

**LETTER REPORT  
FOR  
LAKE LINDEN EMERGENCY RESPONSE SITE  
LAKE LINDEN, HOUGHTON COUNTY, MICHIGAN**

Prepared for

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
Region V Emergency Response Branch  
9311 Groh Road  
Grosse Ile, Michigan 48138

Prepared by

**WESTON SOLUTIONS, INC.**  
2501 Jolly Road, Suite 100  
Okemos, Michigan 48864

Date Prepared	November 30, 2007
TDD Number	S05-0001-0707-021
Contract Number	EP-S5-06-04
Document Control Number	248-2A-ABHD
START Project Manager	Daniel Capone
Telephone No.	(517) 381-5932
U.S. EPA On-Scene Coordinator	Brian Kelly

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FOR  
LAKE LINDEN EMERGENCY RESPONSE SITE  
LAKE LINDEN, HOUGHTON COUNTY, MICHIGAN**

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Okemos, Michigan 48864

November 30, 2007

Prepared by:

 for

Date 11-30-07

Nancy Posavatz  
WESTON START Project Lead

Reviewed and Approved by:



Date 11-30-07

Daniel M. Capone  
WESTON START Project Manager



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Mr. Brian Kelly  
United States Environmental Protection Agency  
Region V Emergency Response Branch  
9311 Groh Road  
Grosse Ile, Michigan 48138

Re: Lake Linden Emergency Response Site  
Lake Linden, Houghton County, Michigan  
TDD: S05-0001-0707-021  
DCN: 248-2A-ABHD  
WO#: 20405.012.001.0248.00

Dear Mr. Kelly:

The United States Environmental Protection Agency (U.S. EPA) tasked the Weston Solutions, Inc., (WESTON®) Superfund Technical Assistance and Response Team (START) to conduct reconnaissance, sampling, and oversight of emergency response activities at the Lake Linden Emergency Response Site (Site) located in Lake Linden, Houghton County, Michigan. WESTON START was requested under Technical Direction Document (TDD) S05-0003-0707-021 to perform X-ray fluorescence (XRF) screening, surface water and soil/sediment sampling, and written and photographic documentation of the time-critical removal action conducted by the Emergency and Rapid Response Services (ERRS) contractor, Environmental Quality Management (EQM). Site reconnaissance and sampling associated with the emergency response began on July 26, 2007, and was completed on July 31, 2007. The time critical removal action began on August 5, 2007, and was completed on October 3, 2007.

#### **SITE DESCRIPTION**

The Site is located at the north end of Torch Lake in Lake Linden, Houghton County, Michigan, at 47.18919 degrees north and 88.40629 degrees west (**Attachment A - Figure 1**). The Site is located within a delisted portion of the Torch Lake Superfund Site.



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The Lake Linden Recreation Park (LLRP) is a publicly owned recreational area at the north end of Torch Lake at M-26, Lake Linden, Houghton County, Michigan. The LLRP includes a public campground, playground, sandy swimming beach, dock, and boat launch. The Village of Lake Linden owns two miles of the northern shore of Torch Lake which encompasses the LLRP. The entire area is associated with historic mine waste (mining stamp sands). As part of the Torch Lake Superfund remedy, stamp sands were capped along the Torch Lake shoreline up to the water's edge. Due to low lake levels experienced in the area during 2007 (lake levels were down one to two feet), previously submerged stamp sands and other potential waste material became exposed on the surface.

## **BACKGROUND**

Approximately 700 acres of stamp sand and slag deposits within the Torch Lake National Priorities List (NPL) Site have been remediated by U.S. EPA's Remedial Branch. The remedy implemented at the Torch Lake NPL Site primarily addressed the ecological effects resulting from more than 100 years of copper mining, milling, and smelting in the area. The most significant ecological effect was the severe degradation of the benthic community as a result of past and current metal and particulate-matter surface water loadings from mining wastes, including stamp sand, located on land along and near Torch Lake. The U.S. EPA cleanup decision for terrestrial portions of the Torch Lake NPL Site is documented in the September 30, 1992, U.S. EPA Record of Decision (ROD).

The 1992 ROD included constructing a soil and vegetative cover over exposed mining wastes that border area water bodies. This cover was designed to minimize human exposure and prevent further contamination and ecological degradation by reducing ongoing transport (*i.e.*, wind erosion, surface water runoff, and shoreline erosion) and loading of mining waste metals and particulates.



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On June 21, 2007, Michigan Department of Environmental Quality (MDEQ) representatives visited the Site to assess the newly exposed shoreline areas. While at the Site, MDEQ observed and sampled white, clayey waste material on the shoreline.

The MDEQ sample (LK Linden Park) was collected along the shoreline west of the Site's swimming beach. Analytical results of the white clayey material showed polychlorinated biphenyl (PCB) concentrations of 12 milligrams per kilogram (mg/kg) and elevated target analyte list (TAL) metals including antimony (600 mg/kg), arsenic (45 mg/kg), barium (120,000 mg/kg), copper (81,000 mg/kg), and lead (78,000 mg/kg). Concentrations of these TAL metals exceeded MDEQ Residential and Commercial I Soil Direct Contact Criteria (RDCC) established under Part 201 of Act 451 of the Michigan Compiled Laws. In addition, the concentrations of barium, cadmium (100 mg/kg), chromium (210 mg/kg), lead, and selenium (36 mg/kg) exceeded 20 times the extract of Toxicity Characteristic Leaching Procedure (TCLP) limits, indicating the waste was a characteristic hazardous waste under 40 Code of Federal Regulations (CFR) 261.24 (**Attachment B - Table 1**).

There were also reports of blue-colored water present in a nearby creek, and within child-created depressions in the sandy swimming beach area adjacent to the creek. On July 24, 2007, the Western Upper Peninsula District Health Department (WUPDHD) personnel observed the blue-colored water. MDEQ personnel also collected additional samples from the clayey material located within the Site. All data generated from MDEQ samples are provided in **Attachment B**.

On July 25, 2007, MDEQ, WUPDHD, Michigan Department of Community Health (MDCH), and the Village of Lake Linden contacted U.S. EPA requesting assistance to address the potential environmental and public health concerns identified by MDEQ sampling in soil at the Site. In addition, WUPDHD and the Village of Lake Linden restricted access to the portion of the Site where the MDEQ samples were collected.



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## EMERGENCY RESPONSE

On July 25, 2007, the U.S. EPA ERB tasked WESTON START to respond to the Site and further investigate the concerns presented by MDEQ, and delineate the extent of contamination posing an imminent threat to human health, welfare and the environment. On July 26, 2007, WESTON START collected two soil/sediment samples from the white, clayey waste material located west of the Site's swimming beach (LLV-Sediment1 and LLV-Sediment2). In addition, WESTON START collected one surface water sample from the creek located west of the Site's swimming beach, and one water sample from a hole dug in the sandy swimming beach. WESTON START dug holes, designed to mimic child-created depressions in the sand, every 50 feet along the swimming beach in an effort to observe blue-colored water. WESTON START did not observe any blue-colored water during the reconnaissance or sampling. Sediment and surface water samples were analyzed by Trace Analytical Laboratories, Inc., in Muskegon, Michigan, for volatile organic compounds (VOCs) via U.S. EPA Method 8260B, semi-VOCs via U.S. EPA Method 8270C, TAL Metals, PCBs via U.S. EPA Method 8082, Total Cyanide, and pH.

Analytical results for the two soil/sediment samples are presented in **Table 2 (Attachment C)**. No VOCs were detected in either sample. Sample LLV-Sediment 1 contained bis (2-ethylhexyl) phthalate at 340 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) and PCBs at 1,131  $\mu\text{g}/\text{kg}$ . Sample LLV-Sediment 1 contained concentrations of the following metals in excess of MDEQ Part 201 RDCC: barium (140,000  $\text{mg}/\text{kg}$ ), copper (79,000  $\text{mg}/\text{kg}$ ), arsenic (8.2  $\text{mg}/\text{kg}$ ), and lead (80,000  $\text{mg}/\text{kg}$ ). Sample LLV-Sediment 2 contained concentrations of arsenic (9.2  $\text{mg}/\text{kg}$ ) and lead (2,100  $\text{mg}/\text{kg}$ ) in excess of MDEQ Part 201 RDCC.

Analytical results for the two water samples collected on July 26, 2007, are presented in **Table 3 (Attachment C)**. Sample LLV-Beach 1 contained concentrations of the following metals in excess of MDEQ Part 201 Residential and Commercial I Drinking Water Criteria (RDWC): lead (44 micrograms per liter [ $\mu\text{g}/\text{L}$ ]), iron (2,800  $\mu\text{g}/\text{L}$ ), aluminum (3,100  $\mu\text{g}/\text{L}$ ), and vanadium (7.80  $\mu\text{g}/\text{L}$ ).



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Sample LLV-Creek 1 contained concentrations of lead (550 µg/L), iron (14,000 µg/L), aluminum (3,900 µg/L), and vanadium (20 µg/L) in excess of MDEQ Part 201 RDWC. Concentrations of barium, copper, lead, and silver exceeded the MDEQ Groundwater-Surface Water Interface (GSI) criteria in both of the surface water samples, and concentrations of zinc, antimony, and vanadium exceeded the GSI criteria in Sample LLV-Creek 1. In addition, the concentration of lead in Sample LLV-Beach 1 exceeded the MDEQ Rule 57 Human Drinking Water (HDW) value, and the concentrations of copper, lead, and aluminum in Sample LLV-Creek 1 exceeded the Rule 57 HDW value.

#### **SITE RECONNAISSANCE AND SAMPLING ACTIVITIES**

On July 27, 2007, U.S. EPA On-Scene Coordinator (OSC) Brian Kelly tasked WESTON START with collecting additional soil/sediment samples along a 0.5-mile section of the northern shore of Torch Lake within the Site to further delineate the newly exposed sediments and to support decisions by U.S. EPA in determining whether emergency removal actions at the Site were necessary to protect human health, welfare and the environment. WESTON START prepared a Sampling and Analysis Plan (SAP) on August 3, 2007, describing the sampling approach, sample analysis, and technical and quality control measures to be employed during the sampling. A copy of the SAP is provided in **Attachment D**.

Specifically, the tasks conducted by WESTON START during the August 2007 sampling effort included:

- Established 100-foot by 100-foot sampling grids along the north shore of Torch Lake (LLRP property between the marina and the east side of LLRP Rustic Campground) as shown in **Figure 2 (Attachment A)**. In addition, 100-foot by 100-foot grids further inland from the shoreline grids, from west of the creek to the eastern edge of the swimming beach, were established. A total of 32 grids were identified. One biased sampling location was established within each grid based on visual observations and XRF screenings for metals in exposed soil/sediment or waste (white, clayey material), with the exception of Grid #11, which had been previously sampled by the MDEQ and START. At each grid sampling location, two soil/sediment samples were collected as follows:



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- One surface sample from 0 to three inches below ground surface (bgs);
- One sample from 12 to 18 inches bgs.
- Provided assistance to the U.S. EPA Research Vessel (R/V) Mud Puppy crew with collection of sediment samples offshore from Grid #12.
- Conducted visual assessment/photo documentation of Site soils, sediments, and surface water.
- Located all sampling locations with a Trimble global positioning system (GPS) receiver and prepared maps showing sampling locations and extent-of-contamination areas.
- Conducted sample and data management.
- Compiled, tabulated, and presented all findings with the geographic information system.

Between July 30, 2007, and July 31, 2007, WESTON START collected 75 soil samples, 2 from each of the 31 sampling grid locations, and 13 quality assurance/quality control (QA/QC) samples. All sampling locations are shown on **Figure 3 (Attachment A)**. One duplicate sample was collected for every 10 investigative samples from both the 0 to 3 inches bgs and 12 to 18 inches bgs sampling intervals. In addition, 1 equipment blank was collected for every 20 investigative samples. Samples were submitted to STAT Analytical Corporation laboratory in Chicago, Illinois, for analysis of five select metals via U.S. EPA Method 6020 (antimony, arsenic, barium, copper, and lead) and PCBs via EPA Method 8082. Results are presented in **Table 4 (Attachment C)**.

On August 6, 2007, and August 7, 2007, the U.S. EPA R/V Mud Puppy crew from the Great Lakes National Program Office and WESTON START collected nine ponar sediment samples (0 to six inches) from within Torch Lake, near the area of the white, clayey material, to help delineate the extent of contamination located off shore (**Attachment A - Figure 3**). Samples were submitted to STAT Analytical Corporation in Chicago, Illinois, for analysis of five select metals via U.S. EPA Method 6020 (antimony, arsenic, barium, copper, and lead) and PCBs via U.S. EPA Method 8082. Results are presented in **Table 5 (Attachment C)**.

**Figure 4 (Attachment A)** shows the sampling locations of samples detailed in **Tables 2, 3, 4 and 5 (Attachment C)** that exhibit contaminant concentrations exceeding MDEQ Part 201 RDCC. These





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samples include: LLV-Sediment1, LLV-Sediment2, LLV-Creek1, LLV-Beach1, LLV-2A, LLV-2B, LLV-MP2, LLV-14B, LLV-21A, and LLV-27A.

- Samples LLV-Sediment1, LLV-Sediment2, LLV-Creek1, and LLV-Beach1 were collected during initial Site activities and are proximal to the area containing white, clayey waste material. They contain several metals which exceeded the MDEQ Part 201 RDCC, as discussed previously (**Table 2 and 3**).
- Sampling location LLV-14B contained concentrations of arsenic (11 mg/kg) and lead (470 mg/kg) which exceeded MDEQ Part 201 RDCC (**Table 4**). The sample is located east of the creek, and northeast of the clayey waste material area.
- Location LLV-MP2 was collected off-shore from the area of white, clayey waste material with the U.S. EPA R/V Mud Puppy. The concentration of lead (1,300 mg/kg) exceeded the MDEQ Part 201 RDCC (**Table 5**).
- Sampling locations LLV-2A, LLV-2B, LLV-21A, and LLV-27A exhibited arsenic concentrations in excess of the MDEQ Part 201 RDCC (**Table 4**).
- The concentration of arsenic at LLV-2A (65 mg/kg) was more than ten times the MDEQ Part 201 RDCC and was flagged for further investigation.

WESTON START recommended further investigation of the white, clayey waste material initially identified by MDEQ, and further investigation of the area of high arsenic concentrations located near sampling location LLV-2A. The clayey material area was designated Area 1 and the arsenic area proximal to LLV-2A was designated Area 2. Based on results of reconnaissance and sampling, U.S. EPA determined there was an imminent and substantial threat to public health, welfare, and the environment present and the Site met the criteria for an emergency removal action provided for in the National Contingency Plan, 40 CFR 300.415(b)(2)(I), (iii) and (v).

## **EMERGENCY REMOVAL ACTIONS**

On August 3, 2007, U.S. EPA initiated an emergency removal action to mitigate the imminent threats to public health, welfare, and the environment posed by the presence of uncontrolled hazardous substances at the Site. On August 5, 2007, the ERRS contractor, EQM, mobilized to the Site to secure the property and begin Area 1 removal activities. OSC Kelly and START member



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Nancy Posavatz mobilized to the Site to begin oversight of removal activities and to further investigate Area 2.

### **Emergency Removal Summary**

Emergency removal activities began on August 6, 2007, and were completed on October 3, 2007. Photo documentation is provided in **Attachment E**. The emergency removal activities completed during this time period are summarized below.

- Between August 6 and August 7, 2007, ERRS secured the Site with snow fencing, denoted the area as "Authorized Personnel Only" with placards, and deployed hard- and soft-boom silt curtains to prevent migration of contaminated soil during excavation.
- On August 6, 2007, WESTON START delineated Area 1 by field screening with an XRF unit. The approximate extent of Area 1 was 200 feet by 200 feet. The direct contact threat was projected to be in the top 18 inches of soil/sediment.
- Excavation of Area 1 began on August 7, 2007 and was completed on August 12, 2007. Two excavators, one standard-reach and one long-reach, were used to excavate the top two to five feet of the area contaminated with clayey waste material, Area 1 (**Attachment A - Figure 5**). WESTON START directed the excavation limits with XRF screening and visual identification of the white, clayey waste material. An estimated 905.5 tons of soil were removed and stockpiled at the Site for later disposal. ERRS treated the excavated soil at the Site by adding Calciment® and covered it with plastic sheeting to prevent contact with the public and the addition of moisture. Calciment is used to fix metals in soils and enable disposal as non-hazardous.
- Between August 7, 2007, and August 8, 2007, WESTON START and ERRS conducted further investigation and delineation of Area 2. OSC Kelly requested a letter report on August 8, 2007, to assist in the U.S. EPA's assessment of Area 2. WESTON START submitted a letter report summarizing observations at Area 2 on August 9, 2007, (**Attachment F**). Area 2 was determined to be approximately three feet by 200 feet with the direct contact threat determined to be in the top 18 inches of soil/sediment.
- ERRS initiated the soil/sediment excavation at Area 2 on August 13, 2007, and completed activities on August 15, 2007. The long-reach excavator was used to excavate the top 18 inches of soil from Area 2 (**Attachment A - Figure 5**). An estimated 64.69 tons of soil was removed and stockpiled at the Site for later disposal. ERRS covered the soil pile with plastic sheeting to prevent contact with the public and the addition of moisture.



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- Between August 15, 2007, and October 3, 2007, daily monitoring of the soil piles was conducted by ERRS to ensure safe storage.
- On August 12, 2007, WESTON START collected confirmatory soil samples from the bottom of the excavations. Three samples were collected from Area 1 (LLV-EXC-1, LLV-EXC-2, and LLV-EXC-3) and one sample and one duplicate sample were collected from Area 2 (LLV-2EXC-2 and LLV-2EXC-2 DUP). Samples were submitted to Microbac Laboratory located in Merrillville, Indiana, for analysis of five select metals via U.S. EPA Method 6010B (antimony, arsenic, barium, copper, and lead) and mercury via U.S. EPA Method 7471A and total PCBs via U.S. EPA Method SW8082. Analytical results are presented in **Table 6 (Attachment C)**. All concentrations were below MDEQ Part 201 RDCC with the exception of the sample collected from Area 2, LLV-2EXC-2, which exceeded the MDEQ Part 201 RDCC for arsenic at 20 mg/kg.
- On August 15, 2007, WESTON START collected surface water samples from the creek and along the swimming beach (LLV-Creek1, LLV-Beach1, and LLV-Beach2). All concentrations were below MDEQ Part 201 RDWC and Residential Groundwater Contact Criteria (**Attachment C - Table 7**). Based on a review of these results, the WUPDHD removed the swimming advisory at the Site's swimming beach.
- Area 1 was capped with clean soil. Geotextile fabric was placed above the excavation on Area 2 and backfilled with rip-rap.

