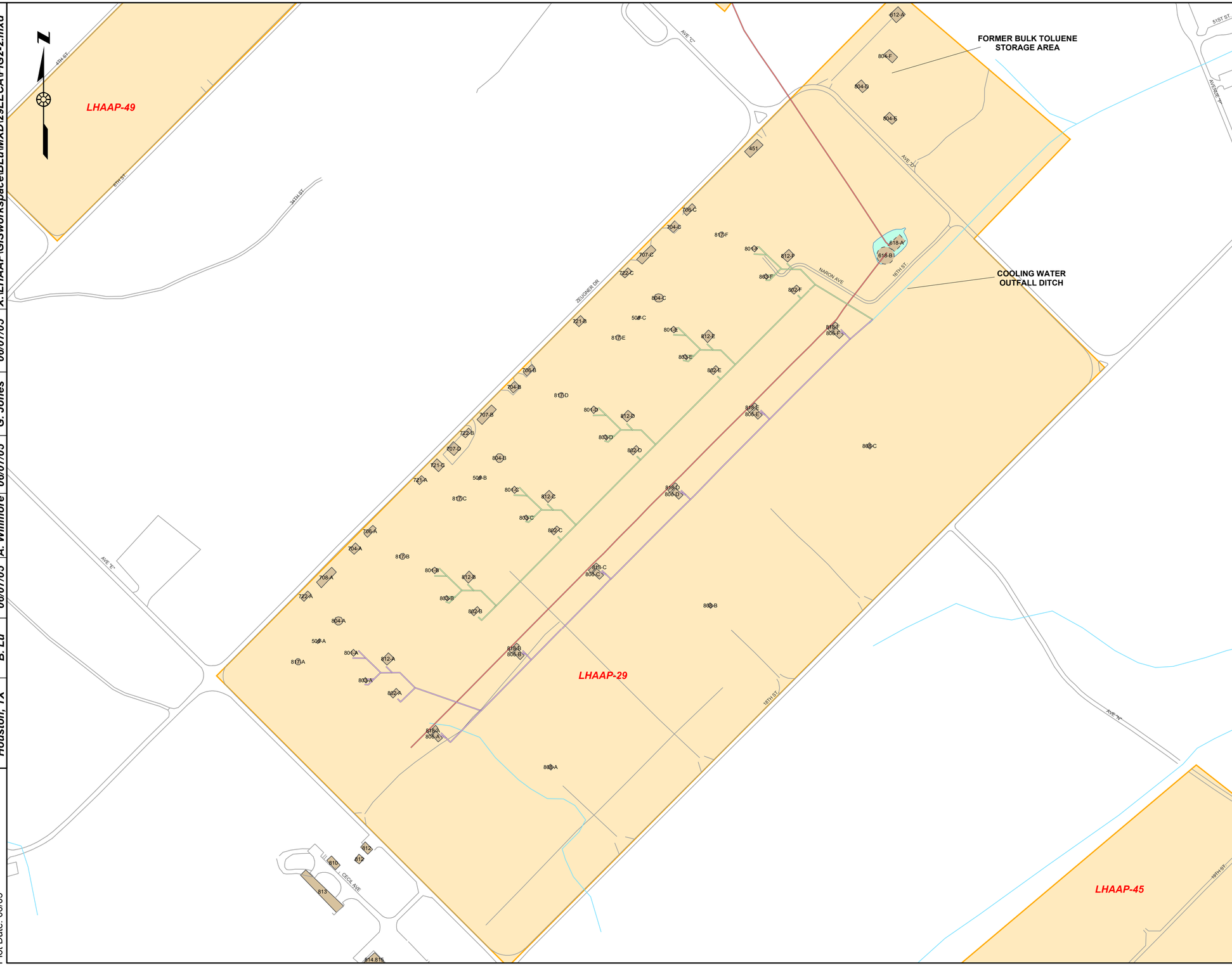
TULSA, OKLAHOMA

FIGURE 2–1
SITE VICINITY MAP
LHAAP–29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

IMAGE	X–REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Houston, Texas	J. RDZ 12/17/03	G. JONES 5/20/05	P. SRIVASTAV 5/20/05	845714–B56

PLOT DATE: 6/06/05
FORMAT REVISION 3/25/99



Legend

- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

Former Buildings and Structures in or Adjacent to LHAAP-29

Structure or Building Number	Description	Materials Handled
Former Buildings and Structures in or Adjacent to LHAAP-29		
Original Use (1942-1945)		
451	Compressed Air Plant	- - -
508-A to -C	Storage Building	- - -
704-A to -C	Nitric Acid Storage	Acids
705-A to -C	Neutralization House	Cooling water from production (blue water)
707-A to -D	Pump House	Cooling water from production (blue water)
708-A	Wash House	TNT wastewater (red liquor)
721-A to -C	Storage Tank	TNT wastewater (red liquor)
722-A to -C	Solvent Storage Building	TNT waste water (red liquor)
801-A to -F	Solvent Storage Building and/or Powder Magazine	Solvents
802-A to -F	Powder Magazine	Solvents
803-A to -F	Storage Building	- - -
804-A to -F	Storage Building	- - -
805-A to -F	Storage Building	- - -
806-A to -F	Storage Building	- - -
808-A to -C	Inspector's Office	- - -
812-A to -F	Mononitrobenzene House	Toluene, nitrotoluene, nitric acid, sulfuric acid
817-A to -F	Mononitrotoluene House	Mononitrotoluene, dinitrotoluene, nitric acid, sulfuric acid
818-A to -F	Dinitrotoluene House	Dinitrotoluene, mononitrotoluene, nitric acid, sulfuric acid
818-A to -F	Trinitrotoluene House	Trinitrotoluene, dinitrotoluene, nitric acid, sulfuric acid
818-A to -F	Toluene Storage	Toluene
808-A to -C	Toluene Unloading Storage	Toluene
809-A to -F	Toluene Tank	Toluene
809-A to -F	Wash House	TNT, caustic soda, sulfite, residual acids, TNT wastewater (red liquor), yellow liquor
812-A to -F	Acid & Fume Recovery House	TNT, caustic soda, sulfite, residual acids, TNT wastewater (red liquor), yellow liquor
808-A to -C	Nail House	TNT, boxes, nails
812-A to -F	Oleum Storage	Oleum
812-A to -F	Acid & Fume Recovery House	Nitric acid fumes, recovered acid
817-A to -F	Gencorp	Oleum
818-A to -F	Oleum Storage	Oleum
818-A to -F	Barricade	- - -
Subsequent Use		
707-C	General Purpose Warehouse	Out-of-specification rocket motors containing composite propellants (e.g. polysulfide, perchlorate), methylene chloride-based industrial solvent, liquid solvent waste, lubricants, polymers, fuels
801-F	Rocket Motor Soak-Out Facility	Out-of-specification rocket motors containing composite propellants (e.g. polysulfide, perchlorate), methylene chloride-based industrial solvent, liquid solvent waste, lubricants, polymers, fuels
801-F	Rocket Motor Soak-Out Facility	

- - - Not documented

Reference: *Environmental Site Assessment, Phase I and II Report* (Plexus, 2004)

0 200 400 800 Feet

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TULSA, OKLAHOMA

FIGURE 2-2

SITE MAP
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	06/07/05	A. Willmore	06/07/05	G. Jones	06/07/05	X:\LHAAP\GISworkspace\BLu\MXD\29ECA\FIG2-2.mxd

Plot Date: 06/05

3.0 Environmental Investigations at LHAAP-29

LHAAP-29 has been the subject of numerous investigations. These include the Pre-RI investigations by Environmental Protection Systems in 1982 and 1987; the Phase I, Phase II, and Phase III RIs conducted by Jacobs in 1993, 1995, and 1998, respectively; the site-wide perchlorate investigation conducted by Solutions To Environmental Problems, Inc. (STEP) in 2002; the Environmental Site Assessment activities performed by Plexus in 2003; the data gaps investigation by Shaw in the spring and summer of 2004; additional explosives and perchlorate sampling by Shaw in December 2004 and February 2005; and explosives sampling by USACE at a building foundation in February 2005. Detailed discussions of these field investigations can be found in the documents listed in **Table 3-1**.

This report is based on those data that were utilized for the human health risk assessment (Jacobs, 2002a) plus subsequent sampling and analyses. The 2002 risk assessment data set includes results from Phases I, II, and III of the RI, with the exception of explosives results from Phase II that were determined by USEPA to be unusable for environmental decision making. Phases I, II, and III of the RI, as well as subsequent investigations, are described in **Sections 3.1** through **3.6**. These sections reference numerous sample locations. Those locations are presented on **Figures 3-1** through **3-3** for soil, sediment and surface water, and groundwater, respectively. **Tables 3-2** through **3-5** provide summaries of the number of detected results and the maximum concentrations of contaminants in the various media at LHAAP-29 during Phases I, II, and III of the RI and subsequent investigations.

3.1 Remedial Investigation and Baseline Human Health Risk Assessment

The pre-RI and RI at LHAAP-29 (and other Group 2 sites) culminated in the development of an RI Report (Jacobs, 2001). In that report, the RI activities and findings for LHAAP-29 were summarized as follows:

> "The Phase I – Phase II field activities included the installation and sampling of 33 monitoring wells, sampling at six Pre-Phase I monitoring wells, and the collection of 125 soil samples, 10 waste line content and associated soil samples, and 31 surface water and sediment samples.
>
> **<u>Waste Line Samples</u>**
> Waste line contents samples were analyzed for explosive compounds and metals, and the adjacent waste line soil samples were analyzed for metals, VOCs and explosive compounds. Two metals (antimony and lead) were detected in the content samples at a concentration above PCLs [*Protective Concentration Levels*]. Two metals (barium and lead) were detected in the waste line associated soils at concentrations above PCLs.

Soils
Shallow soil samples were analyzed for VOCs, SVOCs [*semivolatile organic compound*], explosive compounds, metals, pesticides/PCBs [*polychlorinated biphenyls*] and dioxins/furans. One VOC (methylene chloride) was detected at a concentration above PCLs. Six metals (antimony, arsenic, barium, lead, selenium, and silver) were detected at concentrations above PCLs.

Surface Water/Sediments
Surface water/sediment samples were analyzed for VOCs, SVOCs, explosive compounds, metals, pesticides/PCBs and dioxins/furans. Surface water samples were also analyzed for anions (chloride, sulfate, and nitrate plus nitrite [as N]). Seven metals (arsenic, barium, beryllium, cadmium, lead, selenium, and silver) were detected in the sediment samples at concentrations above PCLs. Three metals (copper, lead, and zinc) were detected in the surface water samples at concentrations above TWQS [*Texas Surface Water Quality Standards*] values.

Groundwater
The groundwater samples were analyzed for VOCs, SVOCs, explosive compounds, metals, pesticides/PCBs, dioxins/furans, chloride, sulfate, and nitrate plus nitrite (as N). Three VOCs (methylene chloride, 1,2-dichloroethane, and trichloroethene) and two SVOCs – (2,4-dinitrotoluene and 2,6-dinitrotoluene) were detected at concentrations above PCLs. Four explosive compounds (2,4-dinitrotoluene, 2,6-dinitrotoluene, o-nitrotoluene, and p-nitrotoluene) were detected at concentrations above PCLs. Fourteen metals (aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, iron, lead, mercury, nickel, selenium, silver, and thallium) were detected at concentrations above PCLs. The anions (chloride, nitrate + nitrite [as N], and sulfate) were detected at concentrations above TNRCC PCL/SCLs [*Secondary Constituent Levels*]. The groundwater flow directions are generally to the east-southeast in the shallow and intermediate saturated zones.

Nature and Extent
Elevated levels of metals were found in Site 29 soils, but were primarily isolated in the upper two feet. There were significant explosive constituents present at two soil locations in the northern portion of Site 29. Groundwater contaminants were primarily confined to the upper layers. Four groundwater locations showed elevated explosive constituent contamination and two instances of elevated VOCs."

As noted earlier, the results for explosives for the Phase I and Phase II RIs were largely deemed "unusable for environmental decision making" by the USEPA. Nonetheless, Jacobs was able to use the acceptable data to prepare a Baseline Human Health Risk Assessment (Jacobs, 2002a). The assessment considered a current trespasser as well as a future maintenance worker. Given the reasonably anticipated future use of the site as a wildlife refuge, the future maintenance

worker can be considered a conservative scenario. The results of that 2002 risk assessment for the future maintenance worker scenario are provided in **Table 3-6**.

The soil risk values include impacts from sediment ditch samples. The soil cancer risk is within the target range and, as noted in the human health risk assessment, "The hazard index (HI) is approximately equal to the benchmark of 1 (Jacobs, 2002a)."

The groundwater risks at LHAAP-29 are orders-of-magnitude higher than the target values. The major contributors to the risk are organic solvents and perchlorate that are likely associated with rocket motor washout, and explosives-related contaminants that are probably byproducts of the TNT production.

The 2002 assessment (Jacobs, 2002a) indicated the limited risk associated with soil and sediment was largely due to explosives (notably TNT and 2,4-dintrotoluene) while the contributors to groundwater risks were organic solvents, perchlorate, and explosives. As discussed in **Sections 3.2** through **3.6**, subsequent field investigations have focused on these families of compounds.

3.2 Perchlorate Investigation

A site-wide perchlorate investigation was implemented in 2002 (STEP, 2003). As part of this investigation, LHAAP-29 was the subject of the following activities:

- 20 monitoring wells were sampled in and around LHAAP-29 in March and September 2002
- Three groundwater samples were collected by direct-push technique sampler
- Water samples were collected "from the sump behind the rocket wash facility and from the pond adjacent to the main access road"
- 10 soil samples were collected from five locations around the perimeter of the rocket motor washout facility, the foundations near monitoring well 29WW15, and the ditch that drains the rocket motor washout area
- 28 soil samples were collected from five locations along the ditch that drains the rocket motor washout area
- Four surface soil samples were collected at four locations around the perimeter of the pond

The STEP (2002) investigation confirmed two areas of suspected perchlorate groundwater contamination – one near monitoring well 29WW06 (2,950 micrograms per liter [μg/L] in September 2002) and the other near monitoring well 29WW15 (61,400 μg/L in March 2002). A

high soil perchlorate concentration of 2,410 micrograms per kilogram (µg/kg) was detected at 1 to 2 feet bgs at 29SS02. The investigation report concluded as follows:

> "The east area of groundwater contamination is fairly well defined but the west area needs further delineation. Consideration should be given to applying active remedial measures in both areas specifically designed to reduce the levels of perchlorate in the groundwater. The lateral extent of soil contamination in the vicinity of well 29WW15 has been defined. However, the vertical extent needs to be defined, perhaps in conjunction with a removal action or other remedial measure."

3.3 Environmental Site Assessment

Plexus performed an environmental site assessment at LHAAP in 2003. No additional samples were collected for laboratory analysis during the environmental site assessment. However, Plexus did perform a visual examination of the soil around specific building foundations at LHAAP-29. Surface soil was exposed on all four sides of each of the 806 series buildings (the six wash houses). Plexus stated the following in their report (Plexus, 2004):

> "Distinctive reddish staining was noted on the west end of Building 806-A. The stained soils extended approximately six feet from the foundation and from a depth of approximately four to eight inches. The stained soil was field-screened using the Expray explosive detection kit. The screening was positive for the presence of nitroaromatic compounds. Some staining was also observed on the west side of the Building 806-D foundation at a depth of approximately six inches. A thin layer of staining was noted near the surface on the north side of the foundation. The extent of contamination is limited at this building. No other staining was noted. Well 29WW24 is located in the area of contamination. The foundations of Buildings 803-A and E (Bi-Houses) were also checked. No visible evidence of contamination was found."
>
> "The staining observed at the Building 806-A and D foundations was not a coherent mass and appeared to be evenly distributed in the soil. Some vegetation is present in each of the stained areas. The material in the soil is unlikely to present an explosive safety hazard."

The environmental site assessment also described the limited amount of information known about the underground lines:

> "Potential sources of contamination at the site are the 6-inch wooden red and yellow liquor and blue water pipelines that transported LHAAP-29 process wastes to the TNT Waste Disposal Plant (LHAAP-32) just northeast of LHAAP-29. For the RI, a total of ten pipeline contents and ten soil samples were collected from the area adjacent to the pipeline to evaluate this potential source of contamination. Antimony and lead were above PCLs in the pipeline content samples. The

explosive data for the pipeline contents were deemed unusable for environmental decision making by USEPA."

3.4 Groundwater Data Gaps Investigation

As part of a data gaps investigation, Shaw sampled 20 wells at LHAAP-29 in August 2004. This included a new monitoring well that Shaw installed at 29WW34. The samples were analyzed for explosives, VOCs, and perchlorate. A complete discussion of the procedures and results for this investigation are presented in the Data Gaps Investigation Report (Shaw, 2005), but **Table 3-7** provides a summary of results pertinent to the 20 wells that were sampled at LHAAP-29. As highlighted in that table, results for a number of VOCs equal or exceed their concentrations as measured in earlier sampling. Some of the highlighted results are associated with 29WW21 and are estimated values of analytes that were also detected in the associated blank. The remaining highlighted values are from the clustered well pair 29WW15/29WW16 and from the new intermediate zone well, 29WW34.

3.5 December 2004 and February 2005 Activities

Shaw performed additional field investigation activities at LHAAP-29 in December 2004 and February 2005. A full description of these activities and the analytical results are provided in **Appendix A**. These results are included in the summary tables (**Tables 3-2** through **3-5)** and are evaluated in **Section 4.0** together with other LHAAP-29 results for specific media. The December 2004 and February 2005 investigation activities can be described briefly as follows:

- **Explosives in Soil near TNT Wastewater Line.** Ten soil samples were collected from five locations near the wash house sumps and analyzed for explosives. The few detected results were insignificant; the high value was 0.9 milligrams per kilogram (mg/kg) for 2-amino-4,6-dinitrotolune.

- **Explosives in Sediments from Cooling Water Lines, Pump House Pond, and Outfall Ditch.** In December 2004, eight samples of sediment were collected at various manholes along the cooling water lines. The results varied from 0.29J to 11 mg/kg in the southern segment and 0.41 to 7 mg/kg in the northern segment. The sediment at the pond had one detected value (TNT), and that result was just above the detection limit. In contrast to those results, the sediment sample from the Outfall Ditch had 26,000 mg/kg TNT and 8,000 mg/kg DNT.

- **Explosives in Water from Cooling Water Lines, Pump House Pond, and Outfall Ditch.** In December 2004, three samples of water were collected at three of the twelve manholes along the cooling water lines. The three water samples had results of 250, 0.93J, and 5,200 µg/L for 2,4,6-TNT at Manholes 1, 2, and 9, respectively. In

February 2005, water samples were collected from nine of the manholes. The February results for TNT varied from 0.955 J µg/L to 430 JL µg/L. The water sample from the Outfall Ditch had a TNT result of 860 µg/L.

- **Perchlorate in Soil.** Three samples were collected from each of four borings for a total of twelve soil samples that were analyzed for perchlorate. Two of the locations were through foundations at the rocket motor washout facility area (Building 806-F). Perchlorate was detected just below the foundation slab at 29SB88 (74.5 µg/L) and just above the groundwater table at 29SB89 (144 µg/L). More significant concentrations of perchlorate were detected at soil boring 29SB86, which was installed an area about 600 feet southwest of Building 806-F:

Depth (feet bgs)	Perchlorate (µg/kg)
0 – 0.5	40.3
6 – 8	8,600
20- 21 (just above the water table)	689

The three results from 29SB87, which was installed down slope from 29SB86, were all non-detect.

3.6 Foundation Soil Sampling

On February 9 and 10, 2005, the USACE collected samples of soil at the foundation of Wash House 806-D and submitted them for explosives analysis (USACE, 2005). The results are presented in **Table 3-8**.

The concrete foundation was cored in two places on the western end of the wash house. The western end of each wash house is the downgradient end and could be expected to have received runoff from settling tanks that were once housed in each wash house. Location 29DLineWHC01 was at a crack in the slab. The second location was slightly north and downgradient of the first core. The soil beneath the cores was slightly sandy with high clay content.

The third sample was collected along the edge of the foundation at the most western end of the wash house slab. The soil was visually inspected at several locations along the foundation, and sample 29DLineWHW01 was collected at the location with the most obvious staining.

The soil samples at the cored locations had no detected results for explosives. The sample from the edge of the foundation had detected results for four explosives parameters; the highest result was 27.3 mg/kg TNT.

Table 3-1
Reference Documents for Field Investigations

Investigation	Reference Document
Pre-RI Investigations	*Final Remedial Investigation Report, Group 2 Sites, Longhorn Army Ammunition Plant, Karnack, Texas* (Jacobs, 2001). *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites, Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou and Caddo Lake, Longhorn Army Ammunition Plant, Karnack, Texas*, Draft Final (Jacobs, 2002a).
Phase I, II, and III RI Investigations	*Final Remedial Investigation Report, Group 2 Sites, Longhorn Army Ammunition Plant, Karnack, Texas* (Jacobs, 2001). *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites, Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou and Caddo Lake, Longhorn Army Ammunition Plant, Karnack, Texas*, Draft Final (Jacobs, 2002a).
Site-Wide Perchlorate Investigation	*Plant-Wide Perchlorate Investigation, Longhorn Army Ammunition Plant, Karnack, Texas*, Draft Final (STEP, 2003).
Environmental Site Assessment	*Environmental Site Assessment, Phase I and II Report, Draft, Production Areas, Longhorn Army Ammunition Plant, Karnack, Texas* (Plexus, 2004).
Data Gaps Investigation	*Draft Data Gaps Investigation Report, Longhorn Army Ammunition Plant, Karnack, Texas* (Shaw, 2005).
December 2004 and February 2005 Investigations by Shaw	Appendix A of this report
February 2005 Investigation by USACE	Section 3.6 of this report and Personal Communication (USACE, 2005).

Notes:

RI remedial investigation
STEP Solutions to Environmental Problems, Inc.
USACE U.S. Army Corps of Engineers

Table 3-2
Summary of Analytes Detected in Soil

Analyte	Number Detects/Number Samples	Minimum Detect	Maximum Detect
Dioxins/Furans (ng/kg)			
1,2,3,4,6,7,8-Heptachlorodibenzofuran	9/14	0.199	13.84
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	14/14	1.051	40.124
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1/14	0.355	0.355
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1/14	0.565	0.565
1,2,3,4,7,8-Hexachlorodibenzofuran	2/14	1.145	7.986
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	7/14	0.812	1.905
1,2,3,6,7,8-Hexachlorodibenzofuran	1/14	0.278	0.278
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	6/14	0.334	1.101
1,2,3,7,8,9-Hexachlorodibenzofuran	1/14	0.394	0.394
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1/14	2.371	2.371
1,2,3,7,8-Pentachlorodibenzofuran	1/14	5.046	5.046
2,3,4,6,7,8-Hexachlorodibenzofuran	3/14	0.561	1.405
2,3,7,8-Tetrachlorodibenzo-furan	3/14	0.306	0.343
Heptachlorodibenzo-p-dioxin	14/14	1.687	74.662
Heptachlorodibenzofuran	12/14	0.26	13.84
Hexachlorodibenzo-p-dioxin	13/14	0.736	17.962
Hexachlorodibenzofuran	11/14	0.308	15.558
Octachlorodibenzo-p-dioxin	14/14	113.697	2728.43
Octachlorodibenzofuran	8/14	1.177	23.598
Pentachlorodibenzo-p-dioxin	3/14	0.368	3.096
Pentachlorodibenzofuran	13/14	0.375	32.465
Tetrachlorodibenzo-p-dioxin	2/14	0.46	3.453
Tetrachlorodibenzofuran, Total	13/14	0.503	19.587
Explosives (mg/kg)			
1,3,5-Trinitrobenzene	2/95	0.43	3.5
2,4,6-Trinitrotoluene	4/95	0.43	110
2,4-Dinitrotoluene	3/92	0.54	6.2
2-Amino-4,6-dinitrotoluene	5/92	0.23	15
4-Amino-2,6-dinitrotoluene	3/92	0.3	12
General Chemistry (mg/kg)			
Chloride	65/67	2.9	359.6
Nitrate	4/67	0.17	1.89
Sulfate	52/67	3.5	3251.4
pH	70/70	4.67	8.31
Metals (mg/kg)			
Aluminum	14/14	3700	15000
Antimony	24/131	1.2	2.7
Arsenic	131/131	1.1	17.2
Barium	131/131	18.8	884.5
Beryllium	4/14	0.65	0.692
Calcium	8/14	560	2700
Chromium	131/131	5.26	40.5

Table 3-2 (*continued*)
Summary of Analytes Detected in Soil

Analyte	Number Detects/Number Samples	Minimum Detect	Maximum Detect
Cobalt	3/14	5.7	6.4
Copper	13/14	3.61	8.77
Iron	14/14	4500	19000
Lead	129/131	3.68	247
Magnesium	8/14	560	940
Manganese	14/14	70.2	521
Mercury	3/131	0.13	0.15
Nickel	130/131	2.47	89.5
Potassium	14/14	620	1300
Selenium	13/131	0.71	4.06
Silver	4/131	1.1	5
Sodium	4/14	780	1400
Strontium	2/14	5.6	8.2
Thallium	21/131	1.28	2.46
Vanadium	14/14	13	34
Zinc	14/14	7.3	700
Perchlorate (µg/kg)			
Perchlorate	18/68	24.5	8600
Semivolatiles (mg/kg)			
Butyl benzyl phthalate	14/81	0.57	1.6
bis(2-Ethylhexyl)phthalate	14/81	0.43	4
di-n-Butyl phthalate	41/81	0.41	3.9
Volatiles (mg/kg)			
2-Butanone	1/85	0.015	0.015
Acetone	8/85	0.0047	0.4
Methylene chloride	9/85	0.001	0.028
Styrene	1/85	0.00065	0.00065
p-Isopropyltoluene	1/14	0.012	0.012

Notes:

mg/kg milligrams per kilogram
ng/kg nanograms per kilogram
µg/kg micrograms per kilogram

Table 3-3
Summary of Analytes Detected in Sediment

Analyte	Units	Number Detects/Number Samples	Minimum	Maximum
Dioxins/Furans (ng/kg)				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	ng/kg	2/4	1.18	5.59
1,2,3,4,6,7,8- Heptachlorodibenzo-p-dioxin	ng/kg	4/4	2.89	18.4
1,2,3,4,7,8-Hexachlorodibenzofuran	ng/kg	3/4	0.45	2
2,3,7,8- Tetrachlorodibenzo-furan	ng/kg	1/4	0.872	0.872
Heptachlorodibenzo-p-dioxin	ng/kg	4/4	3.55	32.3
Heptachlorodibenzofuran	ng/kg	2/4	1.35	5.59
Hexachlorodibenzo-p-dioxin	ng/kg	1/4	2.21	2.21
Hexachlorodibenzofuran	ng/kg	1/4	3.55	3.55
Octachlorodibenzo-p-dioxin	ng/kg	4/4	198	444
Octachlorodibenzofuran	ng/kg	2/4	2.71	17.6
Pentachlorodibenzofuran	ng/kg	2/4	1.68	2.61
Tetrachlorodibenzofuran, Total	ng/kg	1/4	0.975	0.975
Explosives (mg/kg)				
2,4,6-Trinitrotoluene	mg/kg	4/31	0.41	26000
2,4-Dinitrotoluene	mg/kg	1/31	8000	8000
2,6-Dinitrotoluene	mg/kg	1/31	15	15
2-Amino-4,6-dinitrotoluene	mg/kg	2/31	20	48
4-Amino-2,6-dinitrotoluene	mg/kg	1/31	16	16
General Chemistry (mg/kg)				
Chloride	mg/kg	6/18	4.8	13
Nitrate	mg/kg	1/18	0.21	0.21
Sulfate	mg/kg	14/18	3.4	18.6
pH	STD Unit	18/18	4.04	6.69
Metals (mg/kg)				
Aluminum	mg/kg	10/10	3400	11000
Antimony	mg/kg	1/31	1.4	1.4
Arsenic	mg/kg	30/31	1.53	15
Barium	mg/kg	31/31	45.7	270
Beryllium	mg/kg	2/10	1.28	1.57
Cadmium	mg/kg	2/31	0.991	1.03
Calcium	mg/kg	10/10	690	3800
Chromium	mg/kg	31/31	7.2	68.3
Cobalt	mg/kg	3/10	7.1	15
Copper	mg/kg	11/13	3.5	17.1
Iron	mg/kg	10/10	5800	39000
Lead	mg/kg	31/31	7.03	161
Magnesium	mg/kg	6/10	690	3700
Manganese	mg/kg	10/10	63	458
Mercury	mg/kg	1/31	0.22	0.22
Nickel	mg/kg	26/31	3.28	25.4
Potassium	mg/kg	1/10	770	770
Selenium	mg/kg	3/31	2.08	3.51

Table 3-3 (continued)
Summary of Analytes Detected in Sediment

Analyte	Units	Number Detects/Number Samples	Minimum	Maximum
Silver	mg/kg	2/31	1.55	1.93
Strontium	mg/kg	5/10	9.9	57
Thallium	mg/kg	1/31	1.74	1.74
Vanadium	mg/kg	10/10	13	77
Zinc	mg/kg	13/13	12	120
Semivolatiles (mg/kg)				
Butyl benzyl phthalate	mg/kg	1/22	0.58	0.58
Fluoranthene	mg/kg	1/22	0.28	0.28
Pyrene	mg/kg	1/22	0.28	0.28
di-n-Butyl phthalate	mg/kg	7/22	0.549	11
Volatiles (mg/kg)				
Acetone	mg/kg	7/28	0.007	0.112
Methylene chloride	mg/kg	1/28	0.0036	0.0036
Toluene	mg/kg	1/28	0.031	0.031
Trichloroethene	mg/kg	1/28	0.0076	0.0076
cis-1,2-Dichloroethene	mg/kg	1/28	0.0077	0.0077
p-Isopropyltoluene	mg/kg	2/10	0.0043	0.032

Notes:

mg/kg milligrams per kilogram
ng/kg nanograms per kilogram
µg/kg micrograms per kilogram

Table 3-4
Summary of Analytes Detected in Surface Water

Analyte	Units	Number Detects/Number Samples	Minimum	Maximum
Dioxins/Furans (pg/L)				
1,2,3,4,6,7,8-HpCDD	pg/L	1/4	3.903	3.903
Octachlorodibenzo-p-dioxin	pg/L	4/4	17.4	264.786
Explosives (µg/L)				
1,3,5-Trinitrobenzene	µg/L	2/46	0.634	0.73
1,3-Dinitrobenzene	µg/L	1/46	0.0495	0.0495
2,4,6-Trinitrotoluene	µg/L	12/46	0.2	860
2,4-Dinitrotoluene	µg/L	8/46	0.413	19
2,6-Dinitrotoluene	µg/L	8/46	0.06	7.9
2-Amino-4,6-dinitrotoluene	µg/L	15/46	0.339	21
4-Amino-2,6-dinitrotoluene	µg/L	18/46	0.2	48
RDX	µg/L	1/46	0.731	0.731
m-Nitrotoluene	µg/L	0/46		
o-Nitrotoluene	µg/L	1/46	0.3	0.3
p-Nitrotoluene	µg/L	3/46	0.28	1.3
General Chemistry (µg/L)				
Chloride	µg/L	21/28	1020	21900
Nitrate	µg/L	4/18	80	3760
Nitrate / Nitrite	µg/L	1/10	121	121
Specific Conductivity	µmhos	18/18	26	1100
Sulfate	µg/L	28/28	1620	14900
Temperature	Deg C	18/18	15.9	25
pH	STD Unit	14/14	6.16	8.82
Metals (µg/L)				
Aluminum	µg/L	10/10	480	28000
Antimony	µg/L	1/31	8	8
Arsenic	µg/L	4/31	11.2	17
Barium	µg/L	24/31	28.9	2200
Beryllium	µg/L	2/10	0.7	1.9
Cadmium	µg/L	1/31	1	1
Calcium	µg/L	7/10	5900	12000
Chromium	µg/L	1/31	30	30
Copper	µg/L	3/13	10	41
Hardness	µg/L	1/3	44000	44000
Iron	µg/L	10/10	840	25000
Lead	µg/L	19/31	2.07	53
Manganese	µg/L	10/10	56	1520
Potassium	µg/L	4/10	5200	5700
Strontium	µg/L	2/10	60	70
Vanadium	µg/L	1/10	50	50
Zinc	µg/L	10/13	9	130

Table 3-4 (*continued*)
Summary of Analytes Detected in Surface Water

Analyte	Units	Number Detects/Number Samples	Minimum	Maximum
PERC (µg/L)				
Perchlorate	µg/L	2/13	0.814	12.1
Semivolatiles (µg/L)				
bis(2-Ethylhexyl)phthalate	µg/L	1/22	45	45
Volatiles (µg/L)				
2-Butanone	µg/L	1/39	5.7	5.7
Acetone	µg/L	7/39	1.06	25
Chloromethane	µg/L	1/43	0.704	0.704
Methylene chloride	µg/L	3/43	1	2.81
Toluene	µg/L	3/43	0.22	1.09
Trichloroethene	µg/L	1/43	1.1	1.1

Notes:

µg/L micrograms per liter
pg/L picograms per liter

Table 3-5
Summary of Analytes Detected in Groundwater

Analyte	Number Detects/Number Samples	Minimum Detect	Maximum Detect
Dioxins/Furans (pg/L)			
Octachlorodibenzo-p-dioxin	1/3	14.995	14.995
Explosives (µg/L)			
1,3,5-Trinitrobenzene	1/66	1.7	1.7
2,4,6-Trinitrotoluene	1/66	10	10
2,4-Dinitrotoluene	8/66	8.7	3,000
2,6-Dinitrotoluene	9/65	8.7	530
2-Amino-4,6-dinitrotoluene	2/66	5.9	11
4-Amino-2,6-dinitrotoluene	4/66	0.21	24
RDX	1/66	29	29
Tetryl	1/66	490	490
m-Nitrotoluene	10/66	2.1	730
o-Nitrotoluene	12/66	2	18,000
p-Nitrotoluene	9/66	5.4	2,900
General Chemistry (µg/L)			
Chloride	45/45	21,400	3,040,000
Nitrate	4/6	140	1,000
Nitrate / Nitrite	9/39	183	12,100
Specific Conductivity	6/6	1,400	6,100
Sulfate	45/45	4,200	1,700,000
Temperature	6/6	18.5	20
pH	6/6	6.38	6.87
Metals(µg/L)			
Aluminum	29/39	210	130,000
Antimony	37/62	6	52
Arsenic	7/62	8	59
Barium	33/62	24	6,500
Beryllium	6/39	0.5	9.9
Cadmium	2/62	1.2	6.23
Calcium	38/39	9,800	490,000
Chromium	42/62	10	7,600
Cobalt	2/39	90	140
Copper	9/39	25	170
Iron	39/39	220	250,000
Lead	23/62	2.41	350
Magnesium	37/39	21,000	520,000
Manganese	38/39	22	2,410
Mercury	1/62	3	3
Nickel	27/62	40	8,400
Potassium	1/39	14,000	14,000
Selenium	5/62	6	350
Silver	5/62	10	80
Sodium	39/39	46,000	910,000

Table 3-5 (*continued*)
Summary of Analytes Detected in Groundwater

Analyte	Number Detects/Number Samples	Minimum Detect	Maximum Detect
Strontium	39/39	200	19,000
Thallium	13/62	1.1	2.7
Vanadium	2/39	120	360
Zinc	31/39	20	1,000
Perchlorate (µg/L)			
Perchlorate	28/90	2.6	88,000
Semivolatiles (µg/L)			
2,4-Dinitrotoluene	1/9	74	74
2,6-Dinitrotoluene	3/9	110	220
bis(2-Ethylhexyl)phthalate	1/9	5.6	5.6
Volatiles (µg/L)			
1,1,2-Trichloroethane	1/98	4	4
1,1-Dichloroethane	2/98	3	2,100
1,1-Dichloroethene	1/98	4	4
1,2,3-Trichlorobenzene	1/75	4	4
1,2,4-Trichlorobenzene	1/75	2	2
1,2-Dichloroethane	4/98	0.52	14,000
Acetone	1/98	5.8	6
Bromochloromethane	1/75	2,100	2,100
Bromodichloromethane	5/98	0.69	2.2
Bromoform	1/92	12	12
Chloroform	14/98	0.5	20
Dibromochloromethane	1/98	9	9
Hexachlorobutadiene	1/75	1	1
Methylene chloride	29/98	0.65	7,300,000
Naphthalene	1/75	3	3
Trichloroethene	17/98	0.66	8,800
cis-1,2-Dichloroethene	2/81	1.3	3
p-Isopropyltoluene	2/75	0.84	2.9
trans-1,2-Dichloroethene	1/81	12	12

Notes:

µg/L micrograms per liter
pg/L picograms per liter

Table 3-6
2002 Risk Assessment Results for Future Maintenance Worker

Risk Category	Target Value	LHAAP-29 Value	Major Contributors to Risk
Soil 0 to 0.5 Feet Below Ground Surface			
Excess Lifetime Cancer Risk	1×10^{-6} to 1×10^{-4}	4.7×10^{-6}	2,4,6-trinitrotoluene
Hazard Index (Non-cancer risk)	<1	1.3	- - -
Soil 0 to 2 Feet Below Ground Surface			
Excess Lifetime Cancer Risk	1×10^{-6} to 1×10^{-4}	7.3×10^{-6}	2,4,6-trinitrotoluene; 2,4-dinitrotoluene
Hazard Index (Non-cancer risk)	<1	1.3	- - -
Groundwater			
Excess Lifetime Cancer Risk	1×10^{-6} to 1×10^{-4}	3.9×10^{-1}	Methylene chloride; 1,2-dichloroethane; 2,4-dinitrotoluene; 2,6-dinitrotoluene; arsenic; trichloroethene
Hazard Index (Non-cancer risk)	<1	3,000	Methylene chloride; 1,2-dichloroethane; perchlorate; 2-nitrotoluene; 4-nitrotoluene

Notes:

Reference: Baseline Human Health and Screening Ecological Risk Assessment, Group 2 Sites (Jacobs Engineering Group, Inc., 2002a).

Table 3-7
Results of Groundwater Sampling in August 2004

Analyte	Units	Detected Results	Minimum Detect	Maximum Detect	Location of Maximum Detect[a]
Explosives					
2,4-Dinitrotoluene	ug/L	2	13	160J	29WW05
2,6-Dinitrotoluene	ug/L	3	17	280J	29WW05
4-Amino-2,6-dinitrotoluene	ug/L	2	0.21J	15J	29WW05
m-Nitrotoluene	ug/L	3	12J	400J	29WW05
o-Nitrotoluene	ug/L	3	120	3,100	29WW05
p-Nitrotoluene	ug/L	1	16J	16J	29WW05
Tetryl	ug/L	5	0.2R	4R	29WW05,20
Perchlorate					
Perchlorate	ug/L	6	3	24,000	29WW15
Volatiles					
1,1,2-Trichloroethane	ug/L	1	4J	**4J**	29WW15
1,1-Dichloroethane	ug/L	1	3J	3J	29WW15
1,1-Dichloroethene	ug/L	1	4J	**4J**	29WW15
1,2,3-Trichlorobenzene	ug/L	1	4BJ	**4BJ**	29WW21
1,2,4-Trichlorobenzene	ug/L	1	2BJ	**2BJ**	29WW21
1,2-Dichloroethane	ug/L	1	6,400	6,400	29WW15
Bromodichloromethane	ug/L	1	2J	2J	29WW34
Bromoform	ug/L	1	12	12	29WW34
Chloroform	ug/L	2	2J	6	29WW15
cis-1,2-Dichloroethene	ug/L	1	3J	**3J**	29WW15
Dibromochloromethane	ug/L	1	9	9	29WW34
Hexachlorobutadiene	ug/L	1	1BJ	**1BJ**	29WW21
Methylene chloride	ug/L	7	2BJ	7,300,000	29WW16
Naphthalene	ug/L	1	3BJ	**3BJ**	29WW21
trans-1,2-Dichloroethene	ug/L	1	12	12	29WW15
Trichloroethene	ug/L	4	2J	160J	29WW15

Notes:

Bold indicates that the August 2004 result exceeded earlier results at LHAAP-29.

[a] The detection limits for volatiles at 29WW16 exceed the maximum detects at other locations.

B Analyte was detected in an associated blank sample.

J Reported result was estimated.

R Reported result was rejected.

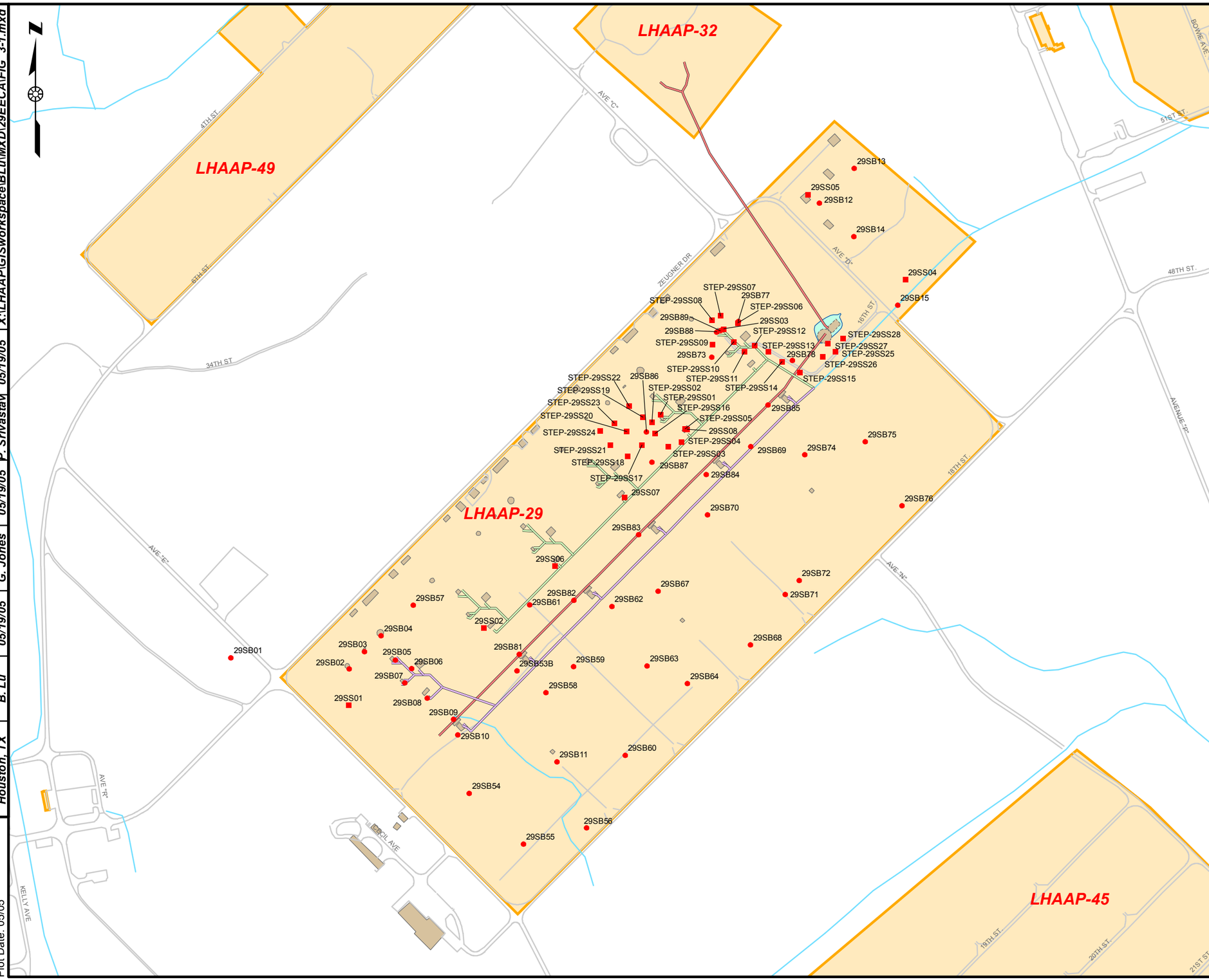
Table 3-8
Explosives Analytes at Wash House 806-D Foundation[a]

Analyte	Explosives Results (mg/kg)		
	29DLineWHC01	29DLineWHC02	29DLineWHW01
1,3,5-Trinitrobenzene	< 0.375	< 0.375	4.61
2,4,6-Trinitrotoluene	< 0.375	< 0.375	27.3
2,4-Dinitrotoluene	< 0.375	< 0.375	< 0.375
2,6-Dinitrotoluene	< 0.375	< 0.375	< 0.375
2-Amino-4,6-dinitrotoluene	< 0.375	< 0.375	5.78
4-Amino-2,6-dinitrotoluene	< 0.375	< 0.375	2.87
HMX	< 0.375	< 0.375	< 0.375
m-Dinitrobenzene	< 0.375	< 0.375	< 0.375
m-Nitrotoluene	< 0.375	< 0.375	< 0.375
Nitrobenzene	< 0.375	< 0.375	< 0.375
o-Nitrotoluene	< 0.375	< 0.375	< 0.375
p-Nitrotoluene	< 0.375	< 0.375	< 0.375
RDX	< 0.375	< 0.375	< 0.375
Tetryl	< 0.375	< 0.375	< 0.375

Notes:

[a] Reference: USACE, 2005, Personal Communication (e-mail from C. Murray to R. Zeiler), Subject: Wash house soil sampling, March 28.

mg/kg milligrams per kilogram



Legend

Sample Location

- Surface Soil
- Soil Boring
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

0 250 500 1,000 Feet

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FIGURE 3-1

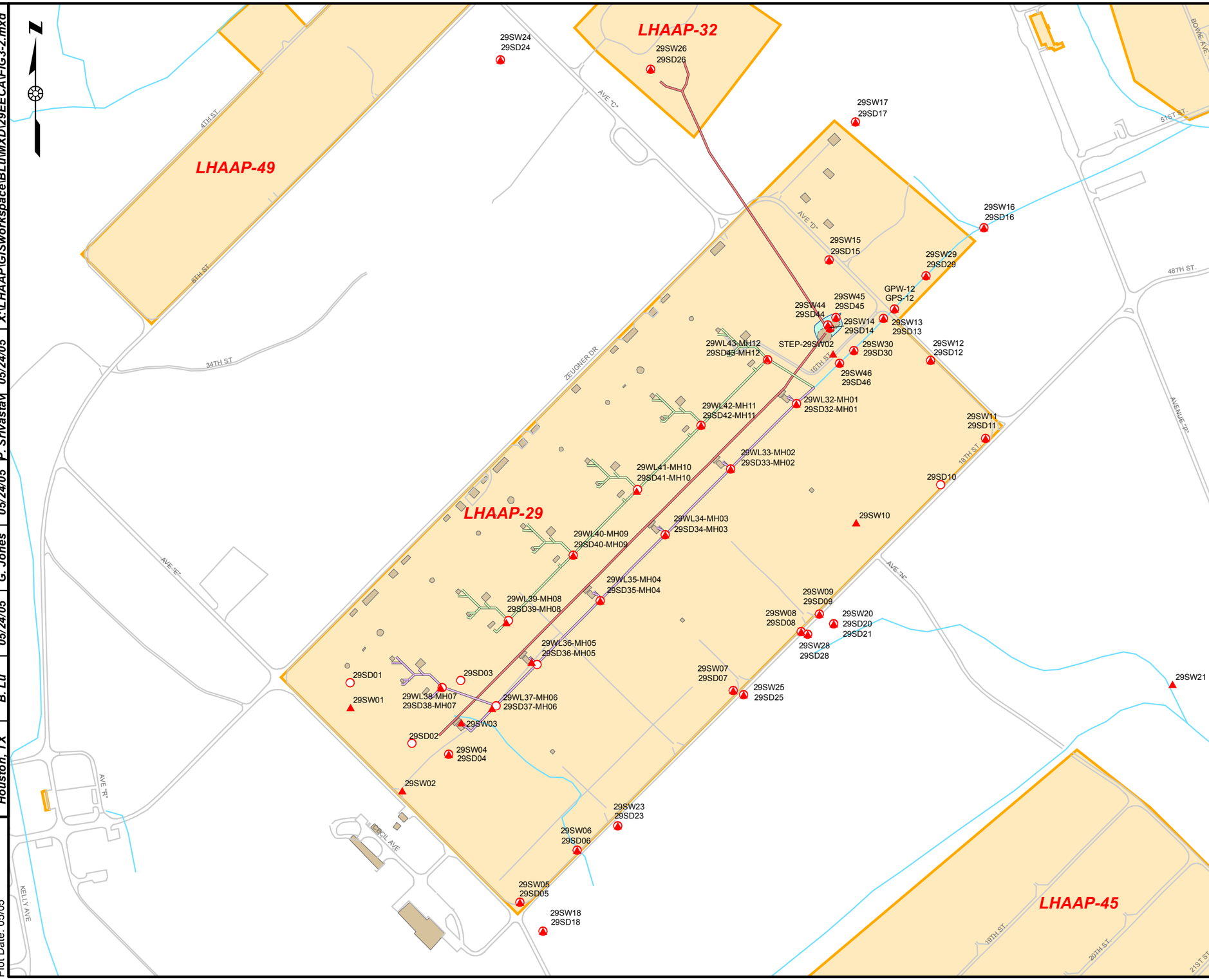
SAMPLE LOCATIONS - SOIL
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 05/19/05	G. Jones 05/19/05	P. Srivastav 05/19/05	X:\LHAAP\GIS\workspace\BLu\MXD\29EECA\FIG 3-1.mxd

Plot Date: 05/05

00041838



Legend

Sample Location

- Surface Water
- Sediment
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

0 250 500 1,000 Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 3-2

SAMPLE LOCATIONS - SURFACE WATER AND SEDIMENT
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	05/24/05	G. Jones	05/24/05	P. Srivastav	05/24/05	X:\LHAAP\GIS\workspace\BLu\MXD\29EECA\FIG3-2.mxd

Plot Date: 05/05

00041839

Legend

Monitoring Well

- Shallow
- Intermediate
- Deep
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

0 250 500 1,000 Feet

Shaw®

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FIGURE 3-3

MONITORING WELL LOCATIONS
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	05/19/05	G. Jones	05/19/05	P. Srivastav	05/19/05	X:\LHAAP\GIS\workspace\BLu\MXD\29EECA\FIG3-3.mxd

Plot Date: 05/05

4.0 Evaluation of Results

This section summarizes the findings of the various investigations at LHAAP-29. **Section 4.1** provides a description of the local geology/hydrogeology based on the RI (Jacobs, 2001) and the Data Gaps investigation (Shaw, 2005). **Section 4.2** provides an assessment of various media at LHAAP-29 for those environmental contaminants found to be major contributors to risk at the site.

4.1 LHAAP-29 Geology/Hydrogeology

At LHAAP-29, a layer of silty clay was generally encountered from ground surface to a maximum of 20 feet and then a sandy silt to poorly sorted sand zone was observed to approximately 30 feet bgs. Below this shallow sand unit, a semi-confining silty clay layer was encountered down to a maximum depth of 60 feet before the second layer of sand zone was encountered. This second (intermediate) sand zone was not as clearly defined in the north-northeastern portion of the site. Below the intermediate saturated zone is a clay layer that ranges in thickness from approximately 25 feet on the southwestern portion of the site to over 45 feet toward the northeast. Underlying this lower clay layer is a thick silty sand zone that extends down to the top of the Midway formation. The top of the Midway formation is 140–157 feet bgs. Thus, LHAAP-29 has been conceptualized as having groundwater in three zones. Those zones are presented in an idealized fashion in the conceptual cross section that is provided in **Figure 4-1**. Detailed stratigraphic information for LHAAP-29 is provided in five cross sections in the RI report (Jacobs, 2001). The RI report also provides the following hydraulic conductivity data for the various groundwater zones at LHAAP-29 based on slug test results:

Groundwater Zone	Minimum Hydraulic Conductivity (cm/sec)	Maximum Hydraulic Conductivity (cm/sec)
Shallow	4.94×10^{-6}	1.33×10^{-3}
Intermediate	9.28×10^{-5}	1.34×10^{-3}
Deep	1.13×10^{-4}	5.76×10^{-4}

The Data Gaps Investigation Report (Shaw, 2005) provides the most recent information on groundwater flow at LHAAP-29. The groundwater elevations in the shallow and intermediate zones from that report are presented in **Figures 4-2** and **4-3**, respectively. Based on measured groundwater elevations, the predominant groundwater flow direction in the shallow zone is toward the east, while the predominant groundwater flow direction in the intermediate zone is toward the north. Because only two deep wells have been installed at LHAAP-29, the potentiometric surface of the deep groundwater zone at LHAAP-29 was not estimated.

However, deep groundwater was examined on an installation-wide basis (Shaw, 2005) and data indicated that the predominant flow direction in the deep zone near LHAAP-29 is toward the southeast.

4.2 Media Contamination Assessment

This section discusses the source, nature, and extent of contamination at LHAAP-29, as well as its potential impacts on human receptors. This assessment considers the findings through the RI (Jacobs, 2001) and FS (Jacobs, 2002b) as well as additional information in the perchlorate investigation (STEP, 2003), environmental site assessment (Plexus, 2004), data gaps investigation (Shaw, 2005), December 2004 and February 2005 field work performed by Shaw, and February 2005 field work performed by USACE.

4.2.1 Potential Sources

As noted previously, the TNT production buildings were largely razed in 1959. The remaining potential sources of contamination are the foundations and underground pipelines. There are two underground pipelines of interest at LHAAP-29; the TNT wastewater line (or the red/yellow liquor line) and the cooling water drain lines (or the blue water line). The sections below discuss the foundations and each of the two underground lines in terms of concentrations of those contaminants that are the major contributors to risk at the site.

4.2.1.1 Foundations

Foundations are of interest because there is the potential for source material to have been leaked or spilled near the foundations during periods when TNT production or rocket motor washout was on going. Based on historical information about the chemicals used at LHAAP-29, as well as what contaminants are known to contribute to risk for the soil and groundwater, the key compounds are explosives, perchlorate, and organic solvents. The perchlorate and organic solvents are of interest in that portion of LHAAP-29 where rocket motors were washed out.

The foundations at LHAAP-29 were examined during three field investigations: field observations during the environmental site assessment, samples collected in December 2004 by Shaw, and samples collected in February 2005 by USACE. The environmental site assessment identified stained soil at Buildings 806-A and 806-D, two of six wash houses where TNT was purified, and identified the staining as explosives, based on field testing (Plexus, 2004). In December 2004, Shaw collected ten soil samples from five borings near five of the six wash house sumps. As presented in **Table 4-1,** these ten samples were analyzed for explosives, but yielded only a minor detection of TNT at 29SB83 (0.43 mg/kg at 4-5 feet bgs) and three detections of TNT decay products at 29SB85 (0.23J mg/kg 2-A-4,6-DNT at 4.5 feet bgs, 0.9 mg/kg 2-A-4,6-DNT at 8-9 feet bgs, and 0.3J mg/kg 4-A-2,6-DNT at 8-9 feet bgs). In February 2005, USACE collected three soil samples at a wash house foundation. The results for the

samples are provided in **Table 3-8**. Two samples from soil beneath the concrete had no detected results. A sample from a stained location at the edge of the foundation had detected results for four explosives parameters, including 27.3 mg/kg TNT at 29DLineWHW01. Thus, staining appears to indicate that some TNT leaked or spilled near the foundations. The analytical results indicate that remnant TNT and TNT degradation products lie in those stained areas near the foundations. However, the results indicate that explosives are present at concentrations considered environmental contamination rather than concentrations that would indicate the presence of source material.

Shaw investigated the possible presence of perchlorate in soil at the foundation of the motor washout facility (Building 806-F) in December 2004. Six soil samples were collected from two borings and analyzed for perchlorate. Perchlorate was detected in two of the six samples, but at relatively low concentrations of 74.5 and 144 µg/kg. In comparison, the USEPA's Residential and Industrial Outdoor Worker soil screening levels are 7,800 and 110,000 µg/kg, respectively (USEPA, 2004).

There has been no evaluation of VOCs near the foundations. Given the detections of 1,2-DCA, TCE, and methylene chloride in the groundwater at 29WW15 and 29WW16, sampling for VOCs near the foundations close to those wells appears to be needed. However, these compounds are dense (specific gravities from 1.23 to 1.46) and volatile; therefore, any spilled or leaked material is likely to have migrated downward, and remnants in the surface soil may have evaporated or biodegraded.

In summary, the samples that have been collected near foundations have yielded no results that indicate source material. These samples are limited in number and have been analyzed for only explosives or perchlorate. Areas of stained soil require further investigation and evaluation for explosives. Lack of VOC analyses near wells 29WW15 and 29WW16 is considered a data gap.

4.2.1.2 TNT Wastewater Line

The TNT wastewater line has been investigated as a potential on-going source of explosives contamination. In a 1988 report summarizing its Resource Conservation and Recovery Act (RCRA) Facility Assessment of LHAAP (Texas Water Commission, 1988), the Texas Water Commission reported that "this pipeline was clear-flushed in 1946" and that the line appeared sound. However, several trenches were excavated across the line in 1993, and the wood was found to be soft and severely degraded at most locations (Sverdrup Environmental, Inc. [Sverdrup], 1993).

Twenty-one soil samples have been collected beneath the wastewater pipeline or near sumps immediately adjacent to the wastewater pipeline. The detected results from those samples are presented in **Table 4-1**. Sixteen of those samples have usable explosives results and the

concentrations of explosives in those samples are very low or non-detect. These data do not indicate that soil surrounding the TNT wastewater line has been adversely affected by the line.

Similarly, the pump house pond, which receives inflow from portions of the TNT wastewater line, has yielded only marginal evidence of explosive compounds. Three water samples (29SW14, 29SW44, and 29SW45) and three sediment samples (29SD14, 29SD44, and 29SD45) have been collected from the pond. The highest TNT results were 0.4J µg/L and 0.41 mg/kg in the water and sediment, respectively. One explosive compound, 4-A-2,6-DNT, was detected in all three surface water samples; the highest result was 2.2 µg/L.

A limited number of samples of liquid and solids have been collected from the TNT wastewater line itself. The analytical results from these 1993 and 1995 samples are presented in **Tables 4-2** and **4-3**, respectively. (Data from the RI investigations has been deleted in those cases where the data was deemed unusable for environmental decision making [Jacobs, 2001].) One liquid sample and one solids sample exhibited high concentrations of TNT (3,500 µg/L and 3,700 mg/kg, respectively). For comparison to the solids value, the USEPA's Residential and Outdoor Worker soil screening levels are 1.6 and 64 mg/kg, respectively (USEPA, 2004). While there is no consistent pattern of high explosives concentrations, these samples do indicate the existence of pockets of more highly contaminated material within the TNT wastewater line.

4.2.1.3 Cooling Water Drain Lines

There are two cooling water lines that join together and discharge into an open ditch in the northeastern portion of LHAAP-29. The lines run parallel to the TNT wastewater line, but lie approximately 165 feet to the northwest and 100 feet to the southeast of the wastewater line, respectively (see **Figure 2-2**). These lines drained the former TNT production facilities of cooling water that came into direct contact with TNT production mixtures.

Prior to December 2004, the only samples directly from the interior of the cooling water lines (29WL09, 29WL10, and 29WL11) were reported by Sverdrup as part of the Phase II Investigation (Sverdrup, 1996). These samples were analyzed for explosives and metals, but the explosives results were determined by USEPA to be unusable (Jacobs, 2001).

In December 2004 and February 2005, Shaw collected eight samples of sediment and twelve samples of water at various manholes along the cooling water lines. The sediment sample results for TNT varied from 0.29J to 11 mg/kg in the southern segment (MH01 to MH06) and 0.41 to 7 mg/kg in the northern segment (MH07 to MH12) of the cooling water drain line, as presented in **Table 4-4**. Water samples were obtained from 11 of the 12 manholes, and TNT was detected in all samples (see **Table 4-5**). The TNT ranged from 0.93J at MH02 to 5,200 µg/L at MH09 (See **Figure 4-4**). The full results for the December 2004 and February 2005 sampling events are presented in **Appendix A**.

The two cooling water line segments join together about 100 feet northeast of Manhole 1, and the combined line empties into a ditch. Water that infiltrates or flows into the two segments has the potential for carrying contamination from upstream locations to the ditch. Consequently, samples from the ditch also offer evidence of potential contaminants in the cooling water drain lines. Sediment samples were collected at six locations in the ditch (29SD13, 29SD16, 29SD29, 29SD30, 29SD46, and GPS-12). Similarly, surface water was collected at six locations (29SW13, 29SW16, 29SW29, 29SW30, 29SW46, and GPW-12), of which one location (GPW-12) was sampled 16 times from 1995 to 2004. The results from the GPS-12 sediment sample and one of the 16 GPW-12 water samples were deemed unusable for environmental decision making and are excluded from this discussion (Jacobs, 2001). In the ditch, explosive contaminants have been measured across the following ranges:

Medium	Parameter	Number of Samples	Number of Detections	Range of Detections
Sediment	2,4,6-TNT	5	3	3.8 – 26,000 mg/kg
Sediment	2,4-DNT	5	1	8,000 mg/kg
Surface Water	2,4,6-TNT	20[a]	10	0.2 – 860 µg/L
Surface Water	2,4-DNT	20[b]	8	0.413 – 19 µg/L
Surface Water	2,6-DNT	20[c]	8	0.06J to 7.9 µg/L

[a]15 of the samples and 7 of the detections are at location GPW-12.
[b]15 of the samples and 5 of the detections are at location GPW-12.
[c]15 of the samples and 5 of the detections are at location GPW-12.

Three soil samples (29WL09[007_0], 29WL10[006_0], and 29WL11[006_0]) were collected from beneath the southern cooling water line as part of the Phase II RI investigation. However, explosives data from Phase II has been deemed unusable (Jacobs, 2001).

4.2.2 Soil and Sediment

The Group 2 FS (Jacobs, 2002b) stated that "No unacceptable risks to current or future receptors were found in the soil" at LHAAP-29. On-site sediment was included in that assessment. Consequently, subsequent investigations involved soil and sediment sampling only to the extent that such sampling might clarify other issues. Specifically, the December 2004 sampling activities performed by Shaw included (1) further examination of explosives in soil and sediment related to the underground pipelines, and (2) soil analyses for perchlorate in areas where the groundwater has been affected by that chemical.

The TNT results for soil and sediment at LHAAP-29 are presented in **Figures 4-5** and **4-6**, respectively. Two soil samples were collected at each of five wash house sumps along the TNT wastewater line. Only one of the ten soil samples was found to contain 2,4,6-TNT, and that

result was 0.43 mg/kg. Similarly, the two sediment samples collected at the pump house pond in December 2004 had a maximum result of 0.41 mg/kg 2,4,6-TNT. Since the exposure point concentration in the risk assessment (Jacobs, 2002) was 190 mg/kg, these two minor detections will not invalidate the conclusions of the risk assessment. In contrast to those soil and sediment results, sample 29SD46 had a 2,4,6-TNT concentration of 26,000 mg/kg and a 2,4-DNT concentration of 8,000 mg/kg. This sample was collected in the ditch that receives flow from the cooling water drain lines. This result indicates that the ditch has hot spots of explosives contamination. Hence the ditch must be considered separately from other LHAAP-29 soils to preserve the validity of the 2002 risk assessment in regard to soil across the remainder of the site.

The December 2004 investigation performed by Shaw identified a higher concentration of perchlorate in soil (8,600 µg/kg at 29SB86) than had been detected at LHAAP-29 in the past. The location of this and other perchlorate results is provided on **Figure 4-7**. The 2002 risk assessment did not identify perchlorate as a significant contributor to soil risks at LHAAP-29 (Jacobs, 2002). For comparison, the maximum detection of 8,600 µg/kg exceeds the USEPA Region 6 Residential soil screening level (7,800 µg/kg), but is far below the soil screening level for an Industrial Outdoor Worker (110,000 µg/kg) (USEPA, 2004). The industrial scenario is conservative at an installation where the anticipated future use is as a wildlife refuge. Hence, the perchlorate concentrations found at LHAAP-29 are not considered a problem relative to the screening levels, though the potential effect to groundwater is not addressed and could still be a concern.

4.2.3 Surface Water

In the 2002 risk assessment, surface water risks were evaluated for Caddo Lake and Harrison Bayou, but not for local features such as the ditches that drain LHAAP-29. Those local surface water features were not considered to be direct pathways for chronic exposure. Risks associated with Caddo Lake and Harrison Bayou are best based on samples collected directly from those bodies of water rather than by modeling the effect from individual ditch samples. Consequently, the results of surface water samples collected around LHAAP-29 have not been directly incorporated into any risk calculations. However, these results can be seen as indicators of impacts in the drainage ditches themselves and their drainage areas.

The analytical results for surface water at LHAAP-29 are summarized in **Table 3-4**. The results for the major risk contributor to soil and sediment, 2,4,6-TNT, are plotted on **Figure 4-8**. Location GPW-12 was sampled repeatedly and only the maximum value (136 µg/L in 2002) is presented on the figure.

The surface water results can be subdivided by specific areas within LHAAP-29 as shown in **Table 4-6** for TNT. As demonstrated by the information in that table, surface water impacts at LHAAP-21 are largely limited to the Cooling Water Outfall Ditch. While there were two

detections of 2,4,6-TNT at the Pump House Pond, those results are estimated values and very close to the limit of detection. Also, the 23 locations outside the Pump House Pond and the Cooling Water Outfall Ditch had no detections of TNT. One explosive compound (p-nitrotoluene) was detected at two of those 23 locations (1.3 µg/L at both 29SW01 and 29SW03).

4.2.4 Groundwater

Table 3-5 presents a summary of groundwater data at LHAAP-29. Results of investigations prior to the RI report indicated that there was evidence of groundwater contamination beneath LHAAP-29. Some of that data appeared to be anomalous (e.g., the high methylene chloride result at 29WW16). However, the subsequent site-wide perchlorate investigation (STEP, 2003) and 2004 data gaps investigation (Shaw, 2005) have confirmed the evidence from earlier investigations. Groundwater contamination at LHAAP-29 can be described as follows:

- **Explosives.** Explosive compounds have been detected in six of the 29 shallow zone wells that have been analyzed for explosives:

Well	Analyte with highest results (µg/L)
116	o-nitrotoluene 4,400J
29WW03	p-nitrotoluene 1,900
29WW05	o-nitrotoluene 18,000
29WW09	p-nitrotoluene 5.4
29WW20	o-nitrotoluene 3,200
29WW29	o-nitrotoluene 10

The highest concentrations were measured in samples collected in 1995 and 1998. The peak value in the 2004 activities was 3,100 µg/L o-nitrotoluene at 29WW05. In contrast to the earlier results, the highest explosive constituent at 29WW03 in 2004 was o-nitrotoluene at 120 µg/L; p-nitrotoluene was not detected at 29WW03 in 2004. **Figure 4-9** presents the 2004 results for nitrotoluene.

In the nine intermediate zone wells, there has been one, low-level detection of explosives (2J µg/L o-nitrotoluene at 29WW28 in 1998). The 2004 sample from the same well was non-detect for explosives. While eight of the intermediate wells are nested with shallow wells, only one intermediate well, 29WW33, is nested with a shallow well that had high explosives results (29WW03). However, the newest intermediate well, 29WW34, was installed within approximately 200 feet of wells

29WW05 and 116, which had the highest explosives results of any of the shallow wells. Nonetheless, explosives were not detected at 29WW34.

In the two deep wells, one sample from 29WW04 had results of 8.7 µg/L 2,4-DNT and 8.7 µg/L 2,6-DNT in 1998. The 2004 sample from this well was non-detect for explosives.

Explosive compounds in the shallow groundwater at LHAAP-29 are intermittent and dispersed across the site. The most significant area of shallow zone explosives contamination is at shallow wells 116, 29WW05, and 29WW06. These wells are near the Cooling Water Outfall Ditch at the northeast end of LHAAP-29. Analytical results from intermediate wells indicate that explosive contaminants have not affected that zone. Given the results from the intermediate wells and the limited data from the deep zone wells at LHAAP-29, there is no evidence of deep zone explosives contamination.

- **Volatile Organic Compounds.** Between 1993 and 2005, volatiles have been sampled at 29 shallow wells, nine intermediate wells, and two deep wells at LHAAP-29. The most significant results were at 29WW16 in the intermediate groundwater zone, which has had three detections of methylene chloride that increased from 5,700,000 µg/L in 1998 to 7,300,000 µg/L in 2004. The methylene chloride results for this well are responsible for the majority of the calculated cancer risk that is attributed to LHAAP-29. Well 29WW15 in the shallow zone is nested with the intermediate well 29WW16. In 2005, 29WW15 had detections of the volatiles 1,2-DCA, methylene chloride, and TCE at concentrations well above their maximum contaminant levels (MCLs), but the methylene chloride was detected at a concentration (100 µg/L) much lower than in the intermediate well.

  It should be noted that high results for methylene chloride and TCE were also reported for a number of wells sampled in July 1998. Those results are largely suspect since they were not repeated in March 1999 sampling and then were not reported in the RI Report (Jacobs, 2001). Without the July 1998 data, methylene chloride, TCE, and 1,2-DCA are limited to 29WW16, 29WW15, and 29WW24 (another intermediate well). The deep wells 29WW04 and 29WW08 are free of methylene chloride, TCE, and 1,2-DCA with the exception of the suspect July 1998 results and an estimated result (2J µg/L) at 29WW08 in 2004. However, neither of the deep wells is near the 29WW15/16 location. An additional deep well at 29WW16 would be necessary to better define the extent of volatile contamination at LHAAP-29.

- **Perchlorate.** Eighteen shallow wells have been monitored for perchlorate. Of these, ten had detectable levels of perchlorate during at least one round of sampling. Perchlorate was detected consistently (75 to 100 percent of the time) at four of those ten wells: 116, 29WW05, 29WW06, and 29WW15. As shown in **Figure 4-11**, these wells appear to indicate two major areas of perchlorate contamination that may have merged within the shallow zone. One area extends northeast from the rocket motor washout facility (Building 806-F); the other area is centered about 600 feet southwest of Building 806-F. This is possibly two separate plumes since there is no perchlorate in Well 29WW07, and the perchlorate at 29WW15 is associated with VOCs while the perchlorate at 116, 29WW05, and 29WW06 is not.

  Perchlorate has been detected in three locations in the intermediate groundwater zone: 29WW16, 29WW13, and 29WW33. Perchlorate has been detected in 29WW04 in the deep groundwater zone. These wells appear to indicate a slow vertical migration of the perchlorate through the confining layers between the groundwater zones. Well 29WW13 also appears to indicate the plume is spreading in the intermediate aquifer since no perchlorate was detected in shallow well 29WW12 that is nested with 29WW13. The detections in 29WW33 and 29WW04 are difficult to interpret. These wells are nested with shallow well 29WW03, which had no perchlorate detections. Hence, these wells may indicate extensive lateral migration when perchlorate reaches the intermediate zone.

Based on the human health risk assessment (Jacobs, 2002a), groundwater at LHAAP-29 poses an unacceptable carcinogenic risk and non-carcinogenic hazard to a future maintenance worker at LHAAP under an industrial scenario. However, regardless of risk, a number of parameters at LHAAP-29 exceed the MCL of the National Primary Drinking Water Standards. These parameters are listed in **Table 4-7**.

4.2.5 Off-Site Surface Water

Off-site surface water bodies at LHAAP could be affected by contaminants from LHAAP-29 in either of two ways: surface water runoff or shallow groundwater that seeps into nearby streams. As shown in **Figure 2-1**, runoff from LHAAP-29 drains into Goose Prairie Creek and Central Creek, both of which eventually flow into Caddo Lake (a drinking water source for multiple communities). However, a number of sediment and surface water samples have been collected from the ditches and creeks at locations that are downgradient of LHAAP-29 (see **Figures 4-6** and **4-8**):

Sediment	Surface Water
29SD05	29SW05

Sediment	Surface Water
29SD06	29SW06
29SD07	29SW07
29SD08	29SW08
29SD09	29SW09
29SD10	29SW10
29SD11	29SW11
29SD12	29SW12
29SD16	29SW16
29SD17	29SW17
29SD18	29SW18
29SD23	29SW23
29SD28	29SW28
29SD31	29SW31

Of these samples, 29SD16 had a detection of 3.8J mg/kg TNT. The sample location downgradient of 29SD16 is 29SD31. That location, which is in Goose Prairie Creek itself, was non-detect for TNT, as were the other sediment and surface water samples listed above.

Additionally, plume migration modeling was performed and documented in the Modeling Report (Shaw, 2004a). Modeling calculations were completed to assess the potential for contaminants of concern (COCs) present in shallow groundwater at LHAAP-29 to migrate toward and discharge to Central Creek. The modeling examined the possible effect on Central Creek since that creek is the surface water body closest downgradient to LHAAP-29. The modeling specifically examined TCE, 1,2-dichloroethane, methylene chloride, and perchlorate in the shallow groundwater. The modeling assumed an instantaneous source with no contaminant leaching from vadose zone soil to groundwater. An average hydraulic conductivity of 6.79×10^{-4} cm/sec was used for the shallow zone.

The modeling results indicated that the COCs would not exceed MCLs (or the interim action level in the case of perchlorate) in surface water at Central Creek. Of the COCs, the modeling demonstrated that only perchlorate would reach the surface water. The other parameters were eliminated by a combination of dispersion and degradation. For parameters reaching surface water, the modeling report incorporated mixing of groundwater seepage with the surface water in the creek. Due to the significant dilution that results from mixing within Central Creek, perchlorate was calculated to be below its 2004 interim action level (4 µg/L). It was therefore concluded that contaminants present in the shallow groundwater at LHAAP-29 will not adversely affect surface water.

Table 4-1
Analytes Detected in Soil near TNT Wastewater Line

Soil Near Wash House Sumps Adjacent to TNT Wastewater Line						
	Location:	29SB81	29SB81	29SB82	29SB82	29SB83
	Sample Date:	12/16/2004	12/16/2004	12/15/2004	12/15/2004	12/15/2004
	Sample ID:	29SB81-001	29SB81-002	29SB82-001	29SB82-002	29SB83-001
	Sample Depth (ft bgs):	4 to 5	8 to 9	4 to 5	8 to 9	4 to 5
ANALYTE	UNITS					
Explosives						
2-Amino-4,6-dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4
2,4,6-Trinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	.43
4-Amino-2,6-dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4

Soil Near Wash House Sumps Adjacent to TNT Wastewater Line						
	Location:	29SB83	29SB84	29SB84	29SB85	29SB85
	Sample Date:	12/15/2004	12/15/2004	12/15/2004	12/15/2004	12/15/2004
	Sample ID:	29SB83-002	29SB84-001	29SB84-002	29SB85-001	29SB85-002
	Sample Depth (ft bgs):	8 to 9	4 to 5	8 to 9	4 to 5	8 to 9
ANALYTE	UNITS					
Explosives						
2-Amino-4,6-dinitrotoluene	mg/kg	<.4	<.4	<.4	.23 J	.9
2,4,6-Trinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4
4-Amino-2,6-dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	.3 J

Soil Beneath TNT Wastewater Line							
	Location:	29WL01	29WL02	29WL03	29WL04	32WL01	32WL02
	Sample Date:	5/12/1993	5/13/1993	5/14/1993	5/15/1993	5/17/1993	5/15/1993
	Sample ID:	29WL01(4_5)	29WL02(3_5-4)	29WL03(4_5-5_5)	29WL04(3_5-4_5)	32WL01(2_5-3_0)	32WL02(5_0-5_5)
	Sample Depth (ft bgs):	4.5	3.5 to 4	4.5 to 5.5	3.5 to 4.5	2.5 to 3	5 to 5.5
ANALYTE	UNITS						
Explosives							
2-Amino-4,6-dinitrotoluene	mg/kg	.4 J	---	---	---	---	---
2,4,6-Trinitrotoluene	mg/kg	.3 UJ	<.309	<.781	<.305	<.305	<.305
4-Amino-2,6-dinitrotoluene	mg/kg	<.3	---	---	---	---	---
Volatiles							
Acetone	mg/kg	<.012	<.012	.025	<.012	<.012	<.012

Table 4-1 *(continued)*
Analytes Detected in Soil near TNT Wastewater Line

Soil Beneath TNT Wastewater Line						
	Location:	29WL05	29WL06	29WL08	32WL03	32WL04
	Sample Date:	4/30/1995	4/30/1995	5/1/1995	5/2/1995	5/2/1995
	Sample ID:	29WL05(005_5)	29WL06(005_0)	29WL08(003_5)	32WL03(005_5)	32WL04(002_0)
	Sample Depth (ft bgs):	5.5	5	3 to 3.5	5.5	2
ANALYTE	UNITS					
General Chemistry						
pH	Standard Units	8.31	6.84	---	7.44	7.14
Metals						
Antimony	mg/kg	1.2 R	1.2 R	<1.2	1.3 UJ	1.2 UJ
Arsenic	mg/kg	4.5	1.2	2.2	2.5	1.5
Barium	mg/kg	116 J	46.9 J	108	86 J	52.8 J
Cadmium	mg/kg	---	---	---	<0.6	<0.6
Chromium	mg/kg	23.8	14.8	18	16.1	11
Lead	mg/kg	20.2 J	8.8 J	8.9	10.8 J	7.1 J
Mercury	mg/kg	<0.12	<0.12	<0.12	<0.13	<0.12
Nickel	mg/kg	23	16	6.5	8.3	8.1

Notes:

---	not applicable – not analyzed or result deemed unusable
ft bgs	feet below ground surface
J	reported result was estimated
mg/kg	milligrams per kilogram
R	reported result was rejected
U	result is below detection limit

Table 4-2
Analytes Detected in Liquids from TNT Wastewater Line

Associated Site:		Wastewater Line	Wastewater Line	Wastewater Line	Wastewater Line	Wastewater Line	Wastewater Line	Wastewater Line	Wastewater Line	Wastewater Line
Location Code:		29WL01	29WL04	29WL05	29WL08	32WL01	32WL02	32WL03	32WL04	32WL04
Sample Number:		29WL01-930511	29WL04-930515	29WL05 (WATER)	29WL08 (WATER)	C930517-32WL01-N00	32WL02-930517	32WL03 (WATER)	32WL04 (CONTS)	32WL04 (WATER)
Sample Number:		19930511	19930515	19950430	19950501	19930517	19930517	19950502	19950502	19950502
Sample Date:		5/11/1993	5/15/1993	4/30/1995	5/1/1995	5/17/1993	5/17/1993	5/2/1995	5/2/1995	5/2/1995
ANALYTE	UNITS	REG	REG	REG	REG	REG	REG	REG	REG	REG
Explosives										
1,3,5-Trinitrobenzene	µg/L	88	<0.258	---	---	<521	<0.258	---	---	---
1,3-Dinitrobenzene	µg/L	22 UJ	<0.108	---	---	<521	<0.108	---	---	---
2,4,6-Trinitrotoluene	µg/L	3500 J	<0.113	---	---	<521	<0.113	---	---	---
2,4-Dinitrotoluene	µg/L	300	---	---	---	<521	<0.021	---	---	---
2,6-Dinitrotoluene	µg/L	62 UJ	---	---	---	<542	<0.314	---	---	---
2-Amino-4,6-dinitrotoluene	µg/L	910 J	---	---	---	---	---	---	---	---
4-Amino-2,6-dinitrotoluene	µg/L	600	---	---	---	---	---	---	---	---
HMX	µg/L	160 UJ	<0.836	---	---	<4583	<0.836	---	---	---
RDX	µg/L	<170	<0.836	---	---	<2083	<0.836	---	---	---
Metals										
Arsenic	µg/L	---	---	<5	<5	---	---	<5	8	<5
Barium	µg/L	---	---	32	179	---	---	108	46	2480
Chromium	µg/L	---	---	<10	10	---	---	<10	<10	266
Lead	µg/L	---	---	250	270	---	---	1080	305	220
Mercury	µg/L	---	---	<.2	<.2	---	---	<.2	<.2	1
Nickel	µg/L	---	---	<40	<40	---	---	<40	<40	140
Silver	µg/L	---	---	<10	15	---	---	<10	<10	<10

Notes:

--- not applicable – not analyzed or result deemed unusable
µg/L micrograms per liter
J result or detection limit is estimated
U result is below detection limit
REG regular sample

Table 4-3
Analytes Detected in Solids from TNT Wastewater Line

	Associated Site:	Wastewater Line	Wastewater Line	Wastewater Line	Wastewater Line
	Location Code:	29WL02	29WL03	29WL06	32WL01
	Sample Number:	LH29-WL-02	LH29-WL-03	29WL06(CONTS)	32WL01
	Sample Date:	5/13/1993	5/14/1993	4/30/1995	5/17/1993
ANALYTE	UNITS	REG	REG	REG	REG
Explosives					
1,3,5-Trinitrobenzene	mg/kg	<.333	39	---	<.00025
2,4,6-Trinitrotoluene	mg/kg	6.8	3,700	---	<.00025
2,4-Dinitrotoluene	mg/kg	---	---	---	<.00025
2,6-Dinitrotoluene	mg/kg	---	---	---	<.00026
2-Amino-4,6-dinitrotoluene	mg/kg	---	---	---	---
4-Amino-2,6-dinitrotoluene	mg/kg	---	---	---	---
Metals					
Antimony	mg/kg	---	---	3.4 J	---
Arsenic	mg/kg	---	---	2.6	---
Barium	mg/kg	---	---	61.6 J	---
Chromium	mg/kg	---	---	15.3	---
Lead	mg/kg	---	---	628 J	---
Mercury	mg/kg	---	---	<0.14	---
Nickel	mg/kg	---	---	8.8	---
Semivolatiles					
2,4-Dinitrotoluene	mg/kg	1.2	<.362	---	---
2,6-Dinitrotoluene	mg/kg	<.347	56	---	---

Notes:

--- not applicable – not analyzed or result deemed unusable
J result is estimated
mg/kg milligrams per kilogram
REG regular sample

Table 4-4
Analytes Detected in Solids from Cooling Water Drain Lines

	Associated Site:	Cooling Water Line	Cooling Water Line	Cooling Water Line	Cooling Water Line	Cooling Water Line	Cooling Water Line
	Location Code:	29SD33-MH02	29SD36-MH05	29SD37-MH06	29SD38-MH07	29SD39-MH08	29SD40-MH09
	Sample Number:	29SD33-MH02	29SD36-MH05	29SD37-MH06	29SD38-MH07	29SD39-MH08	29SD40-MH09
	Sample Number:	20041217	20041217	20041217	20041216	20041216	20041217
	Sample Date:	12/17/2004	12/17/2004	12/17/2004	12/16/2004	12/16/2004	12/17/2004
ANALYTE	UNITS	REG	REG	REG	REG	REG	REG
Explosives							
1,3,5-Trinitrobenzene	mg/kg	.44	<.4	<.4	<.4	<.4	<.4
2,4,6-Trinitrotoluene	mg/kg	11	<.4	.29 J	.63	5.5	1.2
2,4-Dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	.71	<.4
2,6-Dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	.3 J	<.4
2-Amino-4,6-dinitrotoluene	mg/kg	3.8 J	.4 UJ	.29 J	<.4	1.2	2.4 J
4-Amino-2,6-dinitrotoluene	mg/kg	2.6 J	.4 UJ	.26 J	<.4	.88	2.5 J
Metals							
Antimony	mg/kg	---	---	---	---	---	---
Arsenic	mg/kg	---	---	---	---	---	---
Barium	mg/kg	---	---	---	---	---	---
Chromium	mg/kg	---	---	---	---	---	---
Lead	mg/kg	---	---	---	---	---	---
Mercury	mg/kg	---	---	---	---	---	---
Nickel	mg/kg	---	---	---	---	---	---

Notes:

Reference: Shaw Environmental, Inc. sampling documented in project files, Houston.

--- not applicable – not analyzed or result deemed unusable
J result or detection limit is estimated
mg/kg milligrams per kilogram
REG regular sample
U result is below detection limit

Table 4-4 *(Continued)*
Analytes Detected in Solids from Cooling Water Drain Lines

	Associated Site:	Cooling Water Line	Cooling Water Line	Cooling Water Line	Cooling Water Line	Cooling Water Line
	Location Code:	29SD41-MH10	29SD43-MH12	29WL09	29WL10	29WL11
	Sample Number:	29SD41-MH10	29SD43-MH12	29WL09(CONTS)	29WL10(CONTS)	29WL11(CONTS)
	Sample Number:	20041216	20041217	19950429	19950429	19950429
	Sample Date:	12/16/2004	12/17/2004	4/29/1995	4/29/1995	4/29/1995
ANALYTE	UNITS	REG	REG	REG	REG	REG
Explosives						
1,3,5-Trinitrobenzene	mg/kg	<.4	<.4	---	---	---
2,4,6-Trinitrotoluene	mg/kg	7	.41	---	---	---
2,4-Dinitrotoluene	mg/kg	1.1	<.4	---	---	---
2,6-Dinitrotoluene	mg/kg	.24 J	<.4	---	---	---
2-Amino-4,6-dinitrotoluene	mg/kg	9	.4 UJ	---	---	---
4-Amino-2,6-dinitrotoluene	mg/kg	7.8	.4 UJ	---	---	---
Metals						
Antimony	mg/kg	---	---	<1.3	<1.3	<1.4
Arsenic	mg/kg	---	---	2.7	2.1	2.6
Barium	mg/kg	---	---	62.3	60.8	69.3
Chromium	mg/kg	---	---	56.1	12	13
Lead	mg/kg	---	---	36.7	43.8	6.5
Mercury	mg/kg	---	---	<0.13	0.19	0.78
Nickel	mg/kg	---	---	10	5.9	17

Notes:

Reference: Shaw Environmental, Inc. sampling documented in project files, Houston.

