

Health Consultation

Blood Lead Results for 2001 Calendar Year

HERCULANEUM LEAD SMELTER SITE

HERCULANEUM, JEFFERSON COUNTY, MISSOURI

EPA FACILITY ID: MOD006266373

FEBRUARY 26, 2002

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

Agency for Toxic Substances and Disease Registry

Division of Health Assessment and Consultation

Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR

or

Visit our Home Page at: <http://www.atsdr.cdc.gov>

Health Consultation

Blood Lead Results for 2001 Calendar year

HERCULANEUM LEAD SMELTER SITE

HERCULANEUM, JEFFERSON COUNTY, MISSOURI

EPA FACILITY ID: MOD006266373

Prepared by:

Missouri Department of Health and Senior Services
Section for Environmental Public Health
under cooperative agreement with the
Agency for Toxic Substances and Disease Registry

BACKGROUND AND STATEMENT OF ISSUES

Statement of Issues

In December 2001, the Missouri Department of Health and Senior Services (DHSS) presented the preliminary results of two voluntary blood lead screening events in Herculaneum, Missouri to the Herculaneum Community Advisory Group. At the request of that group, this health consultation will evaluate all known blood lead data collected from residents in the community near the Herculaneum Lead Smelter facility in Herculaneum, Jefferson County, Missouri during 2001. Conclusions and recommendations in this document were made based on data available as of January 18, 2002.

Background

The Herculaneum lead smelter is an active facility that has been in operation in this community since 1892. The Doe Run Company currently owns and operates the smelter. The facility is located at 881 Main Street in Herculaneum, Missouri, approximately 25 miles south of St. Louis, Missouri, on the Mississippi River. It abuts residential neighborhoods on the north, west, and south, with the Mississippi River on the east. A lead ore concentrate, consisting of approximately 80% lead sulfide, is processed at the smelter. The ore is transported by truck from eight lead mines operated by the company near Viburnum, Missouri, approximately 75 miles south-southwest of Herculaneum. The 52-acre Herculaneum facility consists of a smelter plant, 24-acre waste slag storage pile, and an onsite sulfuric acid plant (1).

The city of Herculaneum has an estimated population of 2,805 people, according to the 2000 US Census. Several homes are within 200 feet of the smelter plant, and at least four homes are within 200 feet of the slag pile. Figures 1 and 2 display the location of the smelter in relationship to the community (2). Three schools are in the city: a high school, a middle school and a junior high school. The elementary school is in near-by Pevely. There are no licensed day-care facilities in the city of Herculaneum.

Environmental sampling has shown lead contamination throughout the community. For example, lead has been found in yard soils at concentrations up to 33,100 parts per million (ppm) (3); in air ranging from non-detectable (ND) to 85 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) (4); and in dust on streets ranging from 30,000 ppm to 300,000 ppm (5). MDHSS has initiated health education for area residents and physicians to increase their awareness of public health issues associated with lead and the benefits of routine blood lead testing for children.

Although there may be multiple sources of lead contributing to the over all contamination (e.g., lead-based paint, lead from gasoline, etc.), it has been documented during previous screenings that proximity to the smelter appears to be associated with higher blood lead levels (BLL) (2).

In the past year, DHSS and Jefferson County Health Department (JCHD), in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), have offered blood lead testing to the residents of Herculaneum and surrounding communities. Two testing efforts have occurred in Herculaneum.

During August of 2001, the DHSS and JCHD offered a voluntary community-wide venous blood lead testing in cooperation with ATSDR. Laboratory support and analysis was provided by the Missouri State Public Health Laboratory (SPHL). Individuals participating in this screening included residents from Herculaneum and surrounding communities including Pevely, Crystal City, and Festus.

The most recent blood lead screening effort was conducted in October 2001 as part of a census to identify all children under the age of 72 months living within the Herculaneum city limits. Venous blood samples were collected by certified phlebotomists from DHSS, JCHD, and St. Louis County Health Department. Laboratory support and analysis was provided by the SPHL. Residents of adjacent communities who thought, for various reasons, that they spent a considerable amount of time in Herculaneum were also tested upon their request. DHSS has identified a total of 199 children under the age of six residing within the Herculaneum city limits.