#### **Waste Characterization Sampling Summary**

- On August 20, 2007, ERRS collected two composite soil samples from the excavated, staged soil stock piles, one from the Area 1 and one from the Area 2 (LL-Lead Soil and LL-Arsenic Soil) stockpiles. Samples were submitted to Microbac Laboratory in Merrillville, Indiana, for TCLP analyses. Laboratory reports are provided in **Attachment G**. Analysis of soil sample LL-Lead Soil yielded a TCLP lead result of 48 mg/L, exceeding the TCLP limit for lead of 5 mg/L. ERRS recommended allowing the soil to cure for an additional week.
- On August 28, 2007, one composite soil sample was again collected from Area 1 for waste characterization analysis. Laboratory reports are presented in **Attachment G**. The sample contained a concentration of TCLP lead of 14 mg/L, again exceeding the TCLP limit for lead of 5 mg/L. The Area 1 soil was subsequently disposed of as a characteristic hazardous waste (D008).

#### **Disposal Summary**

- On September 24, 2007, ERRS commenced transportation of the contaminated soil to disposal facilities.



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- Soil from Area 1 was transported and disposed of as hazardous waste (D008) at the Environmental Quality Company (EQ) disposal facility located in Belleville, Michigan.
- Soil from Area 2 was transported and disposed of as non-hazardous waste at the Delta Landfill located in Escanaba, Michigan.
- On October 3, 2007 ERRS completed removal and disposal of hazardous soil.

**Site Restoration Summary**

- Site restoration in Area 1 included the placement of clean fill followed by reseeded.
- Site restoration in Area 2 included the placement of geotextile fabric and rip rap up to the surrounding grade.

This letter report serves as the final TDD deliverable. All tasks pertaining to this TDD have been completed. The emergency removal actions of Area 1 and Area 2 addressed the direct contact threat to the public. Further investigation of possible contamination greater than 18 inches below the surface is recommended as follow-up activities by U.S. EPA’s Remedial Branch. If you have any questions or comments, please do not hesitate to contact one of us.

Very truly yours,  
Weston Solutions, Inc.

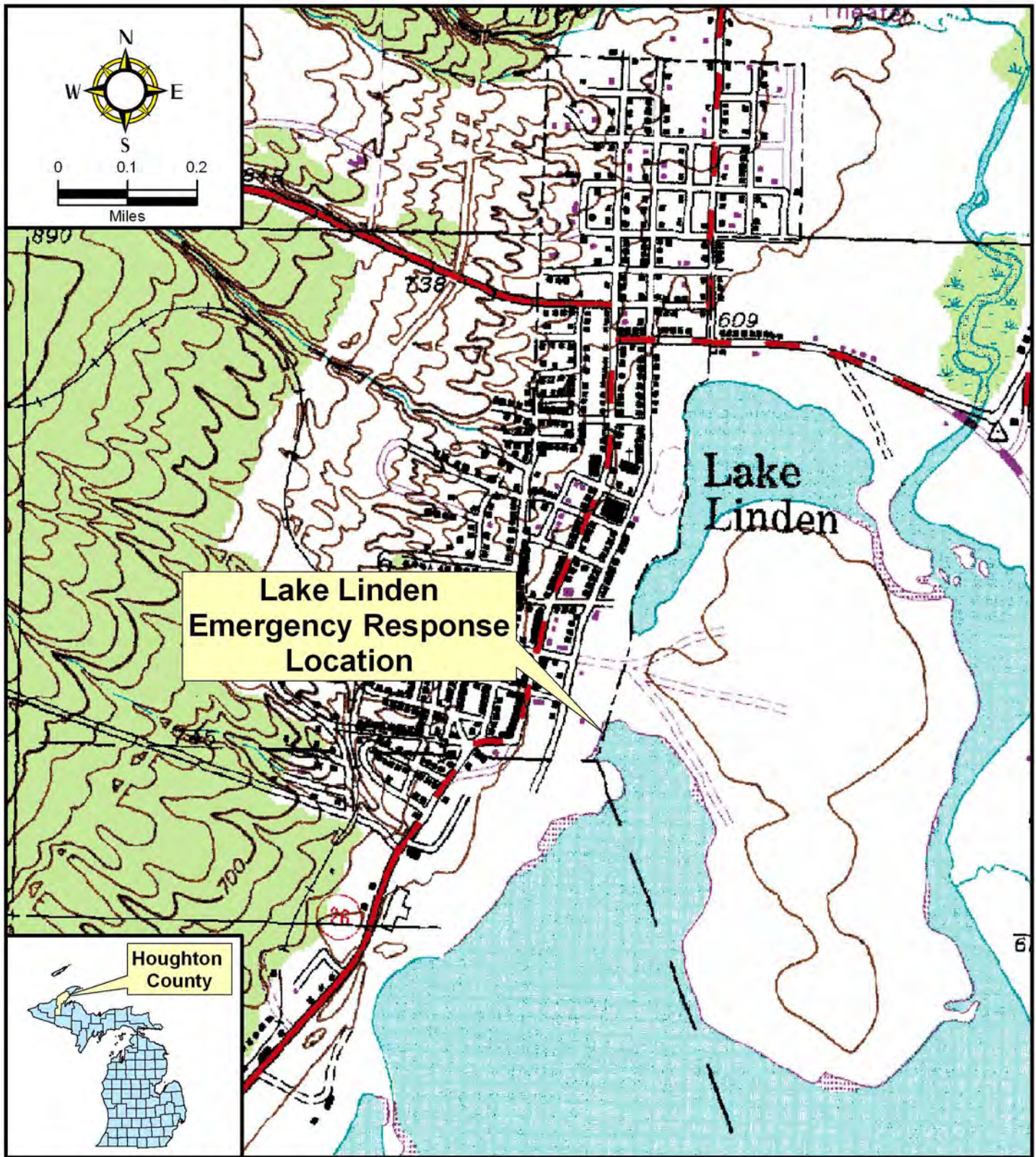
Nancy Posavatz  
WESTON START Project Lead

Daniel M. Capone  
WESTON START Project Manager

- Attachments: A – Figures  
 B – MDEQ Data Tables  
 C – START Analytical Laboratory Results  
 D – Sampling and Analysis Plan  
 E – Photographic Documentation  
 F – Area 2 Letter Report, dated 8/9/07  
 G – ERRS Waste Characterization Data

**ATTACHMENT A**  
**FIGURES**





Source of Topo Map: Michigan Geographic Data Library (C) 2007

**Figure 1**

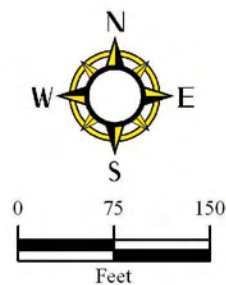
 <p>Prepared for:  <b>U.S. EPA REGION V</b>          Contract No: EP-S5-06-04</p> <p>TDD No.: S05-0001-0707-021          DCN: 248-2A-ABHD</p>	 <p>Prepared by:  <b>WESTON SOLUTIONS, INC.</b>          2501 Jolly Road, Suite 100          Okemos, MI</p>	<p>SITE LOCATION MAP          LAKE LINDEN - ER          LAKE LINDEN, HOUGHTON CO., MI</p> <p>October 2007          Scale: 1"= 0.2 mile</p>
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Source of Imagery: Michigan Geographic Data Library (C) 2007  
 Date of Photography: 06/21/2005

**Figure 2**



**Legend**

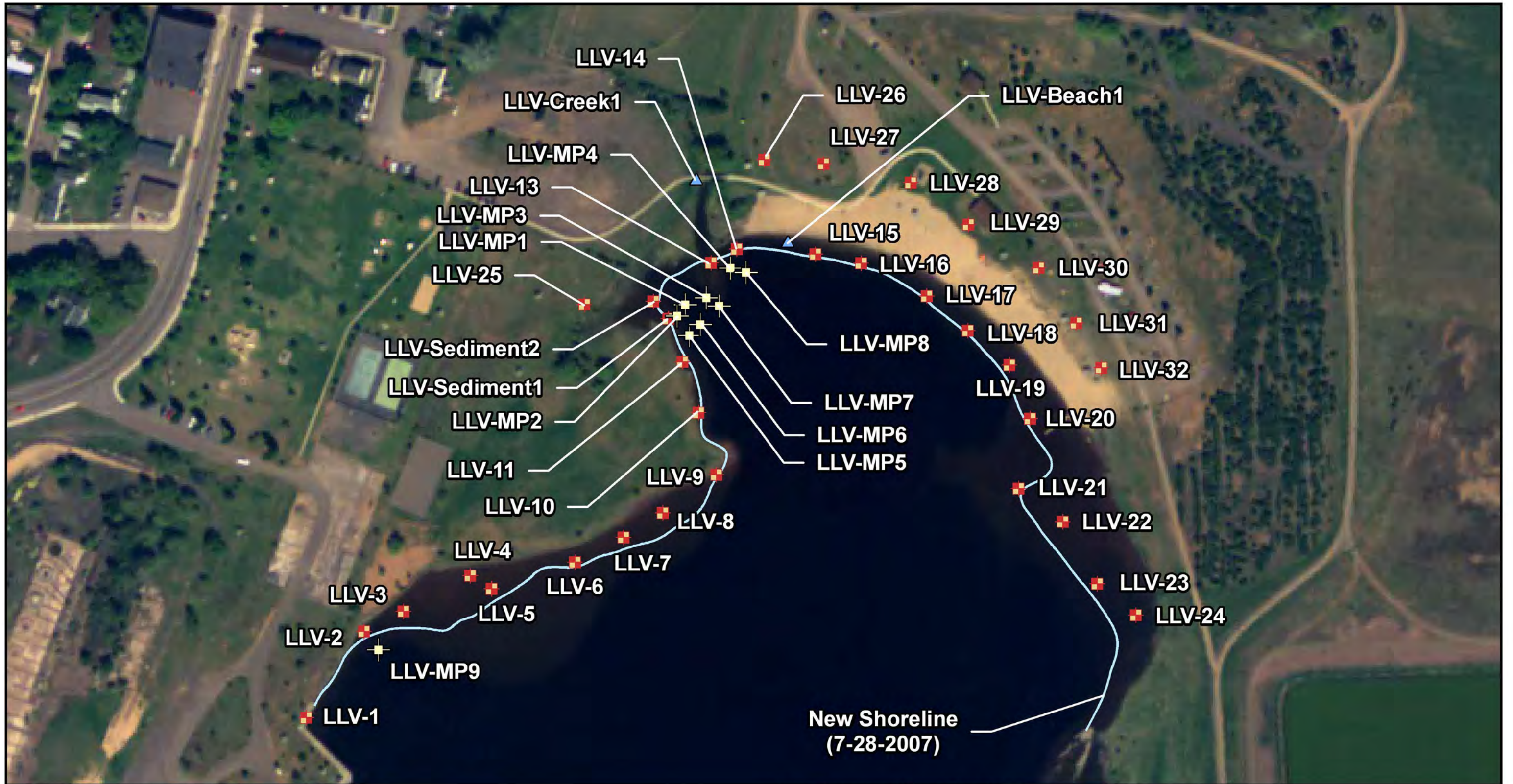
-  Shoreline (7-28-2007)
-  100 Foot Sampling Grid

Prepared for:  
**U.S. EPA REGION V**  
 Contract No: EP-S5-06-04  
 TDD No.: S05-0001-0707-021  
 DCN: 248-2A-ABHD

  
 Prepared by:  
**WESTON SOLUTIONS, INC.**  
 2501 Jolly Road, Suite 100  
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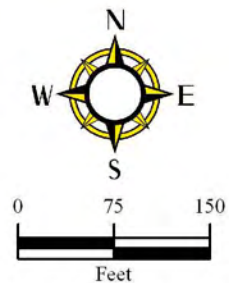
SOIL RECONNAISSANCE AND  
 SAMPLING GRIDS  
 LAKE LINDEN - ER  
 LAKE LINDEN, HOUGHTON CO., MI  
 September 2007  
 Scale: 1"= 150





Source of Imagery: Michigan Geographic Data Library (C) 2007  
 Date of Photography: 06/21/2005

**Figure 3**



**Legend**

-  Mud Puppy Sampling Location
-  Soil Sampling Location
-  Water Sampling Location
-  Shoreline (7-28-2007)

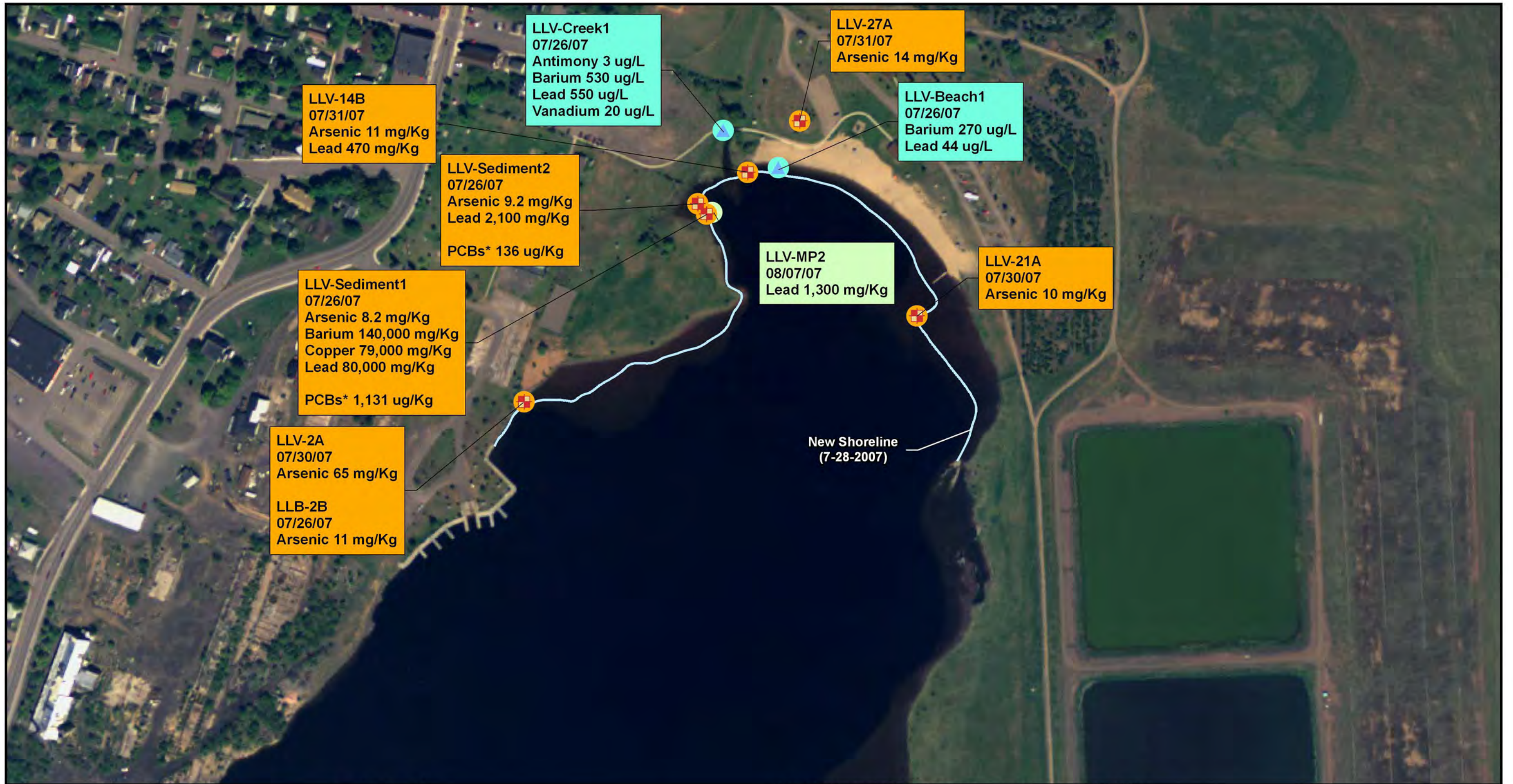
Prepared for:  
**U.S. EPA REGION V**  
 Contract No: EP-S5-06-04

TDD No.: S05-0001-0707-021  
 DCN: 248-2A-ABHD

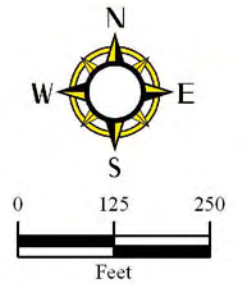
  
 Prepared by:  
**WESTON SOLUTIONS, INC.**  
 2501 Jolly Road, Suite 100  
 Okemos, MI

SAMPLING LOCATIONS  
 LAKE LINDEN - ER  
 LAKE LINDEN, HOUGHTON CO., MI  
 September 2007  
 Scale: 1"= 150





Source of Imagery: Michigan Geographic Data Library (C) 2007  
 Date of Photography: 06/21/2005