--- not applicable – not analyzed or result deemed unusable
J result or detection limit is estimated
mg/kg milligrams per kilogram
REG regular sample
U result is below detection limit

Table 4-5
Analytes Detected in Liquids from Cooling Water Drain Lines

Associated Site:		AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
Sample Location:		29WL32-MH01	29WL33-MH02	29WL34-MH03	29WL36-MH05	29WL37-MH06	29WL38-MH07	29WL39-MH08
Sample Date:		12/15/2004	12/15/2004	2/24/2005	2/24/2005	2/24/2005	2/23/2005	2/23/2005
Sample ID:		29WL32-MH01	29WL33-MH02	29WL34-MH03-02	29WL36-MH05-02	29WL37-MH06-02	29WL38-MH07-02	29WL39-MH08-02
Sample Type:		REG	REG	REG	REG	REG	REG	REG
ANALYTE	UNITS							
Explosives								
1,3,5-Trinitrobenzene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.34 JL	<1.04	<1.03
1,3-Dinitrobenzene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03
2,4,6-Trinitrotoluene	µg/L	250	.93 J	23.0 JL	84.3 JL	430 JL	0.955 J	6.36
2,4-Dinitrotoluene	µg/L	15	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03
2,6-Dinitrotoluene	µg/L	4.1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03
2-Amino-4,6-dinitrotoluene	µg/L	16	3.4	1.19 JL	1.82 JL	6.27 JL	0.428 J	1.29
4-Amino-2,6-dinitrotoluene	µg/L	33	6.1	2.13 JL	2.74 JL	8.15 JL	0.364 J	1.70
HMX	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03
m-Nitrotoluene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03
Nitrobenzene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03
o-Nitrotoluene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03
p-Nitrotoluene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03
RDX	µg/L	<1	<1	1.05 UJL	1.04 UJL	0.494 JL	<1.04	<1.03
Tetryl	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04	<1.03

Notes:

FD field duplicate
J result or detection limit is estimated
L result may be biased low
NA not analyzed
REG regular
U result below detection limit
µg/L micrograms per liter

Table 4-5 *(continued)*
Analytes Detected in Liquids from Cooling Water Drain Lines

Associated Site:		AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
Sample Location:		29WL40-MH09	29WL40-MH09	29WL40-MH09	29WL40-MH09	29WL41-MH10	29WL42-MH11	29WL43-MH12
Sample Date:		12/17/2004	12/17/2004	2/23/2005	2/23/2005	2/23/2005	2/23/2005	2/23/2005
Sample ID:		29WL40-MH09	29WL40-MH09-QC	29WL40-MH09-02	29WL40-MH09-52	29WL41-MH10-02	29WL42-MH11-02	29WL43-MH12-02
Sample Type:		REG	FD	REG	FD	REG	REG	REG
ANALYTE	UNITS							
Explosives								
1,3,5-Trinitrobenzene	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10
1,3-Dinitrobenzene	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10
2,4,6-Trinitrotoluene	µg/L	5200	5900	20.0	24.0	15.0	18.0	25.0
2,4-Dinitrotoluene	µg/L	.8 J	.83 J	1.13	1.09	1.05	0.922 J	0.934 J
2,6-Dinitrotoluene	µg/L	27	27	1.27	1.24	1.35	1.15	1.31
2-Amino-4,6-dinitrotoluene	µg/L	220	210	1.68	1.63	2.01	1.29	1.75
4-Amino-2,6-dinitrotoluene	µg/L	290	280	2.42	2.36	2.58	1.96	2.67
HMX	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10
m-Nitrotoluene	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10
Nitrobenzene	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10
o-Nitrotoluene	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10
p-Nitrotoluene	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10
RDX	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10
Tetryl	µg/L	<1	<1	<1.06	<1.03	<1.03	<1.03	<1.10

Notes:

FD field duplicate
J result or detection limit is estimated
L result may be biased low
NA not analyzed
REG regular
U result below detection limit
µg/L micrograms per liter

Table 4-6
TNT in Surface Water

Area	Number of Locations	Number of Samples	Locations with Detections	Number of Detections	Range of Detections
Cooling Water Outfall Ditch	6	20 [a]	4	10	0.2 – 860 µg/L
Pump House Pond	3	3	2	2	0.39J – 0.40J µg/L
All Other in LHAAP-29	23	23	0	0	- - -
LHAAP-29 Summary	32	46[a]	6	12	0.2-860 µg/L

Notes:

[a] 15 of the samples and 7 of the detections are at location GPW-12.
µg/L micrograms per liter

Table 4-7
Analytes Exceeding MCLs in Groundwater at LHAAP-29

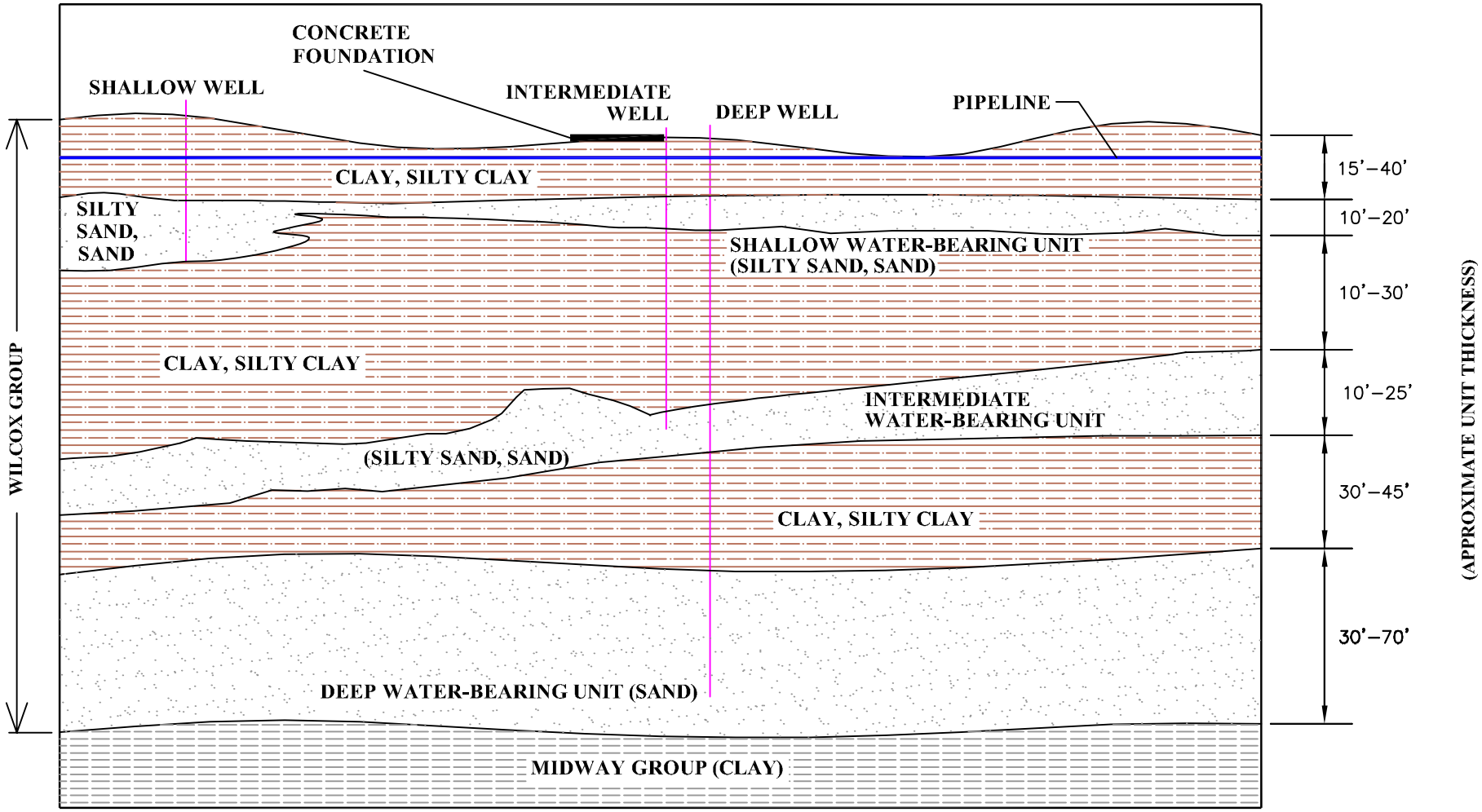
Analyte	Units	Maximum Detect	MCL
1,2-Dichloroethane	µg/L	14,000	5
Antimony	µg/L	52	6
Arsenic	µg/L	59	10
Barium	µg/L	6,500	2,000
Beryllium	µg/L	9.9	4
Cadmium	µg/L	6.23	5
Chromium	µg/L	7,600	1,000
Lead	µg/L	350	15
Mercury	µg/L	3	2
Methylene chloride	µg/L	7,300,000	5
Nitrate / Nitrite	µg/L	12,100	10,000
Selenium	µg/L	350	50
Thallium	µg/L	2.7	2
Trichloroethene	µg/L	8,800	5

Notes:

MCL maximum contaminant limit under the National Primary Drinking Water Standards
µg/L micrograms per liter

00041859

PLOT DATE: 6/06/05 FORMAT REVISION 11/12/04	IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER	845714-A39
	---	---	Houston, Texas	A.WIL	11/11/04	G. JONES	5/20/05	P. SRIVASTAV	5/20/05		



NOTE:
DIMENSIONS ARE TYPICAL RANGE FOR LHAAP-29

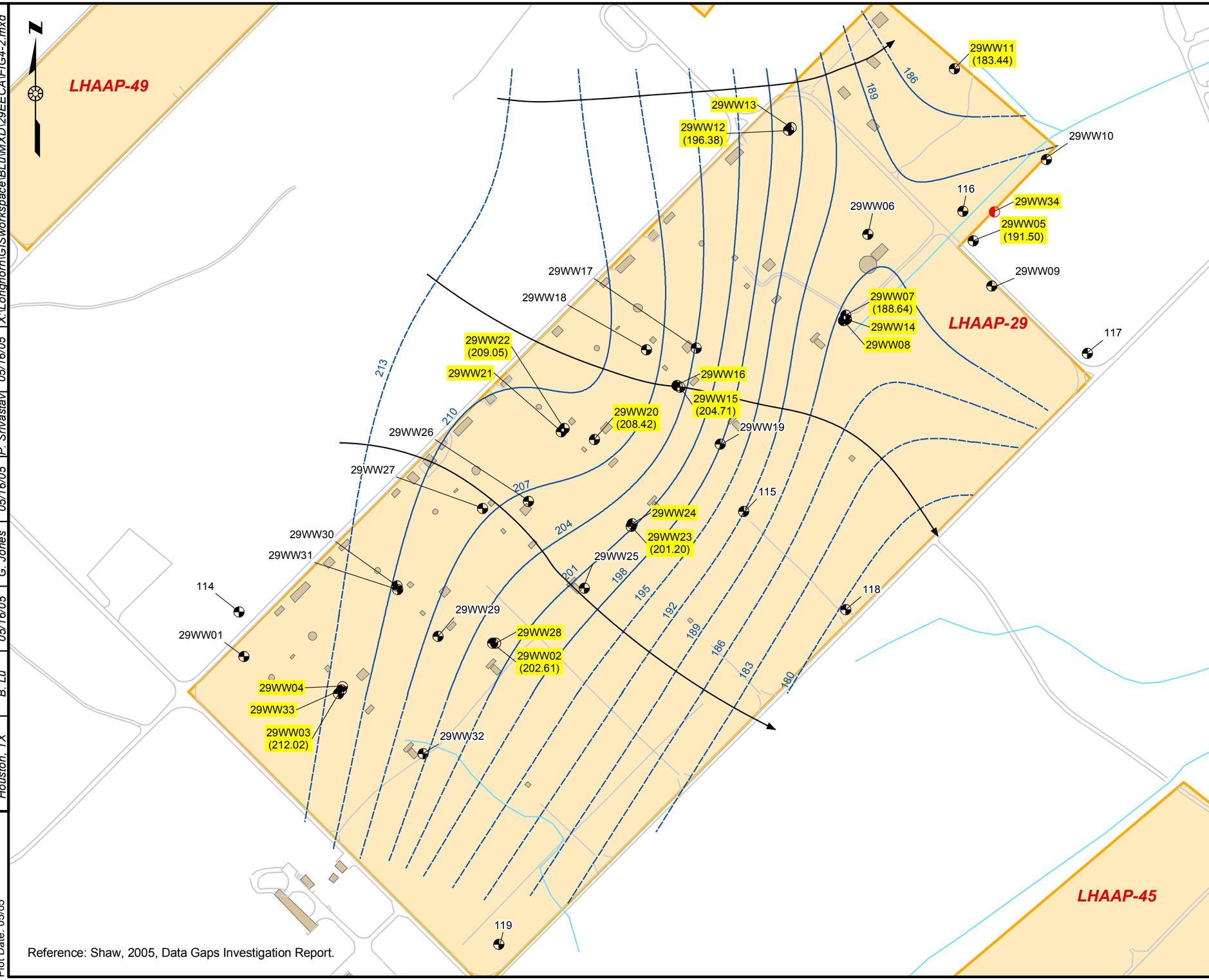
THIS FIGURE IS CONCEPTUAL AND IS NOT TO SCALE

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

FIGURE 4-1

CONCEPTUAL SUBSURFACE GEOLOGY
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS



Reference: Shaw, 2005, Data Gaps Investigation Report.

Legend

Groundwater Monitoring Well
- Shallow
- Intermediate
- Deep

Newly Installed Groundwater Monitoring Well
- Intermediate

186 Groundwater Elevation Contour

186 Estimated Groundwater Elevation Contour

Stream

Road

Former Building or Tank Location

Site

(183.44) Groundwater Elevation in Feet

Inferred Groundwater Flow Direction

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.

0 200 400 800 Feet

Shaw®

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

FIGURE 4-2

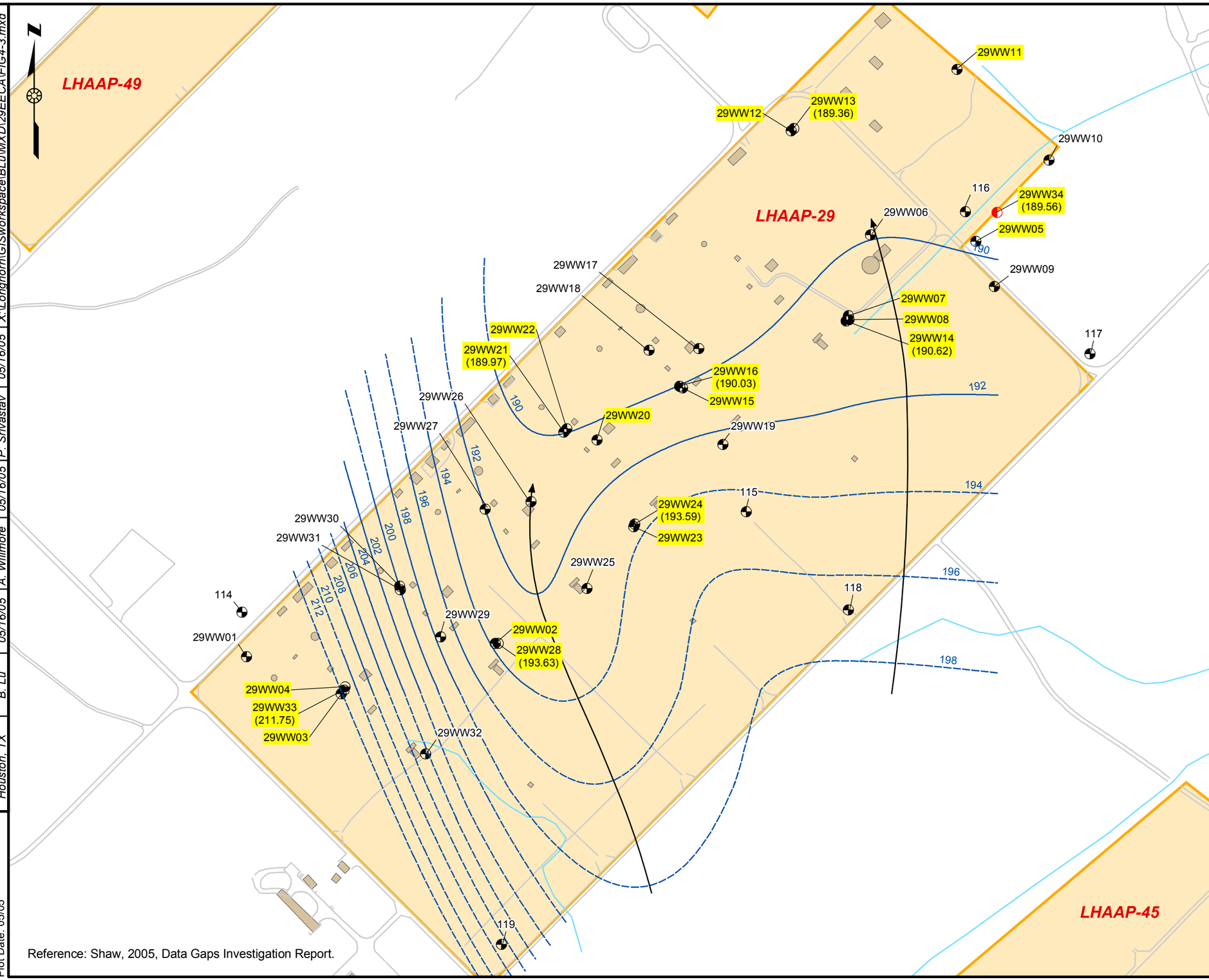
GROUNDWATER ELEVATION - SHALLOW ZONE
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	05/16/05	G. Jones	05/16/05	P. Srivastav	05/16/05	X:\Longhorn\GIS\workspace\BLu\MXD\29EECA\FIG4-2.mxd

Plot Date: 05/05

00041861



Reference: Shaw, 2005, Data Gaps Investigation Report.

Legend

Groundwater Monitoring Well

- Shallow
- Intermediate
- Deep

Newly Installed Groundwater Monitoring Well

- Intermediate
- 190 Groundwater Elevation Contour
- 190 Estimated Groundwater Elevation Contour
- Stream
- Road
- Former Building or Tank Location
- Site
- (189.36) Groundwater Elevation in Feet
- Inferred Groundwater Flow Direction

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.

0 200 400 800 Feet

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TULSA, OKLAHOMA

FIGURE 4-3

GROUNDWATER ELEVATION - INTERMEDIATE ZONE
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	05/16/05	A. Willmore	05/16/05	P. Srivastav	05/16/05	X:\Longhorn\GIS\workspace\BLu\MXD\29EECA\FIG4-3.mxd

Plot Date: 05/05

Legend

- Soil Sample Location
- Water Sample Location
- Sediment Sample Location
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Storage Pond
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Site

Notes:
1. COC: Contaminant of concern.
2. ND: Not detected (detection limits are in parentheses).
3. SED: Sediment Sample.
4. SW: Surface Water Sample.
5. Depths are reported in feet below ground surface.
6. Soil sample concentrations are reported in milligrams per kilogram.
7. Water sample concentrations are reported in micrograms per liter.
8. Building locations and piping systems were positioned using information provided by Corps of Engineers RI/FS Workplan (1992) based on 1942 As Built Map.
9. Yellow highlight indicates detected result.

0 300 600 1,200 Feet

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FIGURE 4-4

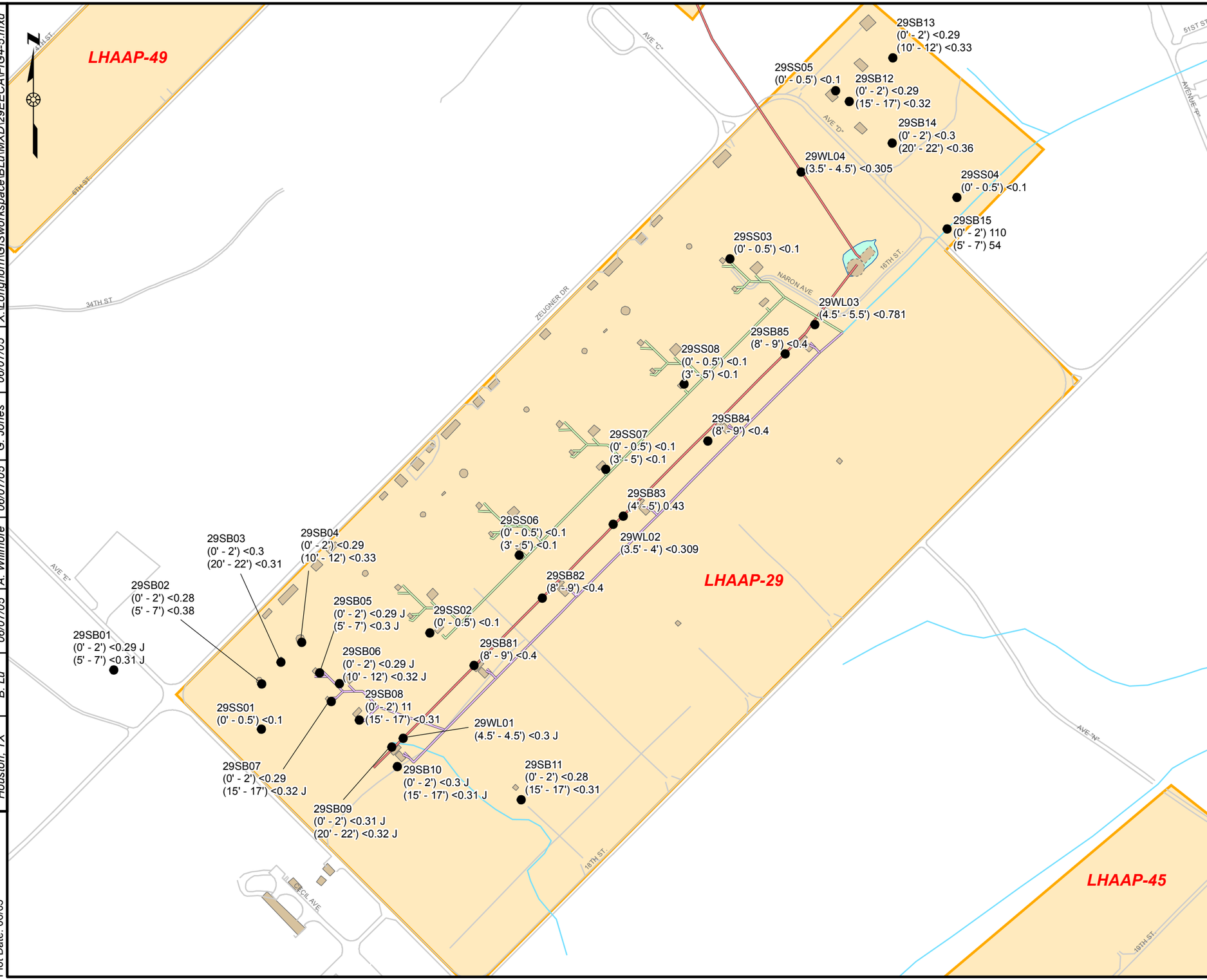
TNT IN OR NEAR UNDERGROUND LINES
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 05/25/05	A. Willmore 05/25/05	G. Jones 05/25/05	X:\Longhorn\GIS\workspace\BLu\MXD\29EECA\Fig4-4.mxd

Plot Date: 05/05

00041863



Legend

- Soil Boring
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

Notes:
1. Depths are reported in feet below ground surface.
2. Soil sample concentrations are reported in milligrams per kilogram.
3. Building Locations and piping systems were positioned using information provided by Corps of Engineers RI/FS Workplan (1992) based on 1942 As Built Map.

0 200 400 800 Feet

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FIGURE 4-5

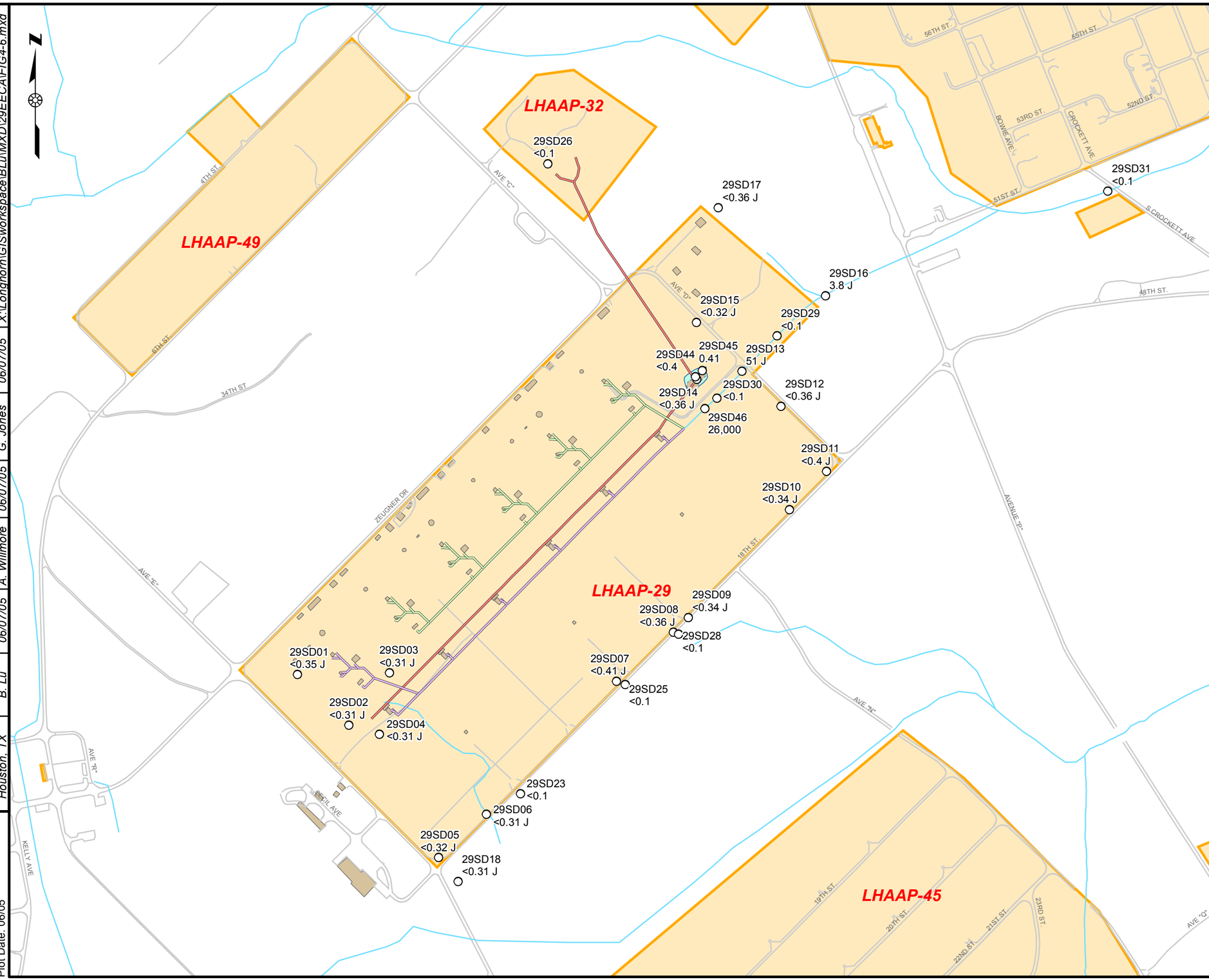
TNT IN SOIL
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 06/07/05	A. Willmore 06/07/05	G. Jones 06/07/05	X:\Longhorn\GIS\workspace\BLu\MXD\29ECA\FIG4-5.mxd

Plot Date: 06/05

00041864



Legend

- Sediment Sample Location
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

Notes:
1. Soil sample concentrations are reported in milligrams per kilogram.
2. Building Locations and piping systems were positioned using information provided by Corps of Engineers RI/FS Workplan (1992) based on 1942 As Built Map.

0 300 600 1,200 Feet

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TULSA, OKLAHOMA

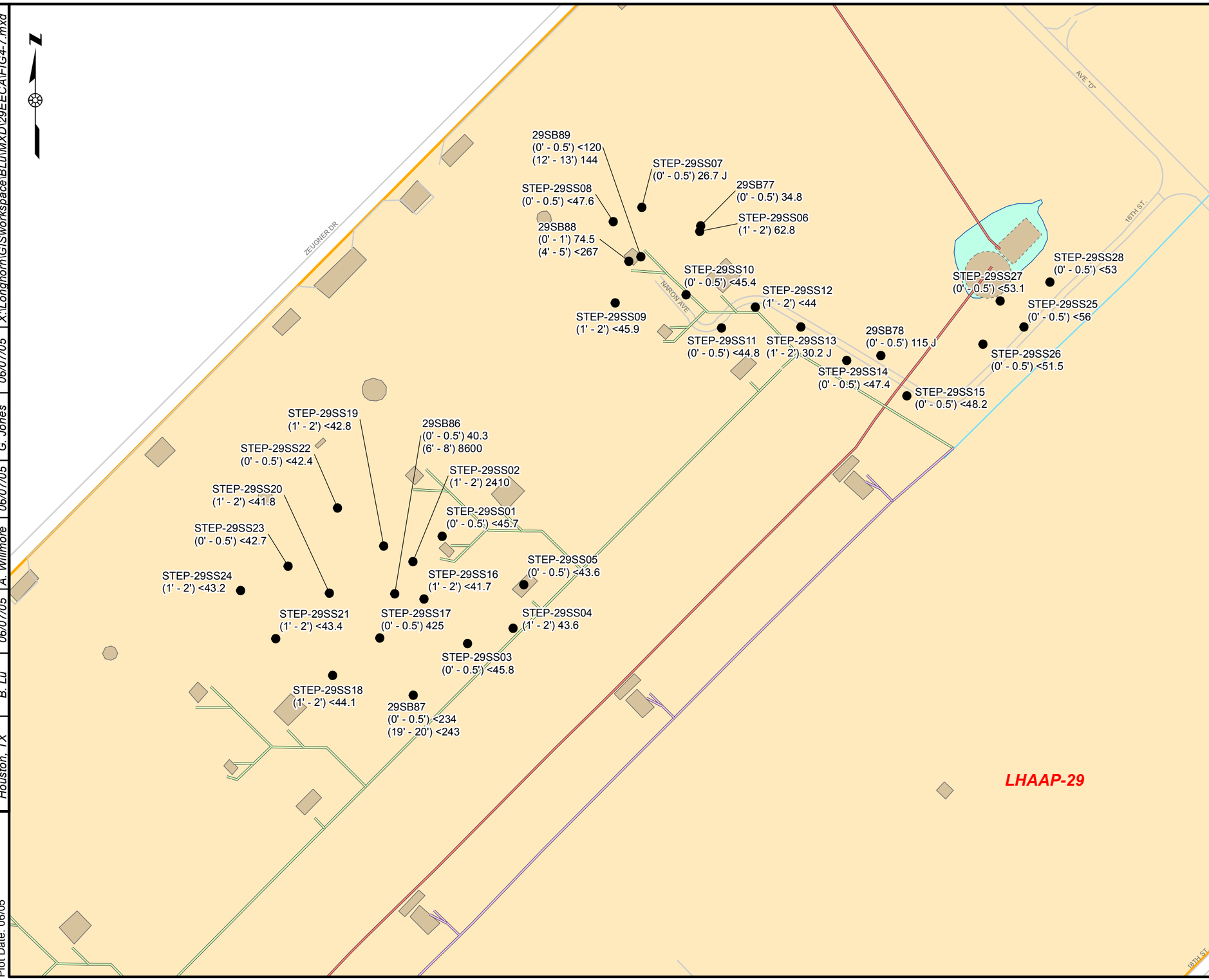
FIGURE 4-6

TNT IN SEDIMENT
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	06/07/05	A. Willmore	06/07/05	G. Jones	06/07/05	X:\Longhorn\GIS\workspace\BLu\MXD\29EECA\FIG4-6.mxd

Plot Date: 06/05



Legend

- Soil Sample Location
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

Notes:
1. Depths are reported in feet below ground surface.
2. Soil sample concentrations are reported in micrograms per kilogram.
3. Building Locations and piping systems were positioned using information provided by Corps of Engineers RI/FS Workplan (1992) based on 1942 As Built Map.

0 75 150 300 Feet

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TULSA, OKLAHOMA

FIGURE 4-7

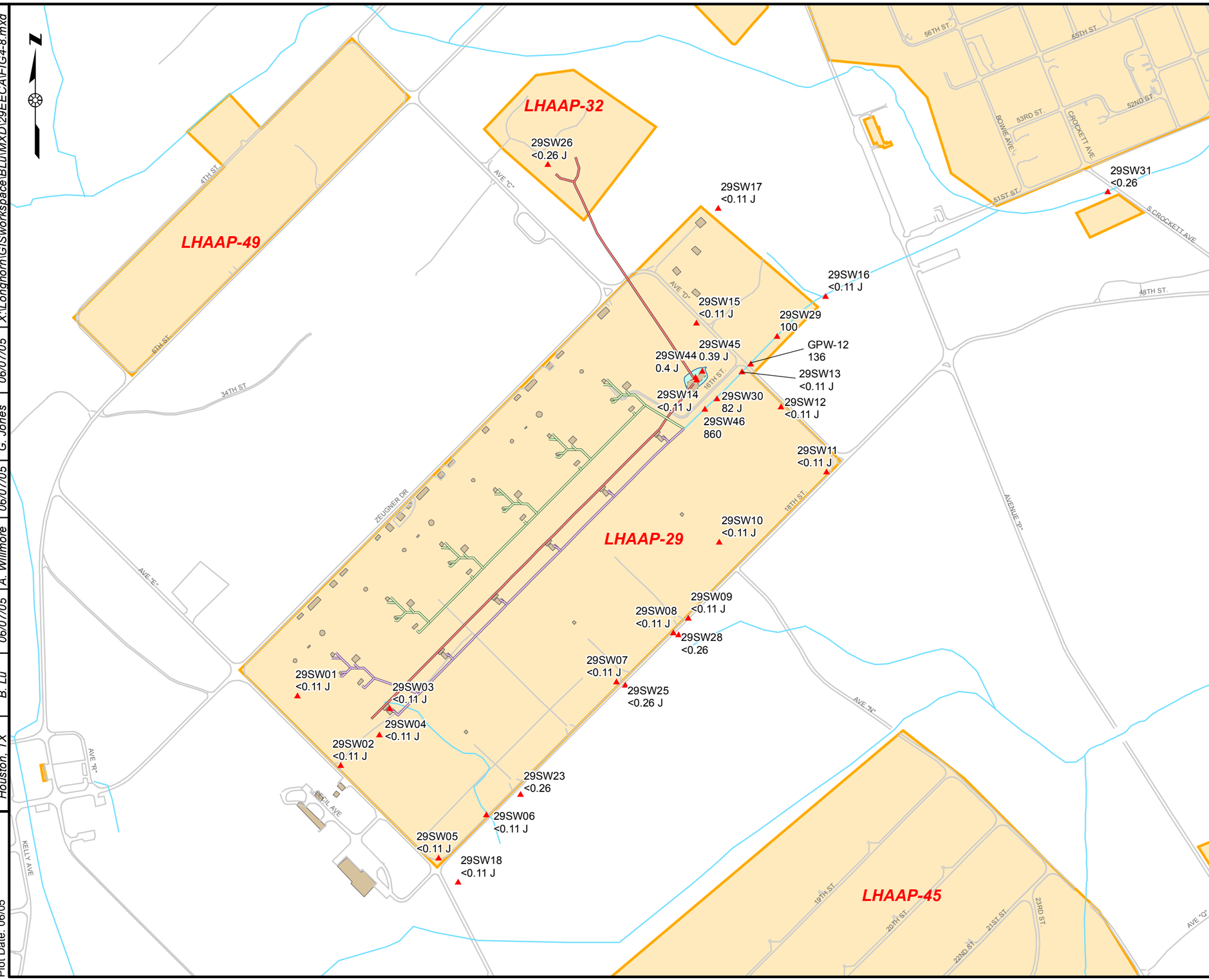
PERCHLORATE IN SOIL
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	06/07/05	A. Willmore	06/07/05	G. Jones	06/07/05	X:\Longhorn\GIS\workspace\BLu\MXD\29EECA\FIG4-7.mxd

Plot Date: 06/05

00041866



Legend

- Surface Water Sample Location
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building or Tank Location
- Former Pump House and Storage Tank
- Pond
- Site

Notes:
1. Water sample concentrations are reported in micrograms per liter.
2. Building Locations and piping systems were positioned using information provided by Corps of Engineers RI/FS Workplan (1992) based on 1942 As Built Map.
3. The TNT result for GPW-12 is the maximum detected at that location (December 2002).

0 300 600 1,200 Feet

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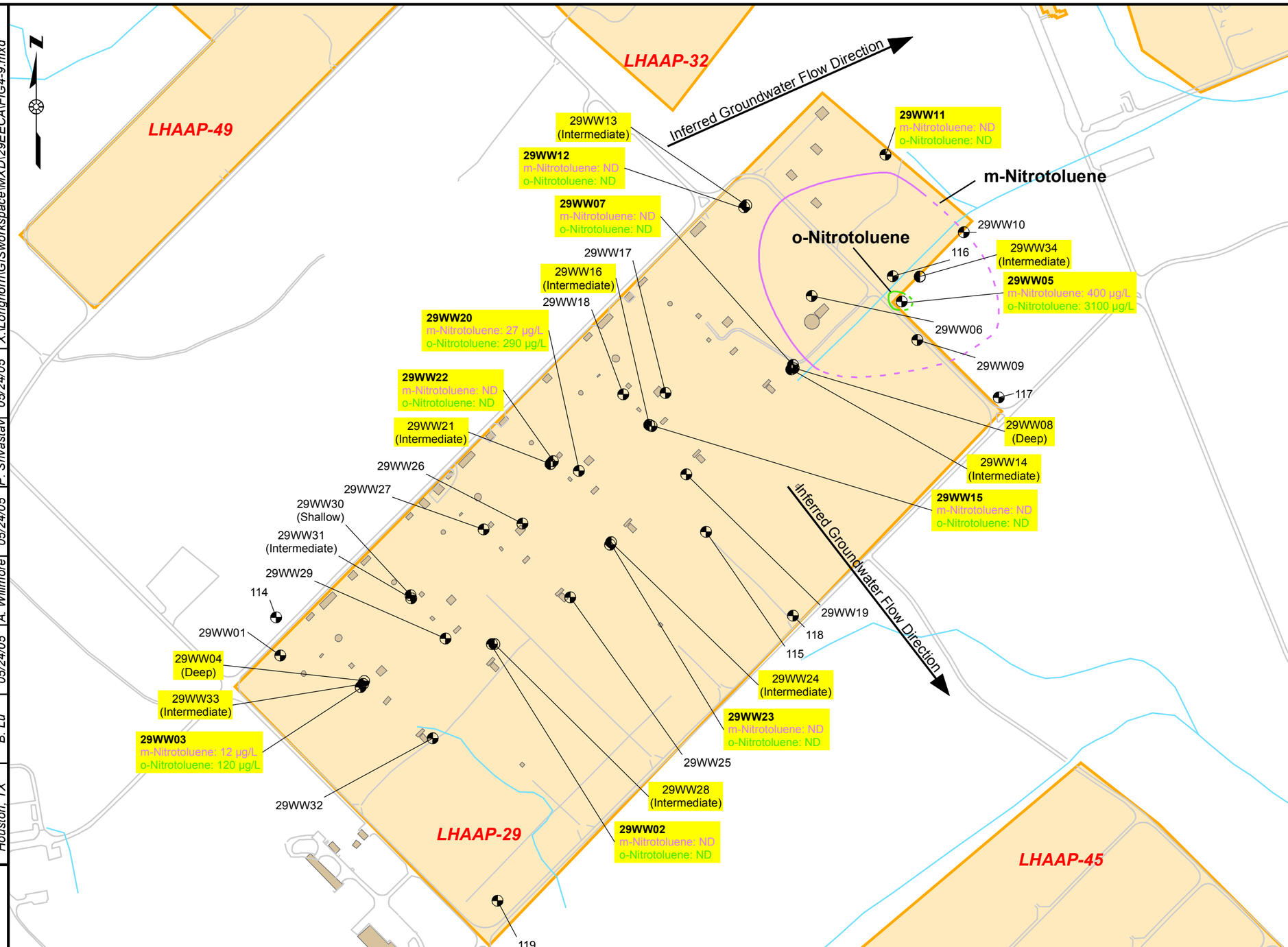
FIGURE 4-8

TNT IN SURFACE WATER
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	06/07/05	A. Willmore	06/07/05	G. Jones	06/07/05	X:\Longhorn\GIS\workspace\BLu\MXD\29EECA\FIG4-8.mxd

Plot Date: 06/05



		29WW04	29WW08	29WW13	29WW14	29WW16	29WW21	29WW24	29WW28	29WW33	29WW34
PARAMETER	UNITS	DEEP	DEEP	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE	INTERMEDIATE
m-Nitrotoluene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Nitrotoluene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Legend

Groundwater Monitoring Well

- Shallow
- Intermediate
- Deep
- ND Not Detected
- m-Nitrotoluene contamination extent at concentration = 365 µg/L
- Estimated m-nitrotoluene contamination extent at concentration = 365 µg/L
- o-Nitrotoluene contamination extent at concentration = 368 µg/L
- Estimated o-nitrotoluene contamination extent at concentration = 368 µg/L
- Stream
- Road
- Former Building or Tank Location
- Site

Notes:
1. Contamination plume extents are based on TCEQ's Medium Specific Concentrations, updated March 31, 2004 or EPA Maximum Contaminant Levels.
2. Yellow highlighted groundwater monitoring wells were sampled in August - September, 2004 during data gaps investigation (Shaw, 2005).

0 250 500 1,000 Feet

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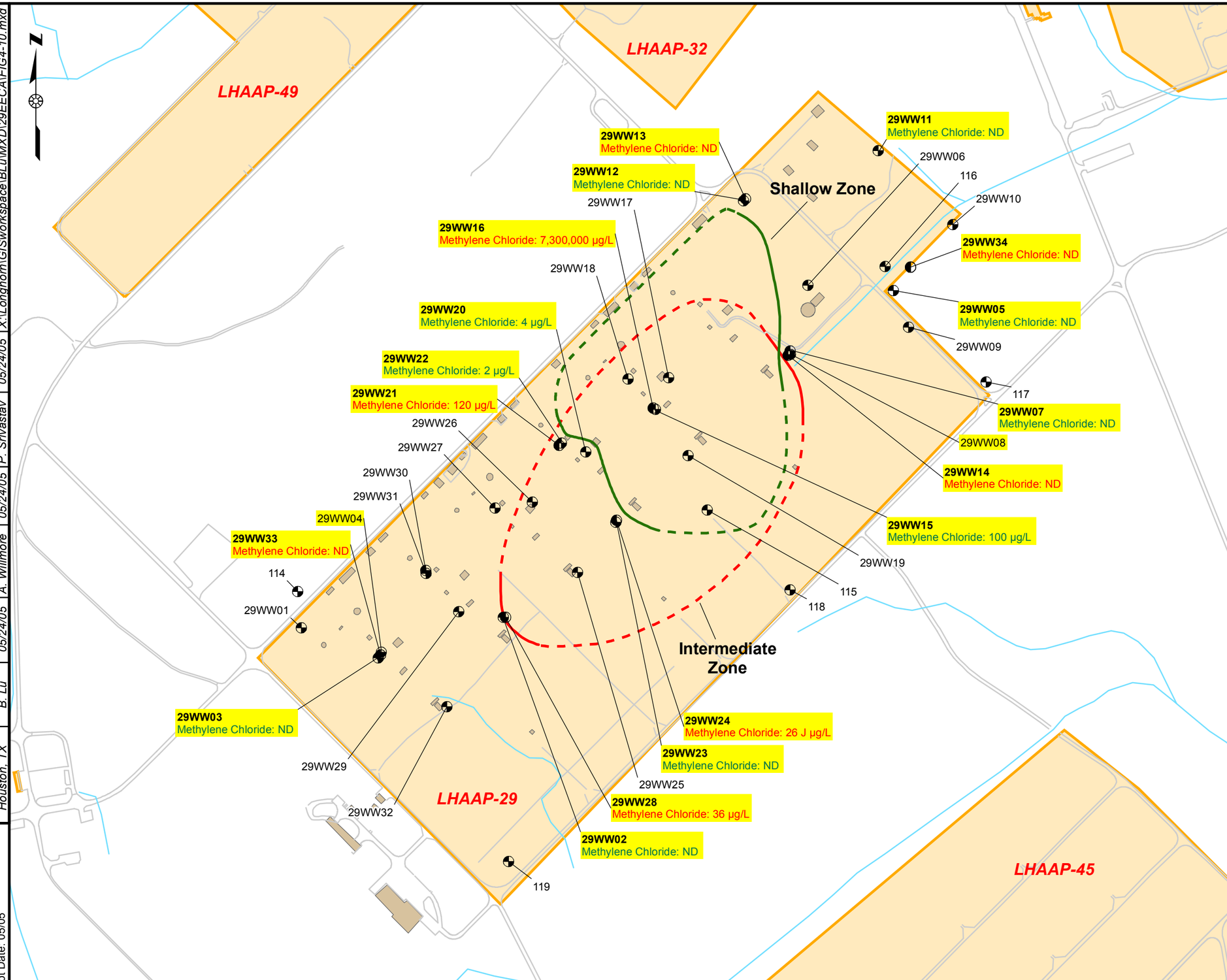
FIGURE 4-9

NITROTOLUENE IN SHALLOW GROUNDWATER
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	05/24/05	A. Willmore	05/24/05	P. Srivastav	05/24/05	X:\Longhorn\GIS\workspace\MXD\29EECA\FIG4-9.mxd

Plot Date: 05/05



Legend

Groundwater Monitoring Well

- Shallow
- Intermediate
- Deep
- ND Not Detected
- Methylene chloride contamination extent in shallow zone, at concentration = 5 µg/L
- Estimated methylene chloride contamination extent in shallow zone, at concentration = 5 µg/L
- Methylene chloride contamination extent in intermediate zone, at concentration = 5 µg/L
- Estimated methylene chloride contamination extent in intermediate zone, at concentration = 5 µg/L
- Stream
- Road
- Former Building or Tank Location
- Site

Notes:
1. Contamination plume extents are based on TCEQ's Medium Specific Concentrations, updated March 31, 2004 or EPA Maximum Contaminant Levels.
2. Yellow highlighted groundwater monitoring wells were sampled in August - September, 2004 during data gaps investigation (Shaw, 2005).

0 250 500 1,000 Feet

Shaw

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TULSA, OKLAHOMA

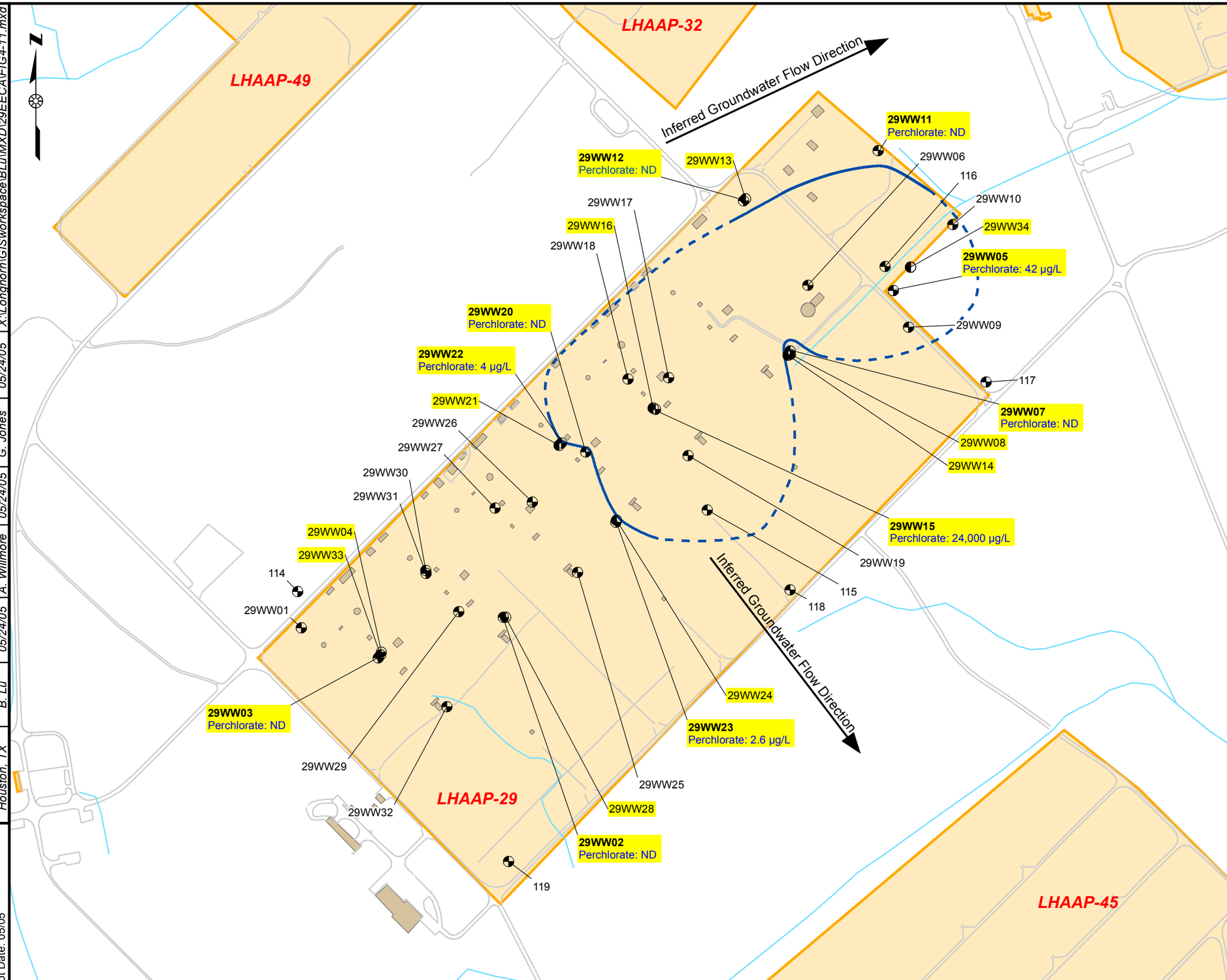
FIGURE 4-10

METHYLENE CHLORIDE IN SHALLOW AND INTERMEDIATE GROUNDWATER
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 05/24/05	A. Willmore 05/24/05	P. Srivastav 05/24/05	X:\Longhorn\GIS\workspace\BLu\MXD\29EECA\FIG4-10.mxd

Plot Date: 05/05



Legend

Groundwater Monitoring Well

- Shallow
- Intermediate
- Deep
- ND Not Detected
- Perchlorate contamination extent at concentration =4 µg/L
- Estimated perchlorate contamination extent at concentration =4 µg/L
- Stream
- Road
- Former Building or Tank Location
- Site

Notes:
1. Contamination plume extents are based on TCEQ's Medium Specific Concentrations, updated March 31, 2004 or EPA Maximum Contaminant Levels.
2. Yellow highlighted groundwater monitoring wells were sampled in August - September, 2004 during data gaps investigation (Shaw, 2005).

0 250 500 1,000 Feet

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TULSA, OKLAHOMA

FIGURE 4-11

PERCHLORATE IN SHALLOW GROUNDWATER
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	05/24/05	A. Willmore	05/24/05	G. Jones	05/24/05	X:\Longhorn\GIS\workspace\BLu\MXD\29EECA\FIG4-11.mxd

Plot Date: 05/05

5.0 Summary

The 2002 risk assessment (Jacobs, 2002a) identified the following:

- Unacceptable risks associated with groundwater at LHAAP-29 due to organic solvents, perchlorate, and explosives compounds
- Acceptable risk associated with soil at LHAAP-29

The only pathway considered for remediation within the FS for the Group 2 Sites (Jacobs, 2002b) was groundwater via ingestion, inhalation, and dermal contact.

The organic solvents and perchlorate in the groundwater at LHAAP-29 are associated with rocket motor washout. The explosive compounds are byproducts of the 1940s TNT production. Subsequent field investigations have confirmed the effect on groundwater. There could be a significant plume of methylene chloride (as well as other organics) beneath the site. The extent of organics in the deep groundwater has not been fully investigated. Perchlorate in the groundwater appears to be associated with two past sources – one at the former rocket motor washout facility plus a second location about 600 feet southwest of the washout facility. Explosives in groundwater appear to be limited to a region around the upgradient end of the Cooling Water Outfall Ditch.

While the soil cancer risk in the 2002 risk assessment was within the target range and the HI was just above the target value of 1, the following factors significantly increase the concern about soil contamination at LHAAP-29:

- Additional field observation in LHAAP-29 has identified stained soil. In the Environmental Site Assessment (Plexus, 2004), it was noted that "Visual evidence of probably TNT soil contamination was found at the foundations of Buildings 806-A and D." Buildings 806-A and –D are two of six wash houses where TNT was purified. Sampling by the USACE confirmed the potential for explosives compounds in stained soil at LHAAP-29.
- The under groundwater lines and surrounding soil at LHAAP-29 serve as a potential source of further TNT contamination. While data are not available to quantify the actual risk from the wooden TNT wastewater lines and the vitrified clay cooling water drain pipes, there are potentially explosive contaminants in the pipelines and adjacent soil that could be a continuing source of groundwater contamination, a safety hazard, and a risk to human health.
- Recent sampling has detected TNT as high as 26,000 mg/kg in the Cooling Water Outfall Ditch.

- Elevated levels of perchlorate have been detected in soil in the northeastern portion of LHAAP-29. Soil in two areas, around the foundation of Building 801-F as well as an area approximately 600 feet southwest of the building, is a potential source for continuing perchlorate contamination of the groundwater as well as organic solvent contamination.

6.0 References

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Appendix A

Investigation Results – December 2004 and February 2005

December 2004 and February 2005 Field Investigations at LHAAP-29

1.0 Introduction

Shaw Environmental, Inc. (Shaw) performed field investigation activities at LHAAP-29 in December 2004 and February 2005 to further define the extent of perchlorate and explosives in soil, sediment, and water. The numbers of samples and the types of analyses are summarized in **Table A-1**. The sample locations are provided in **Figures A-1** and **A-2**.

Shaw collected ten soil, 11 sediment, and 15 water samples at various locations to assess the affect of explosives in or near former wastewater drainage lines, ditches, and a pond. The ten soil samples were collected at five separate locations (29SB81 through 29SB85) at depth intervals of 4 to 5, and 8 to 9 feet bgs. These locations were adjacent to wash house sumps at five of the six former 2,4,6-trinitrotoluene (TNT) production lines. Twelve soil samples (two from each of the six sump locations) were initially proposed, in accordance with the Addendum 3, *Additional Investigation, LHAAP-29 and LHAAP-49, Final Work Plan, Groundwater Data Gaps Investigation Groups 2 and 4* (Addendum 3, Additional Investigation) (Shaw, 2004a). One soil boring location, however, was submerged in water and drilling at this location was not practical. Eight sediment and twelve water samples were collected from manholes around the site. Originally, a total of 12 manholes were proposed to be sampled for sediment and surface water; however, one manhole (MH-04) was collapsed and no samples were collected from this location. Additionally, no sediment samples were collected from manholes MH-01, MH-03, and MH-11 due to a lack of sediment residue. Due to dry conditions during the December 2004 sampling activities, water samples were collected only from manholes MH-01, MH-02, and MH-09. In February 2005, additional water samples were collected from MH-03, and MH-05 through MH-12. One sediment sample and one surface water sample were collected to examine the outfall ditch that received water from the cooling water drain lines. The remaining two sediment and two surface water samples were collected at the pond that exists at the location of the former pump house for the wastewater (red/yellow liquor) collection system.

Shaw also collected 12 samples (three in each of four soil borings) to examine the vertical and horizontal extent of perchlorate contamination in two areas in the northern portion of LHAAP-29. Two of the four borings, 29SB88 and 29SB89, were advanced through the slab at the location of the former rocket motor washout building. Three samples were collected from each boring. One sample was collected from immediately beneath the slab, one sample was collected from a depth of 4 to 5 feet beneath the previous sample, and one sample was collected immediately above the water table. Borings 29SB86 and 29SB87 were advanced in an area approximately 600 feet southwest of the former rocket motor washout building where

perchlorate had been detected in earlier investigations. Samples from these borings were collected at depth intervals of 0 to 0.5 feet below ground surface (bgs), 6 to 8 feet bgs, and immediately above the water table.

The analytical results for the December 2004 and February 2005 investigations at LHAAP-49 are provided in **Tables A-2, A-3,** and **A-4**, for soil, sediment, and water, respectively. Results for one explosive analyte (TNT) are also presented on **Figure A-1,** and results for perchlorate are presented on **Figure A-2**.

2.0 Sampling and Analysis

This section describes the sampling and analysis procedures applicable to water, sediment, and soil samples collected. Samples were collected and handled in accordance with TERC Standard Operating Procedure 1111, Sample Handling (IT Corporation/OHM Remediation Services Corp., 2002). Samples were analyzed on a 7-day turnaround time. Health and safety procedures, including screening methods, are described in the Site Safety and Health Plan, Appendix A of the Final Work Plan (Shaw, 2004b).

2.1 Soil Sampling

Soil samples were collected at the boring locations identified in **Figures A-1** and **A-2**. Two or three soil samples were collected from each boring location. Soil borings were advanced using a direct push technology (DPT) rig. The DPT method involved the use of a high-capacity hydraulic ram mounted on an all-terrain vehicle to advance a drive sampler attached to steel push rods. At two locations (29SB88 and 29SB89), concrete slabs were penetrated using a concrete boring tool. Soil samples were collected continuously during DPT operation using a 24- to 36-inch-long sampler with a disposable liner. The depths of the borings were based on Addendum 3, Additional Investigation (Shaw, 2004a).

Boring locations were marked with a stake, where practical, and a Global Positioning System (GPS) device was used to obtain location coordinates. Site personnel covered the tailgate of a pick-up truck with plastic sheeting and used it as a sample preparation area. Field analytical and health and safety instruments were calibrated and recorded within the field logbook. New disposable gloves was donned between each sampling interval to prevent cross-contamination. The sampling equipment was decontaminated as described in Section 4.5 in the Chemical Data Acquisition Plan, Appendix C of the Final Work Plan (Shaw, 2004b). The drilling operations observed proper safety, sampling, and drilling methods. When the soil sample was received from the driller, the soil-filled sampler was opened, the sample liner was removed from the barrel, the liner was cut open, and the sample liner was placed on the plastic sheeting. The entire length of material from the barrel was described according to ASTM D2488-93, “Standard Practice for

Description and Identification of Soils (Visual-Manual Procedure)" (ASTM International, 2004) and recorded on the standard Drilling Log Form. After verifying the appropriate sampling intervals, composite soil samples were placed in a container. Each sample container was labeled as described in Section 4.6.2 of the Chemical Data Acquisition Plan (Shaw, 2004b), enclosed in a sealable plastic bag, and placed in a cooler containing ice. This procedure was repeated for each interval to the total boring depth. Drilling activities and sampling procedures were recorded on a Field Sampling Report or logbook. COC documentation was completed and a photographic record of sample locations was maintained. Cuttings were disposed into the same borehole and the hole was grouted to surface. Decontamination fluids were disposed at the LHAAP-18/24 groundwater treatment plant. The samples were placed in 4-ounce wide-mouth glass containers, preserved on ice at a temperature of 4 degrees Celsius or less, and delivered to the analytical laboratory for analysis using EPA methods SW 8330 or EPA 314.0 for explosives or perchlorate, respectively.

Field duplicates (quality control samples) were collected and analyzed to assess the precision for the field sampling and laboratory analytical process. Each field duplicate was collected by filling a second sample container in rapid succession after collecting the primary soil sample. Duplicates were collected for samples 29SB85-001 and 29SB85-002.

2.2 Sediment Sampling

Sediment was collected at the locations identified in **Figure A-1**. A sampling site was prepared by laying plastic sheeting on the adjacent ground. Field equipment and instruments were calibrated to verify they were in proper working order and calibration values were recorded in the field logbook. New disposable gloves were donned between samples to prevent cross-contamination. The sampling equipment was decontaminated as described in Section 4.5 in the Chemical Data Acquisition Plan (Shaw, 2004b). Information, deviations from procedures, and rationale for changes were recorded in the field logbook. Coordinates of each sampling location were recorded using a GPS unit.

The sediment sampling interval was 0 to 0.5 feet below ground surface (bgs). In manholes with concrete or masonry floors, the sediment sample was limited to soil-like material that had collected atop the floor. One sediment sample was collected from each proposed location as stated in Addendum 3, Additional Investigation (Shaw, 2004a).

Sediment was placed into a clean stainless steel bowl and thoroughly mixed with a clean stainless steel spoon. At the manholes, a decontaminated trowel was attached to a 12-foot extension handle. Sediment was retrieved using this device, mixed, and placed in a 4-ounce glass container. An organic vapor meter was used to check for volatile organic compounds and record readings in the field logbook. The sample containers were filled directly from the tray or bowl with the spatula or spoon. As many stones, twigs, grass, etc., were removed from the

sample as possible. If the sample was water saturated, the water was carefully decanted from the container with minimal disturbance to the sample. The sample was transferred directly from the sampler to the sample container leaving no headspace. Using wide, clear tape, the label was covered and the container was placed in a sealed plastic bag, and immediately placed in an iced cooler. Location coordinates were obtained using a GPS for the sediment sample locations. The location, sample-depth, and/or field measurements were recorded in the field logbook. COC documentation was completed and a photographic record was maintained. The samples were placed in 4-ounce glass containers, preserved on ice at a temperature of 4 degrees Celsius or less, and delivered to the analytical laboratory for analysis using EPA Method SW 8330 for explosives.

A field duplicate (quality control sample) was collected and analyzed to assess the precision for the field sampling and laboratory analytical process. The field duplicate was collected by filling a second sample container in rapid succession after collecting the primary sediment sample. The duplicate was collected for sample 29SD640-MH09.

2.3 Water Sampling

Water samples were collected at the locations shown in **Figure A-1**. A sampling site was prepared by laying plastic sheeting on the adjacent ground. Field equipment and instruments were calibrated to verify they were in proper working order and calibration values were recorded in the field logbook. Shaw personnel recorded a description of the site and sampling locations, including the coordinates of the sampling locations based on a GPS unit and/or site maps. Personal protective equipment was donned as required and specified in the Site Safety and Health Plan (Shaw, 2004b). New disposable gloves were donned prior to initializing sampling activities. The water samples were usually collected at locations where sediment samples were also collected. At those locations, the water sample was collected first. Water samples were collected in one of three ways:

- Surface water samples from the pond and the ditch were collected in open containers.
- Manhole water samples were collected in December 2004 using a clean/decontaminated 2-inch-diameter PVC sampler with a valve.
- Manhole water samples were collected in February 2005 using a peristaltic pump with clean/decontaminated tubing.

The sampling procedures were recorded on a field logbook. General water quality parameters (e.g., pH, conductivity, temperature, oxidation/reduction potential, turbidity) were measured using field instruments and recorded on the field logbook. COC documentation was completed and a photographic record was maintained. The sample was placed in a 1-liter amber bottle,

preserved on ice at a temperature of 4 degrees Celsius or less, and shipped to the laboratory for analysis. Explosives were analyzed using EPA Method SW 8330.

Two field duplicates were collected and analyzed to assess the precision for the field sampling and laboratory analytical process. The field duplicates were collected by filling two separate 1-liter glass amber containers in rapid succession after collecting the primary water sample. Duplicates were collected for samples 29WL40-MH09 and 29WL40-MH09-02.

3.0 Results

The December 2004 and February 2005 results for explosives and perchlorate in the soil, sediment, and water samples from LHAAP-29 are presented in **Tables A-2, A-3,** and **A-4**. The associated data evaluation reports are included as **Attachment 1** of this document.

3.1 Explosives Results

Explosives were analyzed in soil, sediment, and water samples collected throughout LHAAP-29. The soil samples were associated with the wash house sumps, while the sediment and water samples were associated either with the pond, the cooling water outfall ditch, or the cooling water manholes.

The explosives results in the soil near the sumps were largely non-detects, with a detection limit of 0.4 µg/kg. Of the 14 explosives parameters analyzed in ten primary samples and 2 field duplicates, there were six detected results. These included TNT at 4 to 5 feet bgs at 29SB83 (0.43 mg/kg), 2-amino-4,6-dinitrotoluene (DNT) at 4 to 5 feet bgs at 29SB85 (0.23J mg/kg), and both 2-amino-4,6-DNT (0.9 mg/kg) and 4-amino-2,6-DNT (0.3J mg/kg) at 8 to 9 feet bgs at 29SB85. The remaining two detections were in the field duplicate for the 8 to 9 foot interval at 29SB85.

In the two sediment samples at the pond, the only detection was 0.41 mg/kg TNT; the detection limit was 0.4 mg/kg. The two surface water samples had detections of TNT (0.4J and 0.39J µg/L), 2-amino-4,6-DNT (0.56J and 0.53J µg/L), and 4-amino-2,6-DNT (2 and 1.9 µg/L).

The highest results for both sediment and soil during the investigation were at the cooling water outfall ditch. The sediment sample (29SD46) had 26,000 mg/kg TNT and 8,000 mg/kg DNT. The associated water sample (29SW46) had 860 µg/L TNT. Both samples had smaller detections for other explosives.

Several explosives (1,3,5-trinitrobenzene; TNT; 2,4-DNT; 2,6-DNT; 2-amino-4,6-DNT; and 4-amino-2,6-DNT) were detected in both the water and sediment from the cooling water

manholes. Explosives were detected at low concentrations in sediment samples from six of the eight cooling water manholes that were sampled. The highest sediment result was 11 mg/kg TNT at manhole MH-02. The next highest results were for degradation products (9 mg/kg 2-amino-4,6-DNT and 7.8 mg/kg 4-amino-2,6-DNT) at MH-08. The 12 water samples from the manholes had detected results for explosives, though the magnitude of the results varied several orders of magnitude. The highest explosives concentration from the water samples was 5,200 µg/L TNT in manhole MH-09, which also had detections of 27 µg/L, 220 µg/L, and 290 µg/L of 2,6-DNT, 2-amino-4,6-DNT, and 4-amino-2,6-DNT, respectively. MH-09 was sampled again in February 2005 and had a TNT result of 20 µg/L at that time.

3.2 Perchlorate Results

Perchlorate was detected in five of the 12 soil samples collected at two areas in the northeastern portion of LHAAP-29. The detections at LHAAP-29 varied from 40.3 µg/kg to 8,600 µg/kg. However, due to interferences, the detection limits of the non-detect results varied from 114 to 267 µg/kg. The highest results were not found at the two borings drilled through the slab at the former rocket motor washout facility, but at boring 29SB86. That boring location was chosen because of elevated perchlorate results in earlier investigations. As shown in **Figure A-2**, the results at 29SB86 varied from 40.3 µg/kg at the surface to 8,600 µg/kg at 6-8 feet bgs to 689 µg/kg at 20-21 feet bgs (just above the water table). The 8,600 µg/kg value exceeds perchlorate results in soil from earlier investigations at LHAAP-29.

4.0 References

ASTM International, 2004, ASTM D2488-00, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)" available online at <www.astm.org> (January 2005).

IT Corporation/OHM Remediation Services Corp., 2000, *Standard Operating Procedures Manual, USACE – Tulsa District, Total Environmental Restoration Contract, Contract No. DACA56-94-D-0020,* Houston, Texas.

Shaw 2004a, *Draft Addendum 3, Additional Investigation, LHAAP-29 and LHAAP-49, Final Work Plan Groundwater Data Gaps Investigation Groups 2 and 4*. Houston, Texas, September.

Shaw Environmental, Inc., 2004b, *Final Work Plan, Groundwater Data Gaps Investigation, Groups 2 and 4*, Houston, Texas, February.

Table A-1
December 2004/February 2005 Sampling and Analyses

Media	Sample Locations	Primary Samples	Field Duplicates	Analytical Suite	Results Table
Soil					
Soil Near Wash House Sumps	29SB81-29SB85	10	2	Explosives	A-2
Soil in Perchlorate Areas	29SB86-29SB89	12	0	Perchlorate	A-2
Sediment					
Pond Sediment	29SD44, 29SD45	2	0	Explosives	A-3
Outfall Ditch Sediment	29SD46	1	0	Explosives	A-3
Manhole Sediment	29SD33, 29SD36-29SD41, 29SD43 (Manholes 2, 5-10, and 12)	8	1	Explosives	A-3
Water					
Pond Surface Water	29SW44, 29SW45	2	0	Explosives	A-4
Outfall Ditch Surface Water	29SW46	1	0	Explosives	A-4
Manhole Water	29SW32-29SW34, 29SW36-29SW43 (Manholes 1-3 and 5-12)	12	2	Explosives	A-4

Table A-2
Soil Results

	Associated Site:	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
	Sample Date:	12/16/2004	12/16/2004	12/15/2004	12/15/2004	12/15/2004	12/15/2004	12/15/2004
	Sample Location:	29SB81	29SB81	29SB82	29SB82	29SB83	29SB83	29SB84
	Sample ID:	29SB81-001	29SB81-002	29SB82-001	29SB82-002	29SB83-001	29SB83-002	29SB84-001
	Start Depth (ft bgs):	4	8	4	8	4	8	4
	End Depth (ft bgs):	5	9	5	9	5	9	5
	Sample Type:	REG	REG	REG	REG	REG	REG	REG
PARAMETER	UNITS							
Anions								
Perchlorate	µg/kg	NA	NA	NA	NA	NA	NA	NA
Explosives								
1,3,5-Trinitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
1,3-Dinitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
2,4,6-Trinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	.43	<.4	<.4
2,4-Dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
2,6-Dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
2-Amino-4,6-dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
4-Amino-2,6-dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
HMX	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
m-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
Nitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
o-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
p-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
RDX	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4
Tetryl	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4	<.4

Notes can be found on last page of this table

Table A-2
Soil Results

	Associated Site:	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
	Sample Date:	12/15/2004	12/15/2004	12/15/2004	12/15/2004	12/15/2004	12/14/2004	12/14/2004
	Sample Location:	29SB84	29SB85	29SB85	29SB85	29SB85	29SB86	29SB86
	Sample ID:	29SB84-002	29SB85-001	29SB85-001-QC	29SB85-002	29SB85-002-QC	29SB86-001	29SB86-002
	Start Depth (ft bgs):	8	4	4	8	8	0	6
	End Depth (ft bgs):	9	5	5	9	9	0.5	8
	Sample Type:	REG	REG	FD	REG	FD	REG	REG
PARAMETER	UNITS							
Anions								
Perchlorate	µg/kg	NA	NA	NA	NA	NA	40.3	8600
Explosives								
1,3,5-Trinitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
1,3-Dinitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
2,4,6-Trinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
2,4-Dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
2,6-Dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	<.4	.23 J	<.4	.9	.83	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	<.4	<.4	<.4	.3 J	.24 J	NA	NA
HMX	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
m-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
Nitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
o-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
p-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
RDX	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA
Tetryl	mg/kg	<.4	<.4	<.4	<.4	<.4	NA	NA

Notes can be found on last page of this table

Table A-2
Soil Results

	Associated Site:	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
	Sample Date:	12/14/2004	12/14/2004	12/14/2004	12/14/2004	12/14/2004	12/14/2004	12/14/2004
	Sample Location:	29SB86	29SB87	29SB87	29SB87	29SB88	29SB88	29SB88
	Sample ID:	29SB86-003	29SB87-001	29SB87-002	29SB87-003	29SB88-001	29SB88-002	29SB88-003
	Start Depth (ft bgs):	20	0	6	19	0	4	15
	End Depth (ft bgs):	21	0.5	8	20	1	5	16
	Sample Type:	REG	REG	REG	REG	REG	REG	REG
PARAMETER	UNITS							
Anions								
Perchlorate	µg/kg	689	<234	<114	<243	74.5	<267	<129
Explosives								
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	NA
HMX	mg/kg	NA	NA	NA	NA	NA	NA	NA
m-Nitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	mg/kg	NA	NA	NA	NA	NA	NA	NA
o-Nitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	NA
p-Nitrotoluene	mg/kg	NA	NA	NA	NA	NA	NA	NA
RDX	mg/kg	NA	NA	NA	NA	NA	NA	NA
Tetryl	mg/kg	NA	NA	NA	NA	NA	NA	NA

Notes can be found on last page of this table

Table A-2
Soil Results

	Associated Site:	AREA 29	AREA 29	AREA 29
	Sample Date:	12/15/2004	12/15/2004	12/15/2004
	Sample Location:	29SB89	29SB89	29SB89
	Sample ID:	29SB89-001	29SB89-002	29SB89-003
	Start Depth (ft bgs):	0	4	12
	End Depth (ft bgs):	0.5	5	13
	Sample Type:	REG	REG	REG
PARAMETER	UNITS			
Anions				
Perchlorate	µg/kg	<120	<128	144
Explosives				
1,3,5-Trinitrobenzene	mg/kg	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	NA	NA	NA
HMX	mg/kg	NA	NA	NA
m-Nitrotoluene	mg/kg	NA	NA	NA
Nitrobenzene	mg/kg	NA	NA	NA
o-Nitrotoluene	mg/kg	NA	NA	NA
p-Nitrotoluene	mg/kg	NA	NA	NA
RDX	mg/kg	NA	NA	NA
Tetryl	mg/kg	NA	NA	NA

Notes:

FD field duplicate
ft bgs feet below ground surface
J estimated concentration
mg/kg milligrams per kilogram
NA not analyzed
REG regular
µg/kg micrograms per kilogram

Table A-3
Sediment Results

	Associated Site:	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
	Sample Date:	12/17/2004	12/17/2004	12/17/2004	12/16/2004	12/16/2004	12/17/2004
	Sample Location:	29SD33-MH02	29SD36-MH05	29SD37-MH06	29SD38-MH07	29SD39-MH08	29SD40-MH09
	Sample ID:	29SD33-MH02	29SD36-MH05	29SD37-MH06	29SD38-MH07	29SD39-MH08	29SD40-MH09
	Sample Type:	REG	REG	REG	REG	REG	REG
PARAMETER	UNITS						
Explosives							
1,3,5-Trinitrobenzene	mg/kg	.44	<.4	<.4	<.4	<.4	<.4
1,3-Dinitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4
2,4,6-Trinitrotoluene	mg/kg	11	<.4	.29 J	.63	5.5	1.2
2,4-Dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	.71	<.4
2,6-Dinitrotoluene	mg/kg	<.4	<.4	<.4	<.4	.3 J	<.4
2-Amino-4,6-dinitrotoluene	mg/kg	3.8 J	.4 UJ	.29 J	<.4	1.2	2.4 J
4-Amino-2,6-dinitrotoluene	mg/kg	2.6 J	.4 UJ	.26 J	<.4	.88	2.5 J
HMX	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4
m-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4
Nitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4
o-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4
p-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4
RDX	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4
Tetryl	mg/kg	<.4	<.4	<.4	<.4	<.4	<.4

Notes can be found on the last page of table

Table A-3
Sediment Results

	Associated Site:	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
	Sample Date:	12/17/2004	12/16/2004	12/17/2004	12/19/2004	12/19/2004	12/16/2004
	Sample Location:	29SD40-MH09-QC	29SD41-MH10	29SD43-MH12	29SD44	29SD45	29SD46
	Sample ID:	29SD40-MH09-QC	29SD41-MH10	29SD43-MH12	29SD44	29SD45	29SD46
	Sample Type:	FD	REG	REG	REG	REG	REG
PARAMETER	UNITS						
Explosives							
1,3,5-Trinitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	<4
1,3-Dinitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	<4
2,4,6-Trinitrotoluene	mg/kg	1.1	7	.41	<.4	.41	26,000
2,4-Dinitrotoluene	mg/kg	<.4	1.1	<.4	<.4	<.4	8,000
2,6-Dinitrotoluene	mg/kg	<.4	.24 J	<.4	<.4	<.4	15
2-Amino-4,6-dinitrotoluene	mg/kg	.47 J	9	.4 UJ	<.4	<.4	48
4-Amino-2,6-dinitrotoluene	mg/kg	.46 J	7.8	.4 UJ	<.4	<.4	<4
HMX	mg/kg	<.4	<.4	<.4	<.4	<.4	<4
m-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<4
Nitrobenzene	mg/kg	<.4	<.4	<.4	<.4	<.4	<4
o-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<4
p-Nitrotoluene	mg/kg	<.4	<.4	<.4	<.4	<.4	<4
RDX	mg/kg	<.4	<.4	<.4	<.4	<.4	<4
Tetryl	mg/kg	<.4	<.4	<.4	<.4	<.4	<4

Notes:

FD field duplicate
J estimated concentration or detection limit
mg/kg milligrams per kilogram
REG regular
U result below detection limit

Table A-4
Water Results

	Associated Site:	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
	Sample Location:	29WL32-MH01	29WL33-MH02	29WL34-MH03	29WL36-MH05	29WL37-MH06	29WL38-MH07
	Sample Date:	12/15/2004	12/15/2004	2/24/2005	2/24/2005	2/24/2005	2/23/2005
	Sample ID:	29WL32-MH01	29WL33-MH02	29WL34-MH03-02	29WL36-MH05-02	29WL37-MH06-02	29WL38-MH07-02
	Sample Type:	REG	REG	REG	REG	REG	REG
PARAMETER	UNITS						
Explosives							
1,3,5-Trinitrobenzene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.34 JL	<1.04
1,3-Dinitrobenzene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04
2,4,6-Trinitrotoluene	µg/L	250	.93 J	23.0 JL	84.3 JL	430 JL	0.955 J
2,4-Dinitrotoluene	µg/L	15	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04
2,6-Dinitrotoluene	µg/L	4.1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04
2-Amino-4,6-dinitrotoluene	µg/L	16	3.4	1.19 JL	1.82 JL	6.27 JL	0.428 J
4-Amino-2,6-dinitrotoluene	µg/L	33	6.1	2.13 JL	2.74 JL	8.15 JL	0.364 J
HMX	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04
m-Nitrotoluene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04
Nitrobenzene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04
o-Nitrotoluene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04
p-Nitrotoluene	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04
RDX	µg/L	<1	<1	1.05 UJL	1.04 UJL	0.494 JL	<1.04
Tetryl	µg/L	<1	<1	1.05 UJL	1.04 UJL	1.04 UJL	<1.04

Notes can be found on last page of this table

Table A-4
Water Results

	Associated Site:	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
	Sample Location:	29WL39-MH08	29WL40-MH09	29WL40-MH09	29WL40-MH09	29WL40-MH09	29WL41-MH10
	Sample Date:	2/23/2005	12/17/2004	12/17/2004	2/23/2005	2/23/2005	2/23/2005
	Sample ID:	29WL39-MH08-02	29WL40-MH09	29WL40-MH09-QC	29WL40-MH09-02	29WL40-MH09-52	29WL41-MH10-02
	Sample Type:	REG	REG	FD	REG	FD	REG
PARAMETER	UNITS						
Explosives							
1,3,5-Trinitrobenzene	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03
1,3-Dinitrobenzene	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03
2,4,6-Trinitrotoluene	µg/L	6.36	5200	5900	20.0	24.0	15.0
2,4-Dinitrotoluene	µg/L	<1.03	.8 J	.83 J	1.13	1.09	1.05
2,6-Dinitrotoluene	µg/L	<1.03	27	27	1.27	1.24	1.35
2-Amino-4,6-dinitrotoluene	µg/L	1.29	220	210	1.68	1.63	2.01
4-Amino-2,6-dinitrotoluene	µg/L	1.70	290	280	2.42	2.36	2.58
HMX	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03
m-Nitrotoluene	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03
Nitrobenzene	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03
o-Nitrotoluene	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03
p-Nitrotoluene	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03
RDX	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03
Tetryl	µg/L	<1.03	<1	<1	<1.06	<1.03	<1.03

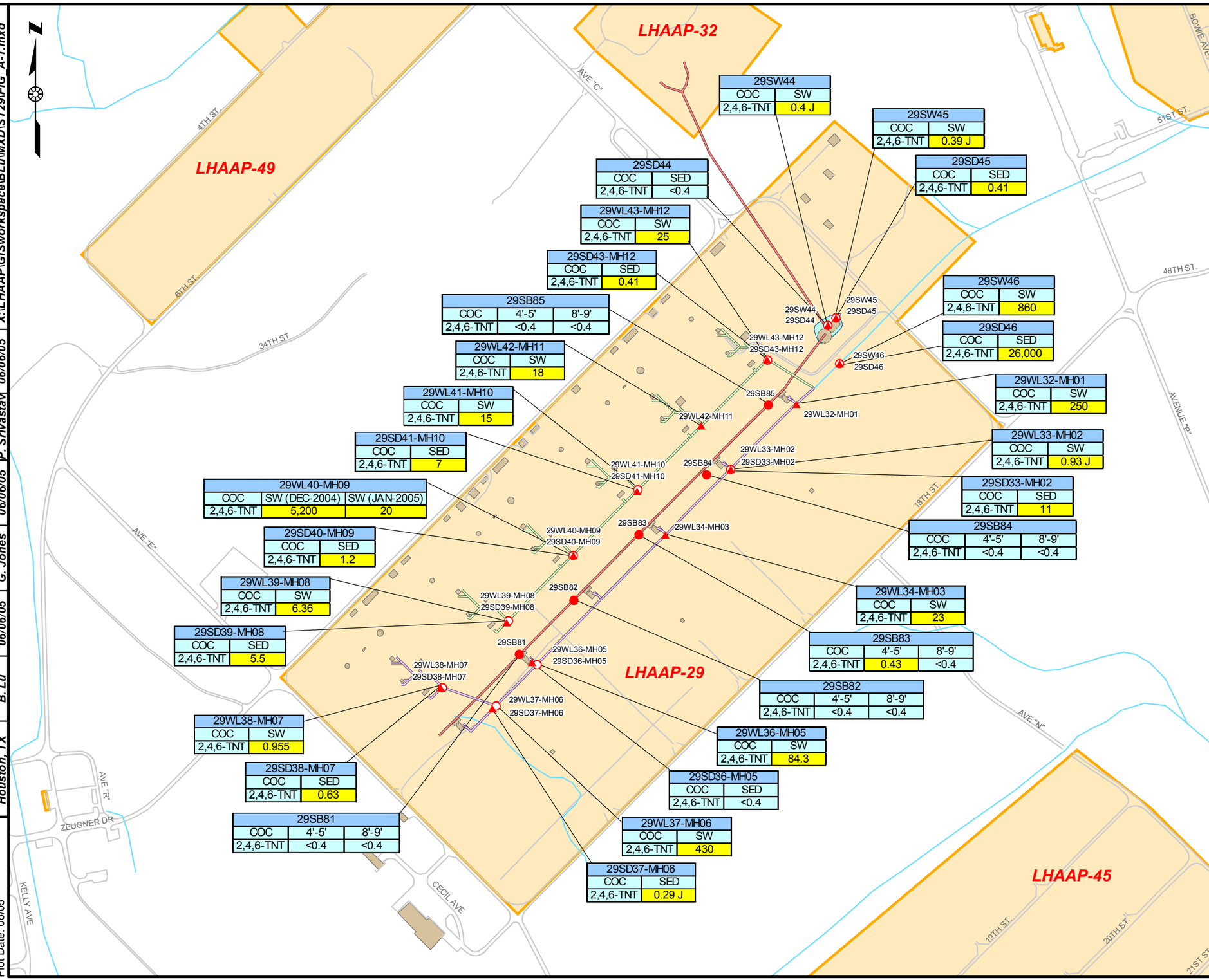
Notes can be found on last page of this table

Table A-4
Water Results

	Associated Site:	AREA 29	AREA 29	AREA 29	AREA 29	AREA 29
	Sample Location:	29WL42-MH11	29WL43-MH12	29SW44	29SW45	29SW46
	Sample Date:	2/23/2005	2/23/2005	12/19/2004	12/19/2004	12/16/2004
	Sample ID:	29WL42-MH11-02	29WL43-MH12-02	29SW44	29SW45	29SW46
	Sample Type:	REG	REG	REG	REG	REG
PARAMETER	UNITS					
Explosives						
1,3,5-Trinitrobenzene	µg/L	<1.03	<1.10	<1	<1	.73 J
1,3-Dinitrobenzene	µg/L	<1.03	<1.10	<1	<1	<1
2,4,6-Trinitrotoluene	µg/L	18.0	25.0	.4 J	.39 J	860
2,4-Dinitrotoluene	µg/L	0.922 J	0.934 J	<1	<1	19
2,6-Dinitrotoluene	µg/L	1.15	1.31	<1	<1	7.6
2-Amino-4,6-dinitrotoluene	µg/L	1.29	1.75	.56 J	.53 J	20
4-Amino-2,6-dinitrotoluene	µg/L	1.96	2.67	2	1.9	48
HMX	µg/L	<1.03	<1.10	<1	<1	<1
m-Nitrotoluene	µg/L	<1.03	<1.10	<1	<1	<1
Nitrobenzene	µg/L	<1.03	<1.10	<1	<1	<1
o-Nitrotoluene	µg/L	<1.03	<1.10	<1	<1	<1
p-Nitrotoluene	µg/L	<1.03	<1.10	<1	<1	<1
RDX	µg/L	<1.03	<1.10	<1	<1	<1
Tetryl	µg/L	<1.03	<1.10	<1	<1	<1

Notes:

FD field duplicate
J estimated concentration or detection limit
L result may be biased low
REG regular
U result below detection limit
µg/L micrograms per liter



29SW44	
COC	SW
2,4,6-TNT	0.4 J

29SW45	
COC	SW
2,4,6-TNT	0.39 J

29SD45	
COC	SED
2,4,6-TNT	0.41

29SD44	
COC	SED
2,4,6-TNT	<0.4

29WL43-MH12	
COC	SW
2,4,6-TNT	25

29SD43-MH12	
COC	SED
2,4,6-TNT	0.41

29SB85		
COC	4'-5'	8'-9'
2,4,6-TNT	<0.4	<0.4

29SW46	
COC	SW
2,4,6-TNT	860

29SD46	
COC	SED
2,4,6-TNT	26,000

29WL42-MH11	
COC	SW
2,4,6-TNT	18

29WL32-MH01	
COC	SW
2,4,6-TNT	250

29WL41-MH10	
COC	SW
2,4,6-TNT	15

29SD41-MH10	
COC	SED
2,4,6-TNT	7

29WL33-MH02	
COC	SW
2,4,6-TNT	0.93 J

29WL40-MH09		
COC	SW (DEC-2004)	SW (JAN-2005)
2,4,6-TNT	5,200	20

29SD33-MH02	
COC	SED
2,4,6-TNT	11

29SD40-MH09	
COC	SED
2,4,6-TNT	1.2

29SB84		
COC	4'-5'	8'-9'
2,4,6-TNT	<0.4	<0.4

29WL39-MH08	
COC	SW
2,4,6-TNT	6.36

29WL34-MH03	
COC	SW
2,4,6-TNT	23

29SD39-MH08	
COC	SED
2,4,6-TNT	5.5

29SB83		
COC	4'-5'	8'-9'
2,4,6-TNT	0.43	<0.4

29SB82		
COC	4'-5'	8'-9'
2,4,6-TNT	<0.4	<0.4

29WL38-MH07	
COC	SW
2,4,6-TNT	0.955

29WL36-MH05	
COC	SW
2,4,6-TNT	84.3

29SD38-MH07	
COC	SED
2,4,6-TNT	0.63

29SD36-MH05	
COC	SED
2,4,6-TNT	<0.4

29SB81		
COC	4'-5'	8'-9'
2,4,6-TNT	<0.4	<0.4

29WL37-MH06	
COC	SW
2,4,6-TNT	430

29SD37-MH06	
COC	SED
2,4,6-TNT	0.29 J

Legend

Sample Location

- Soil Boring
- Sediment
- Surface Water
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building Location
- Former Pump House and Storage Tank
- Storage Pond
- Site

Notes:
1. COC - Contaminant of concern
2. SW - Surface water
3. SED - Sediment
4. TNT - Trinitrotoluene
5. Depths are reported in feet below ground surface.
6. Soil and sediment sample concentrations are reported in milligrams per kilogram.
7. Water sample concentrations are reported in micrograms per liter.
8. Yellow highlight indicates detected result.