The DHSS has established elevated blood lead to be a reportable condition. CSR 20-20.020 states that all blood lead levels of 10 micrograms of lead per deciliter of whole blood (µg/dL) or higher in persons under age 18, or 25 µg/dL or higher in persons age 18 or greater (lead poisoning level for adults) are reportable to the DHSS by a physician, laboratory, and hospital. The State Public Health Laboratory (SPHL), private physicians, and various laboratories have provided blood lead level data to the DHSS Office of Surveillance, which maintains databases on reportable conditions.

The data set evaluated in this health consultation includes blood lead data collected by and/or reported to the DHSS over the course of calendar year 2001, as required by the state regulation as well as results from the two screening events conducted by the DHSS. Laboratory analytical methods are not described, and vary for all of the data. However, the data are sufficient to determine whether blood lead levels in the community were elevated.

Only data for Herculaneum residents are considered in this analysis. For individuals who have multiple BLL results for the year, the highest BLL reported for the individual has been used in the evaluation. Only test results from venous blood draws were used; any capillary test results have been removed from the data set.

A total of 935 people were tested; 118 of these were children under the age of 72 months, 162 children between the ages of six and 17 years, and 655 adults age 18 or higher. Of the children less than 72 months of age, which were tested, 33 had BLLs of 10 µg/dL or higher (28%),

ranging from ND-31 µg/dL. In children between the ages of six and 17 years, 13 had BLLs of 10 µg/dL or higher (8%), ranging from 10 µg/dL to 19 µg/dL. Of the 655 adults tested, two had BLLs of 25 µg/dL or higher. The men range from 10 µg/dL to 31 µg/dL and women were from 10 µg/dL to 55 µg/dL. Tables 1, 2, and 3 contain a summary of these results.

Table 1. Blood Lead Levels of Children less than 72 months of age for January through December, 2001 reported to DHSS for Zip Code 63048

Blood lead levels in µg/dL	Number of individuals
0 – 9	85
10 – 19	27
20 – 29	5
30 or higher	1

Table 2. Blood Lead Levels of Children between 6 and 17 years of age for January through December, 2001 reported to DHSS for Zip Code 63048

Blood lead levels in µg/dL	Number of Individuals
0 – 9	149
10 – 19	13
20 – 29	0
30 or higher	0

Table 3. Blood Lead Levels for Adults, 18 years and older for January through December, 2001 reported to DHSS for Zip Code 63048

Blood lead level (µg/dL)	Number of Individuals
0 – 24	653
25 – 39	1
40 – 49	0
50 and higher	1

Data for other sensitive subgroups such as fetuses, theoretically exposed through women of childbearing age 15-44 years, and the elderly (i.e., 65 and older) were examined more closely. Table 4 summarizes this evaluation. This analysis found that 197 women of childbearing age were tested. In this group, only one had a BLL of 10 µg/dL or higher (55 µg/dL). Twenty-one of the women tested in this group were aged 15 to 17 years; the remaining 176 were 18 or older.

A total of 166 residents 65 years of age and older were tested. Twenty-one had BLLs of 10 µg/dL or higher; five females and 16 males. Twenty-two µg/dL was the highest female BLL and 24 µg/dL was the highest male BLL.

Table 4. Blood Lead Levels for sensitive populations for January through December, 2001 reported to DHSS for Zip Code 63048

Blood lead level (µg/dL)	Women of child bearing age 15-44 years (n=197)	Elderly, 65 years and older (n=166)
0 – 9	196	145
10 – 19	0	17
20 – 29	0	4
30 or higher	1	0

DISCUSSION

Childhood lead poisoning is a major, but preventable, environmental health problem. Children are a high risk group. They are generally assumed to be at an increased risk of exposure to chemicals in soil due to their more frequent soil contact and tendency to ingest soil, either intentionally or through normal hand-to mouth behavior. Exposure to lead in utero, in infancy, and in early childhood may slow mental development and lower intelligence later in life. The Centers for Disease Control and Prevention (CDC) recommends that BLLs remain below 10 µg/dL to decrease the likelihood of neurological and learning problems in children. Other unusually susceptible populations include the elderly, people with inheritable genetic diseases, alcoholics and smokers, and people with neurological dysfunction or kidney disease (6,7).