**Legend**

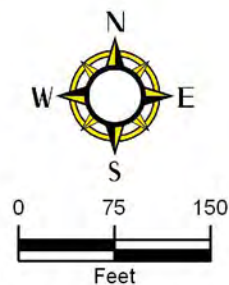
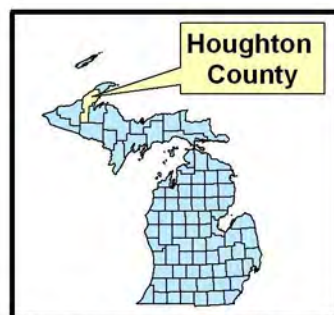
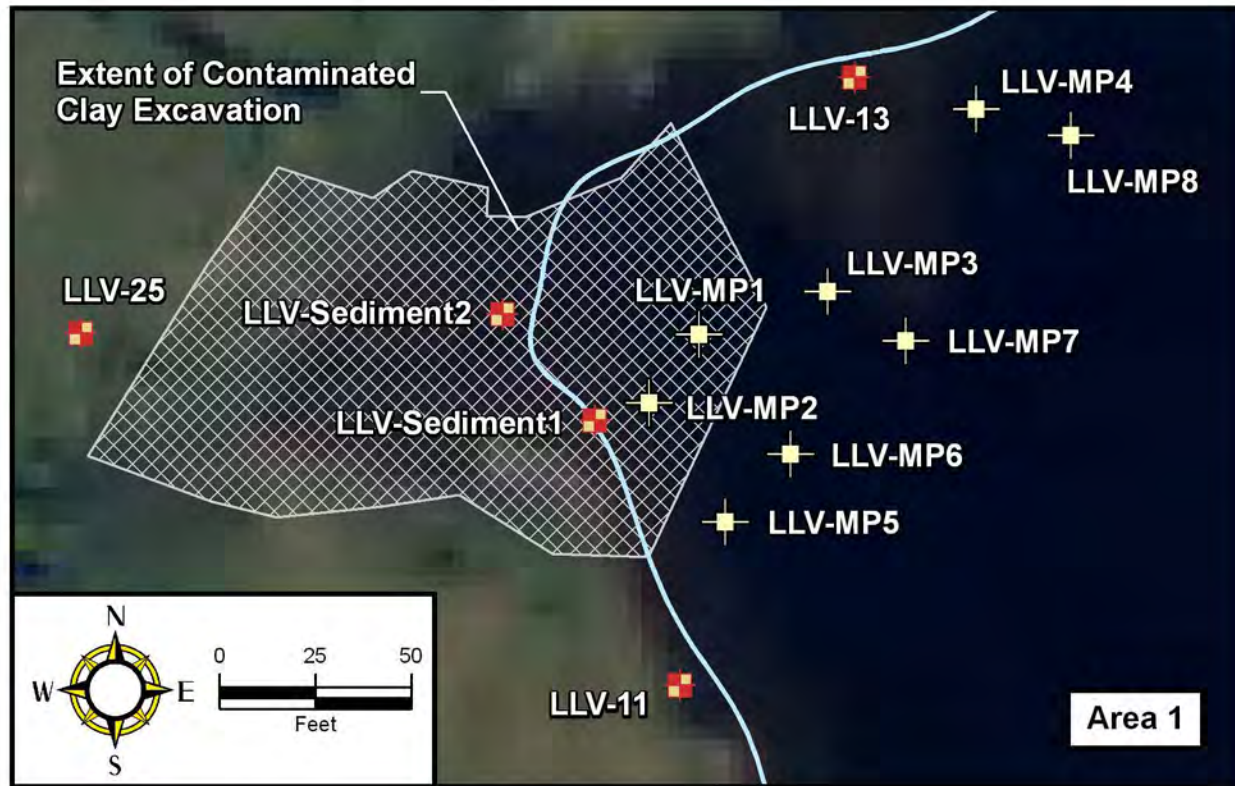
- ⊕ Soil Sample Exceeds Part 201 RDCC
- Water Sample Exceeds Applicable Part 201 Criteria
- Sediment Sample Exceeds Part 201 RDCC

Note: PCBs\* have been included on this figure; however, concentrations do not exceed Part 201 RDCC.  
 PCB - Polychlorinated Biphenyl  
 RDCC - Residential Direct Contact Criteria  
 mg/Kg - milligrams per kilogram; mg/L - milligrams per liter

**Figure 4**

 Prepared for: <b>U.S. EPA REGION V</b> Contract No: EP-S5-06-04	 Prepared by: <b>WESTON SOLUTIONS, INC.</b> 2501 Jolly Road, Suite 100 Okemos, MI	CRITERIA EXCEEDANCE MAP LAKE LINDEN - ER LAKE LINDEN, HOUGHTON CO., MI August, 2007 Scale: 1"= 250'
TDD No.: S05-0001-0707-021 DCN: 248-2A-ABHD		





**Legend**

- Mud Puppy Sampling Locations
- Soil Sampling Location
- Water Sampling Location
- Excavation
- Shoreline (7-28-2007)

Source of Imagery: Michigan Geographic Data Library (C) 2007  
Date of Photograph: 06/21/2005

**Figure 5**

<p>Prepared for: <b>U.S. EPA REGION V</b> Contract No: EP-S5-06-04</p>	<p>Prepared by: <b>WESTON SOLUTIONS, INC.</b> 2501 Jolly Road, Suite 100 Okemos, MI</p>	<p>EXTENT OF CONTAMINATED CLAY AND ARSENIC SOILS EXCAVATIONS LAKE LINDEN - ER LAKE LINDEN, HOUGHTON CO., MI</p>
		<p>TDD No.: S05-0001-0707-021 DCN: 248-2A-ABHD</p>



**ATTACHMENT B**  
**MDEQ DATA TABLES**

**Table 1**  
**Summary of Analytical Results of Clayey Material Collected by MDEQ**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**June and July 2007**

Parameter	Sample Name	LK Linden Park	A1380	A1381	A1382	A1383	A1384	A1385	Part 201 SDBL	Part 201 RDCC
	Sampling Date	6/21/07	07/24/07	07/24/07	07/24/07	07/24/07	07/24/07	07/24/07		
	Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil		
	Sample Number/ Location	Clayey Material	Tan /Water Edge	Gray/Green Mid PT	Gray/South Side	7' from Grass/North Side	Center	Drum Piece/West		
	Units									
Antimony	mg/Kg-dry			84		98	NT	160		180
Arsenic	mg/Kg-dry						NT		5.8	7.6
Barium	mg/Kg-dry			14,000		16,000	NT		75	37,000
Beryllium	mg/Kg-dry	11	9	2	11	3	NT	3	NA	410
Cadmium	mg/Kg-dry	100	35	19	50	39	NT	21	1	550
Chromium	mg/Kg-dry	210	180	36	170	52	NT	95	18	790,000
Cobalt	mg/Kg-dry	33	33	12	83	19	NT	14	6.8	2,600
Copper	mg/Kg-dry			19,000		18,000	NT		32	20,000
Iron	mg/Kg-dry	34,000	26,000	15,000	34,000	26,000	NT	21,000	12,000	160,000
Lead	mg/Kg-dry						NT		21.0	400
Mercury	mg/Kg-dry	1.40	1.50	0.31	1.30	0.38	NT	1.20	0.1	160.0
Nickel	mg/Kg-dry	180	200	68	250	120	NT	97	20	4,000
Selenium	mg/Kg-dry	36	16	4	12	4	NT	6	0.4	2,600
Silver	mg/Kg-dry	67	400	97	400	130	NT	160	1	2,500
Thallium	mg/Kg-dry	0.5	ND	ND	ND	ND	NT	ND	NA	35
Vanadium	mg/Kg-dry	17	ND	27	26	38	NT	22	NA	750
Zinc	mg/Kg-dry	4,700	6,300	1,200	5,000	2,100	NT	22,000	47	170,000
PCBs (Total)	ug/Kg-dry			1.6		1.0			NA	4

NOTES:  
Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.  
Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level  
Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria  
mg/kg - Milligrams per kilogram  
START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor  
"--" Not listed in MDEQ Part 201 Tables  
< - less than listed method limit of detection  
NT - Not tested

**ATTACHMENT C**  
**START ANALYTICAL DATA TABLES**

**Table 2**  
**Summary of Analytical Results of Clayey Material Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, START**  
**July 26, 2007**

Parameter	Sample Name	Test Method	LLV-Sediment1	LLV-Sediment2	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/26/07	07/26/07		
	Sample Matrix		Soil	Soil		
	Sample Number/ Location		Clayey material	Clayey/silt material		
	Units					
Cyanide (total)	mg/Kg-dry	EPA 9012B	<0.20	<0.20	0.39	<b>12</b>
Aluminum	mg/Kg-dry	EPA 6010B	5,800	7,800	6,900	<b>50,000</b>
Barium	mg/Kg-dry	EPA 6010B		350	75	<b>37,000</b>
Beryllium	mg/Kg-dry	EPA 6010B	8.5	1.0	--	<b>410</b>
Cadmium	mg/Kg-dry	EPA 6010B	120	4.2	1	<b>550</b>
Calcium	mg/Kg-dry	EPA 6010B	22,000	6,600	--	--
Chromium	mg/Kg-dry	EPA 6010B	290	19	18	<b>790,000</b>
Cobalt	mg/Kg-dry	EPA 6010B	30	10	6.8	<b>2,600</b>
Copper	mg/Kg-dry	EPA 6010B		1,900	32	<b>20,000</b>
Iron	mg/Kg-dry	EPA 6010B	33,000	13,000	12,000	<b>160,000</b>
Magnesium	mg/Kg-dry	EPA 6010B	5,100	7,000	--	<b>1,000,000</b>
Potassium	mg/Kg-dry	EPA 6010B	280	540	--	--
Sodium	mg/Kg-dry	EPA 6010B	130	110	--	<b>1,000,000</b>
Vanadium	mg/Kg-dry	EPA 6010B	6.1	28	--	<b>750</b>
Antimony	mg/Kg-dry	SW6020	50	0.97	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020			5.8	<b>7.6</b>
Lead	mg/Kg-dry	SW6020			21	<b>400</b>
Manganese	mg/Kg-dry	SW6020	220	170	440	<b>25,000</b>
Nickel	mg/Kg-dry	SW6020	160	32	20	<b>4,000</b>
Selenium	mg/Kg-dry	SW6020	9.1	0.53	0.4	<b>2,600</b>
Silver	mg/Kg-dry	SW6020	45	8.0	1	<b>2,500</b>
Thallium	mg/Kg-dry	SW6020	<0.50	<0.50	--	<b>35</b>
Zinc	mg/Kg-dry	SW6020	13,000	390	47	<b>170,000</b>
Mercury	mg/Kg-dry	EPA 7471A	1.9	0.11	0.1	<b>160.0</b>

PCBs (Total)	ug/Kg-dry		1,131	136	--	<b>4,000</b>
Bis(2-ethylhexyl)phthalate	ug/Kg-dry	EPA 8270C	340	<330	--	2800
2-Fluorophenol	ug/Kg-dry	EPA 8270C	37	48	--	---
Phenol-d5	ug/Kg-dry	EPA 8270C	44	52	--	12,000
Nitrobenzene-d5	ug/Kg-dry	EPA 8270C	42	51	--	100
2-Fluorobiphenyl	ug/Kg-dry	EPA 8270C	46	52	--	---
2,4,6-Tribromophenol	ug/Kg-dry	EPA 8270C	54	66	--	---
Terphenyl-d14	ug/Kg-dry	EPA 8270C	46	53	--	---

NOTES:

Results in shaded boxes exceed the Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in Part 201 Tables

< - less than listed method limit of detection

**Table 3**  
**Summary of Analytical Results of Surface Water Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 26, 2007**

	Sample Name	LLV Beach 1	LLV Creek 1		
	Sampling Date	7/26/2007	7/26/2007		
	Sample Matrix	Water	Water		
	Sample Number/ Location	LLV Beach	LLV Creek, N. of Bridge		
Parameter	Units	ug/L	ug/L	Part 201 RGCC	Part 201 RDWC
Barium	µg/L	270	530	1.4E+7	2,000 (A)
Beryllium	µg/L	ND	ND	2.9E+5	4.0 (A)
Cadmium	µg/L	ND	1.2	1.9E+5	5.0 (A)
Chromium (III)	µg/L	ND	14	2.9E+8	100 (A)
Copper	µg/L	240	990	7.4E+6	1,000 (E)/HB = 1,400
Lead	µg/L	<b>44</b>	<b>550</b>	ID	4.0 (L)
Manganese	µg/L	180	720	9.1E+6	50 (E)/HB = 860
Nickel	µg/L	ND	ND	7.4E+7	100 (A)
Zinc	µg/L	ND	110	1.1E+8	2,400
Calcium	µg/L	57,000	33,000	NA	NA
Iron	µg/L	<b>2,800</b>	<b>14,000</b>	5.8E+7	300 (E)/HB = 2,000
Magnesium	µg/L	5,000	7,000	1.0E+9 (D)	4.00E+05
Sodium	µg/L	7,700	14,000	1.0E+9 (D)	1.20E+05
Aluminum	µg/L	<b>3,100</b>	<b>3,900</b>	6.4E+7	50 (V)
Antimony	µg/L	ND	3	68,000	6.0 (A)
Arsenic	µg/L	9.50	<b>20</b>	4,300	10 (A)
Cobalt	µg/L	ND	ND	2.4E+6	40
Potassium	µg/L	1,600	3,800	NA	NA
Selenium	µg/L	ND	ND	9.7E+5	50 (A)
Silver	µg/L	0.88	4.6	1.5E+6	34
Thallium	µg/L	ND	ND	13,000	2.0 (A)
Vanadium	µg/L	<b>7.80</b>	<b>20</b>	9.7E+5	4.5
Mercury	µg/L	ND	ND	56 (S)	2.0 (A)
pH	µg/L	7.55	7.72	NA	6.5-8.5 (E)
Cyanide	µg/L	ND	ND	57,000	200 (A)

Notes:

Metal results are for total metals (unfiltered)

Part 201-RGCC - MDEQ Part 201 Residential Groundwater Direct Contact Criteria

Part 201-RDWC - MDEQ Part 201 Residential Groundwater Drinking Water Criteria

**Bold font results exceed MDEQ Part 201 Residential Drinking Water Criteria**

ND - below detection limit

HB = Health Based

µg/L = micrograms per liter

**Table 3**  
**Summary of Analytical Results of Surface Water Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 26, 2007**

Part 201 Criteria Footnotes:

A - Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 pa 399, mcl 325.1005.

E - Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).

L - Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(10) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specific rules. The generic residential drinking water criterion of 4 ug/L is linked to the generic residential soil direct contact criterion of 400 mg/kg.

S - Criterion defaults to the hazardous substance-specific water solubility limit.

X - The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV) listed in the table in this footnote, except for those HDV indicated with an asterisk. For HDV with an asterisk, the generic GSI criterion shall be the lowest of the HDV, the WV, and the calculated FCV.

Note: the HDV was applied for this data as Torch Lake is considered a connecting water to a Great Lake (Lake Superior).

Final chronic value (FCV) = the level of a substance or a mixture of substances that does not allow injurious or debilitating effects in an aquatic organism resulting from repeated long-term exposure to a substance relative to the organisms lifespan

Final acute value (FAV) = the level of a substance or a mixture of substances that does not allow injurious or debilitating effects in an aquatic organism resulting from short-term exposure to a substance relative to the organisms lifespan



**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-1A	LLV-1B	LLV-2A	LLV-2B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#1, 0-3"	LLV Shoreline, Grid#1, 12-18"	LLV Shoreline, Grid#2, 0-3"	LLV Shoreline, Grid#2, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.5	3.1	< 2.4	< 2.5	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	3	2			5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	20	21	17	18	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	1900	7100	1100	5100	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	23	40	27	9	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-3A	LLV-3B	LLV-4A	LLV-4B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#3, 0-3"	LLV Shoreline, Grid#3, 12-18"	LLV Shoreline, Grid#4, 0-3"	LLV Shoreline, Grid#4, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.6	< 2.6	< 2.5	< 2.4	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	7	7	2	2	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	12	10	21	19	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	810	1200	770	1500	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	19	14	16	8	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-5A	LLV-5B	LLV-6A	LLV-6B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#5, 0-3"	LLV Shoreline, Grid#5, 12-18"	LLV Shoreline, Grid#6, 0-3"	LLV Shoreline, Grid#6, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.6	< 2.4	< 2.6	< 2.3	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	1.7	1.4	2.4	2.3	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	17	16	14	11	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	6400	1300	2600	3900	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	20	20	35	13	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-7A	LLV-7B	LLV-7ADUP	LLV-7BDUP	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#7, 0-3"	LLV Shoreline, Grid#7, 12-18"	LLV Shoreline, Grid#7, 0-3"	LLV Shoreline, Grid#7, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.5	< 2.6	< 2.4	< 2.4	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	3	2	2	3	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	16	11	9.3	14	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	1,000	560	470	1,100	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	27	22	18	25	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-8A	LLV-8B	LLV-9A	LLV-9B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#8, 0-3"	LLV Shoreline, Grid#8, 12-18"	LLV Shoreline, Grid#9, 0-3"	LLV Shoreline, Grid#9, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.2	< 2.3	< 2.1	< 2.4	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	< 1.1	< 1.2	1.6	1.6	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	7.2	7.4	11	12	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	1,500	1,000	1,700	2,200	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	11	14	59	36	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-10A	LLV-10B	LLV-11A	LLV-11B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#10, 0-3"	LLV Shoreline, Grid#10, 12-18"	LLV Shoreline, Grid#11, 0-3"	LLV Shoreline, Grid#11, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.5	< 2.3	< 2.2	< 2.4	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	2.2	< 1.2	2.7	1.3	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	14	8	43	41	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	910	970	800	780	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	74	18	79	16	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-13A	LLV-13B	LLV-14A	LLV-14B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/31/07	07/31/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#13, 0-3"	LLV Shoreline, Grid#13, 12-18"	LLV Shoreline, Grid#14, 0-3"	LLV Shoreline, Grid#14, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.5	< 2.6	< 2.4	< 2.3	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	1.7	3.2	<1.2		5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	54	100	19	110	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	300	1100	72	1500	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	23	49	4.5		21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-15A	LLV-15B	LLV-16A	LLV-16B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/31/07	07/31/07	07/31/07	07/31/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#15, 0-3"	LLV Shoreline, Grid#15, 12-18"	LLV Shoreline, Grid#16, 0-3"	LLV Shoreline, Grid#16, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.3	< 2.4	< 2.3	< 2.5	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	< 1.2	2.6	< 1.2	1.6	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	15	21	14	23	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	130	590	160	380	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	2.5	20	2.7	16	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection



**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-17A	LLV-17B	LLV-18A	LLV-18B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/31/07	07/31/07	07/31/07	07/31/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#17, 0-3"	LLV Shoreline, Grid#17, 12-18"	LLV Shoreline, Grid#18, 0-3"	LLV Shoreline, Grid#18, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.4	< 2.5	< 2.2	< 2.4	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	2.2	2.2	2	1.2	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	21	40	17	20	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	390	440	290	930	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	10	49	9.4	13	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-19A	LLV-19B	LLV-20A	LLV-20B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/31/07	07/31/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#19, 0-3"	LLV Shoreline, Grid#19, 12-18"	LLV Shoreline, Grid#20, 0-3"	LLV Shoreline, Grid#20, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.3	< 2.7	< 2.5	< 2.4	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	2.8	2.1	3.9	1.5	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	19	25	28	23	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	440	930	410	850	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	4.7	39	9.7	4	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-21A	LLV-21B	LLV-22A	LLV-22B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#21, 0-3"	LLV Shoreline, Grid#21, 12-18"	LLV Shoreline, Grid#22, 0-3"	LLV Shoreline, Grid#22, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.3	< 2.5	< 2.3	< 2.4	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020		5	2.3	1.7	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	57	49	22	22	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	3200	760	580	580	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	10	9.6	8.5	2.5	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