0 250 500 1,000 Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

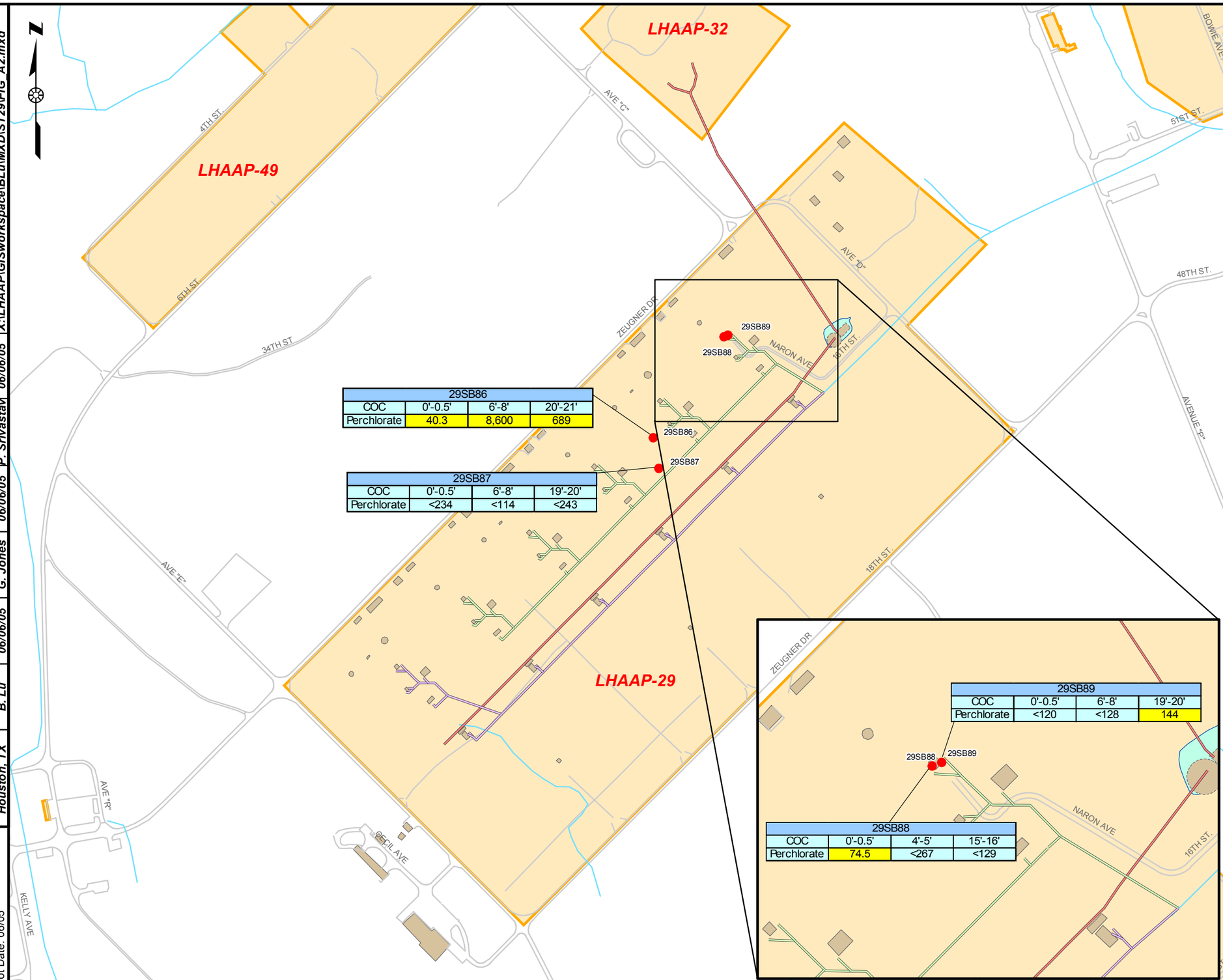
FIGURE A-1

SAMPLE LOCATIONS FOR EXPLOSIVES AND RESULTS FOR TNT, DECEMBER 2004 AND FEBRUARY 2005
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 06/06/05	G. Jones 06/06/05	P. Srivastav 06/06/05	X:\LHAAP\GIS\workspace\BLu\MXD\ST29\FIG_A-1.mxd

Plot Date: 06/05



Legend

Sample Location

- Soil Boring
- TNT Cooling Water Drain Line (South)
- TNT Cooling Water Drain Line (North)
- TNT Wastewater Line
- Stream
- Road
- Former Building Location
- Former Pump House and Storage Tank
- Storage Pond
- Site

Notes:
1. COC - Contaminant of concern
2. Depths are reported in feet below ground surface.
3. Concentrations are reported in micrograms per kilogram.
4. Yellow highlight indicates detected result.

0 250 500 1,000 Feet

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

FIGURE A-2

SAMPLE LOCATIONS AND RESULTS FOR PERCHLORATE, DECEMBER 2004
LHAAP-29

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	06/06/05	G. Jones	06/06/05	P. Srivastav	06/06/05	X:\LHAAP\GIS\workspace\BLu\MXD\ST29\FIG_A2.mxd

Plot Date: 06/05

Attachment 1
Data Evaluation Reports

DATA EVALUATION REPORT
OF EMAX REPORT NUMBER 04L128
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

SHAW PROJECT NUMBER 845714

Prepared by

Shaw Environmental, Inc.
1430 Enclave Parkway
Houston, Texas 77077

January 6, 2005

DATA EVALUATION REPORT
EMAX REPORT NUMBER 04L128
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

January 6, 2005

Approved by: Diane Meyer
Diane Meyer, Program Chemist

Date: 1/6/05

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Attachments

Attachment A - Validation Qualifiers and Validation Reason Code Definitions

Acronyms and Abbreviations

%D	percent deviation
%RSD	percent relative standard deviation
COC	chain of custody
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LHAPP	Longhorn Army Ammunition Plant
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NFG	National Functional Guidelines
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RL	reporting limit
TERC	Total Environmental Restoration Contract
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 soil boring and water sampling at Site 29 at Longhorn Army Ammunition Plant (LHAPP), Karnack, Texas. This was part of a Data Gaps Investigation, Addendum 3. **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 Total Environmental Restoration Contract (TERC), Number DACA56-94-D-0020, and Task Order 109. This Data Evaluation Report is a summary of the analytical data generated by EMAX Laboratory, Torrance, California.

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 and reason codes were added to the applicable results in the data package. A list of validation qualifiers and validation reason code definitions is included in **Attachment A.**

Table 1-1
Chain-of-Custody Summary

Sample I.D.	Lab Sample Number	Matrix	Chain of Custody Number	Date Collected	Methods SW-846
29SB85-001	L128-01	Soil	29-EMAX-DEC04-002	12/15/04	Explosives - 8330
29SB85-002	L128-02	Soil	29-EMAX-DEC04-002	12/15/04	Explosives – 8330
29SB85-001-QC	L128-03	Soil	29-EMAX-DEC04-002	12/15/04	Explosives – 8330
29SB85-002-QC	L128-04	Soil	29-EMAX-DEC04-002	12/15/04	Explosives – 8330
29SB82-001	L128-05	Soil	29-EMAX-DEC04-001	12/15/04	Explosives – 8330
29SB82-002	L128-06	Soil	29-EMAX-DEC04-001	12/15/04	Explosives – 8330
29SB83-001	L128-07	Soil	29-EMAX-DEC04-001	12/15/04	Explosives – 8330
29SB83-002	L128-08	Soil	29-EMAX-DEC04-001	12/15/04	Explosives – 8330
29SB84-001	L128-09	Soil	29-EMAX-DEC04-001	12/15/04	Explosives – 8330
29SB84-002	L128-10	Soil	29-EMAX-DEC04-001	12/15/04	Explosives – 8330
29WL32-MH01	L128-11	Water	29-EMAX-DEC04-008	12/15/04	Explosives – 8330
29WL33-MH02	L128-12	Water	29-EMAX-DEC04-008	12/15/04	Explosives - 8330

00041899

2.0 Explosives

The soil and water samples were collected and analyzed for explosives by SW-846 method 8330.

2.1 Initial and Continuing Calibration

The initial and continuing calibrations were within established limits.

2.2 Accuracy

The laboratory control sample (LCS), laboratory control sample duplicate (LCSD), matrix spike (MS), matrix spike duplicate (MSD), and surrogates were within quality control limits.

2.3 Precision

The water batch LCS/LCSD relative percent difference (RPD) was within quality control limits. The MS/MSD RPD for the soil samples was within quality control limits.

2.4 Representativeness

The method blanks were free of contamination. Two soil quality control (QC) replicate samples were analyzed with this batch. The replicates agreed within a RPD of 50% when concentrations exceeded the reporting limit (RL). Comparison of data below the RL is not applicable and data were not qualified.

3.0 Technical Summary

The following summarizes the data review for the sampling at LHAPP.

3.1 Documentation

The COC were complete and contained the required information. Any omissions were corrected and an amended COC was submitted to the laboratory. The actual methods used for sample analysis were based upon the COC.

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 90% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). None of the data were rejected. Multiple analyses were required for 29WL32-MH01 to bring all analytes within the linear calibration range.

- Data reported between the MDL and reporting limit (RL) were "J" flagged with reason code 15 (quantitation 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).

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.

ATTACHMENT A

VALIDATION QUALIFIERS AND VALIDATION REASON CODE DEFINITIONS

VALIDATION QUALIFIER DEFINITIONS

Qualifier	Definition
U	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit,
J	The analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.
B	The concentration reported was detected in the associated method blank, trip blank, or equipment blank within 5X/10X the blank concentration.
R	The reported results are rejected due to 1. Severe deficiencies in the supporting quality control data; 2. Anomalies noted in the sampling or analysis process. 3. the presence or absence of the constituent cannot be verified based on the data provided. $. To indicate not to use a particular result in the event of a reanalysis.
UJ	The analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data have indicated that the "non-detect" may be inaccurate or imprecise. The non-detect result should be estimated.
L	Result may be biased low. Details are provided in the validation report.
H	Result may be biased high. Details are provided in the validation report.

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)

VALIDATION REASON CODE DEFINITIONS (continued)

Reason Code	Description
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

SHAW ENVIRONMENTAL, INC.
TECHNICAL SERVICE GROUP
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.: 845714
Laboratory: EMAX
Report No.: 04L128

COMMENTS:

Data Reviewed by: Diane Meyer Date: 1/6/05
Diane Meyer
Project Chemist

DATA COMPLETENESS

	REQUIREMENTS	Y	N	NA
Cooler Receipt Form	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° F?	✓		
	Was the pH of the sample acceptable?			✓
Chain of Custody	Original chain of custody/analytical request form present and complete?	✓		
	Signature, dates, and times complete?	✓		
	Comparison of the reported parameters to the request on the chain of custody?	✓		
	Each sample number transcribed by the laboratory?	✓		
	Cross reference of field sample number, laboratory number and analytical batch?	✓		
	Correct sample collection date given for each sample?	✓		
Laboratory Reports	Date of preparation / extraction for each sample?	✓		
	Date analyzed for each sample?	✓		
	Dilution factors for samples?	✓		
	Detection / Quantitation limits reported as specified?	✓		
	Sample analytical results?	✓		
	Results reported for method blanks?	✓		
	Results reported for trip blanks (VOCs only)?			✓
	Results reported for laboratory duplicates (inorganic and radiological only)?			✓
QC Reports	Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported?	✓		
	Laboratory Control Samples (LCS) / LCS Duplicates (LCSD) % recoveries and RPDs reported?	✓		
	Surrogate values provided (organic samples only)?	✓		
	Raw data provided for analysis, if applicable?			✓

If "NO," then List all samples on attached sheets

TIER 1 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID X

EPA METHOD: 8330 SOLID/SOIL X TCLP

BY: GC OR HPLC

REQUIREMENTS Hold times were met		Y	N	NA
Method Blank	Every Batch or 20 Samples	✓		
	All Compounds <MDL	✓		
Matrix Spike % Recovery Values - Soil only	Within those set by Lab	✓		
Matrix Spike Dup % Recovery Values	Within those set by Lab	✓		
MS/MSD RPD	<Lab QC Limits	✓		
% LCS Recovery Value	Within those set by Lab	✓		
% LCSD Recovery Values - water only	Within those set by Lab	✓		
LCS/LCSD RPD	<Lab QC Limits	✓		
% Surrogate Recovery Limits	Within those set by Lab OK - all others ND	✓		
(1) 295B85-001+QC: 2-AM-4,6-DNT 230J vs ND	Ratio < 2.0 for water			✓
Field Duplicate Evaluation (2) 295685-002+QC: 4-AM-4,6-DNT - 300J vs 240J OK 2-AM-4,6-DNT - 900 vs 830 RPD = 8.1%	Ratio < 5.0 for soil RPD ≤ 50%	✓		

If "NO," List all samples below:

Blank Information

Run Date	Run Time	Date Extracted	Blank ID	Compound	Conc. Units	Associated Samples

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

Sample Type	Sample ID	Analyte	MS Recovery	MSD Recovery	Result - 1	Result - 2	RPD %

Any runs with one (1) or more recoveries outside limits for each fraction?

Run Date	Surrogate Compound	Analyte	Original % Recovery	Re-Run Recovery	Comments

Laboratory Control Sample

Sample Type	Sample ID	Compound	LCS %	LCSD %	Comments

5x were air dried

No quals added to explosives data other than J flags for values between MDL and RL

TIER 2 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives
EPA METHOD: 8330
BY: GC OR HPLC

MATRIX: LIQUID X
SOLID/SOIL X TCLP____

REQUIREMENT		Y	N	NA
Initial Calibration	% RSD <OR = 30%	✓		
Continuing Calibration	% DIFF <OR = 15%	✓		
All sample/blank internal standard (IS) retention times	Within those set by lab	✓		
All sample/blank IS retention times	Within 30 sec. of Standard IS	✓		

If "NO," list all samples below

Initial Calibration

Calibration		Instrument ID	Matrix	Correlation Coefficient	% RSD	Compound	Associated Samples
Date	Time						

Continuing Calibration

Calibration		Instrument ID	Matrix	% Diff.	Compound	Associated Samples
Date	Time					

Internal Standard Performance

Sample Number	Compound	Internal Standard Area/RT	Limits

Shaw *Environmental & Infrastructure, Inc.*
1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-002

04L128

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact: Joe Kelbley

Project Name: Longhorn AAP | Project Location: Area 29 Former TNT Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | USACE Telephone No.:

Project Manager/Supervisor: Praveen Srivastav

Item No.	Sample Number	Date	Time	Comp	Grab	Matrix	Sample Description, Location	Number of Containers	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
1	29SB85-001	12/15/04	10:15			SOIL	29SB85	1	X							
2	29SB85-002		10:22			SOIL	29SB85	1	X							
3	29SB 85 -001-QC		10:15			SOIL	29SB85	1	X							
4	29SB 85 -002-QC		10:22			SOIL	29SB85	1	X							
~~5~~																
~~6~~																
~~7~~																
~~8~~																
~~9~~																
~~10~~																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
M. Allen			
		Laboratory	12-16-04 0930

Special Instructions: 1

FedEx Airbill No.:

Sampler's Signature

TAT: ____ Standard ____ Rush Due: ____ Seals Intact? ____ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold 3.0°C

White - Lab Copy Canary - Field Copy Pink - File Copy

00041910

1001

Received Fax : Dec 14 2004 12:34AM Fax Station : HP LASERJET 3330 p. 7
12/13/2004 14:39 FAX 8656934944 SHAW EI INC 007/010

Shaw Environmental & Infrastructure, Inc.
1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-001

04L128

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact: Joe Kelbley

Project Name: Longhorn AAP | Project Location: Area 29 Former TNT Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | USACE Telephone No.: | Project Manager/Supervisor: Praveen Srivastav

Item No.	Sample Number	Date	Time	Comp	Grab	Matrix	Sample Description, Location	Number of Containers	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
~~1~~	~~29SB80-001~~					~~SOIL~~	~~29SB80~~	~~1~~	~~X~~							
~~2~~	~~29SB80-002~~					~~SOIL~~	~~29SB80~~	~~1~~	~~X~~							
~~3~~	~~29SB81-001~~					~~SOIL~~	~~29SB81~~	~~1~~	~~X~~							
~~4~~	~~29SB81-002~~					~~SOIL~~	~~29SB81~~	~~1~~	~~X~~							
5	29SB82-001	12/15/04	14:30	~~X~~	X	SOIL	29SB82	1	X							
6	29SB82-002		14:48	~~X~~	X	SOIL	29SB82	1	X							
7	29SB83-001		1400	~~X~~	X	SOIL	29SB83	1	X							
8	29SB83-002		1405	~~X~~	X	SOIL	29SB83	1	X							
9	29SB84-001		1125	~~X~~	X	SOIL	29SB84	1	X							
10	29SB84-002		1130	~~X~~	X	SOIL	29SB84	1	X							

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
[signature]	12/15/04 1600		
		Laboratory [signature]	12-16-04 0930

Special Instructions

FedEx Airbill No.:

Sampler's Signature

TAT: ____ Standard ____ Rush Due: _____ Seals Intact? ____ Y ____ N Received Good Condition ____ Y ____ N ____ Cold

White - Lab Copy Canary - Field Copy Pink - File Copy

1002
00041911

Shaw *Environmental & Infrastructure, Inc.*

1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-008

04L128

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact:

Project Name: Longhorn AAP | Project Location: Area 29 Former TNT Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | USACE Telephone No.:

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	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
1	29WL32-MH01	12/15/04	1330		X	SW	29WL32-MH01	2	X							
2	29WL33-MH02	12/15/04	1445		X	SW	29WL33-MH02	2	X							
~~3~~	~~29WL34-MH03~~					~~SW~~	~~29WL34-MH03~~	~~2~~	~~X~~							
~~4~~	~~29WL35-MH04~~					~~SW~~	~~29WL35-MH04~~	2	X							
~~5~~	~~29WL36-MH05~~					~~SW~~	~~29WL36-MH05~~	2	X							
~~6~~	~~29WL37-MH06~~					~~SW~~	~~29WL37-MH06~~	2	X							
~~7~~	~~29WL38-MH07~~					~~SW~~	~~29WL38-MH07~~	2	X							
8	~~29WL39-MH08~~					~~SW~~	~~29WL39-MH08~~	2	X							
9																
10																

MSW

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time	Special Instructions
[signature]	12/15/04 1600			
				FedEx Airbill No.:
		Laboratory [signature]	12-16-04 0930	Sampler's Signature

TAT: ____ Standard ____ Rush Due: _____ Seals Intact? ____ Y ____ N Received Good Condition ____ Y ____ N ____ Cold

White - Lab Copy Canary - Field Copy Pink - File Copy

1003

00041912

DATA EVALUATION REPORT
OF EMAX REPORT NUMBER 04L129
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

SHAW PROJECT NUMBER 845714

Prepared by

Shaw Environmental, Inc.
1430 Enclave Parkway
Houston, Texas 77077

January 12, 2005

DATA EVALUATION REPORT
EMAX REPORT NUMBER 04L129
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

January 12, 2005

Approved by: Diane Meyer
Diane Meyer, Program Chemist

Date: 1/12/05

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Table 1-1 Chain-of-Custody Summary 1-2

Attachments

Attachment A

Acronyms and Abbreviations

%D	percent deviation
%RSD	percent relative standard deviation
COC	chain of custody
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LHAPP	Longhorn Army Ammunition Plant
MS	matrix spike
MSD	matrix spike duplicate
NFG	National Functional Guidelines
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
TERC	Total Environmental Restoration Contract
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 soil boring sampling, at Site 29 at Longhorn Army Ammunition Plant (LHAPP), Karnack, Texas. This was part of a Data Gaps Investigation, Addendum 3. **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 Total Environmental Restoration Contract (TERC), Number DACA56-94-D-0020, and Task Order 109. This Data Evaluation Report is a summary of the analytical data generated by EMAX Laboratory, Torrance, California.

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 and reason codes were added to the applicable results in the data package. A list of validation qualifiers and validation reason code definitions is included in **Attachment A.**

Table 1-1
Chain-of-Custody Summary

Sample I.D.	Lab Sample Number	Matrix	Chain of Custody Number	Date Collected	Methods EPA
29SB86-001	L129-01	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB86-002	L129-02	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB86-003	L129-03	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB87-001	L129-04	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB87-002	L129-05	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB87-003	L129-06	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB88-001	L129-07	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB88-002	L129-08	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB88-003	L129-09	Soil	29-EMAX-DEC04-003	12/14/04	Perchlorate -314
29SB89-001	L129-10	Soil	29-EMAX-DEC04-004	12/15/04	Perchlorate -314
29SB89-002	L129-11	Soil	29-EMAX-DEC04-004	12/15/04	Perchlorate -314
29SB89-003	L129-12	Soil	29-EMAX-DEC04-004	12/15/04	Perchlorate -314

00041918

2.0 Perchlorate

The soil samples were collected and analyzed for perchlorate by EPA method 314.

2.1 Accuracy

The laboratory control sample (LCS), laboratory control sample duplicate (LCSD), and matrix spike (MS) were within quality control limits.

2.2 Precision

The LCS/LCSD relative percent difference (RPD) and sample duplicate RPD were within quality control limits.

2.3 Representativeness

The method blank was free of contamination. No QC replicate sample was analyzed with this batch.

3.0 Technical Summary

The following summarizes the data review for the sampling at LHAPP.

3.1 Documentation

The COC were complete and contained the required information. Any omissions were corrected and an amended COC was submitted to the laboratory. The actual methods used for sample analysis were based upon the COC.

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 90% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). All of the data are acceptable as reported. None of the data were rejected nor qualified.

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).

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.

United States Environmental Protection Agency (USEPA), 1983, *Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020,* Environmental Monitoring and Support Laboratory, Office of Research and Development, Cincinnati, Ohio.

ATTACHMENT A

VALIDATION QUALIFIERS AND VALIDATION REASON CODE DEFINITIONS

VALIDATION QUALIFIER DEFINITIONS

Qualifier	Definition
U	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit,
J	The analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.
B	The concentration reported was detected in the associated method blank, trip blank, or equipment blank within 5X/10X the blank concentration.
R	The reported results are rejected due to 1. Severe deficiencies in the supporting quality control data; 2. Anomalies noted in the sampling or analysis process. 3. the presence or absence of the constituent cannot be verified based on the data provided. $. To indicate not to use a particular result in the event of a reanalysis.
UJ	The analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data have indicated that the "non-detect" may be inaccurate or imprecise. The non-detect result should be estimated.
L	Result may be biased low. Details are provided in the validation report.
H	Result may be biased high. Details are provided in the validation report.

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)

VALIDATION REASON CODE DEFINITIONS (continued)

Reason Code	Description
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

SHAW ENVIRONMENTAL, INC.
TECHNICAL SERVICE GROUP
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.: 845714
Laboratory: EMAX
Report No.: 041129

COMMENTS:

Perchlorates

Data Reviewed by: Diane Meyer Date: 1/12/05
Diane Meyer
Project Chemist

DATA COMPLETENESS

	REQUIREMENTS	Y	N	NA
Cooler Receipt Form	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° F?	✓		
	Was the pH of the sample acceptable?	✓		
Chain of Custody	Original chain of custody/analytical request form present and complete?	✓		
	Signature, dates, and times complete?	✓		
	Comparison of the reported parameters to the request on the chain of custody?	✓		
	Each sample number transcribed by the laboratory?	✓		
	Cross reference of field sample number, laboratory number and analytical batch?	✓		
	Correct sample collection date given for each sample?	✓		
Laboratory Reports	Date of preparation / extraction for each sample?	✓		
	Date analyzed for each sample?	✓		
	Dilution factors for samples?	✓		
	Detection / Quantitation limits reported as specified?	✓		
	Sample analytical results?	✓		
	Results reported for method blanks?	✓		
	Results reported for trip blanks (VOCs only)?			✓
	Results reported for laboratory duplicates (inorganic and radiological only)?	✓		
QC Reports	Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported?	✓		
	Laboratory Control Samples (LCS) / LCS Duplicates (LCSD) % recoveries and RPDs reported?	✓		
	Surrogate values provided (organic samples only)?			✓
	Raw data provided for analysis, if applicable?			✓

If "NO," then List all samples on attached sheets

TIER 1 DATA REVIEW – CONVENTIONAL ANALYSIS

ANALYSIS: Perchlorate
METHOD: 314.0
BY: _____

MATRIX: LIQUID_____
SOLID/SOIL X

REQUIREMENTS		Y	N	NA
Method Blank	Every Batch or 20 Samples	✓		
	All Compounds <MDL	✓		
Matrix Spike Recovery Values	75-125%	✓		
~~Matrix Spike~~ Sample Duplicate ~~Recovery Values~~	~~75-125%~~ RPD ≤ 20%	✓		
LCS Recovery Values	80-120%	✓		
LCSD Recovery Values	80-120%	✓		
LCS / LCSD RPD	<20%	✓		
PRECISION (QC Sample Field Sample or Field Sample/QC Sample)	Ratio <2.0 for Water			✓
	Ratio <5.0 for Soil			✓

If "NO," List all samples below:

Blank Type	Run Date	Run Time	Date Prepped	Blank ID	Compound	Concentration (units)	Associated Samples

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

Sample Type	Sample ID	Analyte	MS Recovery	MSD Recovery	Result -1	Result - 2	RPD%

Laboratory Control Sample Analysis

File Name	Analysis Type / Element	Instrument ID	Recovery %

No qualifiers added to data.

Shaw *Environmental & Infrastructure, Inc.*

1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

B6

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-003

04L129

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact: Joe Kelbley

Project Name: Longhorn AAP | Project Location: Area 29 Former TNT Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | USACE Telephone No.:

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	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
1	29SB86-001	12/14/04	9:10		X	SOIL	29SB86	1		X						
2	29SB86-002		9:23		X	SOIL	29SB86	1		X						
3	29SB86-003		12:30		X	SOIL	29SB86	1		X						
4	29SB87-001		13:10		X	SOIL	29SB87	1		X						
5	29SB87-002		13:25		X	SOIL	29SB87	1		X						
6	29SB87-003		13:47		X	SOIL	29SB87	1		X						
7	29SB88-001 + FD (29SB88-0010)		14:35		X	SOIL	29SB88	2		X						
8	29SB88-002 + FD (29SB88-0020)		14:40		X	SOIL	29SB88	2		X						
9	29SB88-003 + FD (29SB88-0030)		15:05		X	SOIL	29SB88	2		X						
~~10~~																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time	Special Instructions
M. Ill	12/15/04 1600		12/16/04 0930	
				FedEx Airbill No.:
		Laboratory		Sampler's Signature

TAT: ____ Standard ____ Rush Due: ____ Seals Intact? ____ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold 3.0°C

White - Lab Copy Canary - Field Copy Pink - File Copy

Shaw *Environmental & Infrastructure, Inc.*

1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-004

041129

Laboratory Name: **EMAX** Address: **1835 205th Street Torrance, CA 90501** Contact: Joe Kelbley

Project Name: **Longhorn AAP** Project Location: **Area 29 Former TNT Production Area**

Project No.: **845714** Project Contact: **Diane Meyer** Project Telephone No.: **281-368-4404**

USACE Point of contact: **Cliff Murray**

USACE Telephone No.:

Project Manager/Supervisor: **Praveen Srivastav**

	Item No.	Sample Number	Date	Time	Comp	Grab	Matrix	Sample Description, Location	Number of Containers	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
10	~~1~~	29SB89-001	12/15/04	0850		X	SOIL	29SB89	1		X						
11	~~2~~	29SB89-002	↓	0910		X	SOIL	29SB89	1		X						
12	~~3~~	29SB89-003	↓	0920		X	SOIL	29SB89	1		X						
	~~4~~	~~29SB 00 -OC~~					~~SOIL~~		1		X						
	5																
	6																
	7																
	8																
	9																
	10																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time	Special Instructions:
M. [illegible]	12/15/04 1600	[illegible]	12/16/04 0930	
				FedEx Airbill No.:
		Laboratory		Sampler's Signature

TAT: ____ Standard ____ Rush Due: _____ Seals Intact? ____ Y ____ N Received Good Condition ____ Y ____ N ____ Cold

White - Lab Copy Canary - Field Copy Pink - File Copy

DATA EVALUATION REPORT
OF EMAX REPORT NUMBER 04L142
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

SHAW PROJECT NUMBER 845714

Prepared by

Shaw Environmental, Inc.
1430 Enclave Parkway
Houston, Texas 77077

January 3, 2005

DATA EVALUATION REPORT
EMAX REPORT NUMBER 04L142
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

January 3, 2005

Approved by: Diane Meyer
Diane Meyer, Program Chemist

Date: 1/3/05

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Table 1-1 Chain-of-Custody Summary 1-2

Attachments

Attachment A - Validation Qualifiers and Validation Reason Code Definitions

Acronyms and Abbreviations

%D	percent deviation
%RSD	percent relative standard deviation
COC	chain of custody
LCS	laboratory control sample
LHAPP	Longhorn Army Ammunition Plant
IDL	instrument detection limit
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NFG	National Functional Guidelines
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
TERC	Total Environmental Restoration Contract
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 soil boring, sediment, and surface water sampling at Site 29 at Longhorn Army Ammunition Plant (LHAPP), Karnack, Texas. This was part of a Data Gaps Investigation, Addendum 3. **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 Total Environmental Restoration Contract (TERC), Number DACA56-94-D-0020, and Task Order 109. This Data Evaluation Report is a summary of the analytical data generated by EMAX Laboratory, Torrance, California.

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 and reason codes were added to the applicable results in the data package. A list of validation qualifiers and validation reason code definitions is included in **Attachment A**.

3.0 Technical Summary

The following summarizes the data review for the sampling at LHAPP.

3.1 Documentation

The COC were complete and contained the required information. Any omissions were corrected and an amended COC was submitted to the laboratory. The actual methods used for sample analysis were based upon the COC.

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 90% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). A completeness goal of 100% was met. None of the data has been rejected nor qualified.

- Data reported between the MDL and reporting limit (RL) were "J" flagged with reason code 15 (quantitation 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).

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.

ATTACHMENT A

VALIDATION QUALIFIERS AND VALIDATION REASON CODE DEFINITIONS

VALIDATION QUALIFIER DEFINITIONS

Qualifier	Definition
U	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit,
J	The analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.
B	The concentration reported was detected in the associated method blank, trip blank, or equipment blank within 5X/10X the blank concentration.
R	The reported results are rejected due to 1. Severe deficiencies in the supporting quality control data; 2. Anomalies noted in the sampling or analysis process. 3. the presence or absence of the constituent cannot be verified based on the data provided. $. To indicate not to use a particular result in the event of a reanalysis.
UJ	The analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data have indicated that the "non-detect" may be inaccurate or imprecise. The non-detect result should be estimated.
L	Result may be biased low. Details are provided in the validation report.
H	Result may be biased high. Details are provided in the validation report.

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)

VALIDATION REASON CODE DEFINITIONS (continued)

Reason Code	Description
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

SHAW ENVIRONMENTAL, INC.
TECHNICAL SERVICE GROUP
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.: 845714
Laboratory: EMAX
Report No.: 04L142

COMMENTS:

Data Reviewed by: Diane Meyer Date: 1/3/05
Diane Meyer
Project Chemist

DATA COMPLETENESS

	REQUIREMENTS	Y	N	NA
Cooler Receipt Form	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° F?	✓		
	Was the pH of the sample acceptable?			✓
Chain of Custody	Original chain of custody/analytical request form present and complete?	✓		
	Signature, dates, and times complete?	✓		
	Comparison of the reported parameters to the request on the chain of custody?	✓		
	Each sample number transcribed by the laboratory?	✓		
	Cross reference of field sample number, laboratory number and analytical batch?	✓		
	Correct sample collection date given for each sample?	✓		
Laboratory Reports	Date of preparation / extraction for each sample?	✓		
	Date analyzed for each sample?	✓		
	Dilution factors for samples?	✓		
	Detection / Quantitation limits reported as specified?	✓		
	Sample analytical results?	✓		
	Results reported for method blanks?	✓		
	Results reported for trip blanks (VOCs only)?			✓
	Results reported for laboratory duplicates (inorganic and radiological only)?			✓
QC Reports	Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported?		✓	
	Laboratory Control Samples (LCS) / LCS Duplicates (LCSD) % recoveries and RPDs reported?	✓		
	Surrogate values provided (organic samples only)?	✓		
	Raw data provided for analysis, if applicable?			✓

If "NO," then List all samples on attached sheets

TIER 1 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID X

EPA METHOD: 8330 SOLID/SOIL _____ TCLP _____

BY: GC OR HPLC

REQUIREMENTS Hold Times were met		Y	N	NA
Method Blank	Every Batch or 20 Samples	✓		
	All Compounds <MDL	✓		
Matrix Spike % Recovery Values	Within those set by Lab			✓
Matrix Spike Dup % Recovery Values	Within those set by Lab			✓
MS/MSD RPD	<Lab QC Limits			✓
% LCS Recovery Value	Within those set by Lab	✓		
% LCSD Recovery Values	Within those set by Lab	✓		
LCS/LCSD RPD	<Lab QC Limits	✓		
% Surrogate Recovery Limits	Within those set by Lab	✓		
Field Duplicate Evaluation	Ratio < 2.0 for water			✓
	Ratio < 5.0 for soil			✓

If "NO," List all samples below:

Blank Information

Run Date	Run Time	Date Extracted	Blank ID	Compound	Conc. Units	Associated Samples

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

Sample Type	Sample ID	Analyte	MS Recovery	MSD Recovery	Result - 1	Result - 2	RPD %

Any runs with one (1) or more recoveries outside limits for each fraction?

Run Date	Surrogate Compound	Analyte	Original % Recovery	Re-Run Recovery	Comments

Laboratory Control Sample

Sample Type	Sample ID	Compound	LCS %	LCSD %	Comments

No data qualified for aqueous sample

TIER 1 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID _____

EPA METHOD: 8330 SOLID/SOIL X TCLP _____

BY: GC OR (HPLC)

REQUIREMENTS Hold Times were met		Y	N	NA
Method Blank	Every Batch or 20 Samples	✓		
	All Compounds <MDL	✓		
Matrix Spike % Recovery Values	Within those set by Lab			✓
Matrix Spike Dup % Recovery Values	Within those set by Lab			✓
MS/MSD RPD	<Lab QC Limits			✓
% LCS Recovery Value	Within those set by Lab	✓		
% LCSD Recovery Values	Within those set by Lab			✓
LCS/LCSD RPD	<Lab QC Limits			✓
% Surrogate Recovery Limits	Within those set by Lab	✓*		
Field Duplicate Evaluation	Ratio < 2.0 for water			✓
	Ratio < 5.0 for soil			✓

If "NO," List all samples below:

Blank Information

Run Date	Run Time	Date Extracted	Blank ID	Compound	Conc. Units	Associated Samples

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

Sample Type	Sample ID	Analyte	MS Recovery	MSD Recovery	Result - 1	Result - 2	RPD %

Any runs with one (1) or more recoveries outside limits for each fraction?

Run Date	Surrogate Compound	Analyte	Original % Recovery	Re-Run Recovery	Comments
* 5X	295046-surrogate	was diluted	out due to	high analyte	
concentration					

Laboratory Control Sample

Sample Type	Sample ID	Compound	LCS %	LCSD %	Comments

no quals added

Shaw Environmental & Infrastructure, Inc.

1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000

B6

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-001

041142

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact: Joe Kelbley

Project Name: Longhorn AAP | Project Location: Area 29 Former TNT Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | USACE Telephone No.:

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	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
1	~~29SB80-001~~					~~SOIL~~	~~29SB80~~	~~1~~	~~X~~							
2	~~29SB80-002~~					~~SOIL~~	~~29SB80~~	~~1~~	~~X~~							
1 ~~3~~	29SB81-001	12/16/04	0900		X	SOIL	29SB81	1	X							
2 ~~4~~	29SB81-002	12/16/04	0905		X	SOIL	29SB81	1	X							
5	~~29SB82-001~~					~~SOIL~~	~~29SB82~~	~~1~~	~~X~~							
6	~~29SB82-002~~					~~SOIL~~	~~29SB82~~	~~1~~	~~X~~							
7	~~29SB83-001~~					~~SOIL~~	~~29SB83~~	~~1~~	~~X~~							
8	~~29SB83-002~~					~~SOIL~~	~~29SB83~~	~~1~~	~~X~~							
9	~~29SB84-001~~					~~SOIL~~	~~29SB84~~	~~1~~	~~X~~							
10	~~29SB84-002~~					~~SOIL~~	~~29SB84~~	~~1~~	~~X~~							

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
[signature]	14:00 12/16/04	[signature]	12/16/04 0930

Special Instructions

FedEx Airbill No.: 66V 725

Laboratory

Sampler's Signature

TAT: 7 day Standard ____ Rush Due: 7 days | Seals Intact? ✓ Y ____ N | Received Good Condition ✓ Y ____ N ____ Cold 3.4°C

White - Lab Copy Canary - Field Copy Pink - File Copy

00041944

1001

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1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-005

041142

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact:

Project Name: Longhorn AAP | Project Location: Area 29 Former TNT Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | USACE Telephone No.:

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	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
~~1~~	~~29SD32-MH01~~					~~SED~~	~~29SD32-MH01~~	~~1~~	~~X~~							
~~2~~	~~29SD33-MH02~~					~~SED~~	~~29SD33-MH02~~	~~1~~	~~X~~							
3	29SD34-MH03					SED	29SD34-MH03	1	X							
~~4~~	~~29SD35-MH04~~					~~SED~~	~~29SD35-MH04~~	~~1~~	~~X~~							
~~5~~	~~29SD36-MH05~~					~~SED~~	~~29SD36-MH05~~	~~1~~	~~X~~							
~~6~~	~~29SD37-MH06~~					~~SED~~	~~29SD37-MH06~~	~~1~~	~~X~~							
3 ~~7~~	29SD38-MH07	12/16/04	12:45			SED	29SD38-MH07	1	X							
4 ~~8~~	29SD39-MH08	12/16/04	1307			SED	29SD39-MH08	1	X							
~~9~~																
~~10~~																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
M. Allen	12/16/04 1600		
		Laboratory	12/17/04 0930

Special Instructions

FedEx Airbill No.: 6604 725

Sampler's Signature: M. Allen

TAT: 7 day Standard ____ Rush Due: 7 days | Seals Intact? ✓ Y ____ N | Received Good Condition ✓ Y ____ N ____ Cold 3.4°C

White - Lab Copy Canary - Field Copy Pink - File Copy

00041945

1002

Shaw *Environmental & Infrastructure, Inc.*

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Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-006

041142

Laboratory Name: **EMAX** Address: **1835 205th Street Torrance, CA 90501** Contact: Joe Kelbley

Project Name: **Longhorn AAP** Project Location: **Area 29 Former TNT Production Area**

Project No.: **845714** Project Contact: **Diane Meyer** Project Telephone No.: **281-368-4404**

USACE Point of contact: **Cliff Murray**

USACE Telephone No.:

Project Manager/Supervisor: **Praveen Srivastav**

Item No.	Sample Number	Date	Time	Comp	Grab	Matrix	Sample Description, Location	Number of Containers	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
~~1~~	~~29SD40-MH09~~					~~SED~~	~~29SD40-MH09~~	~~1~~	~~X~~							
5 ~~2~~	29SD41-MH10	12/16/04	1315		X	SED	29SD41-MH10	1	X							
~~3~~	~~29SD42-MH11~~					~~SED~~	~~29SD42-MH11~~	~~1~~	~~X~~							
~~4~~	~~29SD43-MH12~~					~~SED~~	~~29SD43-MH12~~	~~1~~	~~X~~							
~~5~~	~~29SD44~~					~~SED~~	~~29SD44~~	~~1~~	~~X~~							
~~6~~	~~29SD45~~					~~SED~~	~~29SD45~~	~~1~~	~~X~~							
6 ~~7~~	29SD46	12/16/04	1515		X	SED	29SD46	1	X							
~~8~~	~~29SD___-MH___-QC~~	~~12/16/04~~			~~X~~	~~SED~~	~~29SD___-MH___-QC~~	~~1~~	~~X~~							
~~9~~	~~29SD___-QC~~					~~SED~~	~~29SD___-QC~~	~~1~~	~~X~~							
10																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
[signature]	12/16/04 1600		
		Laboratory [signature]	12/17/04 0930

Special Instructions

FedEx Airbill No.: 666 725

Sampler's Signature: [signature]

TAT: 7 day Standard ____ Rush Due: 7 day Seals Intact? ✓ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold 3.4°C

White - Lab Copy Canary - Field Copy Pink - File Copy

00041946

Shaw *Environmental & Infrastructure, Inc.*

1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. **29-EMAX-DEC04-007**

041142

Laboratory Name: **EMAX** Address: **1835 205th Street Torrance, CA 90501** Contact: Joe Lelbley

Project Name: **Longhorn AAP** Project Location: **Area 29 Former TNT Production Area**

Project No.: **845714** Project Contact: **Diane Meyer** Project Telephone No.: **281-368-4404**

USACE Point of contact: **Cliff Murray**

USACE Telephone No.:

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	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
~~1~~	~~29SW44~~					~~SW~~	~~29SW44~~	~~2~~	~~X~~							
~~2~~	~~29SW45~~					~~SW~~	~~29SW45~~	~~2~~	~~X~~							
7 ~~3~~	29SW46	12/16/04	15:10			SW	29SW46	2	X							
~~4~~	~~29SW_____-QC~~					~~SW~~	~~29SW_____-QC~~	~~2~~	~~X~~							
5																
6																
7																
8																
9																
10																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
[signature]	12/16/04 16:00		
		Laboratory [signature]	12/16/04 170930

Special Instructions

FedEx Airbill No.: ~~66V~~ 66V 725

Sampler's Signature [signature]

TAT: 7 day Standard ____ Rush Due: 7 days Seals Intact? ____ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold 3.4°C

White - Lab Copy Canary - Field Copy Pink - File Copy

00041947

DATA EVALUATION REPORT
OF EMAX REPORT NUMBER 04L145
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

SHAW PROJECT NUMBER 845714

Prepared by

Shaw Environmental, Inc.
1430 Enclave Parkway
Houston, Texas 77077

January 3, 2005

DATA EVALUATION REPORT
EMAX REPORT NUMBER 04L145
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

January 3, 2005

Approved by: Diane Meyer
Diane Meyer, Program Chemist

Date: 1/3/05

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List of Tables

Table 1-1 Chain-of-Custody Summary 1-2

Attachments

Attachment A - Validation Qualifiers and Validation Reason Code Definitions

Acronyms and Abbreviations

%D	percent deviation
%RSD	percent relative standard deviation
COC	chain of custody
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LHAPP	Longhorn Army Ammunition Plant
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NFG	National Functional Guidelines
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
TERC	Total Environmental Restoration Contract
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 sediment and surface water sampling at Site 29 at Longhorn Army Ammunition Plant (LHAPP), Karnack, Texas. This was part of a Data Gaps Investigation, Addendum 3. **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 Total Environmental Restoration Contract (TERC), Number DACA56-94-D-0020, and Task Order 109. This Data Evaluation Report is a summary of the analytical data generated by EMAX Laboratory, Torrance, California.

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 and reason codes were added to the applicable results in the data package. A list of validation qualifiers and validation reason code definitions is included in **Attachment A**.

Table 1-1
Chain-of-Custody Summary

Sample I.D.	Lab Sample Number	Matrix	Chain of Custody Number	Date Collected	Methods SW-846
29WL40-MH09	L145-01	Water	29-EMAX-DEC04-009	12/17/04	Explosives - 8330
29WL40-MH09-QC	L145-02	Water	29-EMAX-DEC04-009	12/17/04	Explosives – 8330
29SD40-MH09	L145-03	Sediment	29-EMAX-DEC04-006	12/17/04	Explosives – 8330
29SD43-MH12	L145-04	Sediment	29-EMAX-DEC04-006	12/17/04	Explosives – 8330
29SD40-MH09-QC	L145-05	Sediment	29-EMAX-DEC04-006	12/17/04	Explosives – 8330
29SD33-MH02	L145-06	Sediment	29-EMAX-DEC04-005	12/17/04	Explosives – 8330
29SD36-MH05	L145-07	Sediment	29-EMAX-DEC04-005	12/17/04	Explosives – 8330
29SD37-MH06	L145-08	Sediment	29-EMAX-DEC04-005	12/17/04	Explosives - 8330

00041953

2.0 Explosives

The sediment and water samples were collected and analyzed for explosives by SW-846 method 8330.

2.1 Initial and Continuing Calibration

The initial and continuing calibrations were within established limits.

2.2 Accuracy

The laboratory control sample (LCS), laboratory control sample duplicate (LCSD), matrix spike (MS), matrix spike duplicate (MSD), and surrogates were within quality control limits.

2.3 Precision

The MS/MSD relative percent difference (RPD) was within quality control limits for the sediment samples. The LCS/LCSD RPD was within quality control limits for the sediment samples.

2.4 Representativeness

The method blanks were free of contamination. One water quality control (QC) replicate sample was analyzed with this batch. The results agreed within an RPD of 35%, which is an acceptable criterion for aqueous samples. One sediment QC replicate was submitted with this delivery group. Results for all analytes were non-detects or agreed within an RPD of 50%, except for 4-AM-2,6-DNT (RPD = 138%) and 2-AM-4,6-DNT (RPD = 134%). Data for these two analytes were qualified "UJ" or "J" in each of the sediment samples with a data validation qualifier code of 17 (field duplicate RPD exceeded).

3.0 Technical Summary

The following summarizes the data review for the sampling at LHAPP.

3.1 Documentation

The COC were complete and contained the required information. Any omissions were corrected and an amended COC was submitted to the laboratory. The actual methods used for sample analysis were based upon the COC.

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 90% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). None of the data was rejected, although some data was qualified as estimated.

- Data 4-AM-2,6-DNT and 2-AM-4,6-DNT in the sediments were qualified "UJ" or "J" with a data validation qualifier code of 17 (field duplicate RPD exceeded).
- Data reported between the MDL and reporting limit (RL) were "J" flagged with reason code 15 (quantitation 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).

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.

ATTACHMENT A

VALIDATION QUALIFIERS AND VALIDATION REASON CODE DEFINITIONS

VALIDATION QUALIFIER DEFINITIONS

Qualifier	Definition
U	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit,
J	The analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.
B	The concentration reported was detected in the associated method blank, trip blank, or equipment blank within 5X/10X the blank concentration.
R	The reported results are rejected due to 1. Severe deficiencies in the supporting quality control data; 2. Anomalies noted in the sampling or analysis process. 3. the presence or absence of the constituent cannot be verified based on the data provided. $. To indicate not to use a particular result in the event of a reanalysis.
UJ	The analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data have indicated that the "non-detect" may be inaccurate or imprecise. The non-detect result should be estimated.
L	Result may be biased low. Details are provided in the validation report.
H	Result may be biased high. Details are provided in the validation report.

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)

VALIDATION REASON CODE DEFINITIONS (continued)

Reason Code	Description
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

SHAW ENVIRONMENTAL, INC.
TECHNICAL SERVICE GROUP
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.: 845714
Laboratory: EMAX
Report No.: 04L145

COMMENTS:

Data Reviewed by: Diane Meyer Date: 1/3/05
Diane Meyer
Project Chemist

DATA COMPLETENESS

	REQUIREMENTS	Y	N	NA
Cooler Receipt Form	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° F?	✓		
	Was the pH of the sample acceptable?			✓
Chain of Custody	Original chain of custody/analytical request form present and complete?	✓		
	Signature, dates, and times complete?	✓		
	Comparison of the reported parameters to the request on the chain of custody?	✓		
	Each sample number transcribed by the laboratory?	✓		
	Cross reference of field sample number, laboratory number and analytical batch?	✓		
	Correct sample collection date given for each sample?	✓		
Laboratory Reports	Date of preparation / extraction for each sample?	✓		
	Date analyzed for each sample?	✓		
	Dilution factors for samples?	✓		
	Detection / Quantitation limits reported as specified?	✓		
	Sample analytical results?	✓		
	Results reported for method blanks?	✓		
	Results reported for trip blanks (VOCs only)?			✓
	Results reported for laboratory duplicates (inorganic and radiological only)?			✓
QC Reports	Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported?	✓		
	Laboratory Control Samples (LCS) / LCS Duplicates (LCSD) % recoveries and RPDs reported?	✓		
	Surrogate values provided (organic samples only)?	✓		
	Raw data provided for analysis, if applicable?			✓

If "NO," then List all samples on attached sheets

TIER 1 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID X

EPA METHOD: 8330 SOLID/SOIL _____ TCLP _____

BY: GC OR HPLC

REQUIREMENTS Hold Time was met		Y	N	NA
Method Blank	Every Batch or 20 Samples	✓		
	All Compounds <MDL	✓		
Matrix Spike % Recovery Values	Within those set by Lab			✓
Matrix Spike Dup % Recovery Values	Within those set by Lab			✓
MS/MSD RPD	<Lab QC Limits			✓
% LCS Recovery Value	Within those set by Lab	✓		
% LCSD Recovery Values	Within those set by Lab	✓		
LCS/LCSD RPD	<Lab QC Limits	✓		
% Surrogate Recovery Limits	Within those set by Lab	✓		
Field Duplicate Evaluation 29WL40-MH09 + QC	~~Ratio < 2.0~~ RPD < 35% for water	✓		
	Ratio < 5.0 for soil			✓

2,4,6-TNT: 5200 vs 5900 RPD = 12.6

4-AM-2,6-DNT: 290 vs 280 RPD = 3.5

2-AM-4,6-DNT: 220 vs 210 RPD = 4.6

If "NO," List all samples below:

Blank Information 2,4-DNT < RL - OK

Run Date	Run Time	Date Extracted	Blank ID	Compound	Conc. Units	Associated Samples
						2,6-DNT: 27 vs 27 RPD=0%

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

Sample Type	Sample ID	Analyte	MS Recovery	MSD Recovery	Result - 1	Result - 2	RPD %

Any runs with one (1) or more recoveries outside limits for each fraction?

Run Date	Surrogate Compound	Analyte	Original % Recovery	Re-Run Recovery	Comments

Laboratory Control Sample

Sample Type	Sample ID	Compound	LCS %	LCSD %	Comments

no quals for water samples

Soil/sediment samples were air dried

TIER 2 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID X

EPA METHOD: 8330 SOLID/SOIL_____ TCLP_____

BY: GC OR HPLC

REQUIREMENT		Y	N	NA
Initial Calibration	% RSD <OR = 30%	✓		
Continuing Calibration	% DIFF <OR = 15%	✓		
All sample/blank internal standard (IS) retention times	Within those set by lab	✓		
All sample/blank IS retention times	Within 30 sec. of Standard IS	✓		

If "NO," list all samples below

Initial Calibration

Calibration		Instrument ID	Matrix	Correlation Coefficient	% RSD	Compound	Associated Samples
Date	Time						

Continuing Calibration

Calibration		Instrument ID	Matrix	% Diff.	Compound	Associated Samples
Date	Time					

Internal Standard Performance

Sample Number	Compound	Internal Standard Area/RT	Limits

TIER 1 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID _____

EPA METHOD: 8330 SOLID/SOIL X TCLP _____

BY: GC OR HPLC

REQUIREMENTS Hold Time was met		Y	N	NA
Method Blank	Every Batch or 20 Samples	✓		
	All Compounds <MDL	✓		
Matrix Spike % Recovery Values	Within those set by Lab	✓		
Matrix Spike Dup % Recovery Values	Within those set by Lab	✓		
MS/MSD RPD	<Lab QC Limits	✓		
% LCS Recovery Value	Within those set by Lab	✓		
% LCSD Recovery Values	Within those set by Lab			✓
LCS/LCSD RPD	<Lab QC Limits			✓
% Surrogate Recovery Limits	Within those set by Lab	✓		
* *Field Duplicate Evaluation* 295D40-MH09 & QC	Ratio < 2.0 for water RPD ≤ 50% ~~Ratio < 5.0~~ for soil		✓	

2,4,6-TNT: 1200 vs 1100 RPD= 8.7%
4-AM-2,6-DNT: 2500 vs 460 RPD=138%
2-AM-4,6-DNT: 2400 vs 470 RPD=134%

If "NO," List all samples below:

Blank Information

Run Date	Run Time	Date Extracted	Blank ID	Compound	Conc. Units	Associated Samples
* Qualify 4-AM-2,6-DNT and 2-AM-4,6-DNT for the sediment samples in this SDG.						J or UJ -code 17

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

Sample Type	Sample ID	Analyte	MS Recovery	MSD Recovery	Result - 1	Result - 2	RPD %

Any runs with one (1) or more recoveries outside limits for each fraction?

Run Date	Surrogate Compound	Analyte	Original % Recovery	Re-Run Recovery	Comments

Laboratory Control Sample

Sample Type	Sample ID	Compound	LCS %	LCSD %	Comments

TIER 2 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives
EPA METHOD: 8330
BY: GC OR (HPLC)

MATRIX: LIQUID _____
SOLID/SOIL X TCLP ____

REQUIREMENT		Y	N	NA
Initial Calibration	% RSD <OR = 30%	✓		
Continuing Calibration	% DIFF <OR = 15%	✓ primary column		
All sample/blank internal standard (IS) retention times	Within those set by lab	✓		
All sample/blank IS retention times	Within 30 sec. of Standard IS	✓		

Second source < 15%

If "NO," list all samples below

Initial Calibration

Calibration Date	Calibration Time	Instrument ID	Matrix	Correlation Coefficient	% RSD	Compound	Associated Samples

Continuing Calibration

Calibration Date	Calibration Time	Instrument ID	Matrix	% Diff.	Compound	Associated Samples

Internal Standard Performance

Sample Number	Compound	Internal Standard Area/RT	Limits

Shaw Environmental & Infrastructure, Inc.
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Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-009

I 8

041145

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact: Joe Kelbley

Project Name: Longhorn AAP | Project Location: Area 29 Former TNT Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | USACE Telephone No.:

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	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
5. 1	29WL40-MH09	12/17/04	1315		X	SW	29WL40-MH09	2	X							
~~2~~	~~29WL41-MH10~~						~~29WL41-MH10~~	~~2~~	~~X~~							
~~3~~	~~29WL42-MH11~~						~~29WL42-MH11~~	~~2~~	~~X~~							
12.20.04. 4	29WL43-MH12						~~29WL43-MH12~~	~~2~~	~~X~~							
~~5~~	~~29WL47~~						~~29WL47~~	~~2~~	~~X~~							
2. ~~6~~	29WL40-MH09-QC	12/17/04	1315		X	SW	29WL40-MH09-QC	2	X							
7																
8																
9																
10																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
[signature]	12/17/04 1600		
		[signature]	12.20.04. 10:30
		Laboratory	

Special Instructions

~~FedEx~~ UPS Airbill No.: 66V 725

Sampler's Signature: [signature]

TAT: 7 day Standard ____ Rush Due: _____ Seals Intact? ✓ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold

White - Lab Copy Canary - Field Copy Pink - File Copy

T=4.1°C

12/13/2004 14:39 FAX 8656934944 SHAW EI INC 1001
00041966

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Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-006

Laboratory Name: **EMAX** Address: **1835 205th Street Torrance, CA 90501** Contact: Joe Kelbley

Project Name **Longhorn AAP** Project Location **Area 29 Former TNT Production Area**

Project No. **845714** Project Contact **Diane Meyer** Project Telephone No. **281-368-4404**

USACE Point of contact: **Cliff Murray** Project Manager/Supervisor **Praveen Srivastav**

USACE Telephone No.

12.20.04. 5.5.

Item No.	Sample Number	Date	Time	Comp	Grab	Matrix	Sample Description, Location	Number of Containers	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
3. 1	29SD40-MH09	12/12/04	12:40		X	SED	29SD40-MH09	1	X							
~~2~~	~~29SD41-MH10~~					~~SED~~	~~29SD41-MH10~~	~~1~~	~~X~~							
~~3~~	~~29SD42-MH11~~					~~SED~~	~~29SD42-MH11~~	~~1~~	~~X~~							
4	29SD43-MH12	12/17/04	1147		X	SED	29SD43-MH12	1	X							
~~5~~	~~29SD44~~					~~SED~~	~~29SD44~~	~~1~~	~~X~~							
~~6~~	~~29SD45~~					~~SED~~	~~29SD45~~	~~1~~	~~X~~							
~~7~~	~~29SD46~~					~~SED~~	~~29SD46~~	~~1~~	~~X~~							
5. ~~8~~	29SD 40 -MH 09 -QC	12/17/04	1240		X	SED	29SD 40 -MH 09 -QC	1	X							
~~9~~	~~29SD____-QC~~					~~SED~~	~~29SD____-QC~~	~~1~~	~~X~~							
10																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
M. Hill Cn	12/17/04 1600		
			12.20.04. 1045
		Laboratory	

Special Instructions

FedEx Airbill No.: 66V 725

Sampler's Signature M. Hill Cn

TAT: ____ Standard ____ Rush Due: _____ Seals Intact? ✓ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold

White - Lab Copy Canary - Field Copy Pink - File Copy

00041967

1002

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Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-005

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact: Joe Kelbley

Project Name: Longhorn AAP | Project Location: Area 29 Former TNT Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | Project Manager/Supervisor: Praveen Srivastav

USACE Telephone No.:

12.20.04. 5.5.

Item No.	Sample Number	Date	Time	Comp	Grab	Matrix	Sample Description, Location	Number of Containers	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
~~1~~	~~29SD32-MH01~~					~~SED~~	~~29SD32-MH01~~	~~1~~	~~X~~							
6. 2	29SD33-MH02	12/17/04	0855		X	SED	29SD33-MH02	1	X							
~~3~~	~~29SD34-MH03~~					~~SED~~	~~29SD34-MH03~~	~~1~~	~~X~~							
~~4~~	~~29SD35-MH04~~					~~SED~~	~~29SD35-MH04~~	~~1~~	~~X~~							
7. 5	29SD36-MH05	12/17/04	0915		X	SED	29SD36-MH05	1	X							
8. 6	29SD37-MH06	12/17/04	0931		X	SED	29SD37-MH06	1	X							
~~7~~	~~29SD38-MH07~~					~~SED~~	~~29SD38-MH07~~	~~1~~	~~X~~							
~~8~~	~~29SD39-MH08~~					~~SED~~	~~29SD39-MH08~~	~~1~~	~~X~~							
9																
10																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
[signature]	12/17/04 1600		
		[signature]	12.20.04. 10:30
		Laboratory	

Special Instructions

FedEx Airbill No.: 66V 725

Sampler's Signature

TAT: ____ Standard ____ Rush Due: ____ Seals Intact? ✓ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold

White - Lab Copy Canary - Field Copy Pink - File Copy

00041968

1003

DATA EVALUATION REPORT
OF EMAX REPORT NUMBER 04L154
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

SHAW PROJECT NUMBER 845714

Prepared by

Shaw Environmental, Inc.
1430 Enclave Parkway
Houston, Texas 77077

January 6, 2005

DATA EVALUATION REPORT
EMAX REPORT NUMBER 04L154
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

January 6, 2005

Approved by: Diane Meyer
Diane Meyer, Program Chemist

Date: 1/6/05

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Table 1-1 Chain-of-Custody Summary 1-2

Attachments

Attachment A - Validation Qualifiers and Validation Reason Code Definitions

Acronyms and Abbreviations

%D	percent deviation
%RSD	percent relative standard deviation
COC	chain of custody
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LHAPP	Longhorn Army Ammunition Plant
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NFG	National Functional Guidelines
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RL	reporting limit
TERC	Total Environmental Restoration Contract
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 sediment and surface water sampling at Site 29 at Longhorn Army Ammunition Plant (LHAPP), Karnack, Texas. This was part of a Data Gaps Investigation, Addendum 3. **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 Total Environmental Restoration Contract (TERC), Number DACA56-94-D-0020, and Task Order 109. This Data Evaluation Report is a summary of the analytical data generated by EMAX Laboratory, Torrance, California.

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 and reason codes were added to the applicable results in the data package. A list of validation qualifiers and validation reason code definitions is included in **Attachment A**.

Table 1-1
Chain-of-Custody Summary

Sample I.D.	Lab Sample Number	Matrix	Chain of Custody Number	Date Collected	Methods SW-846
29SW44	L154-01	Water	29-EMAX-DEC04-007	12/19/04	Explosives - 8330
29SW45	L154-02	Water	29-EMAX-DEC04-007	12/19/04	Explosives – 8330
29SD44	L154-03	Sediment	29-EMAX-DEC04-006	12/20/04	Explosives – 8330
29SD45	L154-04	Sediment	29-EMAX-DEC04-006	12/20/04	Explosives - 8330

00041974

2.0 Explosives

The sediment and water samples were collected and analyzed for explosives by SW-846 method 8330.

2.1 Initial and Continuing Calibration

The initial and continuing calibrations were within established limits.

2.2 Accuracy

The laboratory control sample (LCS), laboratory control sample duplicate (LCSD), and surrogates were within quality control limits. No matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with this batch.

2.3 Precision

The LCS/LCSD relative percent difference (RPD) was within quality control limits.

2.4 Representativeness

The method blanks were free of contamination. No quality control (QC) replicate sample was submitted with this batch.

3.0 Technical Summary

The following summarizes the data review for the sampling at LHAPP.

3.1 Documentation

The COC were complete and contained the required information. Any omissions were corrected and an amended COC was submitted to the laboratory. The actual methods used for sample analysis were based upon the COC.

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 90% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). None of the data was rejected.

- Data reported between the MDL and reporting limit (RL) were "J" flagged with reason code 15 (quantitation 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).

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.

ATTACHMENT A

VALIDATION QUALIFIERS AND VALIDATION REASON CODE DEFINITIONS

VALIDATION QUALIFIER DEFINITIONS

Qualifier	Definition
U	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit,
J	The analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.
B	The concentration reported was detected in the associated method blank, trip blank, or equipment blank within 5X/10X the blank concentration.
R	The reported results are rejected due to 1. Severe deficiencies in the supporting quality control data; 2. Anomalies noted in the sampling or analysis process. 3. the presence or absence of the constituent cannot be verified based on the data provided. $. To indicate not to use a particular result in the event of a reanalysis.
UJ	The analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data have indicated that the "non-detect" may be inaccurate or imprecise. The non-detect result should be estimated.
L	Result may be biased low. Details are provided in the validation report.
H	Result may be biased high. Details are provided in the validation report.

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)

VALIDATION REASON CODE DEFINITIONS (continued)

Reason Code	Description
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

SHAW ENVIRONMENTAL, INC.
TECHNICAL SERVICE GROUP
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.: 845714
Laboratory: EMAX
Report No.: 04L154

COMMENTS:

Data Reviewed by: Diane Meyer Date: 1/6/05
Diane Meyer
Project Chemist

DATA COMPLETENESS				
	REQUIREMENTS	Y	N	NA
Cooler Receipt Form	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° F?	✓		
	Was the pH of the sample acceptable?			✓
Chain of Custody	Original chain of custody/analytical request form present and complete?	✓		
	Signature, dates, and times complete?	✓		
	Comparison of the reported parameters to the request on the chain of custody?	✓		
	Each sample number transcribed by the laboratory?	✓		
	Cross reference of field sample number, laboratory number and analytical batch?	✓		
	Correct sample collection date given for each sample?	✓		
Laboratory Reports	Date of preparation / extraction for each sample?	✓		
	Date analyzed for each sample?	✓		
	Dilution factors for samples?	✓		
	Detection / Quantitation limits reported as specified?	✓		
	Sample analytical results?	✓		
	Results reported for method blanks?	✓		
	Results reported for trip blanks (VOCs only)?			✓
	Results reported for laboratory duplicates (inorganic and radiological only)?			✓
QC Reports	Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported?		✓	✓
	Laboratory Control Samples (LCS) / LCS Duplicates (LCSD) % recoveries and RPDs reported?	✓		
	Surrogate values provided (organic samples only)?	✓		
	Raw data provided for analysis, if applicable?			✓

If "NO," then List all samples on attached sheets

TIER 1 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID X

EPA METHOD: 8330 SOLID/SOIL X TCLP

BY: GC OR HPLC

REQUIREMENTS		Y	N	NA
Method Blank	Every Batch or 20 Samples	✓		
	All Compounds <MDL	✓		
Matrix Spike % Recovery Values	Within those set by Lab			✓
Matrix Spike Dup % Recovery Values	Within those set by Lab			✓
MS/MSD RPD	<Lab QC Limits			✓
% LCS Recovery Value	Within those set by Lab	✓		
% LCSD Recovery Values water only	Within those set by Lab	✓		
LCS/LCSD RPD	<Lab QC Limits	✓		
% Surrogate Recovery Limits	Within those set by Lab	✓		
Field Duplicate Evaluation	Ratio < 2.0 for water			✓
	Ratio < 5.0 for soil			✓

If "NO," List all samples below:

Blank Information

Run Date	Run Time	Date Extracted	Blank ID	Compound	Conc. Units	Associated Samples

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

Sample Type	Sample ID	Analyte	MS Recovery	MSD Recovery	Result - 1	Result - 2	RPD %

Any runs with one (1) or more recoveries outside limits for each fraction?

Run Date	Surrogate Compound	Analyte	Original % Recovery	Re-Run Recovery	Comments

Laboratory Control Sample

Sample Type	Sample ID	Compound	LCS %	LCSD %	Comments

Soil samples were air dried. No quals, except J flags between MDL and RL

TIER 2 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID X

EPA METHOD: 8330 SOLID/SOIL X TCLP ____

BY: GC OR HPLC

REQUIREMENT		Y	N	NA
Initial Calibration	% RSD <OR = 30%	✓		
Continuing Calibration	% DIFF <OR = 15%	✓		
All sample/blank internal standard (IS) retention times	Within those set by lab	✓		
All sample/blank IS retention times	Within 30 sec. of Standard IS	✓		

second source verification ≤ 15%

If "NO," list all samples below

Initial Calibration

Calibration Date	Calibration Time	Instrument ID	Matrix	Correlation Coefficient	% RSD	Compound	Associated Samples

Continuing Calibration

Calibration Date	Calibration Time	Instrument ID	Matrix	% Diff.	Compound	Associated Samples

Internal Standard Performance

Sample Number	Compound	Internal Standard Area/RT	Limits

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Tulsa TERC DACA56-94-D-0020

E2

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-007

041154

Laboratory Name: **EMAX** Address: **1835 205th Street Torrance, CA 90501** Contact: Joe Kelley

Project Name **Longhorn AAP** Project Location **Area 29 Former TNT Production Area**

Project No. **845714** Project Contact **Diane Meyer** Project Telephone No. **281-368-4404**

USACE Point of contact: **Cliff Murray**

USACE Telephone No.

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	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
1	29SW44	12/19/04	11:43			SW	29SW44	2	X							
2	29SW45	12/19/04	11:52			SW	29SW45	2	X							
~~3~~	~~29SW46~~					~~SW~~	~~29SW46~~	~~2~~	~~X~~							
~~4~~	~~29SW_____ QC~~					~~SW~~	~~29SW_____ QC~~	~~2~~	~~X~~							
5																
6																
7																
8																
9																
10																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
[signature]	12/20/04 1200		
		Laboratory [signature]	12-21-04 1000

Special Instructions: 7 day TAT

~~FedEx~~ UPS Airbill No.: 66V 725

Sampler's Signature

TAT: 7 days Standard ____ Rush Due: _____ Seals Intact? ✓ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold 3.2°C

White - Lab Copy Canary - Field Copy Pink - File Copy

00041985

Shaw Environmental & Infrastructure, Inc.
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Houston, TX 77077 (281) 368-4000
Tulsa TERC DACA56-94-D-0020

E2

CHAIN-OF-CUSTODY

No. 29-EMAX-DEC04-006

041154

Laboratory Name: EMAX | Address: 1835 205th Street, Torrance, CA 90501 | Contact: Joe Kelley

Project Name: Longhorn AAP | Project Location: ~~Area 29 Former TNT~~ Production Area

Project No.: 845714 | Project Contact: Diane Meyer | Project Telephone No.: 281-368-4404

USACE Point of contact: Cliff Murray | USACE Telephone No.: | Project Manager/Supervisor: Praveen Srivastav

Item No.	Sample Number	Date	Time	Comp	Grab	Matrix	Sample Description, Location	Number of Containers	Nitroaromatics and Nitroamines by 8330	Perchlorate by 314.0						Remarks
~~1~~	~~29SD40-MH09~~					~~SED~~	~~29SD40-MH09~~	~~1~~	~~X~~							
~~2~~	~~29SD41-MH10~~					~~SED~~	~~29SD41-MH10~~	~~1~~	~~X~~							
~~3~~	~~29SD42-MH11~~					~~SED~~	~~29SD42-MH11~~	~~1~~	~~X~~							
~~4~~	~~29SD43-MH12~~	~~12/19/04~~				~~SED~~	~~29SD43-MH12~~	~~1~~	~~X~~							
3 ~~5~~	29SD44	~~12/20/04~~ 12/19/04	11:43		X	SED	29SD44	1	X							
4 ~~6~~	29SD45	~~12/20/04~~ 12/19/04	11:52		X	SED	29SD45	1	X							
~~7~~	~~29SD46~~					~~SED~~	~~29SD46~~	~~1~~	~~X~~							
~~8~~	~~29SD____-MH____-QC~~					~~SED~~	~~29SD____-MH____-QC~~	~~1~~	~~X~~							
~~9~~	~~29SD____-QC~~					~~SED~~	~~29SD____-QC~~	~~1~~	~~X~~							
10																

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time	Special Instructions
[signature]	12/20/04 1200			
				~~FedEx~~ Airbill No.: 66V 725
		Laboratory [signature]	12-21-04 1000	Sampler's Signature

TAT: ____ Standard ____ Rush Due: ____ Seals Intact? ✓ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold 3.2°C

White - Lab Copy Canary - Field Copy Pink - File Copy

00041986

DATA EVALUATION REPORT
OF KEMRON REPORT NUMBER L0502503
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

SHAW PROJECT NUMBER 845714

Prepared by

Shaw Environmental, Inc.
1430 Enclave Parkway
Houston, Texas 77077

March 17, 2005

DATA EVALUATION REPORT
KEMRON REPORT NUMBER L0502503
DATA GAPS INVESTIGATION SITE 29
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

March 17, 2005

Approved by: Diane Meyer
Diane Meyer, Program Chemist

Date: 3/17/05

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Attachment A - Validation Qualifiers and Validation Reason Code Definitions

Acronyms and Abbreviations

%D	percent deviation
%RSD	percent relative standard deviation
COC	chain of custody
LCS	laboratory control sample
LHAPP	Longhorn Army Ammunition Plant
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NFG	National Functional Guidelines
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RL	reporting limit
TERC	Total Environmental Restoration Contract
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 Site 29 at Longhorn Army Ammunition Plant (LHAPP), 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 Total Environmental Restoration Contract (TERC), Number DACA56-94-D-0020, and Task Order 109. 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 and reason codes were added to the applicable results in the data package. A list of validation qualifiers and validation reason code definitions is included in **Attachment A**.

Table 1-1
Chain-of-Custody Summary

Sample I.D.	Lab Sample Number	Matrix	Chain of Custody No.	Date Collected	Methods SW-846
29WL34-MH03-02	L0502503-01	Water	01-KEMM-FEB05	2/24/05	Explosives - 8330
29WL36-MH05-02	L0502503-02	Water	01-KEMM-FEB05	2/24/05	Explosives - 8330
29WL37-MH06-02	L0502503-03	Water	01-KEMM-FEB05	2/24/05	Explosives - 8330
29WL38-MH07-02	L0502503-04	Water	01-KEMM-FEB05	2/23/05	Explosives - 8330
29WL39-MH08-02	L0502503-05	Water	01-KEMM-FEB05	2/23/05	Explosives - 8330
29WL40-MH09-02	L0502503-06	Water	01-KEMM-FEB05	2/23/05	Explosives - 8330
29WL40-MH09-52	L0502503-07	Water	01-KEMM-FEB05	2/23/05	Explosives - 8330
29WL41-MH10-02	L0502503-08	Water	01-KEMM-FEB05	2/23/05	Explosives - 8330
29WL42-MH11-02	L0502503-09	Water	01-KEMM-FEB05	2/23/05	Explosives - 8330
29WL43-MH12-02	L0502503-10	Water	01-KEMM-FEB05	2/23/05	Explosives - 8330

2.0 Explosives

The water samples were collected and analyzed for explosives by SW-846 method 8330.

2.1 Initial and Continuing Calibration

The initial and continuing calibrations were within established limits.

2.2 Accuracy

The laboratory control sample (LCS), laboratory control sample duplicate (LCSD), and surrogates were within quality control limits, except as noted below. No matrix spike (MS), and matrix spike duplicate (MSD) were analyzed with this batch.

2.2.1 Surrogate Recoveries

The following surrogates were outside quality control limits.

Table 2-1
Surrogate Recoveries

Sample I.D.	Surrogate	% Recovery	% Recovery	Control Limits (%)
29WL34-MH03-02	3.4-dinitrotoluene	42.9 (1X)	42.7 (5X)	50 - 150
29WL36-MH05-02	3.4-dinitrotoluene	0 (1X)	0 (10X)	50 - 150
29WL37-MH06-02	3.4-dinitrotoluene	0 (1X)	0 (100X)	50 - 150

The high 2,4,6-trinitotoluene concentration in these co-eluted with the surrogate peak. For samples 29WL36-MH05-02 and 29WL37-MH06-02, the surrogate concentration could not be separated from the 2,4,6-trinitotoluene peak. For sample 29WL34-MH03-02, it was poorly resolved from the 2,4,6-trinitotoluene peak. The data for these three samples were qualified "JL" for detected analytes and "UJL" for non-detects with a validation code 07A.

2.3 Precision

The LCS/LCSD relative percent difference (RPD) was within quality control limits.

2.4 Representativeness

The method blank was free of contamination. One QC replicate sample was submitted with this data package. A comparison between the field duplicates is shown in **Table 2-2**. The samples were extracted within 7 days and analyzed within 40 days.

Table 2-2
Field Duplicate Comparison

Analyte	29WL40-MH09-02 µg/L	29WL40-MH09-52 µg/L	RPD %	Comment
2,4,6-trinitrotoluene	20.0	24.0	18	Agree
2,4-dinitrotoluene	1.13	1.09	3.6	Agree
2,6-dinitrotoluene	1.27	1.24	2.4	Agree
2-amino-4,6-dinitrotoluene	1.68	1.63	3.0	Agree
2-amino-4,6-dinitrotoluene	2.42	2.36	2.5	Agree

For aqueous samples a RPD of 35% is considered good agreement. No qualifiers were added based on field duplicate variation.

3.0 Technical Summary

The following summarizes the data review for the sampling at LHAPP.

3.1 Documentation

The COC were complete and contained the required information. Any omissions were corrected and an amended COC was submitted to the laboratory. The actual methods used for sample analysis were based upon the COC.

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 90% completeness goal was met as set forth in the USACE Engineering Manual 200-1-3 (February, 2001). None of the data were rejected, although some data was qualified estimated. Valid data are non-qualified data and estimated data.

- Samples 29WL34-MH03-02, 29WL36-MH05-02, and 29WL37-MH06-02 were qualified "JL" for detects and "UJL" for non-detects with validation qualifier code 07A due to low surrogate recovery due to matrix interference.
- Data reported between the MDL and reporting limit (RL) were "J" flagged with reason code 15 (quantitation 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).

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 Inorganic Data Review, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C., October 1999.

ATTACHMENT A

VALIDATION QUALIFIERS AND VALIDATION REASON CODE DEFINITIONS

VALIDATION QUALIFIER DEFINITIONS

Qualifier	Definition
U	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit,
J	The analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.
B	The concentration reported was detected in the associated method blank, trip blank, or equipment blank within 5X/10X the blank concentration.
R	The reported results are rejected due to 1. Severe deficiencies in the supporting quality control data; 2. Anomalies noted in the sampling or analysis process. 3. the presence or absence of the constituent cannot be verified based on the data provided. $. To indicate not to use a particular result in the event of a reanalysis.
UJ	The analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data have indicated that the "non-detect" may be inaccurate or imprecise. The non-detect result should be estimated.
L	Result may be biased low. Details are provided in the validation report.
H	Result may be biased high. Details are provided in the validation report.

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)

VALIDATION REASON CODE DEFINITIONS (continued)

Reason Code	Description
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

SHAW ENVIRONMENTAL, INC.
TECHNICAL SERVICE GROUP
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.: 845774
Laboratory: Kemron
Report No.: K0502503

COMMENTS:

Explosives

Data Reviewed by: Diane Meyer Date: 3/16/05
Diane Meyer
Project Chemist

TIER 1 DATA REVIEW

	DATA COMPLETENESS			
	REQUIREMENTS	Y	N	NA
Cooler Receipt Form	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° F?	✓		
	Was the pH of the sample acceptable?	✓		
Chain of Custody	Original chain of custody/analytical request form present and complete?	✓		
	Signature, dates, and times complete?	✓		
	Comparison of the reported parameters to the request on the chain of custody?	✓		
	Each sample number transcribed by the laboratory?	✓		
	Cross reference of field sample number, laboratory number and analytical batch?	✓		
	Correct sample collection date given for each sample?	✓		
Laboratory Reports	Date of preparation / extraction for each sample?	✓		
	Date analyzed for each sample?	✓		
	Dilution factors for samples?	✓		
	Detection / Quantitation limits reported as specified?	✓		
	Sample analytical results?	✓		
	Results reported for method blanks?	✓		
	Results reported for trip blanks (VOCs only)?			✓
	Results reported for laboratory duplicates (inorganic and radiological only)?			✓
QC Reports	Matrix Spike (MS) /Matrix Spike Duplicates (MSD) % recoveries and RPDs reported?			
	Laboratory Control Samples (LCS) / LCS Duplicates (LCSD) % recoveries and RPDs reported?	✓		
	Surrogate values provided (organic samples only)?	✓		
	Raw data provided for analysis, if applicable?			✓

If "NO," then List all samples on attached sheets

TIER 1 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives MATRIX: LIQUID X
EPA METHOD: 8330 SOLID/SOIL_____ TCLP_____
BY: GC OR (HPLC)

REQUIREMENTS		Y	N	NA
Method Blank	Every Batch or 20 Samples	✓		
	All Compounds <MDL	✓		
Matrix Spike % Recovery Values	Within those set by Lab			✓
Matrix Spike Dup % Recovery Values	Within those set by Lab			✓
MS/MSD RPD	<Lab QC Limits			✓
% LCS Recovery Value	Within those set by Lab	✓		
% LCSD Recovery Values	Within those set by Lab	✓		
LCS/LCSD RPD	<Lab QC Limits	✓		
% Surrogate Recovery Limits	Within those set by Lab		✓	
Field Duplicate Evaluation 29WL40-MH09-02 & 29WL40-MH09-52	Ratio < 2.0 for water			✓
	Ratio < 5.0 for soil			✓

2,4,6-TNT: 20.0 vs 24.0 RPD = 18% 2,6-dinitrotoluene: 1.27 vs 1.24 RPD = 2.4%
2,4-dinitrotoluene: 1.13 vs 1.09 RPD = 3.6% 2-Am-4,6DNT: 1.68 vs 1.63 RPD = 3.0%
4-Am-4,6-DNT: 2.42 vs 2.36 RPD = 2.5%

If "NO," List all samples below:

Blank Information

Run Date	Run Time	Date Extracted	Blank ID	Compound	Conc. Units	Associated Samples

Matrix Spike / Matrix Spike Duplicate Results and Field Duplicate

Sample Type	Sample ID	Analyte	MS Recovery	MSD Recovery	Result - 1	Result - 2	RPD %

Any runs with one (1) or more recoveries outside limits for each fraction?

Run Date	Surrogate Compound	~~Analyte~~ Range	Original % Recovery	Re-Run Recovery	Comments	
3/2/05	3,4-dinitrotoluene	50-150	42.9% (1X)	42.7 (5X)	29WL34-MH03-02 -	matrix
			-0 * (1X)	-0 (10X)	29WL36-MH05-02 -	"
			-0 * (1X)	-0 (100X)	29WL37-MH06-02	"
Qualify detects JL; non-detects UJL code 07A						

Laboratory Control Sample

Sample Type	Sample ID	Compound	LCS %	LCSD %	Comments

*surrogate recoveries were low due to co-elution with the high 2,4,6-trinitrotoluene peak

TIER 2 DATA REVIEW – ORGANIC ANALYSIS

ANALYSIS: Explosives
EPA METHOD: 8330
BY: GC OR HPLC

MATRIX: LIQUID X
SOLID/SOIL_____ TCLP_____

REQUIREMENT		Y	N	NA
Initial Calibration	% RSD <OR = 30% or $r^2 > 0.990$	✓		
Continuing Calibration	% DIFF <OR = 15%	✓		
All sample/blank internal standard (IS) retention times	Within those set by lab			✓
All sample/blank IS retention times	Within 30 sec. of Standard IS			✓

If "NO," list all samples below

Initial Calibration

Calibration		Instrument ID	Matrix	Correlation Coefficient	% RSD	Compound	Associated Samples
Date	Time						

Continuing Calibration

Calibration		Instrument ID	Matrix	% Diff.	Compound	Associated Samples
Date	Time					

Internal Standard Performance

Sample Number	Compound	Internal Standard Area/RT	Limits

Shaw *Environmental & Infrastructure, Inc.*

1430 Enclave Parkway
Houston, TX 77077 (281) 368-4000

CHAIN-OF-CUSTODY

No. **01-KEMM-FEB05**

Laboratory Name: **Kemron** Address: **109 Starlite Park Marietta, OH 45750** Contact: 740 373-4071

Project Name **Longhorn AAP**

Project Location **Manholes** ~~Area 49 Acid Storage Area~~ LHAAP-29 (MAW)

Project No. **845714**

Project Contact **Diane Meyer**

Project Telephone No. **281-368-4408**

USACE Point of contact: **Cliff Murray**

USACE Telephone No.

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	Nitroaromatics and Nitroamines by 8330							Remarks
1	29WL34-MH03-02	2/24/05	14:05			WATER	29WL34-MH03	2	X							
2	~~29WL35-MH04-02~~ (MAW)	~~2/24/05~~				WATER	~~29WL35-MH04~~ (MAW)	~~2~~	~~X~~							No Sample
3	29WL36-MH05-02	2/24/05	14:13			WATER	29WL36-MH05	2	X							
4	29WL37-MH06-02	2/24/05	14:22			WATER	29WL37-MH06	2	X							
5	29WL38-MH07-02	2/23/05	16:15			WATER	29WL38-MH07	2	X							
6	29WL39-MH08-02	2/23/05	15:17			WATER	29WL39-MH08	2	X							
7	29WL40-MH09-02	2/23/05	14:18			WATER	29WL40-MH09	2	X							
8	29WL40-MH09-52	2/23/05	14:18			WATER	29WL40-MH09	2	X							
9	29WL41-MH10-02	2/23/05	14:34			WATER	29WL41-MH10	2	X							
10	29WL42-MH11-02	2/23/05	13:43			WATER	29WL42-MH11	2	X							
11	29WL43-MH12-02	2/23/05	13:12			WATER	29WL43-MH12	2	X							

Transfers Relinquished By (Signature)	Date/Time	Transfers Accepted By (Signature)	Date/Time
[signature]	2/24/05		
		Laboratory Cara Strickler	2/25/05 9:40

Special Instructions: COC sealed, DX Dentact CHD

FedEx Airbill No.:

Sampler's Signature: [signature]

TAT: 7day Standard ____ Rush Due: _____ Seals Intact? ✓ Y ____ N Received Good Condition ✓ Y ____ N ____ Cold 2°, 3°, 4° CHD

7-day TAT

White - Lab Copy Canary - Field Copy Pink - File Copy

00042004

Shaw® Shaw Environmental, Inc.

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

Location of Meeting: Shaw Office, Houston

Date of Meeting: **August 22, 2006, 1:30 – 4:00 PM**

Meeting Participants:

BRAC:	Rose M. Zeiler
USAEC:	Jeff Armstrong
USACE-Tulsa:	Cliff Murray, Rick Smith
USFWS:	Paul Bruckwicki, Barry Forsythe
Shaw Environmental:	Praveen Srivastav, Dave Cobb, Kay Everett, Frank Eidson, Nicole Olson, John Elliott, Bob Culbertson
USEPA Region 6:	Chris Villarreal, Stephen Tzhone
TCEQ:	Fay Duke, Tom Erny

Prior to the meeting Shaw and Army had distributed copies of the meeting agenda, minutes of July 18, 2006 Monthly Managers' Meeting, and document status tables for the TERC and PBC work via e-mail.

Rose Zeiler went through the list of action items from the previous monthly managers' meeting. Below are the highlights of this discussion:

- **Army – Resolve Future Use Issue for MMRP Sites:** Rose Zeiler indicated that the resolution is in progress as part of the EE/CA process.
- **Army – Send Site 12 letter regarding change in alternatives**: The letter has been sent by the Army.
- **Army – Check requirements for demolition documentation to be in the administrative record:** Rose Zeiler stated that she checked the Fort Chaffee AR and found that the only demolition-related documents in the AR were related to an asbestos burial site. She indicated that Army will include documents related to disposal of asbestos at the landfill. Chris Villarreal added that only those documents that are basis of a decision should be included in the AR.
- **Army –** Resolve Electricity Issue: The electric company may provide an estimate to bring in a line to the Administration Building.
- **TCEQ – Provide comments on LHAAP-29 and 35/36 work plans:** Comments on LHAAP-29 and LHAAP-35/36 work plans have been provided.

- **EPA – Provide comments on LHAAP-29 and 35/36 work plans:** Comments have been provided.