Recent data from the National Health and Nutrition Examination Survey, Blood Lead Levels in Young Children, 1996- 1999 (NHANES) conducted by the CDC, stated that the mean children’s BLL in the U.S. is 2.0 µg/dL (8). Average BLLs in the United States have fallen dramatically since the 1970’s. In 1976-1980, the average BLL in children was 15 µg/dL, and in 1991-1994, the average was 2.7 µg/dL (7). The national prevalence for BLLs greater than or equal to 10 µg/dL in children is 7.6% (8).

Based on all the blood lead data provided to DHSS, significant blood lead elevations have been documented in this community. The data provided neither represent a random sample of the community nor represent the entire community; these BLLs are reflective of physician selection and/or self-selection. During the 2001 calendar year, 118 children in the 63048 zip code were tested for lead. Thirty-three of these 118 were found to have BLLs of 10 µg/dL or higher (28%). This is higher than the national prevalence rate of 7.6% (8) and the Missouri rate of 8%.

When BLLs for children residing east of Highway 61/Commercial Blvd. (the portion of the community closer to the smelter) are examined exclusively, 30 of 67 children, approximately 45%, had BLLs of 10 µg/dL or higher. This is significantly higher than the national prevalence rate of 7.6 % and the Missouri prevalence rate of 8%. The average BLL in children less than 72 months, regardless of proximity to the smelter, was 8.0 µg/dL for the entire calendar year,

with BLLs ranging from 2-31 µg/dL. This is also higher than the national mean BLL of 2.0 µg/dL. Based on these BLLs and prevalence rates, it is likely that adverse health effects, such as those mentioned above, may be occurring in a considerable portion of the children in this community.

The data indicates that the average BLL for women between the ages of 15- 44 is 3.4 µg/dL. This is higher than the national mean BLL of 1.8 µg/dL for this age group (9). No adverse health effects would be expected for women at this level. Nevertheless, lead has been demonstrated to cross the placenta at levels less than 10 µg/dL (10). Adverse health effects may be expected for the one female screened late in the year with a BLL of 55 µg/dL. That is, should this woman become pregnant at this BLL, adverse health effects may be expected for the fetus.

Individuals 65 years and older were found to have a mean blood lead level of 5.9 µg/dL (9). This is slightly higher than the national mean BLL of 3.3 µg/dL. No adverse health effects, however, would be expected from current BLLs at this level (9). Still, some past and present occupational and recreational exposures (e.g., crafts and hobbies) have been identified for this subgroup that may be contributing to their elevations.

Child Health Initiative

Children and adults are exposed to lead in many of the same ways. But children are not small adults. They differ in the behaviors that lead to their exposures as well as their susceptibility to toxic effects from lead exposures. Children are more likely to play outdoors and bring food into contaminated areas. They are also shorter than adults, so are more likely to breathe dust and soil that are close to the ground, and children are smaller, resulting in higher doses of chemical exposure per pound of body weight. (6)

Further, children have developing body systems that can sustain permanent damage if toxic exposures occur during critical growth stages. Compared to adults, children absorb more of the lead they take into their bodies, retain more of the lead they take in, and are more sensitive to its effects. (6)

Children may be exposed to lead inside their homes, outside in their yards, playgrounds, parks, and while attending school. This community is faced with widespread environmental contamination. Because children depend on adults for risk identification and management decisions, it is prudent that further lead exposure be prevented.

CONCLUSIONS

The blood lead data reviewed indicate that exposures have occurred, are occurring, and are likely to occur in the future; and short-term exposures are likely to have an adverse impact on human health. Consequently, this site has been classified as an urgent public health hazard. Specifically, we conclude the following:

1. Twenty-eight percent (28%) of children in this community have blood lead levels known to cause adverse health effects. Forty-five percent (45%) of the children residing east of Hwy 61/Commercial Blvd. have blood lead levels known to cause adverse health effects.
2. Of the females of childbearing age in this community tested for BLL, one has a blood lead level that could cause adverse health effects to her developing fetus if she became pregnant.