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**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-23A	LLV-23B	LLV-24A	LLV-24B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#23, 0-3"	LLV Shoreline, Grid#23, 12-18"	LLV Shoreline, Grid#24, 0-3"	LLV Shoreline, Grid#24, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.6	< 2.2	< 2.5	< 2.3	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	5	1.6	4.6	2.1	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	66	27	80	23	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	630	880	750	570	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	15	3	5.6	3.7	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

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**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-25A	LLV-25B	LLV-26A	LLV-26B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/31/07	07/31/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#25, 0-3"	LLV Shoreline, Grid#25, 12-18"	LLV Shoreline, Grid#26, 0-3"	LLV Shoreline, Grid#26, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2	< 2	< 1.9	< 2	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	5.9	1.3	3	1.4	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	33	11	28	18	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	100	1200	60	1100	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	9.3	2.2	6.5	29	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

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**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-27A	LLV-27B	LLV-28A	LLV-28B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/31/07	07/31/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#27, 0-3"	LLV Shoreline, Grid#27, 12-18"	LLV Shoreline, Grid#28, 0-3"	LLV Shoreline, Grid#28, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2	< 2	< 1.9	< 2.2	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020		1.5	1.6	1.5	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	110	25	16	19	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	2,000	730	33	170	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	110	43	1.6	3	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

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< - less than listed method limit of detection

**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-29A	LLV-29B	LLV-30A	LLV-30B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/31/07	07/31/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#29, 0-3"	LLV Shoreline, Grid#29, 12-18"	LLV Shoreline, Grid#30, 0-3"	LLV Shoreline, Grid#30, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2	< 2.1	< 2	< 2.2	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	2.6	1.1	1.5	1.4	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	34	23	16	12	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	92	820	570	580	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	7.6	2.6	10	2.6	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

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**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-31A	LLV-31B	LLV-32A	LLV-32B	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/31/07	07/31/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#31, 0-3"	LLV Shoreline, Grid#31, 12-18"	LLV Shoreline, Grid#32, 0-3"	LLV Shoreline, Grid#32, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2	< 2.1	< 2	< 2.3	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	1.1	1.3	< 0.99	2.4	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	18	16	17	120	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	200	490	140	1100	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	3.8	2.3	0.94	4.2	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

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**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-13ADUP	LLV-13BDUP	LLV-28ADUP	LLV-28BDUP	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/30/07	07/30/07	07/30/07	07/30/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#13, 0-3"	LLV Shoreline, Grid#13, 12-18"	LLV Shoreline, Grid#28, 0-3"	LLV Shoreline, Grid#28, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2	< 2.1	< 2.1	< 2.2	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	2.6	1.1	2	1.5	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	34	23	18	19	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	92	820	39	250	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	7.6	2.6	1.9	4.7	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

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**Table 4**  
**Summary of Laboratory Analytical Results For Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**July 30- July 31, 2007**

Parameter	Sample Name	Test Method	LLV-15ADUP	LLV-15BDUP	LLV-22ADUP	LLV-22BDUP	Part 201 SDBL	Part 201 RDCC
	Sampling Date		07/31/07	07/31/07	07/31/07	07/31/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV Shoreline, Grid#15, 0-3"	LLV Shoreline, Grid#15, 12-18"	LLV Shoreline, Grid#22, 0-3"	LLV Shoreline, Grid#22, 12-18"		
	Units							
Antimony	mg/Kg-dry	SW6020	< 2.3	< 2.4	< 2.4	< 2.3	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6020	< 1.2	3.1	1.9	1.6	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6020	13	22	21	18	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6020	130	550	720	570	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6020	2.4	27	3.9	2.2	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.7	<0.7	<0.7	<0.7	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 5**  
**Summary of Laboratory Analytical Results For Sediment Samples Collected via the RV Mudpuppy**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**August 7 - August 8, 2007**

Parameter	Sample Name	Test Method	LLV-MP1-01	LLV-MP2-01	LLV-MP3-01	LLV-MP4-01	Part 201 SDBL	Part 201 RDCC
	Sampling Date		08/07/07	08/07/07	08/07/07	08/07/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV-MP1	LLV-MP2	LLV-MP3	LLV-MP4		
	Units							
Antimony	mg/Kg-dry	SW6020	<5.2	5.9	<4.7	<5.2	--	180
Arsenic	mg/Kg-dry	SW6020	<2.6	<2.9	<2.3	<2.6	5.8	7.6
Barium	mg/Kg-dry	SW6020	87	930	29	25	75	37,000
Copper	mg/Kg-dry	SW6020	360	1,700	200	340	32	20,000
Lead	mg/Kg-dry	SW6020	100		40	21	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.77	0.58	<0.70	<0.77	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

All samples collected using a Ponar dredge deployed from the RV Mudpuppy.

**Table 5**  
**Summary of Laboratory Analytical Results For Sediment Samples Collected via the RV Mudpuppy**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**August 7 - August 8, 2007**

Parameter	Sample Name	Test Method	LLV-MP5-01	LLV-MP6-01	LLV-MP7-01	LLV-MP8-01	Part 201 SDBL	Part 201 RDCC
	Sampling Date		08/07/07	08/07/07	08/07/07	08/07/07		
	Sample Matrix		Soil	Soil	Soil	Soil		
	Sample Number/ Location		LLV-MP5	LLV-MP6	LLV-MP7	LLV-MP8		
	Units							
	Test Method							
Antimony	mg/Kg-dry	SW6020	<4.8	<6.2	<5.0	<7.4	--	180
Arsenic	mg/Kg-dry	SW6020	<2.4	<3.1	<2.5	4.1	5.8	7.6
Barium	mg/Kg-dry	SW6020	170	120	32	150	75	37,000
Copper	mg/Kg-dry	SW6020	310	330	100	540	32	20,000
Lead	mg/Kg-dry	SW6020	130	110	11	68	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.70	<0.91	<0.77	<1.05	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

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< - less than listed method limit of detection

All samples collected using a Ponar dredge deployed from the RV Mudpuppy.

**Table 5**  
**Summary of Laboratory Analytical Results For Sediment Samples Collected via the RV Mudpuppy**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**August 7 - August 8, 2007**

Parameter	Sample Name	Test Method	LLV-MP-DUP-01	Part 201 SDBL	Part 201 RDCC
	Sampling Date		08/08/07		
	Sample Matrix		Soil		
	Sample Number/ Location		LLV-MP9		
	Units				
	Test Method				
Antimony	mg/Kg-dry	SW6020	<4.9	--	180
Arsenic	mg/Kg-dry	SW6020	<2.4	5.8	7.6
Barium	mg/Kg-dry	SW6020	66	75	37,000
Copper	mg/Kg-dry	SW6020	270	32	20,000
Lead	mg/Kg-dry	SW6020	97	21.0	<b>400</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.70	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

All samples collected using a Ponar dredge deployed from the RV Mudpuppy.

**Table 6**  
**Summary of Laboratory Analytical Results For Post-Excavation Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**August 12, 2007**

Parameter	Sample Name	Test Method	LLV-EXC-1	LLV-EXC-2	LLV-EXC-3	Part 201 SDBL	Part 201 RDCC
	Sampling Date		08/12/07	08/12/07	08/12/07		
	Sample Matrix		Soil	Soil	Soil		
	Sample Number/ Location		Area 1, Excavation	Area 1, Excavation	Area 1, Excavation		
	Units						
Antimony	mg/Kg-dry	SW6010B	< 0.93	2	< 0.93	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6010B	2.7	2.4	3.1	5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6010B	23	45	45	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6010B	2400	2900	3800	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6010B	6	130	280	21.0	<b>400</b>
Mercury	mg/Kg-dry	SW7471A	0.035	0.039	0.060	0.13	<b>160</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.033	0.038	<0.033	--	4

**NOTES:**

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 6**  
**Summary of Laboratory Analytical Results For Post-Excavation Soil/Sediment Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**August 12, 2007**

Parameter	Sample Name	Test Method	LLV-2EXC-2	LLV-2EXC-2 DUP	Part 201 SDBL	Part 201 RDCC
	Sampling Date		08/12/07	08/12/07		
	Sample Matrix		Soil	Soil		
	Sample Number/ Location		Area 2, Excavation	Area 2, Excavation		
	Units					
Antimony	mg/Kg-dry	SW6010B	< 0.93	< 0.97	--	<b>180</b>
Arsenic	mg/Kg-dry	SW6010B			5.8	<b>7.6</b>
Barium	mg/Kg-dry	SW6010B	14	12	75	<b>37,000</b>
Copper	mg/Kg-dry	SW6010B	5600	3500	32	<b>20,000</b>
Lead	mg/Kg-dry	SW6010B	3	4	21.0	<b>400</b>
Mercury	mg/Kg-dry	SW7471A	<0.037	<0.038	0.13	<b>160</b>
PCBs (Total)	mg/Kg-dry	SW8082	<0.033	<0.033	--	4

NOTES:

Results in shaded boxes exceed the MDEQ Part 201 Residential Direct Contact Criteria.

Part 201-SDBL - MDEQ Part 201 Statewide Default Background Level

Part 201-RDCC - MDEQ Part 201 Residential Direct Contact Criteria

mg/kg - Milligrams per kilogram

START - U.S. EPA's Superfund Technical Assistance and Response Team Contractor

"--" Not listed in MDEQ Part 201 Tables

< - less than listed method limit of detection

**Table 7**  
**Summary of Analytical Results of Post-Excavation Surface Water Samples Collected by START**  
**Lake Linden ER Site**  
**Lake Linden, Houghton County, Michigan**  
**August 15, 2007**

Parameter	Sample Name	LLV Beach 1	LLV Beach 2	LLV Creek 1	Part 201 RGCC	Part 201 RDWC
	Sampling Date	8/15/2007	8/15/2007	8/15/2007		
	Sample Matrix	Water	Water	Water		
	Sample Number/ Location	LLRP Swimming Beach	LLRP Swimming Beach	LLRP Creek, N. of Bridge		
	Units	ug/L	ug/L	ug/L		
Barium	μg/L	63	62	200	1.4E+7	2,000 (A)
Copper	μg/L	32	32	25	7.4E+6	1,000 (E)/HB = 1,400
Lead	μg/L	ND	ND	ND	ID	4.0 (L)
Zinc	μg/L	ND	ND	ND	1.1E+8	2,400
Antimony	μg/L	ND	ND	ND	68,000	6.0 (A)
Arsenic	μg/L	ND	ND	ND	4,300	10 (A)
Silver	μg/L	ND	ND	ND	1.5E+6	34
Vanadium	μg/L	ND	ND	ND	9.7E+5	4.5
Mercury	μg/L	ND	ND	ND	56 (S)	2.0 (A)

Notes:

Metal results are for total metals (unfiltered)

Part 201-RGCC - MDEQ Part 201 Residential Groundwater Direct Contact Criteria

Part 201-RDWC - MDEQ Part 201 Residential Groundwater Drinking Water Criteria

**Bold font results exceed MDEQ Part 201 Residential Drinking Water Criteria**

ND - below detection limit

HB = Health Based

μg/L = micrograms per liter

Part 201 Criteria Footnotes:

A - Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 pa 399, mcl 325.1005.

L - Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(10) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specific rules. The generic residential drinking water criterion of 4 ug/L is linked to the generic residential soil direct contact criterion of 400 mg/kg.



**ATTACHMENT D**  
**SAMPLING AND ANALYSIS PLAN**

# Sampling and Analysis Plan

For the  
Lake Linden Village Park  
Lake Linden, Houghton County, Michigan

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY  
REGION V

By

*Weston Solutions, Inc.  
Region V*

*Superfund Technical Assessment and Response Team III (START)  
July 28, 2007*

Approved by:

\_\_\_\_\_ Date \_\_\_\_\_  
U.S. EPA Region V On-Scene Coordinator

Projected Dates of Sampling: July 30 – August 3, 2007

CERCLA Site/Spill Identifier No.:

Contractor Organization: Weston Solutions, Inc.

Contract Name: START

Contract Number: EP-S5-06-04

Technical Direction Document No.:S05-0001-0707-021

## Preface and Instructions

This Sampling and Analysis template will be used to develop site-specific Sampling and Analysis Plans (SAPs) in conjunction with the U.S. Environmental Protection Agency (EPA) *Region 5 Instructions on the Preparation of a Superfund Division Quality Assurance Project Plan* and *START III Generic QAPP*. The SAP will describe technical and quality control activities specific to the data collection operation, and will refer back to the *START III Generic QAPP* for routine technical and quality assurance procedures that will be employed.

The user should incorporate previously developed planning documents such as work plans and Statements of Work (SOWs) directly into the SAP to facilitate its development and to preclude redundancy of effort. A copy of the SAP will be filed in the site file.

### Acronyms

<b>ATSDR</b>	Agency for Toxic Substances and Disease Registry
<b>CLP</b>	Contract Laboratory Program
<b>COC</b>	Contaminant of Concern
<b>CRL</b>	Central Regional Laboratory
<b>DAS</b>	Delivery of Analytical Services
<b>DQO</b>	Data Quality Objectives
<b>ERRS</b>	Emergency Rapid Response Services
<b>ERT</b>	Environmental Response Team
<b>MDL</b>	Method Detection Limit
<b>MS</b>	Matrix Spike
<b>MSD</b>	Matrix Spike Duplicate
<b>MSDS</b>	Material Safety Data Sheet
<b>NCP</b>	National Contingency Plan
<b>OSC</b>	On-Scene Coordinator
<b>PCB</b>	Polychlorinated Biphenyl
<b>PE</b>	Performance Evaluation
<b>QA</b>	Quality Assurance
<b>QAPP</b>	Quality Assurance Project Plan
<b>QC</b>	Quality Control
<b>QL</b>	Quantitation Limit
<b>RAL</b>	Removal Action Level
<b>RSCC</b>	Regional Sample Control Coordinator
<b>SAP</b>	Sampling and Analysis Plan
<b>SOP</b>	Standard Operating Procedure
<b>SOW</b>	Statement of Work
<b>START</b>	Superfund Technical Assessment and Response Team
<b>SVOC</b>	Semivolatile Organic Compound

<b>TAL</b>	Target Analyte List
<b>USCG</b>	United States Coast Guard
<b>VOA</b>	Volatile Organic Analysis
<b>VOC</b>	Volatile Organic Compound
<b>XRF</b>	X-Ray Fluorescence

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SAP Table 1: SAP Revision Form

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## **Appendices:**

Appendix A: Site Location Map, Proposed Sample Grid Map

## 1.0 Introduction

This SAP identifies the data collection activities and associated quality assurance/quality control (QA/QC) measures specific to the Lake Linden Village Park located in Lake Linden, Michigan. All data will be generated in accordance with the quality requirements described in the *START III Generic QAPP*, dated June 2006. The purpose of this SAP is to describe site-specific tasks that will be performed in support of the stated objectives. The SAP will reference back to the QAPP for “generic” tasks common to all data collection activities including routine procedures for sampling and analysis, sample documentation, equipment decontamination, sample handling, data management, assessment and data review. Additional site-specific procedures and/or modifications to procedures described in the *START III Generic QAPP* are described in the following SAP elements.

This SAP is prepared, reviewed and approved in accordance with the procedures detailed in the *START III Generic QAPP*. Any deviations or modifications to the approved SAP will be documented using **SAP Table 1: (SAP Revision Form)**.

## 2.0 Project Management and SAP Distribution

Management of the site will be as documented in the *START III Generic QAPP*. Refer to the *START III Generic QAPP* for organizational chart, communication pathways, personnel responsibilities and qualifications, and special personnel training requirements.

### 2.1 Project Team Members List

The following personnel will be involved in planning and/or technical activities performed for this data collection activity. Each will receive a copy of the approved SAP. (A copy of the SAP will also be retained in the site file.)

Personnel	Title	Organization	Phone Number	Email
Brian Kelly	OSC	EPA	734-692-7654	Kelly.Brian@epa.gov
Dan Capone	Project Manager	START	517-381-5932	Dan.Capone@westonsolutions.com
Nancy Posavatz	Project Leader	START	231-499-1151	nposavatz@grtusa.com
Eric Benson	Field Member	START	231-342-0360	eric@grtusa.com
Chris Douglas	Field Team Leader	START	517-256-7663	C.Douglas@westonsolution.com
Gary Swartz	Field Member	START	906-482-3043	G.Swartz@westonsolutions.com

Tonya Balla	Health and Safety Officer and QA Reviewer	START	847-918-4094	T.balla@westonsolutions.com
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### 3.0 Planning and Problem Definition

#### 3.1 Problem Definition

The Lake Linden Village Park (Site) is located in Lake Linden, Houghton County, Michigan at 47.18919 degrees north and 88.40629 degrees west. The Site is located within a delisted portion of the Torch Lake Superfund Site.

The Lake Linden Village Park (LLVP) is a publicly-owned recreational area located at the north end of Torch Lake at M-26, Lake Linden, Houghton County, Michigan. LLVP offers a public campground, playground, sandy swimming beach, dock and boat launch. The Village of Lake Linden owns two miles of the northern shore of Torch Lake which encompasses the LLVP. The entire area is associated with historic mine waste (mining stamp sands). As part of the Torch Lake Superfund site remedy, stamp sands were capped along the entire Torch Lake shoreline up to the water's edge. The low lake levels experienced in the area during 2007 (lake levels are down 1 to 2 feet) have exposed stamp sands and other potential waste material previously under water.

The Michigan Department of Environmental Quality (MDEQ), Western Upper Peninsula District Health Department (WUPDHD), Michigan Department of Community Health (MDCH), and Village of Lake Linden contacted the U.S. EPA on July 25, 2007 seeking guidance to identify actions that should be taken to address the potential environmental and public health concerns recently identified at the Site. The MDEQ sent reports of analytical data documenting recognized environmental concerns at the site on July 25, 2007. MDEQ provided analytical data from an environmental sample collected from the Site on June 21, 2007.