Defense Environmental Restoration Program (DERP) PBC Update (Dave Cobb)

Field Update. Shaw mobilized on 8/21/06 to perform monitoring well installation at LHAAP-29, and sampling at LHAAP-03, 06, 64, 66, 35/36, and 55. USFWS requested that Shaw copy them on the field schedule.

GWTP. Greg Jones provided an update on the GWTP operation. The plant is performing as usual. The INF pond has 3.5 feet of freeboard. The plant treated 700,000 gallons last month, as compared to 1 million gallons/month in February and March of this year. The plant is being operated 3 days a week. No other significant developments to report. Shaw distributed copies of a proposed system optimization plan for the GWTP. Greg Jones pointed out that Shaw's optimization plan involves conversion of some of the extraction sumps to injection points, conversion of one of the monitoring wells to an extraction well, creation of percolation galleries, among others. The optimization measures will increase the flow of water through the system that would help flush chlorinated solvents at a higher rate than currently achieved, and also alleviate the problem of having to store the effluent water in the INF pond during dry periods when Harrison Bayou is not flowing. The optimization also proposes a reduction in the frequency of sampling of GWTP effluent and the monitoring well network, in an effort to streamline the sampling and reporting process.

Document Status. PBC document status table was provided to the participants. Dave Cobb posed a question to the regulators as to whether they would consider time-critical removal (TCRA) action for sites like LHAAP-50, which requires remedial action of removal/disposal for soil and MNA/LTM for groundwater. Chris Villarreal indicated that TCRA process is typically not used for groundwater action but he would get back to Shaw and Army on that issue. Fay Duke stated that there may be a statutory limitation on the use of TCRA for this purpose, but it would be EPA's decision.

BERA. The work plan is in Army's review. Army's comments are expected soon. The work plan will be submitted to regulators after resolution of Army's comments. Jeff Armstrong asked Praveen Srivastav to provide a summary of the issue revolving around perchlorate toxicity and hazard calculations. Praveen Srivastav explained that the stakeholders agreed during the BERA meeting in Austin that Shaw would calculate a TRV for perchlorate based on available toxicity data and present hazard calculations in the BERA report. It was agreed that PRGs will not be presented in the BERA report. The Army has since determined that the available toxicity information on perchlorate is not adequate to allow calculation of TRV and ecological hazard. The values calculated by Shaw may be presented as bench mark values for perchlorate. Barry Forsythe stated that soil perchlorate toxicity will likely not be a problem at Longhorn because of the lack of pathways. Surface water ingestion may be a problem. Jeff Armstrong asked the regulators whether the BERA report may be called final if perchlorate is not addressed in the report. Chris Villarreal indicated that EPA, specifically Susan Roddy, would like to see the hazard evaluation. Praveen Srivastav indicated that the perchlorate toxicity issues are being resolved with the Army and will be forwarded to the regulators after the resolution.

Military Munitions Response Program (Rick Smith)

- Rick Smith provided an update on the MMRP activities. Some discussion took place on the sampling for white phosphorous. Four locations are picked in the OB/OD area at Site 27 and 2 samples are planned near the mortar test area at Site 5. Chris Villarreal and Tom Erny pointed out that any samples collected would probably not show white phosphorous because white phosphorous ignites upon contact with air and is consumed. Rick Smith indicated that the sites will be NFA if no MEC is found.
- Steve Tzhone requested a copy of the MMRP report. Rose Zeiler replied that the report is not available yet but may be provided to EPA when it is available.

Defense Environmental Restoration Program (DERP) TERC Update (P. Srivastav)

Document Status. TERC document status table was provided to the participants. Highlights of discussion are:

- LHAAP-12 Remedial Design Addendum is in regulatory review
- Steve Tzhone mentioned that he has provided comments on Draft Final Proposed Plans for LHAAP-08 and 60. He said that the documents look fine.
- Fay Duke expressed a concern that she has seen several documents that are based on draft or draft final documents such as the Draft Final Modeling Report, Draft Final Evaluation of Perimeter Well Data as Background, among others. Praveen Srivastav explained that the reason for this happening is that these reports have been in review for a very long time. In the mean time, there was a need to use the results of these reports and thus it was decided to go ahead and start using them.

DERP Corps of Engineers Update (Rick Smith)

Perimeter Well Sampling
Rick Smith informed that the perimeter well sampling issue has not been resolved. Chris Villarreal informed that EPA will utilize one of its contracts to sample the perimeter wells if the issue is not resolved soon.

Other (Rose Zeiler)

Transfer Update. Nothing has changed. Funding has been approved for ECOPIV; however, it is not known when the money will come in. Rose Zeiler mentioned that she received an e-mail from Paul Fortune asking why there has not been any transfer of property since the hold was lifted. The West FIA, one of the parcels on hold, in fact transferred in April.

Demolition. Rose Zeiler mentioned that the demolition contractor damaged a monitoring well at LHAAP-47 (47WW24). The contractor will have to replace the well at its own expense.

Security. Rose Zeiler indicated that the site is scheduled to be opened in September, 2006 for escorted tours. Army is planning to have Bill Corrigan repair gates and fences. Security will

remain until March 14, 2007; however, they may operate out of the Fire Station instead of the front gate.

Schedule. Next monthly managers' meeting is scheduled for September 26, 2006 at 1:30 pm at Longhorn. The RAB meeting is scheduled for the same day at 6:30 pm.

Meeting Adjourn.

Action Items:

Army	- Provide MMRP report to EPA when available
	- Provide comments on GWTP Optimization Memo
EPA	– Provide input on the use of TCRA for remedial action at LHAAP-50 and other similar sites
Shaw	- Provide a field schedule to USFWS
	- Resolve perchlorate TRV and hazard calculation issue and provide perchlorate memo the stakeholders

LONGHORN ARMY AMMUNITION PLANT
MONTHLY MANAGERS' MEETING

Location	Shaw E & I, Inc. Houston, Texas		
Date	22-Aug-2006	**Time**	1330

ATTENDEES

Name (printed)	Signature	Organization	Phone	E-mail
Longhorn Team Members				
Rose M. Zeiler		BRAC	(479) 635-0110	rose.zeiler@monroe.army.mil
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Cliff Murray		USACE, Tulsa	(918) 669-7573	cliff.murray@usace.army.mil
Rick Smith	Rick Smith	USACE, Tulsa	(918) 669-4956	richard.p.smith@usace.army.mil
Chris Villarreal	Chris Villarreal	USEPA, Dallas	(214) 665-6758	villarreal.chris@epa.gov
Stephen Tzhone		USEPA, Dallas	(214) 665-8409	tzhone.stephen@epa.gov
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Fay Duke		TCEQ, Austin	(512) 239-2443	fduke@tceq.state.tx.us
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Paul Bruckwicki		USFSW	(903) 679-~~4538~~ 9144	paul_bruckwicki@fws.gov
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JOHN ELLIOTT		SHAW	713-996-4517	JOHN.ELLIOTT@SHAWGRP.COM

Shaw® Shaw Environmental, Inc.

Date: ***September 21, 2006***

Project No.:117591.0007A100

TRANSMITTAL LETTER:

To: Mr. Cliff Murray

Address: US Army Corps of Engineers - Tulsa

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

Re: **Final Addendum 7 Additional Investigation at LHAAP-35/36 Sumps and Waste Rack Sumps to Final Installation-Wide Work Plan**
Longhorn Army Ammunition Plant - Karnack, Texas

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	3	September 2006	**Final Addendum 7 Additional Investigation at LHAAP-35/36 Sumps and Waste Rack Sumps to Final Installation-Wide Work Plan** (a) EPA and TCEQ Comments to Draft Final Addendum 7 Additional Investigation at LHAAP-35/36 Sumps and Waste Rack Sumps (b) *Shaw Response to EPA and TCEQ Comments to Draft Final Addendum 7 Additional Investigation at LHAAP-35/36 Sumps and Waste Rack Sumps*

Enclosed are three copies of the above-named documents to attach to your current document entitled *Draft Final Addendum 7 Additional Investigation at LHAAP-35/36 Sumps and Waste Rack Sumps to Final Installation-Wide Work Plan*. These attachments and cover letters, when attached to the draft final document, constitutes the final document, *Final Addendum 7 Additional Investigation at LHAAP-35/36 Sumps and Waste Rack Sumps to Final Installation-Wide Work Plan*.

Please distribute to interested parties. Copies have also been sent to people on the distribution list below.

Please call if any questions or comments.

Sincerely:

David P. Cobb

CC: See attached page

100 Technology Center Drive Stoughton, MA 02072 Phone: (617) 589-8000/Fax: (617) 589-2160

Distribution List:

Mr. Rick Smith, USACE, Tulsa (sent to C. Murray for distribution)
Mr. Ken Kebbel, USACE, Tulsa (sent to C. Murray for distribution)
Mr. Chris Villearreal, USEPA, Dallas
Ms. Fay Duke, TCEQ, Austin
Mr. Dale Vodak, TCEQ, Tyler
Mr. Paul Bruckwicke, USFWL
Mr. Jeff Armstrong - AEC
Ms. Rose Zeiler – BRAC-LHAAP

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

September 21, 2006

DAIM-BD-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
TCEQ Environmental Cleanup Section II MC-221
12100 Park 35 Circle
Austin, TX 78753

Re: Final Addendum 7 Additional Investigation at LHAAP-35/36, Sumps and Waste Rack Sumps to Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas, September 2006

Dear Ms. Duke,

The above-referenced document is being transmitted to you for your review. 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 David Cobb, 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, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
Chris Villarreal, USEPA Region 6, Dallas, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE – Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
David P. Cobb, Shaw – Stoughton, MA
P. Srivastav, Shaw – Houston, TX (for project files)

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

September 21, 2006

DAIM-BD-LO

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

Re: Final Addendum 7 Additional Investigation at LHAAP-35/36, Sumps and Waste Rack Sumps to Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas, September 2006

Dear Mr. Villarreal,

The above-referenced document is being transmitted to you for your review. 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 David Cobb, 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, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
Fay Duke, TCEQ, Austin, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE – Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
David Cobb, Shaw – Stoughton, MA
P. Srivastav, Shaw – Houston, TX (for project files)

Response to Comments on
Draft Final Addendum 7, Soil Sampling at LHAAP-35/36 Sumps and Waste Rack Sumps Work Plan (April 2006)
Final Installation-Wide Work Plan
Longhorn Army Ammunition Plant, Karnack, Texas (June 2007)

September 2006

Reviewer: Raji Josiam, USEPA, Region 6; Fay Duke, TCEQ
Respondents: Kay Everett and Praveen Srivastav, 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 #	Section/ Pages	Paragraph /line	Comment	C,D, or E	Response	A or D[2]
Comments from Raji Josiam, USEPA						
1	1.2/page 1-1		Include a statement that x number of sumps have been removed and x number of sumps remain in place.	C	The statement will be added to the report of the sampling results.	
2	2.2/page 2-2		Is there a list available of the sumps that are in-place and the sumps that have been removed? That will be useful information to include as a table if we ever need to go back and sample the in-place sumps themselves in the future. In the list of the sumps that were not located during earlier field reconnaissance by Shaw, shouldn't Sump 115 also be included? What are the plans for abandoning the sumps that are still in place? Include in document or reference another document.	C	Shaw will include a list as requested in the report of the sampling results. Sumps 115 and 124 will be added to the list of sumps whose location is to be verified in the field. Future plans for the sumps will depend upon the results of the investigation and proposed actions will be included in the report of the sampling results.	
3	2.2/page 2-3		The section indicates that since the waste rack sumps are still present will be sampled and analyzed. Are there other sumps that are not waste rack sumps still present? Will those be sampled? As indicated above a table indicating the sumps abandoned and those in place will be useful information.	C	A list of sumps that are still present will be included in the report of the sampling results. If the waste rack sumps are present and contain a material that can be sampled, a sludge, sediment, or water samples from the sump or waste rack sump will be collected at the time of the field investigation.	
4	3.1/page 3-1		In the procedures for sampling each boring item # 8 indicates that if the location is clear of underground utilities, proceed with DPT drilling. Shouldn't utilities be marked before the start of the sampling? Please indicate.	C	Prior to a mobilization, Shaw personnel review historical maps for the possible presence of underground lines and a professional utility locate	

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					service is contacted to mark the utilities present, where applicable. These procedures are followed prior to going to the field. In addition, Shaw's standard operating procedures for installation of borings requires that the first 5 feet of each hole be advanced using hand augers or other such manual methods. Item #8 is based on all of the above measures taken to ensure that underground utilities are not damaged.	
5	3.2/page 3-2		This section indicates that except for 21 sumps past investigations indicate that various metals ere detected above clean up levels. Should this number of sumps be 31?	C	The report of the sampling results will indicate the appropriate number of sumps.	
6	3.2/page 3-3		Where will the samples be sent for analysis? Please indicate.	C	The samples will be submitted for analytical testing at Kemron Environmental Services in Marietta, Ohio. This will be clarified in the sampling report.	
Comments from Fay Duke, TCEQ						
7	General		It is stated that 31 sumps are excluded from additional further investigations based on review of existing information. To facilitate review, a brief descriptions of historical actions taken (e.g., investigations, closure/remediation) with regards to these sumps would have been useful for the review.	C	The information will be included in the report of results.	
			Two reports were referenced as the basis for excluding 21 sumps for further investigation. The TCEQ could not locate these two reports in the Administrative Records. If the bases of decisions for these sumps are based on data in these reports, the information should be added to the Administrative Records.		The reports will be included in the Administrative Record.	
			Additionally, a table summarizing the results/information used in arriving at these decisions should be included in the final evaluation report for LHAAP 35/36.		The information will be included in the report of results.	

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8	Section 2.1		It is unclear to the TCEQ why in some cases, sumps and areas affected by the sumps are evaluated within each LHAAP unit while others are included in LHAAP35/36. It is stated that nine sumps are excluded from investigation based on the Site Evaluation Report for LHAAP-48 and LHAAP 35-C. However, based on the recent draft final version of the Site Evaluation Report, certain data from the sump areas were excluded in the evaluation. Please confirm. Please also confirm that waste rack sump (WRSump013) is closed and areas surrounding the sumps were assessed and evaluated as part of the LHAAP-45.	C	Sumps within sites that were already in an advanced stage of evaluation or closure (e.g. LHAAP-48, LHAAP-35C(53)) prior to beginning of the LHAAP-35/36 investigation were left within those sites. This is also true for several other sites such as LHAAP-45, LHAAP-35B(37), LHAAP-67, which have been either closed (LHAAP-45) or are at FS stage (LHAAP-35B(37) and LHAAP-67). Sumps that are within sites such as LHAAP-46 or LHAAP-47 that are in FS stage are being investigated under LHAAP-35/36 so that the data is available when FSs for those sites are prepared. The Site Evaluation Report for LHAAP-48 and LHAAP-53 is being revised to include the data from the sumps within these sites. WRS013 has not been investigated or closed. Sampling of this sump and the soil around it will be included in the work plan.	
9	Table 2-3		Perchlorate is present in the groundwater in the vicinity of Build 25C. Please provide rationale for not analyzing for perchlorate in soils around sumps located in Building 25C. Similarly, please consider adding perchlorate to the analysis list to samples collected from areas where perchlorate is present in the groundwater (e.g., center portion of LHAAP 46).	C	Perchlorate will be added as an analyte to samples from sumps at Building 25C. Perchlorate was added as an analyte to soil samples from those sumps where associated buildings had oxidizer (perchlorate)-related operations. Shaw will review the analyte list for sumps in LHAAP-46, 47 and other areas to verify that the analytes are consistent with building functions and modify the list as appropriate.	

00042016

DRAFT FINAL
ADDENDUM 7
ADDITIONAL INVESTIGATION AT LHAAP-35/36 SUMPS AND WASTE RACK SUMPS
TO
FINAL INSTALLATION-WIDE WORK PLAN
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

June 2006

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Acronyms and Abbreviations

DPT	direct push technology
GPS	global positioning system
LHAAP	Longhorn Army Ammunition Plant
MARC	Multiple Award Remediation Contract
MSC	medium-specific concentration
OHM	OHM Remediation Services Corp.
QA	quality assurance
QC	quality control
Shaw	Shaw Environmental, Inc.
SVOC	semivolatile organic compound
TCEQ	Texas Commission on Environmental Quality
TO	task order
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

1.0 Introduction

This addendum describes investigation activities planned at various sumps and waste rack sumps, known collectively as site LHAAP-35/36, at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas, and describes how the investigation objectives will be accomplished.

The U.S. Army Corps of Engineers (USACE), Tulsa District, contracted Shaw Environmental, Inc. (Shaw), to perform this work under the Louisville District's Multiple Award Remediation Contract (MARC) No. W912QR-04-D-0027, Task Order (TO) DS02, with oversight by the USACE, Tulsa District. This document is an addendum to the *Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas* (Work Plan) (Shaw, 2006a).

1.1 Project Objectives

The objectives of the activities described in this addendum are to determine the presence or absence and to delineate the extent of contamination related to the various sumps and waste rack sumps included within LHAAP-35/36. The sumps are physically located within sites LHAAP-04, -18, -29, -39, -46, -47, -48, -35C(53), -35A(58), -59, and -66, and have been collectively designated as LHAAP-35/36.

1.2 Site Descriptions

LHAAP was active from the early 1940s to the late 1990s for the manufacturing of explosives, pyrotechnics, and rocket motors for World War II, the Korean War, and the Cold War. LHAAP was placed on inactive status in 1997. Aside from the abundant wildlife, the installation is predominantly unoccupied. Many of the production facilities have been demolished. LHAAP now consists of a heavily vegetated landscape with flat to slightly undulating terrain.

Many of the production buildings had sumps that collected washdown water. Sumps were also associated with waste racks where containers were cleaned. LHAAP-35/36 consists of 125 sumps and 20 waste rack sumps located throughout the LHAAP (**Figure 1-1**). The sumps have been organized into six sub-areas to aid in locating and investigating the sumps. **Table 1-1** provides a list of the sumps, the associated buildings, and the coordinates of the sump locations.

1.3 Document Organization

The tables and figures cited in this addendum are provided at the end of each section.

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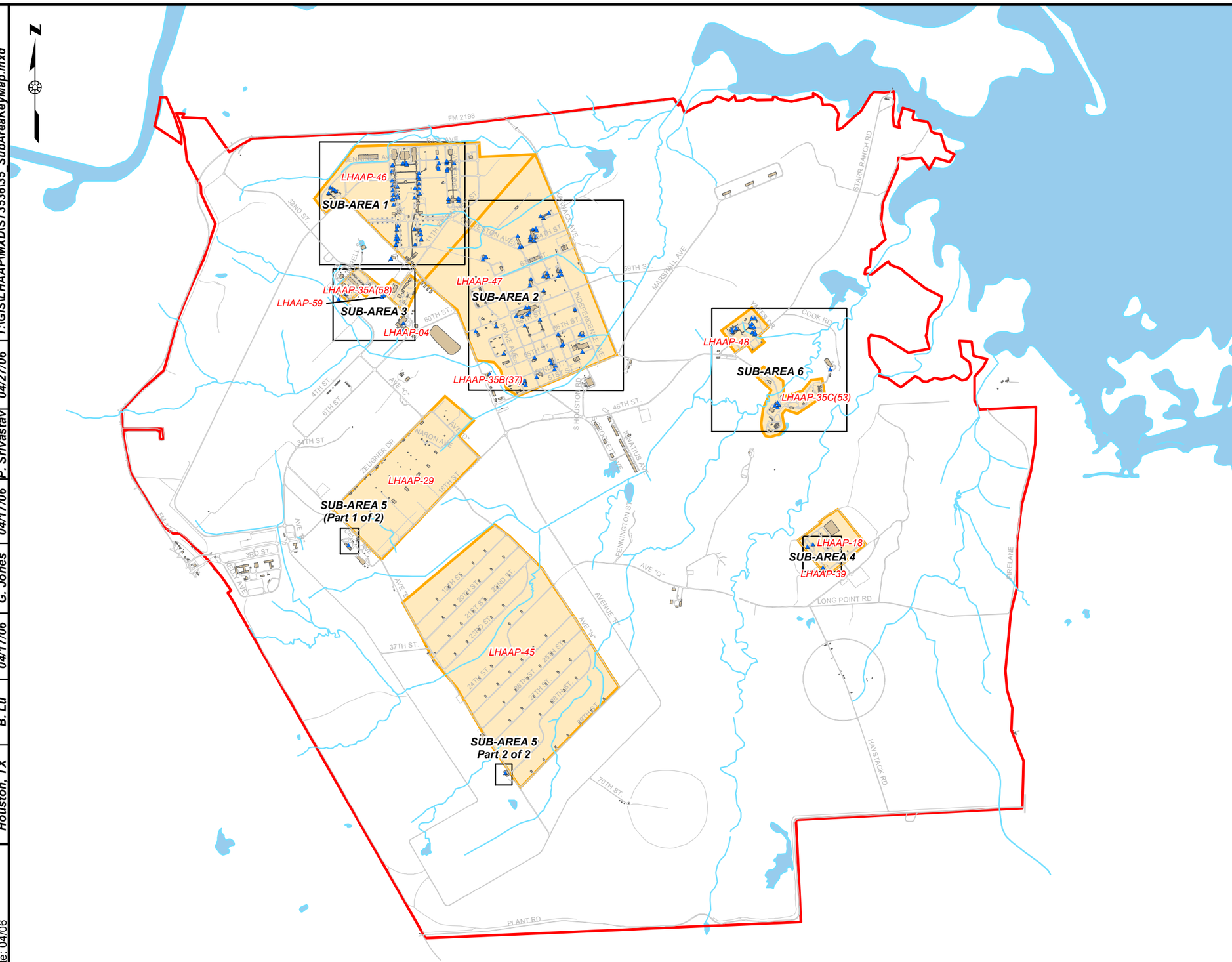

Legend

- Sump
- Stream
- Road
- Former or Existing Building
- Site
- Sub-Area
- Lake
- LHAAP Boundary

0 1,250 2,500 5,000 Feet

Shaw®

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

FIGURE 1-1

SUMP AND WASTE RACK SUMP LOCATIONS AND SUB-AREA KEY MAP
LHAAP-35/36

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	04/17/06	G. Jones	04/17/06	P. Srivastav	04/27/06	T:\GIS\LHAAP\MXD\ST3536\35_SubAreaKeyMap.mxd

Plot Date: 04/06

Table 1-1
Sump and Waste Rack Sump Master List

LOCATION CODE	Nearest Site	Building	Sub-Area	Easting	Northing	Sump Depth (feet)
LHAAP-35 Sumps						
SUMP001	LHAAP-46	P-1	1	3305660.0	6963271.3	5.0
SUMP002	LHAAP-46	P-3	1	3305918.0	6963332.6	5.0
SUMP003	LHAAP-46	P-3	1	3305906.0	6963306.1	5.0
SUMP004	LHAAP-46	P-3	1	3306009.0	6963290.8	5.0
SUMP005	LHAAP-46	P-3	1	3305998.0	6963333.7	4.0
SUMP006	LHAAP-46	P-116	1	3307022.0	6963177.5	11.0
SUMP007	LHAAP-46	P-116	1	3307026.0	6963140.4	9.0
SUMP008	LHAAP-46	P-117	1	3307014.0	6963357.9	5.0
SUMP009	LHAAP-46	P-117	1	3307003.0	6963324.6	7.0
SUMP010	LHAAP-46	P-118	1	3307055.0	6962430.5	9.0
SUMP011	LHAAP-46	P-118	1	3307053.0	6962355.2	11.0
SUMP012	LHAAP-46	P-118	1	3307302.0	6962438.8	10.0
SUMP013	LHAAP-46	P-118	1	3307304.0	6962369.6	9.0
SUMP014	LHAAP-46	B-5	1	3305677.0	6962282.8	4.0
SUMP015	LHAAP-46	B-7	1	3305660.0	6962405.0	5.0
SUMP016	LHAAP-46	B-7	1	3305651.0	6962434.4	4.0
SUMP017	LHAAP-46	B-9	1	3305664.0	6962528.0	2.5
SUMP018	LHAAP-46	B-9	1	3305742.0	6962466.5	5.0
SUMP019	LHAAP-46	B-10	1	3306332.0	6962559.9	5.0
SUMP020	LHAAP-46	B-11	1	3305653.0	6962645.2	5.5
SUMP021	LHAAP-46	B-12	1	3306316.0	6962691.7	3.5
SUMP022	LHAAP-46	B-13	1	3305654.0	6962775.2	7.0
SUMP023	LHAAP-46	B-14	1	3306311.0	6962809.7	3.5
SUMP024	LHAAP-46	B-15	1	3305644.0	6962890.6	1.5
SUMP025	LHAAP-46	B-16	1	3306318.0	6962924.5	5.0
SUMP026	LHAAP-46	SHED C	1	3306299.0	6962983.7	3.5
SUMP027	LHAAP-46	P-9	1	3305635.0	6963123.4	5.0
SUMP028	LHAAP-46	P-122	1	3306808.0	6963171.2	3.0
SUMP029	LHAAP-46	P-123	1	3306767.0	6963455.0	11.0
SUMP030	LHAAP-46	212-12	1	3305722.0	6961255.4	3.0
SUMP031	LHAAP-46	212-12	1	3305728.0	6961273.4	3.0
SUMP032	LHAAP-46	212-14	1	3305725.0	6961408.2	3.5
SUMP033	LHAAP-46	212-14	1	3305765.0	6961357.8	4.0
SUMP034	LHAAP-46	212-16	1	3305755.0	6961495.8	3.0
SUMP035	LHAAP-46	212-18	1	3305753.0	6961652.4	3.5
SUMP036	LHAAP-46	P-122	1	3306799.0	6963213.1	Unknown
SUMP037	LHAAP-46	212-29	1	3305775.0	6962514.6	3.0
SUMP038	LHAAP-46	212-32	1	3306217.0	6961282.8	2.0
SUMP039	LHAAP-46	212-33	1	3306377.0	6961418.3	Unknown
SUMP040	LHAAP-46	212-33	1	3306377.0	6961393.1	3.0
SUMP041	LHAAP-46	212-35	1	3306366.0	6961535.7	3.0
SUMP042	LHAAP-46	212-37	1	3306345.0	6961626.6	3.0
SUMP043	LHAAP-46	212-38	1	3306197.0	6961662.2	1.5
SUMP044	LHAAP-47	25-C	2	3308961.0	6957854.1	4.0
SUMP045	LHAAP-47	25-C	2	3309000.0	6957748.3	6.5
SUMP046	LHAAP-47	25-C	2	Unknown Location		Unknown
SUMP047	LHAAP-47	25-D	2	3309271.0	6957946.0	1.5
SUMP048	LHAAP-47	26-E	2	3309726.0	6958136.9	Unknown
SUMP049	LHAAP-47	26-E	2	3309759.0	6958232.3	3.0
SUMP050	LHAAP-47	26-E	2	3309609.0	6958381.8	4.0
SUMP051	LHAAP-47	26-E	2	3309647.0	6958295.4	6.0
SUMP052	LHAAP-47	28-G	2	3310425.0	6958579.4	2.0
SUMP053	LHAAP-47	29-D	2	3309227.0	6958440.6	7.0
SUMP054	LHAAP-47	31-G	2	3309903.0	6958742.0	5.0
SUMP055	LHAAP-47	31-G	2	3309937.0	6958768.8	4.5
SUMP056	LHAAP-47	32-H	2	3310440.0	6958998.2	3.0
SUMP057	LHAAP-47	33-G	2	3309811.0	6959025.1	6.0
SUMP058	LHAAP-47	36-B	2	3308448.0	6958541.1	Unknown

Table 1-1
Sump and Waste Rack Sump Master List

LOCATION CODE	Nearest Site	Building	Sub-Area	Easting	Northing	Sump Depth (feet)
SUMP059	LHAAP-47	41-E	2	3308972.0	6959235.3	4.0
SUMP060	LHAAP-47	42-E	2	3309353.0	6959391.8	5.0
SUMP061	LHAAP-47	42-H	2	3310237.0	6959647.9	8.0
SUMP062	LHAAP-47	45-E	2	3308753.0	6959484.6	2.5
SUMP063	LHAAP-47	45-E	2	3308907.0	6959461.0	2.5
SUMP064	LHAAP-47	45-E	2	3309044.0	6959513.6	4.0
SUMP065	LHAAP-47	45-E	2	3309092.0	6959575.0	4.0
SUMP066	LHAAP-47	45-E	2	3309082.0	6959699.1	4.0
SUMP067	LHAAP-47	45-E	2	3309002.0	6959693.0	3.0
SUMP068	LHAAP-47	46-A	2	3307741.0	6959101.2	5.5
SUMP069	LHAAP-47	46-B	2	3308258.0	6959223.1	5.5
SUMP070	LHAAP-47	50-G	2	3309449.0	6960124.0	7.0
SUMP071	LHAAP-47	54-F	2	3309133.0	6960412.1	6.0
SUMP072	LHAAP-47	54-F	2	3309105.0	6960247.2	6.0
SUMP073	LHAAP-47	54-G	2	3309438.0	6960478.6	2.5
SUMP074	LHAAP-47	54-G	2	3309538.0	6960557.8	3.0
SUMP075	LHAAP-47	54-G	2	3309576.0	6960472.4	3.5
SUMP076	LHAAP-47	54-H	2	3309822.0	6960486.8	6.0
SUMP077	LHAAP-47	54-H	2	3309871.0	6960612.8	6.0
SUMP078	LHAAP-47	68-C	2	3307985.0	6960967.9	3.5
SUMP079	LHAAP-47	68-C	2	3308004.0	6960965.9	3.5
SUMP080	LHAAP-47	68-C	2	3307922.0	6960908.0	1.0
SUMP081	LHAAP-47	68-F	2	3308837.0	6961204.3	9.0
SUMP082	LHAAP-47	68-F	2	3308899.0	6961231.9	6.0
SUMP083	LHAAP-47	68-F	2	3308795.0	6961493.3	8.5
SUMP084	LHAAP-47	68-G	2	3309216.0	6961370.5	1.5
SUMP085	LHAAP-47	68-G	2	3309118.0	6961472.3	3.5
SUMP086	LHAAP-47	68-G	2	3309123.0	6961430.0	7.0
SUMP087	LHAAP-47	68-G	2	3309180.0	6961664.8	2.5
SUMP088	LHAAP-47	68-G	2	3309255.0	6961680.4	6.0
SUMP089	LHAAP-47	68-G	2	3309275.0	6961633.3	6.0
SUMP090	LHAAP-47	68-G	2	3309255.0	6961480.7	8.0
SUMP091	LHAAP-47	75-I	2	3309375.0	6961997.0	5.0
SUMP092	LHAAP-47	75-I	2	3309448.0	6961946.0	6.5
SUMP093	LHAAP-47	75-I	2	3309581.0	6962071.9	5.5
SUMP094	LHAAP-48	16-Y	6	3314201.0	6959077.1	2.0
SUMP095	LHAAP-48	34-Y	6	3314773.0	6959043.2	5.5
SUMP096	LHAAP-48	34-Y	6	3314695.0	6959072.0	1.5
SUMP097	LHAAP-48	38-Y	6	3314745.0	6959194.6	4.0
SUMP098	LHAAP-48	38-Y	6	3314675.0	6959214.7	2.0
SUMP099	LHAAP-48	38-Y	6	3314687.0	6959291.8	2.0
SUMP100	LHAAP-48	45-Y	6	3314684.0	6959424.4	1.5
SUMP101	LHAAP-48	45-Y	6	3314769.0	6959424.6	4.0
SUMP102	LHAAP-35C(53)	16-T	6	3315331.0	6957302.8	4.0
SUMP103	LHAAP-35C(53)	16-T	6	3315376.0	6957244.9	4.0
SUMP104	LHAAP-35C(53)	16-T	6	3315261.0	6957234.4	7.5
SUMP105	LHAAP-35C(53)	16-T	6	3315334.0	6957178.6	4.0
SUMP106	LHAAP-66	401	3	TBD	TBD	Unknown
SUMP107	LHAAP-46	403	1	3304220.0	6962625.3	2.0
SUMP108	LHAAP-46	406	1	3304167.0	6962665.8	1.5
SUMP109	LHAAP-46	408	1	3304038.0	6962574.3	2.0
SUMP110	LHAAP-46	207	1	3305605.0	6960922.4	4.2
SUMP111	LHAAP-35A(58)	722-P	3	3305272.0	6960171.7	3.5
SUMP112	LHAAP-35A(58)	722-P	3	3305238.0	6960122.1	4.5
SUMP113	LHAAP-35A(58)	744	3	3304486.0	6960042.2	4.0
SUMP114	LHAAP-39	25-X	4	3316477.0	6953151.6	3.5
SUMP115	LHAAP-18	33-X	4	TBD	TBD	7.0

Table 1-1
Sump and Waste Rack Sump Master List

LOCATION CODE	Nearest Site	Building	Sub-Area	Easting	Northing	Sump Depth (feet)
SUMP116	LHAAP-18	37-X	4	3316083.0	6953676.5	5.5
SUMP117	LHAAP-58	744-A	3	3304290.0	6959900.9	Unknown
SUMP118	LHAAP-29	813	5[a]	3304549.0	6953715.7	3.0
SUMP119	LHAAP-59	725	3	3305443.0	6959996.6	5.0
SUMP120	LHAAP-59	725	3	3305384.0	6959963.3	4.0
SUMP121	LHAAP-47	32-H	2	3310365.0	6959021.9	Unknown
SUMP122	LHAAP-04	401-C	3	3305919.0	6959108.4	4.0
SUMP123	LHAAP-48	18-Y	6	3314190.0	6959128.2	Unknown
SUMP800 (Sump124)	LHAAP-53	23-T	6	TBD	TBD	Unknown
Unnumbered Sump (Sump125)	LHAAP-58	723	3	TBD	TBD	Unknown
LHAAP-36 Waste Rack Sumps						
WRSUMP001	LHAAP-48	34-Y	6	3314758.0	6959018.5	4.0
WRSUMP002	LHAAP-48	38-Y	6	3314644.0	6959229.7	4.0
WRSUMP003	LHAAP-48	16-Y	6	3314290.0	6959161.5	4.0
WRSUMP004	LHAAP-46	P-1	1	3305644.0	6963265.8	4.0
WRSUMP005	LHAAP-46	P-117	1	3307018.0	6963384.6	4.0
WRSUMP006	LHAAP-46	P-118	1	3307324.0	6962430.8	4.0
WRSUMP007	LHAAP-46	P-122	1	3306818.0	6963325.2	4.0
WRSUMP008	LHAAP-46	B-8	1	3306214.0	6962694.8	4.0
WRSUMP009	LHAAP-46	S-113	1	3306197.0	6962456.4	4.0
WRSUMP010	LHAAP-46	P-12	1	3305783.0	6962467.3	4.0
WRSUMP011	LHAAP-46	B-13	1	3305777.0	6962727.1	4.0
WRSUMP012	LHAAP-46	P-113	1	3307198.0	6963322.7	4.0
WRSUMP013	LHAAP-45	824	5[b]	3308486.0	6947986.5	4.0
WRSUMP014	LHAAP-37	29-A	2	3308086.0	6958019.4	4.0
WRSUMP015	LHAAP-46	212-14	1	3305793.0	6961425.5	4.0
WRSUMP016	LHAAP-46	407	1	3304087.0	6962710.9	4.0
WRSUMP017	LHAAP-47	68-G	2	3309119.0	6961379.5	4.0
WRSUMP018	LHAAP-47	54-H	2	3309897.0	6960525.6	4.0
WRSUMP019	LHAAP-46	212-20	1	3305781.0	6961746.7	4.0
WRSUMP021	LHAAP-46	P-11	1	3306316.0	6963080.5	4.0

Notes:
[a] Part 1 of 2 of Sub-Area 5
[b] Part 2 of 2 of Sub Area 5
TBD to be determined

2.0 Investigation Approach

Shaw's overall approach to the investigation of LHAAP-35/36 is to review the existing information, identify where further sampling is needed, and implement field sampling activities. The steps of this approach are diagrammed in **Figure 2-1** and described in more detail in following subsections.

2.1 Review of Existing Information

Of the 145 sumps and waste rack sumps in LHAAP-35/36, 31 are excluded from any further investigation based on a review of existing information (**Table 2-1**). The rationale for excluding these sumps is as follows:

- Based on historical analytical data provided by Thiokol Corporation in *Closure Report, Closure of 29 Active and 11 Transition Sumps, Longhorn Army Ammunition Plant, Karnack, Texas* (Thiokol, 1996) and historical data provided by OHM Remediation Services Corp. (OHM) in the report entitled *Removal and Closure of Wastewater Sumps, Longhorn Army Ammunition Plan, Karnack, Texas* (OHM, 1997), 21 sumps will not be a part of this investigation. As indicated in **Figure 2-1**, these sumps were excluded because the analytical results for material from the sumps indicate that contaminant concentrations do not exceed Texas Commission on Environmental Quality (TCEQ) medium-specific concentrations (MSCs). The data in those reports indicated that 37 sumps were "clean;" however, the analysis of samples from in and around the sumps were typically limited to volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. Based on the 2005 *Environmental Site Assessment Phase I and II Report* (Plexus Scientific Corporation, 2005), potential contaminants were identified for the various buildings associated with the LHAAP-35/36 sumps (see **Table 2-2**), and several other contaminants were found to be potentially associated with building operations adjacent to 16 of the 37 clean sumps. Therefore, only 21 of the 37 clean sumps were excluded from further investigation.

- Based on the *Site Evaluation Report, LHAAP-48 (Former Igniter Production Area) and LHAAP-35C(53) (Former Static Test Area), Longhorn Army Ammunition Plant, Karnack, Texas* (Shaw, 2006b), no further investigation is required at LHAAP-48 and -35C(53) (Sub-Area 6). Seventeen sumps exist at these sites and can be excluded from this investigation. Since eight of those 17 sumps were already excluded based on the historical data discussed above (see **Table 2-1**), nine sumps are excluded from investigation solely based on the Site Evaluation Report.

- LHAAP-45 has already been transferred to the U.S. Fish and Wildlife Service. One waste rack sump, WRSump013, exists at this site and is not subject to further investigation.

2.2 Proposed Sampling Locations

This section identifies the specific sampling locations that are proposed at each sump. For the 114 sumps and waste rack sumps that require further investigation, borings are proposed to provide a triangular grid around each sump. Each proposed boring is typically located either downgradient from the sump or at a location that steps out from a historical boring location where a past result exceeded a TCEQ MSC.

A former sump location may have up to three borings advanced within a 15-foot radius of the original sump location. The borings will be placed in areas around the former sump location to be certain that any possible contamination is delineated. Borings will be placed either downgradient, between the nearest building and the sump, and/or between the nearest streets and the sump. The proposed boring location may change if field reconnaissance suggests a more suitable location. Because of existing historical data, some sumps will not require three boring locations. Boring depths are dependent on sump depths. **Table 2-3** lists the borings to surround each former sump location, the direction from the former sump location that the borings are to be placed, and the sump and depths. **Figures 2-2** through **2-6** show proposed boring locations.

The location of some sumps must be determined or verified during field investigation. Below is a list of those sumps that were not located during earlier field reconnaissance by Shaw. Also provided are the buildings and sites with which the sumps are suspected to be associated.

Sump	Building	Site
Sump046	Building 25-C	LHAAP-47
Sump106	Building 401	LHAAP-04
Sump125	Building 723	To Be Investigated

Two samples (one surface and one subsurface) will typically be collected from each boring location designated in **Table 2-3**. Subsurface sample depths are 1 foot below the depth of the sump to vertically delineate any contamination. Surface soil samples are intended to identify potential contamination associated with sump overflows or spills at the sumps. Because many of the sumps have been removed and the area around them potentially filled and regraded, the proposed default locations for the surface samples are the boring locations around each sump or former sump location. However, in some cases (particularly waste rack sumps that are still in place), drainage pathways away from the sumps may be readily identifiable. For those sumps, it is proposed that surface sampling be limited to a single surface sample collected in the centerline of the drainage pathway. The individual surface samples would be biased toward areas of stained soil and/or locations as close as possible to the sump or former sump location.

Since the waste rack sumps are still present, the contents of the waste rack sumps (sludge and/or water) will be sampled and analyzed. The results will be compared to TCEQ MSCs. Borings outside the waste rack sumps will be advanced and sampled for the parameters suggested in **Table 2-3** only if the results for the sump contents exceed TCEQ MSCs. Analytical results exist for samples from one boring at each of the waste rack sumps (USACE, 1995); therefore, two additional borings would typically be advanced at each waste rack sump. Where possible (given the physical limitations of the sites), the additional borings would be the same distance from the waste rack sump as the existing sample location and approximately 120 degrees clockwise and counterclockwise, respectively, from a line extending from the sump to the existing sample location.

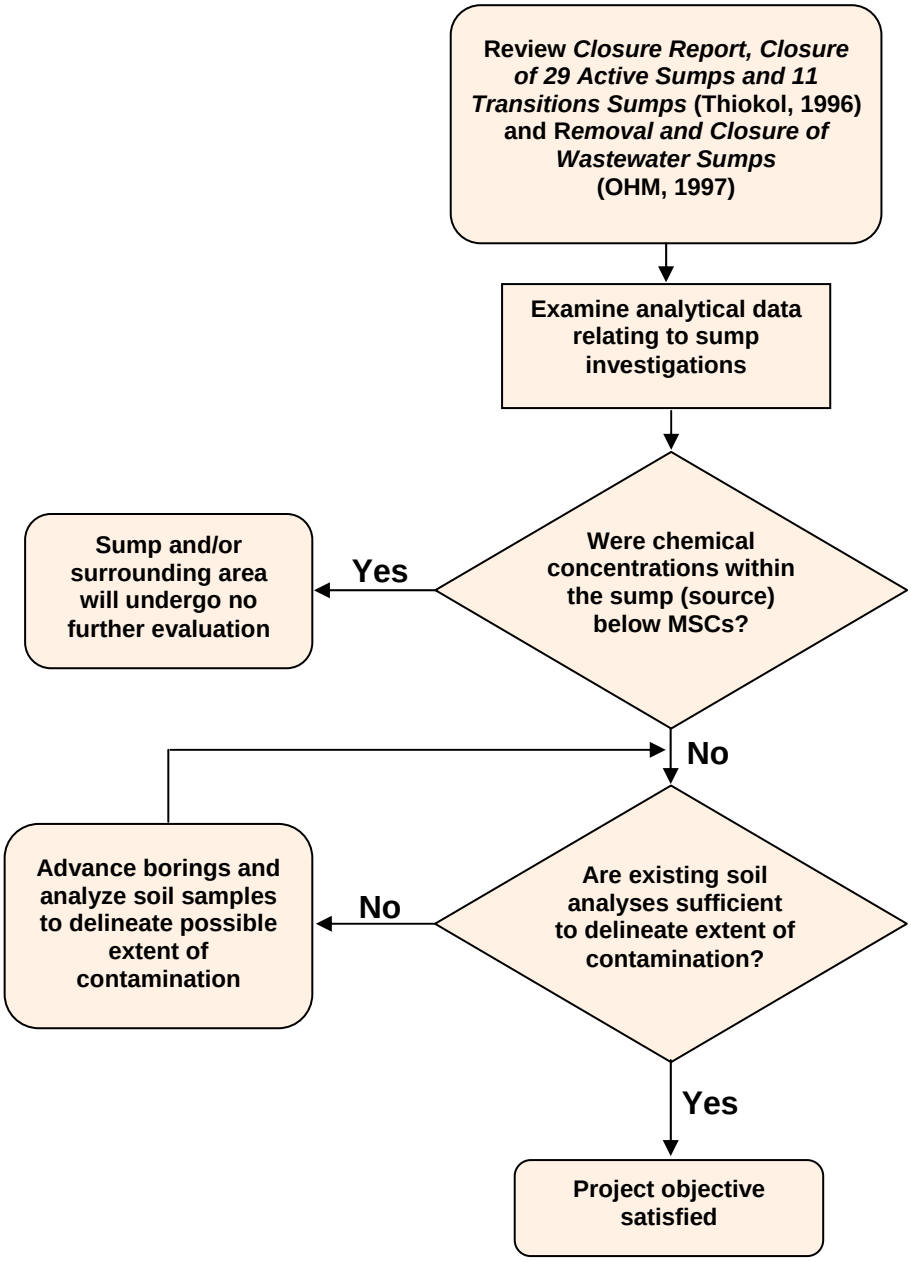

Figure 2-1
LHAAP-35/36 Sampling Decision Logic

00042029

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 04/13/06	A. Willmore 04/13/06	P. Srivastava 04/27/06	T:\GIS\LHAAP\MXD\Site35\36\35_SumpSA1_46.mxd

Legend

- Proposed Soil Boring
- Existing Soil Boring
- Sump
- Road
- Stream
- Former or Existing Building
- Site

Sumps in Sub-Area 1			
Location No.	Site ID	Building	Depth
SUMP001	LHAAP-46	P-1	5.0
SUMP002	LHAAP-46	P-3	5.0
SUMP003	LHAAP-46	P-3	5.0
SUMP004	LHAAP-46	P-3	5.0
SUMP005	LHAAP-46	P-3	4.0
SUMP006	LHAAP-46	P-116	11.0
SUMP007	LHAAP-46	P-116	9.0
SUMP008	LHAAP-46	P-117	5.0
SUMP009	LHAAP-46	P-117	7.0
SUMP010	LHAAP-46	P-118	9.0
SUMP011	LHAAP-46	P-118	11.0
SUMP012	LHAAP-46	P-118	10.0
SUMP013	LHAAP-46	P-118	9.0
SUMP014	LHAAP-46	B-5	4.0
SUMP015	LHAAP-46	B-7	5.0
SUMP016	LHAAP-46	B-7	4.0
SUMP017	LHAAP-46	B-9	2.5
SUMP018	LHAAP-46	B-9	5.0
SUMP019	LHAAP-46	B-10	5.0
SUMP020	LHAAP-46	B-11	5.5
SUMP021	LHAAP-46	B-12	3.5
SUMP022	LHAAP-46	B-13	7.0
SUMP023	LHAAP-46	B-14	3.5
SUMP024	LHAAP-46	B-15	1.5
SUMP025	LHAAP-46	B-16	5.0
SUMP026	LHAAP-46	SHED C	3.5
SUMP027	LHAAP-46	P-9	5.0
SUMP028	LHAAP-46	P-122	3.0
SUMP029	LHAAP-46	P-123	11.0
SUMP030	LHAAP-46	212-12	3.0
SUMP031	LHAAP-46	212-12	3.0
SUMP032	LHAAP-46	212-14	3.5
SUMP033	LHAAP-46	212-14	4.0
SUMP034	LHAAP-46	212-16	3.0
SUMP035	LHAAP-46	212-18	3.5
SUMP036	LHAAP-46	P-122	Unknown
SUMP037	LHAAP-46	212-29	3.0
SUMP038	LHAAP-46	212-32	2.0
SUMP039	LHAAP-46	212-33	Unknown
SUMP040	LHAAP-46	212-33	3.0
SUMP041	LHAAP-46	212-35	3.0
SUMP042	LHAAP-46	212-37	3.0
SUMP043	LHAAP-46	212-38	1.5
SUMP107	LHAAP-46	403	2.0
SUMP108	LHAAP-46	406	1.5
SUMP109	LHAAP-46	408	2.0
SUMP110	LHAAP-46	207	4.2
WRSUMP004	LHAAP-46	P-1	4.0
WRSUMP005	LHAAP-46	P-117	4.0
WRSUMP006	LHAAP-46	P-118	4.0
WRSUMP007	LHAAP-46	P-122	4.0
WRSUMP008	LHAAP-46	B-8	4.0
WRSUMP009	LHAAP-46	S-113	4.0
WRSUMP010	LHAAP-46	P-12	4.0
WRSUMP011	LHAAP-46	B-13	4.0
WRSUMP012	LHAAP-46	P-113	4.0
WRSUMP015	LHAAP-46	212-14	4.0
WRSUMP016	LHAAP-46	407	4.0
WRSUMP019	LHAAP-46	212-20	4.0
WRSUMP021	LHAAP-46	P-11	4.0

0 100 200 400 Feet

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FIGURE 2-2

SOIL SAMPLE AND SUMP LOCATION MAP
(SUB-AREA 1)
LHAAP-35/36

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

00042030

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
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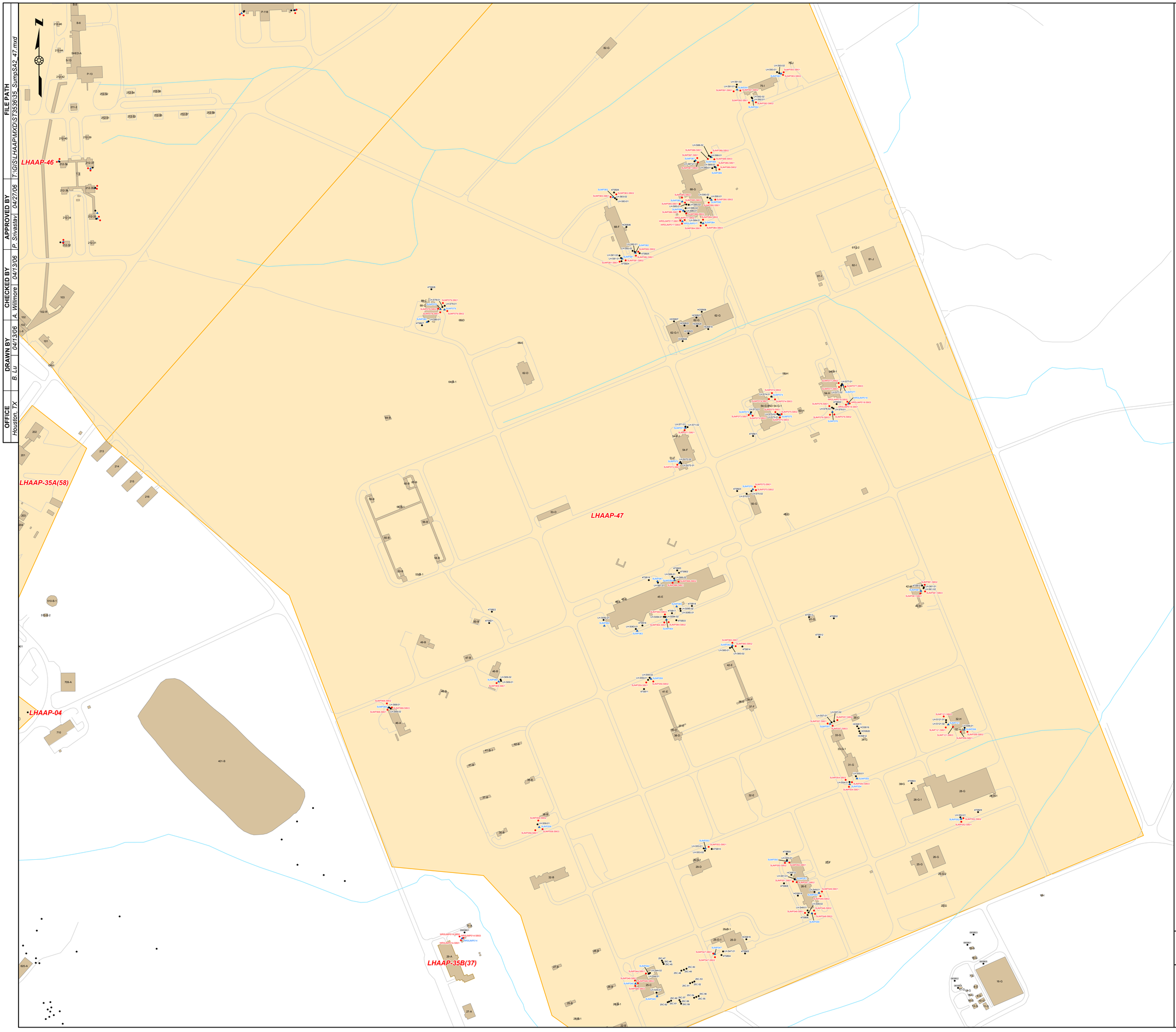

Legend

- Proposed Soil Boring
- Existing Soil Boring
- Sump
- Road
- Stream
- Former or Existing Building
- Site

Sumps in Sub-Area 2			
Location No.	Site ID	Building	Depth
SUMP044	LHAAP-47	25-C	4.0
SUMP045	LHAAP-47	25-C	6.5
SUMP046	LHAAP-47	25-C	Unknown
SUMP047	LHAAP-47	25-D	1.5
SUMP048	LHAAP-47	26-E	Unknown
SUMP049	LHAAP-47	26-E	3.0
SUMP050	LHAAP-47	26-E	4.0
SUMP051	LHAAP-47	26-E	6.0
SUMP052	LHAAP-47	28-G	2.0
SUMP053	LHAAP-47	29-D	7.0
SUMP054	LHAAP-47	31-G	5.0
SUMP055	LHAAP-47	31-G	4.5
SUMP056	LHAAP-47	32-H	3.0
SUMP057	LHAAP-47	33-G	6.0
SUMP058	LHAAP-47	36-B	Unknown
SUMP059	LHAAP-47	41-E	4.0
SUMP060	LHAAP-47	42-E	5.0
SUMP061	LHAAP-47	42-H	8.0
SUMP062	LHAAP-47	45-E	2.5
SUMP063	LHAAP-47	45-E	2.5
SUMP064	LHAAP-47	45-E	4.0
SUMP065	LHAAP-47	45-E	4.0
SUMP066	LHAAP-47	45-E	4.0
SUMP067	LHAAP-47	45-E	3.0
SUMP068	LHAAP-47	46-A	5.5
SUMP069	LHAAP-47	46-B	5.5
SUMP070	LHAAP-47	50-G	7.0
SUMP071	LHAAP-47	54-F	6.0
SUMP072	LHAAP-47	54-F	6.0
SUMP073	LHAAP-47	54-G	2.5
SUMP074	LHAAP-47	54-G	3.0
SUMP075	LHAAP-47	54-G	3.5
SUMP076	LHAAP-47	54-H	6.0
SUMP077	LHAAP-47	54-H	6.0
SUMP078	LHAAP-47	68-C	3.5
SUMP079	LHAAP-47	68-C	3.5
SUMP080	LHAAP-47	68-C	1.0
SUMP081	LHAAP-47	68-F	9.0
SUMP082	LHAAP-47	68-F	6.0
SUMP083	LHAAP-47	68-F	8.5
SUMP084	LHAAP-47	68-G	1.5
SUMP085	LHAAP-47	68-G	3.5
SUMP086	LHAAP-47	68-G	7.0
SUMP087	LHAAP-47	68-G	2.5
SUMP088	LHAAP-47	68-G	6.0
SUMP089	LHAAP-47	68-G	6.0
SUMP090	LHAAP-47	68-G	8.0
SUMP091	LHAAP-47	75-I	5.0
SUMP092	LHAAP-47	75-I	6.5
SUMP093	LHAAP-47	75-I	5.5
SUMP121	LHAAP-47	32-H	Unknown
WRSUMP014	LHAAP-35B(37)	29-A	4.0
WRSUMP017	LHAAP-47	68-G	4.0
WRSUMP018	LHAAP-47	54-H	4.0

0 150 300 600 Feet

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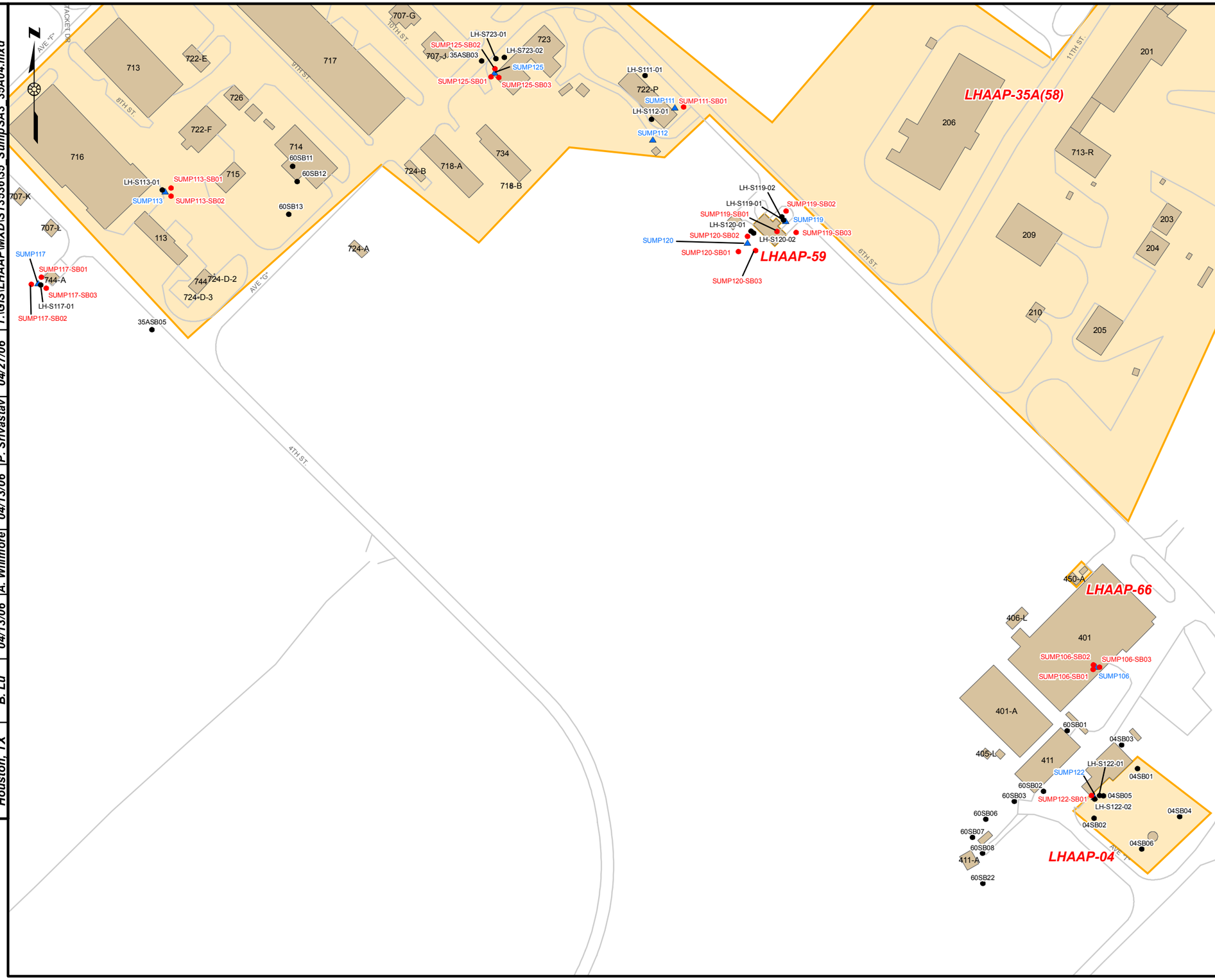
FIGURE 2-3

SOIL SAMPLE AND SUMP LOCATION MAP
(SUB-AREA 2)
LHAAP-35/36

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

00042031



Legend

- Proposed Soil Boring
- Existing Soil Boring
- Sump
- Road
- Former or Existing Building
- Site

Sumps in Sub-Area 3			
Location No.	Site ID	Building	Depth
SUMP106	LHAAP-66	401	Unknown
SUMP111	LHAAP-35A(58)	722-P	3.5
SUMP112	LHAAP-35A(58)	722-P	4.5
SUMP113	LHAAP-35A(58)	744	4.0
SUMP117	LHAAP-35A(58)	744-A	Unknown
SUMP119	LHAAP-59	725	5.0
SUMP120	LHAAP-59	725	4.0
SUMP122	LHAAP-04	401-C	4.0
Unnumbered Sump (Sump125)	LHAAP-35A(58)	723	Unknown

0 75 150 300 Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2-4

SOIL SAMPLE AND SUMP LOCATION MAP
(SUB-AREA 3)
LHAAP-35/36

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	04/13/06	A. Willmore	04/13/06	P. Srivastav	04/27/06	T:\GIS\LHAAP\MXD\ST3536\35_SumpSA3_35A04.mxd

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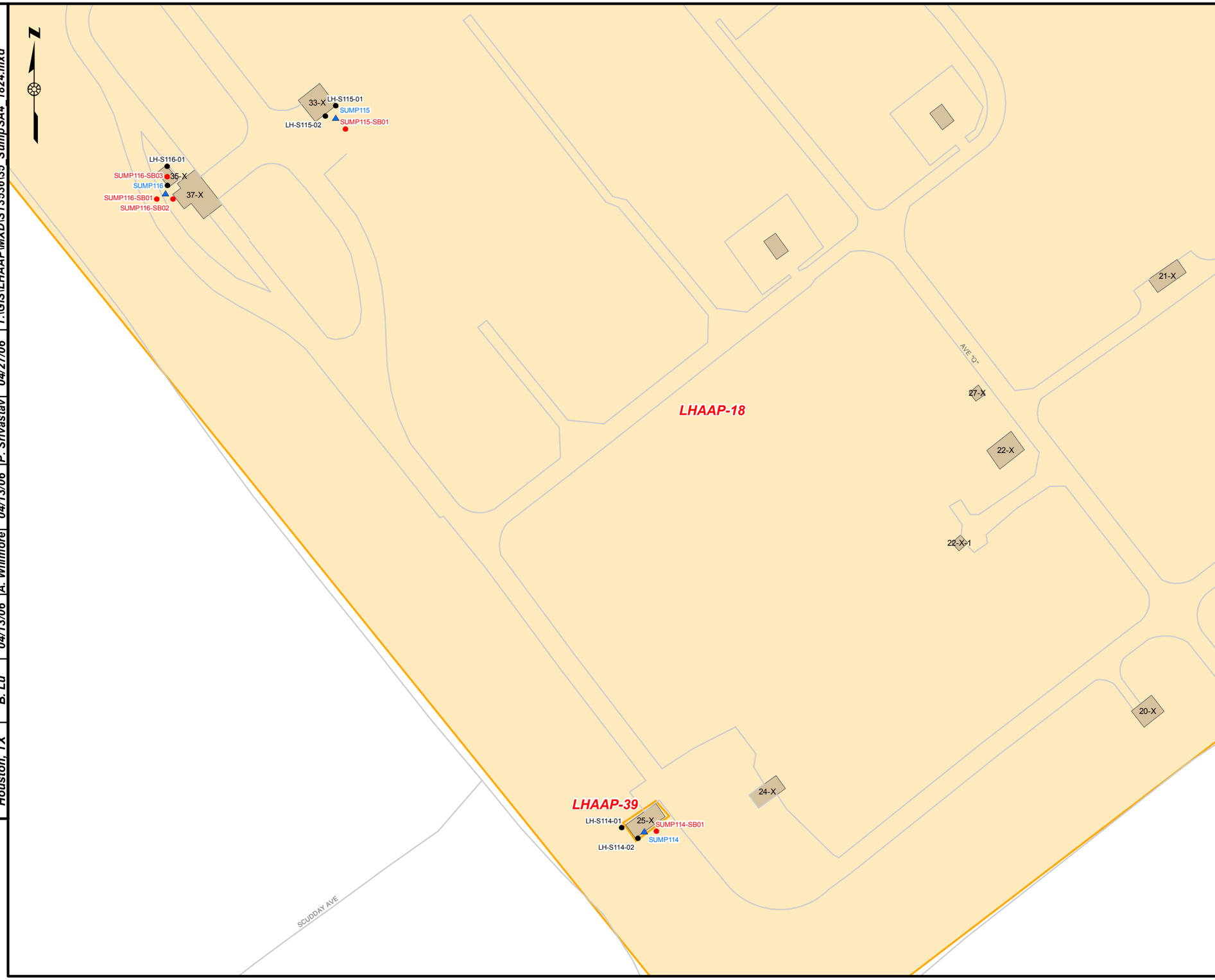

Legend

- Proposed Soil Boring
- Existing Soil Boring
- Sump
- Road
- Former or Existing Building
- Site

Sumps in Sub-Area 4			
Location No.	Site ID	Building	Depth
SUMP114	LHAAP-18	25-X	3.5
SUMP115	LHAAP-18	33-X	7.0
SUMP116	LHAAP-18	37-X	5.5

0 40 80 160 Feet

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FIGURE 2-5

SOIL SAMPLE AND SUMP LOCATION MAP
(SUB-AREA 4)
LHAAP-35/36

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	04/13/06	A. Willmore	04/13/06	P. Srivastav	04/27/06	T:\GIS\LHAAP\MXD\ST3536\35_SumpSA4_1824.mxd

Legend

- Proposed Soil Boring
- Existing Soil Boring
- Sump
- Road
- Former or Existing Building
- Site

Sumps in Sub-Area 5			
Location No.	Site ID	Building	Depth
SUMP118	LHAAP-29	813	3.0
WRSUMP013	LHAAP-45	744	4.0

0 25 50 100 Feet

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FIGURE 2-6

SOIL SAMPLE AND SUMP LOCATION MAP
(SUB-AREA 5, PART 1 OF 2)
LHAAP-35/36

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	04/13/06	A. Willmore	04/13/06	P. Srivastav	04/27/06	T:\GIS\LHAAP\MXD\ST3536\35_SumpSA5_2945.mxd

Table 2-1
Sumps Requiring No Further Investigation

LOCATION CODE	Nearest Site	Building	Sub-Area	Easting	Northing	Sump Depth	Reason Investigation Not Required [a]
LHAAP-35 Sumps							
SUMP006	LHAAP-46	P-116	1	3307022.0	6963177.5	11.0	1
SUMP014	LHAAP-46	B-5	1	3305677.0	6962282.8	4.0	1
SUMP028	LHAAP-46	P-122	1	3306808.0	6963171.2	3.0	1
SUMP039	LHAAP-46	212-33	1	3306377.0	6961418.3	Unknown	1
SUMP045	LHAAP-47	25-C	2	3309000.0	6957748.3	6.5	1
SUMP055	LHAAP-47	31-G	2	3309937.0	6958768.8	4.5	1
SUMP062	LHAAP-47	45-E	2	3308753.0	6959484.6	2.5	1
SUMP063	LHAAP-47	45-E	2	3308907.0	6959461.0	2.5	1
SUMP065	LHAAP-47	45-E	2	3309092.0	6959575.0	4.0	1
SUMP067	LHAAP-47	45-E	2	3309002.0	6959693.0	3.0	1
SUMP080	LHAAP-47	68-C	2	3307922.0	6960908.0	1.0	1
SUMP094	LHAAP-48	16-Y	6	3314201.0	6959077.1	2.0	1, 2
SUMP095	LHAAP-48	34-Y	6	3314773.0	6959043.2	5.5	2
SUMP096	LHAAP-48	34-Y	6	3314695.0	6959072.0	1.5	1, 2
SUMP097	LHAAP-48	38-Y	6	3314745.0	6959194.6	4.0	2
SUMP098	LHAAP-48	38-Y	6	3314675.0	6959214.7	2.0	1, 2
SUMP099	LHAAP-48	38-Y	6	3314687.0	6959291.8	2.0	2
SUMP100	LHAAP-48	45-Y	6	3314684.0	6959424.4	1.5	1, 2
SUMP101	LHAAP-48	45-Y	6	3314769.0	6959424.6	4.0	1, 2
SUMP102	LHAAP-35C(53)	16-T	6	3315331.0	6957302.8	4.0	1, 2
SUMP103	LHAAP-35C(53)	16-T	6	3315376.0	6957244.9	4.0	1, 2
SUMP104	LHAAP-35C(53)	16-T	6	3315261.0	6957234.4	7.5	2
SUMP105	LHAAP-35C(53)	16-T	6	3315334.0	6957178.6	4.0	1, 2
SUMP108	LHAAP-46	406	1	3304167.0	6962665.8	1.5	1
SUMP112	LHAAP-35A(58)	722-P	3	3305238.0	6960122.1	4.5	1
SUMP123	LHAAP-48	18-Y	6	3314190.0	6959128.2	Unknown	2
SUMP800 (Sump124)	LHAAP-35C(53)	23-T	6	TBD	TBD	Unknown	2
LHAAP-36 Waste Rack Sumps							
WRSUMP001	LHAAP-48	34-Y	6	3314758.0	6959018.5	4.0	2
WRSUMP002	LHAAP-48	38-Y	6	3314644.0	6959229.7	4.0	2
WRSUMP003	LHAAP-48	16-Y	6	3314290.0	6959161.5	4.0	2
WRSUMP013	LHAAP-45	824	5	3308486.0	6947986.5	4.0	3

Notes:

[a] The reasons investigation is not required are as follows:

1 - Sump contents were analyzed. Concentrations were below the maximum value of TCEQ Medium-Specific Concentration Cleanup Goals or Upper Prediction Limits (UPLs) for background in soil. Analytical results are presented in OHM Remediation Services Corporation, 1997. *Removal and Closure of Wastewater Sumps, April*.

2 - Sites 48 and 35C(53) were evaluated in the Shaw 2006, *Draft Final Site Evaluation Report, LHAAP-48 (Former Igniter Production Area) and LHAAP-35C(53) (Former Static Test Area), March*. No further remedial action is required at these sites.

3 - Due to property transfer, site is subject to no further investigation.

TBD To be determined

Table 2-2
Buildings Associated with LHAAP-35/36 Sumps

Building	Function[a]	Potential Contaminants[a]	Possible Analytes	Associated Sump(s)
16-T	Reclamation unit	Aluminum, chlorates, magnesium, nitrates, PBAA, polysulfide perchlorates, SVOC, VOC, zirconium	Metals, SVOC, VOC, perchlorates	SUMP102 SUMP103 SUMP104 SUMP105
16-Y	Igniter Assembly Building	explosives	SVOC, VOC, TPH, Metals, explosives	WRSUMP003 SUMP094
18-Y	Storage and component rework	Aluminum, cesium nitrate, magnesium, potassium nitrate, rubidium nitrate, sulfur, SVOC, talc, VOC, zirconium	Metals, SVOC, VOC	SUMP123
23-T	Conditioning	PBAA, polysulfide, SVOC, VOC	SVOC, VOC	SUMP124
25-C	Grind ammonium, oxidizer dryer	Ammonium perchlorate, chlorates, nitrates	Metals, SVOC	SUMP044 SUMP045 SUMP046
25-D	Oxidizer blending	Chlorates, magnesium carbonate, nitrates, perchlorates, sodium nitrate	Metals, SVOC, VOC, perchlorate	SUMP047
25-X	Washout Pad, Holding Area for explosive usage	VOC, SVOC, explosives	SVOC, VOC, explosives	SUMP114
26-E	Mixing and casting, grain manufacturing	Aluminum, chlorates, diesel, isopropyl alcohol, magnesium, magnesium carbonate, nitrates, perchlorates, SVOC, sodium nitrate, VOC, zirconium	Metals, SVOC, VOC, TPH	SUMP048 SUMP049 SUMP050 SUMP051
28-G	Motor case preparation	SVOC, VOC	SVOC, VOC	SUMP052
29-A	Control and Chemistry Laboratory	Solvents, metals, organics	SVOC, VOC, TPH, metals, explosives	WRSUMP014
29-D	Oxidizer grinding	Chlorates, magnesium carbonate, nitrates, perchlorates, sodium nitrate	Metals, perchlorate	SUMP053
31-G	Fuel preparation	Aluminum, magnesium, oxamide, zirconium	Metals	SUMP054 SUMP055
32-H	Teflon and propellant mixing	SVOC, VOC	SVOC, VOC	SUMP056 SUMP121
33-G	Septic toilet and shower	Unknown	Unknown	SUMP057
33-X	General Purpose Storage Shed	Unknown	Unknown	SUMP115
34-Y	Signal assembly	Cesium nitate, potassium nitate, rubidium nitrate, SVOC, VOC	Metals, SVOC, VOC	SUMP095 SUMP096 WRSUMP001
36-B	Sample preparation	PBAA, polysulfide perchlorate	SVOC, VOC, perchlorate	SUMP058
37-X	Unknown	Unknown	Unknown	SUMP116
38-Y	Consolidate and assemble propellants	Ethyl alcohol, isoproply alcohol, potassium nitrate, sulfur	Metals, SVOC, VOC	SUMP097 SUMP098 SUMP099 WRSUMP002
41-E	Propellant mixer	PBAA, polysulfide perchlorate	SVOC, VOC, perchlorate	SUMP059
42-E	Propellant mixer	PBAA, polysulfide perchlorate	SVOC, VOC, perchlorate	SUMP060
42-H	Vertical mixer	PBAA, polysulfide perchlorate	SVOC, VOC, perchlorate	SUMP061

Table 2-2
Buildings Associated with LHAAP-35/36 Sumps

Building	Function[a]	Potential Contaminants[a]	Possible Analytes	Associated Sump(s)
45-E	Casting, curing, and finishing motors	PBAA, polysulfide perchlorate, SVOC, VOC	SVOC, VOC, perchlorate	SUMP062 SUMP063 SUMP064 SUMP065 SUMP066 SUMP067
45-Y	Metal powder, preparation building, propellant finishing, illuminating	Metals, explosives, perchlorate	Metals, exposives, perchlorate	SUMP100 SUMP101
46-A	Casting and curing building	degreasing, vacuum blasting, tanks for cleaning and coating, tanks for phosphate and rinse, liner spraying, casting can cleaning, black powder drying, mixing and casting plastic bonded explosive (PBX) propellant, and PBX production in this building	SVOC, VOC, TPH, metals, explosives	SUMP068
46-B	Finishing	PBAA, polysulfide perchlorate, SVOC, VOC	SVOC, VOC, perchlorate	SUMP069
50-G	Cleaning Bay	Detergent, diesel, PBAA, polysulfide perchlorate, SVOC, VOC	SVOC, VOC, perchlorate	SUMP070
54-F	Motor casting	PBAA, polysulfide perchlorate	SVOC, VOC, perchlorate	SUMP071 SUMP072
54-G	Motor packout	Acetone, diesel, hexane, isopropyl alcohol, magnesium, PBAA, perfluorooctanoic acid, potassium sulfate, polysulfide perchlorate, SVOC, VOC	Metals, SVOC, VOC, TPH, perchlorate	SUMP073 SUMP074 SUMP075
54-H	Bomb and flare production	Acetone, diesel, hexane, isopropyl alcohol, magnesium, perfluorooctanoic acid, potassium sulfate, SVOC, VOC	Metals, SVOC, VOC, TPH	SUMP076 SUMP077 WRSUMP018
68-C	Button bomb manufacturing	Red phosphorus, SVOC, VOC	Metals, SVOC, VOC	SUMP078 SUMP079 SUMP080
68-F	Button bomb finish packout	Metals, SVOC, VOC	Metals, SVOC, VOC	SUMP081 SUMP082 SUMP083
68-G	Simulant manufacturing/Septic toilet and shower	Unknown	Unknown	SUMP084 SUMP085 SUMP086 SUMP087 SUMP088 SUMP089 SUMP090 WRSUMP017
75-I	Canister assembly	Aluminum, magnesium, SVOC, VOC, zirconium	Metals, SVOC, VOC	SUMP091 SUMP092 SUMP093
207	Office and laboratory	All	Metals, SVOC, VOC	SUMP110
212-12	Surge storage	Aluminum, magnesium, SVOC, VOC, zirconium	Metals, SVOC, VOC	SUMP030 SUMP031
212-14	Utility press	Aluminum, diesel, magnesium, isopropyl alcohol, SVOC, VOC, zirconium	Metals, SVOC, VOC, TPH	SUMP032 SUMP033 WRSUMP015

Table 2-2
Buildings Associated with LHAAP-35/36 Sumps

Building	Function[a]	Potential Contaminants[a]	Possible Analytes	Associated Sump(s)
212-16	Mill House/Pyrotechnic Production	magnesium, tetrafluoroethylene, MEK. Arsenic	Metals, SVOC, VOC, explosives	SUMP034
212-18	Mill House/Pyrotechnic Production	magnesium, tetrafluoroethylene, MEK. Arsenic	Metals, SVOC, VOC, explosives	SUMP035
212-20	Pyrotechnic Production	Acetone, diesel, SVOC, VOC	SVOC, VOC, TPH, Metals, explosives	WRSUMP019
212-29	Consolidated illuminant storage	explosives	SVOC, VOC, TPH, Metals, explosives	SUMP037
212-32	Process TNC	Unknown	Unknown	SUMP038
212-33	Acetone storage	Acetone, barium chromate, isopropyl alcohol, potassium nitrate, potassium perchlorate, sulfur, SVOC, tungsten VOC	Metals, SVOC, VOC, perchlorates	SUMP039 SUMP040
212-35	Weighting and mixing	Acetone, barium chromate, boron, magnesium, cesium nitrate, ethyl alcohol, fluoroelastomer copolymer, isopropyl alcohol, potassium nitrate, potassium perchlorate, rubidium nitrate	Metals, SVOC, VOC, perchlorates	SUMP041
212-37	Weighting and mixing	Acetone, barium chromate, boron, diesel, isopropyl alcohol, fluoroelastomer copolymer, isopropyl alcohol, magnesium, potassium nitrate, potassium perchlorate, sulfur, SVOC, tungsten VOC	Metals, SVOC, VOC, perchlorate	SUMP042
212-38	Weighting and mixing	Cesium nitrate, potassium nitrate, rubidium nitrate, SVOC, VOC	Metals, SVOC, VOC	SUMP043
401	Power House	Provides electrical power to installation	VOC, SVOC, metals, PCBs	SUMP106
401-C	Wastewater storage	Mixed organic halogenated/non-halogenated solvents	Metals, SVOC, VOC, TPH - GRO, TPH-DRO, pesticides, herbicides	SUMP122
403	Pyrotechnic Production Operations Building	Ethyl acetate, Magnesium	Metals, VOC	SUMP107
406	Chemical Process Building	Metal powders, flare illuminant compositions, igniter compositions	Metals, explosives	SUMP108
407	In-Process Comp Testing	metals	SVOC, VOC, metals	WRSUMP016
408	Mixing & Pressing Building	Oxidizers (perchlorates, chlorates, nitrates); Metal powders (aluminum, magnesium, zirconium); AN/ALA-17 flare illuminant compositions	Metals, SVOC, VOC, perchlorates	SUMP109
722-P	Paint Shop	waste (may have included paint thinner, paints, and kerosene)	Metals, SVOC, VOC, TPH - GRO, TPH-DRO	SUMP111 SUMP112
723	Fixed Laundry	Chlorinated solvents	VOC, SVOC	SUMP125
725	Insecticide Storage Building	Pesticide, herbicide	Metals, SVOC, VOC, pesticides, herbicides	SUMP119 SUMP120
744	Service Station	VOC, SVOC, TPH	Unknown	SUMP113
744-A	Vehicle wash rack & oil/water separator	Wash rack effluent	Metals, SVOC, VOC, TPH - GRO, TPH-DRO	SUMP117
813	Pyrotechnic Assembly	Acetone, diesel, SVOC, VOC	SVOC, VOC, TPH	SUMP118
824	Unknown	Unknown	Unknown	WRSUMP013

Table 2-2
Buildings Associated with LHAAP-35/36 Sumps

Building	Function[a]	Potential Contaminants[a]	Possible Analytes	Associated Sump(s)
B-5	Blender Building	explosives	SVOC, VOC, TPH, metals, explosives	SUMP014
B-7	XM816 candle mix, covert composition/consolidate/pack, mixing Type I first fire	Acetone, aluminum, barium nitrate, boron, 2-butanone, cesium nitrate, cobalt napthenate, diesel, ferric oxide, hexamethylenetetramine, isopropyl alcohol, magnesium, potassium nitrate, potassium perchlorate, silicon, sodium nitrate, strontium nitrate, vinyl chloride, zirconium	Metals, SVOC, VOC, TPH, perchlorate	SUMP015 SUMP016
B-8	Blender Building	Explosives	SVOC, VOC, TPH, metals, explosives	WRSUMP008
B-9	Pyrotechnic production	Acetone, diesel, SVOC, VOC	SVOC, VOC, TPH, metals, explosives	SUMP017 SUMP018
B-10	105mm press	Cesium nitrate, potassium nitrate, rubidium nitrate	Metals	SUMP019
B-11	Illuminant mixing, first fire mixing, infrared flare, igniter composition, dipcoat, intermediate charge compositions	Acetone, aluminum, barium nitrate, 2-butanone, cobalt napthenate, diesel, iron oxide, isopropyl alcohol, magnesium, perfluorooctanoic acid, silicon, sodium nitrate, strontium nitrate, vinyl chloride, potassium nitrate, potassium perchlorate, zirconium	Metals, SVOC, VOC, TPH, perchlorate	SUMP020
B-12	Illuminant mixing, Type I and III first fire mixing,	Acetone, aluminum, 2-butanone, barium nitrate, cobalt napthenate, isopropyl alcohol, magnesium, potassium nitrate, potassium perchlorate, silicon, strontium nitrate, vinyl chloride, zirconium	Metals, SVOC, VOC, perchlorate	SUMP021
B-13	400 area mixing, granulate flare composition/slider composition	Acetone, fluoroelastomer, magnesium, tetrafluoroethylene	SVOC, VOC	SUMP022 WRSUMP011
B-14	Illuminant composition	Acetone, aluminum,2-butanone, barium nitrate, cobalt napthenate, isopropyl alcohol, magnesium, potassium perchlorate, silicon, sodium nitrate, strontium nitrate, vinyl chloride, zirconium,	Metals, SVOC, VOC, perchlorate	SUMP023
B-15	First fire preparation	Cesium nitrate, potassium nitrate, rubidium nitrate	Metals	SUMP024
B-16	155mm delays	Potassium nitrate, sulfur	Metals	SUMP025
P-1	Metal powders, infrared flare, weigh-up fuels,	Aluminum, boron, hexamethylenetetramine, magnesium, vinyl chloride, silicon, tungsten, zirconium	Metals, SVOC, VOC	SUMP001 WRSUMP004
P-3	Oxidizer preparation, infrared flare	Aluminum, barium chromate, cesium nitrate, iron oxide, barium nitrate, magnesium, perfluorooctanoic acid, potassium perchlorate, potassium nitrate, potassium sulfate, sodium nitrate, strontium nitrate, zirconium	Metals, SVOC, perchlorate	SUMP002 SUMP003 SUMP004 SUMP005
P-9	Cleaning bay	Acetone, acrylic elastomer, SVOC, VOC	SVOC, VOC	SUMP027

Table 2-2
Buildings Associated with LHAAP-35/36 Sumps

Building	Function[a]	Potential Contaminants[a]	Possible Analytes	Associated Sump(s)
P-11	Pyrotechnic production	Acetone, diesel, SVOC, VOC	SVOC, VOC, TPH, metals, explosives	WRSUMP021
P-12	Pyrotechnic production	Acetone, diesel, SVOC, VOC	SVOC, VOC, TPH, metals, explosives	WRSUMP010
P-113	Mixing and Consolidation Building	Unknown	Unknown	WRSUMP012
P-116	Flare, extrude plank/cord	Diesel, isopropyl alcohol, potassium sulfate	Metals, VOC, TPH	SUMP006 SUMP007
P-117	Illuminant consolidation, mixing	VOC, SVOC, explosives, metals	VOC, SVOC, explosives, metals	SUMP008 SUMP009 WRSUMP005
P-118	Infrared flares, remix dipcoat/tumble first fire, pellet finishing/assembly/packout	Acetone, diesel, isopropyl alcohol, semi-volatiles, volatiles	VOC, SVOC, TPH	SUMP010 SUMP011 SUMP012 SUMP013 WRSUMP006
P-122	Unknown	Unknown	Unknown	SUMP028 SUMP036 WRSUMP007
P-123	Unknown	Unknown	Unknown	SUMP029
S-113	Sump	Sump contents	VOC, SVOC, explosives, and metals.	WRSUMP009
SHED C	See B-16	See B-16	See B-16	SUMP026

Notes:

[a] The information on building function and potential contaminants is based on Plexus, 2005.

