HEALTH CONSULTATION
(Evaluation of Soil Data from the July 13, 2013 Ash Release)

HERITAGE THERMAL SERVICES
EAST LIVERPOOL, COLUMBIANA COUNTY, OHIO

Prepared by the
Ohio Department of Health
Health Assessment Section

March 19, 2014

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This document has not been reviewed and cleared by ATSDR.
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SUMMARY

Introduction
The Heritage Thermal Services (HTS, formerly known as WTI) is a hazardous waste incinerator located in a mixed industrial and residential area within the city of East Liverpool, Columbiana County, Ohio. On July 13, 2013, an incident occurred at the HTS facility where an estimated 700 to 800 pounds of ash was released into the air beyond the property boundary over the adjacent neighborhood west of the facility. In addition to the collection of wipe samples of surfaces in the immediate area, soil sampling was conducted on July 29 and 30, 2013 to assess the impact of the ash release on the chemistry of the soils of the area adjacent to the HTS facility.

At the request of the Ohio Environmental Protection Agency (Ohio EPA), the Health Assessment Section (HAS) of the Ohio Department of Health (ODH) has prepared this health consultation, which evaluates the results of soil sampling conducted after the ash release. This report determines whether or not there are harmful levels of contaminants in surface soils, and, if necessary, makes recommendations to protect public health.

Conclusion
HAS concludes that the trace amounts of toxic metals in the surface and shallow soils of the residential area west of the HTS facility affected by the July 2013 ash release are not expected to harm people's health. The reason for this is that the concentrations of these metals found in the soils are below levels of health concern.

Basis for Decision
The concentrations of potentially toxic metals found in the soils are at or are slightly above background levels typically found in Ohio soils and below levels that could cause harm. There appears to be no apparent impact on the surface soils in the residential area west of the site due to the ash release of July 2013, based on a comparison of the metallic content of the surface soils and the underlying shallow soils. Two locations, ELSS-10 located off site and ELSS-13 on site, which are closest to and downwind of the HTS property, did generally show higher levels of the elements of concern. The analysis of the ash indicate elevated levels of lead and arsenic which could pose a hazard to small children if the ash was deposited and remained on surfaces that children came into contact with.

Next Steps
It is recommended that measures be taken to prevent the accidental release of hazardous waste ash from the HTS facility to off-site areas in the future.

For More Information
If you have any concerns about your health, as it relates to exposure to the chemicals of concern at this site, you should contact your health care provider. You can also call HAS at (614) 466-1390 health-related questions regarding chemicals.
BACKGROUND

Site Description and History

The Heritage Thermal Services (HTS, formerly known as WTI) is located in a mixed industrial and residential area within the city of East Liverpool, Columbiana County, Ohio. HTS treats hazardous and nonhazardous waste through a rotary kiln incineration process. The facility is bounded by a single-family residential area to the west and the Ohio River to the south. On July 13, 2013, an incident occurred at the HTS facility where an estimated 700 to 800 pounds of ash was released into the air beyond the property boundary over the adjacent neighborhood west of the facility.

It appears that most of ash was deposited at the facility’s west fence line. Heritage collected dust samples in the neighborhood to the west of the facility from the external surfaces of vehicles and other objects within the neighborhood. The “10-day area,” where trucks at the facility were staged, had the highest wipe sample results, including 3,600 parts per million (ppm) of arsenic, 13,000 ppm of lead, and 8,000 ppm of nickel. However, this area is a gravel lot with limited or no public access, as it is fenced off and gated with an access code needed for entry. The top and sides of trucks and roll-off boxes were cleaned.

Two of the eight off-site wipe samples showed high concentrations of arsenic and lead. A wipe sample from a small plastic slide at a home on Ohio Avenue showed arsenic at 277 ppm and lead at 819 ppm. The arsenic level exceeded ATSDR’s chronic minimal risk level (MRL) of 15 ppm for arsenic for a 10 kg child. The lead level was about two times the U.S. EPA residential soil screening level of 400 ppm for lead. In addition, elevated arsenic (296 ppm) and lead (1,046 ppm) were detected off-site on a Black S10 pick-up truck. Both of these surfaces have since been washed, either by the Heritage personnel or by the subsequent rainfall events.