The sample (collected by the MDEQ on June 21, 2007) was collected from a white clayey waste substance along the shoreline west of the LLVP swimming beach. Analytical results of the sample showed polychlorinated biphenyl (PCB) concentrations (12 mg/kg), and elevated target analyte list (TAL) metals including antimony (600 mg/kg), arsenic (45 mg/kg), barium (120,000 mg/kg), copper (81,000 mg/kg), and lead (78,000 mg/kg). Concentrations of these TAL metals exceed MDEQ Residential and Commercial I Soil Direct Contact Criteria (DCC) established under Part 201 of Act 451 of the Michigan Compiled Laws. In addition, concentrations of barium, cadmium (100 mg/kg), chromium (210 mg/kg), lead, and selenium (36 mg/kg) exceed 20 times the extract of Toxicity Characteristic Leaching Procedure (TCLP) limits, making the waste a potential characteristic hazardous waste under 40 CFR 261.24.

There were also reports of 'blue-colored' water present in the nearby creek that discharges to the



north end of Torch Lake within the LLVP, and within child-created depressions in the sandy swimming beach area adjacent to the creek.

The WUPDHD and the Village of Lake Linden have restricted access to the portion of the LLVP where the MDEQ sample was collected and have requested assistance from the Region 5 U.S. EPA Emergency Response Branch in evaluating the threats to human health posed by potential contaminants recently exposed along the north end of Torch Lake.

The U.S. EPA tasked Weston Solutions, Inc. (WESTON) under the START Contract to mobilize to the Site on July 25, 2007. On July 26, 2007, START collected two soil/sediment samples from the white clayey substance located west of the LLVP swimming beach. In addition, one surface water sample was collected from the creek located west of the LLVP swimming beach and one water sample was collected from a hole dug in the sandy swimming beach. START did not observe any 'blue water' during the sample collection. Sediment and surface water samples were analyzed by Trace Analytical Laboratories, Inc. in Muskegon, Michigan for VOCs via EPA Method 8260B, SVOCs via EPA Method 8270C, TAL Metals, PCBs via EPA Method 8082, Total Cyanide, and pH.

Preliminary analytical results for the two soil/sediment samples were received on July 28, 2007. No VOCs were detected in either sample. Sample LLV Sediment 1 contained the SVOC bis (2-ethylhexyl) phthalate at 340 ug/kg. Sample LLV Sediment 2 contained the SVOC fluoranthene at 59 ug/kg. Sample LLV Sediment 1 contained PCBs at 990 ug/kg. Sample LLV Sediment 1 contained concentrations of the following metals which exceed MDEQ Part 201 DCC: barium (140,000 mg/kg), copper (79,000 mg/kg), arsenic (8.2 mg/kg), and lead (80,000 mg/kg). Sample LLV Sediment 2 contained concentrations of arsenic (9.2 mg/kg) and lead (2,100 mg/kg) which exceed MDEQ Part 201 DCC. Analytical results of the water samples are pending.

### **3.2 Site History and Background**

The Torch Lake site is located on the Keweenaw Peninsula in Houghton County, Michigan. Copper mining activities in the area from the 1890s until 1969 produced mill tailings (called stamp sands) that were deposited in and along the Torch Lake shoreline.

The Torch Lake Superfund site is comprised of several sites ranging in size from approximately 10 acres to over 200 acres in size. The sites are located around the Keweenaw Peninsula, Upper Peninsula, Michigan. The area is mostly forested with numerous lakes. There is some industry in the area, but the primary business and commerce in the area today centers around recreation and tourism.

About 200 million tons of copper mill stamp sands were dumped into Torch Lake itself, filling about 20 percent of the lake's volume. The contaminated sediments are believed to be 70 feet thick in some areas, and surface sediments contain up to 2,000 parts per million (ppm) copper. The stamp sands deposited in Torch Lake and on the shoreline were dredged up during the early part of the 1900s and were processed with flotation chemicals to reclaim copper. The stamp sands and much of the flotation chemicals were returned to the lake and along the shoreline. Other wastes were also

historically deposited in and along the Torch Lake shoreline including mine pumpage, leaching chemicals, explosive residues, and by-products. In 1972, an estimated 27,000 gallons of cupric ammonium carbonate were released into the lake from storage vats. Barrels have been found at several sites along the shoreline of the lake.

The only active industry on the Torch Lake shoreline is the Peninsula Copper Company, which reclaims copper oxide from scrap electronic circuit boards. During the early 1980s, the company dumped processing water, containing 2,400 times the local sewage authority's allowable limits for copper and 100 times the limit for ammonia, into the Tamarack lagoon system.

Approximately 4,000 people live within one mile of the lake.

By the fall of 2004, 700 acres of stamp sands and slag were remediated. This included stamp sands along the western shore of Torch Lake, Dollar Bay, Point Mills, Calumet Lake, Boston Pond and Michigan Smelter.

A partial National Priorities List (NPL) delisting of the Lake Linden portion of the site and all of operable unit 2 (sediments, surface water, and groundwater) was finalized in April 2002. The partial delisting of the Hubbell/Tamarack City portion of the site was finalized in 2004.

### **3.3 Contaminants of Concern / Target Analytes**

Contaminated media include debris, soil/sediment, and potentially surface water.

The contaminants listed below were considered the contaminants of concern to be addressed by cleanup actions previously performed at the site.

The contaminants of concern (COCs) previously identified at the Torch Lake Superfund Site include inorganics, metals, and polynuclear aromatic compounds (PAHs).

In order to characterize the potential hazards associated with the low lake level and subsequent exposure of additional mining material and debris, laboratory analyses will be performed on collected samples. The laboratory parameters will include selected TAL metals (antimony, arsenic, barium, copper, and lead) and PCBs.

Note: A site specific Health and Safety Plan may be referenced for this information.

### **4.0 Project Description and Schedule**

The soil/sediment sample collection will consist of tasks necessary to document and characterize threats posed to human health at the Site. Specifically the following tasks will be performed:

- Site reconnaissance, including air monitoring and sampling location determination;

- XRF screening of soils/sediments for metals; and
- Sample collection along LLVP property for laboratory analysis to evaluate potential threats human health posed by exposed shoreline areas.

The sampling design is provided below in Section 6.0.

A commercial laboratory will be utilized for analytical services. WESTON START will provide sample collection and coordination/management including laboratory procurement and sample shipment. Sample labels and chain-of-custody (COC) paperwork will be generated by START. Samples will be packaged properly by START and shipped daily for next-day delivery. The turn-around time for the sample data will be 24 to 72 hours. The sampling results will be reviewed and validated by a START chemist within one week of data receipt from the laboratory. A summary report of the sampling results will be submitted to U.S. EPA within two weeks of receipt of the validated data.

U.S. EPA and START will perform the soil/sediment sampling and XRF screening beginning of Monday, July 30, 2007. The soil/sediment sampling is expected to take three to four days.

## 5.0 Project Quality Objectives

### 5.1 Project Objectives

Sufficient data will be obtained from a representative number of samples to support defensible decisions by the U.S. EPA and to determine whether removal actions at the site are necessary.

The following project objectives apply to the soil/sediment sampling:

- To rapidly assess and evaluate the urgency, magnitude, extent and impact of a release, or threatened release, of hazardous substances, pollutants or contaminants, and their impact on human health and/or the environment as a result of the low lake levels at Torch Lake.
- To determine whether removal actions are warranted and if so whether the response should be classified as an emergency, time-critical, or non-time critical removal action.
- To supply the Village of Lake Linden, WUPCHD, and MDCH officials with information about the nature and magnitude of any health threat and to support subsequent public health advisories.
- To determine a remedy to eliminate, reduce, or control risks to human health and to support an "Action" decision memorandum documenting the identified removal approach.
- To verify or confirm field screening parameters.
- To support a "Closure" decision memorandum, if and when removal site evaluation is terminated.

### 5.2 Measurement and Performance Criteria

Generic measurement and performance criteria described in the *START III Generic QAPP* will be used to ensure that data are sufficiently sensitive, precise, accurate, and representative to support site decisions.

### 5.3 Data Quality Objectives (Decision Statements)

Data quality objectives address requirements that include when, where, and how to collect samples, the number of samples, and the limits on tolerable error rates. These steps should periodically be revisited as new information about a problem is learned.

Sediment and/or soil samples will be collected at the Site and compared to relevant criteria as described below:

- **Sediment/Soil Samples.** The soil sample results for select TAL metals will be compared to MDEQ Part 201 Residential DCC. In addition, if total metals results warrant, soil/sediment samples may be additionally analyzed for TCLP metals and results compared to the hazardous waste criteria outlined in 40 Code of Federal Regulations (CFR) Part 261.24 Subpart C to support evaluation for emergency removal action via the NCP, 40 CFR

300.413. In addition, PCB results will be compared to the PCB regulations in 40 CFR Part 761.

Refer to *START III Generic QAPP, Figure 13*.

## 6.0 Sampling Design

Sampling activities will commence on July 30, 2007. Initially, a sample grid will be established along the north shore of Torch Lake (LLVP property) as shown on the attached Figure and described below.

- A 100 x 100 foot sample grid will be established along the LLVP shoreline between the marina and the east side of the non-rustic campground (estimated at 2,400 feet along the shoreline).
- One biased sample location will be established within each grid based on visual observations and XRF screening of potential exposed sediment/soil or waste (white, clayey material). If visual observations and XRF screening results do not yield a suspect contaminant source, then the sample location will be located in the middle of the sample grid. At each grid sample location, two soil/sediment will be collected as follows:
  - One surface sample from 0-3 inches below ground surface (bgs); and
  - One sample from 12-18 inches bgs
- If clayey material or suspicious material is observed within a 100 x 100 foot grid along the shoreline, an additional sample location will be established within the adjacent 100 x 100 foot grid further inland. Two samples from the further inland grid will be collected at each location as described above (i.e. 0-3 inches bgs and 12-18 inches bgs). If the second 100 x 100 foot inland grid is observed to contain only cap or fill material within the sampling intervals, samples will not be collected.
- The additional 100 x 100 foot inland grids identified on the attached figure from the grid just west of the creek to the eastern edge of the swimming beach will be sampled regardless of the observations and XRF screening results from the adjacent shoreline grids. Sampling of these inland grids will be performed regardless of observations and media present (stamp sands or fill material).
- The total number of soil/sediment samples to be collected for laboratory analysis will be based on XRF screening results and field observations. It is anticipated that 46 samples (23 locations at two depths) will be collected along the shoreline 100 x 100 foot grids. In addition, it is anticipated that at least 16 samples (8 locations at two depths) will be collected from 100 x 100 foot inland grids (Figure 1).

- The minimum expected number of samples is 62 investigative soil/sediment samples and 10 QAQC samples for a total of 72 samples.
- The X-Ray fluorescence analyzer (XRF) will be used to screen soil/sediment samples for metals and may further reduce the number of samples submitted for laboratory analysis and/or the specific metals analyzed.
- Soil/sediment samples will analyzed by an approved off-site laboratory for select metals (antimony, arsenic, barium, copper, and lead) and PCBs.

All soil and/or sediment samples will be grab samples.

## **SAP Table 2: Sampling Locations and Sampling and Analysis Summary.**

### **7.0 Sampling Procedures**

#### **7.1 Sampling Standard Operating Procedures**

The Weston Standard Operating Procedure (SOP) for Soil Sampling (S-#-###) will be used during the soil/sediment sampling.

#### **7.2 Confirmatory Sampling**

Confirmatory samples may be collected when X-Ray fluorescence analyzer (XRF) field screening analyses are performed on site. Sufficient volume will be collected from each sample location to perform both screening and laboratory confirmation analyses. The matrix to be sampled will be thoroughly homogenized before removing an aliquot for screening purposes.

#### **7.3 Decontamination Procedures**

For the most part, decontamination procedures are described in the individual sampling SOPs listed in Section in 9.1. General decontamination procedures are described in Section B.2 of the *START III Generic QAPP*.

The following standard decontamination protocols will be used:

- All disposable sampling supplies and PPE will be bagged, labeled and sealed with duct tape.
- Hand augers, trowels, and any other non-dispsable sampling supplies will be decontaminated withalconox and water.

### **8.0 Sample Handling, Tracking, and Custody Procedures**

All samples will be identified, handled, shipped, tracked, and maintained under chain of custody in accordance with *START III Generic QAPP* Section B.3.

## **9.0 Field Analytical Methods and Procedures**

### **9.1 Field Analytical Methods and Standard Operating Procedures**

Field analytical methods will not be employed during the site assessment.

### **9.2 Field Testing Laboratory (if applicable)**

A field testing laboratory will not be used during the site assessment.

### **9.3 Screening/Confirmatory Analyses**

Not applicable.

## **10.0 Fixed Laboratory Analytical Methods and Procedures**

Trace Analytical Laboratory in Muskegon, Michigan has been selected through a competitive bid process based on the OSCs anticipated sampling needs.

## **11.0 Quality Control Activities**

### **11.1 Field Quality Control**

Field QC samples will be collected and analyzed for this project at the frequency described in *START III Generic QAPP*, Table 4. The number of QC samples collected for each analytical parameter and concentration level are listed in **SAP Table 2: Sampling Locations and Sampling and Analysis Summary / Field Quality Control Summary**.

### **11.2 Analytical Quality Control**

QC for analytical procedures will be performed at the frequency described in *START III Generic QAPP*, Tables 5 and 6. In addition, method-specific QC requirements will be used to ensure data quality.

### 11.3 Performance Evaluation Samples (if applicable)

Not applicable to this phase of work

### 12.0 Documentation, Records, and Data Management

Documentation, record keeping, and data management activities will be conducted in accordance with the *START III Generic QAPP*, Section B.10.

### 13.0 Quality Assurance Assessment and Corrective Actions

One field audit may be conducted during the early phase of a long-term response activity. Field sampling and field analytical procedures will be assessed for conformance with procedures described in the *START III Generic QAPP* and with this site-specific SAP. Findings will be documented in a report to management. Corrective actions in response to audit findings will be initiated, implemented and checked according to the *START III Generic QAPP*, Section C.

Type of Audit: \_\_\_\_\_  
Date(s) of Audit: \_\_\_\_\_  
Performed by What Organization: \_\_\_\_\_

This is anticipated to be a three to four day sampling event. No specific audit will be performed. Field staff will communicate with the project manager as applicable during the sampling activities.

### 14.0 Reports to Management

Reports to management will be written and distributed in accordance with the *START III Generic QAPP*, Section C.

### 15.0 Steps 1, 2 and 3: Data Review Requirements and Procedures

Step 1. Data collection activities, including sample collection and data generation, will be verified in accordance with the *START III Generic QAPP*, Section D.

Step 2. Data will be validated in accordance with the *START III Generic QAPP*, Section D.

WESTON will provide a review of the data. A level II data package has been requested.



Step 3. Data will be reviewed for usability in accordance with the *START III Generic QAPP*, Section D.

WESTON will review the data usability.

**SAP Table 1: SAP Revision Form**

**Site: Lake Linden Village Park**

**OSC: Brian Kelly**

**TDD: S05-0001-0707-021**

<b>Date</b>	<b>Rev. #</b>	<b>Proposed Change to SAP/QAPP</b>	<b>Reason for Change of Scope/Procedures</b>	<b>SAP Section Superseded</b>	<b>Requested By</b>	<b>Approved By</b>

**SAP Table 2: Sampling Locations and Sampling and Analysis Summary / Field Quality Control Summary**

**Site Name / Location: Lake Linden Village Park, Lake Linden, MI**

**OSC: Brian Kelly**

**TDD/Task No: S05-0002-0707-022** \_\_\_\_\_

Matrix	Analytical Parameter	Analytical Method	# of sampling locations	Containers (Numbers, size, and type)	Preservation Requirements	# of sampling locations	# of field duplicate pairs	# of MS/MSD or spike / duplicates	# of VOA trip blanks	# of equip./ rinsate blanks	Total # of samples to lab
Soil/Sediment	TAL Metals	USEPA SW 846 Method 6010/6020	62	Soil/Sed = 1-4 oz glass jar ; Liquid =1-500 mL Poly	Soil-Ice Liquid – HNO3 to pH < 2		6	Batch QC		4	72
Soil/Sediment	PCBs	USEPA SW 846 Method 8082	62	Soil/Sed = 1-4 oz glass jar; Liquid = 1-1 L amber glass	Soil – Ice Liquid - Ice		6	Batch QC		4	72
Soil/Sediment	TCLP Metals	USEPA SW 846 Methods 1311/6010 B/7471A	62	Soil/Sed – 1 -4 oz glass jar; Liquid – 1-500 mL poly bottle	Soil – Ice; Liquid – HNO3 to pH < 2						Only analyzed if requested based on total metals

Note:  
 If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location/station.

Total # of samples to the lab does not include MS/MSD or spike/duplicate samples. However, please note that MS/MSD or spike/duplicate analysis may require additional sample volume.