RECOMMENDATIONS

1. Risk management agencies should assure that steps are taken to eliminate/reduce the source(s) of lead exposure as soon as possible.
2. Risk management agencies should conduct environmental sampling to evaluate all lead exposure pathways for this community.
3. DHSS and JCHD should continue health education activities for both the people in the community and area health care providers. These activities should focus on awareness of lead poisoning, its adverse health effects, how to reduce exposures, and encourage blood lead testing, especially for children.
4. Consider a health study to evaluate the health impacts of lead on the community.

When additional information becomes available, DHSS will evaluate it thoroughly and, if appropriate, update existing assessment documents. ATSDR and DHSS will respond appropriately to any request for additional information or action.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Herculaneum Lead Smelter site contains a description of actions to be taken by the Missouri Department of Health and Senior Services (DHSS), the Agency for Toxic Substances and Disease Registry (ATSDR), and others. The purpose of the PHAP is to ensure that this health consultation not only identifies public health hazards, but also provides an action plan to mitigate and prevent adverse human health effects resulting from present and/or future exposure to hazardous substances at or near the site. Included is a commitment from DHSS and/or ATSDR to follow-up on this plan to ensure that it is implemented. The public health actions to be implemented by DHSS, ATSDR and /or cooperators are as follows:

1. DHSS/ATSDR will coordinate with the appropriate environmental agencies to identify environmental sampling that needs to occur so that exposure pathways can be adequately identified and characterized.
2. DHSS/ATSDR will continue to evaluate any additional data that become available regarding human exposure or contaminants at the site, including identifying additional exposure pathways and evaluating health impacts of risk reduction and remediation plans.
3. DHSS/ATSDR have developed and are implementing a comprehensive health education plan in this community. Those efforts will continue and will focus on increased childhood lead testing, awareness of lead poisoning, its adverse health effects, and how to reduce exposures, especially for children.
4. JCHD/DHSS/ATSDR will continue to assure case management of children with elevated BLLs.
5. DHSS/ATSDR are evaluating the feasibility of initiating health study activities in this community.

Preparers of Report:

Angela Minor, Gale Carlson, Missouri Department of Health and Senior Services

Attachments:

Figure 1- Site Map

Figure 2- Site Map

Certification

This health consultation for the Herculaneum Lead Smelter Site was prepared by the Missouri Department of Health and Senior Services under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved methodology and procedures at the time the health consultation was initiated.