After the incident, the incinerator operator shut down the facility and the company deployed cleanup crews within 48 hours of the release to wash down impacted properties, vehicles, and streets. Heavy rains in the area within 48 hours of the release also likely limited the long-term impact of the ash fallout on the neighborhood. Additional sampling of soils and surfaces in the impacted area was suggested to further investigate the longer term, post-incident impacts of the ash residue on the downwind neighborhood.

HTS contracted with an environmental firm, Cox-Colvin, for soil sampling of the area. This sampling was conducted on July 29 and 30, 2013. The Ohio Environmental Protection Agency (Ohio EPA) was provided with split samples of all soil samples collected. A copy of the analytical report prepared by Cox-Colvin, dated September 9, 2013 was received by Ohio EPA on October 23, 2013. The Ohio EPA requested the assistance of the Ohio Department of Health’s Health Assessment Section (HAS) to review and evaluate the results of the soil samples that were collected from the residential neighborhood west of the facility. This health consultation evaluates the available environmental data regarding this soil sampling.

Demographics
East Liverpool is located in northeast Ohio along the Ohio River. East Liverpool is known historically for its pottery and is still home to three major potteries. It is about 60 miles west of Pittsburgh, Pennsylvania and about 100 miles southeast of Cleveland, Ohio. Based on the 2010 Census, the city has a population of 11,195. By race, the population of East Liverpool is 91.7 percent White, 4.6 percent Black, 0.2 percent Native American, 0.2 percent Asian, 0.3 percent some other race, and 3.0 percent two or more races. About 1 percent of the population is Hispanic or Latino (of any race). The city has a total of 4,601 households and 2,892 families. The residential area affected by the ash release was to the west of the HTS facility along the Ohio River shoreline. It covered an area that was about 600 feet wide and 4,200 feet long, or about 0.09 square miles (Cox-Colvin 2013).

**DISCUSSION**

**Exposure Pathways**

In order for residents to be exposed to chemical contaminants, they must come into direct contact with the contaminants through a completed exposure pathway. A completed exposure pathway consists of five main parts:

1. A **Source** of contamination (a chemical release, landfill, etc.),
2. A method of **Environmental Transport** (air, water, soil, sediment, etc.), which allows the chemicals to move from the source area and bring it into contact with people,
3. A **Point of Exposure** where people come into direct contact with the chemicals,
4. A **Route of Exposure** (ingestion, inhalation, or dermal contact), which is how people come into contact with chemicals, and
5. A **Population at Risk**, i.e., people likely to come into contact with site-related chemicals.

Physical contact with a chemical contaminant does not necessarily result in adverse health effects. A chemical’s ability to affect a person’s health depends on:

- How much of the chemical a person is exposed to (dose)
- How long a person is exposed (duration)
- How often a person is exposed (frequency)
- The toxicity of the chemical (how chemicals can make people sick)

Other factors affecting a chemical’s likelihood of causing adverse health effects upon contact include the resident’s

- personal habits,
- diet,
- age and sex,
- current health status, and
- past exposures to toxic chemicals (occupational, hobbies, etc.).
Environmental Data

Data Evaluation

Cox-Colvin, an environmental firm contracted by HTS, collected soil samples on July 29 and 30, 2013. “Surface” soil samples were collected from one square foot at each of 15 locations (Figure 1) between the surface and a depth of 2 inches. “Shallow” soil samples were also collected from the same one square foot area at each location but at a depth between 2 and 3 inches. In addition, a sample of the ash was provided. The information the ODH HAS reviewed included results for:

- 10 soil samples (ELSS-01–ELSS-10) from the affected residential neighborhood west of HTS (Off site)
- 2 soil samples (ELSS-11 & ELSS-12) located north and upwind of the ash release (Off site background)
- 3 soil samples (ELSS-13, ELSS-14, & ELSS-15) located on the HTS facility’s property (On site)
- 1 sample of the ash material (ELASH-01)

These soils and a sample of ash were analyzed for a total of 25 metals, which included U.S. EPA’s Target Analyte List (TAL) metals plus tin and titanium. This report, however, focuses on a subset of these metals which are considered to be more toxic to people and of particular health concern. The metals selected for evaluation were arsenic, cadmium, chromium, lead, manganese, mercury and zinc. The tables in the Tables section of this report were created using the data provided in the Cox-Colvin report dated September 9, 2013. The results were summarized and compared to health-based guidelines or comparison values. Comparison values (CVs) are chemical and media-specific concentrations in air, soil, and drinking water that are used by the Agency for Toxic Substances and Disease Registry (ATSDR) health assessors and others to identify environmental contaminants at hazardous waste sites that require further evaluation. It should be noted that contaminants detected at concentrations that exceed their respective CVs do not necessarily represent a health threat. Instead, the results of the CV screening identify those contaminants that warrant a more detailed, site-specific evaluation to determine whether health effects may occur.