MS = Matrix Spike

MSD = Matrix Spike Duplicate

## **Appendix A**

Site Location Map  
Sample Grid Location Map

**ATTACHMENT E**  
**PHOTOGRAPHIC DOCUMENTATION**



**Site:** Lake Linden ER

**Photo Number:** 1

**Direction:** Northeast

**Subject:** Clayey waste material on the western shoreline of Lake Linden Recreation Park (LLRP)

**Date:** July 25, 2007

**Photographer:** JB



**Site:** Lake Linden ER

**Photo Number:** 2

**Direction:** South

**Subject:** LLRP Swimming Beach, eastern side, north of clayey waste material area

**Date:** July 26, 2007

**Photographer:** NP



**Site:** Lake Linden ER  
**Photo Number:** 3  
**Direction:** East  
**Subject:** LLRP swimming beach

**Date:** July 26, 2007  
**Photographer:** NP



**Site:** Lake Linden ER  
**Photo Number:** 4  
**Direction:** East  
**Subject:** Shoreline of LLRP Swimming Beach

**Date:** July 26, 2007  
**Photographer:** NP





**Site:** Lake Linden ER  
**Photo Number:** 5  
**Direction:** East  
**Subject:** LLRP shoreline, east of swimming beach

**Date:** July 26, 2007  
**Photographer:** NP



**Site:** Lake Linden ER  
**Photo Number:** 6  
**Direction:** North  
**Subject:** Clayey waste material area of LLRP (Area 1)

**Date:** July 26, 2007  
**Photographer:** NP





**Site:** Lake Linden ER  
**Photo Number:** 7  
**Direction:** South  
**Subject:** Shoreline of LLRP, south of campground

**Date:** July 26, 2007  
**Photographer:** NP



**Site:** Lake Linden ER  
**Photo Number:** 8  
**Direction:** Down  
**Subject:** Red clayey material on shoreline of LLRP, located south of campground area near boat dock

**Date:** July 26, 2007  
**Photographer:** NP





**Site:** Lake Linden ER  
**Photo Number:** 9  
**Direction:** North  
**Subject:** LLRP, sunbathers in area north of marina

**Date:** July 26, 2007  
**Photographer:** NP



**Site:** Lake Linden ER  
**Photo Number:** 10  
**Direction:** West  
**Subject:** Soil sampling along shoreline of LLRP

**Date:** July 31, 2007  
**Photographer:** NP





**Site:** Lake Linden ER

**Photo Number:** 11

**Direction:** East

**Subject:** Group meeting with EPA, MDEQ, WUPDPH, and the Village of Lake Linden prior to removal activities at LLRP

**Date:** August 6, 2007

**Photographer:** NP



**Site:** Lake Linden ER

**Photo Number:** 12

**Direction:** East

**Subject:** Delivery of Calciment™ for on site treatment of soil excavated from Area 1

**Date:** August 7, 2007

**Photographer:** NP



**Site:** Lake Linden ER

**Photo Number:** 13

**Direction:** North

**Subject:** Sunbathers in recently exposed stamp sands, north of marina in LLRP

**Date:** July 26, 2007

**Photographer:** NP



**Site:** Lake Linden ER

**Photo Number:** 14

**Direction:** East

**Subject:** ERRS staging area, just west of Area 1

**Date:** August 6, 2007

**Photographer:** NP





**Site:** Lake Linden ER

**Photo Number:** 15

**Direction:** East

**Subject:** U.S. EPA Mud Puppy crew collecting sediment samples east of Area 1

**Date:** August 7, 2007

**Photographer:** NP



**Site:** Lake Linden ER

**Photo Number:** 16

**Direction:** North

**Subject:** Excavated, striated, clayey waste material from Area 1

**Date:** August 7, 2007

**Photographer:** NP





**Site:** Lake Linden ER  
**Photo Number:** 17  
**Direction:** North  
**Subject:** Long-reach excavator in Area 1

**Date:** August 9, 2007  
**Photographer:** NP



**Site:** Lake Linden ER  
**Photo Number:** 18  
**Direction:** South  
**Subject:** Striated, clayey waste material visible below soil surface in Area 1

**Date:** August 9, 2007  
**Photographer:** NP





**Site:** Lake Linden ER

**Photo Number:** 19

**Direction:** North

**Subject:** Arsenic contaminated area of LLRP (Area 2)

**Date:** August 9, 2007

**Photographer:** NP



**Site:** Lake Linden ER

**Photo Number:** 20

**Direction:** Down

**Subject:** Arsenic impacted area along shoreline of Area 2, LLRP

**Date:** August 9, 2007

**Photographer:** NP





**Site:** Lake Linden ER

**Photo Number:** 21

**Direction:** North

**Subject:** Clean boundary east of silt curtains in Area 1, LLRP

**Date:** August 8, 2007

**Photographer:** NP



**Site:** Lake Linden ER

**Photo Number:** 22

**Direction:** Southwest

**Subject:** Geotextile material placement below cap in Area 2

**Date:** August 14, 2007

**Photographer:** EB



**Site:** Lake Linden ER

**Photo Number:** 23

**Direction:** North

**Subject:** Area 1 of LLRP following completion of removal and capping activities

**Date:** August 15, 2007

**Photographer:** EB



**Site:** Lake Linden ER

**Photo Number:** 24

**Direction:** Southwest

**Subject:** Area 2 of LLRP following completion of removal and capping activities

**Date:** August 15, 2007

**Photographer:** EB

**ATTACHMENT F**  
**AREA 2 LETTER REPORT, DATED AUGUST 9, 2007**



**DRAFT**



Weston Solutions, Inc.  
7800 West Outer Drive, Suite 200  
Detroit, MI 48235  
313-739-2500/313-739-2501

August 10, 2007

Mr. Brian Kelly  
On-Scene Coordinator  
Emergency Response Branch  
United States Environmental Protection Agency  
9311 Groh Road  
Grosse Ile, Michigan 48138

Re: Draft Arsenic-Contaminated Soil/Sediment Summary Report  
Lake Linden Recreation Park Emergency Response  
Lake Linden, Houghton County, Michigan  
TDD No.: S05-0001-0707-021  
Contract No.: EP-S5-06-04

Dear Mr. Kelly:

Per your request, Weston Solutions, Inc. (WESTON®) is providing this summary report to address the recently identified arsenic-contaminated area at the Lake Linden Recreation Park (LLRP).

## **Background**

The LLRP is located in Lake Linden, Houghton County, Michigan at 47.18919 degrees north and 88.40629 degrees west. The LLRP is located within a delisted portion of the Torch Lake Superfund Site and is a publicly-owned recreational area located at the north end of Torch Lake at Highway M-26. The LLRP offers a public campground, playground, sandy swimming beach, dock and boat launch. The Village of Lake Linden owns two miles of the northern shore of Torch Lake which encompasses the LLRP. The entire area was once the location of copper mining and processing operations. As a result, the entire area is covered with historic mining waste (stamp sands). As part of the Torch Lake Superfund Site remedy, stamp sands were capped along the entire Torch Lake shoreline up to the water's edge.

However, the low lake levels experienced in the area during 2007 (lake levels are down 1 to 2 feet) have exposed stamp sands and other potential waste material previously under water. The Michigan Department of Environmental Quality (MDEQ) recently collected several samples along the shoreline of the LLRP. Analytical results revealed extremely elevated concentrations of lead in one area of the LLRP in close proximity to the swimming beach. The elevated lead concentrations appeared to be associated with a white, clayey, purported waste material.



Mr. Kelly, OSC  
U.S. EPA Emergency Response Branch

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August 10, 2007

In July 2007, the MDEQ requested assistance from the United States Environmental Protection Agency (U.S. EPA) Emergency Response Branch to further evaluate the elevated lead concentrations. U.S. EPA tasked WESTON to mobilize to the Site on July 25, 2007 under the Superfund Technical Assistance and Response Team (START) contract under an emergency response task order to perform the evaluation.

### **Site Assessment**

WESTON collected two soil/sediment samples from the white clayey substance located west of the LLRP swimming beach on July 26, 2007. Subsequently (July 30 and 31, 2007), WESTON set up 100 by 100 foot grids along the shoreline at the LLRP to further define the extent of the elevated lead concentrations and clayey substance (**Figure 1**). START collected soil/sediment samples at the 0-3 inch and 18 inch below ground surface (bgs) intervals within each grid.

WESTON discovered a discolored area approximately 250 feet north of the marina near the Torch Lake shoreline during reconnaissance. WESTON sampled the discolored area at the 0-3 inch and 18 inch below ground surface (bgs) intervals (location LLV-2). The concentration of arsenic in the surface sample (0-3 inch) was 65 milligrams per kilogram (mg/kg) and the subsurface sample was 11 mg/kg. The arsenic concentrations of 65 mg/kg and 11 mg/kg are above the Part 201 Residential/Commercial Direct Contact Criteria of 7.6 mg/kg.

### **Removal Action**

On August 5, 2007, the U.S. EPA tasked WESTON to perform oversight of a removal action associated with the elevated lead and arsenic concentrations. The scope of the removal action was to excavate and dispose of soil, sediment, and clayey material with concentrations exceeding Part 201 Residential/Commercial Direct Contact Criteria.

WESTON performed x-ray fraction (XRF) screening in the elevated arsenic area to further define the area requiring removal. The area arsenic-contaminated area requiring removal was estimated to be 60 feet long, 3 feet wide, and 3 inches deep based on the additional XRF screening. The arsenic concentrations ranged between 50 and 80 parts per million (ppm).

U.S. EPA mobilized an Emergency and Rapid Response Services (ERRS) contractor (Environmental Quality Management [EQM]) to the LLRP to perform the removal action on August 6, 2007. U.S. EPA directed ERRS to excavate the arsenic-contaminated area with a shovel. Following removal of the top 3 inches of soil, brightly yellow/orange stained material was discovered below the surface at the water's edge. Upon further excavation in the area, the yellow stained area was determined to be 75 feet long and 18



Mr. Kelly, OSC  
U.S. EPA Emergency Response Branch

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August 10, 2007

feet wide. Arsenic concentrations ranged between 50 and 180 ppm from the ground surface to 8 inches bgs in this area based on XRF screening results (**Figure 2**). In one location, ERRS excavated to 12 inches bgs where the arsenic concentration was 13 ppm. The typical arsenic concentration of the stamp sands that cover the area in this vicinity is approximately 20 ppm based on recent sampling and XRF screening results.

In addition to the yellow stained sediments, yellow stained rocks and pipes persist in the area. WESTON performed XRF screening of many rocks along the shore within 200 feet of the northern end of the marina dock. Arsenic concentrations ranged between 0 and 756 ppm. Thus, not all yellow stained rocks contain elevated levels of arsenic. Rocks and rock piles containing concentrations of arsenic in excess of 20 ppm were flagged. Please see attached photo and **Figure 2**.

### **Recommendations**

WESTON recommends the following action for the arsenic-contaminated area based on the Site Assessment and Removal Action to date:

- Excavate the exposed stained sediments. The excavation is expected to be approximately 18 feet wide, 75 feet long, and 1 foot deep. WESTON recommends that the excavation continue into the water for an additional 10 feet to ensure removal of the material of concern;
- Cap the entire area that extends from the north edge of the marina dock to the other side of the exposed stained sediments (estimated to be a 275 feet long by 25 feet wide area); and,
- Remove and cap (as necessary) encountered piping.

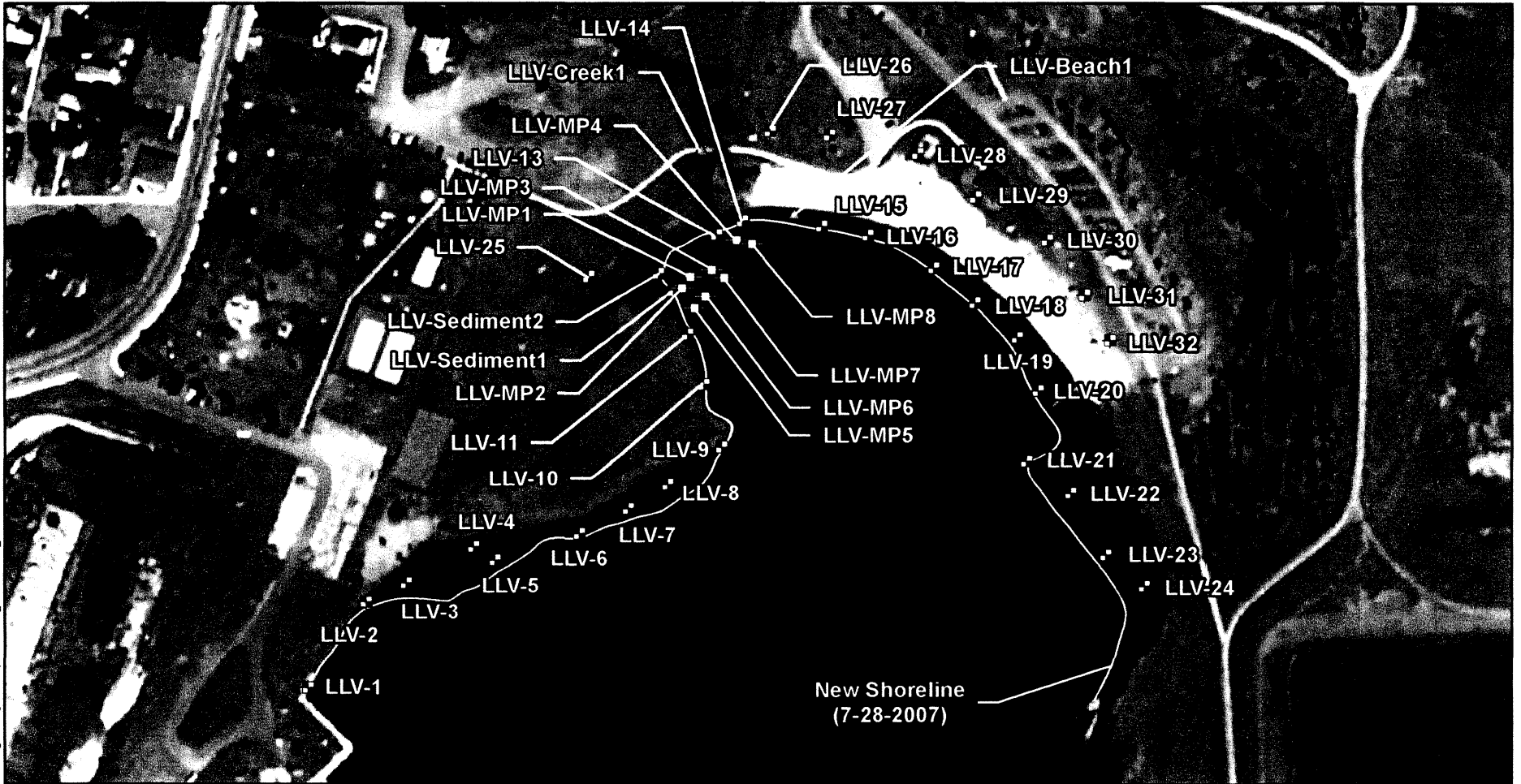
Should you have any questions regarding the above summary, please contact me at (517) 381-5932.

Very truly yours,  
Weston Solutions, Inc.

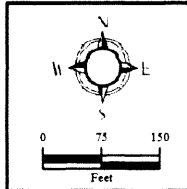
Daniel M. Capone  
START Deputy Program Manager

Attachments


P:\P\_Current\WES060\Lake\_Linden\Engineering\GIS\Maps\SAMPLE\_LOCATIONS\_Re.MXD




Source of Imagery: ESRI Map Service (C) 2007, Orthophotograph taken on June 21, 2005



Legend	
	Mud Puppy Sample Locations
	Soil Sample Location
	Water Sample Location
	Shoreline (7-28-2007)


 Prepared for:  
**U.S. EPA REGION V**  
 Contract No: EP-S5-06-04  
  
 TDD No.: S05-0001-0707-021  
 DCN:

  
 Prepared by:  
**WESTON SOLUTIONS, INC.**  
 2501 Jolly Road, Suite 100  
 Okemos, MI

**Figure 1**

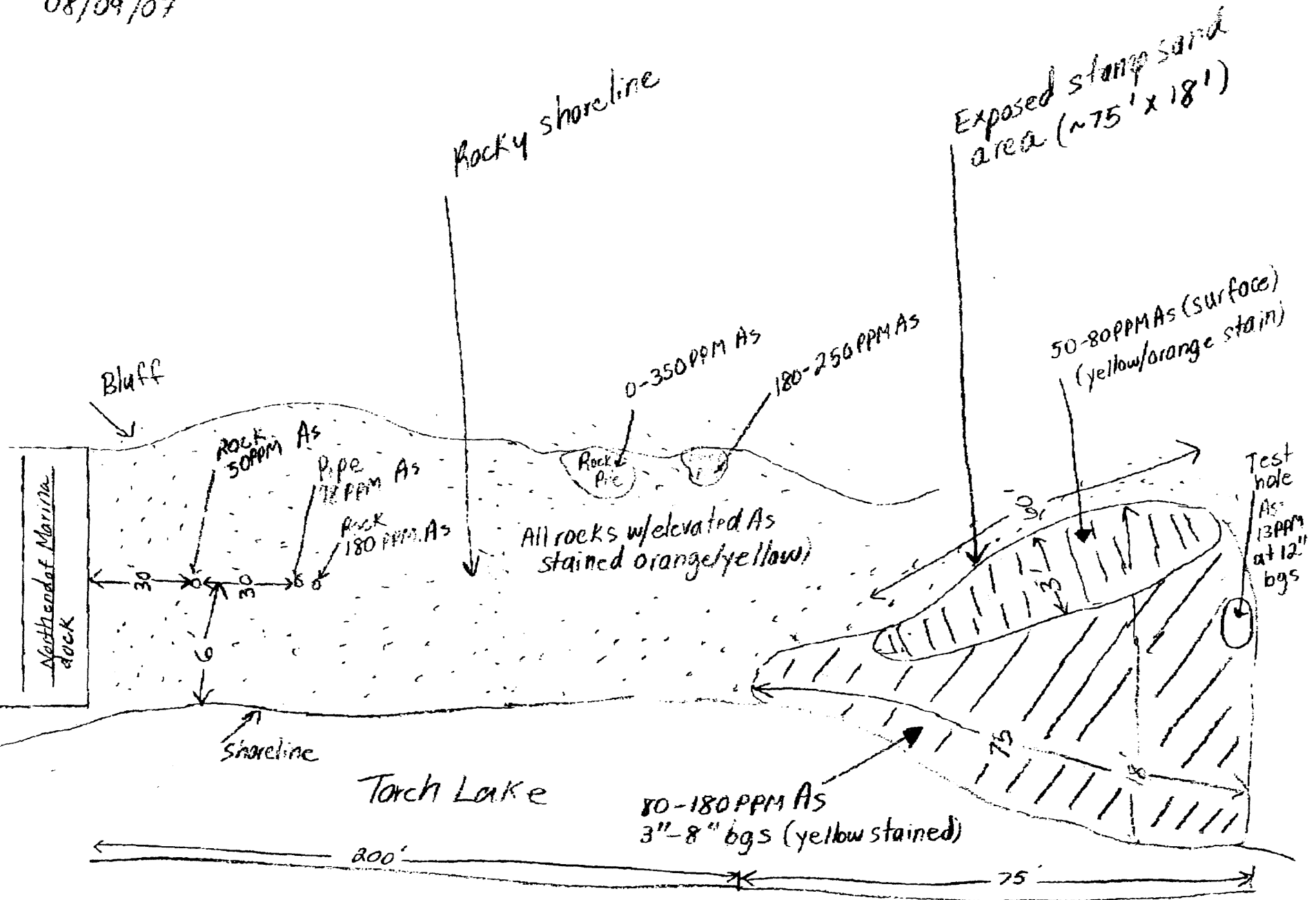
SAMPLING LOCATIONS  
 LAKE LINDEN - ER  
 LAKE LINDEN, HOUGHTON CO., MI  
 August 7, 2007  
 Scale: 1"= 150