DRO diesel range organic
GRO gasoline range organic
MEK methyl ethyl ketone
mm millimeter
PBAA polybutadiene acrylic acid
SVOC semivolatile organic compound
TPH total petroleum hydrocarbon
VOC volatile organic compound
WRSUMP waste rack sump

Table 2-3
Summary of Boring Locations and Proposed Analyses

LOCATION CODE	Nearest Site	Building	Sub-Area	Easting	Northing	Sump Depth (feet)	Associated Historical and Proposed Boring Locations								Parameters Proposed for Analysis
							West	Northwest	North	Northeast	East	Southeast	South	Southwest	
LHAAP-35 Sumps															
SUMP001	LHAAP-46	P-1	1	3305660.0	6963271.3	5.0		LH-S01-02/***Sump001-SB-02***	***Sump001-SB-03***				LHS-S01-01/***Sump001-SB-01***		Metals
SUMP002	LHAAP-46	P-3	1	3305918.0	6963332.6	5.0			LH-S02-01/***Sump002-SB-02***	LH-S02-02/***Sump002-SB-03***		***Sump002-SB-01***			Metals, perchlorate
SUMP003	LHAAP-46	P-3	1	3305906.0	6963306.1	5.0		***Sump003-SB-02***			LH-S03-01	LH-S03-02/***Sump001-SB-03***	***Sump002-SB-01***		Metals, perchlorate
SUMP004	LHAAP-46	P-3	1	3306009.0	6963290.8	5.0	LH-S04-02		***Sump004-SB-01***		LH-S04-01				Metals, perchlorate
SUMP005	LHAAP-46	P-3	1	3305998.0	6963333.7	4.0			LH-S05-01	LH-S05-02		***Sump005-SB-01***			Metals, perchlorate
SUMP007	LHAAP-46	P-116	1	3307026.0	6963140.4	9.0	LH-S07-02/***Sump007-SB-01***			LH-S07-01 /***Sump007-SB-02***		***Sump007-SB-03***			Metals, TPH
SUMP008	LHAAP-46	P-117	1	3307014.0	6963357.9	5.0			LH-S08-01	LH-S08-02/***Sump008-SB-01***		***Sump009-SB-02***			Explosives, Metals
SUMP009	LHAAP-46	P-117	1	3307003.0	6963324.6	7.0			***Sump008-SB-01***		LH-S09-01/***Sump009-SB-02***	LH-S09-02			Explosives, Metals
SUMP010	LHAAP-46	P-118	1	3307055.0	6962430.5	9.0			LH-S10-01/***Sump010-SB-02***	LH-S10-02/***Sump010-SB-02***				***Sump010-SB-01***	Metals, TPH
SUMP011	LHAAP-46	P-118	1	3307053.0	6962355.2	11.0				LH-S11-02	LH-S11-01	***Sump011-SB-02***		***Sump011-SB-01***	Metals, TPH
SUMP012	LHAAP-46	P-118	1	3307302.0	6962438.8	10.0	LH-S12-01	LH-S12-02		***Sump012-SB-02***			***Sump012-SB-01***		Metals, TPH
SUMP013	LHAAP-46	P-118	1	3307304.0	6962369.6	9.0	LH-S13-01				***Sump013-SB-02***		***Sump013-SB-01***	LH-S13-02	Metals, TPH
SUMP015	LHAAP-46	B-7	1	3305660.0	6962405.0	5.0	***Sump015-SB-01***	HO-SB-01		LH-S15-02/***Sump015-SB-02***		LH-S15-01/***Sump015-SB-03***			Metals, TPH
SUMP016	LHAAP-46	B-7	1	3305651.0	6962434.4	4.0	LH-S16-01		***Sump016-SB-01***		***Sump016-SB-02***	LH-S15-02			Metals, TPH
SUMP017	LHAAP-46	B-9	1	3305664.0	6962528.0	2.5			***Sump017-SB-02***		***Sump017-SB-03***			***Sump017-SB-01***	Explosives
SUMP018	LHAAP-46	B-9	1	3305742.0	6962466.5	5.0			***Sump018-SB-02***			***Sump018-SB-03***		***Sump018-SB-01***	Explosives
SUMP019	LHAAP-46	B-10	1	3306332.0	6962559.9	5.0	LH-S19-02			***Sump019-SB-01***		***Sump019-SB-02***		LH-S19-01	Metals
SUMP020	LHAAP-46	B-11	1	3305653.0	6962645.2	5.5		LH-S20-01				***Sump020-SB-02***		LH-S20-01/***Sump020-SB-02***	Metals, TPH
SUMP021	LHAAP-46	B-12	1	3306316.0	6962691.7	3.5			***Sump021-SB-01***	***Sump021-SB-02***			LH-S021-01	LH-S021-02	Metals
SUMP022	LHAAP-46	B-13	1	3305654.0	6962775.2	7.0	***Sump022-SB-01***	LH-S022-01/***Sump022-SB-02***			***Sump022-SB-03***			LH-S022-02/***Sump022-SB-01***	Metals
SUMP023	LHAAP-46	B-14	1	3306311.0	6962809.7	3.5	***Sump023-SB-01***				LH-S023-01		LH-S023-02		Metals
SUMP024	LHAAP-46	B-15	1	3305644.0	6962890.6	1.5		LH-S24-01	***Sump024-SB-02***		***Sump024-SB-02***			***Sump024-SB-01***	Metals
SUMP025	LHAAP-46	B-16	1	3306318.0	6962924.5	5.0	LH-S025-02/***Sump025-SB-02***	LH-S025-01	***Sump025-SB-03***				***Sump025-SB-01***		Metals
SUMP026	LHAAP-46	SHED C	1	3306299.0	6962983.7	3.5	LH-S026-01/***Sump026-SB-01***	LH-S026-02/***Sump026-SB-02***				***Sump026-SB-03***			Explosives, Metals
SUMP027	LHAAP-46	P-9	1	3305635.0	6963123.4	5.0	LH-S27-02		LH-S27-01			***Sump027-SB-01***	LH-DL27-01		Metals
SUMP029	LHAAP-46	P-123	1	3306767.0	6963455.0	11.0			LH-S29-01	LH-S29-02		***Sump029-SB-02***		***Sump029-SB-01***	Metals
SUMP030	LHAAP-46	212-12	1	3305722.0	6961255.4	3.0		***Sump030-SB-02***	LH-S30-01	LH-S31-01			***Sump030-SB-01***		Metals
SUMP031	LHAAP-46	212-12	1	3305728.0	6961273.4	3.0				***Sump031-SB-01***		LH-S30-01/***Sump030-SB-02***	LH-S31-01	***Sump030-SB-01***	Metals
SUMP032	LHAAP-46	212-14	1	3305725.0	6961408.2	3.5	***Sump032-SB-02***				***Sump032-SB-03***		LH-S32-01/***Sump032-SB-01***		Metals, TPH
SUMP033	LHAAP-46	212-14	1	3305765.0	6961357.8	4.0			LH-S33-01/**Sump033-SB-02**			***Sump033-SB-03***		***Sump033-SB-01***	TPH
SUMP034	LHAAP-46	212-16	1	3305755.0	6961495.8	3.0			***Sump034-SB-01***	LH-S34-01	***Sump034-SB-02***		***Sump034-SB-03***		Explosives
SUMP035	LHAAP-46	212-18	1	3305753.0	6961652.4	3.5	LH-S35-01		***Sump035-SB-02***			***Sump035-SB-03***		***Sump035-SB-01***	Explosives
SUMP036	LHAAP-46	P-122	1	3306799.0	6963213.1	Unknown	***Sump036-SB-02***			***Sump036-SB-02***			***Sump036-SB-01***		Metals
SUMP037	LHAAP-46	212-29	1	3305775.0	6962514.6	3.0			LH-S37-01/***Sump037-SB-02***			***Sump037-SB-03***		***Sump037-SB-01***	Explosives
SUMP038	LHAAP-46	212-32	1	3306217.0	6961282.8	2.0	LH-S38-01		***Sump038-SB-02***				***Sump038-SB-01***		Metals
SUMP040	LHAAP-46	212-33	1	3306377.0	6961393.1	3.0				***Sump040-SB-02***		***Sump040-SB-03***		LH-S40-01/***Sump040-SB-01***	Metals, perchlorate
SUMP041	LHAAP-46	212-35	1	3306366.0	6961535.7	3.0				***Sump041-SB-01***	LH-S41-01/***Sump041-SB-01***	***Sump041-SB-03***			Metals, perchlorate
SUMP042	LHAAP-46	212-37	1	3306345.0	6961626.6	3.0	***Sump042-SB-02***				LH-S42-01		***Sump042-SB-01***		Metals, perchlorate
SUMP043	LHAAP-46	212-38	1	3306197.0	6961662.2	1.5			***Sump043-SB-02***			LH-S43-01		***Sump043-SB-01***	Metals

Notes are provided at the end of this table.

Table 2-3
Summary of Boring Locations and Proposed Analyses

LOCATION CODE	Nearest Site	Building	Sub-Area	Easting	Northing	Sump Depth (feet)	Associated Historical and Proposed Boring Locations								Parameters Proposed for Analysis
							West	Northwest	North	Northeast	East	Southeast	South	Southwest	
LHAAP-35 Sumps															
SUMP044	LHAAP-47	25-C	2	3308961.0	6957854.1	4.0	***Sump044-SB-01***		LH-S44-01	LH-S44-02		LH-DL44-01			Metals
SUMP046	LHAAP-47	25C	2	Unknown Location					***Sump046-SB-02***		***Sump046-SB-03***		***Sump046-SB-01***		Metals
SUMP047	LHAAP-47	25-D	2	3309271.0	6957946.0	1.5	***Sump047-SB-02***			LH-S47-01	47SB04		***Sump047-SB-01***		Metals, TPH, perchlorate
SUMP048	LHAAP-47	26-E	2	3309726.0	6958136.9	Unknown	LH-S48-02/***Sump048-SB-01***	LH-S48-01/LH-DL48-01		***Sump048-SB-02***		***Sump048-SB-03***		47SB06	Metals, TPH
SUMP049	LHAAP-47	26-E	2	3309759.0	6958232.3	3.0	LH-S49-01				***Sump049-SB-02***			***Sump049-SB-01***	Metals, TPH
SUMP050	LHAAP-47	26-E	2	3309609.0	6958381.8	4.0			LH-S50-01/47SB09/***Sump050-SB-02***		LH-DL50-01/***Sump050-SB-03***	***Sump050-SB-03***		***Sump050-SB-01***	Metals, TPH
SUMP051	LHAAP-47	26-E	2	3309647.0	6958295.4	6.0	***Sump051-SB-01***	HOSB13	LH-S51-01/***Sump051-SB-02***				***Sump051-SB-03***	***Sump051-SB-01***	Metals, TPH
SUMP052	LHAAP-47	28-G	2	3310425.0	6958579.4	2.0		LH-DL-01	LH-S52-01		***Sump052-SB-02***		***Sump052-SB-01***		Metals
SUMP053	LHAAP-47	29-D	2	3309227.0	6958440.6	7.0	LH-S53-01			***Sump053-SB-01***	47SB10		LH-S53-02		Perchlorate, Explosives, Metals
SUMP054	LHAAP-47	31-G	2	3309903.0	6958742.0	5.0		***Sump054-SB-02***	LH-S54-01	***Sump054-SB-03***				***Sump054-SB-01***	Metals
SUMP056	LHAAP-47	32-H	2	3310440.0	6958998.2	3.0			LH-S56-01			***Sump056-SB-02***		***Sump056-SB-01***	Metals
SUMP057	LHAAP-47	33-G	2	3309811.0	6959025.1	6.0	***Sump057-SB-01***			***Sump057-SB-02***		***Sump057-SB-03***			Perchlorate
SUMP058	LHAAP-47	36-B	2	3308448.0	6958541.1	Unknown		LH-S58-01/LH-DL58-01	***Sump058-SB-02***			***Sump058-SB-03***		***Sump058-SB-01***	Metals, perchlorate
SUMP059	LHAAP-47	41-E	2	3308972.0	6959235.3	4.0	LH-S59-02	LH-S59-02				***Sump059-SB-02***		47SB11/***Sump059-SB-01***	Metals, perchlorate
SUMP060	LHAAP-47	42-E	2	3309353.0	6959391.8	5.0			***Sump060-SB-01***		47SB14	***Sump060-SB-02***	LH-S60-02	LH-S60-01	Metals, perchlorate
SUMP061	LHAAP-47	42-H	2	3310237.0	6959647.9	8.0	***Sump061-SB-01***		47SB61	LH-S61-01/LH-S61-02/***Sump061-SB-02***		***Sump061-SB-03***		***Sump061-SB-01***	Metals, perchlorate
SUMP064	LHAAP-47	45-E	2	3309044.0	6959513.6	4.0		LH-S64-02	LH-S64-01/***Sump064-SB-01***		47SB33	***Sump064-SB-03***		***Sump064-SB-01***	Metals, perchlorate
SUMP066	LHAAP-47	45-E	2	3309082.0	6959699.1	4.0		LH-S66-01	LH-S66-02/47SB20	47SB02	***Sump066-SB-02***			***Sump066-SB-01***	Metals, perchlorate
SUMP068	LHAAP-47	46-A	2	3307741.0	6959101.2	5.5			***Sump068-SB-02***			***Sump068-SB-03***		***Sump068-SB-01***	Perchlorate
SUMP069	LHAAP-47	46-B	2	3308258.0	6959223.1	5.5		LH-DL-069-01		LH-S69-01	LH-S69-02			***Sump069-SB-01***	Metals
SUMP070	LHAAP-47	50-G	2	3309449.0	6960124.0	7.0	47SB23			***Sump070-SB-02***		***Sump070-SB-03***		LH-S70-01/LH-S70-02/***Sump070-SB-03***	Metals
SUMP071	LHAAP-47	54-F	2	3309133.0	6960412.1	6.0			LH-S71-01		LH-S71-02	LH-DL-071-01	***Sump071-SB-01***		Metals
SUMP072	LHAAP-47	54-F	2	3309105.0	6960247.2	6.0			LH-S72-02		LH-S72-01			***Sump072-SB-01***	Metals
SUMP073	LHAAP-47	54-G	2	3309438.0	6960478.6	2.5			LH-S73-01/LH-DL-073-01			***Sump073-SB-02***		***Sump073-SB-01***	Metals, TPH
SUMP074	LHAAP-47	54-G	2	3309538.0	6960557.8	3.0			***Sump074-SB-02***			***Sump074-SB-03***		***Sump074-SB-01***	TPH
SUMP075	LHAAP-47	54-G	2	3309576.0	6960472.4	3.5	LH-S75-01/LH-S75-02/***Sump075-SB-02***			***Sump075-SB-03***			***Sump075-SB-01***	LH-DL075-01	Metals, TPH
SUMP076	LHAAP-47	54-H	2	3309822.0	6960486.8	6.0	***Sump076-SB-01***	LH-S76-02		LH-S76-01/***Sump076-SB-02***		***Sump076-SB-03***			Metals, TPH
SUMP077	LHAAP-47	54-H	2	3309871.0	6960612.8	6.0	LH-S77-01	***Sump077-SB-02***				***Sump077-SB-03***		LH-S77-02/***Sump077-SB-01***	Metals, TPH
SUMP078	LHAAP-47	68-C	2	3307985.0	6960967.9	3.5	***Sump078-SB-01***		LH-S78-01/***Sump079-SB-01***		***Sump079-SB-02***				Metals
SUMP079	LHAAP-47	68-C	2	3308004.0	6960965.9	3.5	***Sump078-SB-02***		LH-S79-01/***Sump079-SB-01***		***Sump079-SB-02***		***Sump078-SB-01***		Metals
SUMP081	LHAAP-47	68-F	2	3308837.0	6961204.3	9.0	LH-S81-01	LH-S81-02	LH-S82-01			***Sump081-SB-02***		47SB24/***Sump081-SB-01***	Metals
SUMP082	LHAAP-47	68-F	2	3308899.0	6961231.9	6.0		LH-S82-02		***Sump082-SB-02***	47SB25			***Sump082-SB-01***	Metals
SUMP083	LHAAP-47	68-F	2	3308795.0	6961493.3	8.5	***Sump083-SB-01***		47SB26	***Sump083-SB-02***		LH-S83-01/LH-S83-02		***Sump084-SB-01***	Metals
SUMP084	LHAAP-47	68-G	2	3309216.0	6961370.5	1.5			***Sump084-SB-02***			***Sump084-SB-03***		***Sump084-SB-01***	Metals, Perchlorate
SUMP085	LHAAP-47	68-G	2	3309118.0	6961472.3	3.5			***Sump085-SB-02***			***Sump085-SB-03***		***Sump085-SB-01***	Metals, Perchlorate
SUMP086	LHAAP-47	68-G	2	3309123.0	6961430.0	7.0	***Sump086-SB-01***			LH-S86-02		LH-S86-01/***Sump086-SB-02***			Metals , Perchlorate
SUMP087	LHAAP-47	68-G	2	3309180.0	6961664.8	2.5				***Sump087-SB-01***		***Sump087-SB-02***		LH-S87-01	Metals , Perchlorate
SUMP088	LHAAP-47	68-G	2	3309255.0	6961680.4	6.0		LH-S88-01/LH-S88-02	***Sump088-SB-02***			***Sump088-SB-03***		***Sump088-SB-01***	Metals , Perchlorate

Notes are provided at the end of this table.

Table 2-3
Summary of Boring Locations and Proposed Analyses

LOCATION CODE	Nearest Site	Building	Sub-Area	Easting	Northing	Sump Depth (feet)	Associated Historical and Proposed Boring Locations								Parameters Proposed for Analysis
							West	Northwest	North	Northeast	East	Southeast	South	Southwest	
LHAAP-35 Sumps															
SUMP089	LHAAP-47	68-G	2	3309275.0	6961633.3	6.0	LH-S89-01			***Sump089-SB-01***		***Sump089-SB-02***		LH-S89-01	Metals , Perchlorate
SUMP090	LHAAP-47	68-G	2	3309255.0	6961480.7	8.0	LH-S90-01/LH-S90-02				***Sump090-SB-02***			***Sump090-SB-01***	Metals , Perchlorate
SUMP091	LHAAP-47	75-I	2	3309375.0	6961997.0	5.0			LH-S91-01/LH-S91-02			***Sump091-SB-02***		***Sump091-SB-01***	Metals
SUMP092	LHAAP-47	75-I	2	3309448.0	6961946.0	6.5			LH-S92-01/LH-S92-02			***Sump092-SB-02***		***Sump092-SB-01***	Metals
SUMP093	LHAAP-47	75-I	2	3309581.0	6962071.9	5.5	LH-S93-01/LH-S93-02				***Sump093-SB-02***	***Sump093-SB-01***			Metals
SUMP106	LHAAP-66	401	3	TBD	TBD	Unknown		***Sump106-SB-02***			***Sump106-SB-03***			***Sump106-SB-01***	PCBs, Metals, VOCs, SVOCs
SUMP107	LHAAP-46	403	1	3304220.0	6962625.3	2.0			***Sump107-SB-02***			LH-S107-01/***Sump107-SB-03***		***Sump107-SB-01***	Explosives
SUMP109	LHAAP-46	408	1	3304038.0	6962574.3	2.0		LH-S109-01	***Sump109-SB-02***			***Sump109-SB-03***		***Sump109-SB-01***	Perchlorate
SUMP110	LHAAP-46	207	1	3305605.0	6960922.4	4.2		***Sump110-SB-02***			***Sump110-SB-03***		LH-S110-01/***Sump110-SB-01***		Metals
SUMP111	LHAAP-58	722-P	3	3305272.0	6960171.7	3.5		LH-S111-01				***Sump111-SB-01***		LH-S112-01	Metals
SUMP113	LHAAP-58	744	3	3304486.0	6960042.2	4.0	LH-S113-01	***Sump113-SB-01***			***Sump113-SB-02***				Metals, TPH
SUMP114	LHAAP-18	25-X	4	3316477.0	6953151.6	3.5	LH-S114-01				***Sump114-SB-02***			LH-S114-02	Metals, Explosives
SUMP115	LHAAP-18	33-X	4	TBD	TBD	7.0		LH-S115-02		LH-S115-01		***Sump115-SB-01***			Metals, Explosives
SUMP116	LHAAP-18	37-X	4	3316083.0	6953676.5	5.5			LH-S116-01/LH-S116-02/***Sump116-SB-02***			***Sump116-SB-03***		***Sump116-SB-01***	Metals
SUMP117	LHAAP-58	744-A	3	3304290.0	6959900.9	Unknown	***Sump117-SB-01***			***Sump117-SB-02***	LH-S117-01	***Sump117-SB-03***			Metals, TPH
SUMP118	LHAAP-29	813	5	3304549.0	6953715.7	3.0			***Sump118-SB-01***			LH-S118-02		LH-S118-01	Metals, TPH
SUMP119	LHAAP-59	725	3	3305443.0	6959996.6	5.0		***Sump119-SB-02***			***Sump119-SB-03***		***Sump119-SB-01***		Pesticides
SUMP120	LHAAP-59	725	3	3305384.0	6959963.3	4.0		***Sump120-SB-02***			***Sump120-SB-03***		***Sump120-SB-01***		Pesticides
SUMP121	LHAAP-47	32-H	2	3310365.0	6959021.9	Unknown		LH-S121-01/LH-S121-02/***Sump121-SB-02***				***Sump121-SB-03***		***Sump121-SB-01***	Metals
SUMP122	LHAAP-04	401-C	3	3305919.0	6959108.4	4.0		***Sump122-SB-01***			LH-S122-01/04SB05		LH-S122-02/04SB02/***Sump122-SB-03***		Metals, TPH, pesticides, herbicides
Unnumbered Sump (Sump125)		723	3	TBD	TBD	Unknown	***Sump125-SB-01***			***Sump125-SB-02***		***Sump125-SB-03***			Metals

Notes are provided at the end of this table.

Table 2-3
Summary of Boring Locations and Proposed Analyses

LOCATION_CODE	Nearest Site	Building	Sub-Area	Easting	Northing	Sump Depth (feet)	Associated Historical and Proposed Boring Locations								Parameters Proposed for Analysis
							West	Northwest	North	NE	East	Southeast	South	Southwest	
LHAAP-36 Waste Rack Sumps															
WRSUMP004	LHAAP-46	P-1	1	3305644.0	6963265.8	4.0	WRSump004-SB-01			LH-S01-02	LH-S01-01				Metals, VOCs, SVOCs
WRSUMP005	LHAAP-46	P-117	1	3307018.0	6963384.6	4.0	WRSump005-SB-01		WRSump005-SB-01					***Sump008-SB-02***	Metals, VOCs, SVOCs
WRSUMP006	LHAAP-46	P-118	1	3307324.0	6962430.8	4.0	***Sump012-SB-02***		***Sump012-SB-01***			WRSump006-SB-01			Metals, TPH, VOCs, SVOCs
WRSUMP007	LHAAP-46	P-122	1	3306818.0	6963325.2	4.0		WRSump007-SB-02		WRSump007-SB-03			WRSump007-SB-01	LH-S07-02	Metals, VOCs, SVOCs
WRSUMP008	LHAAP-46	B-8	1	3306214.0	6962694.8	4.0		WRSump008-SB-02		WRSump008-SB-03				WRSump008-SB-01	Metals, Explosives, VOCs, SVOCs
WRSUMP009	LHAAP-46	S-113	1	3306197.0	6962456.4	4.0			WRSump009-SB-02		WRSump009-SB-03			WRSump009-SB-01	Metals, VOCs, SVOCs
WRSUMP010	LHAAP-46	P-12	1	3305783.0	6962467.3	4.0				WRSump010-SB-02			WRSump010-SB-03	WRSump010-SB-01	Metals, VOCs, SVOCs
WRSUMP011	LHAAP-46	B-13	1	3305777.0	6962727.1	4.0		WRSump011-SB-02		WRSump011-SB-03			WRSump011-SB-01		Metals, VOCs, SVOCs
WRSUMP012	LHAAP-46	P-113	1	3307198.0	6963322.7	4.0			WRSump012-SB-02			WRSump012-SB-03		WRSump012-SB-01	Metals, VOCs, SVOCs
WRSUMP014	LHAAP-47	29-A	1	3308086.0	6958019.4	4.0		WRSump014-SB-02		35BSB01	WRSump014-SB-03		WRSump014-SB-01		Exlplosives, Metals, VOCs, SVOCs
WRSUMP015	LHAAP-46	212-14	1	3305793.0	6961425.5	4.0	WRSump015-SB-02				WRSump015-SB-03			WRSump015-SB-01	Metals, TPH, VOCs, SVOCs
WRSUMP016	LHAAP-46	407	1	3304087.0	6962710.9	4.0		WRSump016-SB-02			WRSump016-SB-03			WRSump016-SB-01	Metals, VOCs, SVOCs
WRSUMP017	LHAAP-47	68-G	2	3309119.0	6961379.5	4.0	WRSump017-SB-02			WRSump017-SB-03			WRSump017-SB-01		Metals, Perchlorate, VOCs, SVOCs
WRSUMP018	LHAAP-47	54-H	2	3309897.0	6960525.6	4.0	47SB30	WRSump018-SB-02			WRSump018-SB-03			***WRSump118-SB-01***	Metals, TPH, VOCs, SVOCs
WRSUMP019	LHAAP-46	212-20	1	3305781.0	6961746.7	4.0			WRSump019-SB-02		WRSump019-SB-03			WRSump019-SB-01	Explosives, Metals, TPH, VOCs, SVOCs
WRSUMP021	LHAAP-46	P-11	1	3306316.0	6963080.5	4.0		WRSump021-SB-02			WRSump021-SB-03			WRSump021-SB-01	Metals, VOCs, SVOCs

Notes and Abbreviations:

1. Sump depths are from Waste Summary Inventory Remedial Investigation, (USACE, April 1993).
2. ***Blue, Bold, Italicized Text*** ***indicates that boring location is proposed.***
3. Operations associated with the nearest building may have yielded VOCs and SVOCs. These parameters have historically been below the cleanup goals. Therefore, VOCs and SVOCs are proposed only where no historical information is available (Sump 106 and the waste rack sumps).
4. See Table 3-1 for parameter method, container, preservative, and holding time.

PCBs polychlorinated biphenyls
SVOCs semivolatile organic compounds
TPH total petroleum hydrocarbon
VOCs volatile organic compounds

3.0 Sampling and Analysis

For the sumps and waste rack sumps under investigation, a visual inspection will be performed to confirm information presented in the earlier reports. The visual inspection will include site reconnaissance to verify safety of drilling, establishing boring locations, and confirming accessibility to all locations to be drilled. Previous information to be verified consists of sump location, number of sumps, proximity to buildings and building operations, and verification that sumps have been removed.

3.1 Sample Collection

Soil borings will be advanced using a direct push technology (DPT) rig or 5-foot stainless steel hand augers with extensions. The DPT method will involve the use of a high-capacity hydraulic ram mounted on an all-terrain vehicle. The hydraulic ram will advance a drive sampler attached to steel push rods. The contracted drilling company will provide appropriate rig attachments to core through concrete and asphalt. Composite soil samples will be collected during drilling from the surface (0-0.5 feet below ground surface) and from the bottom one-foot interval of each location. The total depth of each boring will be 1-foot below the depth of the sump. The sample depths are targeted to determine the existence of contamination from surface spills or subsurface leaks. Sump depths are presented in **Table 2-3**. In the event that a soil boring location is inaccessible by the DPT rig, a hand auger with appropriate extensions may be used to obtain the samples.

The procedures for sampling each boring are summarized as follows:

1. Mark boring locations with a pin flag, where practical, and use a global positioning system (GPS) device to obtain location coordinates.
2. Set up portable sample table and cover with plastic sheeting.
3. Calibrate field analytical and health and safety instruments.
4. Don a new pair of disposable sample gloves between sampling intervals to prevent cross-contamination.
5. Decontaminate the sampling equipment as described in Section 4.5 in the Chemical Data Acquisition Plan, Appendix C of the Final Work Plan (Shaw, 2006a).
6. Observe the drilling and auger operations to verify that proper safety, sampling, and drilling methods are being instituted.
7. Drill an exploratory hole to 5 feet with a hand auger to ensure utility clearance.
8. If the location is clear of underground utilities, proceed with DPT drilling.

9. When soil sample is received from the driller, open the soil-filled sampler, remove the sample liner from the barrel, cut open the liner, and place the sample liner and sample on the plastic sheeting. This is not necessary for borings that will be advanced by auger. If sampling by auger, recover the sample from the auger by hand using rubber nitrile gloves.

10. Describe the entire length of material from the barrel or as the auger is advanced according to ASTM D2488-93, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM International, 2004) and record on the standard Shaw Drilling Log Form.

11. After verifying the appropriate sampling intervals, collect composite soil samples for laboratory analysis by filling the types of sample containers described in **Table 3-1**.

12. Label each sample container as described in Section 4.6.2 of Appendix C of the Final Work Plan (Shaw, 2006a), enclose each container in a sealable plastic bag, and place in a cooler containing ice.

13. Record the location, soil color, odors, textures, sample-depth, and any field measurements obtained, including GPS readings, in the field logbook.

14. Repeat Steps 4 through 13 for each interval to the total boring depth.

15. Record the drilling and auger activities and sampling procedures on a Field Sampling Report or logbook.

16. Complete chain-of-custody documentation including relinquishing and receiving signatures of sampling personnel and sample coordinator, respectively, if applicable.

17. Maintain a photographic record of sample locations.

18. Dispose cuttings into the same borehole and grout any remaining open hole.

19. Dispose of decontamination fluids at the LHAAP-18/24 groundwater treatment plant.

3.2 Analytical Requirements

The parameters to be analyzed at each sump or waste rack sump are listed in **Table 2-3**. The choice of parameters is based on the potential contaminants at each building (see **Table 2-2**) and the results of the earlier investigations. Except for 21 sumps discussed in **Section 2.1**, past investigations indicate that various metals were detected above clean up levels. Therefore, each sample will be analyzed for metals. However, organic constituents were consistently below cleanup levels in the historical results, and are not included in the proposed analyses with two exceptions:

- The contents of the waste rack sumps have not been previously analyzed. Based on evaluation of operations at the associated buildings (see **Table 2-2**), these sumps have

the potential for VOC and SVOC contamination; therefore, VOCs and SVOCs are included among the proposed analytes for all the waste rack sumps listed in **Table 2-3**.

- Shaw does not possess any historical soil data for Sump 106, which was located within Building 401 (Power House). For that reason, soil extracted from borings associated with Sump 106 will be analyzed for polychlorinated biphenyls, VOCs, SVOCs, and metals, which are parameters associated with Building 401 operations.

The methods, containers, and holding times for the soil samples are presented in **Table 3-1**.

Table 3-1
Analytical Method, Container, Preservative, and Holding Time

Parameter	Method	Container	Preservative	Maximum Holding Time
Metals	SW846[a] 6020	2-oz Open Mouth Glass Container	HNO_3 to pH<2	6 months
Perchlorate	Method 314.0	2-oz Open Mouth Glass Container	4ºC	28 days
Explosives	Method 8330	2-oz Open Mouth Glass Container	4ºC	14/40 days
Pesticides	Method 8081	2-oz Open Mouth Glass Container	4ºC	14/40 days
PCBs	Method 8082	2-oz Open Mouth Glass Container	4ºC	14/40 days
SVOCs	Method 8270	4-oz Open Mouth Glass Container	4ºC	14/40 days
TPH	TX 1005	2-oz Open Mouth Glass Container	4ºC	14/14 days
VOCs	Method 8260	Encore Samples	4ºC, H_2SO_4, HCl, or $NaHSO_4$ to pH<2	14 days

Notes and Abbreviations:

[a] U.S. Environmental Protection Agency, 1997, *Test Methods for Evaluating Solid Waste, Physical Chemical Methods*

°C degrees Centigrade
HCl hydrogen chloride
HNO_3 nitric acid
H_2SO_4 sulfuric acid
$NaHSO_4$ sodium bisulfate
PCB polychlorinated biphenyl
SVOC semivolatile organic compound
TPH total petroleum hydrocarbon
VOC volatile organic compound

3.3 Sampling Nomenclature

The sampling nomenclature will follow the format SumpAAA-SBbb-cc, where "SumpAAA" identifies the sump number, "SBbb" identifies the sample as soil boring "bb", and "cc" represents the vertical component of that sample or the sampling depth. For quality control (QC) or quality assurance (QA), "QC" or "QA" is added at the end of the sample name to distinguish

those samples from original samples. For example, the first sample taken at the first depth interval would be Sump001-SB01-01 and the quality control nomenclature for that sample would be Sump001-SB01-01-QC.

3.4 H&S Field Screening Methods

Health and safety screening methods are described in the Health & Safety Plan, Appendix A of the Work Plan (Shaw, 2006a). Sample screening addressed in this work plan is limited to screening of soil samples for total VOCs using a photoionization detector.

3.5 Quality Assurance/Quality Control

QA and QC activities will be performed in accordance with Appendices B and C of the Installation-Wide Work Plan (Shaw, 2006a). As noted in that plan, the frequency of QC samples (field duplicates) will be one for every 10 or fewer field samples.

4.0 References

ASTM International (formerly American Society for Testing and Materials), 2004, *Annual Book of Standards*, 100 Bar Harbor Drive, West Conshohocken, Pennsylvania 19428-2959.

OHM Remediation Services Corp., 1997, *Removal and Closure of Wastewater Sumps, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas, April.

Plexus Scientific Corporation, 2005, *Final Environmental Site Assessment Phase I and II Report, Production Areas, Longhorn Army Ammunition Plant, Karnack, Texas*, February.

Shaw Environmental, Inc. 2006a, *Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas*, prepared for the U.S. Army Corps of Engineers, Tulsa District, Houston, Texas, November.

Shaw Environmental, Inc. 2006b, *Site Evaluation Report, LHAAP-48 (Former Igniter Production Area) and LHAAP-35C(53) (Former Static Test Area) Longhorn Army Ammunition Plant, Karnack, Texas*, Draft Final, prepared for the U.S. Army Corps of Engineers, Tulsa District, Houston, Texas, November.

Thiokol Corporation, 1996, *Closure Report, Closure of 29 Active and 11 Transition Sumps, Longhorn Army Ammunition Plant, Karnack, Texas*, September.

U.S. Army Corps of Engineers (USACE), 1995, *Draft Report, Phase II Investigations of 125 Waste Process Sumps and 20 Waste Rack Sumps, Longhorn Army Ammunition Plant*, September.

U.S. Environmental Protection Agency, 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)*, 3rd Edition, Update IIIA (June 1999) or most recent update, Office of Solid Waste and Emergency Response, Washington, D.C., <http://www.epa.gov/epaoswer/hazwaste/test/main.htm> (April 2006).

Shaw Environmental, Inc.

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

Location of Meeting: Army Trailer, Longhorn AAP, Karnack, TX
Date of Meeting: September 26, 2006, 2:00 – 4:00 PM

Meeting Participants:

BRAC:	Rose M. Zeiler
USACE-Tulsa:	Cliff Murray
USFWS:	Mark Williams, Barry Forsythe
Shaw Environmental:	Praveen Srivastav (phone), Kay Everett, Greg Jones
USEPA Region 6:	Raji Josiam
TCEQ:	Fay Duke (phone)

Prior to the meeting Shaw and Army had distributed copies of the meeting agenda, minutes of August 22, 2006 Monthly Managers' Meeting, and document status tables for the TERC and PBC work via e-mail.

Rose Zeiler opened the meeting and welcomed those in attendance and those joining on the phone. She informed the group that the MMRP update presentation was not going to be presented since there was nothing new to report. By October 15, the MMRP work will be completed and a presentation will be made after that time.

Dr. Zeiler went through the list of action items from the previous monthly managers' meeting. Below are the highlights of this discussion:

- **Army – Provide MMRP report to EPA when available:** Rose Zeiler indicated that a draft should come out in mid-October.
- **Army – Provide comments on GWTP Optimization Memo:** Shaw has comments from the Army. Fay Duke indicated that infiltration galleries are okay as long as it is treated water and will follow up with Tom Erny for his concurrence. Raji will follow up with Chris Villarreal, since we don't have his comments yet.
- **EPA – Provide input on the use of TCRA for remedial action at LHAAP-50 and similar sites:** There is nothing new to report. Raji will follow up with Chris and provide any comments. She indicated that Army should include documents related to disposal of asbestos at the landfill in the Administrative Record.
- **Shaw – Provide a field schedule to USFWS:** A schedule was provided prior to beginning of field work to Army and regulators, with copy to Barry Forsythe. Any changes or schedule updates will also be provided.

- **Shaw – Resolve perchlorate TRV and hazard calculation issue and provide memo to the stakeholders**: completed

Defense Environmental Restoration Program (DERP) PBC Update (Praveen Srivastav/Greg Jones)

Field Activities Update. Shaw completed the installation, development, and sampling of wells at LHAAP-29 last week. Transite pipe at LHAAP-29 will be located and sampled this week. It was originally sampled by Jacobs but the results were disqualified by EPA due to irregularities in laboratory procedures. Dale Vodak, TCEQ, was concerned about the deep well isolation casing. Prior to beginning drilling in the deep zone, after the isolation casing is set to the bottom of the intermediate zone, the mud would be replaced with fresh mud and sampled to confirm a tight casing seal. Field sampling has been completed at sites LHAAP-03, 04, 06, 07, 51, 64, and 68. LHAAP-35/36 sampling is close to being completed this week and will be followed by LHAAP-55 sampling. The BERA sampling (sediment and surface water) will be initiated next week (October 2). Barry Forsythe and Paul Bruckwicki would like to be included in the tailgate safety meeting on the morning of Tuesday (October 3). The details would be emailed to them and copied to Dale Vodak.

Document Status. PBC document status table was provided to the participants. Shaw is trying to resolve issues regarding the use of time-critical removal actions at some of the sites with the Army. The GWTP optimization memorandum is in the comment resolution stage. Shaw is addressing Army's comments. The final work plan for BERA field work is in preparation and field work is scheduled to begin on October 2.

Refuge Opening. A question about the plans of the refuge opening was asked. Volunteers will be guiding the "public". Jay Webb is the interim president of the Friends Group that will provide the volunteer guides. They are putting together a news release regarding the "opening" of the base and tour schedules. According to Mark Williams, interested parties will be able to call in on Monday to Tuesday of a week. Then tours will occur on Wednesday to Thursday of that or a later week. USFWS and Friends Group are planning on groups of approximately 10 people. The volunteer tour guides will take their groups to specific places where they will be allowed out of the vehicle. Otherwise, the participants will stay inside the vehicle. The tour guide will be responsible for their group while at the installation. They will meet them at the front gate and return them to the front gate. Rose Zeiler mentioned that moving Army's security guards back from the front gate was tentative and that if the guided car tours were going to be conducted as described, the Army didn't see a problem leaving the guards where they are until decommissioning them in March 2007. Mark Williams said that the tours will only take place as long as there is public demand. He didn't anticipate they would be conducting tours all the time, unless there is more volunteerism and public demand.

The tour schedules would also take into account remedial activities occurring at the installation. In the event the contractors are onsite working, the tour schedule would be suspended for the duration. No public ceremony is planned. There are some individuals and public officials involved in some type of ceremony, but it won't be open to the public.

In preparation for the guided tours, the Army has closed and locked gates to LHAAP-48 and LHAAP-53 and signs have been posted all around LHAAP-29 and LHAAP-49. Rose Zeiler said some funds may be available for some debris removal and hazard mitigation. A discussion regarding a new gate over the bridge to the Groundwater Treatment Plant is planned to prevent unauthorized access.

GWTP. Greg Jones provided an update on the GWTP operation. The plant is performing as usual. It was reported that the catalytic oxidizer went down the night before (September 25). Trouble shooting requires confined space entry. The Shaw Health and Safety supervisor, Wayne Watson, will arrive on site the next day (September 27) to train and supervise plant personnel on confined space entry in trouble shooting the catalytic oxidizer. In the meantime, the system is on recirculation.

Copies of the GWTP Quarterly Report were provided to the participants. Eleven tons of filter cake have been disposed since the last quarterly report. A lead excursion has been identified, but it did not exceed the daily or the maximum threshold amount. Shaw is working to resolve the problem. Shaw is checking with the laboratory to see if they have made any changes to their laboratory process. The treatment process at GWTP is unchanged so it is not clear why lead excursion would occur.

Fay Duke asked whether any surface water samples at LHAAP-16 were collected in May 2006. She was informed that there was no water in the creek at that time and therefore discharge to the creek did not occur. The next time there is water in the creek, samples will be collected.

Defense Environmental Restoration Program (DERP) TERC Update (Praveen Srivastav)

Document Status. TERC document status table was provided to the participants. Highlights of the discussion are:

- **Status of reviews for Proposed Plans 8, 32, 37/67, 48/53**: Proposed plans for these sites are in the review process. Responses to regulatory comments on LHAAP-08 proposed plan are in preparation. Responses to regulatory comments on LHAAP-32 proposed plan have been submitted to the Army and will be transmitted to the regulators soon. Responses to EPA comments on LHAAP-37/67 proposed plan were prepared earlier. Responses to TCEQ comments are in preparation. The revised draft proposed plan for LHAAP-48/53 is in Army's review.
- **Discussion of Site LHAAP-37 and MNA**: Army has received TCEQ comments and is resolving comments. Shaw recently sampled for MNA parameters at LHAAP-37 and 67 and data are just received from the laboratory. The Army plans to conduct at least two rounds of MNA sampling. With respect to the TCEQ comment about data gaps in the definition of extent of contamination by TCE in the intermediate zone, Rose Zeiler mentioned that the site data was reviewed by stakeholders while identifying data gaps. Data gaps identified by the team were addressed by Shaw as a part of the data gaps investigation conducted in 2004. Fay Duke mentioned that her primary concerns are: (1) the MNA remedy presented in the Proposed Plan contradicts the Final Feasibility Study which ruled out MNA as a feasible alternative; and (2) TCE is highest in the

intermediate zone at well LHSMW59. This zone probably needs to be addressed separately from the shallow zone. Cliff Murray indicated that the source of TCE at well LHSMW59 appears to be dumping of TCE at that location because there are no other known visible or documented sources at that location. Praveen Srivastav stated that the report of MNA sampling will be available approximately 2 weeks after the data are validated.

- **Status of LHAAP-12 – Remedial Design**: Rose Zeiler said the process of deed recordation would be similar to a deed recordation procedure conducted at Ft. Chaffee. Chromium sampling data from LHAAP-12 and LHAAP-48 are just coming in. TCEQ has concerns regarding the screen depth in well 12WW20 at LHAAP-12 and the location of this well with regards to well considering the groundwater flow direction at the site. Fay Duke mentioned that she is not sure which way the groundwater is flowing at the site. She also mentioned that water levels may be incorrect for two wells in Figure 2-5 of the LHAAP-12 ROD. Cliff Murray indicated that water level data from February 2003, February 2004, and December 2004 showed little variability in the groundwater flow. Fay Duke said comments on the Remedial Design will not be provided until chromium sampling results are provided and the screen depth issue for well 12WW20 is resolved.

DERP Corps of Engineers Update (Cliff Murray)

Groundwater Perimeter Wells
Shaw conducted perimeter well sampling on September 19 and 20, 2006 at six perimeter wells. Analytical results are forthcoming and will be available by next monthly meeting.

Other (Rose Zeiler)

Transfer Update
EFIA Review Status: Still waiting on USEPA comments on the East Further Investigation Area ECOP. USEPA gave verbal comments but have not provided written comments.

ECOPIV: ECOPIV consists of about 800 acres and has the cemeteries on it. It also has small areas excluded corresponding to the sump areas.

Demolition Progress: Rose Zeiler mentioned that the landfill has been inspected and Bill Corrigan is working with the contractor. The demolition crew will be demobing soon. As recommended by Plexus, soil around Building 407 should not be disturbed until ash and soil contamination concerns are resolved, so the building cannot be demolished yet. This building is located in production Plant #2 and is due north in a dead end of the 400-Area. This is the only building left in the area and also contains ash. The demo firm needs to remove their sign.

Security-Refuge Opening: Rose Zeiler indicated that the refuge opening is still being planned as discussed above with the use of guided vehicle tours of possibly 10 people per volunteer tour guide. A press release regarding the opening of the refuge and the subsequent tour schedules is being prepared. Mark Williams mentioned that a personalized tour for a delegation of women from Russia is being planned for October 7, 2006.

Fire Station: As discussed earlier, security will remain until March 14, 2007; and if the guided vehicle tours as described above are conducted, it may not be necessary to move security back to the Fire Station.

Schedule. Next monthly managers' meeting is scheduled for October 24, 2006 at 1:00 pm at the USEPA offices in Dallas. The next monthly managers' meeting is scheduled for November 14, 2006 at 1 pm at the TCEQ offices in Austin. The December meeting will be held on the 12th, 2006 at 1:30 pm at the Army Trailer at Longhorn AAP, Karnack, Texas. The quarterly RAB meeting is scheduled for the same day at 6:30 pm.

Meeting Adjourn.

Action Items:

Army - Provide MMRP report to EPA when available

EPA - Provide input on the use of TCRA for remedial action at LHAAP-50 and other similar sites

Shaw - Provide chromium results for LHAAP-12 and LHAAP-48 at the next monthly managers' meeting
- Provide perimeter well sampling results by next monthly managers' meeting
- Provide results of MNA sampling, if available, by next monthly managers' meeting

LONGHORN ARMY AMMUNITION PLANT
MONTHLY MANAGERS' MEETING

Location	Longhorn Trailer		
Date	26-Sep-2006	**Time**	1330

ATTENDEES

Name (printed)	Signature	Organization	Phone	E-mail
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Shaw Environmental, Inc.

Subject: **Draft Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting, Longhorn Army Ammunition Plant (LHAAP)**

Location of Meeting: Karnack Community Center, Karnack, Texas

Date of Meeting: **September 26, 2006, 6:30 – 7:30 PM**

Meeting Participants:

BRAC:	Rose M. Zeiler (RMZ), Mark Hilton
USACE-Tulsa:	Cliff Murray (CM)
USFWS:	Mark Williams (MW), Barry Forsythe, (BF), Paul Bruckwicki (PB)
Shaw Environmental:	Kay Everett (KE), Greg Jones (GJ)
USEPA Region 6:	Raji Josiam (RJ)
RAB:	Shirley Shivers, Nigel Shivers, Tom Walker, Ken Shaw
Community:	J. Sanders, M.J. Sanders, J. Webb

An agenda for the meeting was distributed prior to the meeting

Welcome and Introductions – Rose Zeiler
RMZ welcomed the attendees and brought the 2006 third quarter of the Restoration Activity Board meeting to order. The draft final minutes from the June 2006 meeting were distributed. RMZ asked if there were comments or changes to the minutes from the June 2006 RAB meeting. No changes were indicated.

RMZ mentioned that Mark Hilton, a project manager at her BRAC office would be in attendance. She said that over the last few months BRAC has been reorganized and centralized and that all field offices were closed.

Open Items – Rose Zeiler
The transfer process for areas not yet transferred and security issues regarding opening the refuge to visitors during the ongoing environmental work would be discussed later on the agenda.

Defense Environmental Restoration Program (DERP) (PBC) Update– Shaw
Document Status/Environmental Sites
Shaw's Greg Jones indicated that Shaw teams were currently at LHAAP completing several tasks at various sites. A work plan to complete some ecological sampling was finalized this week and the ecological field team would be at LHAAP next week to collect surface water,

sediment, and tissue samples. Well installations at LHAAP-29 were just completed, and a team would be looking for a transite line at LHAAP-29 and sampling its contents.

Groundwater Treatment Plant (GWTP) Update
Greg Jones noted that no major maintenance was conducted at the GWTP in the last quarter and that sludge was disposed off site. Some minor equipment replacements and repairs were conducted.

DERP Total Environmental Restoration Contract Update – Shaw

Document Status/Environmental Sites
Shaw's Kay Everett noted that several documents were in review and that currently several sites including LHAAP-37 and 67 were in the proposed plan stage. There are currently four proposed plans in progress. Field sampling at LHAAP-59 was completed. A new well was installed at LHAAP-48 during the past couple weeks.

After a question from the community, there was a brief discussion regarding the performance based contracting (PBC) system, its execution in relation to "completing" sites and what constitutes "completing" a site such that it is ready for transfer. Tony Novak from the community asked about sites not yet cleaned up, if a "cap" would be put on them, and what the cap material would be. RMZ explained that some sites may require capping, but that a cap is not always the option or remedy selected. The landfill sites do have caps in place that prevent further migration of contaminants. Such caps are clay and not concrete. As part of the PBC, the contractor is tasked to bring the sites to "operating properly and successfully". Only EPA can give that status to a site. CM said that MMRP sites may have to be fenced until totally remediated. Some sites are already fenced and capped.

DERP Corps of Engineers Update – Cliff Murray
Perimeter Well Monitoring
The PBC contractor is now tasked to sample the perimeter wells. Samples were collected by Shaw last week. No samples were collected from the creeks because of the dry conditions.

Question from the community: How extensive are the analyses? CM responded that they are analyzed for explosives, pesticides/herbicides, VOCs, SVOCs, metals, and radon.

Question from the community: What about the gas wells? MW indicated that two have been drilled with poor results. A third location was prepared but that well may not be drilled.

Military Munitions Response Program (MMRP) Update – Cliff Murray
The results of the munitions study are not yet finalized. The report should be submitted in the next 2 weeks. Early impression is that the munitions contractor has found very little in terms of hazard, but did find some items in the OB/OD area. However, no fused munitions were found. The results of the study will be presented at the next RAB meeting. Some of their work was delayed because they could not conduct "burn" activities, since the area is under dry conditions. After the burn ban was lifted, recent burns helped to expose problem areas. There are no buried munitions and the depth of penetration is not very deep (about 3 inches to 6 inches).

Transfer Update – Rose Zeiler
Dr. Zeiler indicated that the West Further Investigation Area (WFIA parcel #3) along with a few acres (ECOPIII) were offered to the USFWS for transfer. The transfers took place in April. The WFIA was one of the parcels on congressional hold. The other three are the Fire Station, the East FIA and the Production Area. The Fire Station parcel will be available for transfer as soon as the electricity issues are resolved and the East FIA and about 600 acres of the Production Area will be offered with ECOP IV. About 100 acres of the Production Area parcel were offered to USFWS in April, but have not been accepted. In response to a question about why the Army has not transferred all of the parcels that were on hold, RZ responded that the Army would transfer all of the land immediately and has offered to do so in the past. However, USFWS has a policy of not accepting contaminated land. Since much of the remaining Army land contains environmental sites, the sites must be Response-Complete or Operating Properly and Successfully prior to transfer.

A "permit" for USFWS to manage all of the remaining Army land as a wildlife refuge was proposed by Army in late 2004 and paperwork was begun in March 2005. There has been delay in resuming work on the permit after the release of the hold by Senator Hutchison because of the reorganization and centralization of BRAC. Now Longhorn has a new BRAC PM who has renewed work on the permit.

Work on ECOPIV is still awaiting funding. The Eastern Further Investigation Area (EFIA parcel #4), one of the parcels previously on hold, is included in ECOPIV. Some of the Production Area Parcel, also one of the parcels previously on hold, has been identified as suitable to transfer and approximately 500 acres will be addressed in ECOPIV. Sumps in Plant 2, an environmental site, were identified as unsuitable for transfer and oval areas extending 30 feet around each sump and the groundwater plume area, have been cut out of the acreage addressed in ECOPIV.

In preparation for the opening of the refuge to visitors, funds have been identified to fence and/or sign environmental sites. New signs were placed at LHAAP-29 and LHAAP-49 to discourage visitors from entering these sites.

Tony Novak expressed concern about safety at the refuge when it is opened to tours. Mark Williams discussed the plan for limited tours of the refuge that would be led by Jay Webb and the Friends group. The group expects to be able to take people within the next couple months by tour. The refuge will not be open at night.

Tony asked about the water rights. Tony expressed a worry that the City of Marshall may come in and take the water rights. RMZ indicated that Tom Lederle of the BRAC Division, will recommend that the permit provide for management of the water rights by USFWS until they are transferred on a prorated basis with each transfer of additional acreage.

Mrs. Shivers asked about are the environmental dangers at the sites. RMZ indicated that there are environmental dangers if you ingest dirt and groundwater. CM added that physical hazards are the real worry.

PF noted that the building behind #703 was torn down and asked why not have Army tear down this building, too? MW indicated that USFWS owns the building, but that they would be interested in using the Army's contractor to have it done to avoid mobilization costs. RMZ added that the contractor is currently demobing, however there may be more demolition scheduled for next year and she would notify MW so that he could take advantage of the situation.

Other Interest – Rose Zeiler
Two cemeteries are addressed for transfer in ECOPIV. These are the Hayner and Hope cemeteries.

Next RAB Meeting
Rose Zeiler suggested that the next RAB meeting be held on December 12, 2006 at 6:30 PM. Elections for the new Co-Chair will be held at that time.

Adjourn

December Meeting Attachments and Handouts:
September Meeting Agenda; September 2006 RAB Meeting Minutes; September Attendees Signup Sheet; USACE Status of Technical Documents TERC; Status of Technical Documents MARC

Shaw™ Shaw Environmental, Inc.

Longhorn Army Ammunition Plant
Restoration Advisory Board Meeting

Location	Karnack Community Center, Karnack, Texas
Date	26-Sep-2006 6:30 PM

Please add your name and address information if your name does not appear below or on page 2.

ATTENDEES

Name (printed)	Signature	Organization	Phone	E-mail
Community Members				
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Mark Williams	Mark Williams			
Jack Sanders	Jack W Sanders			
Mary Jane Sanders	Mary Jane Sanders			
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continued on next page

26-Sep-2006

Please add your name and address information if your name does not appear below.

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Shaw® Shaw Environmental, Inc.

Date: ***October 5, 2006***

Project No.:117591

TRANSMITTAL LETTER:

To: Mr. Cliff Murray

Address: US Army Corps of Engineers - Tulsa

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

Re: **Final Baseline Ecological Risk Assessment Field Sampling Work Plan, September 2006**
Longhorn Army Ammunition Plant - Karnack, Texas

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	3	September 2006	**Final Baseline Ecological Risk Assessment Field Sampling Work Plan, September, 2006**

Enclosed are three copies of the above-named document for your use.

Please distribute to interested parties. Copies have also been sent as indicated on distribution list below.

Please call if any questions or comments.

Sincerely:

David P. Cobb

Distribution List:

Mr. Rick Smith, USACE, Tulsa (sent to C. Murray for distribution)
Mr. Ken Kebbel, USACE, Tulsa (sent to C. Murray for distribution)
Mr. Chris Villearreal, USEPA, Dallas
Ms. Fay Duke, TCEQ, Austin
Mr. Dale Vodak, TCEQ, Tyler
Mr. Paul Bruckwicke, USFWL
Mr. Jeff Armstrong - AEC
Ms. Rose Zeiler – BRAC-LHAAP

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DEPARTMENT OF THE ARMY
LONGHORN ARMY AMMUNITION PLANT
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RATCLIFF, AR 72951

October 5, 2006

DAIM-BD-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
TCEQ Environmental Cleanup Section II MC-221
12100 Park 35 Circle
Austin, TX 78753

Re: Final Baseline Ecological Risk Assessment Work Plan
Longhorn Army Ammunition Plant, Karnack, Texas, September 2006

Dear Ms. Duke,

The above-referenced document is being transmitted to you for your review. 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 David Cobb, 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, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
Chris Villarreal, USEPA Region 6, Dallas, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE – Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
David P. Cobb, Shaw – Stoughton, MA
P. Srivastav, Shaw – Houston, TX (for project files)

DEPARTMENT OF THE ARMY
LONGHORN ARMY AMMUNITION PLANT
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October 5, 2006

DAIM-BD-LO

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

Re: Final Baseline Ecological Risk Assessment Work Plan ,
Longhorn Army Ammunition Plant, Karnack, Texas, September 2006

Dear Mr. Villarreal,

The above-referenced document is being transmitted to you for your review. 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 David Cobb, 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, Ph.D.
Longhorn AAP Site Manager

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P. Srivastav, Shaw – Houston, TX (for project files)

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Subject: **Minutes on the Conference Call to Discuss Comments on Draft Final BERA Field Sampling Work Plan, Longhorn Army Ammunition Plant (LHAAP)**

Date of call: **September 21, 2006**

Date issued: **September 27, 2006**

Call Participants:

Shaw Environmental

Jon Lindberg (JL)
Praveen Srivastav (PS)
Mark Weisberg (MW)
Dave Cobb (DC)

USACE

Susan Trussel (ST)
Cliff Murray (CM)

USFWS

Barry Forsythe (BF)

USEPA Region 6

Chris Villarreal (CV)
Susan Roddy (SR)

TCEQ

Vickie Reat (VR)
Fay Duke (FD)

USACHPPM

Larry Tannenbaum (LT)

Minutes prepared by Shaw on behalf of the USACE and BRAC. Call started at 3:00 EDT. Meeting participants are referred to by initials (e.g., "CV" = Chris Villarreal).

Call was initiated at the request of Shaw, in preparation for Baseline Ecological Risk Assessment (BERA) Field Work scheduled for October 3 – October 7, 2006 at LHAAP. TCEQ had submitted draft comments on September 20, 2006, and these comments were discussed as follows during the call. Additional questions, comments, and discussion from others on the call are also included. Action Items are presented at the end of Memo.

TCEQ Comments on Main Document
General Comments

1. This work plan describes the methodology and approach for field work to be conducted as part of the Installation-Wide combined Step 3/baseline ecological risk assessment (Step 3/BERA) at Longhorn. We appreciate the opportunity to provide comments. As

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discussed during our July 12, 2006 conference call, selection of the final COPEC list is tied to additional work performed by Shaw as part of the revised Step 3. This effort in particular has not been reviewed by regulators in its entirety. As such, our silence regarding the appropriateness of the COPECs carried forward for this evaluation does not represent an endorsement of the COPECs selected. We do recognize and support the addition of cadmium (industrial sub-area soil), silver (Goose Prairie Creek sediment), and thallium (Goose Prairie Creek, Central Creek, and Harrison Bayou sediment) as COPECs carried forward into this phase.

Response and Discussion
Comment noted.

2. Most comments fall in the category of clarification or interpretation as to the use in the final Step 3/baseline ecological risk assessment. We understand Longhorn/Shaw plans to initiate field work during the week of September 25, 2006. As such we recommend that Longhorn/Shaw quickly evaluate comments 4, 9, 17, 19, 22, 23, 26, and 27 in the event that the comment would impact the field work or coordination with a contract laboratory.

Response and Discussion
Comment noted. MW stated that field work is currently scheduled for Oct. 3 through Oct. 7, 2006. BF stated he would be present during the field event and requested to be kept informed of dates and times. MW said he would send out email to the group with field work schedule, as well as contact cell phone numbers for field team.

Specific Comments

3. 2.0 Revised Conceptual Site Model - Looking at Figure 2-2 and the accompanying discussion, we understand that some pathways are not being targeted for field studies as they were reportedly not risk drivers in the Step 3 calculations. Our presumption is that the total dose for each wildlife receptor will be evaluated in the final Step 3/BERA. This dose would include information derived from the planned field studies (such as site-specific uptake information) as well as components of the dose/diet that were not considered primary risk drivers. Please confirm.

Response and Discussion
MW confirmed that the total dose for each wildlife receptor will be evaluated in the final Step 3/BERA. Text will be revised to clarify this point.

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4. 2.0 Revised Conceptual Site Model - There is a discussion on page 2-2 that since a site-specific field study was previously conducted as part of an expanded Step 3 effort to determine bioaccumulation factors for soil-to-small mammals, additional investigation is not proposed in the BERA. Similarly, in the summary of ecological significant exposure pathways for final COPECs in soil (Table 2-1); there is a notation that the soil-to-mammal and soil-to-bird pathways (for explosives within the Waste Sub-Area) were previously addressed via site-specific studies. We believe this statement is misleading. According to our understanding of the small mammal uptake study (Appendix D in the Draft Final Step 3 Report), explosives were not detected in soil samples so soil-to-mammal uptake factors were not calculated for 2,4-DNT, 2,6-DNT, or 2,4,6-TNT. Further, the small mammal study was conducted in the Plant 2 area within the Goose Prairie Creek watershed whereas the areas of elevated explosives in soils are concentrated near Site 17 of the Waste Sub-Area. Please clarify and explain how this pathway will be modeled for these COPECs within the Waste-Sub Area.

   Response and Discussion
   JL discussed the approach that was used in the Step 3 ERA. Text will be revised to clarify that explosives were not detected in soil samples during the previous field study and therefore, explosives analysis in rodents was not performed. Text will also state that the Step 3 ERA used surrogate organics results for soil and small mammal samples to be conservatively representative of explosives bioaccumulation for the soil-to-mammal and soil-to-bird pathways.

5. 2.0 Revised Conceptual Site Model - Looking at Table 2-2, the distinction between sediment-insects and direct contact (as pathways) is not clear. Please clarify.

   Response and Discussion
   MW explained Table 2-2, specifically that “sediment-insect” represents the bioaccumulation of COPECs from sediment to aquatic biota living in the sediment, that are subsequently consumed by higher order wildlife such as the bank swallow. This exposure pathway is thus on Table 2-2 because there were some COPECs with estimated hazards above 1 for this pathway, and Shaw is recommending the collection of site-specific data to replace literature bioaccumulation factors (BAFs) with site-specific BAFs. “Direct contact” in Table 2-2 represents potential hazards for aquatic biota living in sediment from direct exposure to COPECs in sediment. Results from the AVS-SEM technique that is proposed will be used as a second line of evidence to assist in understanding both COPEC bioaccumulation and direct toxicity. AVS-SEM results are not planed to be used to modify higher order receptor hazards by adjusting BAFs. Text will be clarified.

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6. 2.0 Revised Conceptual Site Model - From the way the last column is displayed (Table 2-2) it is not clear if Longhorn/Shaw intend to use the AVS/SEM analyses to evaluate the bioavailability of metals to wildlife receptors, since both AVS/SEM and tissue residue studies are listed. Be advised that we believe it is an inappropriate extrapolation to use SEM/AVS theory to conclude that there are no risks to upper trophic level receptors based on the SEM/AVS ratios less than one. We are not aware of any sound defense for this extrapolation. This theory is intended to be used for benthic organisms and nothing else. In fact, the U.S. EPA's guidance for metal mixtures states that the guidelines, which are based on equilibrium partitioning theory for partitioning of metals in sediment between acid volatile sulfides, interstitial (pore) water, benthics, and other sediment phases, do not address the possibility of bioaccumulation and trophic transfer to aquatic life and wildlife.[2] SEM/AVS theory does not address sediment and food ingestion.

   Response and Discussion
   See response to Comment No. 5. SEM/AVS results will be used primarily to support findings from the sediment toxicity and bioaccumulation tests. SEM/AVS results will not be used to adjust uptake factors for higher order receptors, or to conclude that there are no hazards to upper trophic level receptors based on the SEM/AVS ratios less than one.

7. 2.0 Revised Conceptual Site Model - See later comment (comment 10) regarding the use of AVS/SEM for the benthic invertebrate exposure pathway.

   Response and Discussion
   See response to Comments Nos. 5, 6, and 10.

8. 4.2 Measurement Endpoints - Looking at Table 3-2 and the remainder of the discussion in this section, it was not clear why both measurement endpoints 2-3 and 2-4 are proposed for different sets of receptors. For instance, is the invertebrate ingestion pathway not believed to be a risk driver for the deer mouse, fox, and raccoon such that

[2]U.S. EPA. 2005. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver and Zinc). EPA-600-R-02-011. Office of Research and Development. Washington, DC.

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it was not included for 2-3 but was included (cumulatively) for 2-4? Please clarify the reason for the difference.

Response and Discussion
MW explained that measurement endpoint (ME) 2-4 is included to show that cumulative hazard from all exposure pathways will be included in the revised Step 3/BERA Report, not just the COPEC dose from the ingestion of soil invertebrates. The invertebrate ingestion pathway is not a risk driver for the deer mouse, fox, or raccoon and therefore was not included for ME 2-3, but was included for ME 2-4 to consider cumulative (total) COPEC dose.

9. 4.3.1 Decision Rules for Risk Questions to Assessment Endpoint No. 1 - In addition to the reference sample locations, toxicity tests should also be tracked with a laboratory control.

Response and Discussion
MW stated that laboratory control testing is discussed in Section 5.2 of Appendix A. Text will be modified to state that results from both reference locations and the laboratory control will be used in deciding whether or not the Testable Hypothesis is accepted or rejected.

10. 4.3.1 Decision Rules for Risk Questions to Assessment Endpoint No. 1 - It is acknowledged that the acid volatile sulfide/simultaneously extracted metals (AVS/SEM) methodology is widely used and is accepted by the scientific community in studies of metals bioavailability to sediment invertebrates. However, it should be acknowledged that this technique is also bound by a number of assumptions and limitations. We recommend that Longhorn/Shaw review the brief discussion in item 23 of TCEQ, 2005[1] for our current policy regarding this methodology.

Response and Discussion
Comment noted. MW stated he had reviewed the cited TCEQ document and agreed with the assumptions and limitations. These assumptions and limitations will be presented in the Step 3/BERA Report.

[1]TCEQ. 2005. Position Paper on Common Issues Encountered During the Review of Ecological Risk Assessments. Remediation Division.
http://www.tceq.state.tx.us/assets/public/remediation/positionpaper.pdf

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11. 4.3.1 Decision Rules for Risk Questions to Assessment Endpoint No. 1 - Regarding Risk Question 1-1, Longhorn should consider the outcome where sediment toxicity tests indicate statistically significant reduction in survival, growth, or reproduction compared to the laboratory control, but not the reference location. How would this be interpreted?

Response and Discussion
MW stated that in the event that sediment toxicity test results indicate a statistically significant reduction in survival, growth, or reproduction compared to the laboratory control, but not compared with the reference location, this would be interpreted by Shaw as "no adverse impact." MW also stated that for the entire toxicity test to be valid, the results of the laboratory control have to be at least 80 percent, and whatever survivability level the laboratory control exhibits must be considered in the interpretation of the results (e.g., an 81% survivability for on-site sediments may be interpreted differently if the lab control shows 82% survivability as opposed to a 95% survivability). There was discussion back and forth on hypothetical results and what they might mean, however the discussion was tabled, as the interpretation of the results can be discussed once they are obtained.

SR asked if the results of the toxicity tests would be used to develop action (i.e., cleanup) levels. MW said it depends on the results, but that is a possibility if a clear dose-response relationship is observed. SR and VR indicated that this possible use of the data was not clearly stated in the Work Plan, and asked that language be added to make this point more clear. MW agreed to add this language to the Work Plan.

LT asked if any other metrics would be used to assess adverse Site impact beside statistical difference from the control or from the reference location. MW replied that a significant biological difference of 20 percent may be used, as this threshold value has been discussed in ecological risk assessment literature and guidance (e.g., Suter). See Work Plan Appendix A Section 5.2.

12. 4.3.1 Decision Rules for Risk Questions to Assessment Endpoint No. 1 - Regarding Risk Questions 1-1 and 1-2, Longhorn should consider the outcome where sediment toxicity tests indicate reduction in survival, growth, or reproduction combined with a finding that the SEM/AVS ratios are generally less than one.

Response and Discussion
MW stated that if this outcome results, the conclusion would likely be a finding of adverse impact. As stated in response to Comment No. 5, AVS-SEM results will be

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used as a second line of evidence, with the primary line of coming from the toxicity test results themselves. AVS-SEM data will hopefully assist in explaining why the toxicity results are what they are.

TCEQ Comments on Appendix A - Sampling and Analysis Plan

13. 1.4 Field Activities - In general it was not clear if soil and sediment samples used in the toxicity tests and uptake studies will be composited in some way with tests performed ultimately on 5 soil or 4 sediment (Table 1) samples, or if the evaluations will be performed on discrete samples. Please clarify the proposal and the associated rationale including any consideration of data objectives to satisfy statistical assumptions.

    Response and Discussion
    MW stated discrete samples will be collected. Text will be clarified. See response to Comment No. 22.

14. 1.4 Field Activities - Regarding the reference sediment locations (Figure 5), we recommend that "stream" and "lake" samples not be used collectively. Also see comments 17 and 22.

    Response and Discussion
    MW stated text will be clarified so that stream and lake terms are not used interchangeably.

15. 1.4.1 Soil Sampling for Earthworm COPEC Uptake Estimates - The text indicates that the bioassay laboratory will hold the samples until chemical analytical results of the surface soil samples are available. After the chemical data have been reviewed, the notification to proceed will be given to the bioassay laboratory. Presumably this protocol is proposed so that bioassay tests are performed on "impacted" soil. What kind of threshold does Shaw/Longhorn have in mind for this decision?

    Response and Discussion
    MW explained that no specific threshold concentration was targeted; however, the goal is to collect soil samples with a range of COPEC concentrations so that the resultant BAFs are appropriate for both low COPEC concentrations and elevated COPEC concentrations. If data are appropriate, a regression BAF equation may be developed, similar to those in the literature for metals.

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16. 1.4.2 Sediment Sampling for Aquatic Invertebrate COPEC Uptake Estimates - Similar to comment 15, what kind of threshold does Shaw/Longhorn have in mind for the decision to use a particular sediment sample for the *Lumbriculus* uptake study?

Response and Discussion
See response to Comment No. 15. MW stated that historical hotspot locations were used to target some of the proposed sample locations, so that a COPEC gradient is represented in the sediment samples. As mercury is likely to be more unstable than the other inorganic COPECs, a rapid turn around time (TAT) will be requested for this metal so that the sediment toxicity test may be initiated within 2 weeks. MW also stated that for sediment samples, the plan is to initially collect more than the 8 proposed sediment samples (e.g., 12), have mercury analyzed with rapid TAT, and then select the 8 samples, respectively, which have the most appropriate mercury gradient for the bioaccumulation tests. The intent is not to run the bioaccumulation tests on sediment samples that may have non-detect results for mercury (other metals are expected to be present in most samples). A similar approach is planned for the samples collected for sediment toxicity testing.

17. 1.4.4.1 Goose Prairie Creek Watershed - The text indicates that the reference sediment sample upstream on Goose Prairie Creek will be selected to match the substrate types (e.g., sediment grain size) of the impacted downstream areas if possible. We also suggest that locations selected for reference sediment sample collection should demonstrate, within reason, similar current velocity, depositional features, and physical properties (organic carbon content, moisture content, bulk density, humic content, pH, sulfide, and redox characteristics) as the site locations that they will be compared with. Longhorn/ Shaw should consider this in site selection, and discuss the rationale for selecting the reference locations in the final Step 3/BERA report.

Response and Discussion
MW stated that sediment grain size will be added to the suite of analyses run on the sediment samples. The reference locations will be selected in the field to be as similar as possible to the Site locations; however, the match will not be exact. The targeted reference sample locations were selected as they had somewhat elevated concentrations of COPECs. Conditions such as visual appearance of substrate, depositional features, and approximate current velocity will be noted and recorded in the field. Photographs of each location are planned. Additional analyses for bulk density, humic content, and sulfide will not be performed, as these results would only be available after the field sampling event has been completed. Organic carbon content and moisture content are already planned to be completed by the chemical laboratory. In addition, AVS-SEM

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results will provide an indication of sediment sulfide content. BF stated that Shaw may be able to find some sediment quality parameter data in the historical dataset that could help them select appropriate sample locations.

18. 1.4.4.2 Goose Prairie Creek Cove of Caddo Lake - Regarding selection of the upstream lake reference sediment sample location, see previous comment 17 and comment 22 that follows.

Response and Discussion
See response to Comments Nos. 17 and 22.

19. 1.4.5 Sediment Sampling for COPEC Bioavailability - The text indicates that discrete sediment samples will be collected for measurement of AVS-SEM. It is important that sampling/measurements of AVS are performed so that the variability is characterized. Note that AVS concentrations generally vary with depth and that they also can vary significantly between seasons. Additionally, AVS concentrations are generally elevated during the summer and lower in the winter, due to the biogeochemical processes that form AVS in sediments. For AVS in particular, we suggest that Longhorn/Shaw use sediment sampling/ processing techniques that will minimize changes to the *in situ* redox conditions. Additionally, sediment sampling for AVS analyses should be limited to the biologically active zone of the surficial sediments, based on observations of biota during sampling. Longhorn/Shaw should consider these factors when planning the sediment sampling for samples that will be used for AVS analyses.

Response and Discussion
MW stated that the temperatures are still in the low 80s (^{o}F) at LHAAP, so AVS conditions should still be elevated, compared with winter conditions. As mentioned previously, AVS-SEM results will be used as a second line of evidence. Sediment sampling is planned using an Ekman dredge for the stream samples and a Petite Ponar for the Lake samples (both lowered on a rope). Each dredge should take a sediment "bite" of approximately six inches, and this is expected to be the biologically active zone. BF commented that the Ekman dredge should be used if possible, as it would disturb the sediments the least. MW stated that some sediment disturbance was unavoidable during sampling.

20. 1.4.5 Sediment Sampling for COPEC Bioavailability - See previous comment 10.

Response and Discussion

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See response to Comment No. 10.

21. 1.4.6.1 Sediment Reference Samples - See previous comment 17 regarding selection of sediment reference sample locations.

Response and Discussion
See response to Comment No. 17.

22. 1.4.6.1 Sediment Reference Samples - We suggest that Longhorn/Shaw consider the inclusion of more than one reference sample for the creek and lake to account for the potential heterogeneity of the sediment characteristics at the reference locations.

Response and Discussion
MW stated that two reference samples could be collected and composited into one sample for analysis, as this would increase the heterogeneity of the sediments. This approach would avoid the confusion of having two separate reference stations for each area (e.g., the stream area and the lake area). There was general consensus on this approach. Text will be revised to state that composite reference sediment samples will be collected.

23. 1.5.1 Chemical Analyses - Looking at Table 2, lipid analysis is planned for terrestrial invertebrates. Why is lipid analysis not planned for aquatic invertebrates as well?

Response and Discussion
MW explained that lipids are not needed for aquatic invertebrates because metals are the only COPEC group, and metals are not known to be lipid soluble. In addition, the tissue biomass required for the lipids analysis is approximately five times that needed for the metals analysis, thereby causing the *Lumbriculus* bioaccumulation study to be much more difficult to run, as these aquatic worms have a very low body mass.

24. 1.5.2 Sediment Toxicity Testing - The text cites a U.S. EPA (USEPA, 2000) method for performing sediment toxicity tests. This conflicts with the citations in Attachment 1 (USEPA 1994 and ASTM 1999). We recommend that the work plan clearly state what methodology will be used, including any modification to the method. We also suggest that the text indicate the alpha level that will be used for determining statistical significance of a response.

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Response and Discussion
MW stated that the reference will be corrected. The USEPA (2000) is correct, and this reference includes the USEPA 1994 and ASTM 1999 references. MW stated that the sediment toxicity test will be the 10-day *Hyalella* growth and survival test, as presented in Section 1.5.2 of Appendix A, and that no significant modifications of the method are planned. MW also stated that the bioassay lab will calculate the statistical difference between the control and the Site and reference samples using an alpha-level of 0.05 for a 95% confidence interval, but they will also look at the relative percent difference and adjust the alpha level if appropriate. ASTM and USEPA both provide the same language and recommend an alpha range of 0.01 to 0.1.

There was general consensus to this approach.

25. 1.5.3 Sediment and Soil Bioaccumulation Testing - Similar to comment 24, we recommend that the work plan clearly state what test methodology will be used, including any modifications to the method.

Response and Discussion
MW stated that the text had the correct references, and no significant modifications to the methods are planned.

26. 1.6.2 Sediment Sampling from Creeks and Caddo Lake - See previous comment 19 regarding samples to be used for AVS analyses. Also sample locations should target depositional areas.

Response and Discussion
See response to Comment No. 19. Depositional areas will be targeted if possible.

TCEQ Comments on 2.0 Part II - Quality Assurance Project Plan

27. 2.3 Chemicals of Potential Concern - The text indicates that additional analyses will be performed for hardness (surface water) and total organic carbon (soil and sediment). We support inclusion of these analyses. Longhorn/Shaw should also consider evaluation of ammonia (pore water), particle size distribution (e.g., percent sand, silt and clay), and percent water content for the sediment samples.

Response and Discussion
MW stated that the bioassay laboratory will be measuring ammonia before, during, and after the bioaccumulation and toxicity tests, as well as DO, pH, conductivity, and

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temperature. As mentioned in response to Comment No. 17, grain size (e.g., percent sand, silt and clay) will be added to the suite of sediment analyses. Percent water content is already being run by the chemistry laboratory.

28. 3.0 Sampling and Sample Handling Procedures - Regarding the sampling locations (Figures 4 and 5), see previous comments 13, 17, and 22.

    Response and Discussion
    See responses to Comments Nos. 13, 17, and 22.

29. 5.2 Toxicity Testing - See previous comments 9 and 11 regarding the use of reference and laboratory controls and the associated decision rules.

    Response and Discussion
    See responses to Comments Nos. 9 and 11.

Other Comments and Discussion

SR asked about sampling plant tissue for perchlorate and how it related to bat receptors and moths. MW explained that plant tissue is being collected at this time for perchlorate analysis, and the collection of moths is an optional task not currently scheduled. Shaw believes that it is conservative to assume perchlorate bioaccumulates from soil to moths and moth larva (caterpillars) at the same rate as it accumulates from soil to plants (i.e., the perchlorate concentration in the plant is expected to be similar to what would be in the moth, as the caterpillar feeds directly on the plant).

SR asked if any data for taxonomic classes would be crossed, i.e., would values for birds be used for mammals or visa versa. MW stated that this would not be done for toxicity values. It should be noted; however, that bioaccumulation from soil to small mammals is assumed to be similar for soil to birds, as already stated in the Step 3 ERA Report.

SR asked what site-specific data would be used for exposure pathways for the raccoon. MW stated these would include soil to plant bioaccumulation, soil to earthworm bioaccumulation, and sediment to aquatic insect bioaccumulation.

SR asked what the term “average” on page 4-3 referred to. MW stated this referred to the use of the 95% UCL soil or sediment concentration used with the site-specific BAF to be determined using the planned field data to be collected.

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SR asked how the sample sizes were determined. MW stated that it was based on best professional judgment. The use of statistical equations to determine sample size often times generate unrealistic estimates of samples size, and were therefore not used. BF said that because COPEC gradients based on previously collected data were being targeted for the BERA sample collection, a random sampling approach is not needed and the sample size is appropriate. The group generally accepted the number of samples presented in the Work Plan.

SR asked why no site-specific field data were being collected for dioxin or furans. MW stated that available literature values for soil bioaccumulation to plants and soil invertebrates would be used due to the complexity and difficulty of collecting this suite of chemicals and the complexity of calculating toxicity equivalent concentrations using toxic equivalent factors for each dioxin/furan congener.

SR asked if plant roots were an exposure pathway of concern. MW and JL stated that only above ground plant parts were a concern because the portions of plants typically ingested by the receptors with elevated food chain model hazards are primarily the above-ground parts of plants. Therefore, no plant roots are proposed for collection in the field.

SR asked if plants would be washed after collection to remove soil. MW stated that plants would not be washed. BF mentioned that this is a conservative approach due to the possibility of soil being stuck to the plant and included in the total concentration. JL mentioned that limited soil would be expected on the plants as no plan roots are to be collected. In addition, soil dust is not expected to be a concern on the plants.

SR asked about applying results from Goose Prairie Creek (GPC) Watershed to other watersheds. MW stated that because GPC generally had higher concentrations of sediment COPECs, this watershed was targeted for the field work. COPEC-specific BAFs based on GPC sediment to aquatic invertebrates would be used to also represent BAFs for similar COPECs in the sediment of other LHAAP watersheds.

SR asked why the text on page 1-6 discusses AVS-SEM and other metals such as zinc, when zinc is not a final COPEC in sediment. MW and JL stated that this text was simply listing all of the metals that AVS-SEM ratios may be applied to for predicting bioavailability. Text will be clarified.

LT made a general statement on behalf of USACHPPM regarding the various proposed tasks of the draft Work Plan. He said that none of the tasks are necessary, that the proposed work will not lead to a better understanding of the site, or be useful in the assessment of ecological hazards at LHAAP. He said that the proposed tasks do not support a weight-of-evidence

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approach. LT said that there was no need to explain on the call why USACHPPM felt this way because prior USACHPPM memoranda to Shaw and USACE had already provided an explanation.

Action Items

- Shaw to prepare TCEQ response to comments and call minutes (contained herein).
- Shaw to prepare final Work Plan to reflect these comments and the major issues discussed on the conference call. Only issues that directly relate to the proposed field work will be addressed in the revised Work Plan.
- MW to send out email to the group with field work schedule, as well as contact cell phone numbers for the field team.

Call terminated at 4:15 PM EDT.

FINAL

BASELINE ECOLOGICAL RISK ASSESSMENT FIELD SAMPLING WORK PLAN
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared for
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Appendix A Sampling and Analysis Plan

Acronyms and Abbreviations

AVS/SEM	acid volatile sulfides/simultaneously extracted metals
COPEC	chemicals of potential concern
CSM	conceptual site model
DQO	data quality objective
EEQ	ecological effects quotient
ERA	ecological risk assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
LHAAP	Longhorn Army Ammunition Plant
LOAEL	lowest-observed-adverse-effect level
NOAEL	no-observed-adverse-effect level
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.
SLERA	screening-level ecological risk assessment
Step 3/BERA	Step 3/baseline ecological risk assessment
TRV	toxicity reference value
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USEPA	U.S. Environmental Protection Agency

1.0 Introduction

This work plan describes the methodology and approach for field work to be conducted as part of the Installation-Wide combined Step 3/baseline ecological risk assessment (Step 3/BERA) at the Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas. The Step 3/BERA is being performed to address potential impacts of chemicals of potential concern (COPEC) on biota at the installation. Specifically, this assessment will address the following potential hazards to ecological receptors:

- Hazards associated with soil and sediment at LHAAP;
- Hazards associated with environmental impacts caused by contaminant migration to adjacent areas (e.g., Caddo Lake).

The ecological risk assessment (ERA) methodology presented herein follows the eight-step process outlined in the Ecological Risk Assessment Guidance for Superfund (ERAGS) (U.S. Environmental Protection Agency [USEPA], 1997). Steps 1 through 3a have been completed for LHAAP, and the results have been presented in the following documents: Jacobs, 2002, 2003; and Shaw Environmental, Inc. (Shaw), 2006. Step 3a included a re-evaluation of conservative assumptions used in the previous screening-level ecological risk assessments (SLERAs) and a refinement of the COPECs in the terrestrial sub-areas and watersheds to determine which COPECs (excluding background) could be eliminated from further consideration. Step 3a results provide the basis for the collection of additional site-specific data for the BERA. The final COPECs carried forward into the BERA are summarized as follows (Shaw, 2006):

<u>SOIL</u>

Industrial Sub-Area

- Cadmium
- Chromium
- Zinc
- Perchlorate

Waste Sub-Area

- Barium
- Chromium
- Lead
- 2,4-DNT
- 2,6-DNT
- TNT
- Dioxins
- *Cadmium*

SEDIMENT

Goose Prairie Creek

- Lead
- Mercury
- *Silver*
- *Thallium*

Central Creek

- *Thallium*

Harrison Bayou

- *Thallium*

The chemicals in italics, i.e., cadmium in soil in the Waste Sub-Area, silver in Goose Prairie Creek sediment, and thallium in Goose Prairie Creek, Central Creek, and Harrison Bayou sediment—have been added to the final COPEC list since the June, 2006 memo (Shaw, 2006) was issued. The selection criteria for these chemicals were reviewed again, and it was concluded that there was considerable uncertainty regarding whether the chemicals posed realistic threats to the environment. To be conservative, these chemicals are also being considered final COPECs, and will be targeted for further investigation in this work plan and the BERA. Full details describing the final COPEC selection process will be included in the forthcoming Step 3/BERA report, which will also include relevant portions of this work plan as part of Step 4, Study Design and Data Quality Objective Process. Steps 5 and 6 will be completed as part of the field data collection process. Steps 7 and 8 are fulfilled when the Step3/BERA report is completed, and the information contained therein is used to make decisions concerning remedial options about the site.

2.0 Revised Conceptual Site Model

The refinement of final COPECs in Step 3 was based on information and analysis of the ecological system at LHAAP as represented by the original ecological conceptual site model (CSM) presented in **Figure 2-1**. Following the selection of final COPECs, the CSM was modified to eliminate receptors that were determined not to be problematic and pathways that were determined not to be significant. The revised CSM was used to guide what information needed to be collected during the BERA to further refine potential threats to the environment.

Tables 2-1 and **2-2** present the final COPECs for soil and sediment, respectively (no chemicals were selected as final COPECs for the surface water medium). All measurement receptors that exceeded an ecological effects quotient (EEQ) of 1 are listed in these two tables, and any exposure pathway that resulted in an intake dose that exceeded the no-observed-adverse-effect level (NOAEL) is listed, as well. (Note: EEQs are similar to hazard quotients, as discussed in ecological risk assessment guidance) Thus, any receptors that were considered to be potentially threatened by any of the final COPECs, and the exposure pathway of concern for each of those receptors, are represented in **Tables 2-1** and **2-2**. Therefore, the CSM presented in **Figure 2-2** has been revised to highlight exposure pathways that represent unacceptable hazard to specific receptors following Step 3 of the ERA based on the information presented in **Tables 2-1** and **2-2**. These pathways (i.e., the non-shaded cells in **Figure 2-2**) are considered for further refinement in the BERA. The modifications to the CSM include the following:

- **Elimination of Receptors**. The following receptors have been removed from the CSM, either because they did not exceed an EEQ of 1 for any final COPEC, or because toxicity information necessary for further evaluation is lacking (i.e., reptile and amphibian toxicity data): Muskrat, Common Snapping Turtle, and River Otter. Furthermore, the fathead minnow and brown bullhead catfish can be eliminated from the "Aquatic Life" receptor category because of the lack of final COPECs in surface water (minnow) and because recently collected fish tissue data (USEPA, 2004) show body burden concentrations are below the levels of concern (catfish).

- **Elimination of Exposure Pathways**. Surface water Ingestion and Direct Contact pathways have been eliminated because no final COPECs were identified in surface water (however, some COPECs in surface water have been put on the background list). The sediment ingestion, aquatic plant ingestion, and fish ingestion pathways have also been eliminated because these pathways did not result in unacceptable risk for any receptor (**Tables 2-1** and **2-2**).

- **Refinement of Receptors Affected by Various Exposure Pathways**. Individual receptors have been removed from specific pathways that did not result in elevated hazard (i.e., EEQs greater than 1). For example, small mammal ingestion was not identified as a significant

pathway for the Raccoon for any of the final COPECs (**Table 2-1**). Therefore, this pathway does not need to be investigated further for this receptor.

- **Ingestion of Mammals and Birds as Prey**. A site-specific field study was previously conducted as part of an expanded Step 3 effort to determine bioaccumulation factors for soil to small mammals. Because uptake factors for birds are generally not available in the literature, and field studies of this type are difficult, mammal uptake factors are used as surrogates for birds as well. Because these uptake factors have already been refined by field studies, additional investigation is not proposed in the BERA. It should be noted that explosives were not detected in soil samples during the previous field study and therefore, explosives analysis in rodents was not performed. The Step 3 ERA used surrogate organics results for soil and small mammal samples to be conservatively representative of explosives bioaccumulation for the soil-to-mammal and soil-to-bird pathways.

The revised CSM, reflecting these changes, is presented in **Figure 2-2**. It should be noted that in the revised Step 3/BERA report, total doses for each wildlife receptor will be calculated using site-specific bioaccumulation data collected for some COPECs as part of this Work Plan and using literature bioaccumulation data from the literature.

Results from the AVS-SEM technique that is proposed will be used as a second line of evidence to assist in understanding both COPEC bioaccumulation and direct toxicity. AVS-SEM results are not planed to be used to modify higher order receptor hazards by adjusting BAFs, or to conclude that there are no hazards to upper trophic level receptors based on the SEM-AVS ratios less than one.