Public Health Implications

Ash

The major elemental components (metals) of the ash sample ELASH-01 were calcium, sodium, and aluminum. These three major constituents make up about 62%, 24%, and 4% of the total mass of the analyzed constituents, respectively. The toxic metals selected for this evaluation (arsenic, cadmium, chromium, lead, manganese, mercury, and zinc) together make up about 2.3% of the detected metal constituents and are minor components of the ash. Some of the most toxic metals were present at levels of health concern. Lead, for example, was detected at 1,800
ppm and arsenic at 1,700 ppm in the ash sample, which could pose a hazard to small children if the ash was deposited and remained on surfaces that children came into contact with.

**Off-site Surface Soils**

With the exception of arsenic, surface soil sample results for the metals of concern were below health-based comparison values for soil (Table 1). ELSS-10, located closest to the western edge of the HTS property (Figure 1), had the highest levels of toxic metals with the exception of arsenic and manganese. The arsenic concentrations in the 10 off-site soil samples from the affected residential neighborhood west of the facility ranged from 14–57 ppm, with an average concentration of 20 ppm. The highest arsenic concentration (57 ppm) was found in ELSS-06, which was located about 2,100 feet west of the HTS property boundary. The mean detected arsenic concentration of 20 ppm is slightly above ATSDR’s chronic environmental media evaluation guide (EMEG) of 15 ppm for a child and below the EMEG of 210 ppm for an adult. Arsenic levels in the two background surface soil samples (ELSS-11 & ELSS-12) ranged from 9.4–15 ppm, with an average of 12 ppm. Arsenic is a naturally occurring element, widely distributed in the earth’s crust. Levels of arsenic in natural soils range from 1 to 40 ppm, with an average level of 5 ppm, although much higher levels may occur in mining areas, at waste sites, near high geological deposits of arsenic-rich minerals, or from pesticide application. In nature, arsenic is mostly found combined with other elements in minerals as opposed to its pure elemental form (ATSDR 2007).

Most cases of arsenic-induced toxicity in humans are due to exposure to inorganic arsenic; differences in potencies of different inorganic chemical forms are usually minor. High oral exposures to inorganic arsenic (in general) can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet. Ingestion of inorganic arsenic can cause injury to the nervous system, including peripheral neuropathy and intellectual deficits in children. The main effect of dermal exposure to arsenic is local irritation and dermatitis. The International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), and the U.S. EPA have all determined that inorganic arsenic is a human carcinogen. Chronic inhalation exposure to arsenic in air increases the risk of lung cancer. Chronic oral exposure to arsenic in drinking water is known to increase the risk of skin cancer and cancer in the lungs, bladder, liver, kidney and prostate (ATSDR 2007).

Arsenic concentrations that exceed EMEG of 15 ppm do not mean that health effect will occur. ATSDR’s EMEGs are derived from ATSDR’s minimal risk levels (MRLs). MRLs are below levels that might cause adverse health effects even in the people most sensitive to such chemical-induced effects. ATSDR’s EMEG was derived by applying an uncertainty factor of 3 (for human variability) to the no observed adverse effect level (NOAEL), which is the highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals. The detected concentrations of metals in soils are at or slightly above background levels typically found in Ohio soils and below levels that could cause harmful health effects. HAS concludes that contact with soil in the affected area west of the HTS facility is not expected to harm people’s health.
Off-site Shallow Soils

The slightly deeper shallow soil samples, collected between 2 and 3 inches in depth from the same area at each location, showed results for the selected metals (Table 2) that were very similar to those found in the surface soils. ELSS-10, for most metals, appeared to have the highest metal concentrations with the exception of arsenic. The arsenic concentrations in the affected residential neighborhood west of the facility ranged from 14–53 ppm, with an average concentration of 20 ppm. Arsenic levels in the two background surface soil samples (ELSS-11 & ELSS-12) ranged from 9.1–17 ppm, with an average of 13 ppm. Overall, the pattern appears to show no difference between the metal concentrations on the surface and the soils slightly deeper, indicating no significant impact on soil composition due to the ash release.