Lake Linden ER

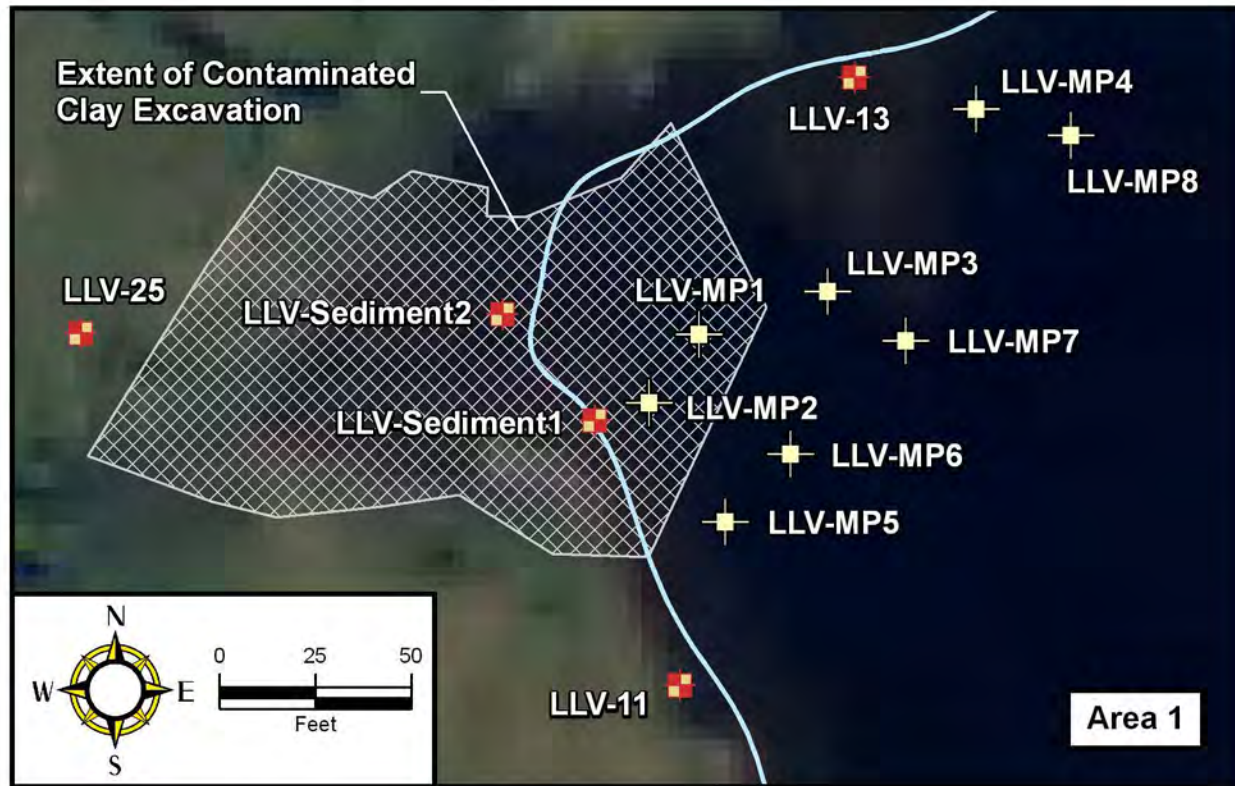
As Contaminated Area

08/09/07

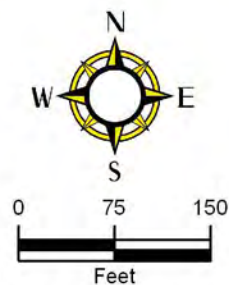
Figure 2







Source of Imagery: Michigan Geographic Data Library (C) 2007  
 Date of Photograph: 06/21/2005



**Legend**

- Mud Puppy Sampling Locations
- Soil Sampling Location
- Water Sampling Location
- Excavation
- Shoreline (7-28-2007)

**DRAFT**

**Figure 5**

Prepared for:  
**U.S. EPA REGION V**  
 Contract No: EP-S5-06-04  
 TDD No.: S05-0001-0707-021  
 DCN: 248-2A-ABHD

Prepared by:  
**WESTON SOLUTIONS, INC.**  
 2501 Jolly Road, Suite 100  
 Okemos, MI

EXTENT OF CONTAMINATED CLAY AND ARSENIC SOILS EXCAVATIONS  
 LAKE LINDEN - ER  
 LAKE LINDEN, HOUGHTON CO., MI  
 September 2007  
 Scale: 1"= 150'; 1"=50'



**ATTACHMENT G**  
**ERRS WASTE CHARACTERIZATION DATA**



August 27, 2007

Aaron Roski  
Environmental Quality Management, Inc.  
1800 Carillon Boulevard  
Cincinnati, OH 45240

Work Order No.: ME0708836

RE: Lake Linden, MI  
Dear Aaron Roski:

Microbac Laboratories, Inc. received 2 samples on 8/21/2007 9:00:00 AM for the analyses presented in the following report.

The enclosed results were obtained from and are applicable to the sample(s) as received at the laboratory. All sample results are reported on an "as received" basis unless otherwise noted.

All data included in this report have been reviewed and meet the applicable project specific and certification specific requirements, unless otherwise noted. A qualifications page is included in this report and lists the programs under which Microbac maintains certification.

This report has been paginated in its entirety and shall not be reproduced except in full, without the written approval of Microbac Laboratories.

We appreciate the opportunity to service your analytical needs. If you have any questions, please feel free to contact us.

Sincerely,  
Microbac Laboratories, Inc.

A handwritten signature in black ink, appearing to read "R. Misiunas".

Ronald J. Misiunas  
Client Services Manager

Enclosures



**WORK ORDER SAMPLE SUMMARY**

**Date:** *Monday, August 27, 2007*

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**CLIENT:** Environmental Quality Management, Inc.  
**Project:** Lake Linden, MI  
**Lab Order:** ME0708836

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<b>Lab Sample ID</b>	<b>Client Sample ID</b>	<b>Tag Number</b>	<b>Collection Date</b>	<b>Date Received</b>
ME0708836-01A	LL - Lead Soil		8/20/2007 10:00:00 AM	8/21/2007
ME0708836-02A	LL - Arsenic Soil		8/20/2007 10:30:00 AM	8/21/2007



# ANALYTICAL RESULTS

Date: Monday, August 27, 2007

**Client:** Environmental Quality Management, Inc.  
**Client Project:** Lake Linden, MI  
**Client Sample ID:** LL - Lead Soil  
**Sample Description:**  
**Sample Matrix:** Soil

**Work Order / ID:** ME0708836-01  
**Collection Date:** 08/20/07 10:00  
**Date Received:** 08/21/07 09:00

Analyses	ST	Result	RL	Qual	Units	DF	Analyzed
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**PCB'S** Method: **SW8082** Prep Date/Time: **08/22/07 09:37** Analyst: **ALS**

Aroclor 1016	A	ND	0.033		mg/Kg	1	08/23/07 10:53
Aroclor 1221	A	ND	0.033		mg/Kg	1	08/23/07 10:53
Aroclor 1232	A	ND	0.033		mg/Kg	1	08/23/07 10:53
Aroclor 1242	A	ND	0.033		mg/Kg	1	08/23/07 10:53
Aroclor 1248	A	ND	0.033		mg/Kg	1	08/23/07 10:53
Aroclor 1254	A	0.20	0.033		mg/Kg	1	08/23/07 10:53
Aroclor 1260	A	ND	0.033		mg/Kg	1	08/23/07 10:53
Aroclor 1262	A	ND	0.033		mg/Kg	1	08/23/07 10:53
Aroclor 1268	A	ND	0.033		mg/Kg	1	08/23/07 10:53
Total PCB's	A	0.20	0.033		mg/Kg	1	08/23/07 10:53
Surr: Tetrachloro-m-xylene	S	70.1	5-165		%REC	1	08/23/07 10:53
Surr: Decachlorobiphenyl	S	80.1	5-222		%REC	1	08/23/07 10:53

**TCLP MERCURY** Method: **SW1311/7470A** Prep Date/Time: **08/22/07 11:25** Analyst: **SAA**

Mercury	A	ND	0.0010		mg/L	1	08/22/07 14:29
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**TCLP METALS** Method: **SW1311/6010B** Prep Date/Time: **08/22/07 11:20** Analyst: **AVC**

Antimony	A	0.054	0.020		mg/L	1	08/22/07 15:05
Arsenic	A	0.022	0.010		mg/L	1	08/22/07 15:05
Barium	A	2.6	0.50		mg/L	1	08/22/07 15:05
Cadmium	A	0.065	0.0020		mg/L	1	08/22/07 15:05
Chromium	A	ND	0.0030		mg/L	1	08/22/07 15:05
Copper	A	140	0.20		mg/L	20	08/23/07 15:18
Lead	A	48	0.0075		mg/L	1	08/22/07 15:05
Selenium	A	ND	0.030		mg/L	1	08/22/07 15:05
Silver	A	ND	0.010		mg/L	1	08/22/07 15:05
Zinc	A	2.7	0.10		mg/L	1	08/22/07 15:05

**TCLP SEMI-VOLATILE ORGANICS** Method: **SW1311/8270C** Prep Date/Time: **08/23/07 08:29** Analyst: **ALS**

1,4-Dichlorobenzene	A	ND	0.050		mg/L	1	08/23/07 12:37
2,4,5-Trichlorophenol	A	ND	0.050		mg/L	1	08/23/07 12:37
2,4,6-Trichlorophenol	A	ND	0.050		mg/L	1	08/23/07 12:37
2,4-Dinitrotoluene	A	ND	0.050		mg/L	1	08/23/07 12:37
2-Methylphenol	A	ND	0.050		mg/L	1	08/23/07 12:37
3/4-Methylphenol	A	ND	0.050		mg/L	1	08/23/07 12:37
Hexachlorobenzene	A	ND	0.050		mg/L	1	08/23/07 12:37
Hexachlorobutadiene	A	ND	0.050		mg/L	1	08/23/07 12:37
Hexachloroethane	A	ND	0.050		mg/L	1	08/23/07 12:37
Nitrobenzene	A	ND	0.050		mg/L	1	08/23/07 12:37
Pentachlorophenol	A	ND	0.25		mg/L	1	08/23/07 12:37



# ANALYTICAL RESULTS

Date: Monday, August 27, 2007

**Client:** Environmental Quality Management, Inc.  
**Client Project:** Lake Linden, MI  
**Client Sample ID:** LL - Lead Soil  
**Sample Description:**  
**Sample Matrix:** Soil

**Work Order / ID:** ME0708836-01  
**Collection Date:** 08/20/07 10:00  
**Date Received:** 08/21/07 09:00

Analyses	ST	Result	RL	Qual	Units	DF	Analyzed
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**TCLP SEMI-VOLATILE ORGANICS** Method: **SW1311/8270C** Prep Date/Time: **08/23/07 08:29** Analyst: **ALS**

Pyridine	A	ND	0.050		mg/L	1	08/23/07 12:37
Total Cresol	A	ND	0.050		mg/L	1	08/23/07 12:37
Surr: Nitrobenzene-d5	S	68.5	10-121		%REC	1	08/23/07 12:37
Surr: 2-Fluorobiphenyl	S	63.5	5.58-109		%REC	1	08/23/07 12:37
Surr: Terphenyl-d14	S	115	10-130		%REC	1	08/23/07 12:37
Surr: Phenol-d5	S	65.4	10-100		%REC	1	08/23/07 12:37
Surr: 2-Fluorophenol	S	65.0	10-84.7		%REC	1	08/23/07 12:37
Surr: 2,4,6-Tribromophenol	S	72.8	10-120		%REC	1	08/23/07 12:37

**TCLP VOLATILES** Method: **SW1311/8260B** Prep Date/Time: **08/22/07 16:10** Analyst: **MLT**

Benzene	A	ND	0.050		mg/L	10	08/25/07 12:25
2-Butanone	A	ND	0.10		mg/L	10	08/25/07 12:25
Carbon tetrachloride	A	ND	0.050		mg/L	10	08/25/07 12:25
Chlorobenzene	A	ND	0.050		mg/L	10	08/25/07 12:25
Chloroform	A	ND	0.050		mg/L	10	08/25/07 12:25
1,1-Dichloroethene	A	ND	0.050		mg/L	10	08/25/07 12:25
1,2-Dichloroethane	A	ND	0.050		mg/L	10	08/25/07 12:25
1,4-Dichlorobenzene	A	ND	0.050		mg/L	10	08/25/07 12:25
Tetrachloroethene	A	ND	0.050		mg/L	10	08/25/07 12:25
Trichloroethene	A	ND	0.050		mg/L	10	08/25/07 12:25
Vinyl chloride	A	ND	0.050		mg/L	10	08/25/07 12:25
Surr: 4-Bromofluorobenzene	S	90.4	72.4-120		%REC	10	08/25/07 12:25
Surr: Dibromofluoromethane	S	116	80.2-126		%REC	10	08/25/07 12:25
Surr: Toluene-d8	S	92.0	83.9-117		%REC	10	08/25/07 12:25
Surr: 1,2-Dichloroethane-d4	S	130	74.4-132		%REC	10	08/25/07 12:25

**IGNITABILITY (OPEN CUP FLASHPOI)** Method: **D92-90 MOD** Prep Date/Time: Analyst: **ALL**

Ignitability	A	>170	30		°F	1	08/22/07 16:00
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**PAINT FILTER** Method: **SW9095B** Prep Date/Time: Analyst: **TMG**

Paint Filter	A	PASS			Pass/Fail	1	08/24/07 14:37
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**CORROSIVITY BY PH** Method: **SW9045C** Prep Date/Time: Analyst: **SMA**

pH	A	11.5	0.1		pH Units	1	08/23/07 10:55
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**CYANIDE, REACTIVE** Method: **SW7.3.3.2\_R3** Prep Date/Time: **08/24/07 09:30** Analyst: **RPL**

Reactive Cyanide	A	ND	4.0		mg/Kg	1	08/24/07 13:04
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**SULFIDE, REACTIVE** Method: **SW7.3.4.2\_R3** Prep Date/Time: **08/24/07 09:30** Analyst: **SMA**

Reactive Sulfide	A	ND	9.5		mg/Kg	1	08/24/07 13:50
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# ANALYTICAL RESULTS

Date: Monday, August 27, 2007

**Client:** Environmental Quality Management, Inc.  
**Client Project:** Lake Linden, MI  
**Client Sample ID:** LL - Arsenic Soil  
**Sample Description:**  
**Sample Matrix:** Soil

**Work Order / ID:** ME0708836-02  
**Collection Date:** 08/20/07 10:30  
**Date Received:** 08/21/07 09:00

Analyses	ST	Result	RL	Qual	Units	DF	Analyzed
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**PCB'S** Method: **SW8082** Prep Date/Time: **08/22/07 09:37** Analyst: **ALS**

Aroclor 1016	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Aroclor 1221	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Aroclor 1232	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Aroclor 1242	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Aroclor 1248	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Aroclor 1254	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Aroclor 1260	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Aroclor 1262	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Aroclor 1268	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Total PCB's	A	ND	0.033		mg/Kg	1	08/22/07 19:05
Surr: Tetrachloro-m-xylene	S	80.1	5-165		%REC	1	08/22/07 19:05
Surr: Decachlorobiphenyl	S	90.1	5-222		%REC	1	08/22/07 19:05

**TCLP MERCURY** Method: **SW1311/7470A** Prep Date/Time: **08/22/07 11:25** Analyst: **SAA**

Mercury	A	ND	0.0010		mg/L	1	08/22/07 14:33
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**TCLP METALS** Method: **SW1311/6010B** Prep Date/Time: **08/22/07 11:20** Analyst: **AVC**

Antimony	A	ND	0.020		mg/L	1	08/22/07 15:10
Arsenic	A	0.055	0.010		mg/L	1	08/22/07 15:10
Barium	A	ND	0.50		mg/L	1	08/22/07 15:10
Cadmium	A	0.0026	0.0020		mg/L	1	08/22/07 15:10
Chromium	A	ND	0.0030		mg/L	1	08/22/07 15:10
Copper	A	47	0.050		mg/L	5	08/23/07 15:23
Lead	A	0.060	0.0075		mg/L	1	08/22/07 15:10
Selenium	A	ND	0.030		mg/L	1	08/22/07 15:10
Silver	A	ND	0.010		mg/L	1	08/22/07 15:10
Zinc	A	0.22	0.10		mg/L	1	08/22/07 15:10

**TCLP SEMI-VOLATILE ORGANICS** Method: **SW1311/8270C** Prep Date/Time: **08/23/07 08:29** Analyst: **ALS**

1,4-Dichlorobenzene	A	ND	0.050		mg/L	1	08/23/07 13:01
2,4,5-Trichlorophenol	A	ND	0.050		mg/L	1	08/23/07 13:01
2,4,6-Trichlorophenol	A	ND	0.050		mg/L	1	08/23/07 13:01
2,4-Dinitrotoluene	A	ND	0.050		mg/L	1	08/23/07 13:01
2-Methylphenol	A	ND	0.050		mg/L	1	08/23/07 13:01
3/4-Methylphenol	A	ND	0.050		mg/L	1	08/23/07 13:01
Hexachlorobenzene	A	ND	0.050		mg/L	1	08/23/07 13:01
Hexachlorobutadiene	A	ND	0.050		mg/L	1	08/23/07 13:01
Hexachloroethane	A	ND	0.050		mg/L	1	08/23/07 13:01
Nitrobenzene	A	ND	0.050		mg/L	1	08/23/07 13:01
Pentachlorophenol	A	ND	0.25		mg/L	1	08/23/07 13:01



# ANALYTICAL RESULTS

Date: Monday, August 27, 2007

**Client:** Environmental Quality Management, Inc.  
**Client Project:** Lake Linden, MI  
**Client Sample ID:** LL - Arsenic Soil  
**Sample Description:**  
**Sample Matrix:** Soil