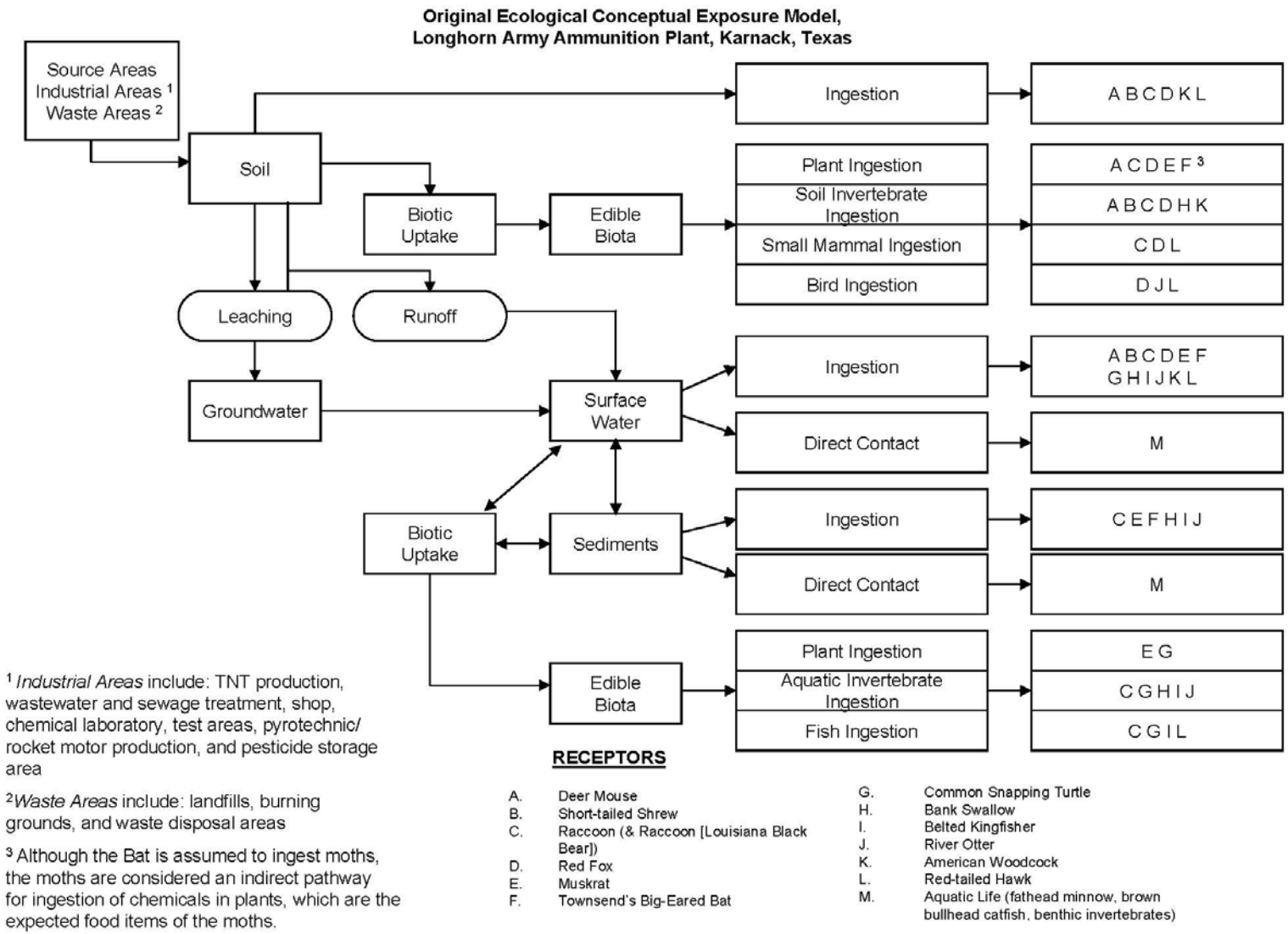


Figure 2-1
Original Ecological Conceptual Exposure Model

Table 2-1
Summary of Ecologically Significant Exposure Pathways for Final COPECs in Soil

Final COPEC [a]	Sub-Area	Receptors With EEQs > 1	Pathways of Concern [b]	Pathways to be Addressed in the BERA for Each Analytical Group	Study Proposed for BERA
Metals					
Barium	WSA	**DM**	Soil-Plant	Soil Ingestion	
			Soil-Earthworm		
		TBEB	Soil-Plant		
		STS	Soil Ingestion		
			Soil-Earthworm		
		AW	Soil-Earthworm	Soil-Plant	Tissue residue study for plants
		RAC	Soil-Plant		
Cadmium	ISA, WSA	**STS**	Soil-Earthworm	Soil-Earthworm	Tissue residue study for earthworms
Chromium	ISA, WSA	**AW**	Soil-Earthworm		
		STS	Soil-Earthworm		
Lead	WSA	**AW**	Soil-Earthworm		
Zinc	ISA	**AW**	Soil-Earthworm		
Perchlorate					
Perchlorate	ISA	**TBEB** [c]	Soil-Plant [c]	Soil-Plant	Tissue residue study for plants
Explosives					
2,4-DNT	WSA	**STS**	Soil Ingestion		
			Soil-Earthworm		
		RF	Soil-Earthworm		
			Soil-Plant		
			Soil-Mammals		
			Soil-Birds		
		DM	Soil-Earthworm		
		RAC	Soil-Earthworm		
			Soil-Plant		
2,6-DNT	WSA	**STS**	Soil-Earthworm		
		RAC	Soil-Earthworm		
		DM	Soil-Earthworm	Soil Ingestion	
			Soil-Plant		
		RF	Soil-Mammals	Soil-Plant	Tissue residue study for plants
2,4,6-TNT	WSA	DM	Soil Ingestion		
			Soil-Earthworm	Soil-Earthworm	Tissue residue study for earthworms
			Soil-Plant		
		RAC	Soil Ingestion	Soil-Mammals	This pathway previously addressed via site-specific studies
			Soil-Earthworm		
			Soil-Plant	Soil-Birds	This pathway previously addressed via site-specific studies
			Soil-Mammals		
		RAC (LBB)	Soil Ingestion		
			Soil-Earthworm		
			Soil-Plant		
			Soil-Mammals		
		STS	Soil Ingestion		
			Soil-Earthworm		
		RF	Soil Ingestion		
			Soil-Earthworm		
			Soil-Plant		
			Soil-Mammals		
			Soil-Birds		
		TBEB	Soil-Plant		
		AW	Soil Ingestion		
			Soil-Earthworm		
		RTH	Soil Ingestion		
			Soil-Mammals		
			Soil-Birds		
Dioxin					
2,3,7,8-TCDD TEQ	WSA	**STS**	Soil-Earthworm		
		DM	Soil-Earthworm		
		RAC	Soil-Earthworm	Soil-Earthworm	Additional characterization is not proposed for dioxin.
		RAC (LBB)	Soil-Earthworm		
		AW	Soil-Earthworm		

[a] Chemical selected as a final COPEC in Step 3 in at least one terrestrial sub-area.
[b] Pathways that resulted in an ecological effects quotient (EEQ) greater than 1.
[c] EEQs not calculated for perchlorate due to Army policy. The Bat represents the receptor with the highest intake dose for perchlorate. The soil-plant pathway was the most significant pathway for the bat (bat diet assumed to be 100 percent moths, which were assumed to have a 1:1 concentration ratio with plants).

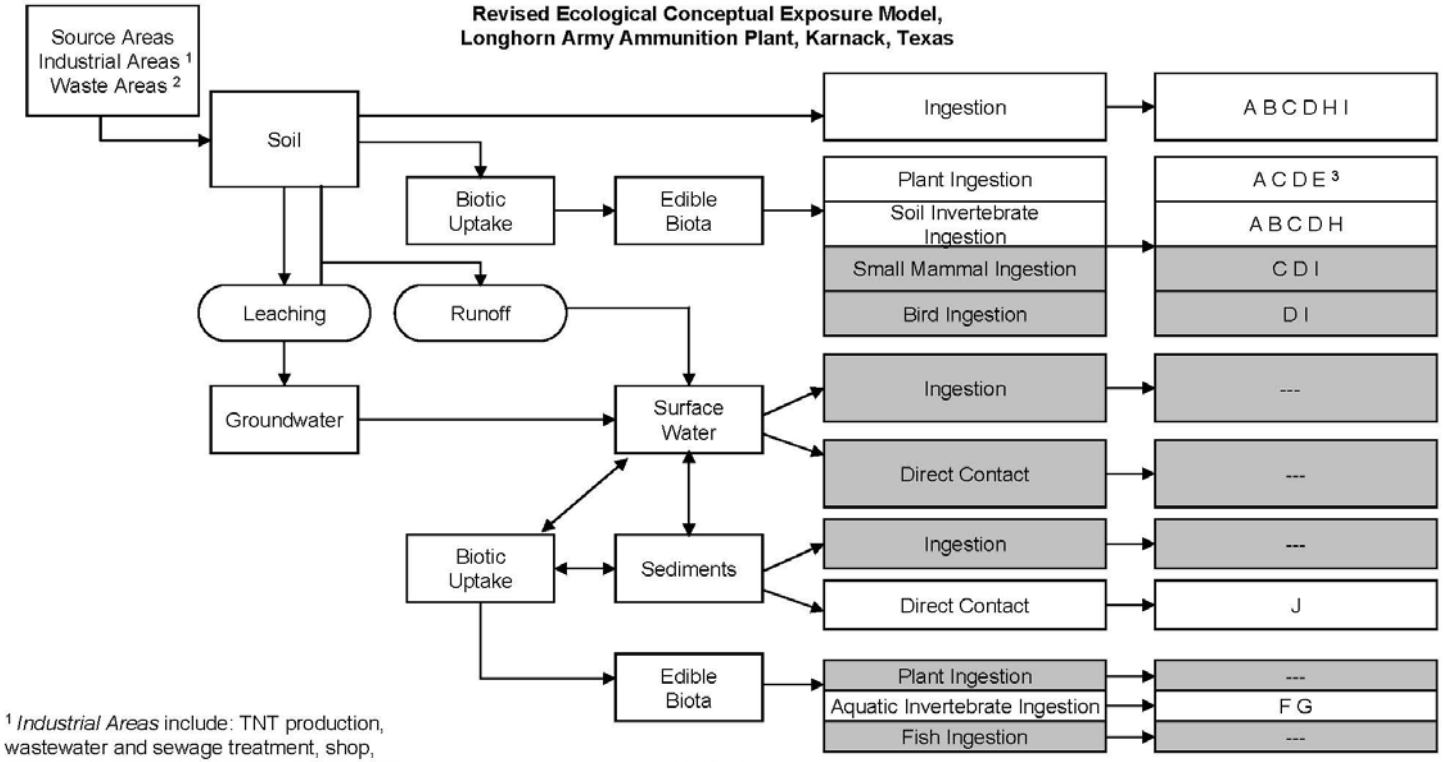
Sub-Areas: ISA = Industrial Sub-Area; WSA = Waste Sub-Area
Receptors: AW = American Woodcock; DM = Deer Mouse; RAC = Raccoon; RAC (LBB) = Raccoon (Louisiana Black Bear); RF = Red Fox; RTH = Red-Tailed Hawk; STS = Short-tailed Shrew; TBEB = Townsend's Big-Eared Bat. Bolded receptors are the most exposed receptor overall, for that chemical
BERA = Baseline ecological risk assessment
COPEC = Chemical of potential ecological concern
EEQ = Ecological effects quotient

Table 2-2
Summary of Ecologically Significant Exposure Pathways for Final COPECs in Sediment

Final COPEC [a]	Watershed	Receptors With EEQs > 1	Pathways of Concern [b]	Pathways to be Addressed in the BERA	Study Proposed for BERA
Metals					
Lead	GPC	**BS**	Sediment-Insects		
		Benth. Inv.	Direct Contact	Sediment-Insects →	Tissue residue study for benthic invertebrates / AVS-SEM
Mercury	GPC	**BS**	Sediment-Insects		
		BK	Sediment-Insects	Direct Contact →	Toxicity studies for benthic invertebrates / AVS - SEM
		Benth. Inv.	Direct Contact		
Silver	GPC	Benth. Inv.	Direct Contact	→ Direct Contact →	Toxicity studies for benthic invertebrates / AVS - SEM
Thallium	GPC	**RAC**	Sediment-Insects		
		RAC (LBB)	Sediment-Insects		
Thallium	HB	**RAC**	Sediment-Insects	→ Sediment-Insects →	Tissue residue study for benthic invertebrates / AVS-SEM
		RAC (LBB)	Sediment-Insects		
Thallium	CC	**RAC**	Sediment-Insects		
		RAC (LBB)	Sediment-Insects		

[a] Chemical selected as a final COPEC in Step 3 in at least one terrestrial sub-area.
[b] Pathways that resulted in an ecological effects quotient (EEQ) greater than 1.

Watershed: GPC = Goose Prairie Creek; HB = Harrison Bayou; CC = Central Creek
Receptors: BS = Bank Swallow; Benth. Inv. = Benthic Invertebrates; BK = Belted Kingfisher; RAC = Raccoon; RAC (LBB) = Raccoon (Louisiana Black Bear)
Bolded receptors are the most exposed receptor overall.
AVS - SEM = Acid volatile sulfides - simultaneously extracted metals



[1] *Industrial Areas* include: TNT production, wastewater and sewage treatment, shop, chemical laboratory, test areas, pyrotechnic/ rocket motor production, and pesticide storage area

[2] *Waste Areas* include: landfills, burning grounds, and waste disposal areas

[3] Although the Bat is assumed to ingest moths, the moths are considered an indirect pathway for ingestion of chemicals in plants, which are the expected food items of the moths.

RECEPTORS

A.	Deer Mouse	F.	Bank Swallow
B.	Short-tailed Shrew	G.	Belted Kingfisher
C.	Raccoon (& Raccoon [Louisiana Black Bear])	H.	American Woodcock
D.	Red Fox	I.	Red-tailed Hawk
E.	Townsend's Big-Eared Bat	J.	Aquatic Life (benthic invertebrates)

Shaded cells indicate pathways that were not identified as significant, are background related, or have already been refined via site-specific investigations, and will not be a focus of field studies for the baseline ecological risk assessment.

Figure 2-2
Revised Ecological Conceptual Exposure Model

3.0 Step 3b – Problem Formulation

This section contains two components of the Problem Formulation, Ecological Assessment Endpoints and Risk Questions, to aid in the development of this Work Plan. This information will also be presented in the Step 3/BERA report.

3.1 Ecological Assessment Endpoints

USEPA guidelines for ERAs define assessment endpoints as "explicit expressions of the actual environmental value that is to be protected, operationally defined by an ecological entity and its attributes" (USEPA, 1998). Additionally, "useful assessment endpoints define both the valued ecological entity at the site (e.g., a species, ecological resource, or habitat type) and characteristic(s) of the entity to protect (e.g., reproductive success, production per unit area, aerial extent)" (USEPA, 1997).

The assessment endpoints selected for additional field investigations established for Step 3b for LHAAP are intended to focus on broad ecological functional groups that represent the range and complexity of receptors that could be at risk from COPECs in soil and sediment. USEPA (1997) guidance notes:

> "Individual assessment endpoints usually encompass a group of species or populations with some common characteristics, such as a specific exposure route or contaminant sensitivity…Assessment endpoints can also encompass the typical structure and function of biological communities or ecosystems associated with a site."

Two broad ecological functional groups identified for assessing COPEC-based hazard for impacted media at the LHAAP that are selected for additional field investigations include the following.

- Aquatic biota living in sediment
- Birds and mammals

Assessment endpoints are summarized in **Table 3-1**. These assessment endpoints are slightly different from those presented in the Step 3 Report (Shaw, 2004), and have been revised in this problem formulation to more accurately address pathways of concern. Each assessment endpoint is accompanied by a number of measurement endpoints that are recommended for additional field investigation, which will be used to evaluate whether or not the assessment endpoint is likely to be adversely affected. It is important to note that the final Step 3/BERA will include

Table 3-1
Summary of Proposed Assessment and Measurement Endpoints

Proposed Assessment Endpoints	Step 3 Receptors (Surrogate Species)	Step 3 Measurement Endpoints (Results)	Proposed BERA Measurement Endpoints That Require Additional Field Work	Proposed BERA Measurement Endpoint Details for Site-Specific Bioaccumulation Approach
AE-1: Survival, growth, and reproduction of aquatic biota living in sediment	1. Freshwater sediment invertebrates-chironomids, amphipods (aquatic biota)	Comparison of site COPEC data to SQB	• Laboratory sediment invertebrate toxicity tests (freshwater amphipods) • Acid Volatile Sulfides - Simultaneously Extracted Metals (AVS - SEM) test to assess bioavailability	No bioaccumulation approach needed for this assessment endpoint.
AE-2: Survival, growth, and reproduction of birds and mammals	• American woodcock (-) • Deer mouse (-) • Short-tailed shrew (-) • Raccoon (-) • Louisiana Black Bear (Raccoon) • Rafinesque's Big Eared Bat (Townsend's Big Eared Bat)	Intake/food-chain model EEQ estimation with generic bioaccumulation factors (some EEQs >1)	• Comparison of food-chain bioaccumulation measurements of biota at site to bioaccumulation measurements of biota at reference location • Intake/food-chain model EEQ with site-specific bioaccumulation factors	• Plant bioaccumulation estimated using co-located soil and plant samples • Sediment invertebrate bioaccumulation estimated using laboratory bioaccumulation study (freshwater aquatic worms) • Soil invertebrate bioaccumulation estimated using laboratory bioaccumulation study (earthworms) • (Optional) Moth bioaccumulation of perchlorate estimated using field collected moths in perchlorate-contaminated areas of LHAAP.

Notes and Abbreviations
For details regarding USEPA Step 4 Measurement Endpoints-measures of effect and exposure, USEPA Step 3b Risk Questions, and USEPA Step 4 Testable Hypotheses, please see Table 3-2.

AE *assessment endpoint*
BERA *baseline ecological risk assessment*
COPEC *chemical of potential ecological concern*
EEQ *ecological effects quotient*
SQB *sediment quality benchmark*
USEPA *U.S. Environmental Protection Agency*

(-) denotes no surrogate species necessary, as the selected receptor has the minimum data requirements for quantification of the assessment and measurement endpoints

additional measurement endpoints that were not selected for, or may not have been appropriate for, the collection of additional field data (e.g., comparison of site COPEC data to sediment quality benchmarks). The assessment endpoints and their associated measurement endpoints are generally consistent with assessments conducted in Steps 1 and 2 of previously completed SLERAs and the Step 3a evaluation (Jacobs, 2002 and 2003; Shaw, 2004 and 2006). The assessment endpoints recommended for problem formulation are listed below:

***Assessment Endpoint No. 1*: Survival, growth, and reproduction of aquatic biota living in sediment**

Reduction or loss of valuable ecosystem functions contributed by aquatic biota caused by exposures to COPECs in sediment could reflect disruption of the ecosystem and loss of semi-aquatic wildlife that feed on these aquatic biota, which is a societal value concern. Assessment of adverse effects to aquatic biota by COPECs in sediment at LHAAP is therefore important. Types of effects of greatest concern for viability of populations of aquatic biota include reductions in survival, growth, or reproduction, which are endpoints most clearly linked to sustainability of populations (USEPA, 1997; U.S. Army Center for Health Promotion and Preventive Medicine [USACHPPM], 2000).

Assessment Endpoint No. 2: Survival, growth, and reproduction of birds and mammals

Reduction or loss of valuable attributes contributed by birds and mammals caused by exposures to COPECs in soil and sediment or the food chain could reflect disruption of the ecosystem and loss of birds and mammals, which is a societal value concern. Therefore, it is important to assess adverse effects of COPECs in soil and sediment to birds and mammals at LHAAP. Types of effects of greatest concern for viability of populations of birds and mammals include reductions in survival, growth, or reproduction, which are endpoints most clearly linked to sustainability of populations (USEPA, 1997; USACHPPM, 2000). Potential hazard to individual birds and mammals, as well as to populations, will be considered for receptor groups intended to represent special status (Federally- and State-listed) species. An evaluation of individual-level effects will be performed to estimate potential hazard to local populations.

3.2 Risk Questions

Specific risk questions support the evaluations for each assessment endpoint. For this purpose a risk question can be stated as the following: "Is exposure to a site contaminant causing adverse effects to the selected assessment endpoint?" In general, if the answer to the risk question is yes, the implication is that the viability or sustainability of populations of the ecological functional group is likely to be reduced based on the measurement endpoints selected. Similarly, if the answer to the risk question is no, the implication is that the viability or sustainability of populations of the ecological functional group is not likely to be reduced based on the measurement endpoints selected. Risk questions developed for the assessment endpoints are

summarized in this section and in **Table 3-2**, "Proposed Assessment and Measurement Endpoints That Are Selected for Additional Field Work: Risk Questions and Testable Hypotheses."

Assessment Endpoint No. 1: Survival, growth, and reproduction of aquatic biota living in sediment

- Does exposure to site sediment cause reduced survival, growth, or reproduction for invertebrates in sediment?
- Are metal COPECs bioavailable such that exposure to site sediment causes reduced survival, growth, or reproduction for invertebrates in sediment?

Assessment Endpoint No. 2: Survival, growth, and reproduction of birds and mammals

- Does the consumption of COPEC concentrations in laboratory-measured freshwater aquatic invertebrates infer reduced survival, growth, or reproduction for birds?
- Does the consumption of COPEC concentrations in field-collected plants infer reduced survival, growth, or reproduction for mammals?
- Does the consumption of COPEC concentrations in laboratory-measured earthworms infer reduced survival, growth, or reproduction for birds and mammals?
- Does the consumption of COPECs in diet, plus incidental surface water, soil, and sediment ingestion, infer reduced survival, growth, or reproduction for birds and mammals?
- (Optional) Does the consumption of perchlorate in moths for the Townsend's big-eared bat infer reduced survival, growth, or reproduction for this bat species?

Table 3-2
Proposed Assessment and Measurement Endpoints That Require Additional Field Work: Risk Questions and Testable Hypotheses

USEPA Step 3: Assessment Endpoint	USEPA Step 4: Measurement Endpoint—Measures of Effect and Exposure	USEPA Step 3b: Risk Questions USEPA Step 4: Testable Hypotheses
AE-1: Survival, growth, and reproduction of aquatic biota living in sediment	ME 1-1: Laboratory survival, growth, or reproduction of sediment-dwelling freshwater invertebrates (*Hyalella azteca*) in samples of site and reference location sediment (note: reference location upstream or in non-LHAAP impacted area of Caddo Lake)	ME 1-1 Risk Question: Does exposure to site sediment cause reduced survival, growth, or reproduction for invertebrates in sediment? ME-1-1 Testable Hypothesis: Means of laboratory survival, growth, or reproduction for invertebrates in site and reference location or control sediment are not significantly different. Note: Mean survival of the laboratory control for test species must equal or exceed 80 percent for results to be considered valid.
	ME 1-2: Acid Volatile Sulfides - Simultaneously Extracted Metals (AVS - SEM) data from sediment samples collected from the site and calculation of AVS – SEM ratio to assess bioavailability	ME 1-2 Risk Question: Are metal COPECs bioavailable such that exposure to site sediment causes reduced survival, growth, or reproduction for invertebrates in sediment? ME 1-2 Testable Hypothesis: Most of the AVS – SEM ratios in the samples (e.g., > 50%) are greater than 1 (i.e., SEM – AVS < 0), suggesting low bioavailability of metals.
AE-2: Survival, growth, and reproduction of birds and mammals	ME 2-1: Survival, growth, and reproduction of birds represented by the bank swallow and belted kingfisher based on consumption of sediment-dwelling aquatic invertebrates containing COPEC concentrations modeled from sediment-to-invertebrate relationship for COPECs for laboratory-measured concentrations of COPECs in samples of aquatic worms (*Lumbriculus variegatus*) and sediment from the site	ME 2-1 Risk Question: Does the consumption of COPEC concentrations in laboratory-measured freshwater aquatic worms for birds infer reduced survival, growth, or reproduction for birds? ME 2-1 Testable Hypothesis: EEQs are below the risk thresholds for birds.
	ME 2-2: Survival, growth, and reproduction of mammals represented by the deer mouse, Townsend's big-eared bat, and raccoon based on consumption of plants containing COPEC concentrations modeled from soil-to-plant relationship for COPECs for measured concentrations of COPECs in co-located field samples of plants and soil from the site	ME 2-2 Risk Question: Does the consumption of COPEC concentrations in field-collected plants for mammals infer reduced survival, growth, or reproduction for mammals? ME 2-2 Testable Hypothesis: EEQs are below the risk thresholds for mammals.

Table 3-2 (*continued*)
Proposed Assessment and Measurement Endpoints That Require Additional Field Work: Risk Questions and Testable Hypotheses

USEPA Step 3: Assessment Endpoint	USEPA Step 4: Measurement Endpoint—Measures of Effect and Exposure	USEPA Step 3b: Risk Questions USEPA Step 4: Testable Hypotheses
AE-2 (*continued*): Survival, growth, and reproduction of birds and mammals	ME 2-3: Survival, growth, and reproduction of birds and mammals represented by the American woodcock and short-tailed shrew based on consumption of soil earthworms containing COPEC concentrations modeled from soil-to-invertebrate relationship for COPECs for laboratory-measured concentrations of COPECs in samples of earthworms (*Eisenia fetida*) and soil from the site	ME 2-3 Risk Question: Does the consumption of COPEC concentrations in laboratory-measured earthworms for birds and mammals infer reduced survival, growth, or reproduction for birds and mammals? ME 2-3 Testable Hypothesis: EEQs are below the risk thresholds for birds and mammals.
	ME 2-4: Survival, growth, and reproduction of birds and mammals represented by the American woodcock, deer mouse, short-tailed shrew, bank swallow, belted kingfisher, Townsend's big-eared bat, and raccoon based on consumption of COPECs in diet, plus incidental surface water, soil, and sediment ingestion	ME 2-4 Risk Question: Does the consumption of COPECs in diet, plus incidental surface water, soil, and sediment ingestion, for birds and mammals infer reduced survival, growth, or reproduction for birds and mammals? ME 2-4 Testable Hypothesis: EEQs based on COPECs in diet, plus incidental surface water, soil, and sediment ingestion, are below risk thresholds for birds and mammals, as represented by the 95 percent UCL of the mean concentrations of COPECs in dietary items and the 95 percent UCL of the mean media concentrations.
	ME 2-5 (optional): Survival, growth, and reproduction of the Townsend's big-eared bat based on consumption of moths containing perchlorate concentrations measured in moths collected from known perchlorate-contaminated areas of LHAAP.	ME 2-5 Risk Question: Does the consumption of perchlorate in moths for the Townsend's big-eared bat infer reduced survival, growth, or reproduction for this bat species? ME 2-5 Testable Hypothesis: The EEQ is below the risk threshold for mammals.

Notes and Abbreviations

AE *assessment endpoint*
COPEC *chemical of potential ecological concern*
EEQ *ecological effects quotient*
LOAEL *lowest-observed-adverse-effect level*
ME *measurement endpoint*
NOAEL *no-observed-adverse-effect level*
SQB *sediment quality benchmark*
UCL *upper confidence level*
USEPA *U.S. Environmental Protection Agency*

4.0 Step 4 – Study Design and Data Quality Objectives

4.1 Objectives of Step 4

Step 4 of the ERA process represents the identification and design of the scientifically defensible site-specific investigations necessary to address the risk questions and risk hypotheses previously developed. Note: Step 4 will also be contained in the Step 3/BERA Report.

Specifically, Step 4 includes the following:

- Identification of specific data needs
- A restatement of the selection of assessment endpoints and specific measurement endpoints
- Determination of the type and amount of necessary data
- Identification of the specific methods for collecting and analyzing the data
- Selection of the appropriate risk characterization approach
- Selection of the specific study methods (e.g., toxicity text, field surveys, tissue analyses)

The primary objective of the study design is to produce a draft work plan and a draft sampling and analysis plan (SAP) that identify the scientifically defensible investigations that will be used to evaluate the exposure and effects of COPECs at LHAAP and in media based on the assessment endpoints identified in **Section 3.0**. These investigation methods are designed to address the following:

- Identify cause-and-effect relationships between COPECs and assessment endpoints
- Support a defensible risk characterization
- Support a risk management decision
- Support the development of preliminary target remediation goals (if necessary).

Activities for the study design include refining measurement endpoints, if needed, for each assessment endpoint and developing assessment endpoint-specific methods using the data quality objective (DQO) process.

4.2 Measurement Endpoints

A measurement endpoint represents that characteristic of the assessment endpoint that will be directly measured in the BERA and used to establish cause-and-effect relationships between the COPECs and the assessment endpoint. As presented in **Tables 3-1** and **3-2**, multiple measurement endpoints will be evaluated for each assessment endpoint to support estimates of hazard presented by COPECs in the soil and sediment at LHAAP. Additional measurement endpoints, which were not selected for additional field work, will be included in the Step 3/BERA Report.

Measurement endpoints for the BERA include measures for both exposure and effects. Measures for bioaccumulation and incidental soil, surface water, and sediment ingestion exposures are addressed in the following subsections in addition to measures for sediment toxicity effects. The measurement endpoints are correlated with testable hypotheses, which are detailed in **Table 3-2**.

Data will be collected to support the analysis of each measurement endpoint. Summaries of the use of the data that will be collected follow the presentation of the measurement endpoints. Specific details of the use of the data are provided in the detailed presentation of the risk questions (**Section 4.3**, "Data Quality Objectives").

4.2.1 Sediment Toxicity

Laboratory toxicity tests measure toxicological effects of bioavailable fractions of COPECs in sediment under controlled conditions. Under **Assessment Endpoint No. 1** these tests are intended to provide a relatively rapid, integrated measure of the effects of a sediment sample and the COPECs in the sample on a toxicologically sensitive form of test organism deemed appropriate for the environmental medium being evaluated. Laboratory measurements for sediment toxicity provide a number of advantages that include the following:

- Results integrate the additive and interactive effects of complex mixtures of COPECs that may be present in sediment.
- Depending on the selected test, various endpoints may be examined using different exposure periods to predict potential impact at several levels of biological organization including physiological (e.g., growth), ontogenetic (development), behavioral (burrowing), or population (reproduction and mortality).
- Measures of toxicological effects can be incorporated into a subsequent remediation strategy either directly as a test of toxicity of field-collected sediment or indirectly as a component in the development of site-specific sediment quality criteria.

The measurement endpoints recommended for the assessment of sediment toxicity are summarized in **Table 3-2** and include the following:

- Laboratory survival, growth, or reproduction of sediment-dwelling invertebrates

Results of toxicity tests will be used to determine whether mean survival, growth, or reproduction of test organisms exposed to site media differs from survival, growth, or reproduction measured for test organisms exposed to control media and reference location areas. Details for the proposed quantity and locations of samples are presented in the SAP (**Appendix A)**.

4.2.2 Bioaccumulation Exposures

Details of the approaches for the assessment of exposures for bioaccumulation of COPECs for food-chain pathways for receptors selected to represent assessment endpoints are provided in **Tables 3-1** and **3-2**. Receptor bioaccumulation exposures for Assessment Endpoint No. 2 (i.e., assessment endpoints for birds and mammals) will be assessed as either field-collected, whole-organism tissue concentrations for a COPEC or laboratory-measured, whole-organism tissue concentrations for a COPEC.

Assessment Endpoint No. 2: Survival, growth, and reproduction of birds and mammals

- Sediment invertebrate bioaccumulation will be estimated using laboratory bioaccumulation studies (freshwater aquatic worms).
- Plant bioaccumulation will be estimated using co-located soil and plant samples.
- Soil invertebrate bioaccumulation will be estimated using laboratory bioaccumulation studies (earthworms).

Analytical data collected for estimating or measuring bioaccumulation for each measurement endpoint listed in **Table 3-2** will be combined to calculate tissue concentrations for assessing potential hazard to birds and mammals. For example, site-specific BAFs will be multiplied by 95% UCL soil or sediment COPEC concentrations to estimate media concentrations. Details for the proposed quantity and locations of samples are presented in the SAP (**Appendix A)**.

4.3 Data Quality Objectives

The DQO process is used to develop data to support defensible risk management decisions for the BERA. Information is incorporated during the DQO process to focus the study design. Output from the DQO process clarifies the objectives of sample collection and determines where and when to collect samples, limitations on sample collection, and the level of uncertainty that may be acceptable. The DQO process is performed during Steps 3b and 4 of the BERA.

A critical component of the DQO process is the development of decision rules for the risk questions that have been developed. Guidance from the U.S. Department of the Navy (2001) states:

"The output of the first four steps of the DQO process are integrated into a statement, the decision rule, which describes that logical basis for making a decision. A decision rule is an 'if…, then…' statement that defines the conditions that would cause the decision-maker to choose an action. In other words, it establishes the exact criteria for making a choice between taking or not taking an action."

The decision rule includes the following three main elements:

- The parameter of interest (e.g., protection of birds from sediment-based COPECs)
- An action level (specific to the measurement endpoint selected)
- Alternative actions or decision choices.

4.3.1 Decision Rules for Risk Questions to Assessment Endpoint No. 1

Two measurement endpoints have been selected to assess the effects of sediment-derived COPECs on the survival, growth, or reproduction of aquatic biota in the aquatic environments of LHAAP, as presented in **Table 3-2**. For the relevant measurement endpoints, a statistically significant reduction of survival, growth, or reproduction by 20 percent or more (compared with the reference location or laboratory control if a reference is not available) will be deemed potentially biologically relevant. Each measurement endpoint has an associated risk question and a testable hypothesis from which specific decision rules can be derived, as follows.

Risk Question 1-1: Does exposure to site sediment cause reduced survival, growth, or reproduction for invertebrates in sediment?

> **Testable Hypotheses 1-1**: Means of laboratory survival, growth, or reproduction for invertebrates in site and reference location sediment and control are not significantly different.
>
> Decision Rule 1: If Testable Hypotheses 1-1 is accepted, a COPEC in site sediment poses an acceptable low hazard for invertebrates, as study results indicate that the mean survival, growth, or reproduction rates of invertebrates are not impacted by COPECs in site sediment, relative to COPECs in sediment from an upgradient reference location or laboratory control.
>
> Decision Rule 2: If Testable Hypotheses 1-1 is rejected (and laboratory survival, growth, or reproduction is lower than the reference location and the laboratory control), a COPEC in site sediment poses an unacceptable hazard for invertebrates, as study results indicate that the mean survival, growth, or reproduction rates of invertebrates are impacted by COPECs in site sediment, relative to COPECs in sediment from an upgradient or other appropriate reference location and the laboratory control.

It should be noted that details on the acceptability criteria for the laboratory control and biologically significant differences are discussed in **Appendix A Section 5.2**. If Decision Rule 2 is supported by the data and a clear dose-response relationship is observed, action levels of COPECs in sediment may be recommended in the Step 3/BERA Report.

Risk Question 1-2: Are metal COPECs bioavailable such that exposure to site sediment causes reduced survival, growth, or reproduction for invertebrates in sediment?

> **Testable Hypothesis 1-2**: Most (e.g., > 50 percent) of the acid volatile sulfides/simultaneously extracted metals (AVS-SEM) ratios in the samples are greater than 1, suggesting low bioavailability of metals.
>
> Decision Rule 1: If Testable Hypothesis 1-2 is accepted, a COPEC in sediment poses an acceptable low hazard for aquatic biota, as the findings indicate that survival, growth, and reproduction are not adversely impacted by COPECs in sediment because they are not bioavailable.
>
> Decision Rule 2: If Testable Hypothesis 1-2 is rejected, a COPEC in sediment may pose an unacceptable hazard for aquatic biota, as the findings indicate that survival, growth, or reproduction may be adversely impacted by COPECs in sediment because they are bioavailable.

It should be noted that AVS-SEM results will be used as a second line of evidence, with the primary line of evidence coming from the toxicity test results themselves. AVS-SEM data are anticipated to assist in understanding the toxicity test results.

4.3.2 Decision Rules for Risk Questions to Assessment Endpoint No 2

Four measurement endpoints and one optional measurement endpoint have been selected to assess the effects of sediment- and soil-derived COPECs on the survival, growth, and reproduction of birds and mammals at LHAAP, as presented in **Table 3-2**. It should be noted that some risk questions apply to birds or mammals (not both), as the exposure pathway may not be a concern for one of the receptor groups. Each measurement endpoint has an associated risk question and testable hypothesis from which specific decision rules can be derived, as follows.

Risk Question 2-1: Does the consumption of COPEC concentrations in laboratory-measured freshwater aquatic invertebrates for birds infer reduced survival, growth, or reproduction for birds?

> **Testable Hypothesis 2-1**: EEQs calculated during the BERA using site-specific uptake factors are below the thresholds of concern for birds.
>
> Decision Rule 1: If Testable Hypothesis 2-1 is accepted, COPECs in sediment pose an acceptable hazard for birds for this exposure pathway.
>
> Decision Rule 2: If Testable Hypothesis 2-1 is rejected, COPECs in sediment may pose an unacceptable hazard for birds.

Risk Question 2-2: Does the consumption of COPEC concentrations in field-collected plants for mammals infer reduced survival, growth, or reproduction for mammals?

> **Testable Hypothesis 2-2**: EEQs calculated during the BERA using site-specific uptake factors are below the thresholds of concern for mammals.
>
> Decision Rule 1: If Testable Hypothesis 2-2 is accepted, COPECs in soil pose an acceptable hazard for mammals for this exposure pathway.
>
> Decision Rule 2: If Testable Hypothesis 2-2 is rejected, COPECs in the soil may pose an unacceptable hazard for mammals.

Risk Question 2-3: Does the consumption of COPEC concentrations in laboratory-measured earthworms for birds and mammals infer reduced survival, growth, or reproduction for birds and mammals?

> **Testable Hypothesis 2-3**: EEQs calculated during the BERA using site-specific uptake factors are below the thresholds of concern for birds and mammals.
>
> Decision Rule 1: If Testable Hypothesis 2-3 is accepted, COPECs in soil pose an acceptable hazard for birds and mammals for this exposure pathway.
>
> Decision Rule 2: If Testable Hypothesis 2-3 is rejected, COPECs in soil may pose an unacceptable hazard for birds and mammals.

Risk Question 2-4: Does the consumption of cumulative COPECs in diet, plus incidental surface water, soil, and sediment ingestion, for birds and mammals infer reduced survival, growth, or reproduction for birds and mammals?

> **Testable Hypothesis 2-4**: EEQs based on COPECs in diet, plus incidental surface water, soil, and sediment ingestion, are below thresholds of concern for birds and mammals.
>
> Decision Rule 1: If Testable Hypothesis 2-4 is accepted, COPECs in site media pose an acceptable hazard for birds and mammals.
>
> Decision Rule 2: If Testable Hypothesis 2-4 is rejected, COPECs in site media may pose an unacceptable hazard for birds and mammals.

It should be noted that Risk Question 2-4 is included to show that cumulative hazard from all exposure pathways will be included in the revised Step 3/BERA Report, not just the COPEC dose from individual pathways (e.g., the ingestion of soil invertebrates, etc.).

Risk Question 2-5 (Optional): Does the consumption of perchlorate in moths for the Townsend's big-eared bat infer reduced survival, growth, or reproduction for this bat species?

Note: Risk Question 2-5 is optional because it is possible the results from Risk Question 2-2 may show that perchlorate is not bioaccumulating in plants to unacceptable levels.

> **Testable Hypothesis 2-5**: The perchlorate dose calculated during the BERA using site-specific uptake factors is below the threshold of concern for mammals.
>
> Decision Rule 1: If Testable Hypothesis 2-5 is accepted, perchlorate in site soil poses an acceptable hazard for bats.
>
> Decision Rule 2: If Testable Hypothesis 2-5 is rejected, perchlorate in soil may pose an unacceptable hazard for bats.

5.0 Step 5 – Verification of Field Sampling Design

Verification of the field sampling design is Step 5 of the eight-step ERAGS process (USEPA, 1997). However, due to the numerous site visits that have occurred at LHAAP over the past several years, an additional site visit to verify the field sampling design is not recommended. Any minor changes to the proposed field program will be made in the field, e.g., a minor change in a sample location to accommodate site-specific access limitations. Any substantive changes that must be made for the proposed field program will be communicated to the stakeholders as soon as practical, preferably during the field collection event.

Note: the brief information presented below for Steps 6 through 8 illustrates the remaining steps of the 8-step ERAGS process, and does not relate directly to the proposed field program.

6.0 Step 6 – Site Investigation and Data Analysis

The site investigation and data analysis comprise Step 6 of the eight-step ERAGS process (USEPA, 1997). The proposed data to be collected during the site investigation are presented in the SAP (**Appendix A)**. Evaluation of the collected data will be presented in the Step 3/BERA Report.

7.0 Step 7 – Risk Characterization

Risk characterization is Step 7 of the eight-step ERAGS process (USEPA, 1997). EEQs will be revised using more realistic exposure parameters and site-specific information obtained during the BERA field investigations. The Army will use both NOAEL and lowest-observed-adverse-effect level (LOAEL) toxicity reference values (TRVs) in the risk characterization for receptors selected to represent measurement endpoints; however, receptors selected to represent listed species will be evaluated using only NOAEL TRVs. This will allow the risk management decisions to properly allow consideration of the special status (listed) species.

Documentation of all data manipulations, exposure equations, and exposure parameters will be provided or referenced in the risk characterization section of the Step 3/BERA Report. The estimated receptor hazards for each media for each assessment endpoint will be documented. A discussion of the likelihood of ecological hazard and pertinent factors that may affect hazard will also be provided. The Step 3/BERA Report will also include discussions of uncertainties relevant to the various steps of the BERA process, and how the uncertainties affect the outcome of risk characterization. Information in the Step 3/BERA Report will be used to support risk management decisions.

8.0 Step 8 – Risk Management

Risk management is Step 8 of the eight-step ERAGS process. The goal of the risk management step in the BERA is to provide sufficient information to the risk managers to proceed with management decisions regarding LHAAP. The Step 3/BERA Report will provide a list of ecological remedial goal options for the COPECs. Scientific recommendations will be presented in the Step 3/BERA Report (as well as site-specific feasibility studies) as to whether a potential remedial alternative would be more detrimental to the environment than leaving chemically impacted media in place. This type of information will help support risk management decisions.

9.0 References

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USEPA, 1998, *Guidelines for Ecological Risk Assessment*, Final, EPA/630/R-95/002F, Risk Assessment Forum, Washington, D.C., April.

USEPA Region 6, 2004, *Investigation of Contaminants in Fish Tissue, Caddo Lake Biological Sampling and Risk Assessment for Longhorn Army Ammunition Depot*, in cooperation with Texas Commission on Environmental Quality (TCEQ) and US Fish and Wildlife Service (USFWS), November.

Appendix A

Sampling and Analysis Plan

APPENDIX A
SAMPLING AND ANALYSIS PLAN

FINAL

BASELINE ECOLOGICAL RISK ASSESSMENT FIELD SAMPLING WORK PLAN
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared for
U.S. Army Corps of Engineers
Tulsa District
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Tulsa, Oklahoma

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Contract Number W912QR-04-D-0027
Task Order No. DS02

September 2006

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Acronyms and Abbreviations

ASTM	ASTM International (formerly American Society for Testing and Materials)
AVS-SEM	acid-volatile sulfides and simultaneously extracted metals
BERA	baseline ecological risk assessment
COC	chain-of-custody
COPEC	chemical of potential ecological concern
DNT	Dinitrotoluene
EEQ	ecological effects quotient
FSP	Field Sampling Plan
LHAAP	Longhorn Army Ammunition Plant
PARCC	precision, accuracy, representativeness, comparability, and completeness
QA	quality assurance
QC	quality control
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.
SOP	standard operating procedure
SRT	Standard Reference Toxicant
TCDD	Tetrachlorodibenzo-p-dioxin
TCEQ	Texas Commission on Environmental Quality
TNT	Trinitrotoluene
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
Work Plan	Baseline Ecological Risk Assessment Field Sampling Work Plan

Sampling and Analysis Plan Introduction

This Appendix presents the Sampling and Analysis Plan (SAP) and describes the details of the proposed sampling and analysis for the field sampling activities described in Section 4.0 of the Baseline Ecological Risk Assessment Field Sampling Work Plan (Work Plan). This SAP has been prepared in support of the Longhorn Army Ammunition Plant (LHAAP) Step 3/Baseline Ecological Risk Assessment (BERA) report. Data will be collected to further assess potential hazards to the environment associated with chemicals identified as final chemicals of potential ecological concern (COPECs) (Shaw Environmental, Inc. [Shaw], 2006a and Section 1.0 of the Work Plan).

This SAP consists of two parts:

- Part I—Field Sampling Plan (FSP)
- Part II—Quality Control section that is unique to this SAP and is not covered by the Final Installation-Wide Work Plan LHAAP (Shaw, 2006b).

The FSP describes in detail the field sampling activities, field quality control (QC), and data gathering methods that will be performed in support of the BERA. The Quality Control section describes the data quality objectives, site-specific quality assurance (QA), laboratory QA/QC activities, and data management procedures that will be followed to achieve the data quality objectives of the project. The LHAAP Installation Wide Work Plan (Shaw, 2006b) is used to fulfill most of the requirements of the Quality Control section.

This SAP is required reading for all staff participating in the work effort, and will be in the possession of the field team who are collecting samples. Project personnel will comply with the procedures documented in this SAP in order to maintain comparability and representativeness of the collected and generated data.

1.0 Part I—Field Sampling Plan

The FSP outlines the details of the proposed field sampling and analysis, requirements for the field QC procedures, and data gathering methods that will be used for investigation activities presented in Section 4.0, "Study Design and Data Quality Objectives," of the Work Plan.

1.1 Sampling and Analysis Scope and Objectives

This FSP describes the sampling and analysis activities that will be conducted in support of the LHAAP BERA. The objectives of these efforts listed below are aligned with the general objectives of the BERA for LHAAP:

- ***Chemical Uptake Estimates*—**Assess bioaccumulation of selected final COPECs
- ***Toxicity Evaluation*—**Evaluate the effects of sediment contamination on selected ecological species.

Chemical data acquisition in support of the BERA will include the following tasks:

- Laboratory biological uptake study of site abiotic media, using test organisms such as earthworms and/or aquatic worms
- Chemical analytical testing of site abiotic media
- Chemical tissue analytical testing of site plant tissue
- Laboratory toxicity testing of sediment
- Laboratory determination of sediment acid-volatile sulfides and simultaneously extracted metals (AVS-SEM)

1.2 Analytical Requirements

The analytical requirements are based on specific data needs identified during Step 4 of the baseline risk assessment process (presented within "Step 4—Study Design and Data Quality Objectives," of the Work Plan). These data needs address final COPECs identified in Section 1 of the Work Plan. Final COPECs are those chemicals that have an estimated ecological effects quotient (EEQ) greater than 1.0, or that may pose a direct contact threat to benthic invertebrates.

1.3 Project Organization and Responsibilities

The field team will be comprised of an Ecological Risk Assessor and a Sample Technician. The Ecological Risk Assessor will ensure that sampling is done according to the SAP specifications, and will be responsible for making, recording, and reporting any decisions that deviate from the SAP. The Sample Technician will have a record of experience in sampling and sample handling procedures. The technician will also be the sample custodian and will be responsible for sampling, recording all field data, and shipping samples to an off-site laboratory. A Project

Chemist will ensure compliance with the SAP, be in charge of the final data review and performance and systems audits over the course of the project, and assist in the preparation of baseline risk assessment report.

The Sample Technician responsibilities will include the following:

- Performing all sampling in accordance with approved procedures and methodologies, as defined and referenced in this SAP
- Ensuring field QC samples are acquired, as specified in this SAP
- Initiating and implementing the chain-of-custody (COC) procedures
- Completing sampling forms and sampling logs
- Shipping samples to an off-site laboratory.

The Project Chemist responsibilities will include the following:

- Providing overall supervision for all sampling and analytical activities
- Selecting qualified off-site laboratories
- Reviewing laboratory data prior to use for project decisions
- Implementing the QA/QC program
- Assessing the data quality.

1.4 Field Activities

This section describes the sampling and analysis strategy for each component of the project. The proposed sampling and analysis, sampling procedures, and decontamination procedures are presented. In general, the media sample locations proposed for uptake and toxicity testing are placed at previous "hot spot" sample locations, as well as at other previously sampled locations, in order to provide a range of COPEC exposure concentrations for toxicity and uptake studies. With the exception of sediment reference samples (**Section 1.4.6**), discrete samples (not composites) will be collected. Historical final COPEC concentrations and the proposed sampling locations for the BERA field work are presented in the following figures:

- **Figure 1**: Presents the locations of elevated concentrations of final soil COPECs (cadmium, chromium, zinc, and perchlorate) in the Industrial Sub-Area;
- **Figure 2**: Presents the locations of elevated concentrations of final soil COPECs (barium, cadmium, chromium, lead, 2,4-Dinitrotoluene [DNT], and 2,4,6-Trinitrotoluene [TNT]) in the Waste Sub-Area;
- **Figure 3**: Presents the locations of elevated concentrations of final sediment COPECs (lead, mercury, silver, and thallium) in the Goose Prairie Creek watershed, including creek samples and lake samples;

- **Figure 4**: Presents the locations of the targeted on-site BERA field sample locations (both soil samples and creek and lake sediment samples);
- **Figure 5**: Presents the locations of the reference creek and lake sediment BERA field sample locations.

1.4.1 Soil Sampling for Earthworm COPEC Uptake Estimates

Discrete surface soil samples will be collected following the procedures presented in the Installation-Wide Work Plan (Shaw, 2006b) from terrestrial areas, as identified in the sections below, and sent to the selected bioassay and chemical analysis laboratories. The bioassay laboratory will introduce earthworms (*Eisenia fetida*) to the impacted soil. The earthworms will be allowed to burrow and feed over an extended time period (see **Section 1.5.3**). At the end of the study, tissue from these invertebrates will be collected for chemical analysis of COPECs in tissue. These analytical results will be used, in conjunction with the associated surface soil COPEC data, to calculate site-specific invertebrate bioaccumulation factors for use in the BERA. **Table 1** summarizes the proposed soil sampling and analysis for earthworm COPEC uptake estimates.

1.4.1.1 Industrial Sub-Area

Five surface soil samples will be collected at the Industrial Sub-Area at the locations shown on **Figure 1** to estimate site-specific bioaccumulation factors for the final COPECs cadmium, chromium, and zinc, presented in Section 1 of the Work Plan. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations.

1.4.1.2 Waste Sub-Area

Five surface soil samples will be collected at the Waste Sub-Area at the locations shown on **Figure 4** to estimate site-specific bioaccumulation factors for the final COPECs barium, cadmium, chromium, lead, 2,4-DNT, 2,6-DNT, and 2,4,6-TNT presented within the Work Plan in Section 1. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations. It should be noted that although 2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD] is a final COPEC in Waste Sub-Area soil, bioaccumulation studies are not proposed for this COPEC.

1.4.2 Sediment Sampling for Aquatic Invertebrate COPEC Uptake Estimates

Discrete sediment samples will be collected following the procedures presented in the Installation-Wide Work Plan (Shaw, 2006b) from aquatic areas, as identified in the sections below, and sent to the selected bioassay and chemical analysis laboratories. The bioassay laboratory will hold the samples until chemical analytical results of the sediment samples are available and have been reviewed. Upon notification, the bioassay laboratory will introduce sediment invertebrates (using the invertebrate species *Lumbriculus variegates* for freshwater

sediments) to the impacted sediment. This approach is being used because some sediment COPECs, such as mercury, have been infrequently detected in historic samples. The sediment invertebrates will be allowed to burrow and feed over an extended time period (see **Section 1.5.3**). At the end of the study, tissue from these invertebrates will be collected for chemical analysis of COPECs in tissue. These analytical results will be used, in conjunction with the associated sediment sample COPEC data, to calculate site-specific invertebrate bioaccumulation factors for use in the BERA. **Table 1** summarizes the proposed sediment sampling and analysis for aquatic worm COPEC uptake estimates.

1.4.2.1 Goose Prairie Creek Watershed

Four sediment samples will be collected along Goose Prairie Creek at the locations shown on **Figure 4** to estimate site-specific bioaccumulation factors for the final COPECs lead, mercury, silver, and thallium presented in Section 1 of the Work Plan. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations. Results for thallium in Goose Prairie will also be applied to thallium in Central Creek and Harrison Bayou. It should be noted that two additional sediment samples will be collected in the field to help ensure that all the target COPECs are obtained, although only four samples will be used for the bioaccumulation tests. If used, the locations of the additional samples, which are not presented in **Figure 4**, will be presented in the Step 3/BERA report.

1.4.2.2 Goose Prairie Creek Cove of Caddo Lake

Four sediment samples will be collected at the Goose Prairie Creek Cove of Caddo Lake at the locations shown on **Figure 4** to estimate site-specific bioaccumulation factors for the final COPECs lead, mercury, silver, and thallium presented in Section 1 of the Work Plan. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations. It should be noted that two additional sediment samples will be collected in the field to help ensure that all the target COPECs are obtained, although only four samples will be used for the bioaccumulation tests. If used, the locations of the additional samples, which are not presented in **Figure 4**, will be presented in the Step 3/BERA report.

1.4.3 Plant Sampling for COPEC Uptake Estimates Based on Tissue

Plant tissue samples will be collected from the terrestrial sites following the procedures presented in **Section 1.6.1**. Co-located surface soil samples will be collected from the terrestrial sites following the procedures presented in the Installation-Wide Work Plan (Shaw, 2006b). Similar plant species (unwashed), typical of forage for small rodents (or by caterpillars, which are the prey items of the Townsend's Big-Eared Bat), will be combined into individual samples. Species information for each composite will be recorded in the field logbook. The plant tissue samples will include above ground plant parts, to best represent the diet of herbivores or omnivores such as the deer mouse. The chemical analysis for media and biota samples will

include the final COPECs barium, cadmium, chromium, lead, zinc, 2,4-DNT, 2,6-DNT, 2,4,6-TNT, and perchlorate, depending on the Sub-Area. The analytical results of plant tissue samples will be used in conjunction with the analytical results of co-located surface soil samples to calculate site-specific bioaccumulation factors (soil to plant tissue bioaccumulation factors) for use in the BERA. **Table 1** summarizes the proposed plant sampling and analysis for COPEC uptake estimates based on tissue.

1.4.3.1 Industrial Sub-Area

Five plant tissue samples will be collected at the Industrial Sub-Area at the locations shown on **Figure 4** to estimate site-specific bioaccumulation factors for the final COPECs barium, cadmium, chromium, lead, zinc, and perchlorate presented in Section 1 of the Work Plan. A co-located surface soil sample will be collected at each plant sample location. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations.

1.4.3.2 Waste Sub-Area

Five plant tissue samples will be collected at the Waste Sub-Area at the locations shown on **Figure 4** to estimate site-specific bioaccumulation factors for the final COPECs barium, cadmium, chromium, lead, zinc, 2,4-DNT, 2,6-DNT, and 2,4,6-TNT presented in Section 1 of the Work Plan. A co-located surface soil sample will be collected at each plant sample location. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations. It should be noted that although 2,3,7,8-TCDD is a final COPEC in Waste Sub-Area soil, bioaccumulation studies are not proposed for this COPEC.

1.4.4 Sediment Sampling for COPEC Sediment Toxicity

Discrete sediment samples will be collected following the procedures presented in the Installation-Wide Work Plan (Shaw, 2006b) from the identified aquatic habitat locations for laboratory invertebrate toxicity studies, using the freshwater invertebrate species *Hyalella azteca* (see **Section 1.5.2**). Sediment samples will also be collected at reference locations. Samples for sediment toxicity testing will be split and an aliquot will be sent to each laboratory (bioassay and chemical analysis). The bioassay laboratory will hold the samples until chemical analytical results of the sediment samples are available and have been reviewed. Upon notification, the bioassay laboratory will introduce sediment invertebrates (using the invertebrate species *Hyalella azteca* for freshwater sediments) to the impacted sediment. This approach is being used because some sediment COPECs, such as mercury, have been infrequently detected in historic samples. The chemical analysis for sediment samples will include the final COPECs lead, mercury, silver, and thallium. The sediment toxicity results will be used in the BERA, in conjunction with paired sediment COPEC concentration data, to determine whether or not sediments are potentially toxic

to sediment-dwelling organisms. **Table 1** summarizes the proposed sediment sampling and analysis for COPEC sediment toxicity.

1.4.4.1 Goose Prairie Creek Watershed

Four sediment samples will be collected along Goose Prairie Creek at the locations shown on **Figure 4**, to determine whether sediments are potentially toxic to sediment-dwelling organisms. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations. The final COPECs presented in Section 1 of the Work Plan are lead, mercury, silver, and thallium. It should be noted that two additional sediment samples will be collected in the field to help ensure that all the target COPECs are obtained, although only four samples will be used for the toxicity tests. If used, the locations of the additional samples, which are not presented in **Figure 4**, will be presented in the Step 3/BERA report. In addition, one reference sediment sample from an upstream creek location will be collected, as shown on **Figure 5**. The reference sediment sample upstream on Goose Prairie Creek will be selected to match the substrate types and general characteristics (e.g., sediment grain size, current velocity, and depositional features) of the impacted downstream areas if possible. Results for thallium in Goose Prairie will also be applied to thallium in Central Creek and Harrison Bayou.

1.4.4.2 Goose Prairie Creek Cove of Caddo Lake

Four sediment samples will be collected at the Goose Prairie Creek Cove of Caddo Lake at the locations shown on **Figure 4** to determine whether sediments are potentially toxic to sediment-dwelling organisms. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations. The final COPECs presented in Section 1 of the Work Plan are lead, mercury, silver, and thallium. It should be noted that two additional sediment samples will be collected in the field to help ensure that all the target COPECs are obtained, although only four samples will be used for the toxicity tests. If used, the locations of the additional samples, which are not presented in **Figure 4**, will be presented in the Step 3/BERA report. One reference sediment sample from an upstream lake location will be collected, as shown on **Figure 5**. The reference sample location will be selected to match the substrate type and general characteristics (e.g., sediment grain size, current velocity, and depositional features) of the sediment of the Cove, if possible.

1.4.5 Sediment Sampling for COPEC Bioavailability

Discrete sediment samples will be collected following the procedures presented in the Installation-Wide Work Plan (Shaw, 2006b) from the identified aquatic habitat locations for measurement of AVS-SEM. Sediment samples are not needed from a reference location. The chemical analysis for sediment samples will include the final COPECs lead and mercury. It should be noted that other metals known to be sequestered with AVS include cadmium, nickel, zinc, and copper. These metals are cations that compete with lead and mercury for binding sites

on sulfide molecules, and are co-analytes that are measured during the procedure. The remaining final COPECs in sediment (i.e., silver and thallium) are not evaluated using this procedure, as they are not expected to bind to sulfides in the sediment matrix. The sediment AVS-SEM results will be used in the BERA, in conjunction with sediment COPEC toxicity data, to determine whether sediments are potentially bioavailable to sediment-dwelling organisms. As mentioned previously, AVS-SEM results will be used as a second line of evidence (i.e., bioavailability of chemicals in sediment to benthic invertebrates) for sediment toxicity. **Table 1** summarizes the proposed sediment sampling and analysis for COPEC sediment AVS-SEM.

1.4.5.1 Goose Prairie Creek Watershed

Four sediment samples will be collected along Goose Prairie Creek at the locations shown on **Figure 4**, to determine whether sediments are potentially bioavailable to sediment-dwelling organisms. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations. It should be noted that two additional sediment samples will be collected in the field to help ensure that all the target COPECs are obtained, although only four samples will be used for the AVS-SEM tests. If used, the locations of the additional samples, which are not presented in **Figure 4**, will be presented in the Step 3/BERA report.

1.4.5.2 Goose Prairie Creek Cove of Caddo Lake

Four sediment samples will be collected at the Goose Prairie Creek Cove of Caddo Lake at the locations shown on **Figure 4** to determine whether sediments are potentially bioavailable to sediment-dwelling organisms. These sample locations were selected based on historical sample results in order to obtain a range of COPEC concentrations. It should be noted that two additional sediment samples will be collected in the field to help ensure that all the target COPECs are obtained, although only four samples will be used for the AVS-SEM tests. If used, the locations of the additional samples, which are not presented in **Figure 4**, will be presented in the Step 3/BERA report.

1.4.6 Reference Sampling

1.4.6.1 Sediment Reference Samples

To assess whether aquatic direct-contact toxicity is related to upstream or Caddo Lake conditions, sediment will be collected from reference locations. These reference sediment samples will be collected at locations hydraulically upgradient from the aquatic sites and analyzed for the final COPECs lead, mercury, silver, and thallium. As appropriate, abiotic reference samples will be sent to the selected bioassay laboratory for appropriate toxicity tests. The first proposed reference sample location is located upstream from LHAAP sites on Goose Prairie Creek. The other reference sample location will be selected from an area upstream of Caddo Lake (i.e., Clinton Lake) not impacted by LHAAP. The two proposed reference sample

locations are shown on **Figure 5**. These upstream creek and lake sampling locations will avoid areas of obvious contaminant discharge, such as outfall pipes or other obvious signs of contamination or anthropogenic input. To ensure appropriate reference location COPEC variability (heterogeneity), two sediment grabs will be collected at each location and composited together so that one sample is obtained for the creek reference location and one sample is collected for the lake reference location. The two grab samples will be collected approximately 20 feet apart.

1.4.7 Sampling Techniques

Sampling methods and operational procedures have been developed to ensure that the data acquired through field sampling will the meet the data quality objectives. Soil and sediment sampling will be performed in accordance with the standard operating procedures (SOPs) presented in **Section 1.6**, "Standard Operating Procedures" and more fully described in the Installation-Wide Work Plan (Shaw, 2006b). Plant samples will be collected by hand.

1.4.8 Decontamination Procedures

All sampling devices that may directly or indirectly contact samples will be decontaminated between sampling events in a designated decontamination area. Decontamination will be performed in compliance with the procedures outlined in the Installation-Wide Work Plan (Shaw, 2006b)

1.5 Analytical Procedures

The analytical program has been designed to acquire sufficient and defensible data to support the BERA. Four general types of sample analyses will be performed, as follows:

- Chemical analysis
- Toxicity testing
- AVS-SEM testing
- Bioaccumulation (i.e., tissue) testing

1.5.1 Chemical Analysis

Chemical analysis of surface soil, sediment, and tissue samples for chemical groups specified in **Section 1.4** will be performed by off-site laboratories. **Table 2** summarizes the analytical methods (as well as the associated containers, sample volume requirements, preservatives, and holding times) to be used for project samples. Lipid analysis of the aquatic invertebrate tissue is not proposed because metals are the only COPECs in sediment, and metals are not considered to be lipophilic.

1.5.2 Sediment Toxicity Testing

Bioassay tests will be used to determine sediment toxicity. Details on the selected bioassay tests discussed below are presented in Attachment 1.

Freshwater sediment toxicity tests will measure toxicity to *Hyalella azteca*, an amphipod that swims in the water and burrows in the sediment surface. As recommended by Texas Commission on Environmental Quality (TCEQ) Guidance (2004), a 10-day test will be used that evaluates survival and growth of the test organism (U.S. Environmental Protection Agency [USEPA], 2000). At the end of a 10-day exposure most chemicals have reached equilibrium in biological tissue and have had effects on survival (and/or growth) if concentrations and subsequent dosing are at toxic thresholds (TCEQ, 2004).

A static surface water renewal design will be employed, using laboratory water adjusted to match the hardness of site surface water. The hardness of the water at the water-sediment interface will be determined by the off-site laboratory.

For statistical comparisons, an alpha-level of 0.05 for a 95 percent confidence interval is planned by the bioassay laboratory.

1.5.3 Sediment and Soil Bioaccumulation Testing

Bioaccumulation tests for freshwater sediment will use *Lumbriculus variegatus*, an oligochaete aquatic worm that burrows in the sediment surface. A 28-day test will be used that will allow the benthic invertebrate sufficient time to bioaccumulate COPEC concentrations (USEPA, 2000). A static surface water renewal design will be employed, using laboratory water adjusted to match the hardness of site surface waters, as previously described. After the duration of the test, samples from the test organisms will be collected for chemical analysis.

Bioaccumulation tests for terrestrial surface soils will use *Eisenia fetida*, a terrestrial lumbricid earthworm that burrows in soil. A 28-day test will be used that will allow the invertebrate sufficient time to bioaccumulate COPEC concentrations (Linder et al., 1992; ASTM, 1997). After the duration of the test, samples from the test organisms will be collected for chemical analysis.

1.6 Standard Operating Procedures

The SOPs that will be used for sample collection, documentation, and sample packaging and shipping are described in the Installation-Wide Work Plan (Shaw, 2006b) for most sample collection procedures proposed in this BERA SAP, with the exception of vegetation sampling, sediment sampling from lakes, and the optional moth collection procedure, which are described in the following sub-sections.

1.6.1 Vegetation Sampling SOP

Vegetation sampling will be performed at co-located soil sampling points to determine uptake of chemicals into plants. Two distinct plant ingestion pathways are potentially significant at LHAAP (**Figure 2**). First, direct ingestion of plant material is a potential hazard driver for several measurement receptors (e.g., the Deer Mouse). Second, ingestion of plants is an indirect pathway of exposure for the Townsend's Big-Eared Bat, because the bat's diet is comprised entirely of moths, and moth larvae (i.e., caterpillars) ingest plants prior to metamorphosing into moths. The types of vegetation of interest are different for these two exposure pathways. The Deer Mouse is the most highly exposed receptor for the direct ingestion pathway, and vegetation typical of its food source will be targeted to refine the COPEC-plant uptake factors for direct ingestion. The Deer Mouse may ingest seeds, some green vegetation, roots, and fruits (USEPA, 1993). It is assumed that the Deer Mouse food source is primarily above-ground vegetation, and consists mostly of grasses. Therefore, the above-ground portions of herbaceous species commonly found at Longhorn will be collected for addressing uptake into plants that are directly ingested by ecological receptors. The species type will be determined during sampling using professional judgment. Most moth species in northeast Texas forage on the leaves of trees, rather than shrubs or herbaceous plants, however (U.S. Geological Survey [USGS], 2006). Therefore, sampling locations will be placed where both trees and grasses are present, if possible. If trees are not located in the immediate vicinity, leaves from shrubs or other woody vegetation will be collected instead. Some tree species are preferred by moth caterpillars over others (USGS, 2006). If present, the following tree species will be targeted for sampling, in descending order of preference: willow, cherry, sweet gum, bald cypress, elm, and oak. If none of these species are present, leaves from other species will be used.

For all vegetation sampling, tissue will be harvested using pruning sheers, scissors, or knives with stainless steel blades. Sampling will be conducted during the growing season. Stressed vegetation will be noted, as will as general habitat characteristics of the sampling location. The plant species will be identified. If sufficient vegetation is available, individual samples will consist of the same species of plant; otherwise, samples will be comprised of multiple species. Loose dirt or other debris will be removed from the tissue prior to packaging; however, vegetation will not be washed. The vegetation matter will be placed in resealable plastic bags and kept cool (less than four degrees Celsius) to reduce decay. The vegetation collected to target direct ingestion by receptors (i.e., the primarily herbaceous plant species) will be analyzed for metals and explosives. The vegetation collected to target ingestion by moth caterpillars (i.e., tree leaves) will only be analyzed for perchlorate.

1.6.2 Sediment Sampling from Creeks and Caddo Lake

Sediment sampling will follow Shaw's SOP No. T-FS-124 (Attachment 2). Samples will target the 0-0.5 foot depth range, as an analysis of data from previously collected samples indicates that

concentrations tend to diminish in sediment at depths deeper than 0.5 foot. Depositional areas will be targeted if possible.

1.6.3 Collection of Moths Using Light Traps

The current assumption in the food chain model used to determine potential exposure to receptors is that perchlorate in moths and in plants occurs at a 1:1 ratio. If the analysis of tree leaf vegetation indicates that perchlorate is present in plant tissue at concentrations that may adversely impact bats, an additional field sampling activity may be conducted to refine this assumption by determining concentrations of perchlorate directly in moths. The proposed method of collecting moth tissue is through the use of a light trap. A simple light trap consists of an incandescent or blacklight bulb suspended over a funnel. A white sheet may be suspended vertically behind the light to act as a light reflector and as a resting site for insects. The funnel sits on the rim of a large can that contains an open killing jar, which is used for the collection of individuals. Dark nights with little or no moonlight are preferred, as the light will tend to attract more insects (Bland and Jaques, 1978). If possible, moth species will be identified, and multiple individuals of a single species will be used as discrete samples. Otherwise, species will be combined into a composite sample.

The methodology for moth collection will be described further at a later date if this data collection step is considered necessary.

1.7 Field Quality Control Sample Types and Frequency

Field QC samples will be collected throughout the field phase of the project. QC samples are used to assess the consistency of the sampling program, to evaluate the precision of the analytical data, and to monitor possible ambient contamination or cross-contamination between samples. Field QC samples will be collected according to the requirements presented in the Installation-Wide Work Plan (Shaw, 2006b) and detailed as follows:

- ***Equipment rinsates*** (one per 20 samples collected with non-disposable equipment; at least one per day)
- ***Field duplicates*** (one per 10 soil and sediment samples [no field duplicates will be collected for toxicity testing or biota samples])
- ***Field blanks*** (one per source of deionized water used for the final equipment decontamination rinse for sample collection for nonvolatile analysis only)
- ***Temperature blanks*** (one per cooler containing field samples for shipment to the off-site laboratory)
- ***Matrix spikes and matrix spike duplicates*** (one per 20 samples).

1.8 Analytical Method References, Preservation, and Holding Times

Sample containers and sample volumes for off-site analysis will be in accordance with the requirements stated in the QA plans of the off-site laboratories and USEPA guidelines. The laboratories will provide certified, pre-cleaned containers for all analyses. **Table 2** presents the sample parameters, analytical methods, containers, preservation methods, and holding times for all matrices that will be encountered during this project.

1.9 Sample Chain-of-Custody Documentation

General requirements for sample identification numbers, sample labeling, sample COC protocols, and documentation of field analytical activities are presented in the Installation-Wide Work Plan (Shaw, 2006b). All applicable state, federal, and local regulations and guidelines for shipping samples to the off-site laboratory will be followed.

1.10 Packing and Shipment of Samples

Project-specific information and procedures for packing, handling, and shipping samples to the off-site laboratory is presented in the Installation-Wide Work Plan (Shaw, 2006b).

1.11 Chemical Quality Control

The approach for QC for this project is described in the Installation-Wide Work Plan (Shaw, 2006b).

1.12 Corrective Action

Discrepancies or other non-conforming items or activities, not meeting project requirements or accepted industry practices, will result in corrective action. The corrective action will include documentation of the problem, determination of the cause to prevent future reoccurrence, correction or replacement of the non-conforming item, and verification of successful corrective action.

2.0 Part II—Quality Assurance Project Plan

This Quality Control section has been prepared to describe project-specific QA/QC requirements for the sampling and analysis activities in support of the baseline risk assessment described in the Work Plan for LHAAP. This Quality Control section serves as an accompaniment to the Installation-Wide Work Plan (Shaw, 2006b). The purpose of the section is to describe project-specific requirements and deviations from the Installation-Wide Work Plan (Shaw, 2006b).

2.1 Project Description

The objectives of the LHAAP BERA, as listed in the Work Plan, are to provide the following:

- An analysis of the baseline hazards to help determine the need for action
- A basis for determining the concentrations of chemicals that can remain on site and still be adequately protective of the environment
- A basis for comparing potential ecological impacts of remedial alternatives
- A consistent process for evaluating and documenting threats to the environment

2.2 Scope of Work

To successfully meet the objectives of the BERA as identified above, the scope of work consists of the following:

- Characterize the chemical and physical properties of the soil and sediment based on existing data and previous risk assessment results.
- Define proposed field investigations to fill in the data gaps.
- Define ecological assessment and measurement endpoints to be evaluated.

2.3 Chemicals of Potential Concern

The following final COPECs have been carried forward to the baseline risk assessment from the Step 3 evaluation at LHAAP for more detailed study in the proposed field investigation:

- Metals
- Explosives
- Perchlorate

Dioxin was also a final COPEC in soil, but is not proposed for further characterization via additional field sampling at this time. The target analytes within the groups listed above and

analytical methods are presented in **Section 4**, "Analytical Procedures." Additional analyses will be performed for hardness (surface water), total organic carbon (soil and sediment), moisture content (soil, sediment, plant tissue, earthworm tissue), and grain size (sediment). During the sediment bioaccumulation and toxicity tests, the bioassay laboratory will record ammonia, dissolved oxygen, pH, conductivity, and temperature.

2.4 Sampling and Analysis Requirements

The analytical tests and estimated sample quantities for each sample type (not including QC samples) are presented in **Table 1**.

3.0 Sampling and Sample Handling Procedures

This section describes the sampling and analysis strategy for each component of the project. Proposed sample locations are presented in **Figures 4** and **5**. The sampling procedures, SOPs, field QC sample types and frequency, decontamination procedures, analytical methods, containers, preservation, holding times, and types and frequency of field QC samples are described below.

3.1 Sample Collection Methods

3.1.1 Standard Operating Procedures

SOPs to be used for sampling are presented in the Installation-Wide Work Plan (Shaw, 2006b) and in **Section 1.6**. All Contractor and subcontractor staff will comply with the procedures documented within these SOPs to maintain comparability and representativeness of the generated data.

3.2 Field Quality Control Samples

Field QC samples will be collected throughout the field phase of the project. QC samples are used to assess the consistency of the sampling program, to evaluate the precision of the analytical data, and to monitor possible ambient contamination or cross-contamination between samples. Field QC samples will be collected according to the requirements listed in the Installation-Wide Work Plan (Shaw, 2006b).

3.3 Sample Containers

Sample containers and sample volumes for off-site analysis will comply with the requirements stated in the Installation-Wide Work Plan (Shaw, 2006b) and USEPA guidelines. The laboratory will provide certified pre-cleaned containers for all analyses.

3.4 Sample Logs, Labeling, and Chain of Custody

All provisions regarding sample logs, labeling, and chain of custody described in the Installation-Wide Work Plan (Shaw, 2006b) will be followed during the execution of project activities for sample logs, labeling, and COC records.

3.5 Decontamination Procedure

All provisions regarding decontamination described in the Installation-Wide Work Plan (Shaw, 2006b) will be followed during the execution of project activities.

3.6 Sample Handling, Storage, and Transport

All provisions regarding sample handling, storage, and transport described in the Installation-Wide Work Plan (Shaw, 2006b) will be followed during the execution of project activities.

3.7 Sample Custody

Sample custody requirements, as outlined in the Installation-Wide Work Plan (Shaw, 2006b) will be followed during the execution of project activities.

4.0 Analytical Procedures

4.1 Laboratory Analytical Procedures

The methods used for environmental analysis of project samples, including laboratory methods, target detection limits, etc. are presented in he Installation-Wide Work Plan (Shaw, 2006b).

4.2 Field Measurements

Field measurements, equipment calibration, and maintenance procedures that will be performed during the field activities are described in the Installation-Wide Work Plan (Shaw, 2006b).

5.0 Analytical Data Quality Parameters

5.1 Data Quality Objectives for Analytical Data

The quality of analytical data is assessed in terms of precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters. These parameters are described in the Installation-Wide Work Plan (Shaw, 2006b).

5.2 Toxicity Testing

Test organism survival of at least 80 percent is required in the controls for the toxicity tests to be considered valid. Toxicity will be defined based on comparisons to the control samples. Samples will be considered toxic if a given test endpoint (survival, weight, or reproduction) is statistically different from the control sample or from the reference site (if available), and at least 20 percent lower than mean test organism response in the control samples and reference site sample, if available. Organisms to be used for testing should be positively identified by a qualified expert and be of similar age and life stage. Only organisms that behave normally, appear healthy, and feed normally in culture will be used. The quality and general health of test organisms will be verified through positive and negative control tests. Positive control tests, or Standard Reference Toxicant (SRT) tests, provide documentation that test organisms are responding to a SRT as expected and are not more or less tolerant. This is documented through control charts for the organism and SRT by the bioassay laboratory. Negative controls or laboratory control sediments provide a measure of non-chemical related stress to which organisms may be subjected during the course of the testing. Unacceptable mortality indicates that test organisms are being adversely affected by something other than the contaminants being tested.

5.3 Data Quality Assessment/Validation

Assessment and validation of project data will be performed and reported according to the requirements described in the Installation-Wide Work Plan (Shaw, 2006b).

6.0 Data Management, Reduction, and Reporting

Data management, review, and reporting will be performed according to the requirements described in the Installation-Wide Work Plan (Shaw, 2006b).

The BERA Report shall contain a section covering off-site laboratory data quality and validity. At a minimum, the following information will be included in the BERA Report:

- Assessment of measurement data precision, accuracy, and completeness
- Discussion of significant QA problems and solutions implemented

The Project Chemist will prepare the quality assessment of off-site laboratory operations and analytical results. The data quality assessment report will be provided to the Program QC Manager and Project Manager for review and inclusion in the final project report. The following reports will be included in the BERA Report:

- Form 1 data reports
- Laboratory case narrative
- COC records
- Third-party validation reports (for a minimum of 10 percent of QC Level D samples)
- Data quality assessment reports for each sample delivery group.

7.0 Audits, Corrective Actions, and Reports to Management

Audits, corrective actions, and reports to management will be performed and documented according to the requirements described in the Installation-Wide Work Plan (Shaw, 2006b).

8.0 References

ASTM, 1997, *Standard Guide for Conducting Laboratory Soil Toxicity or Bioaccumulation Tests with Lumbricid Earthworms Eisenia fetida*, ASTM-E-1676-97, West Conshohocken, Pennsylvania.