On-site Soils

Three soil samples (ELSS-13, ELSS-14, and ELSS-15) were taken on the Heritage Thermal Services property. In general, the soil sample results were not above health-based comparison values (Table 3). The exception was manganese in the surface soil of ELSS-13, located closest to the western edge of the property boundary.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child’s lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children’s health.

Children and adults who are exposed to inorganic arsenic may have similar health effects, such as irritation of the stomach and intestines, blood vessel damage, skin changes, and reduced nerve function. There is some evidence that long-term exposure to arsenic in children may result in lower IQ (intelligence quotient) scores and that exposure to arsenic in early life (including in the womb) may increase mortality in young adults. Children are more sensitive to the effects of lead exposure than are adults. Neurological effects in children may begin at low blood lead levels and studies have found a measured decrease in IQ as blood lead levels increase.

CONCLUSIONS

HAS concludes that the trace amounts of toxic metals in the surface and shallow soils of the residential area west of the HTS facility affected by the July 2013 ash release are not expected to harm people’s health. The reason for this is that the concentrations of these metals found in the
soils are below levels of health concern. In general, the levels of these elements in these soils are similar to background levels typically found in Ohio soils. Based on a comparison of shallow and surface soils, the surface soils in the residential area west of the site do not appear to have been affected by the ash release.

Two locations, ELSS-10 located off site and ELSS-13 on site, which are closest to and downwind of the HTS property, generally showed the highest levels of the elements of concern. The analysis of the ash indicated elevated levels of lead and arsenic, which could pose a hazard to small children if the ash was deposited and remained on surfaces that children came into physical contact with.

**RECOMMENDATIONS**

It is recommended that measures are taken to prevent the release of hazardous waste ash from the WTI/HTS facility to off-site residential areas in the future.

**REFERENCES**


**REPORT PREPARATION**

This Public Health Consultation for this site was prepared by the Ohio Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved agency methods, policies, and procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. This document has not been reviewed and cleared by ATSDR.

**Authors**

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Ohio Department of Health
TABLES
Table 1. Selected Chemicals in Off-site Surface Soils (1–2 inches)

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Range of Detections (ppm)</th>
<th>Average (ppm)</th>
<th>Frequency of Detections</th>
<th>Location of Maximum Detection</th>
<th>Frequency Above Comparison Value</th>
<th>Comparison Value (ppm)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Affected Area (West of HTS)</strong></td>
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<tr>
<td>Arsenic</td>
<td>14–57</td>
<td>20</td>
<td>10/10</td>
<td>06</td>
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<td>Cadmium</td>
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<td>Manganese</td>
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<td>C-EMEG (child)</td>
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</table>

Source: Cox-Colvin & Associates, Inc. 2013

C-EMEG – chronic environmental media evaluation guide (ATSDR)
ppm – parts per million
RMEG – reference dose media evaluation guide (ATSDR)
RSL – regional screening level (U.S. EPA)
Table 2. Selected Chemicals in Off-site Shallow Soils (2–3 inches)

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Range of Detections (ppm)</th>
<th>Average (ppm)</th>
<th>Frequency of Detections</th>
<th>Location of Maximum Detection</th>
<th>Frequency Above Comparison Value</th>
<th>Comparison Value (ppm)</th>
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<td>11</td>
<td>0/2</td>
<td>15,000</td>
<td>C-EMEG (child)</td>
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</tbody>
</table>

Source: Cox-Colvin & Associates, Inc. 2013

C-EMEG – chronic environmental media evaluation guide (ATSDR)
ppm – parts per million
RMEG – reference dose media evaluation guide (ATSDR)
RSL – regional screening level (U.S. EPA)
Table 3. Selected Chemicals in On-site Soils on HTS Property

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<thead>
<tr>
<th>Chemical</th>
<th>Range of Detections (ppm)</th>
<th>Average (ppm)</th>
<th>Frequency of Detections</th>
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<td><strong>Shallow Soils on HTS Property</strong></td>
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</table>

Source: Cox-Colvin & Associates, Inc. 2013

C-EMEG – chronic environmental media evaluation guide (ATSDR)
ppm – parts per million
RMEG – reference dose media evaluation guide (ATSDR)
RSL – regional screening level (U.S. EPA)
FIGURES

Figure 1. Soil Sample Locations