**Work Order / ID:** ME0708836-02  
**Collection Date:** 08/20/07 10:30  
**Date Received:** 08/21/07 09:00

Analyses	ST	Result	RL	Qual	Units	DF	Analyzed
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**TCLP SEMI-VOLATILE ORGANICS** Method: **SW1311/8270C** Prep Date/Time: **08/23/07 08:29** Analyst: **ALS**

Pyridine	A	ND	0.050		mg/L	1	08/23/07 13:01
Total Cresol	A	ND	0.050		mg/L	1	08/23/07 13:01
Surr: Nitrobenzene-d5	S	60.1	10-121		%REC	1	08/23/07 13:01
Surr: 2-Fluorobiphenyl	S	54.0	5.58-109		%REC	1	08/23/07 13:01
Surr: Terphenyl-d14	S	125	10-130		%REC	1	08/23/07 13:01
Surr: Phenol-d5	S	61.9	10-100		%REC	1	08/23/07 13:01
Surr: 2-Fluorophenol	S	56.8	10-84.7		%REC	1	08/23/07 13:01
Surr: 2,4,6-Tribromophenol	S	58.2	10-120		%REC	1	08/23/07 13:01

**TCLP VOLATILES** Method: **SW1311/8260B** Prep Date/Time: **08/22/07 16:10** Analyst: **NLT**

Benzene	A	ND	0.050		mg/L	10	08/27/07 11:24
2-Butanone	A	ND	0.10		mg/L	10	08/27/07 11:24
Carbon tetrachloride	A	ND	0.050		mg/L	10	08/27/07 11:24
Chlorobenzene	A	ND	0.050		mg/L	10	08/27/07 11:24
Chloroform	A	ND	0.050		mg/L	10	08/27/07 11:24
1,1-Dichloroethene	A	ND	0.050		mg/L	10	08/27/07 11:24
1,2-Dichloroethane	A	ND	0.050		mg/L	10	08/27/07 11:24
1,4-Dichlorobenzene	A	ND	0.050		mg/L	10	08/27/07 11:24
Tetrachloroethene	A	ND	0.050		mg/L	10	08/27/07 11:24
Trichloroethene	A	ND	0.050		mg/L	10	08/27/07 11:24
Vinyl chloride	A	ND	0.050		mg/L	10	08/27/07 11:24
Surr: 4-Bromofluorobenzene	S	91.2	72.4-120		%REC	10	08/27/07 11:24
Surr: Dibromofluoromethane	S	109	80.2-126		%REC	10	08/27/07 11:24
Surr: Toluene-d8	S	104	83.9-117		%REC	10	08/27/07 11:24
Surr: 1,2-Dichloroethane-d4	S	111	74.4-132		%REC	10	08/27/07 11:24

**IGNITABILITY (OPEN CUP FLASHPOI)** Method: **D92-90 MOD** Prep Date/Time: Analyst: **ALL**

Ignitability	A	>170	30		°F	1	08/22/07 16:00
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**PAINT FILTER** Method: **SW9095B** Prep Date/Time: Analyst: **TMG**

Paint Filter	A	PASS			Pass/Fail	1	08/24/07 14:37
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**CORROSIVITY BY PH** Method: **SW9045C** Prep Date/Time: Analyst: **SMA**

pH	A	8.1	0.1		pH Units	1	08/23/07 10:55
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**CYANIDE, REACTIVE** Method: **SW7.3.3.2\_R3** Prep Date/Time: **08/24/07 09:30** Analyst: **RPL**

Reactive Cyanide	A	ND	4.0		mg/Kg	1	08/24/07 13:06
Reactive Cyanide	A	ND	37		mg/Kg	2	08/24/07 15:15

**SULFIDE, REACTIVE** Method: **SW7.3.4.2\_R3** Prep Date/Time: **08/24/07 09:30** Analyst: **SMA**

Reactive Sulfide	A	ND	9.4		mg/Kg	1	08/24/07 13:50
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**FLAGS, FOOTNOTES AND ABBREVIATIONS (as needed)**

Table with 4 columns defining abbreviations: NA = Not Analyzed, mg/L = Milligrams per Liter (ppm), mg/Kg = Milligrams per Kilogram (ppm), U = Undetected, J = Analyte concentration detected between RL and MDL (Metals / Organics), B = Detected in the associated Method Blank at a concentration above the routine PQL/RL, b = Detected in the associated Method Blank at a concentration above the Method Detection Limit but less than the routine PQL/RL, D = Surrogate recoveries are not calculated due to sample dilution, ND = Not Detected at the Reporting Limit (or the Method Detection Limit, if listed), E = Value above quantitation range, H = Analyte was prepared and/or analyzed outside of the analytical method holding time, I = Matrix Interference, R = RPD outside accepted recovery limits, S = Spike recovery outside recovery limits, Surr = Surrogate, DF = Dilution Factor, RL = Reporting Limit, ST = Sample Type, MDL = Method Detection Limit.

**SAMPLE TYPES**

Table with 2 columns defining sample types: A = Analyte, I = Internal Standard, S = Surrogate, T = Tentatively Identified Compound (TIC, concentration estimated).

**QC SAMPLE IDENTIFICATIONS**

Table with 4 columns defining QC sample identifications: MBLK = Method Blank, DUP = Method Duplicate, LCS = Laboratory Control Sample, MS = Matrix Spike, ICB = Initial Calibration Blank, ICV = Initial Calibration Verification, PDS = Post Digestion Spike, ICSA = Interference Check Standard "A", ICSAB = Interference Check Standard "AB", LCS D = Laboratory Control Sample Duplicate, MSD = Matrix Spike Duplicate, CCB = Continuing Calibration Blank, CCV = Continuing Calibration Verification, SD = Serial Dilution, OPR = Ongoing Precision and Recovery Standard.

**CERTIFICATIONS**

Below is a list of certifications maintained by the Microbac Merrillville Laboratory. All data included in this report has been reviewed for and meets all project specific and quality control requirements of the applicable accreditation, unless otherwise noted. Complete lists of individual analytes pursuant to each certification below are available upon request.

- Illinois EPA for the analysis wastewater and solid waste in accordance with the requirements of the National Environmental Laboratory Accreditation Program [NELAP] (accreditation #100435)
- Illinois Department of Public Health for the microbiological analysis of drinking water (registry #175458)
- Indiana DEM approved support laboratory for solid waste and wastewater analyses
- Indiana SDH for the chemical analysis of drinking water (lab #C-45-02)
- Indiana SDH for the microbiological analysis of drinking water (lab #M-45-08)
- Kentucky EPPC for the analysis of samples applicable to the Underground Storage Tank program (lab #0061)
- North Carolina DENR for the environmental analysis for NPDES effluent, surface water, groundwater, and pretreatment regulations (certificate #597)
- Wisconsin DNR for the chemical analysis of wastewater and solid waste (lab #998036710)

**MICROBAC LOCATIONS, SERVICE CENTERS (SC) AND SATELLITE OFFICES (Sat)**

Table listing Microbac locations and service centers: Baltimore Division - Baltimore, MD; Camp Hill Division - Camp Hill, PA; Camp Hill Division (SC) - Pittston, PA; Chicagoland Division - Merrillville, IN; Chicagoland Division (SC) - Indianapolis, IN; Corona Division - Corona, CA; Erie Division - Erie, PA; Fayetteville Division - Fayetteville, NC; Hauser Division - Boulder, CO; Kentucky Division - Louisville, KY; Kentucky Division (Sat) - Evansville, IN; Kentucky Division (Sat) - Lexington, KY; Kentucky Division (Sat) - Paducah, KY; Knoxville Division - Maryville, TN; Massachusetts Division - Marlborough, MA; Microbac Corporate Office - Wexford, PA; Microbac NY - Cortland Office - Cortland, NY; Microbac NY - Waverly Office - Waverly, NY; New Castle Division - New Castle, PA; Pittsburgh Division - Warrendale, PA; Richmond Division - Richmond, VA; South Carolina Division - New Ellenton, SC; South Jersey Division - Turnersville, NJ; Southern Headquarters - Poquoson, VA; Southern Testing Division - Wilson, NC; Southern Testing Division (Sat) - Greensboro, NC; Venice Division - Venice, FL.



# COOLER INSPECTION

**Date:** Monday, August 27, 2007

Client Name **Environmental Quality Manage**

Date / Time Received: **8/21/2007 9:00:00 AM**

Work Order Number **ME0708836**

Received by: KRS

Checklist completed by KRS | 8/21/2007 9:34:07 AM

Reviewed by RJM | 8/22/2007 7:57:29 AM

Carrier name: FedEx

- After-Hour Arrival? Yes  No
- Shipping container/cooler in good condition? Yes  No  Not Present
- Custody seals intact on shipping container/cooler? Yes  No  Not Present
- Custody seals intact on sample bottles? Yes  No  Not Present
- Chain of custody present? Yes  No
- Chain of custody included sufficient client identification? Yes  No
- Chain of custody included sufficient sample collector information? Yes  No
- Chain of custody included a sample description? Yes  No
- Chain of custody agrees with sample labels? Yes  No
- Chain of custody identified the appropriate matrix? Yes  No
- Chain of custody included date of collection? Yes  No
- Chain of custody included time of collection? Yes  No
- Chain of custody identified the appropriate number of containers? Yes  No
- Samples in proper container/bottle? Yes  No
- Sample containers intact? Yes  No
- Sufficient sample volume for indicated test? Yes  No
- All samples received within holding time? Yes  No
- Chain of custody identified the appropriate preservatives (if preserved)? Yes  No
- Samples properly preserved? Yes  No

If No, adjusted by? \_\_\_\_\_ Date/Time \_\_\_\_\_

- Chain of custody included the requested analyses? Yes  No
- Chain of custody signed when relinquished and received? Yes  No
- Samples received on ice? Yes  No

Container/Temp Blank temperatures Cooler Temp  
1 1 °C

VOA vials for aqueous samples have zero headspace? No VOA vials submitted  Yes  No

**ANY "NO" EVALUATION (excluding After-Hour Receipt) REQUIRES CLIENT NOTIFICATION.**

General Comments:

Sample ID	Client Sample ID	Comments
ME0708836-01A	LL - Lead Soil	
ME0708836-02A	LL - Arsenic Soil	

Microbac

Samples Submitted to: [ ] 250 West 84th Drive Merrillville, IN 46410 Tel: 219-769-8378 Fax: 219-769-1664

[ ] 5713 West 85th Street Indianapolis, IN 46278 Tel: 317-872-1375 Fax: 317-872-1379

Chain of Custody Record

RUSH! Number 78390

Instructions on back

Client Name EQM, Project 3228-84, Address 1800 CARILLON BLVD, City, State, Zip CINCINNATI OH 45240, Contact Aaron Roski, Telephone # 513-825-7500, Turnaround Time [ ] Routine (7 working days) [ ] RUSH\* (notify lab), Report Type [ ] Results Only [ ] Level II [ ] Level III [ ] Level III CLP-like [ ] Level IV [ ] Level IV CLP-like [ ] EDD, Sampler Signature Don Wilton, Sampler Phone # DAN. CAPONE WESTON SOLUTIONS.COM, TB ALLARD WESTON SOLUTIONS.COM, Send Report via [ ] Mail [ ] Telephone [ ] Fax (fax #) Email AROSKI@EQM.COM [ ] e-mail (address) TB ALLARD WESTON SOLUTIONS.COM

\* Matrix Types: Soil/Solid (S), Sludge, Oil, Wipe, Drinking Water (DW), Groundwater (GW), Surface Water (SW), Waste Water (WW), Other (specify) NPOAVATZ@YTUSA.COM
\*\* Preservative Types: (1) HNO3, (2) H2SO4, (3) HCl, (4) NaOH, (5) Zinc Acetate, (6) Methanol, (7) Sodium Bisulfate, (8) Sodium Phosphite, (9) Hexane, (U) Unpreserved

Table with columns: Client Sample ID, Matrix\*, Grab, Composite, Filtered, Date Collected, Time Collected, No. of Containers, Requested Analyses, Preservative Types, TCLP METALS, REACT, VOA'S, SVOC'S, REACTIVE S, FLASH POINT, PH, PAINT FILTER, PCB'S, For Lab Use Only. Rows include LL-LEAD SOIL and LL-ARSENIC SOIL.

AccuStandard.com out of project for RS, RC, + PCB

Possible Hazard Identification [ ] Hazardous [ ] Non-Hazardous [ ] Radioactive, Sample Disposition, Comments, Relinquished By (signature) Don Wilton 9/20/07, Relinquished By (signature), Relinquished By (signature), Received for Lab By (signature) Jan Smith 8/21/07 0900, Date/Time



September 04, 2007

Aaron Roski  
Environmental Quality Management, Inc.  
1800 Carillon Boulevard  
Cincinnati, OH 45240

Work Order No.: ME0708B97

RE: Lake Linden, MI  
Dear Aaron Roski:

Microbac Laboratories, Inc. received 1 sample on 8/29/2007 9:30:00 AM for the analyses presented in the following report.

The enclosed results were obtained from and are applicable to the sample(s) as received at the laboratory. All sample results are reported on an "as received" basis unless otherwise noted.

All data included in this report have been reviewed and meet the applicable project specific and certification specific requirements, unless otherwise noted. A qualifications page is included in this report and lists the programs under which Microbac maintains certification.

This report has been paginated in its entirety and shall not be reproduced except in full, without the written approval of Microbac Laboratories.

We appreciate the opportunity to service your analytical needs. If you have any questions, please feel free to contact us.

Sincerely,  
Microbac Laboratories, Inc.

A handwritten signature in black ink, appearing to read "R. Misiunas".

Ronald J. Misiunas  
Client Services Manager

Enclosures



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**WORK ORDER SAMPLE SUMMARY****Date:** *Tuesday, September 04, 2007*

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**CLIENT:** Environmental Quality Management, Inc.  
**Project:** Lake Linden, MI  
**Lab Order:** ME0708B97

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<b>Lab Sample ID</b>	<b>Client Sample ID</b>	<b>Tag Number</b>	<b>Collection Date</b>	<b>Date Received</b>
ME0708B97-01A	Lake Linden		8/28/2007 8:30:00 AM	8/29/2007



**ANALYTICAL RESULTS**

Date: *Tuesday, September 04, 2007*

**Client:** Environmental Quality Management, Inc.  
**Client Project:** Lake Linden, MI  
**Client Sample ID:** Lake Linden  
**Sample Description:**  
**Sample Matrix:** Soil

**Work Order / ID:** ME0708B97-01  
**Collection Date:** 08/28/07 08:30  
**Date Received:** 08/29/07 09:30

Analyses	ST	Result	RL	Qual	Units	DF	Analyzed
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**TCLP MERCURY** Method: **SW1311/7470A** Prep Date/Time: **08/30/07 11:05** Analyst: **AVC**

Mercury	A	<b>ND</b>	0.0010		mg/L	1	08/30/07 14:11
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**TCLP METALS** Method: **SW1311/6010B** Prep Date/Time: **08/30/07 11:00** Analyst: **AVC**

Arsenic	A	<b>ND</b>	0.010		mg/L	1	08/31/07 14:20
Barium	A	<b>ND</b>	0.50		mg/L	1	08/31/07 14:20
Cadmium	A	<b>0.038</b>	0.0020		mg/L	1	08/31/07 14:20
Chromium	A	<b>ND</b>	0.0030		mg/L	1	08/31/07 14:20
Lead	A	<b>14</b>	0.0075		mg/L	1	08/31/07 14:20
Selenium	A	<b>ND</b>	0.030		mg/L	1	08/31/07 14:20
Silver	A	<b>ND</b>	0.010		mg/L	1	08/31/07 14:20

**CORROSIVITY BY PH** Method: **SW9045C** Prep Date/Time: Analyst: **SMA**

pH	A	<b>11.4</b>	0.1		pH Units	1	09/04/07 11:05
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**FLAGS, FOOTNOTES AND ABBREVIATIONS (as needed)**

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Table with 2 columns: A = Analyte, I = Internal Standard, S = Surrogate, T = Tentatively Identified Compound (TIC, concentration estimated).

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- North Carolina DENR for the environmental analysis for NPDES effluent, surface water, groundwater, and pretreatment regulations (certificate #597)
- Wisconsin DNR for the chemical analysis of wastewater and solid waste (lab #998036710)

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# COOLER INSPECTION

**Date:** Tuesday, September 04, 2007

Client Name **Environmental Quality Manage**

Date / Time Received: **8/29/2007 9:30:00 AM**

Work Order Number **ME0708B97**

Received by: KRS

Checklist completed by KRS | 8/29/2007 10:24:47 AM

Reviewed by RJM | 8/29/2007 1:33:05 PM

Carrier name: FedEx

- After-Hour Arrival? Yes  No
- Shipping container/cooler in good condition? Yes  No  Not Present
- Custody seals intact on shipping container/cooler? Yes  No  Not Present
- Custody seals intact on sample bottles? Yes  No  Not Present
- Chain of custody present? Yes  No
- Chain of custody included sufficient client identification? Yes  No
- Chain of custody included sufficient sample collector information? Yes  No
- Chain of custody included a sample description? Yes  No
- Chain of custody agrees with sample labels? Yes  No
- Chain of custody identified the appropriate matrix? Yes  No
- Chain of custody included date of collection? Yes  No
- Chain of custody included time of collection? Yes  No
- Chain of custody identified the appropriate number of containers? Yes  No
- Samples in proper container/bottle? Yes  No
- Sample containers intact? Yes  No
- Sufficient sample volume for indicated test? Yes  No
- All samples received within holding time? Yes  No
- Chain of custody identified the appropriate preservatives (if preserved)? Yes  No
- Samples properly preserved? Yes  No

If No, adjusted by? \_\_\_\_\_ Date/Time \_\_\_\_\_

- Chain of custody included the requested analyses? Yes  No
- Chain of custody signed when relinquished and received? Yes  No
- Samples received on ice? Yes  No

Container/Temp Blank temperatures Cooler Temp  
1 6 °C

VOA vials for aqueous samples have zero headspace? No VOA vials submitted  Yes  No

**ANY "NO" EVALUATION (excluding After-Hour Receipt) REQUIRES CLIENT NOTIFICATION.**

General Comments:

Sample ID	Client Sample ID	Comments
ME0708B97-01A	Lake Linden	