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Figures

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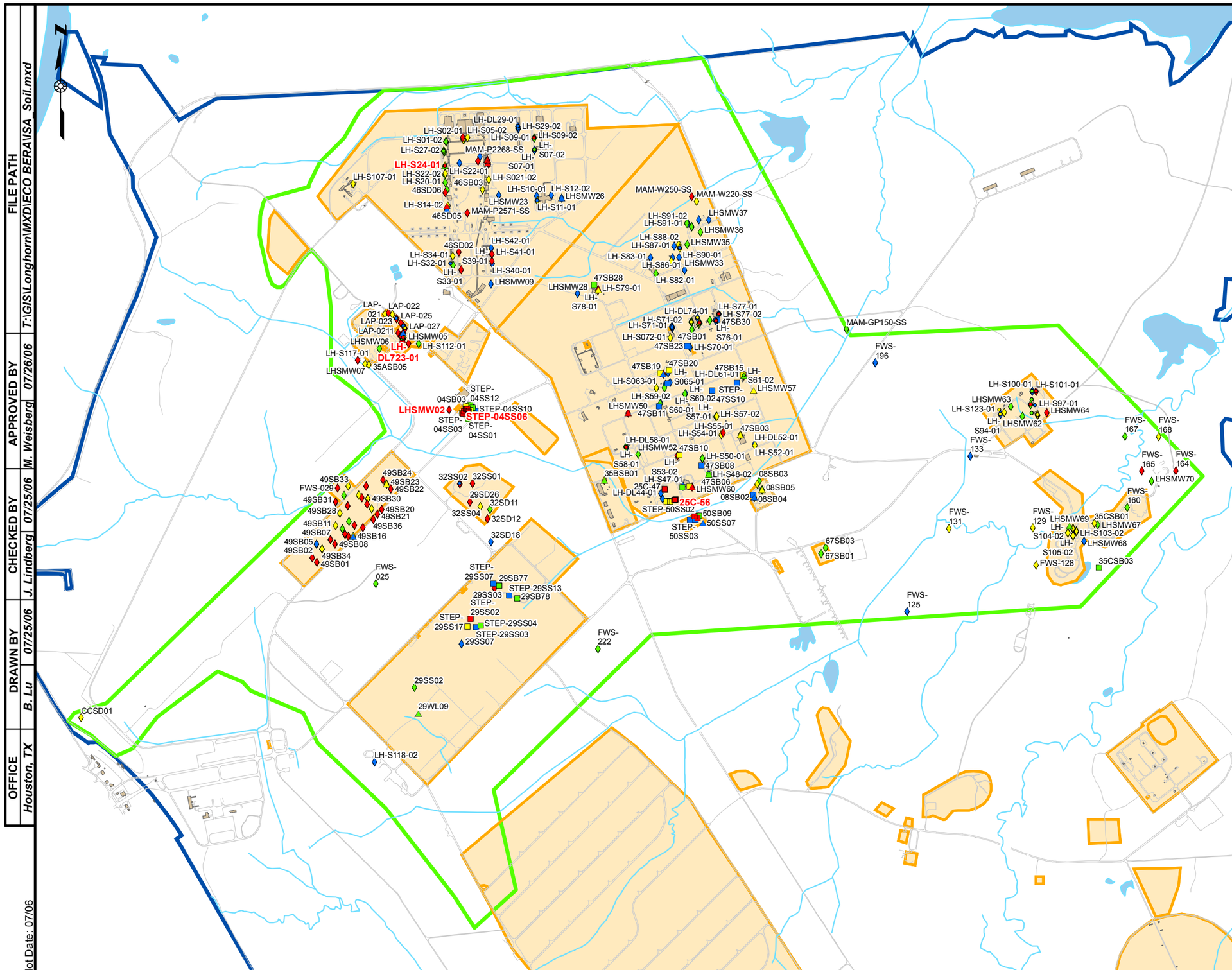

Legend

Cadmium (mg/kg)
- 4.7401 - 37.5000
- 3.2101 - 4.7400
- 2.2001 - 3.2100
- 1.4100 - 2.2000

Chromium (mg/kg)
- 80.0001 - 193.7000
- 56.2001 - 80.0000
- 44.8001 - 56.2000
- 37.0000 - 44.8000

Perchlorate (mg/kg)
- 1.4501 - 163.0000
- 0.1001 - 1.4500
- 0.0340 - 0.1000
- 0.0140 - 0.0339

Zinc (mg/kg)
- 68.01 - 2580.00
- 46.01 - 68.00
- 33.01 - 46.00
- 24.90 - 33.00

Stream
Road
Building or Concrete Slab
Site
Industrial Sub-area
Lake
Approximate LHAAP Boundary

0 750 1,500 3,000 Feet

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FIGURE 1

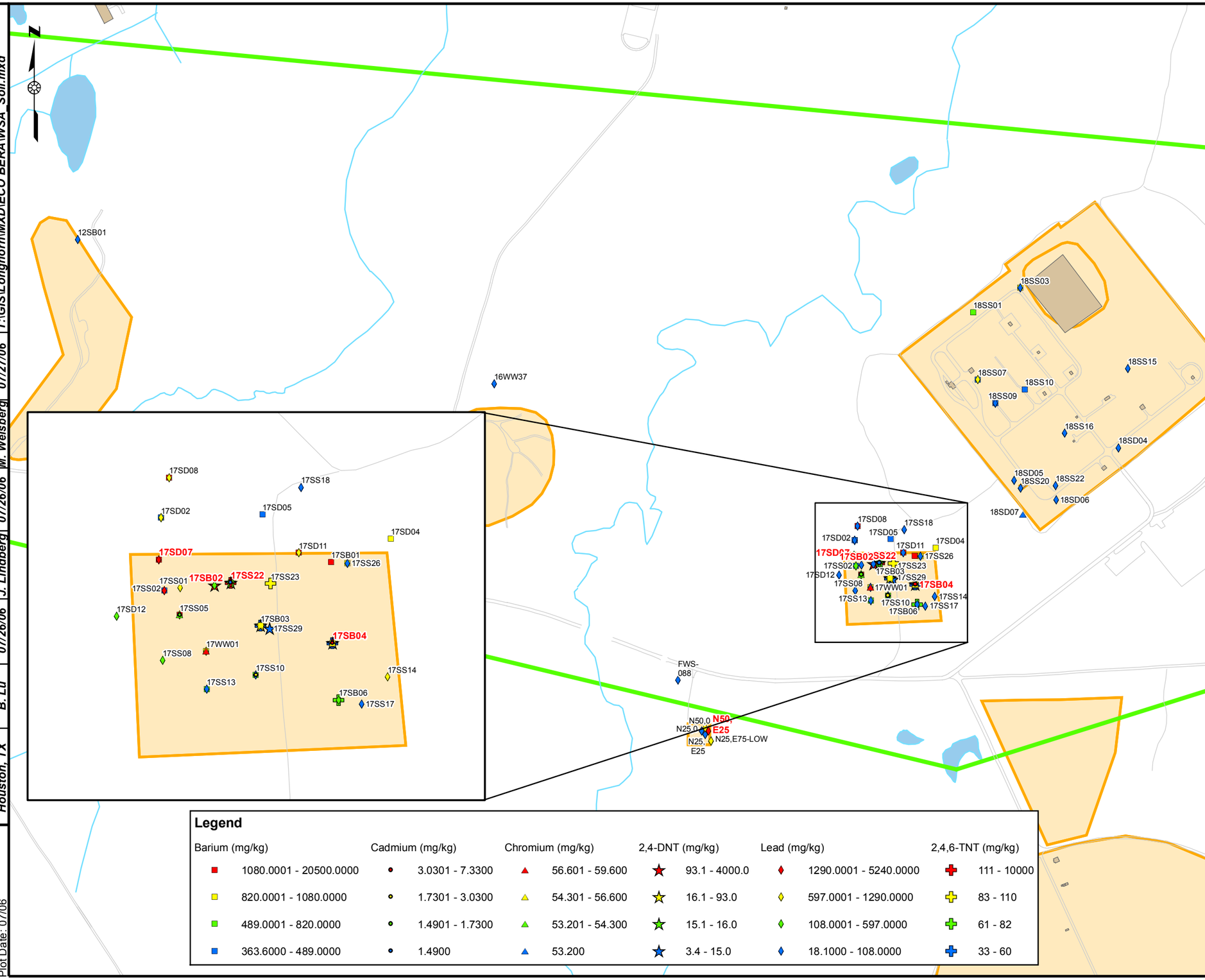
CONCENTRATIONS OF FINAL COPECs
IN SOIL IN THE INDUSTRIAL SUB-AREA

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	07/25/06	J. Lindberg	07/25/06	M. Weisberg	07/26/06	T:\GIS\LonghornMXD\ECO BERA\SA_Soil.mxd

Plot Date: 07/06

00042136



Legend

- Stream
- Road
- Building or Concrete Slab
- Site
- Waste Sub-area
- Lake
- Approximate LHAAP Boundary

0 250 500 1,000 Feet

Legend

Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	2,4-DNT (mg/kg)	Lead (mg/kg)	2,4,6-TNT (mg/kg)
1080.0001 - 20500.0000	3.0301 - 7.3300	56.601 - 59.600	93.1 - 4000.0	1290.0001 - 5240.0000	111 - 10000
820.0001 - 1080.0000	1.7301 - 3.0300	54.301 - 56.600	16.1 - 93.0	597.0001 - 1290.0000	83 - 110
489.0001 - 820.0000	1.4901 - 1.7300	53.201 - 54.300	15.1 - 16.0	108.0001 - 597.0000	61 - 82
363.6000 - 489.0000	1.4900	53.200	3.4 - 15.0	18.1000 - 108.0000	33 - 60

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TULSA, OKLAHOMA

FIGURE 2

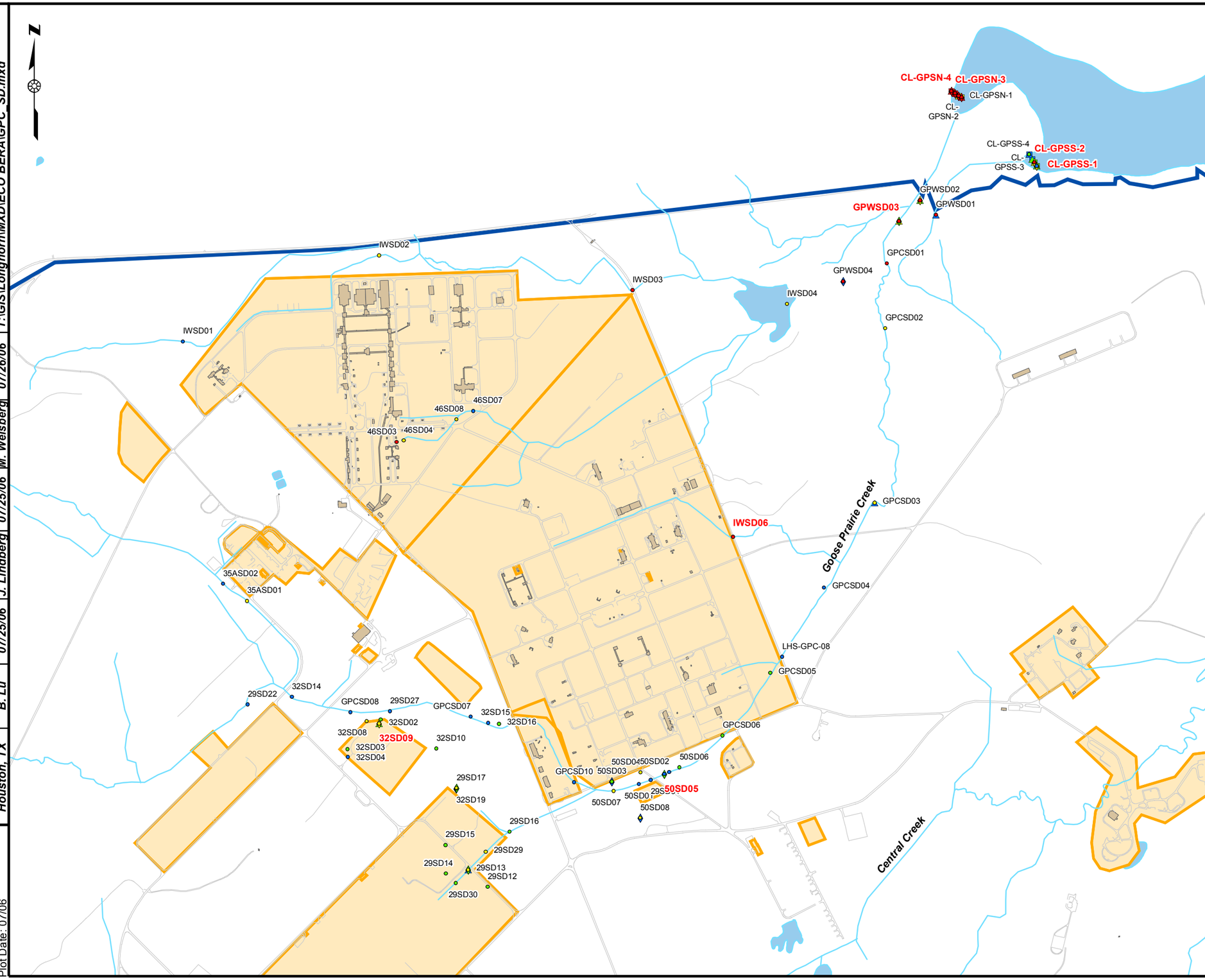
CONCENTRATIONS OF FINAL COPECs
IN SOIL IN THE WASTE SUB-AREA

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	07/26/06	J. Lindberg	07/26/06	M. Weisberg	07/27/06	T:\GIS\Longhorn\MXD\ECO BERA\WSA_Soil.mxd

Plot Date: 07/06

00042137



Legend

Lead (mg/kg)

- 145.1 - 542.0
- 92.3 - 145.0
- 59.3 - 92.2
- 38.4 - 59.2

Mercury (mg/kg)

- 1.0201 - 1.6600
- 0.2901 - 1.0200
- 0.2001 - 0.2900
- 0.1300 - 0.2000

Silver (mg/kg)

- 2.301 - 17.600
- 1.491 - 2.300
- 1.301 - 1.490
- 1.100 - 1.300

Thallium (mg/kg)

- 1.511 - 2.690
- 1.031 - 1.510
- 0.573 - 1.030
- 0.541 - 0.572

- Stream
- Road
- Building or Concrete Slab
- Site
- Lake
- Approximate LHAAP Boundary

0 600 1,200 2,400 Feet

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TULSA, OKLAHOMA

FIGURE 3

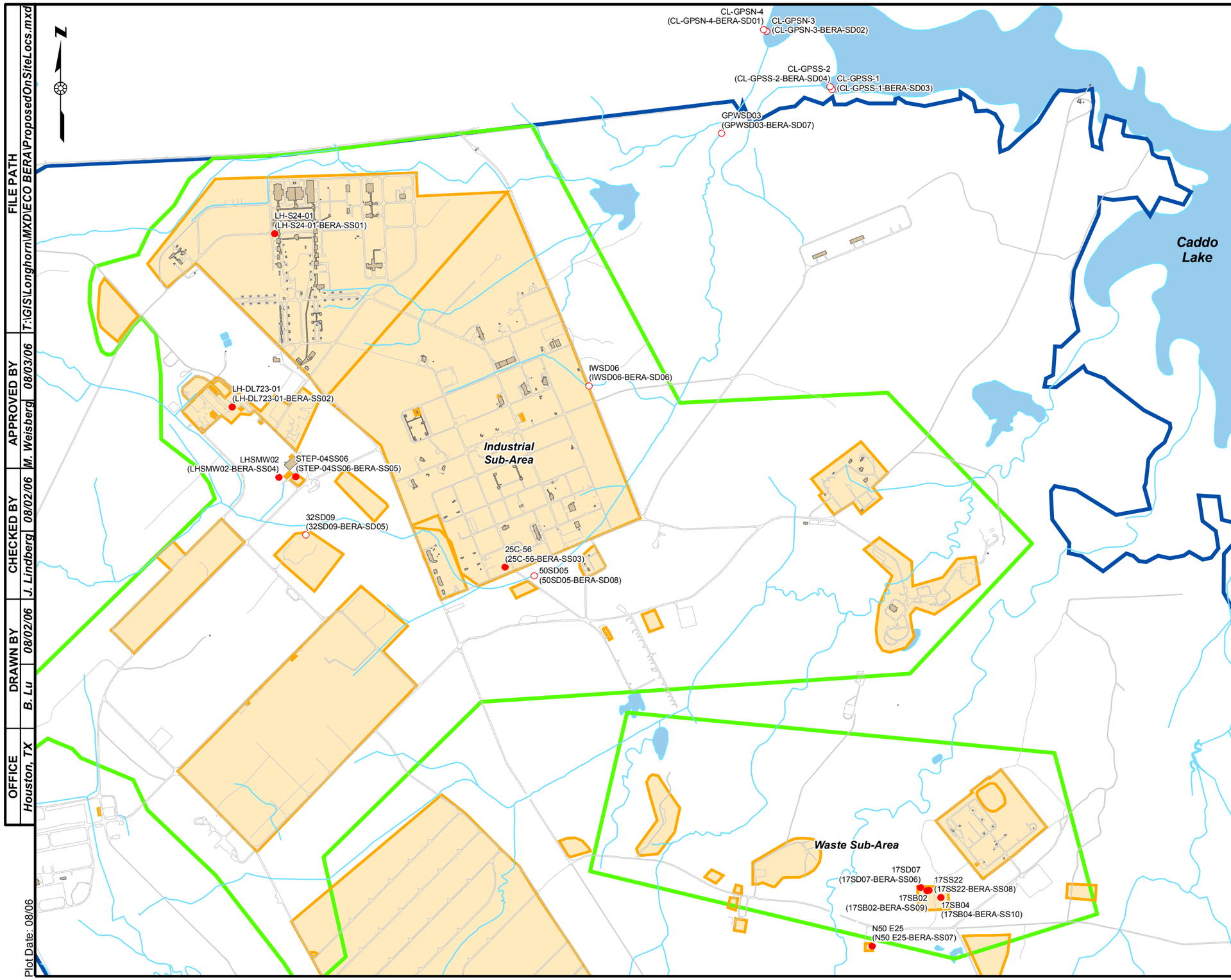
CONCENTRATIONS OF FINAL COPECs IN SEDIMENT IN THE GOOSE PRAIRIE CREEK WATERSHED

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	07/25/06	J. Lindberg	07/25/06	M. Weisberg	07/26/06	T:\GIS\Longhorn\MXD\ECO BERA\GPC_SD.mxd

Plot Date: 07/06

00042138



Legend

Proposed On-site Sample Location

- Soil Sample
- Sediment Sample
- Stream
- Road
- Building or Concrete Slab
- Site
- Sub-area
- Lake
- Approximate LHAAP Boundary

0 750 1,500 3,000 Feet

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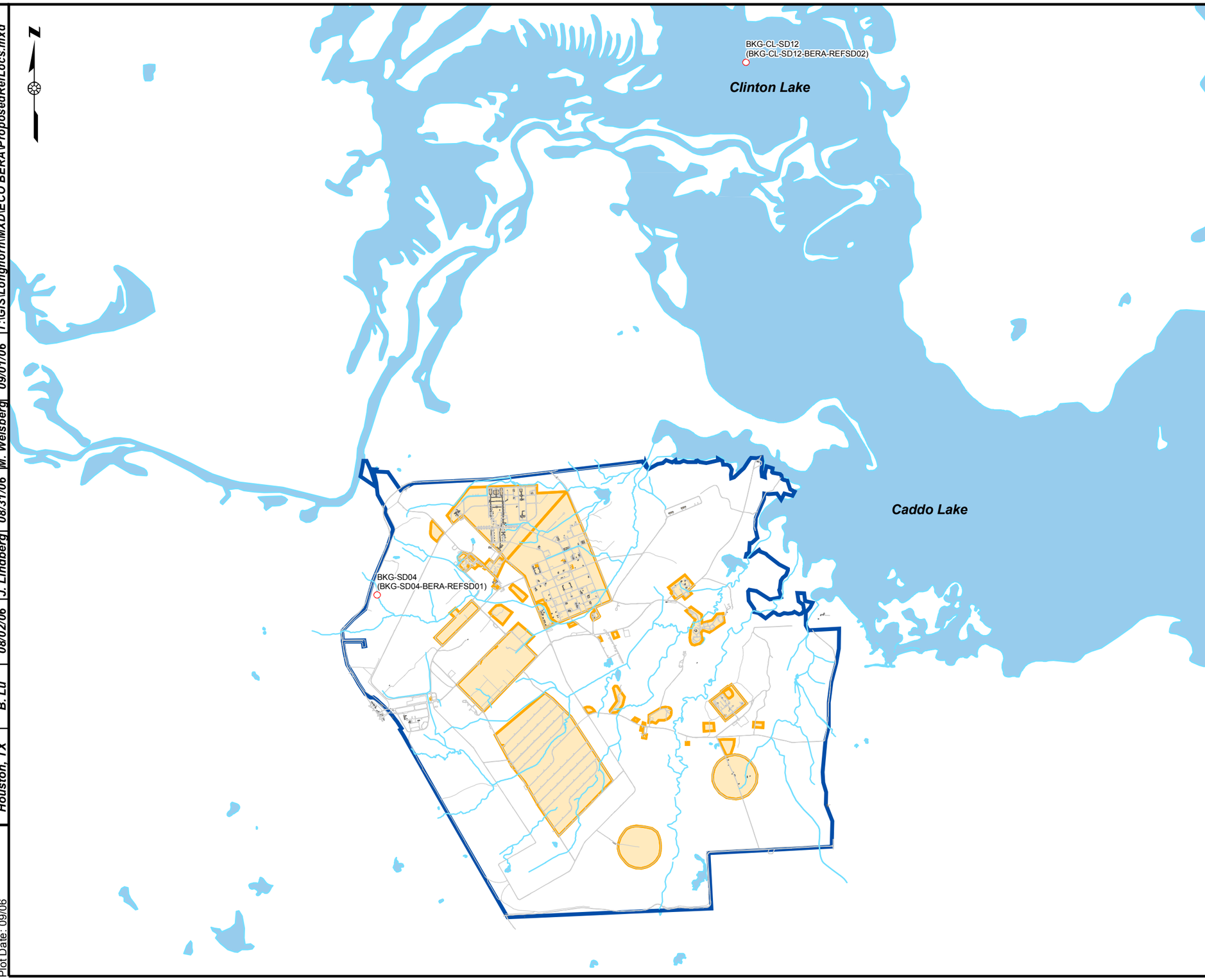
FIGURE 4

PROPOSED ON-SITE SAMPLE LOCATIONS
FOR THE BASELINE
ECOLOGICAL RISK ASSESSMENT

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	08/02/06	J. Lindberg	08/02/06	M. Weisberg	08/03/06	T:\GIS\Longhorn\MXD\ECO BERA\ProposedOnSiteLocs.mxd

Plot Date: 08/06



Legend

- Sediment Sample
- Stream
- Road
- Building or Concrete Slab
- Site
- Lake
- Approximate LHAAP Boundary

0 2,250 4,500 9,000 Feet

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

FIGURE 5
PROPOSED REFERENCE SAMPLE LOCATIONS FOR THE BASELINE ECOLOGICAL RISK ASSESSMENT
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	08/02/06	J. Lindberg	08/31/06	M. Weisberg	09/01/06	T:\GIS\Longhorn\MXD\ECO BERA\ProposedRefLocs.mxd

Plot Date: 09/06

Tables

Table 1
Proposed Sample Types, Estimated Quantities, and Laboratory Analyses for the Baseline Ecological Risk Assessment Field Samples

Site	Sample Type	Measurement Endpoint [a]	Figure Reference	Chemical Groups for Analysis	Estimated No. of Samples and Types [b]	
					Media	Biota (co-located with media samples)
Industrial Sub-Area	Soil Sampling for Earthworm and Plant COPEC Uptake Estimate and Laboratory-Derived Body Burdens	2-2, 2-3, 2-4	Figure 4	Metals and perchlorate	5 Surface Soil	5 Plant
Waste Sub-Area	Soil Sampling for Earthworm and Plant COPEC Uptake Estimate and Laboratory-Derived Body Burdens	2-2, 2-3, 2-4	Figure 4	Metals, explosives	5 Surface Soil	5 Plant
Goose Prairie Creek	Sediment Sampling for Benthic Invertebrate COPEC Uptake Estimate and Laboratory-Derived Body Burdens	2-1, 2-4	Figure 4	Metals	4 Sediment	None
	Sediment Sampling for COPEC Toxicity (freshwater invertebrates)	1-1	Figure 4	Metals	4 Sediment	None
	Sediment Sampling for COPEC Bioavailability (AVS/SEM)	1-2	Figure 4	Special	4 Sediment	None
Goose Prairie Creek Cove of Caddo Lake	Sediment Sampling for Benthic Invertebrate COPEC Uptake Estimate and Laboratory-Derived Body Burdens	2-1, 2-4	Figure 4	Metals	4 Sediment	None
	Sediment Sampling for COPEC Toxicity (freshwater invertebrates)	1-1	Figure 4	Metals	4 Sediment	None
	Sediment Sampling for COPEC Bioavailability (AVS/SEM)	1-2	Figure 4	Special	4 Sediment	None
Goose Prairie Creek Reference Area	Sediment Sampling for COPEC Toxicity (freshwater invertebrates)	1-1, 2-1, 2-4	Figure 5	Metals	1 Sediment	None
Caddo Lake Reference Area	Sediment Sampling for COPEC Toxicity (freshwater invertebrates)	1-1, 2-1, 2-4	Figure 5	Metals	1 Sediment	None

Notes and Abbreviations

[a] *See Table 3-2 from the Work Plan.*
[b] *Estimated number of samples is dependent upon field conditions, though minimum suggested value is indicated. Total number does not include field QC samples.*

Table 2
Test Methods, Containers, Preservatives, and Holding Times for Baseline Ecological Risk Assessment Field Samples [a]

Sample Type	Chemical Group	Test Method	Sample Container and Volume	Preservation Requirements	Holding Time
Surface Water	Hardness (as $CaCO_3$)	2340B	(1) 250-mL HDPE container (WM)	HNO_3	28 days from field collection until analysis
	Perchlorate (blanks)	314	(1) 250-mL HDPE container ((WM)	Cool to 4±2°C	28 days from field collection until analysis
	Explosives (blanks)	8330	(2) 1-L amber glass container (NM)	Cool to 4±2°C	7 days from collection until extraction and 40 days after extraction
	Total Metals & Mercury (blanks)	6020 / 7471A	(1) 500-mL HDPE container (NM)	HNO_3	28 days from field collection until analysis
Sediment	Total Metals	6020	(1) 125-ml glass jar with Teflon™-lined lid (WM) [b]	Cool to 4±2°C	6 months from field collection until analysis
	Mercury	7471A	(1) 125-ml glass jar with Teflon™-lined lid (WM) [b]	Cool to 4±2°C	14 days from field collection until analysis
	Total Organic Carbon	Walkley Black	(1) 125-ml glass jar with Teflon™-lined lid (WM) [b]	Cool to 4±2°C	14 days from field collection until analysis
	Toxicity (*H. azteca*)	EPA (2000)	(1) 1-L HDPE container(s) (WM)	Cool to 4±2°C	14 days from field collection until analysis
	Bioaccumulation (*L. variegatus*)	EPA (2000)	(2) 4-L HDPE container(s) (WM)	Cool to 4±2°C	45 days from field collection until analysis
	AVS-SEM	EPA (1991)	(1) 125-mL glass (limit head space) (WM)	Cool to 4±2°C	14 days from field collection until analysis
	Grain Size	% sand, silt, clay	(1) gallon zip-lock plastic bag	None	None
Soil	Total Metals	6020	(1) 125-ml glass jar with Teflon™-lined lid (WM) [c]	Cool to 4±2°C	6 months from field collection until analysis
	Total Organic Carbon	Walkley Black	(1) 125-ml glass jar with Teflon™-lined lid (WM) [c]	Cool to 4±2°C	14 days from field collection until analysis
	Explosives	8330	(1) 125-ml glass jar with Teflon™-lined lid (WM) [d]	Cool to 4±2°C	14 days from collection until extraction and 40 days after extraction
	Perchlorate	314	(1) 125-ml glass jar with Teflon™-lined lid (WM) [d]	Cool to 4±2°C	28 days from field collection until analysis
	Bioaccumulation (*E. fetida*)	Linder (1992)	(1) 11.4-L HDPE container(s) (WM)	Cool to 4±2°C	45 days from field collection until analysis
Aquatic or Terrestrial Invertebrates [e]	Lipids (Terrestrial Invertebrates only)	NOAA	10g frozen in foil	Frozen	Not specified
	Total Metals (Terrestrial and Aquatic Invertebrates)	6020	5g frozen in foil (as low as 1g for aquatic invertebrates possible)	Frozen	Not specified
	Mercury (Aquatic Invertebrates Only)	7471A	1g frozen in foil	Frozen	Not specified
	Explosives (Terrestrial Only)	8330	30g frozen in foil	Frozen	Not specified
Plants [e]	Total Metals	6020	5g frozen in plastic bag	Frozen	Not specified
	Explosives	8330	30g frozen in plastic bag	Frozen	Not specified
	Perchlorate	314	15g frozen in plastic bag	Frozen	28 days from field collection until analysis
Moths (optional) [e]	Perchlorate	314	15g frozen in plastic bag	Frozen	28 days from field collection until analysis

Table 2 (*continued*)
Test Methods, Containers, Preservatives, and Holding Times for Baseline Ecological Risk Assessment Field Samples

Notes and Abbreviations:

[a] It should be noted that *L. variegatus* and *E. fetida* tissue samples will be collected in the laboratory, not the field, during the bioaccumulation studies with sediment and soil, respectively.
[b] One glass jar (sediment) will be collected from each sample location and used for total metals (6020), mercury (7471A), and TOC (Walkley Black).
[c] One glass jar (soil) will be collected from each sample location and used for total metals (6020) and TOC (Walkley Black).
[d] One glass jar (soil) may be collected from each sample location and used for explosives (8330) and perchlorate (314), if both analyses are required for the same soil sample.
[e] The sample will be homogenized in the laboratory prior to analysis.

°C	degrees Celsius
AVS/SEM	Acid volatile sulfides/simultaneously extracted metals
$CaCO_3$	calcium carbonate
EPA	U.S. Environmental Protection Agency
g	gram(s)
HDPE	high density polyethylene
NOAA	National Oceanic and Atmospheric Association
ml	milliliter
WM	wide mouth
NM	narrow mouth

Linder, G., et al., 1992, Evaluation of Terrestrial Indicators for Use in Ecological Risk Assessments at Hazardous Waste Sites, Environmental Research Laboratory, Office of Research and Development, Corvallis, Oregon, EPA/600/R-92/183.

EPA, 2000, Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates, 2nd Edition, Office of Research and Development, Duluth, Minnesota and Office of Science and Technology, Office of Water, Washington, D.C., EPA/600/R-99/064.

EPA, 1991, *Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment* - (Determination of Acid Volatile Sulfides and Simultaneously Extractable Metals in Sediment), Office of Science and Technology, Office of Water, Health and Ecological Criteria Division, Washington, D.C., August.

Attachment 1

Summary of Test Conditions for Sediment Toxicity and Soil and Sediment Bioaccumulation Tests

Summary of Test Conditions for Conducting a 10-d Toxicity Test with Amphipod, *Hyalella azteca* (USEPA, 2000)	
Test type	Whole sediment with renewal of overlying water
Temperature	23±1ºC
Light quality	Wide-spectrum fluorescent lights
Light intensity	~100 – 1000 lux
Photoperiod	16 hours light, 8 hours dark
Test chamber size	300 mL high-form beaker
Sediment volume	100 mL sediment
Overlying water volume	175 mL
Renewal of test solutions	2 volume additions per day (continuous or intermittent)
Age of test organisms	7- to 8-days old at the start of the test
Number of organisms per test chamber	10
Number of replicate chambers per treatment	4 for survival and growth
Number of organisms per sample	10
Feeding	YCT food, fed 1.0 ml (1800 mg/L stock) daily to each test chamber
Aeration	None, unless DO concentration falls below 2.5 mg/L.
Overlying water	Culture water, well water, surface water or site water. Use of reconstituted water is not recommended
Test chamber cleaning	If screens become clogged during a test, gently brush the outside of the screen
Overlying water quality	Hardness, alkalinity, conductivity and ammonia at the beginning and end of a sediment exposure (Day 0 and Day 10). Temperature daily. Conductivity weekly. DO and pH three times/week. Concentrations of DO should be measured more often if DO drops more than 1 mg/L since the previous measurement.
Test duration	10 days
Endpoints	10-d survival and growth
Test acceptability criteria	Minimum mean control survival of 80% on Day 10.

Summary of Test Conditions for Oligochaete, *Lumbriculus variegatus*, Bioaccumulation Test (USEPA, 2000)	
Test type	Whole sediment with renewal of overlying water
Temperature	23 ± 1° C
Light Quality	Wide spectrum fluorescent lights
Light intensity	~100 – 1000 lx
Photoperiod	16 hours light, 8 hours dark
Test chamber size	4 – 6 liter aquaria with stainless steel screens or glass standpipes
Test solution volume	1 Liter or more of both sediment and overlying water (total organic carbon [TOC] dependent)
Renewal of test solutions	2 volume additions per day
Age of test organisms	Adults
Number of organisms per test chamber	Ratio of TOC in sediment to organisms' dry weight should be no less than 50:1.
Number of replicate chambers per sample	5
Number of organisms per sample	See above
Feeding regime	None
Cleaning	If overflow screens are clogged, gently brush the outside of the screens to clean
Parameters measured	Alkalinity, hardness, and conductivity at the beginning and end of the test and weekly throughout; D.O., pH, and temperature daily
Aeration	None, unless DO concentration falls below 2.5 mg/L. Aeration rate should not exceed 100 bubbles/minute.
Overlying Water and Control Sediment	Synthetic fresh water or laboratory-grade natural fresh water matching the site-specific hardness and laboratory-grade sediment demonstrated to have sufficient survival and growth
Test concentrations	Samples will be tested undiluted only. No concentrations will be used
Test duration	28 days
Endpoints	Bioaccumulation
Depuration	Organisms are isolated in clean water the day prior to testing in order to purge gut contents; guts are depurated for 6 hours in clean water at the end of the test
Test acceptability criteria	None specified
Sample requirements	Sediment sample will be collected once and not changed throughout the test period. Sample should be used within 60 days of collection.

Summary of Test Conditions for Earthworm, *Eisenia fetida*, Bioaccumulation Test (Linder et al., 1992; ASTM, 1997)	
Test type	Whole soil
Temperature	23 ± 1° C
Light Quality	Wide spectrum fluorescent lights
Light intensity	50 – 100 foot candles
Photoperiod	Continuous light
Test chamber size	4-liter
Test solution volume	1500 g
Renewal of test solutions	None
Age of test organisms	Adults
Number of organisms per test chamber	75
Number of replicate chambers per sample	5
Number of organisms per sample	375
Feeding regime	None
Cleaning	None
Aeration	None
Control Soil	Laboratory-grade soil demonstrated to have sufficient survival and growth and to have no contamination
Test concentrations	Samples will be tested undiluted only. No concentrations will be used
Test duration	28 days
Endpoints	Bioaccumulation
Depuration	Organisms are isolated on moist paper prior to testing in order to purge gut contents; guts are depurated for 6 hours on moist paper at the end of the test
Test acceptability criteria	At least 80% survival in the control
Sample requirements	Soil sample will be collected once and not changed throughout the test period. Sample should be used within 60 days of collection.

Attachment 2

Laboratory Shaw SOP No. T-FS-124
(Sediment Sampling Using Ponar/Ekman Type Systems)

STANDARD OPERATING PROCEDURE

Subject: Sediment Sampling using Ponar/Ekman Type Systems

1. PURPOSE

The purpose of this document is to provide the methods and procedures for sampling of sediments using clamshell-type sampling devices such as the Ponar and Ekman systems. These sampling systems can be utilized to collect non-core sediment samples. If core samples are desired, alternative methods should be used.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where non-core sediment samples will be collected via clamshell sampling device methods.

3. REFERENCES

- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans,* Appendix C, Section C.6, EM200-1-3, Washington, D.C.
- Wildlife Supply Company (WILDCO) web-site at http://www.wildco.com.

4. DEFINITIONS

- **Clamshell Device**—A sampling device consisting of spring-loaded jaws that activate either by contact with the bottom or by other means and entrap the collected materials for retrieval. These devices can be operated via hand line or with a winch for deep-water operations.
- **Ekman Sampler**—A type of clamshell device designed for use in soft bottoms. The Ekman sampler rests on the bottom and uses a messenger system to activate the closure spring and scoops up the material caught between the jaws upon closure.
- **Ponar Sampler**—A type of clamshell device designed for hard and gravelly bottoms. Unlike the Ekman, a Ponar sampler self-activates its closure mechanism after it penetrates into the bottom material. Ponar samplers are heavy (45 lbs.) and require a winch to operate.
- **Messenger**—A metal, usually lead, weight with a hole through its core that is used to activate the spring closure on clamshell devices. The messenger is dropped onto the closure activation mechanism by sliding it down a line. It activates the closure by the force of its weight upon impact.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Safety Notes: These sampling devices are spring activated; they close with great force and are capable of causing injury. Care should be used when opening and securing these devices in the "ready" position. Do not handle by the trip line and always transport in the closed position. Always use proper life-saving equipment when sampling from a boat or barge. Consult the project Health and Safety Plan for requirements.

6.1 Equipment

The following equipment should be used when sampling sediments using clamshell-type sampling devices:

- Decontaminated commercial clamshell sampling device, stainless steel construction for trace environmental sampling
- Rope or line with graduations, on winch if required
- Weighted line with graduations to determine depth to bottom, or depth finder if available
- Separate line for messenger if applicable
- Carpenter's chalk
- Plastic sheeting, to keep emptying area clean
- Plastic or metal shallow pan, to empty sampler into–decontaminated or dedicated
- Stainless steel spoons or scoops–decontaminated or dedicated
- Decontaminated or dedicated stainless steel bowl

6.2 Sampling

The following procedure should be used when sampling sediments using clamshell-type sampling devices:

1. Don a pair of clean gloves.
2. Place plastic sheeting around the area where the sampler will be emptied to keep sampled material in place.
3. Determine the depth to the bottom using the weighted line or depth finder and then mark the sample's line at the distance representative of approximately 1m from the bottom with chalk.

00042151

4. Attach the line to the sampler and, if applicable, the messenger line. If the messenger has a separate line, make sure it is at least as long as the tag line. *Do not place the messenger on the line at this time.*

5. Carefully open and lock the sampler. From this point on, handle it only by the tag line and take care not to strike it on the release mechanism.

6. Attach the free end of the tag line to a secure holding place to keep from losing the sampler.

7. Being careful not to contact the sampler, slowly lower it into the water until the 1m-to-bottom mark is reached. Make sure that the rope/line does not become entangled.

8. Slow the descent further and continue until the bottom is contacted. Contact with the bottom will be evidenced when the descent stops and slack appears in the line.

9. If sampling with a Ponar, the slack in the line should have activated the closure mechanism. If using a messenger-type system, thread the messenger onto the tag or trip line and allow it to fall and trip the device.

10. Free the device from the bottom by pulling straight up on the tag line, and slowly raise it until it is about 1 to 2 feet from the surface while being careful not to allow the rope/line coils to entangle on anything.

11. Prepare and clear the sample receiving area, and then slowly raise the sampler out of the water.

12. Allow clear water to drain, and swing the sampler onto the pan in the receiving area once the clear liquids are drained. Do not allow the fine particles to exit the sampler also.

13. If a messenger was used, remove it from the line to keep from accidentally tripping the device when retrieving the sample. Carefully open and lock the sampler and allow the sample to fill the pan. Put the sampler aside for cleaning and decontamination.

14. If collecting samples for VOC analysis, these samples should be taken first from the material in the pan using corer or syringe-type methods.

15. The remainder of the sample material should be mixed in the pan and placed into labeled sample containers or other plan-required receptacles using the spoon or scoop.

16. Complete all required documentation, and place the sample into a cooler or other plan-specified container.

17. Decontaminate the sampler on the inside and outside while open and closed to remove all particles. Dry and return the sampler to its “closed” position when completed.

7. ATTACHMENTS

None.

8. FORMS

None.

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

October 17, 2006

DAIM-BD-LO

Ms. Fay Duke
Texas Commission on Environmental Quality
TCEQ Environmental Cleanup Section II MC-221
12100 Park 35 Circle
Austin, TX 78753

Re: Final Addendum 10 Site Investigation at LHAAP-55 (Ten Septic Tanks),
Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas, October 2006

Dear Ms. Duke,

The above-referenced document is being transmitted to you for your review. 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 David Cobb, 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, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
Chris Villarreal, USEPA Region 6, Dallas, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE – Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
David P. Cobb, Shaw – Stoughton, MA
P. Srivastav, Shaw – Houston, TX (for project files)

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

October 17, 2006

DAIM-BD-LO

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

Re: Final Addendum 10 Site Investigation at LHAAP-55 (Ten Septic Tanks),
Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas, October 2006

Dear Mr. Villarreal,

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Sincerely,

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

Copies furnished:
Fay Duke, TCEQ, Austin, TX
Paul Bruckwicki, Caddo Lake NWR, TX
Cliff Murray, COE – Tulsa District, OK
Richard P. Smith, COE – Tulsa District, OK
David Cobb, Shaw – Stoughton, MA
P. Srivastav, Shaw – Houston, TX (for project files)

FINAL
ADDENDUM 10
SITE INVESTIGATION
LHAAP-55 (TEN SEPTIC TANKS)

FINAL
INSTALLATION-WIDE WORK PLAN
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared for

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

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MARC No. W912QR-04-D-0027, Shaw Project No. 117591
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FINAL
ADDENDUM 10
SITE INVESTIGATION LHAAP-55 (TEN SEPTIC TANKS)
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
OCTOBER 2006

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I certify with my signature below, that the written descriptions and graphical depictions of geology and hydrogeology contained within this report were prepared under my supervision, and accurately reflect existing knowledge about the geology and hydrogeology of the referenced site.

Signature

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PRAVEEN SRIVASTAV
GEOLOGY
1696
LICENSED
PROFESSIONAL GEOSCIENTIST

10/16/06
Date Signed

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Acronyms and Abbreviations

ASTM	ASTM International (formerly American Society for Testing and Materials)
bgs	below ground surface
DPT	Direct Push Technology
EPA	U.S. Environmental Protection Agency
LHAAP	Longhorn Army Ammunition Plant
MARC	Multiple Award Remediation Contract
NPDES	National Pollution Discharge Elimination System
PA	preliminary assessment
Plexus	Plexus Scientific Corporation
Shaw	Shaw Environmental, Inc.
SVOCs	semivolatile organic compounds
TO	task order
USACE	U.S. Army Corps of Engineers
USATHAMA	U.S. Army Toxic and Hazardous Materials
VOCs	volatile organic compounds

1.0 Introduction

The U.S. Army Corps of Engineers (USACE), Tulsa District, has contracted Shaw Environmental, Inc. (Shaw) under the Louisville District's Multiple Award Remediation Contract (MARC) No. W912QR-04-D-0027, Task Order (TO) DS02, with oversight by the USACE Tulsa District to provide environmental services for a site investigation at LHAAP-55, consisting of ten septic tanks at the former Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. This document is Addendum 10 to the *Final Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas* (Shaw, 2006), published separately.

According to the Army, a 1988 preliminary assessment (PA) concluded that no further action is necessary at LHAAP-55 (USACE, 1996). However, the PA report or other supporting documentation could not be found. The objective of this addendum is to describe work activities to collect soil samples at LHAAP-55 to determine if contaminant releases have occurred at septic tank locations. The analytical data from the samples will be used to determine whether chemical constituents are present in soil at concentrations that present an unacceptable risk to human health or the environment.

LHAAP is located in central-east Texas in the northeastern corner of Harrison County. The facility occupies 8,493 acres between State Highway 43 in Karnack, Texas, and the western shore of Caddo Lake. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the east. 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.

1.1 Site Description and History

1.1.1 LHAAP-55

According to the Thiokol Corporation July 1963 figure entitled "Sanitary Sewers and Septic Tank Layout – 3FU1-1021," which includes discharge points and septic tanks, LHAAP-55 consists of ten septic tanks located in the eastern portion of LHAAP. The septic tanks are located south of LHAAP-67, within the boundaries of and southeast of LHAAP-48, and within the boundaries of LHAAP-35C(53) **(Figure 1-1)**. The ten septic tanks served buildings, with outfalls to ditches. The septic tanks were located at Buildings 8-T, 13-T, 16-T-1, 23-T, 25-T, 34-T, 39-T-1, 45-W, 4-Y, 16-Y-1, and 18-Y-1 (Plexus Scientific Corporation [Plexus], 2005). The tanks served areas that could not be connected to the plant sanitary sewer system and allowed sedimentation and bacterial decomposition of sanitary waste before discharge to field lines. The field lines consisted of sand gravel to disperse the wastewater and facilitate aerobic digestion of waste (Plexus, 2005).

Beneath the field lines was a series of collection pipes that collected the wastewater and transported it to the outfalls. Each outfall was equipped with a chlorinating device (Plexus, 2005).

According to the Plexus (2005) report, the design of the septic systems was reviewed in 1985. Plans were available only for two systems: "comfort stations" and "Change House Building 4-Y." All the septic systems were reportedly built using one of the two plans. The septic tanks for the comfort stations were designed to hold approximately 1,000 gallons and the treatment fields were designed as a subsurface sand filter. Effluent from the tanks entered the field via 6-inch-diameter, open-joint, clay tile pipe laterals placed in a 12-inch-thick gravel bed, with the laterals laid on 5-foot centers. Immediately beneath the gravel bed was a 2-foot-thick sand bed underlain by a second 12-inch-thick gravel bed with an offset clay tile collection pipe system.

The second septic system type (Change House Building 4-Y) was designed to hold approximately 1,500 gallons, with a treatment field and a leachate collection system in the leaching trenches. The leaching field consisted of six 40-foot-long, 4-inch-diameter, open-joint, clay tile pipe laterals laid on top of a 15-inch-thick gravel bed in a 15-inch-wide trench. The collection system consisted of 17-foot-long clay tiles laid on the bottom of the trench directly beneath the influent lines.

1.1.1.1 Septic Tank-01

Septic Tank-1 (ST-01) was associated with Building 45-W (Solvent Shed). The former building and associated septic tank were located on Ignatius Avenue south of LHAAP-67, as depicted in **Figures 1-1** and **1-2.** A National Pollutant Discharge Elimination System (NPDES) permit TX0060836 was associated with this septic tank (U.S. Army Toxic and Hazardous Materials [USATHAMA], 1980). The location of ST-01 could not be confirmed during a field reconnaissance.

1.1.1.2 Septic Tank-02

Septic Tank-2 (ST-02) was associated with Building 18-Y-1 (Pyrotech Production) (Thiokol, 1963) and according to Plexus (2005), the building was constructed in 1955 as a toilet/shower with a total of 160 square feet of floor area. The former building and associated septic tank were located in LHAAP-48, as depicted in **Figures 1-1** and **1-3**. This building has a 937-gallon septic tank with a 1,800 square foot filter bed. In 1991 this building's septic was tied into the sewage treatment plant (Plexus, 2005). The location of ST-02 was confirmed during field reconnaissance.

1.1.1.3 Septic Tank-03

Septic Tank-3 (ST-03) was associated with Building 16-Y-1 (Pyrotech Production) (Thiokol, 1963) and was constructed in 1955 as a toilet/shower with a total of 170 square feet of floor area.

The former building and the associated septic tank were located in LHAAP-48, as depicted in **Figures 1-1** and **1-3**. This building had a 937-gallon septic tank with a 1,800 square foot filter bed. In 1991 this building's septic system was tied into the sewerage treatment plant (Plexus, 2005). The location of ST-03 was confirmed during field reconnaissance.

1.1.1.4 Septic Tank-04

Septic Tank-4 (ST-04) is associated with Building 4-Y (Change House). The former building and the associated septic tank were located off Young Drive southwest of LHAAP-48, as depicted in **Figures 1-1** and **1-4**. Buildings 4-Y, 3-Y, and 6-Y were tied to ST-04, a 1,500-gallon septic tank with a 1,600 square foot filter bed. In 1991 Building 4-Y's septic system was tied into the sewage treatment plant (Plexus, 2005). The location of ST-04 was confirmed during field reconnaissance. However, based on the uses of the associated buildings near ST-04 as a Lunch Room (3-Y), Break Room (3-Y), and Change House (4-Y) (Plexus, 2005), no contaminant releases are expected and thus sampling is not planned at this location.

1.1.1.5 Septic Tank-05

Septic Tank-5 (ST-05) was associated with Building 8-T (Change House). The former building and the associated septic tank were located in LHAAP-35C(53), as depicted in **Figures 1-1** and **1-5**. Septic tank specifications could not be found. However, a NPDES permit TX0060861 was associated with this septic tank (USATHAMA, 1980). In 1991 this building's septic was tied into the sewage treatment plant (Plexus, 2005). The location of ST-05 was confirmed during field reconnaissance. However, based on the uses of the associated building as a Change House (Plexus, 2005), no contaminant releases are expected and thus sampling is not planned at this location.

1.1.1.6 Septic Tank-06

Septic Tank-6 (ST-06) was associated with Building 25-T (Control House). Building 23-T (temperature condition building) was also associated with ST-06. The former building and the associated septic tank were located in LHAAP-35C(53), as depicted in **Figures 1-1** and **1-6**. This building had a 972-gallon septic tank with a 1,369 square foot filter bed. In 1991 this building's septic was tied into the sewage treatment plant (Plexus, 2005). The location of ST-06 was confirmed during field reconnaissance.

1.1.1.7 Septic Tank-07

Septic Tank-7 (ST-07) was associated with Building 16-T-1 (Public Toilet). The former building and the associated septic tank were located in LHAAP-35C(53), as depicted in **Figures 1-1** and **1-7**. This building was constructed in 1955 with 121 square feet of floor area and served as a restroom. ST-07 had a 937-gallon capacity with a 1,800 square foot filter bed. In 1991 this building's septic was tied into the sewage treatment plant (Plexus, 2005). The location of ST-07 could not be confirmed during field reconnaissance.

1.1.1.8 Septic Tank-08

Septic Tank-8 (ST-08) was associated with Building 13-T (Administration Building). The former building and the associated septic tank were located in LHAAP-35C(53), as depicted in **Figures 1-1** and **1-8**. This building was constructed in 1955 and was 2,216 square feet (Plexus, 2005). Septic tank specifications could not be found. However, a NPDES permit TX00608887 was associated with this septic tank (USATHAMA, 1980). In 1991 this building's septic was tied into the sewage treatment plant (Plexus, 2005). The location of ST-08 was confirmed during field reconnaissance. Considering that Building 13-T was used for administration purposes, no contaminant release is expected at ST-08, and thus sampling is not planned at this location.

1.1.1.9 Septic Tank-09

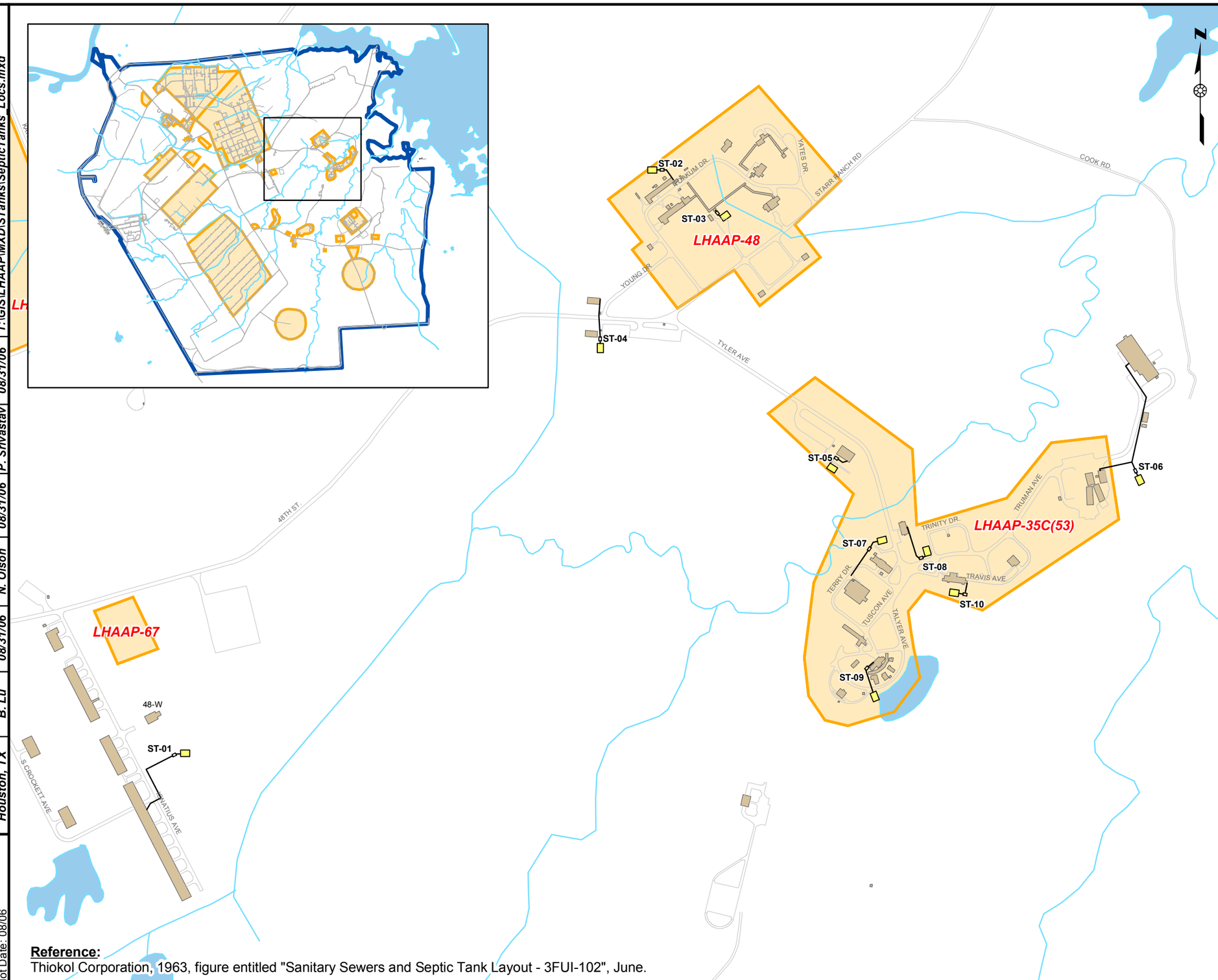
Septic Tank-9 (ST-09) was associated with Building 34-T-1 (Septic Toilet/Shower for the Static Test Facility). The former building and the associated septic tank were located in LHAAP-35C(53), as depicted in **Figures 1-1** and **1-9**. This building was constructed in 1955 as a septic toilet/shower and was 160 square feet (Plexus, 2005). ST-09 had a 937-gallon capacity with a 1,175 square foot filter bed. In 1991 this building's septic was tied into the sewage treatment plant (Plexus, 2005). The location of ST-09 was confirmed during field reconnaissance.

1.1.1.10 Septic Tank-10

Septic Tank-10 (ST-10) was associated with Building 39-T-1 (Septic Toilet/Shower for the Static Test Preparation Building). The former building and associated septic tank were located in LHAAP-35C(53) as depicted in **Figures 1-1** and **1-10**. This building was constructed in 1955 with 100 square feet of floor area and served as a toilet/shower. ST-10 had a 937-gallon capacity with a 1,320 square foot filter bed. In 1991 this building's septic was tied into the sewage treatment plant (Plexus, 2005). The location of ST-10 was confirmed during field reconnaissance.

1.2 Project Objectives

The objective of the sampling proposed in this work plan addendum is to determine if an environmental release has occurred at the septic tanks associated with site LHAAP-55. To achieve this objective, soil samples will be collected from seven septic tank locations, ST-01, ST-02, ST-03, ST-06, ST-07, ST-09, and ST-10. Septic tanks ST-04, ST-05, and ST-08 were associated with non-industrial buildings (e.g., Change Houses, Administration Buildings). Contaminant release is not expected at these locations and thus no sampling is planned.



Legend

- Septic Tank
- Leachate Field
- Stream
- Road
- Former Building
- Site

Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
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Plot Date: 08/06

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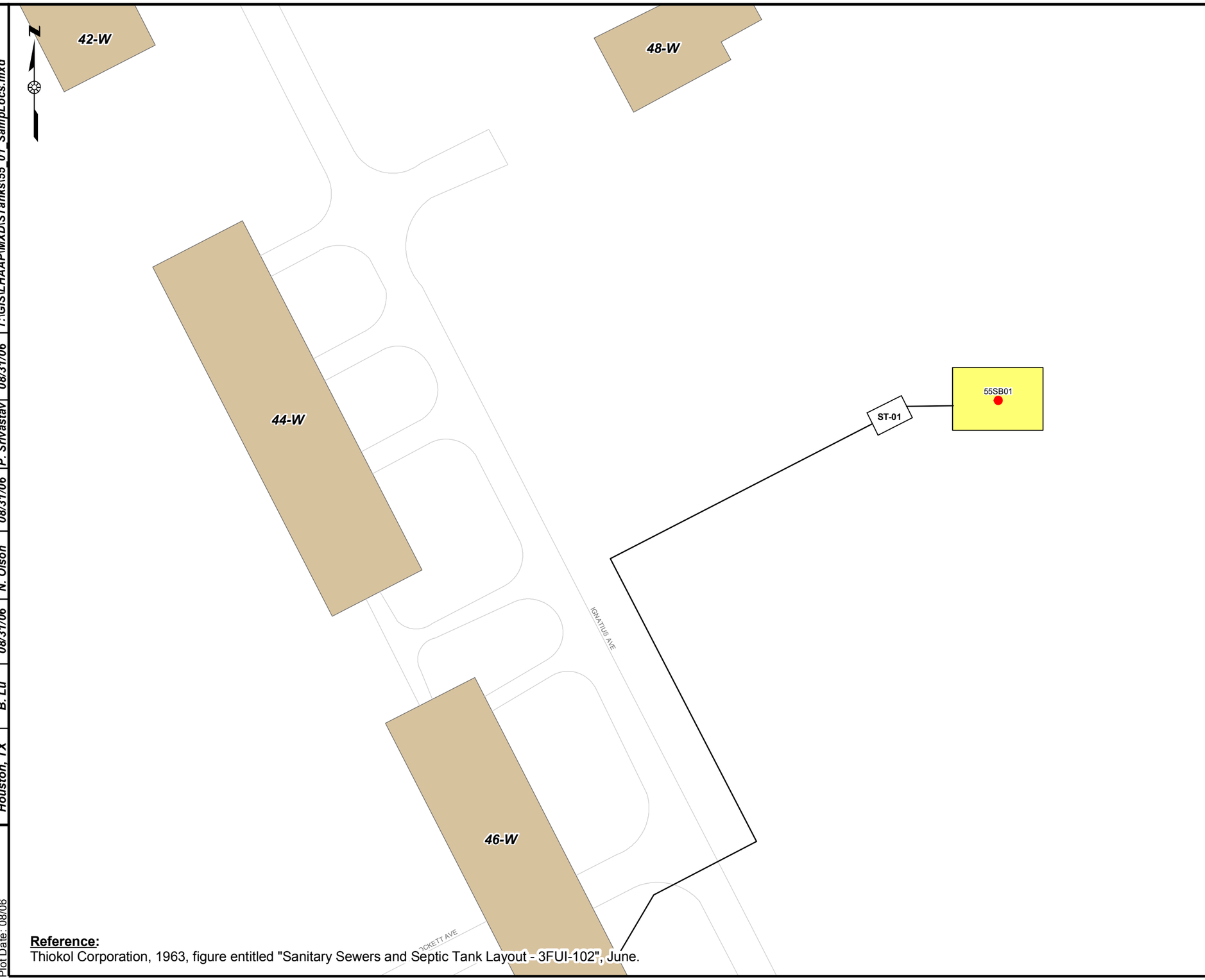
TULSA, OKLAHOMA

FIGURE 1-1

SEPTIC TANKS LOCATION MAP
LHAAP-55

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS



Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

Legend

- Proposed Soil Boring
- Septic Tank
- Leachate Field
- Road
- Former Building

0 25 50 100 Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1-2
PROPOSED SAMPLE LOCATION MAP
FOR ST-01
LHAAP-55
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
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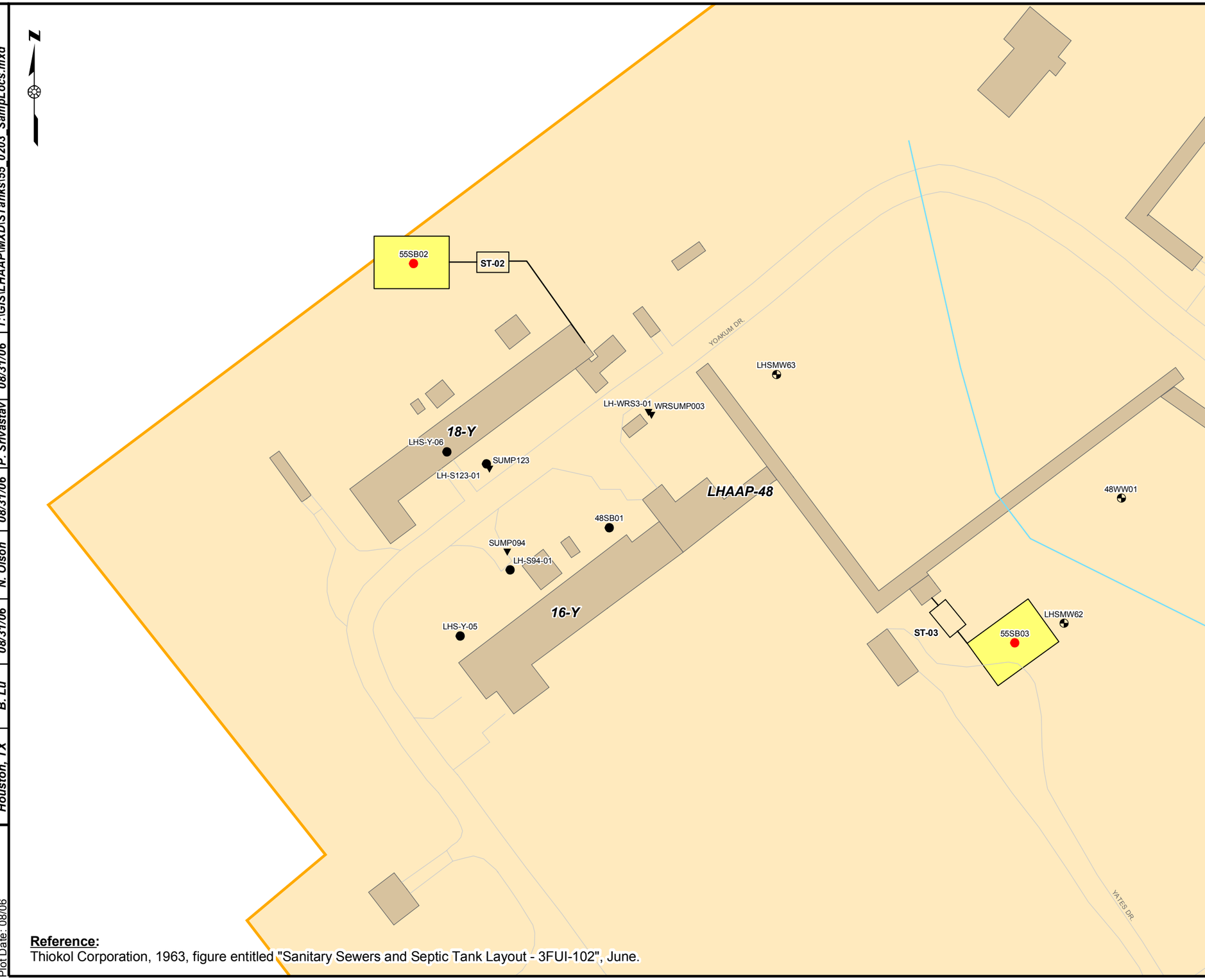

Legend

- Proposed Soil Boring
- Monitoring Well
- Soil Boring
- Sump
- Septic Tank
- Leachate Field
- Stream
- Road
- Former Building
- Site

0 30 60 120 Feet

Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

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Plot Date: 08/06

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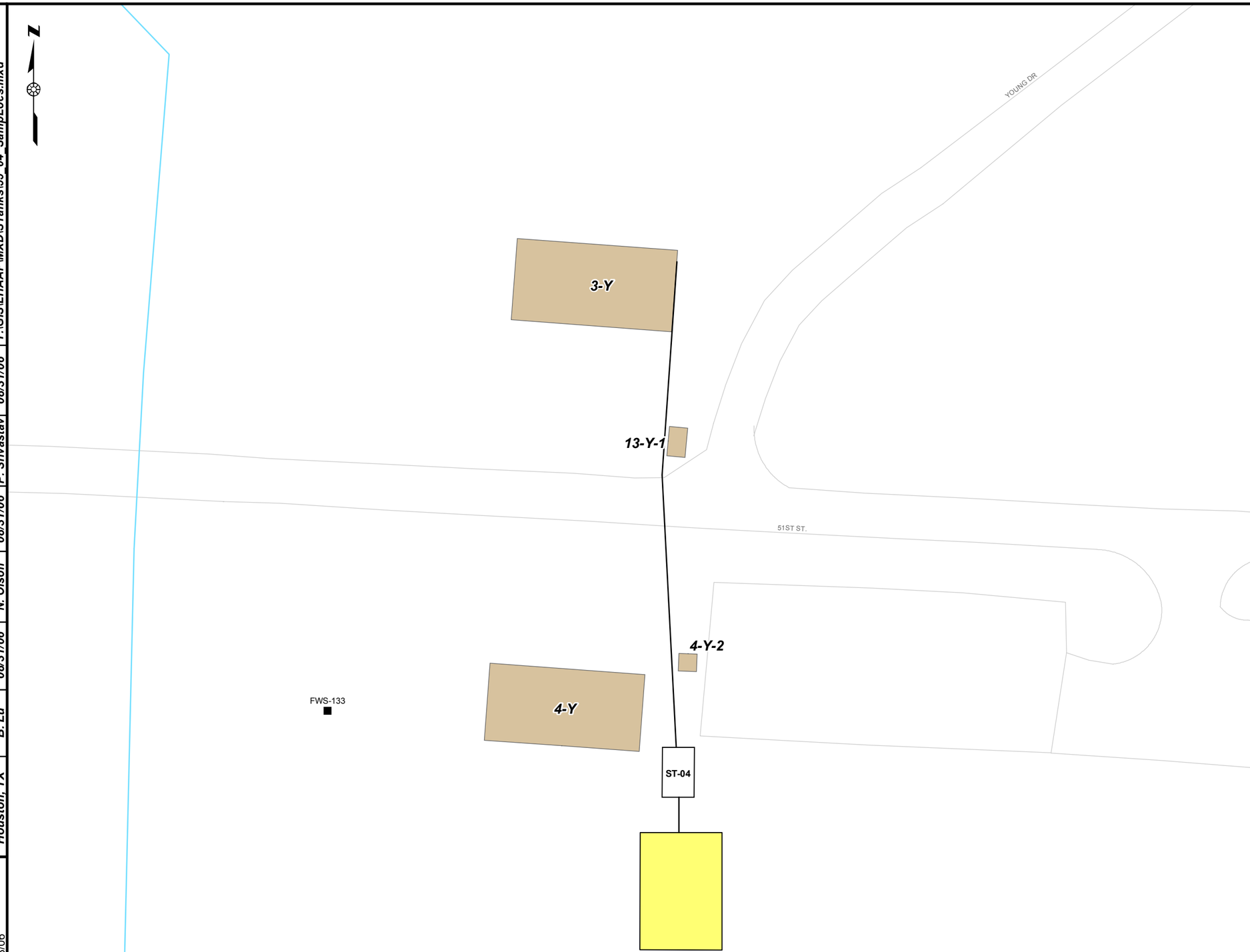
FIGURE 1-3
PROPOSED SAMPLE LOCATION MAP
FOR ST-02 & ST-03
LHAAP-55

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS



Legend

- Surface Soil
- Septic Tank
- Leachate Field
- Stream
- Road
- Former Building

0 20 40 80 Feet

Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

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TULSA, OKLAHOMA

FIGURE 1-4
SITE LOCATION MAP
FOR ST-04
LHAAP-55
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
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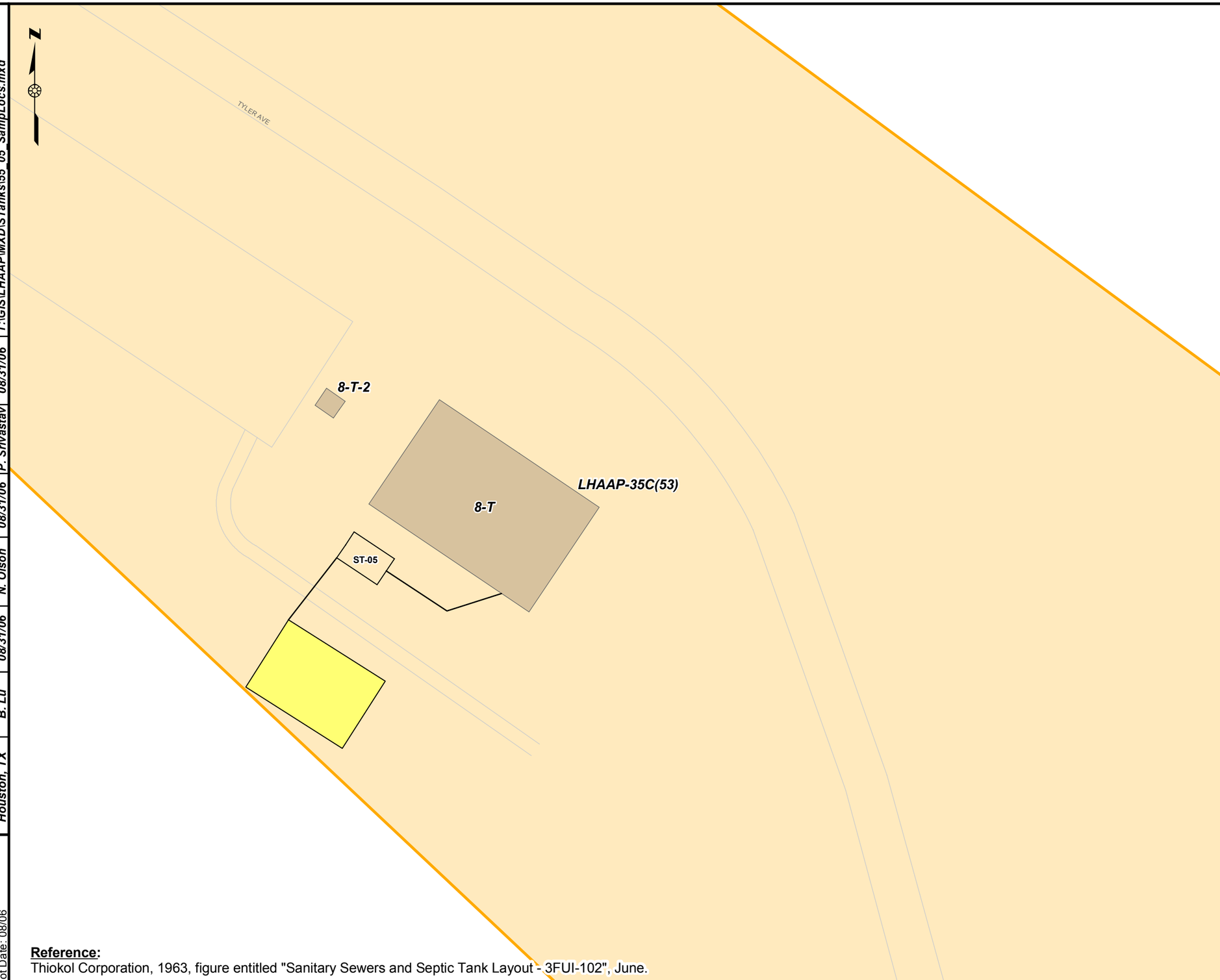

Legend

- Septic Tank
- Leachate Field
- Road
- Former Building
- Site

0 20 40 80 Feet

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FIGURE 1-5
SITE LOCATION MAP
FOR ST-05
LHAAP-55
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

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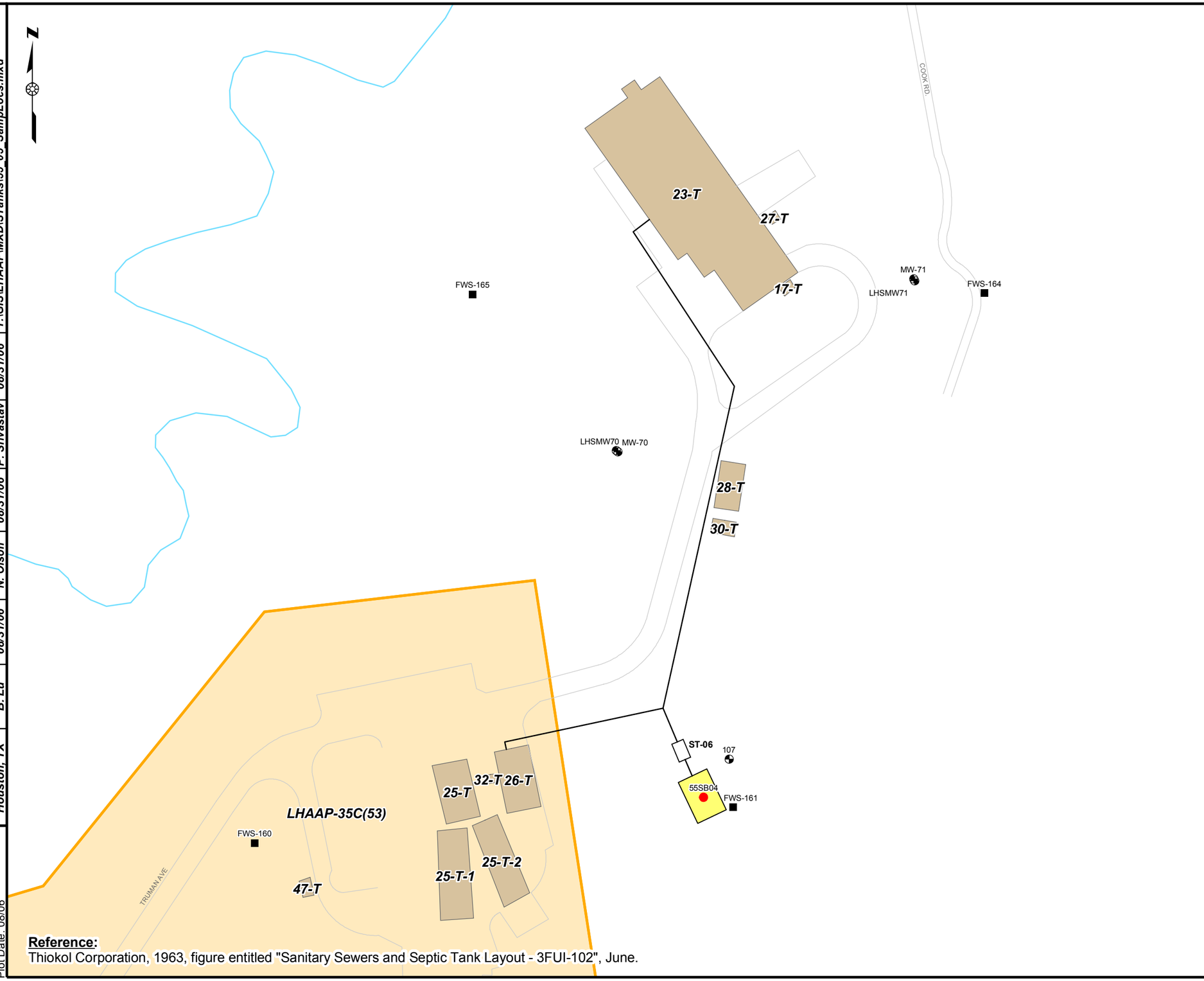

Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

Legend

- Proposed Soil Boring
- Monitoring Well
- Surface Soil
- Septic Tank
- Leachate Field
- Stream
- Road
- Former Building
- Site

0 50 100 200 Feet

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FIGURE 1-6
PROPOSED SAMPLE LOCATION MAP
FOR ST-06
LHAAP-55
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
Houston, TX	B. Lu	08/31/06	N. Olson	08/31/06	P. Srivastav	08/31/06	T:\GIS\LHAAP\MXD\STanks\55_05_SampLocs.mxd

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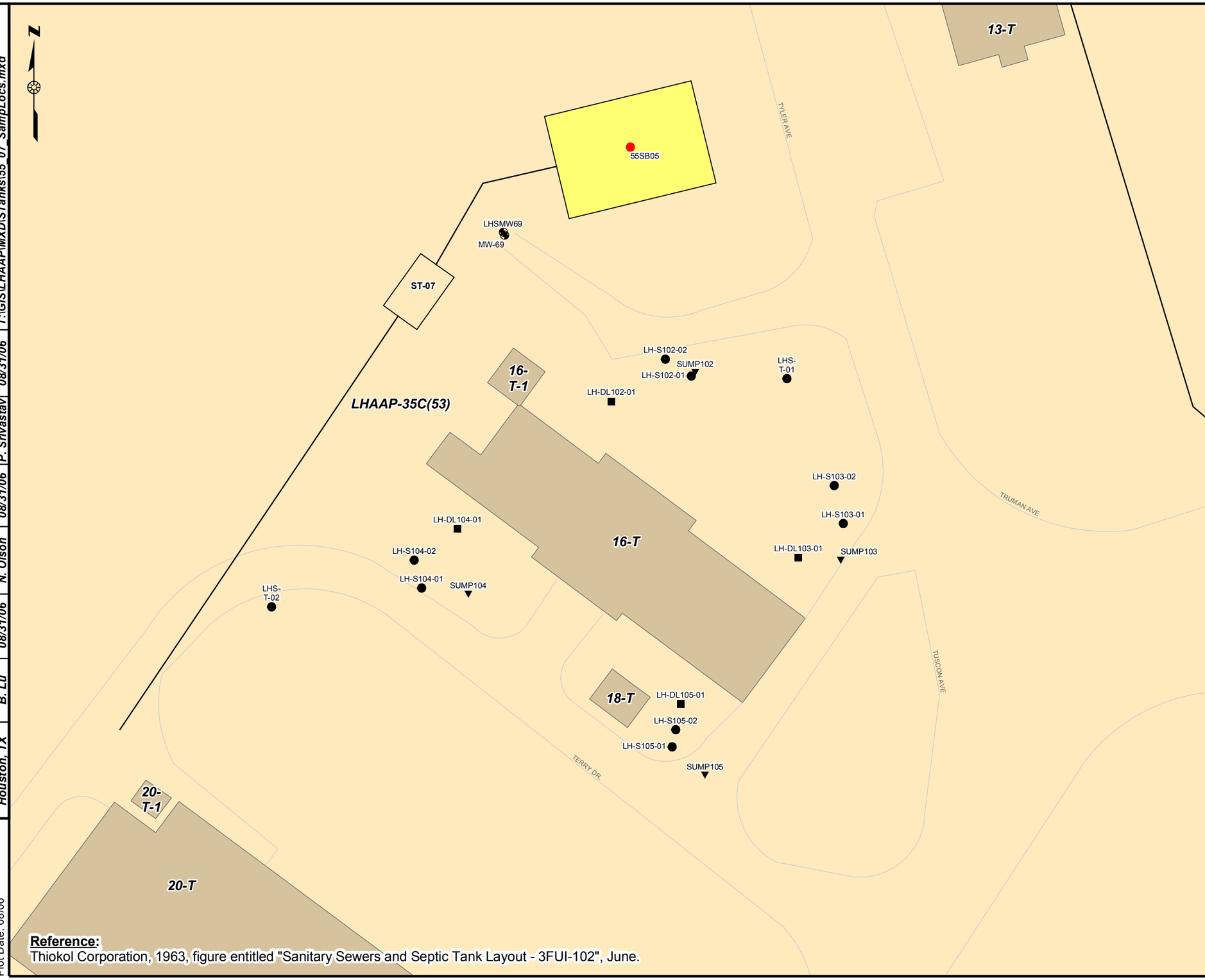

Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

Legend

- Proposed Soil Boring
- Monitoring Well
- Soil Boring
- Surface Soil
- Sump
- Septic Tank
- Leachate Field
- Road
- Former Building
- Site

0 15 30 60 Feet

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FIGURE 1-7
PROPOSED SAMPLE LOCATION MAP
FOR ST-07
LHAAP-55

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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Houston, TX	B. Lu	08/31/06	N. Olson	08/31/06	P. Srivastav	08/31/06	T:\GIS\LHAAP\MXD\STanks\55_07_SampLocs.mxd

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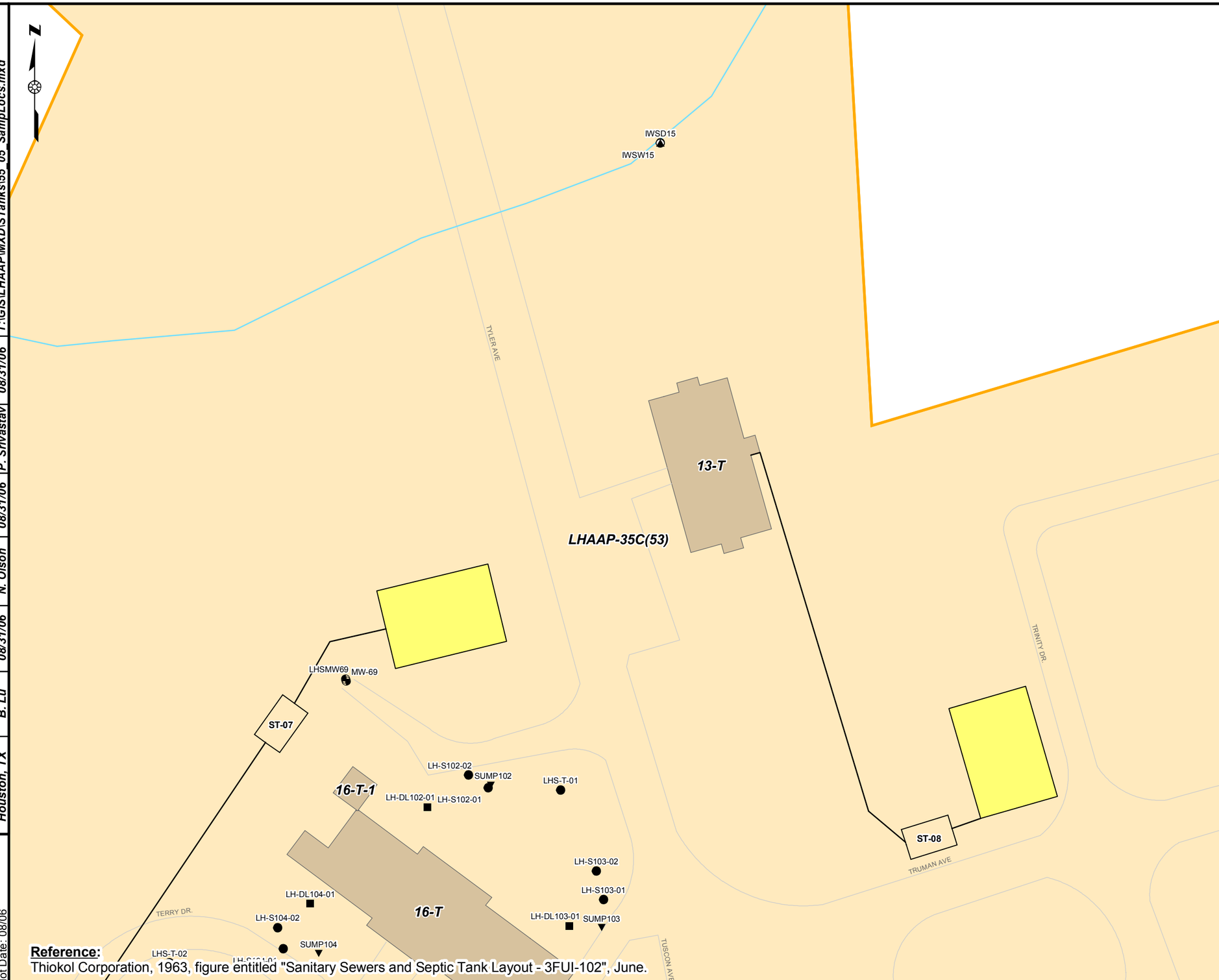

Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

Legend

- Monitoring Well
- Soil Boring
- Surface Soil
- Sump
- Surface Water
- Sediment
- Septic Tank
- Leachate Field
- Stream
- Road
- Former Building
- Site

0 20 40 80 Feet

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FIGURE 1-8
SITE LOCATION MAP
FOR ST-08
LHAAP-55
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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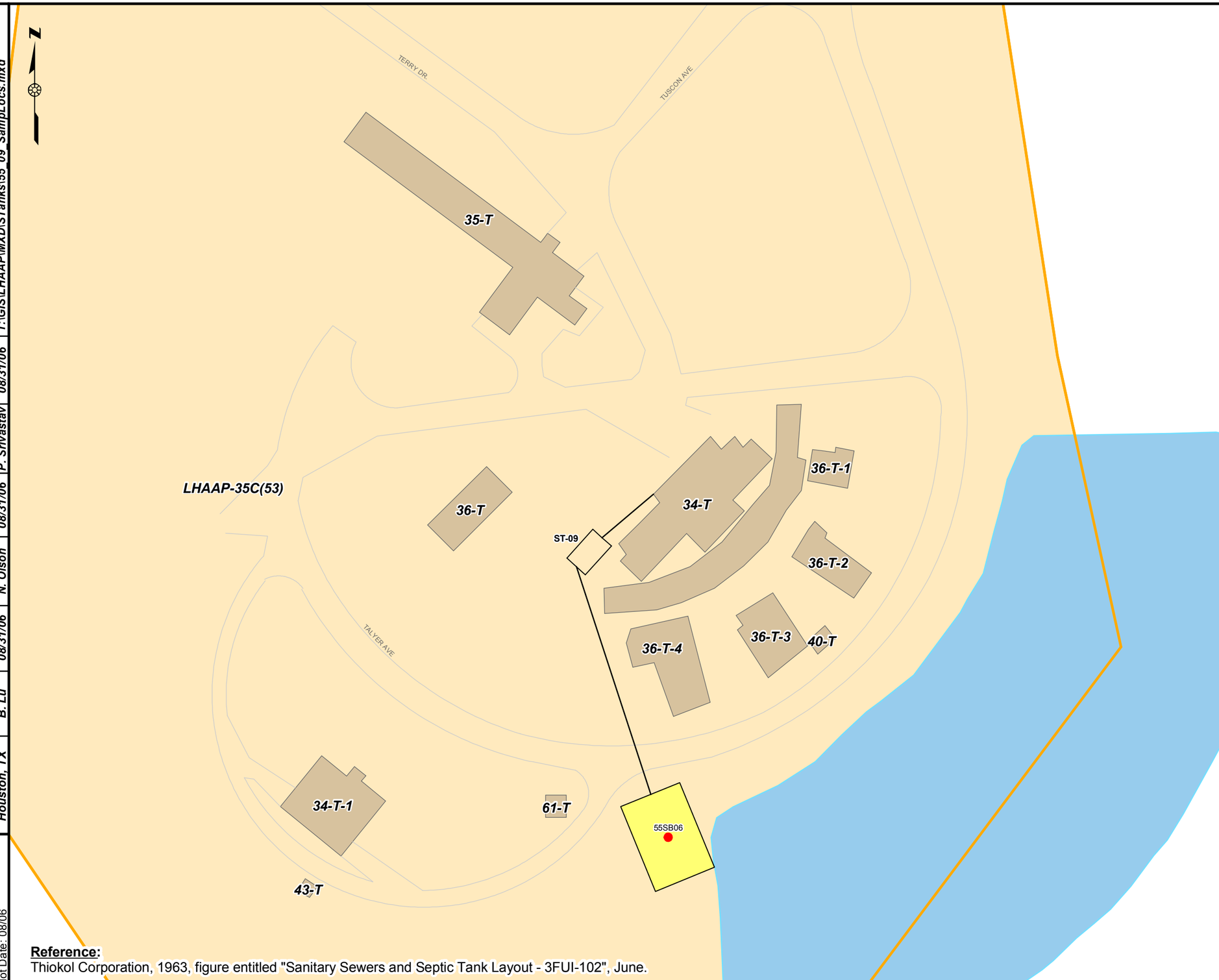

Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

Legend

- Proposed Soil Boring
- Septic Tank
- Leachate Field
- Road
- Former Building
- Site
- Pond

0 25 50 100 Feet

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FIGURE 1-9
PROPOSED SAMPLE LOCATION MAP
FOR ST-09
LHAAP-55
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		FILE PATH
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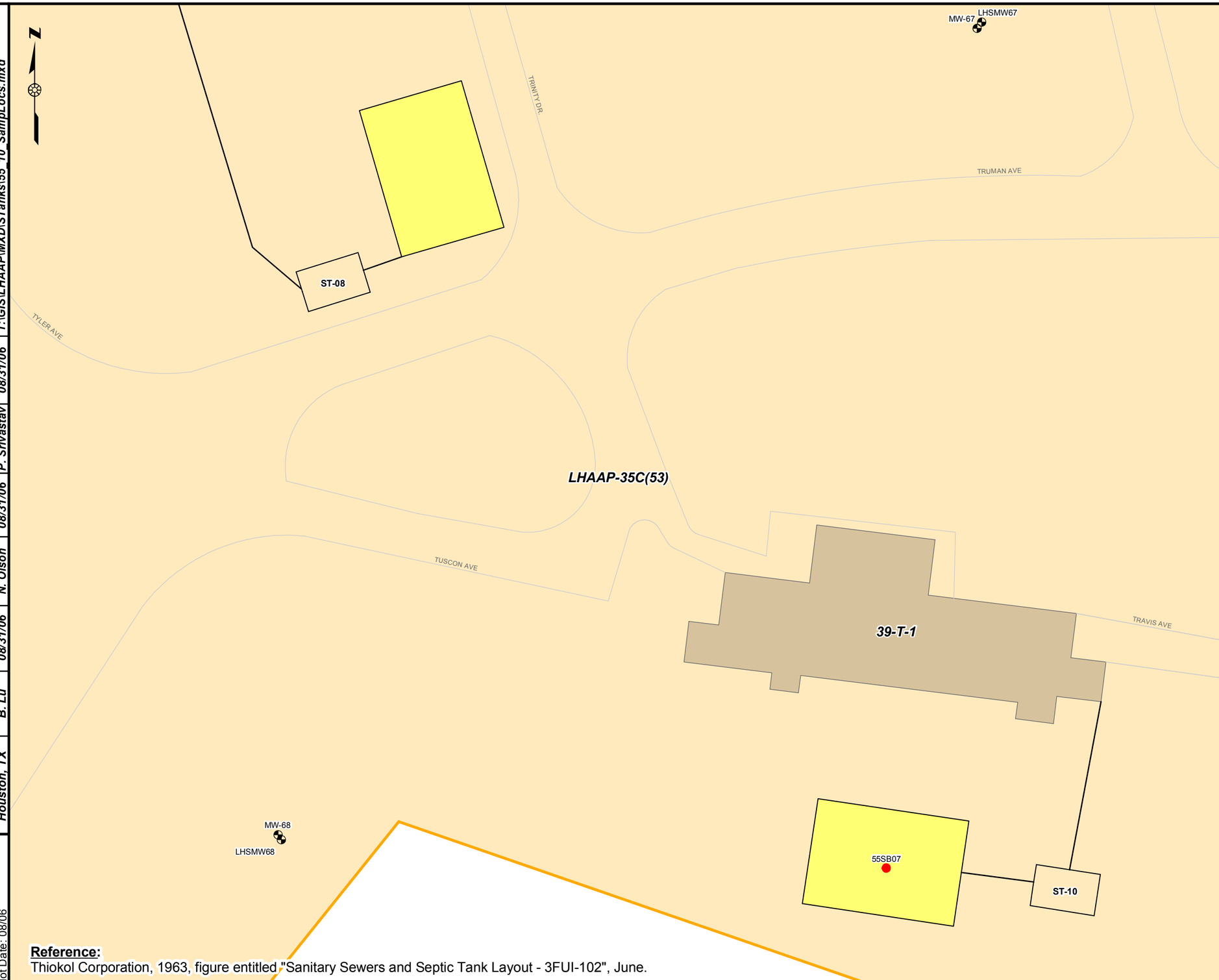
Plot Date: 08/06



Reference:
Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout - 3FUI-102", June.

Legend

- Proposed Soil Boring
- Monitoring Well
- Septic Tank
- Leachate Field
- Road
- Former Building
- Site

0 15 30 60 Feet

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FIGURE 1-10
PROPOSED SAMPLE LOCATION MAP
FOR ST-10
LHAAP-55
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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Plot Date: 08/06

2.0 Field Activities

2.1 Soil Sampling

At locations where tanks were confirmed in the field (ST-02, ST-03, ST-06, ST-09 and ST-10), a sample will be collected of the tank contents if easy access is available, and soil samples will be collected from the leach field. At locations where tanks were not found (ST-01 and ST-07), soil samples will be collected from the leach field. At these locations, soil sample locations will be determined based on GPS coordinates. Two samples from each soil boring (at 1-2 feet and 5-6 feet below ground surface [bgs]) will be collected and submitted for laboratory analysis.

2.1.1 Septic Tank ST-01

Shaw will advance one soil boring at the leach field at ST-01, which is associated with Building 45-W, the Solvent Shed (Plexus, 2005) **(Figure 1-2)**. Soil samples will be analyzed for volatile organic compounds (VOCs) using U.S. Environmental Protection Agency (EPA) method 8260B.

2.1.2 Septic Tank ST-02

Shaw will sample contents of the tank and advance one soil boring at the leach field at ST-02, which is associated with Building 16-Y-1 **(Figure 1-3)**. Because the septic system was associated with several buildings (13-Y, Squib, General Purpose Magazine; 18-Y, Igniter Assembly Building; 29-Y, Service Magazine; 32-Y, General Purpose Magazine for Igniter Area; 34-Y, Oxidizer Preparation Building; 38-Y, Igniter Blender Building; 40-Y, Igniter Test Building; 45-Y, Metal Powder Preparation Building; and 48-Y, General Purpose Magazine for metal powders) (Plexus, 2005), soil samples will be analyzed for VOCs, semivolatile organic compounds (SVOCs), explosives, and TAL metals using EPA methods 8260B, 8270C, 8330, and 6010B, respectively.

2.1.3 Septic Tank ST-03

Shaw will sample contents of the tank and advance one soil boring at the leach field at ST-03, which is associated with Building 18-Y-1 the Igniter Assembly Building (Plexus, 2005) **(Figure 1-3)**. Because the septic system was associated with several buildings (13-Y, Squib, General Purpose Magazine; 18-Y, Igniter Assembly Building; 29-Y, Service Magazine; 32-Y, General Purpose Magazine for Igniter Area; 34-Y, Oxidizer Preparation Building; 38-Y, Igniter Blender Building; 40-Y, Igniter Test Building; 45-Y, Metal Powder Preparation Building; and 48-Y, General Purpose Magazine for metal powders) utilizing various operations (Plexus, 2005), soil samples will be analyzed for VOCs, SVOCs, explosives, and TAL metals using EPA methods 8260B, 8270C, 8330, and 6010B, respectively.

2.1.4 Septic Tank ST-06

Shaw will sample contents of the tank and advance one soil boring at the leach field at ST-06, which is associated with Buildings 23-T and 25-T Explosives Manufacturing **(Figure 1-6)**. The septic system was associated with Buildings 23-T (Temperature Conditioning Facility) and 25-T (Control House/Static Test Building). The Plexus report (Plexus, 2005) indicates the function of Building 23-T was "conditioning" with polybutadiene acrylic acid, polysulfite, SVOCs, and VOCs as associated chemicals. The function of Building 25-T was handling explosives such as HMX, AND, and CL-20. Soil samples will be analyzed for perchlorate and explosives using EPA methods 314 and 8330, respectively.

2.1.5 Septic Tank ST-07

Shaw will advance one soil boring at the leach field at ST-07, which is associated with Building 16-T-1 **(Figure 1-7)**. The septic tank identified as ST-07 was not found during site reconnaissance. Based on past usage of the associated buildings identified as the Reclamation Unit (16-T) and the Flammable Materials Storehouse (18-T) (Plexus, 2005) near ST-07, soil samples will be analyzed for metals, VOCs, SVOCs, and perchlorate using EPA methods 6010B, 8260B, 8270C, and 314 respectively.

2.1.6 Septic Tank ST-09

Shaw will sample contents of the tank and advance one soil boring at the leach field at ST-09, which is associated with Building 34-T **(Figure 1-9)**. Based on past usage of the associated buildings identified as the Static Test Facility for rocket motors (34-T) and Ammunition Quality Facility (36-T) (Plexus, 2005) near ST-09, soil samples will be analyzed for explosives and perchlorate using EPA methods 8330 and 314 respectively.

2.1.7 Septic Tank ST-10

Shaw will sample contents of the tank and advance one soil boring at the leach field at ST-10, which is associated with Building 39-T-1 **(Figure 1-10)**. Based on the use of the associated building (39-T) at ST-10 as an Ammunition Surveillance Facility or Test Preparation (Plexus, 2005), soil samples will be analyzed for explosives and perchlorate using EPA methods 8330 and 314 respectively.

Sample identification and depth of the proposed samples is presented in **Table 2-1**.

2.2 Sampling Methods and Procedures

2.2.1 Soil Boring Advancement and Sampling

Soil borings will be advanced to 6 feet bgs by using a hand auger. A direct push technology (DPT) rig may be used should there be a need to obtain a sample from greater than 6 feet bgs. Subsurface soil samples will be field screened using a photoionization detector in accordance

with the Installation-Wide Work Plan (Shaw, 2006) to measure samples exhibiting elevated readings exceeding background (readings in ambient air). Typically, the subsurface soil samples showing the highest reading and the last two-foot-interval of the boring will be selected and sent to the laboratory for analysis. Subsurface soil samples will be selected for analysis from any depth interval if the on-site geologist suspects potential contamination at the interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analysis. Proposed sampling depths are 1-2 feet and 5-6 feet bgs. The exact soil boring locations will be determined in the field by the on-site geologist and will be based on actual field observations or subsurface soil samples will be collected as indicated in **Table 2-1**.

Table 2-1
Sample Identification and Depth
of Proposed Soil Samples at LHAAP-55

Septic Tank	ST-01		ST-02		ST-03	
Boring ID	55SB01		55SB02		55SB03	
Sample Depth[a] (feet)	1-2	5-6	1-2	5-6	1-2	5-6
Septic Tank	ST-06					
Boring ID	55SB04					
Sample Depth[a] (feet)	1-2			5-6		
Sample Duplicate	One sample duplicate 55SB08				One sample duplicate 55SB09	
Septic Tank	ST-07		ST-09		ST-10	
Boring ID	55SB05		55SB06		55SB07	
Sample Depth[a] (feet)	1-2	5-6	1-2	5-6	1-2	5-6

Notes:

[a] *Sampling intervals will be collected as indicated or at the discretion of the field geologist.*

The procedure for sampling each boring is summarized as follows:

- Execute work in accordance with Shaw and other applicable site-specific health and safety plan.
- Set up portable sample table and cover with plastic sheeting.
- Calibrate field analytical and health and safety instruments.
- Don a new pair of disposable sample gloves between sampling intervals to prevent cross-contamination.

- Decontaminate the sampling equipment as described in Section 4.5 in the Chemical Data Acquisition Plan, Appendix C of the Work Plan (Shaw, 2006).
- Hand auger all soil borings to 6 feet bgs in accordance with the Shaw Underground/Overhead Utility Contact Prevention Policy-HS 308.
- Describe the length of the sample according to ASTM D2488-93, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)," and record on the Shaw Drilling Log Form.
- Should a DPT rig be used, observe the drilling operations to verify that proper safety, sampling, and drilling methods are being instituted.
- After determining the appropriate sampling intervals based on the lithology, collect composite soil samples for laboratory analysis by filling the appropriate number and types of sample containers specified by the laboratory.
- Samples will be composited by collecting representative portions of soil from the designated interval, placing in a decontaminated stainless steel bowl or disposable container for mixing, and placing in the appropriate laboratory-supplied sample jar.
- Label each sample container as described in Section 4.6.2 of Appendix C of the Work Plan (Shaw, 2006), enclose each container in a sealable plastic bag, and place in a cooler containing ice.
- Repeat the above sequence of procedures for each interval to the total boring depth.
- Record the drilling activities and sampling procedures on a Field Sampling Report or logbook. Complete chain-of-custody documentation.

2.2.2 Field Screening Methods

Health and safety screening methods are described in the Health & Safety Plan, Appendix A of the Work Plan (Shaw, 2006).

3.0 References

Plexus Scientific Corporation, 2005, *Final Environmental Site Assessment Phase I and II Report, Production Areas, Longhorn Army Ammunition Plant, Karnack, Texas*, February.

Shaw Environmental, Inc., 2006, *Installation-Wide Work Plan, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas, January.

Thiokol Corporation, 1963, figure entitled "Sanitary Sewers and Septic Tank Layout – 3FU1-1021," July.

U.S. Army Corps of Engineers Tulsa District, 1996, *Final Defense Environmental Restoration Program/Management Information System/Restoration Management Information System Resolution Document*, March.

U.S. Army Toxic and Hazardous Materials, 1980, *Installation Assessment of Longhorn Army Ammunition Plant, Report No. 150*, February.

Shaw Environmental, Inc.

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

Location of Meeting: Region 6, USEPA, Dallas, Texas
Date of Meeting: October 25, 2006, 1:30 – 4:30 PM

Meeting Participants:

BRAC:	Rose M. Zeiler
USACE-Tulsa:	Cliff Murray, Rick Smith
USACE – Fort Worth:	Beverly Post
USAEC:	Jeff Armstrong (phone)
USFWS:	Paul Bruckwicki
Shaw Environmental:	Praveen Srivastav
	Phone: Dave Cobb, John Elliot, Kay Everett, Greg Jones, Van Vangala, Susan Watson, Tarek Ladaa
USEPA Region 6:	Chris Villarreal, Scott Harris, George Malone (EPA Legal)
TCEQ:	Fay Duke, Dale Vodak (phone)

Prior to the meeting Shaw and Army had distributed copies of the meeting agenda, minutes of September 26, 2006 Monthly Managers' Meeting, and document status tables for the TERC and PBC work via e-mail.

Rose Zeiler opened the meeting and welcomed those in attendance and those joining on the phone. There was a review of the September Meeting Minutes and Action Items.
Dr. Zeiler went through the list of action items from the previous monthly managers' meeting. Below are the highlights of this discussion:

- **Army – Provide MMRP report to EPA when available -** Beverly Post indicated MMRP report should be available for EPA review any day.
- **EPA – Provide input on the use of TCRA for remedial action at LHAAP-50 and similar sites:** Chris Villarreal invited George Malone, EPA Legal, to discuss the use of TCRA for remedial action at LHAAP-50. The summary of the discussion is as follows:
    - The Army is the lead agency and can conduct removal actions under the DOD CERCLA Removal Authority with EPA in an observatory role.
    - Factors considered while implementing a removal action include: (a) administrative record; (b) length of time available before removal action, i.e. urgency of the situation; (c) action memorandum documenting need for removal

action; (d) EE/CA, TCRA action memorandum, and TCRA execution do not require approval by EPA, however, sampling and analysis plan (SAP) will need EPA approval; (e) a No Action ROD will be required to delist the site from NPL
  - Groundwater responses are typically considered long-term remedial responses that are not suited for removal actions. They require traditional CERCLA response with RI/FS and ROD
  - To a question from Jeff Armstrong regarding the use of treatability study to remediate perchlorate sites, GM replied that treatability studies are typical not considered remedial actions and would still require RI/FS and ROD before the site is de-listed.
  - JA stated that AEC attorneys may want to discuss with EPA attorneys. JA asked if they could contact GM. GM provided his contact information.

- **Shaw –Provide chromium results for LHAAP-12 and LHAAP-48, perimeter well sampling results, and MNA sampling results at the next monthly managers' meeting**. These action items refer to material presented during the October 25 meeting.

Defense Environmental Restoration Program (DERP) PBC Update (Dave Cobb)

Field Activities Update. Shaw completed the field work in September 2006 at LHAAP-03, -04, -06, -07, -29, -51, -55, -64, and -68. Data is coming in. Shaw is currently providing documentation to the USACE for completion of field activities. Sampling for the BERA was completed in the first part of October 2006. Samples are currently being analyzed. Toxicity tests are underway. A first draft to Army is planned for the first week of December 2006.

Document Status. PBC document status table was provided to the participants. The GWTP optimization memorandum is in comment resolution stage.

GWTP. Van Vangala provided an update on the GWTP operation. The plant is performing as usual. 936,000 gallons of groundwater from LHAAP-18/24 were treated. 20,000 gallons of groundwater from LHAAP-16 were treated. The drought-like conditions are affecting operations. In August 2006, 26,000 pounds of waste were shipped off site. In August 2006, perchlorate exceeded discharge parameters. A nutrient feed pump failed on Saturday (October 22) and was replaced. System took a couple days to restabilize. Perchlorate exceeded daily maximum because of the pump failure. The water was sprinkled at the burning ground on the days of exceedance. Shaw will estimate the volume of water discharged during the time of exceedance and report in the next monthly report. A new tractor is available and kept on site to assist in moving sludge and drums around, for bush-hogging and mowing grass. Freeboard is about 2 feet. No rain, so in last quarter no water was discharged to Harrison Bayou.

BERA. Shaw is planning to submit the BERA report in two parts. The first part will cover the sections up to Step 3 and the second part will present field and toxicity data and steps beyond. Greenberg is onboard with reviewing Longhorn BERA when it is submitted. TCEQ and EPA were agreeable to reviewing the BERA in two parts.

Defense Environmental Restoration Program (DERP) TERC Update (Praveen Srivastav)
Document Status. TERC document status table was provided to the participants.

LHAAP-12 – Abandonment Report. A table showing chromium data from wells 12WW20 and 12WW21 was distributed along with a map showing locations of the wells. Chromium was nondetect in both the wells. The Army is proposing to install a new well downgradient of 12WW12 and between 12WW12 and 12WW10. Responses to comments are back to Shaw who will submit revised RTC to Army. An enlarged map showing location of the new proposed well will be included with the response for regulatory concurrence

LHAAP-48. A table showing chromium results from well 48WW02 was distributed. The results are nondetect. Shaw to submit revised responses to the Army and regulators. Installation and sampling of the new well (48WW02) and abandonment of the old stainless steel wells will be reported in the site evaluation report.

Results of MNA Sampling for LHAAP-12, 37, and 67. Tarek Ladaa on phone discussed the monitored natural attenuation evaluation made on LHAAP-35B (37), -67, and -12. The MNA samples were collected in August. The highlights at LHAAP-12 were that reductive of dechlorination of TCE appears to be active.

Fay Duke asked if data only within the plume needs to be examined for MNA evaluation. TL answered that data both within and outside the plume is normally reviewed.

LHAAP-67. Conditions are not adequate for biodegradation because the conditions are not reducing. Physical mechanisms (i.e. dilution, dispersion, absorption, etc.) are likely causing MNA to occur. Chris Villarreal asked about the time for the degradation. Shaw will provide that data in the MNA modeling report.

LHAAP-37. The shallow zone at LHSMW58 did not show any evidence of degradation of TCE. The conditions at LHSMW59, which appears to be screened across a composite interval of both the shallow zone and a slightly deeper zone, are conducive for degradation of TCE even though biodegradation does not appear to be occurring. Fay mentioned there are lots of wells at LHAAP-47 and wanted to know if geology was looked at in relation to LHAAP-37. Praveen Srivastav stated that the geology changes within short distances. The geology at LHAAP is fluvial with lenses of sand, silt and clay. The water bearing zones are not laterally continuous from site to site. Dale Vodak agreed that the lithology is fluvial and it is common to see rapid changes in geology across sites. Chris Villarreal mentioned that the change in remedy for LHAAP-37 may be documented in the proposed plan and there is no need to amend or revise the FS.

Perimeter Well Data. Praveen Srivastav presented the results of sampling of the perimeter wells for perchlorate. The results were largely nondetect, except for a detection of 1.08 µg/L at LHPMW133. The results are consistent with the previous results and are well below the TCEQ MSC of 26 µg/L. Dave Cobb indicated that the Army and Shaw would like to decrease the sampling frequency to annual and asked how that request should be made. Chris Villarreal and Fay Duke said to make a recommendation for reduction in frequency in writing and submit for review. EPA and TCEQ would respond to the recommendation.

MMRP Update. Nothing to report.

Other (Rose Zeiler)

Transfer Update
ECOPIV: ECOPIV consists of about 800 acres and has the cemeteries on it. It also has small areas excluded corresponding to the sump areas.

Demolition Progress: Fort Worth is administering a contract to fill pits and other hazards at LHAAP. A discussion took place on the disposal options for the water. Beverly Post indicated that they had planned for disposal of water at the GWTP but did not realize that there will be a fee for the disposal of approximately 600,000 gallons of water. They do not have funds to pay for the disposal. Praveen Srivastav clarified that it costs Shaw to run the plan and thus the fee. Another option discussed was pumping of water to the ground outside the pits. Praveen Srivastav expressed concern that many of these pits lie within PBC sites and requested that the water disposal not occur without prior analysis of the water. Rose Zeiler stated that Shaw will get an opportunity to review and comment on the work plan for the sampling and disposal of the water. According to Dave Vodak and Fay Duke, a permit would not be needed for surface discharge if the analytical data are acceptable because this is a CERCLA site.

Security-Refuge Opening: Rose Zeiler presented a map of the route sent by Mark Williams for a tour that was planned for the 12th of October. It was a route through Army land including Sites 46, 47 and 53 and was not the route agreed to previously at Managers' Meetings and as had been presented previously by USFWS. She had the guard notify the tour leader that they were not permitted to go onto Army land. RZ also noted that the tour for the Russian women to the INF pond and the Static Test Area should not have taken place because it is still an MMRP and CERCLA site. It was restated by Army, with concurrence by EPA and TCEQ that refuge visitors may not access environmental sites on Army land.

In addition, it was stated that tours may not include LHAAP-16 or the groundwater treatment plant. Shaw, AEC, and Fish and Wildlife should talk about how to handle access issues. Some areas will have to be closed off throughout the installation. PS said that Shaw does not intend to be there 24 hours and there should be some security to keep people out. RZ noted that Shaw's concerns may be addressed with physical barriers using a Fort Worth District contract that has already been negotiated. Discussion regarding the permit, land transfer and the water rights to the USFWS ensued. Access to Army land and ongoing environmental sites are addressed in the permit. Sections of permit forwarded by Army are also being reviewed by Shaw as it may pertain to their work.

Schedule. The next monthly managers' meeting is rescheduled for November 16, 2006 at 9:00 am via teleconference. The December meeting will be held on the 12th, 2006 at 1:30 pm at the Army Trailer at Longhorn AAP, Karnack, Texas. The quarterly RAB meeting is scheduled for the same day at 6:30 pm at the Karnack Community Center

Meeting Adjourned.

Action Items:

Army - Provide MMRP report to EPA when available

Shaw - Provide calculation of volume of water with perchlorate exceedance in the next monthly report
- Submit a letter with recommendation for changing perimeter well sampling frequency from quarterly to annual

LONGHORN ARMY AMMUNITION PLANT
MONTHLY MANAGERS' MEETING

Location	EPA Region VI Headquarters, Dallas, TX		
Date	25-Oct-2006	**Time**	1300

ATTENDEES

Name (printed)	Signature	Organization	Phone	E-mail
Longhorn Team Members				
Rose M. Zeiler	Rose M. Zeiler	BRAC	(479) 635-0110	rose.zeiler@~~[illegible]~~ 45 army.mil
Jeff Armstrong	by phone	USAEC	(410) 436-1516	Jeffrey.armstrong@us.army.mil
Cliff Murray	Cliff Murray	USACE, Tulsa	(918) 669-7573	cliff.murray@usace.army.mil
Rick Smith	[illegible]	USACE, Tulsa	(918) 669-4956	richard.p.smith@usace.army.mil
Chris Villarreal	Chris Villarreal	USEPA, Dallas	(214) 665-6758	villarreal.chris@epa.gov
Stephen Tzhone		USEPA, Dallas	(214) 665-8409	tzhone.stephen@epa.gov
Scott Harris	Scott Harris	USEPA, Dallas	(214) 665-7114	harris.scott@epa.gov
Fay Duke	[illegible]	TCEQ, Austin	(512) 239-2443	fduke@tceq.state.tx.us
Dale Vodak	by phone	TCEQ	(903) 535-5142	dvodak@tceq.state.tx.us
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Beverly Post	Beverly Post	USACE - Ft Worth	817-886-1884	beverly.j.post@swf02.usarmy.mil
Greg Jones	by phone	SHAW		
'Vau' Vangala	by phone	SHAW		

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

October 25, 2006

Rose M. Zeiler, Ph. D.
Post Office Box 220
Ratcliff, AR 72951

Re: Longhorn Army Ammunition Plant
Evaluation of the East Further Investigation Area

Dear Ms. Zeiler:

The U.S. Environmental Protection Agency (EPA) has completed our review of the *Draft Final Evaluation of 182 Acres of the 357-Acre East Further Investigation Area* (EFIA) (Tulsa District Army Corps of Engineers, March 2006). The purpose of the review was to determine the suitability for transfer of the 182 acres of the EFIA from the Department of the Army to the Department of the Interior (U.S. Fish and Wildlife Service). EPA's focus in reviewing this information was to ensure that sufficient information was presented to support a determination that the property either had no history of contamination or had been properly remediated and is suitable for transfer for refuge purposes. Based on the EPA's review of the information provided, the EPA concurs with the Army's conclusion that 182 acres of the 357-acre EFIA is suitable for transfer to the U.S. Fish and Wildlife Service for refuge purposes. The remaining 175 acres of the EFIA will not be transferred at this time but will be carried through the Comprehensive Environmental Response, Compensation and Liability Act process due to the presence of a solvent plume underlying the western portion of the EFIA. If you have any questions, please feel free to give me a call at 214-665-6758.

Sincerely,

Chris G. Villarreal

Chris G. Villarreal
Remedial Project Manager

cc: Cliff Murray, U.S. Army Corps of Engineers
Faye Duke, Texas Commission on Environmental Quality
Barry Forsythe, U.S. Fish and Wildlife Service
Praveen Srivastav, Shaw – Houston, TX (for project files)

Shaw Environmental, Inc.

Subject: **Update on Baseline Ecological Risk Assessment (BERA) Field Sampling and Changes from Work Plan, Installation-Wide Ecological Risk Assessment, Longhorn Army Ammunition Plant (LHAAP)**

Date Issued: **October 30, 2006**

To: Rick Smith, Cliff Murray, Susan Trussell (USACE-Tulsa)
Rose Zeiler (BRAC)
Jeff Armstrong (USAEC)
Fay Duke, Vickie Reat (TCEQ)
Charles (Chip) Wood (TPWD)
Keith Tischler (TGLO)
Paul Bruckwicki, Barry Forsythe (USFWS)
Susan Roddy, Chris Villarreal (USEPA Region 6)
Marc Greenberg (USEPA – Superfund)
Larry Tannenbaum (USACPPPM)

Through: David Cobb and Praveen Srivastav (Shaw)

From: Mark Weisberg and Jon Lindberg (Shaw)

Memo prepared by Shaw on behalf of the USACE.

Shaw completed the BERA field work from October 2 through 6, 2006. Assistance was provided by Paul Bruckwicki and Barry Forsythe (USFWS) and their help was greatly appreciated. A few deviations from the Work Plan occurred, as summarized as follows:

- All proposed sediment sample locations were dry due to the previous draught conditions (except for the background reference location in Clinton Lake). After consultation with USFWS it was decided to collect sediment samples at the locations planned and have the Bioassay Laboratory rehydrate the sediments in the lab.

- Based on rapid turn around time chemical analytical results from the laboratory on the sediment samples, five sediment samples were selected from the North and South Cove of Caddo Lake and three sediment samples were selected from the Goose Prairie Creek (GPC) watershed, in order to maximize the range of key metal concentrations evaluated in the sediment toxicity and bioaccumulation tests (the Work Plan indicated four samples would be collected from the Coves and four would be collected from the GPC watershed).

- Historic LHAAP GPC Watershed and Caddo Lake surface water data were used to determine the hardness of the water used by the Bioassay Lab to run the sediment tests, as

surface water was not present during the field event and could not be collected for a determination of current water hardness conditions. Historic data indicated the following: (1) an average water hardness of 31 mg/L for the general Cove sediment sample area; and (2) an average water hardness of 47 mg/L for the Goose Prairie Creek sediment sample areas. A hardness of 19 mg/L was indicated for the Clinton Lake background reference sample, based on a combination of current site-specific data and historic data.

- When the Bioassay Lab rehydrated the eight selected (dry) sediment samples, the overlying water was found to have an unexpected low pH (i.e., a range of 3.5 to 4.1 for the Cove sediment samples and a pH range of 5.4 to 5.8 for the GPC stream sediment samples; excluding background). This condition may be related to the unusual drought conditions. As the optimal pH range for the bioassay toxicity test organism (*Hyalella*) is 6 to 9, the Bioassay Lab performed overlying water change outs, as stipulated by the Test Method, to obtain an overlying water pH of at least 6 prior to test initiation. However, during the toxicity test the overlying water was found to become more acidic over time, dropping below a pH of 6 for some sediment samples. As this low pH condition would be expected to result in toxicity, a decision was made to reinitiate all the toxicity tests using water with a hardness of 88 mg/L. This hardness is the standard hardness the Bioassay Lab typically uses for their freshwater tests and represents the optimal hardness preference for the *Hyalella* organisms. This harder water is expected to buffer the pH such that overlying water will remain above a pH of 6 during the test.

  The original toxicity tests, however, are being completed to determine potential toxicity due to low pH in conjunction with using water that matches the site-specific hardness values. The reinitiated toxicity tests will be run to examine toxicity at more normal pH conditions. It should be noted that monitoring data from Caddo Lake (1998 to 2005) shows typical surface water pH that ranges from approximately 6 to 7.

- For the sediment bioaccumulation test the test organism used is *Lumbriculus*, and this organism is expected to be more tolerant of lower pH conditions. In addition, the water-to-sediment ratio used in these tests is greater than in the toxicity tests, so overlying water with low pH is not expected. These bioaccumulation tests are being run using water renewals that match the site-specific hardness of soft waters, in order to replicate site-specific metals bioavailability conditions.

- One proposed soil sample location in the LHAAP-04 area (STEP-04SS06-BERA-SS05) was relocated to LHS-MW50-BERA-SS05 (south of LHAAP-47), as USFWS commented during the field event that the “STEP” sample location had been the site of a pilot perchlorate bioremediation study. As the “STEP” soil sample location had been selected because it was an historic perchlorate “hot spot” location and it was likely remediated as a result of the pilot remediation project that occurred since the historic sampling, the next highest perchlorate “hot-spot” location in the general area was selected for sampling.

Shaw Environmental, Inc.

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

Location of Meeting: Teleconference
Date of Meeting: November 16, 2006, 9:00 – 11:15 AM

Meeting Participants:

BRAC:	Rose M. Zeiler
USACE-Tulsa:	Cliff Murray, Rick Smith
USFWS:	Paul Bruckwicki
Shaw Environmental:	Praveen Srivastav, Dave Cobb, John Elliot, Greg Jones, Van Vangala
USEPA Region 6:	Raji Josiam
TCEQ:	Fay Duke

Prior to the meeting Shaw and Army had distributed via e-mail: meeting agenda, minutes of October 25, 2006 Monthly Managers' Meeting, document status tables for the TERC and PBC projects, Sampling Modification for LHAAP-18/24 Memorandum, map showing results of September 2006 groundwater sampling at LHAAP-29, and maps showing locations of proposed wells at LHAAP-12 and LHAAP-37.

Rose Zeiler opened the meeting and welcomed those in attendance. She went through the list of action items from the previous monthly managers' meeting. Below are the highlights of this discussion:

- **Army – Provide MMRP report to EPA when available:** Rick Smith reported that the report is not available yet.
- **Shaw – Provide calculation of volume of water with perchlorate exceedance in the next monthly report:** Van Vangala reported that the report is not out yet. The calculation will be included in the report when the report is submitted.
- **Shaw – Submit a letter with recommendation for changing perimeter well sampling frequency from quarterly to annual:** Praveen Srivastav reported that the letter is being prepared and will be submitted for Army's review soon.

Defense Environmental Restoration Program (DERP) PBC Update (Praveen Srivastav)

Document Status. PBC document status table was provided to the participants. Shaw is planning to submit Volume I of the BERA report during the first week of December 2006. Volume II will be submitted in January 2007. Fay Duke informed that Vicki Reat may not be available to review the document in January 2007 because of her other commitments.

LHAAP-29 GW Results. Praveen Srivastav discussed the results of groundwater sampling of the new wells at LHAAP-29. A figure showing the methylene chloride results was provided to the team before the meeting. Praveen pointed out that the deep wells 29WW40 had a detection of 92.8 µg/L of methylene chloride. The sample of drilling water collected at a depth of approximately 122 feet, after the water was changed out for the third time, also had a detection of methylene chloride. At this point it is not clear whether the methylene chloride was introduced in the deep zone during drilling or the detection represents a contamination of the deep zone by vertical migration of methylene chloride. Methylene chloride was also detected in an intermediate zone well 29WW35 near the rocket motor wash building at 8,770 µg/L. Wells installed to the north and south of the site to delineate the extent showed methylene chloride above MCL. Shaw proposed to resample the groundwater in the new wells to obtain a second set of results. The team was informed that the sampling will occur either during this week or the week of November 20. EPA and TCEQ were invited to observe. It was decided to proceed with the sampling. EPA and TCEQ may observe if their schedule allows.

GWTP. Van Vangala provided an update on the GWTP operation. The plant is performing as usual. 979,000 gallons of groundwater from LHAAP-18/24 were treated. Shaw will be replacing the agitator blade of the magnesium hydroxide tank in December 2006. Shaw's Sam Frisch was onsite to investigate the reason for perchlorate exceedance in the effluent. He recommended that the ORP probe in the fluidized bed reactor (FBR) be replaced because it seems to malfunction. The probe controls the nutrient feed to the FBR and may have caused insufficient feed to the tank causing perchlorate exceedances in the effluent in October 2006. The problem was corrected after nutrient feed was increased. Shaw will replace the ORP probe.

Rose Zeiler asked about the status of disposal of filter press waste. Van Vangala replied that Shaw has not processed much waste in October and the roll off box is almost empty. The INF pond has less than 1 foot of freeboard. Paul Bruckwicki requested that Shaw calculate volume of water discharged from the plant during the period of perchlorate exceedance in the effluent. Van replied that the calculation will be included in the monthly report.

GWTP Sampling Modification Memorandum. Greg Jones reviewed the main features of the Sampling Modification Memorandum submitted to the regulators on November 14. He mentioned that the tables in the memo provide the original basis for monitoring activities and rationale for modifying sampling points or frequencies. There was some discussion on the need for sampling for hexachlorobenzene. CES had presented data showing that the compound has never been detected in the effluent and recommended that it should be dropped from the list of analytes. However, the change was never implemented. This is one of the modifications in the memo submitted by Shaw. Rose Zeiler mentioned that she will check her files and provide Shaw any documentation she might have on hexachlorobenzene from CES.

Defense Environmental Restoration Program (DERP) TERC Update (Praveen Srivastav and John Elliott)

Document Status. TERC document status table was provided to the participants. John Elliott went through the status of documents in review. Other items discussed are as follows:

Site 12 – Remedial Design
Fay Duke wants to see results of sampling from the proposed well near well 12WW12 before providing her comments. The new well location was provided to the team on a map and the location was approved by everyone.

Proposed Plans for LHAAP-08 and 32. Rose Zeiler is holding the documents until the review of Proposed Plans for LHAAP-48/53 and LHAAP-37/67 by the regulators is complete and all comments have been resolved. Once comments are resolved, Shaw will revise the proposed plans for LHAAP-08, 32, 48/53, and 37/67, and hold them until BERA is available. Responses to comments will be provided to regulators to make sure that they approve the changes to the documents.

LHAAP-48. Rose Zeiler indicated that according to her notes, it was decided during the meeting in Austin on August 11 that all of the wells at LHAAP-48 and 53 will be abandoned, and not just those with stainless steel screens, if chromium is not elevated in the new PVC well at LHAAP-48. She asked EPA and TCEQ to confirm that. Raji Josiam checked her notes and reported that her notes concurred with Rose's notes. Fay Duke said that she needed more time to check her notes and also check with the toxicologist, and get back to the Army on that question.

LHAAP-37 Well Locations and Depths. A discussion took place on the locations and depths of the new wells proposed at LHAAP-37. The location for the new well east of LHSMW-58 was approved by everyone. EPA and TCEQ requested more time to review the location and depths for the well proposed east of LHSMW-59. It was decided to have a follow up conference call the following week.

Perimeter Well Data.

Praveen Srivastav stated that the results of perimeter well sampling conducted in September 2006 were reported at the October 2006 meeting. Shaw will be submitting a memorandum to change the frequency to sampling from quarterly to annual. It will be submitted to the regulators after Army's review.

MMRP Update. Nothing to report.

Schedule. Nothing to report

Other (Rose Zeiler)

Transfer Update
ECOPIV: Rose is reviewing ECOPIV. BRAC legal will review the document after her review.

Permit. Comment responses for the permit are complete. BRAC legal is very busy but Rose will urge him to review the permit before ECOPIV.

Demolition Progress: Sampling of water in the pits is a bigger task than originally envisioned. Rose Zeiler asked what Shaw's requirements would be for sampling since most of the pits are within PBC sites. Praveen Srivastav replied that the sampling requirements would depend upon the liquid discharged into the pits and on the functions of the buildings with which the pits are associated with. He asked if the Army's demolition contractor will be submitting a work plan that Shaw can review and comment on. Rose Zeiler indicated that the contractor is not planning on a work plan for the sampling effort. The Army is still working on the details for the task for filling pits.

Security-Refuge Opening: Rose Zeiler mentioned that the tours are continuing and currently there are no issues.

Schedule. The December meeting will be held on the 12th, 2006 at 1:30 pm at the Army Trailer at Longhorn AAP, Karnack, Texas. The Quarterly RAB meeting is scheduled for the same day at 6:30 pm.

Meeting Adjourned.

Action Items:

Army - Provide MMRP report to EPA when available
- Provide documentation related to hexachlorobenzene to Shaw (completed)

Shaw - Provide LHAAP-37 wells installation information to regulators and team before the conference call the following week.

TCEQ - Fay Duke to inform the Army regarding well abandonment at LHAAP-48/53 – whether the agreement was to abandon all the wells or only those with stainless steel screens.

LONGHORN ARMY AMMUNITION PLANT
MONTHLY MANAGERS' MEETING

Location	Teleconference		
Date	16-Nov-2006	**Time**	9:00 AM

ATTENDEES

Name (printed)	Signature	Organization	Phone	E-mail
Longhorn Team Members				
Rose M. Zeiler	✓ Phone	BRAC	(479) 635-0110	rose.zeiler@monroe.army.mil
Jeff Armstrong		USAEC	(410) 436-1516	Jeffrey.armstrong@us.army.mil
Cliff Murray	✓ Phone	USACE, Tulsa	(918) 669-7573	cliff.murray@usace.army.mil
Rick Smith	✓ Phone	USACE, Tulsa	(918) 669-4956	richard.p.smith@usace.army.mil
Chris Villarreal		USEPA, Dallas	(214) 665-6758	villarreal.chris@epa.gov
Stephen Tzhone		USEPA, Dallas	(214) 665-8409	tzhone.stephen@epa.gov
Scott Harris		USEPA, Dallas	(214) 665-7114	harris.scott@epa.gov
Fay Duke	✓ Phone	TCEQ, Austin	(512) 239-2443	fduke@tceq.state.tx.us
Dale Vodak		TCEQ	(903) 535-5142	dvodak@tceq.state.tx.us
Barry Forsythe		USFSW	(214) 665-8467	forsythe.barry@epa.gov
Paul Bruckwicki	✓ Phone	USFSW	(903) 679-4536	paul_bruckwicki@fws.gov
Mark Williams		USFSW	(903) 679-9144	mark_williams@fws.gov
Praveen Srivastav	✓ [illegible]	SHAW	(713) 996-4588	praveen.srivastav@shawgrp.com
David Cobb	✓	SHAW	(617) 589-5561	david.cobb@shawgrp.com
Kay Everett	[illegible]	SHAW	(713) 996-4421	kay.everett@shawgrp.com
John Elliot T	[illegible]	SHAW	(713) 996-4517	john.elliot@shawgrp.com
Van Vangala	✓ [illegible]	SHAW	(713)996-4459	van.vangala@shawgrp.com
Greg Jones	[illegible]	SHAW	(713)996-4472	greg.n.jones@shawgrp.com
Raji Josiam		USEPA-Dallas	214-665-8529	Josiam.raji@epa.gov

To: Longhorn Team Members
From: Cliff Murray, US Army Corps of Engineers, Tulsa District
Subject: LHAAP-58 Boundary

Date: 24 November 2006

I am writing this narrative to document the different boundaries for environmental site LHAAP-58 that have been presented over the last several years and to present a rationale for this last and hopefully final change.

Fay Duke noted in comment number 8 of her comments on the Draft Final Data Gaps Investigation Report (May 2005) that

> *Figure 3-6: The location and boundary for Site 35A is different from those shown in the work plans and previous reports (see attached). Although, there are differences in the site boundary of previous drawings, none of the previous drawings included the 200 Area. The TCEQ does not object the inclusion of the 200 Area. However, clarifications should be provided for the inclusion of this area. Furthermore, data and risk assessment and evaluations for LHAAP- 35A must include the data collected for the 200 Area in future reports.*

This comment pointed out an error that I had made when drawing the boundary for LHAAP-58 in the last couple of years. When assembling installation information for the GIS database I prepared a drawing that provided boundaries for the various environmental sites. Many of these sites which represented more than a building or a distinct facility had not had boundaries assigned to them but had rather been designated, at best, as general areas on a map. In drawing the boundary for LHAAP-58, I had overzealously included buildings in the 200 Area when I believe a more accurate boundary would only include the buildings within the Shops Area, as shown on Figure 1.

As a starting place for this explanation I refer you to Figure 2 which is a portion of a Thiokol Map from the mid-1980's showing the areas that I'm writing about.

Next, please look at Figure 3 which was taken from the Final DERPMIS/RMIS Resolution Document (June 1995) which can be found in the Longhorn AAP (LHAAP) Administrative Record (bates stamp pages 12865-12935). Site 58 is designated the "Maintenance Complex" and is designated on the map with an arrow pointed to the Shops Area. You may want to zoom in on the pdf file to see the area more clearly. From that figure, it appears fairly clear that the site is in the area labeled "Shops Area" in Figure 2.

Figure 4 is from the Final Remedial Investigation (RI) Report, Volume 1: Report, for the Group 4 Sites (January 2002). This map can be found in the LHAAP Administrative Record on page 027337. As shown in the upper left corner of this figure, Site 35A is shown as the area previously referred to as LHAAP-58. In the text of this report, area is referred to synonymously as 35A or "The Shops Area". It appears that for the RI Sverdrup/Jacobs was evaluating this area under the Sumps Investigation (LHAAP-35)

and thus was referring to the site as 35A rather than the established site name, LHAAP-58. At the same time, LHAAP-37 was referred to as Site 35B.

Figure 5 was taken from the Draft Feasibility Study for the Group 4 Sites (August 2002). This appears to be where the confusion of the boundary for LHAAP-58 began. The boundary, for some reason, was expanded to include the boiler house and LHAAP-60 as well as a large chunk of land to the west that did not contain any environmental sites. I'm guessing that the site was expanded to make it easier to group sumps locations together for the discussion in the FS.

Figures 6 and 7 are from the Final Work Plan for the Groundwater Data Gaps Investigation (February 2004). This document was prepared by Shaw and used the same site boundary for Site 35A as the previous Jacobs report (Figure 5). Figure 7 is the map attached to and referenced by Fay in her comments quoted earlier.

Which brings us to the Draft Final Data Gaps Investigation Report (May 2005) in which Shaw used a site boundary for LHAAP-58 that I had prepared for transfer maps. That boundary is shown in Figure 8. As you can see on this figure, the 200 Area is included.

The boundary recommended and shown in Figure 1 may still be a little generous by including LHAAP-03 (Building 722 – Paint Shop), LHAAP-02 (Vacuum Truck Overnight Parking Lot), , LHAAP-56 (Vehicle Wash Rack & Oil/Water Separator), LHAAP-68 (Mobile Storage Tank) and a portion of LHAAP-60 (Former Storage Building 411 and 714) but I believe it more closely represents the intention of the label originally given as the "Maintenance Complex".

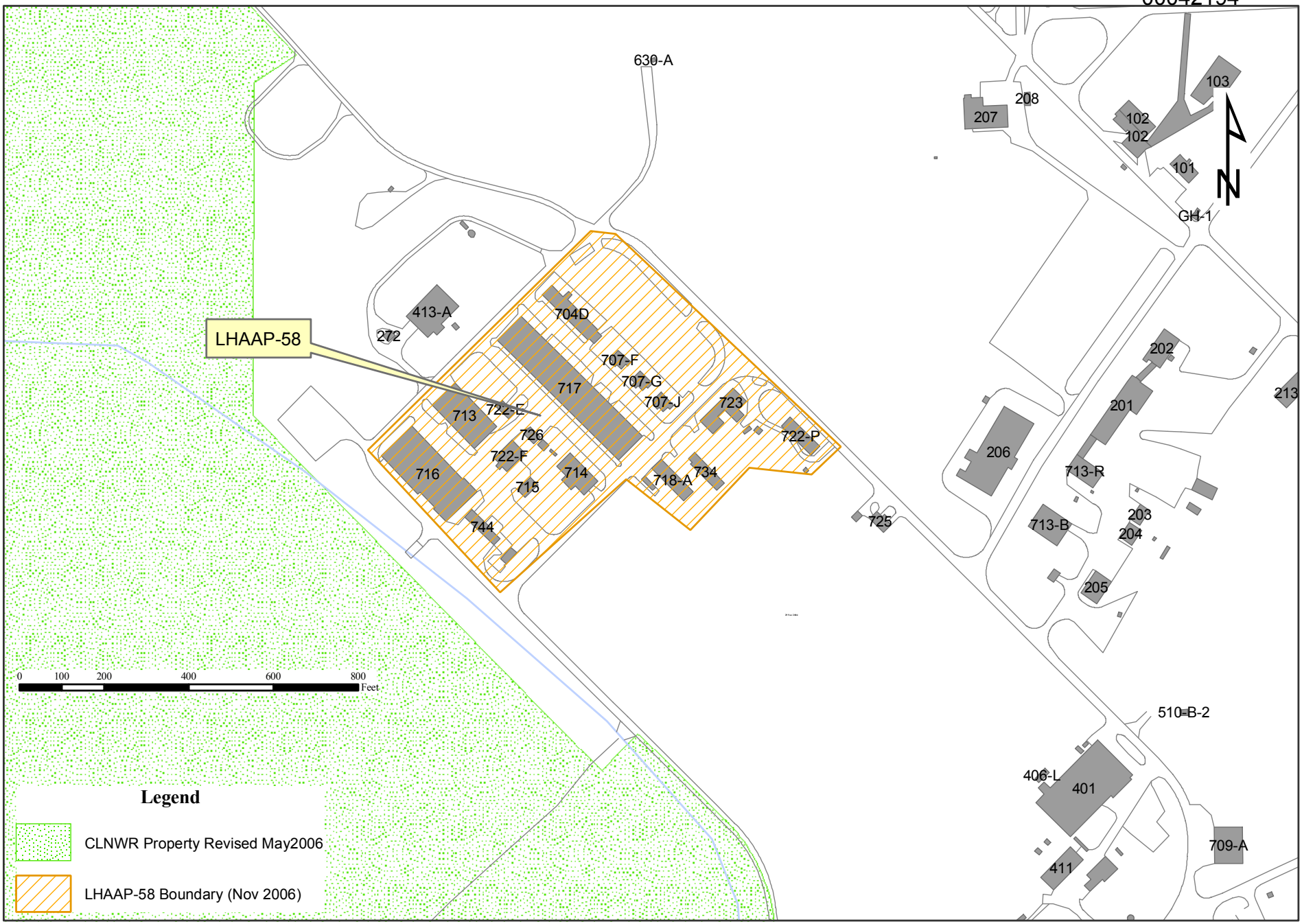


Figure 1

LONGHORN ARMY AMMUNITION PLANT

Shops Area/ 200 Area

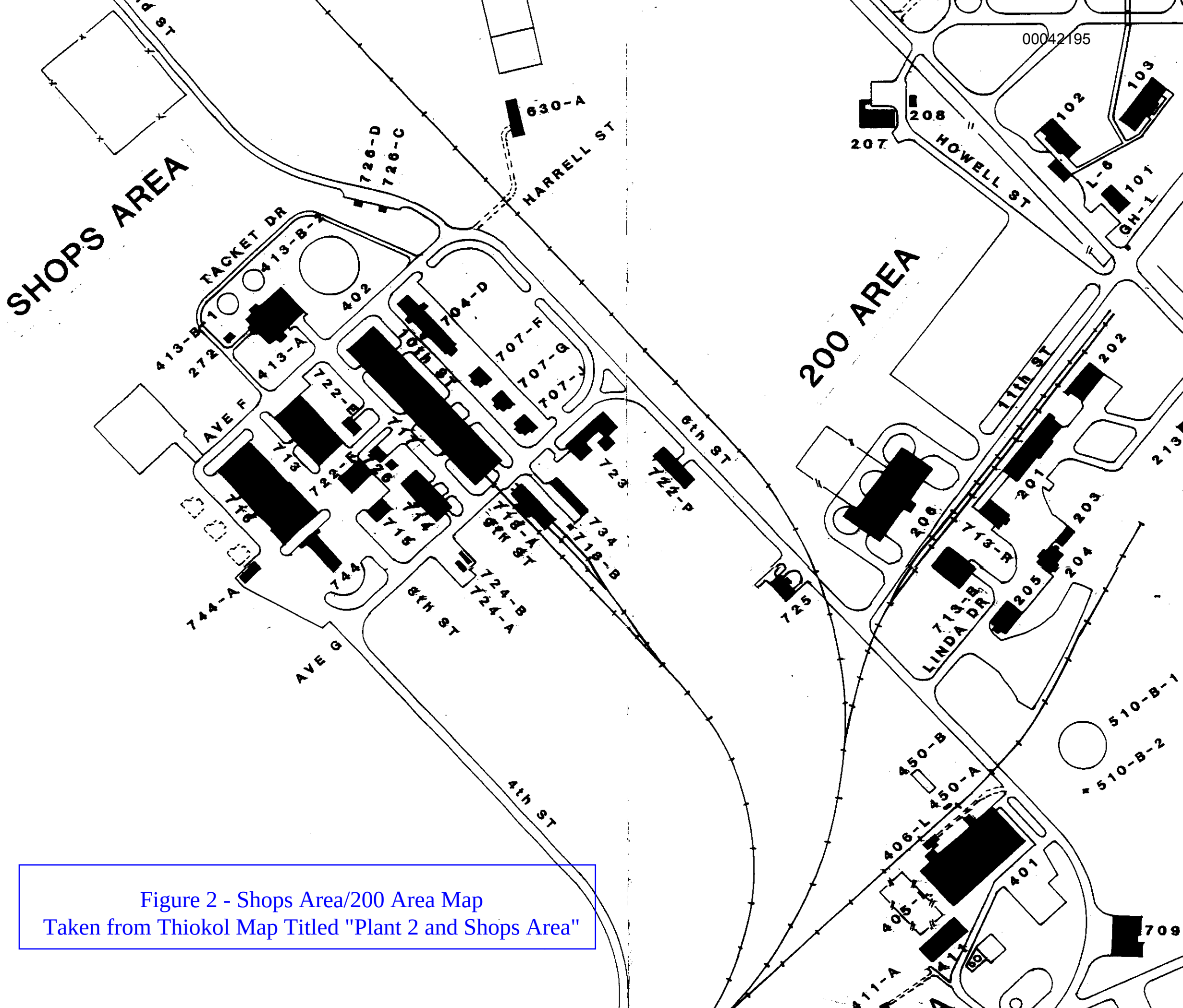


Figure 2 - Shops Area/200 Area Map
Taken from Thiokol Map Titled "Plant 2 and Shops Area"

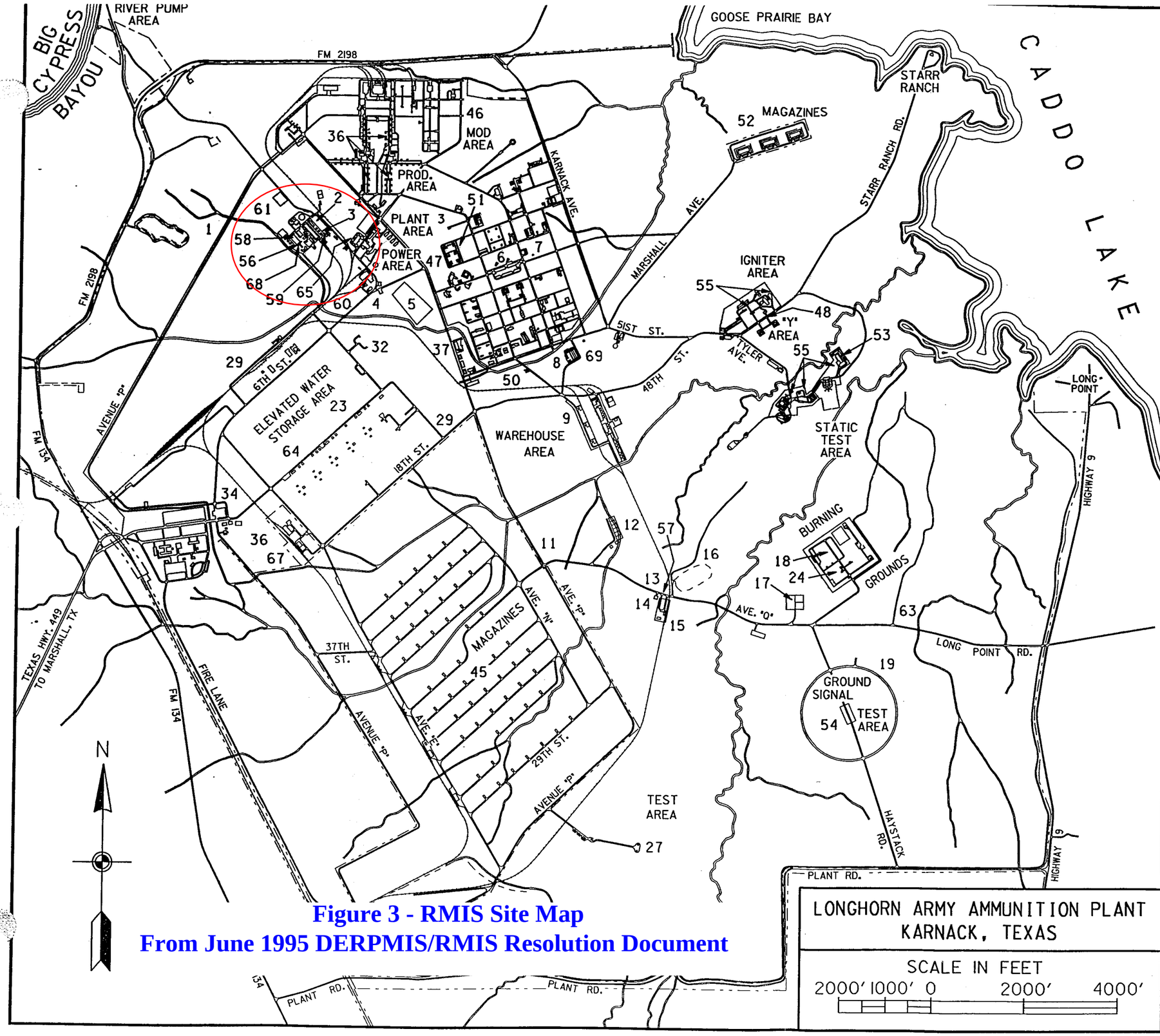


Figure 3 - RMIS Site Map
From June 1995 DERPMIS/RMIS Resolution Document

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

SCALE IN FEET
2000' 1000' 0 2000' 4000'

RMIS	LHAAP #
1	Inert Burning Ground.
2	Vacuum Truck Overnight Parking Lot.
3	Building 722 - Paint Shop.
4	Pilot Waste Water Treatment Plant.
5	Power House Boiler Pond.
6	Building 54F Solvent.
7	Building 50G Drum Processing.
8	Sewage Treatment Plant.
9	Building 31W Drum Storage.
11	Suspected TNT Burial Site at P&Q Ave.
12	Active Landfill.
13	Suspected TNT Burial Between Active and Old Landfill.
14	Area 54W Burial Site.
15	Area 49W Drum Storage.
16	Old Landfill.
17	No. 2 Flashing Area Burning Ground.
18	a) Burning Ground #3, b) 24X Holding Area, c) Air Curtain Destructor, d) Building 41X, e) Building 43X, f) 25X Washout Pad, g) Open Burning Cage, h) Open Burning Pan.
19	Construction Materials Landfill.
23	Building 707 - Storage Area PCB's.
24	Former Unlined Evaporation Pond.
27	South Test Area / Bomb Test Area.
29	a) Former TNT Production Area, b) TNT Red Water Pipeline, c) Former Acid Plant.
32	Former TNT Waste Disposal Plant.
34	Building 701 - PCP Storage.
35	Various Sumps (Located Throughout Facility).
36	Explosive Waste Pads.
37	Quality Assurance Laboratory Building 29A.
45	Magazine Area (Other-Than Plant 1).
46	Plant 2 / Pyrotechnic Operation.
47	Plant 3 / Produces Hand Signal Assemblies.
48	Y Area / Produces Hand Signal Assemblies.
50	Former Waste Disposal Facility.
51	Photographic Laboratory Building 60B.
52	Magazine Area (Plant 1).
53	Static Test Area.
54	Ground Signal Test Area.
55	Septic Tank.
56	Vehicle Wash Rack & Oil/Water Seperator.
57	Rubble Burial Site.
58	Maintenance Complex.
59	Storage Building 725.
60	Former Storage Building 411 and 714.
61	Water Treatment Plant.
63	Burial Pits.
64	Transformer Storage.
65	Building 209.
66	Transformers (Located Throughout Facility).
67	Above Ground Storage Tank.
68	Mobile Storage Tank.
69	Underground Storage Tank.

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

LHRCN7-1.DGN - 06FEB1995 RBP

012874

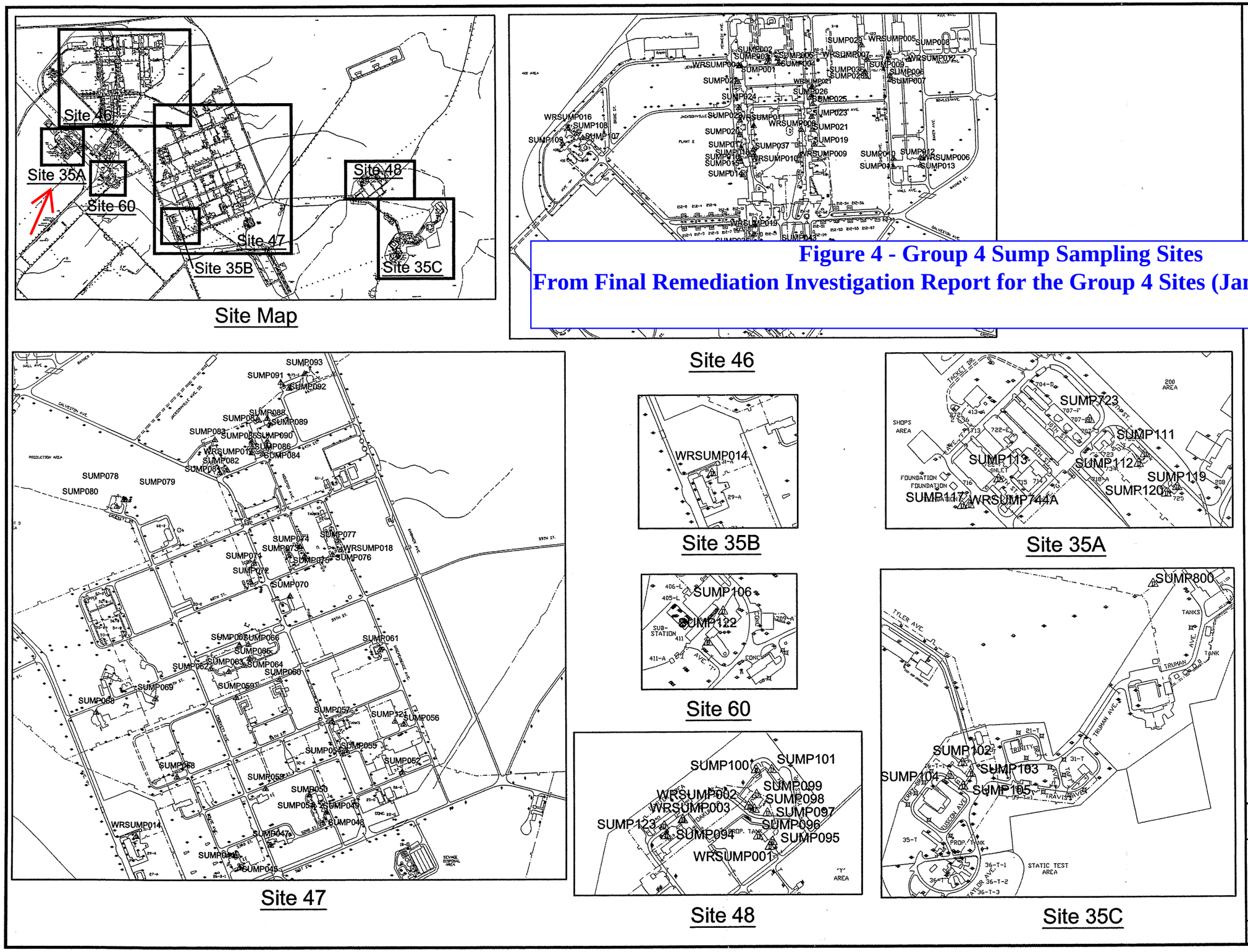


Figure 4 - Group 4 Sump Sampling Sites
From Final Remediation Investigation Report for the Group 4 Sites (January 2002, Jacobs)

US Army Corps of Engineers
Tulsa District

JACOBS

Group 4 Sump Sampling Locations
Group 4 Remedial Investigation
Longhorn Army Ammunition Plant
Karnack, Texas

19Dec01 - Figure 4-1.DWG | Figure 4-1

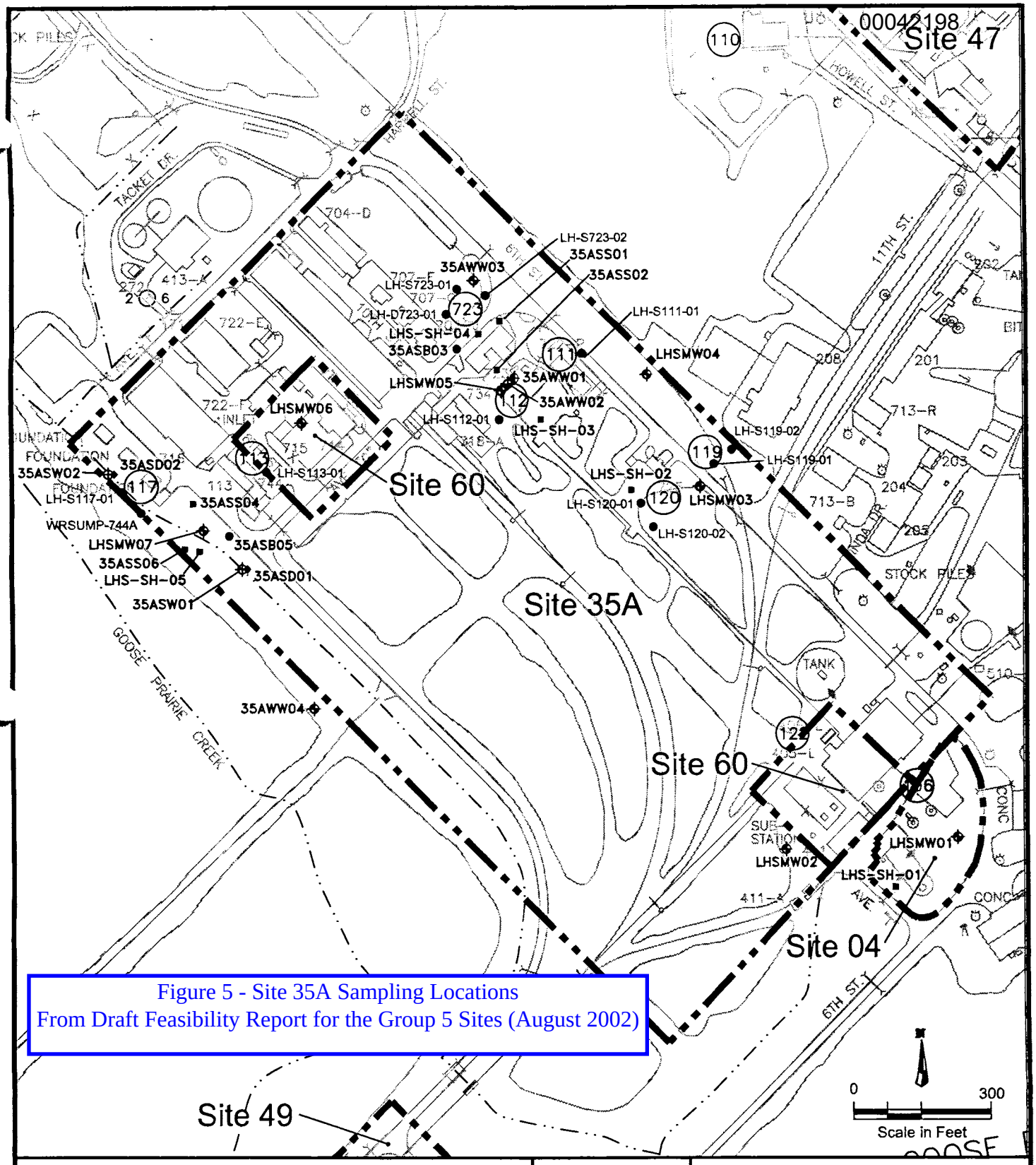


Figure 5 - Site 35A Sampling Locations
From Draft Feasibility Report for the Group 5 Sites (August 2002)

Legend

- Soil Boring Sampling Location
- Shallow Monitoring Well
- Intermediate Monitoring Well
- Deep Monitoring Well
- Surface Water Sampling Location
- Sediment Sampling Location
- Shallow Soil Sampling Location
- (117) Sump Location
- Site Boundary

US Army Corps of Engineers
Tulsa District

JACOBS

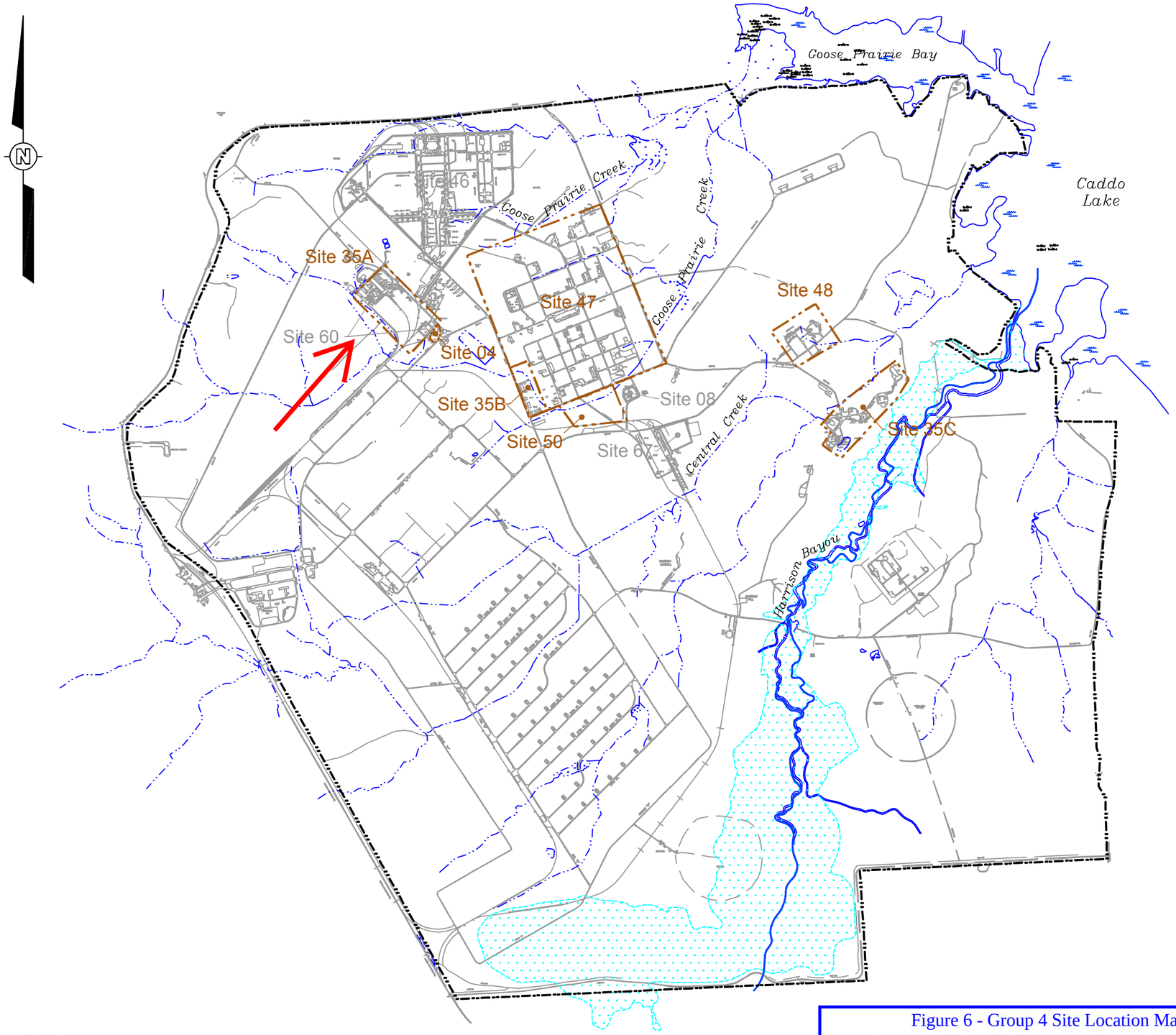
Site 35A Sampling Locations
Group 4 Sites Feasibility Study

Longhorn Army Ammunition Plant
Karnack, Texas

16July02 - Figure 2-5.DWG

Figure 2-5

00042199



LEGEND:

- GROUP 4 SITES TO BE INVESTIGATED
- WATER SUPPLY WELLS
- STREAMS
- CREEK/BAYOU

GROUP 4 SITES

SITE 04	PILOT WASTEWATER TREATMENT PLANT
SITE 08	SEWAGE TREATMENT PLANT
SITE 35A	SHOP AREA
SITE 35B	CHEMICAL LABORATORY
SITE 35C	STATIC TEST AREA
SITE 46	PLANT 2 AREA
SITE 47	PLANT 3 AREA
SITE 48	Y–AREA
SITE 50	FORMER SUMP WATER TANK
SITE 60	PESTICIDE STORAGE BUILDINGS
SITE 67	ABOVEGROUND STORAGE TANK FARM

SCALE

0 2500 5000 FEET

Figure 6 - Group 4 Site Location Map
From Final Work Plan, Groundwater Data Gaps
Investigation, Groups 2 and 4, (February 2004, Shaw)

REFERENCE:
JACOBS ENGINEERING GROUP 2002b, DRAFT FEASIBILITY STUDY FOR THE GROUP 4 SITES, LONGHORN AMMUNITION PLANT, PREPARED FOR THE U.S. ARMY CORPS OF ENGINEERS, TULSA DISTRICT

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

FIGURE 2–2

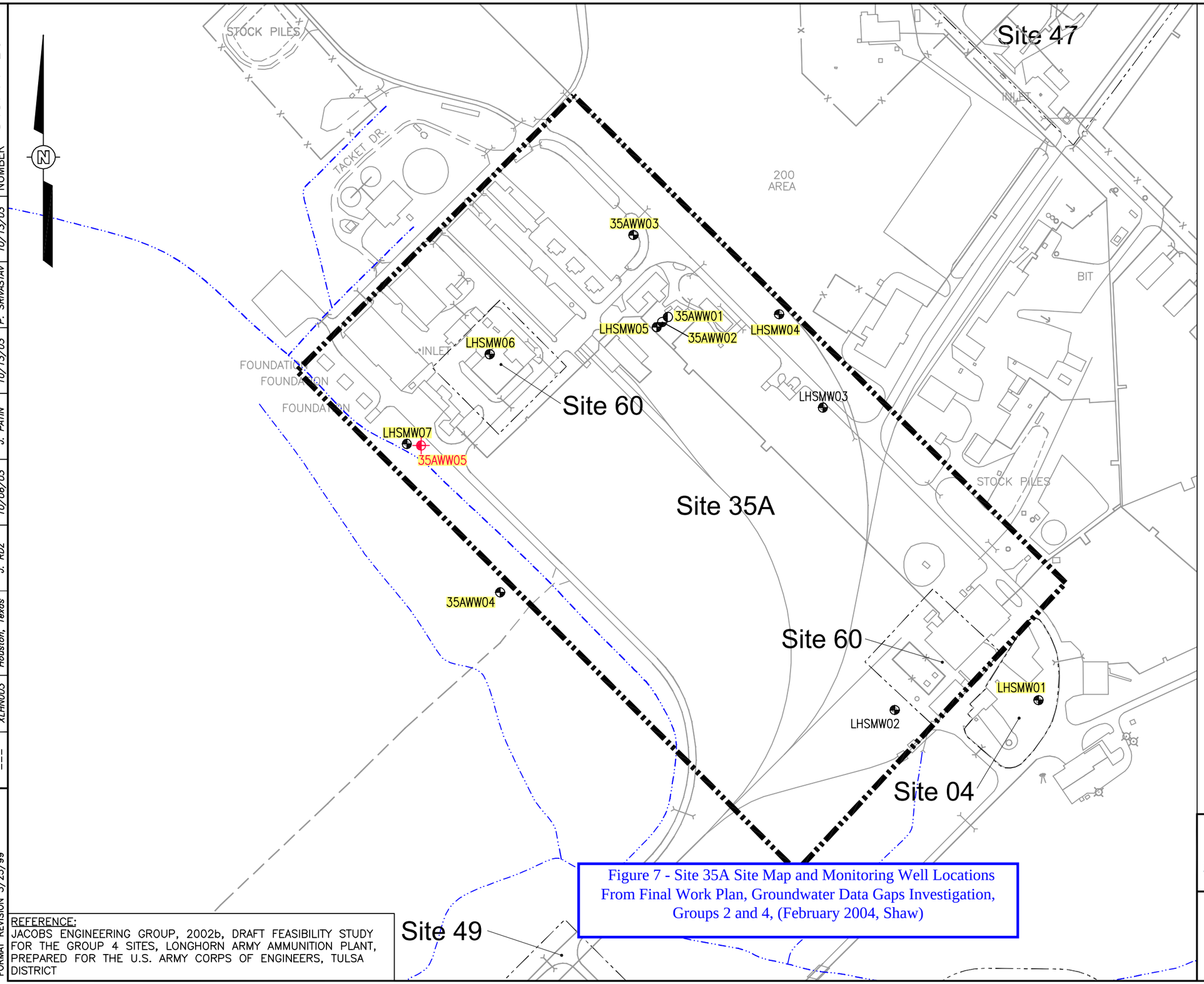
GROUP 4 SITE LOCATION MAP

LONGHORN ARMY AMMUNITON PLANT
KARNACK, TEXAS

IMAGE	X–REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	BASE	Houston, Texas	J. RDZ	10/06/03	J. PATIN	10/13/03	P. SRIVASTAV	10/13/03	845714–B5

PLOT DATE: 10/15/03
FORMAT REVISION 3/25/99

00042200



LEGEND:

- SHALLOW MONITORING WELL
- INTERMEDIATE MONITORING WELL
- DEEP MONITORING WELL
- SITE BOUNDARY
- PROPOSED INTERMEDIATE MONITORING WELL
- WW01 WELLS TO BE SAMPLED

SCALE

0 250 500 FEET

Figure 7 - Site 35A Site Map and Monitoring Well Locations From Final Work Plan, Groundwater Data Gaps Investigation, Groups 2 and 4, (February 2004, Shaw)

REFERENCE:
JACOBS ENGINEERING GROUP, 2002b, DRAFT FEASIBILITY STUDY FOR THE GROUP 4 SITES, LONGHORN ARMY AMMUNITION PLANT, PREPARED FOR THE U.S. ARMY CORPS OF ENGINEERS, TULSA DISTRICT

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

FIGURE 3–5
SITE MAP AND MONITORING WELL LOCATIONS, SITE 35A, GROUP 4
LONGHORN ARMY AMMUNITON PLANT
KARNACK, TEXAS

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X–REF	IMAGE
845714–B6	P. SRIVASTAV 10/13/03	J. PATIN 10/13/03	J. RDZ 10/06/03	Houston, Texas	XLHN003	---

PLOT DATE: 10/15/03
FORMAT REVISION 3/25/99

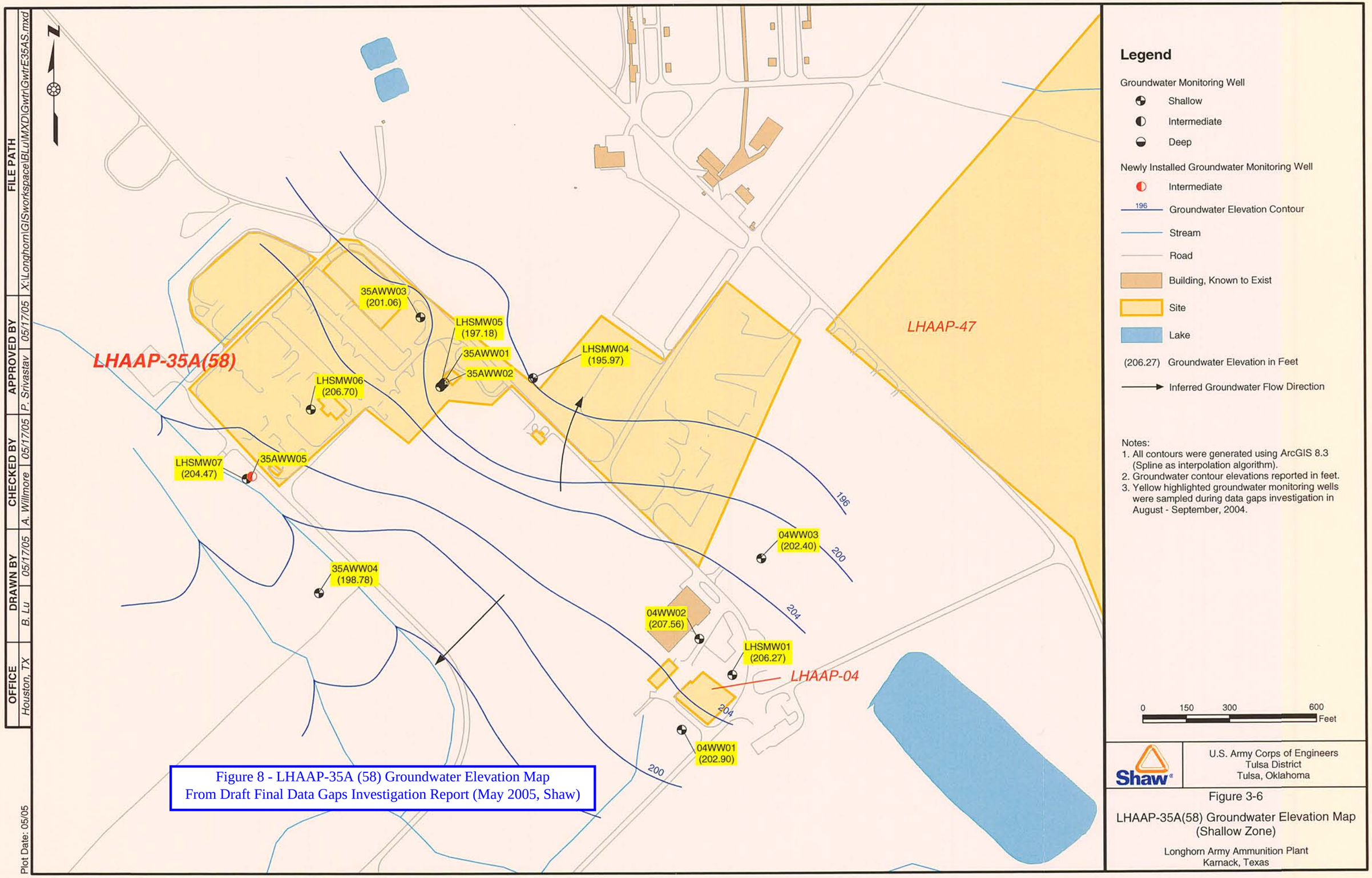


Figure 8 - LHAAP-35A (58) Groundwater Elevation Map
From Draft Final Data Gaps Investigation Report (May 2005, Shaw)

Shaw Environmental, Inc.

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

Location of Meeting: Longhorn AAP – Fire Station
Date of Meeting: December 12, 2006, 1:30 PM – 4:25 PM

Meeting Participants:

BRAC:	Rose M. Zeiler, Tom Lederle
USACE-Tulsa:	Cliff Murray, Rick Smith
USAEC	Jeff Armstrong
USFWS:	Paul Bruckwicki, Barry Forsythe
Shaw Environmental:	Praveen Srivastav, Kay Everett, Van Vangala (phone), Dave Cobb (phone)
USEPA Region 6:	Chris Villarreal, Steve Tzhone, Scott Harris
TCEQ:	Dale Vodak

Prior to the meeting Shaw and Army had distributed via e-mail: meeting agenda, minutes of November 16, 2006 Monthly Managers' Meeting, and the document status tables for the TERC and PBC projects.

Rose Zeiler opened the meeting and welcomed those in attendance. She went through the list of action items from the previous monthly managers' meeting. Below are the highlights of this discussion:

- **Army – Provide MMRP report to EPA when available:** Rick Smith reported that the Army is reviewing a draft of the MMRP report. They have to discuss the report with USFWS. After resolution of comments the report will be made final. This report should be available after the first of the year. Jeff Armstrong said that AEC had money set aside for the follow-on action.
- **Army – Provide documentation related to hexachlorobenzene to Shaw**. Rose Zeiler provided this information to Shaw shortly after the November Monthly Manager's Meeting
- **Shaw** – Provide LHAAP-37 wells installation information to regulators and team before the conference call the following week. This information was provided and a conference call was held as scheduled.

- **TCEQ – Fay Duke to inform the Army regarding well abandonment at LHAAP-48/53 whether the agreement was to abandon all the wells or only those with stainless steel screens.** Fay was not at the meeting. TCEQ will address this issue later.

Concurrence with the removal of stainless steel and all wells at Sites 48 and 53 was provided by TCEQ on December 15, 2006 by email.

Defense Environmental Restoration Program (DERP) PBC Update (Praveen Srivastav)

Document Status. PBC document status table was provided to the participants.

GWTP. Van Vangala provided an update on the GWTP operation via telephone. On November 16, 2006, three samples were collected from the INF pond after an excursion for perchlorate was indicated in the effluent. Sample results were "ND" (not detected), 13 micrograms per liter (µg/L), and 15 µg/L, respectively for the three samples. The average is 10 µg/l which is below the daily maximum of 13 µg/L but above the daily average criterion of 6 µg/L. The INF pond is near capacity with 1-foot of freeboard. Since there is currently flow in the creek, discharge from the INF pond can occur upon regulatory approval. Van indicated that the pond has probably 2 to 3 million gallon capacity. About 676,000 gallons of clean water has been discharged into the pond since the excursion. Rainfall was not added into the calculation, although about 4 to 5 inches of rainfall had occurred at the site recently. The samples collected were before this rainfall. Cliff Murray pointed out that the additional rainfall diluted the pond even further. It was decided that Shaw will recalculate the concentrations in the pond based on the sampling data and estimated amount of clean water added via discharge and rain water. If the recalculated concentrations are still above the daily average criterion, Shaw will collect additional samples from the INF pond to determine the current perchlorate levels so that a decision can be made whether or not the pond water can be discharged to Harrison Bayou. Shaw will report the results of recalculations or sampling results for regulatory concurrence via e-mail.

The CATOX unit was reported down last Monday, December 4, 2006 and could not be started. A subcontractor has been working on it as of December 11, and the unit is now up and running. The FBR has been on recirculation since December 5, 2006.

Van reported that the lead excursion issue appears to be taken care of by the installation of an agitator blade in the magnesium hydroxide tank. Regulator maintenance is being performed. A power outage had occurred since last report.

Chris Villarreal asked if extraction from LHAAP-16 and 18/24 was still taking place. Van indicated that extraction is continuing because there is still room in the holding tank.

Baseline Ecological Risk Assessment
Shaw is planning to submit Volume I of the Installation-Wide BERA report in December 2006. Volume II will be submitted in January 2007. Fay Duke had mentioned earlier that Vicki Reat may not be available to review the document in January 2007 because of her other commitments.

LHAAP-29 GW Results. Praveen Srivastav discussed the results of groundwater sampling of the new wells at LHAAP-29 from the November 20, 2006 sampling event. A figure showing the methylene chloride results was provided to the team before the meeting. Praveen pointed out that the deep well 29WW40 had a detection of 6.9 µg/L of methylene chloride during the

latest round of sampling in November 2006, which is much lower than the detection from September 2006. Based on these and past samples, it is believed that the drilling process may have contributed to detections of methylene chloride in the deep well 29WW40. Shaw is planning to resample the deep well 29WW40 and possibly other wells that haven't been sampled in awhile on the periphery of the LHAAP-29 boundary. Praveen indicated that Shaw is preparing cross sections and groundwater and concentration contours at LHAAP-29 utilizing the new data.

GWTP Sampling Modification Memo
Scott Harris indicated that he had no comments on the memo. He had a discussion with Fay Duke and is waiting to see if she has any comments before EPA provides their concurrence.

Time Critical Removal Actions for Sites LHAAP-04, 49, 50 and Pistol Range
Shaw has submitted a revised TCRA memo to the Army. Jeff Armstrong indicated that AEC has no further comments. The decision lies with BRAC as to whether or not it will support TCRA. Rose Zeiler indicated that Tom Lederle will make a decision based on the BRAC legal's review.

GWTP System Optimization
A discussion ensued on the document(s) that would be needed before Shaw could proceed with the optimization of the treatment system to allow increased flushing of the aquifer. Shaw had proposed that the optimization could be done under an amendment to the IRA ROD. Jeff Armstrong indicated that AEC counsel had advised him that the Army would prefer a feasibility study, proposed plan, and ROD path so that the Army has a final ROD.

Rose Zeiler stated that a ROD amendment may not work because of components of bioaugmentation and MNA that were not part of the original pump and treat remedy.

Stephen Tzhone indicated that the EPA may accept a ROD amendment if it meets the requirement of evaluation against nine criteria. In that case, MNA and bioaugmentation portions on the remedy can be either included in the first amendment or would have to be added later through another amendment. Steve further indicated that an FS, PP, ROD path would allow remedy evaluation to be done up front. The FS will set up the new remedial action objectives (RAO) because they have changed since the IRA ROD. Chris Villarreal added that extraction may not be adequate for the restoration of the groundwater and Army may want to consider applying for a technical impracticability (TI) waiver.

Jeff Armstrong said that the GWTP can be shut down to demonstrate plume stability, and a reactive barrier or slurry wall may be installed to contain the source area.

Chris Villarreal stated that optimization would be just an enhancement of the current extraction remedy. The final remedy would probably require containment and restoration.

Stephen Tzhone indicated that if MNA is a part of the remedy, he was not sure whether MNA would have to be demonstrated up front or can be done after the plant is shut down. He will get back to the team with an answer.

Creek Sampling
Praveen Srivastav informed the team that there is water in the creeks, especially Harrison Bayou and Goose Prairie Creek. Shaw plans to sample the creeks in December 2006. He distributed a map showing proposed locations along the two creeks. Shaw is proposing to collect samples from three locations along Harrison Bayou (HBW-1, HBW-7, and HBW10) and two samples from Goose Prairie Creek (GPW-1 and GPW-3). The sample points were chosen from those used by USACE in their sampling and Shaw will use the same location IDs. Dale Vodak and Chris Villarreal concurred with the locations.

Update on Field Sampling Results for LHAAP-03, 06, 07, 51, 55, 64, and 68
Praveen Srivastav indicated that Shaw is currently evaluating the sampling results. Of the sites mentioned above, only site LHAAP-03 had a significant detection of over 5,000 mg/kg of lead in one surface soil sample. Shaw is planning to collect additional samples around this location to confirm the data and to define the extent. The sampling will be conducted in December 2006.

Defense Environmental Restoration Program (DERP) TERC Update (Praveen Srivastav)
Document Status. TERC document status table was provided to the participants. Praveen briefly discussed status of some of the documents. Several documents are in the proposed plan stage and are awaiting the BERA results. These include LHAAP-08, -32, -37, and -67. Response to comments on the data gaps report and on the modeling report are in preparation. Need a confirmation from Fay Duke regarding the abandonment of all wells at LHAAP-48 (53).

Field Update
At LHAAP-37, two wells were installed and sampled. There were no hits in the temporary well set in the shallow zone. This well was converted to a permanent shallow well. An intermediate well was installed at about 49-50 feet below ground surface. Shaw is also installing a new well at LHAAP-12. Shaw will also be collecting a second round of MNA samples at LHAAP-12, 37, and 67.

Perimeter Well Data.
Analytical data from the perimeter wells was reported previously. Shaw has submitted a memo on the Army's behalf recommending that the frequency of sampling be dropped from quarterly to annual. Regulatory comments are pending.

MMRP Update
Rick Smith indicated that a draft report is still under review. There are significant comments. No MEC has been found at Static Test Area/LHAAP-53. It is designated NDAI or "no Department of Defense action indicated." The other two sites have some MEC and will require further action. Tom Lederle said that BRAC would evaluate any future actions required at these sites based on the future reuse by USFWS. Jeff Armstrong added that the AEC wants to fund good sites and Longhorn is a good candidate. Paul Bruckwicki indicated that any burns in the button bomb area should be done before March 2007 and USFWS can help with the burn.

Others

Refuge Opening
Tom Lederle discussed refuge opening with CLI, Mark Williams, and several members of the community before joining the Monthly Managers' Meeting. At that meeting, it was agreed by Tom Lederle to allow USFWS-sponsored tours of Army land. A map with a proposed route(s) through Army land is to be prepared by Mark Williams of USFWS and sent to BRAC Division. Tours may begin immediately upon Mr. Lederle's approval of the map. The tours may take place any day of the week, with or without Army or USFWS presence, as long as the tour is led by a USFWS-trained volunteer. USFWS will be responsible for "policing" to ensure their visitors remain on the USFWS grounds and do not stray onto areas with environmental or physical hazards. The USFWS staff indicated they will rely heavily on volunteers. Previously, concern was expressed to the Army by the EPA/TCEQ and PBC contractors regarding access to environmental sites by refuge visitors. Some sites, such as LHAAP-29 and -49 have been posted with signs restricting access. In addition, there are large gates and existing fencing across some of the main areas that should help prevent unauthorized access by refuge visitors. Steve Tzhone questioned the legal instrumentation or tort liability. Will it be open during the day for unlimited access or for tours only? Tom Lederle's interest is keeping people out of the contaminated areas.

A permit between Army and USFWS is being developed that will allow USFWS to operate a refuge on the remaining Army land prior to transfer. The permit would allow USFWS to undertake all those actions and authorities that go along with refuge management. Mr. Lederle stated that this type of permit has been done in other places all over the country, in areas of active cleanup, with public access, and with USFWS oversight. Steve asked if any incidents or lawsuits have occurred at other locations. Tom Lederle was not aware of anything except for the occasional ATV running over fencing, fence cutting, etc. Rose Zeiler indicated that there would be no security at the front gate starting March 14. At that time USFWS will be responsible for phone service and gate cards if they desire to retain that service.

Regarding UXO safety issues, BRAC will provide a UXO safety person and brief USFWS on it as well as get information on munitions (RMZ Note: LHAAP has already provided this training and information).

Transfer Update (Tom Lederle and Rose Zeiler)

ECOPIII: BRAC has not received a letter requesting transfer of 100 acres by USFWS as yet.

ECOPIV: This document has been reviewed by Rose Zeiler and BRAC legal. The USACE will have a revised version for Rose's review by next Friday. Then it will be submitted to the regulators and USFWS.

Permit: Tom Lederle had a few comments on the permit and one map (historical sites) needs to be modified. His comments are being addressed.

Pits and Hazards Abatement. Fort Worth is sampling the water next week. All work should be complete by March 14, 2007.

Schedule. The January meeting will be held on the 17th, 2007. Time and location are pending. IAP is set for April 3 and 4, 2007.
Meeting Adjourned.

Action Items:

Army - Provide MMRP report to EPA and TCEQ when available.

Shaw - Determine the volume of discharged water in the INF pond and total volume of water in the pond, and recalculate perchlorate concentration in the pond water. If the estimated concentration is above the daily average criterion, collect additional samples of the pond water for subsequent approval from agencies for discharge of the water to the creek.

TCEQ - Fay Duke to inform the Army regarding well abandonment at LHAAP-48/53 – whether the agreement was to abandon all the wells or only those with stainless steel screens.

EPA - Steve Tzhone will research the requirements for OPS for the GWTP, especially the timing for demonstration of MNA

LONGHORN ARMY AMMUNITION PLANT
MONTHLY MANAGERS' MEETING

Location	Longhorn AAP Trailer, Karnack, Texas		
Date	12-Dec-2006	**Time**	1:30 PM

ATTENDEES

Name (printed)	Signature	Organization	Phone	E-mail
Longhorn Team Members				
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Tom Lederle	Stopped by ≈ 2:35pm			