Technical Project Officer, SPS, SSAB, DAC

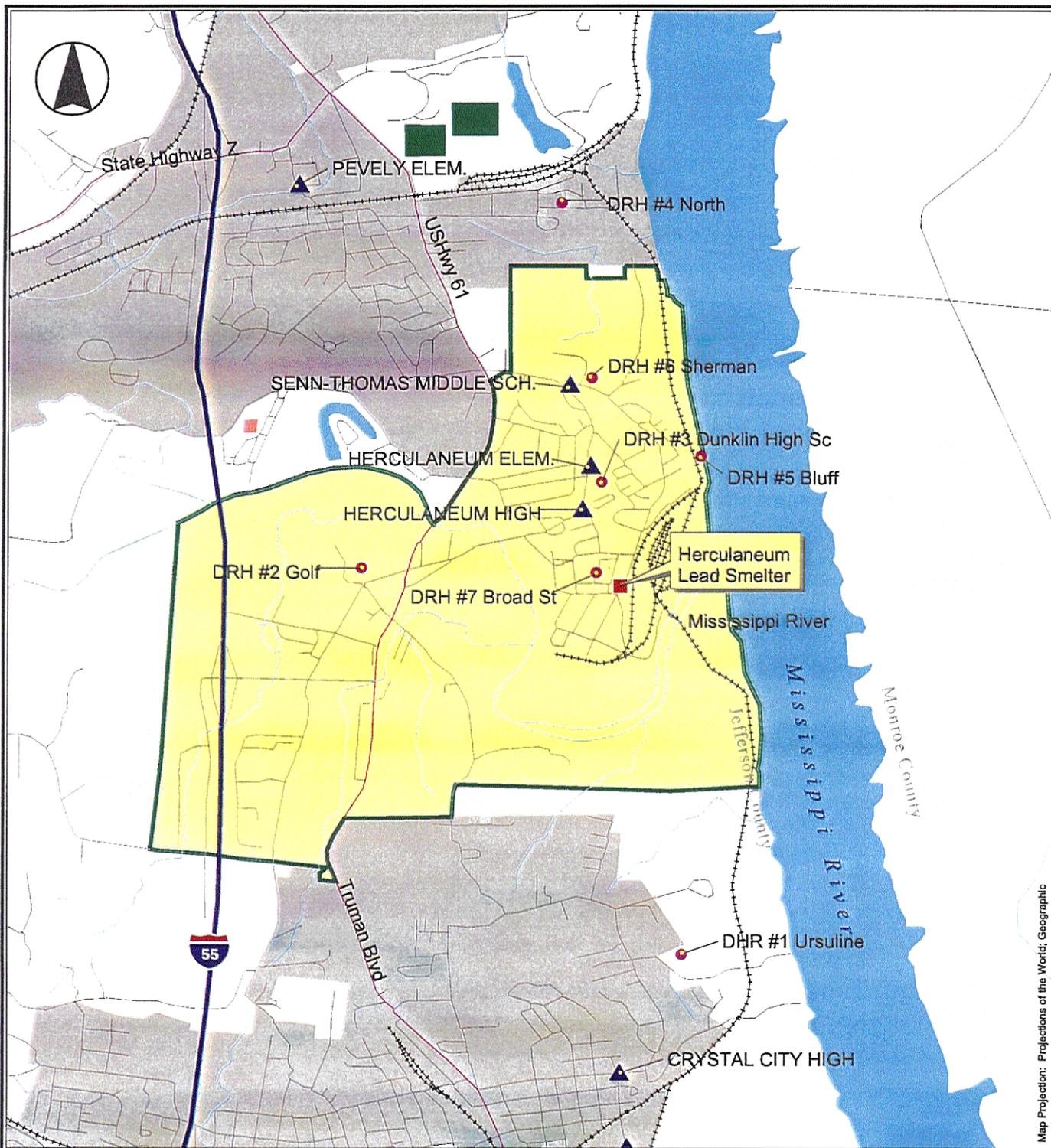
The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



Section Chief, SPS, DHAC, ATSDR

REFERENCES

1. Missouri Department of Natural Resources, Division of Environmental Quality, Hazardous Waste Program. Preliminary Assessment: Herculaneum Lead Smelter Site, Jefferson County, Missouri. March 30, 1999.
2. Agency for Toxic Substances and Disease Registry. Health consultation for Herculaneum Lead Smelter site: Atlanta: US Department of Health and Human Services; 2001 Jul 13.
3. Environmental Protection Agency. Transmittal from Bruce Morrison to Missouri Department of Health and Senior Services, January 8, 2002.
4. Missouri Department of Natural Resources. Transmittal from David Mosby to Tony Petruska, Environmental Protection Agency, Sample#A58, November 28, 2001.
5. Walker P. Missouri Department of Health and Senior Services. Herculaneum, Missouri Lead Contamination Health Threat. September 13, 2001.
6. Agency for Toxic Substances and Disease Registry, 1999. Toxicological Profile for Lead (Update). Atlanta, Georgia: US Department of Health and Human Services, Public Health Services, Agency for Toxic Substance and Disease Registry.
7. Centers for Disease Control and Prevention. Screening young children for Lead Poisoning: Guidance for State and Local Public Health Officials. November 1997. Atlanta, Georgia: US Department of Health and Human Services, Public Health Services, CDC, 1997.
8. Centers for Disease Control and Prevention. Blood Lead Levels in Young Children- United States and selected states, 1996-1999. MMWR 2000; 49: 1133-7.
9. Centers for Disease Control and Prevention. Blood Lead Levels- United States, 1991-1994. MMWR 1997; 46: 141-6.
10. Agency for Toxic Substances and Disease Registry, 1990. Toxicological Profile for Lead. Atlanta, Georgia: US Department of Health and Human Services, Public Health Services, Agency for toxic Substance and Disease Registry.



Map Projection: Projections of the World; Geographic

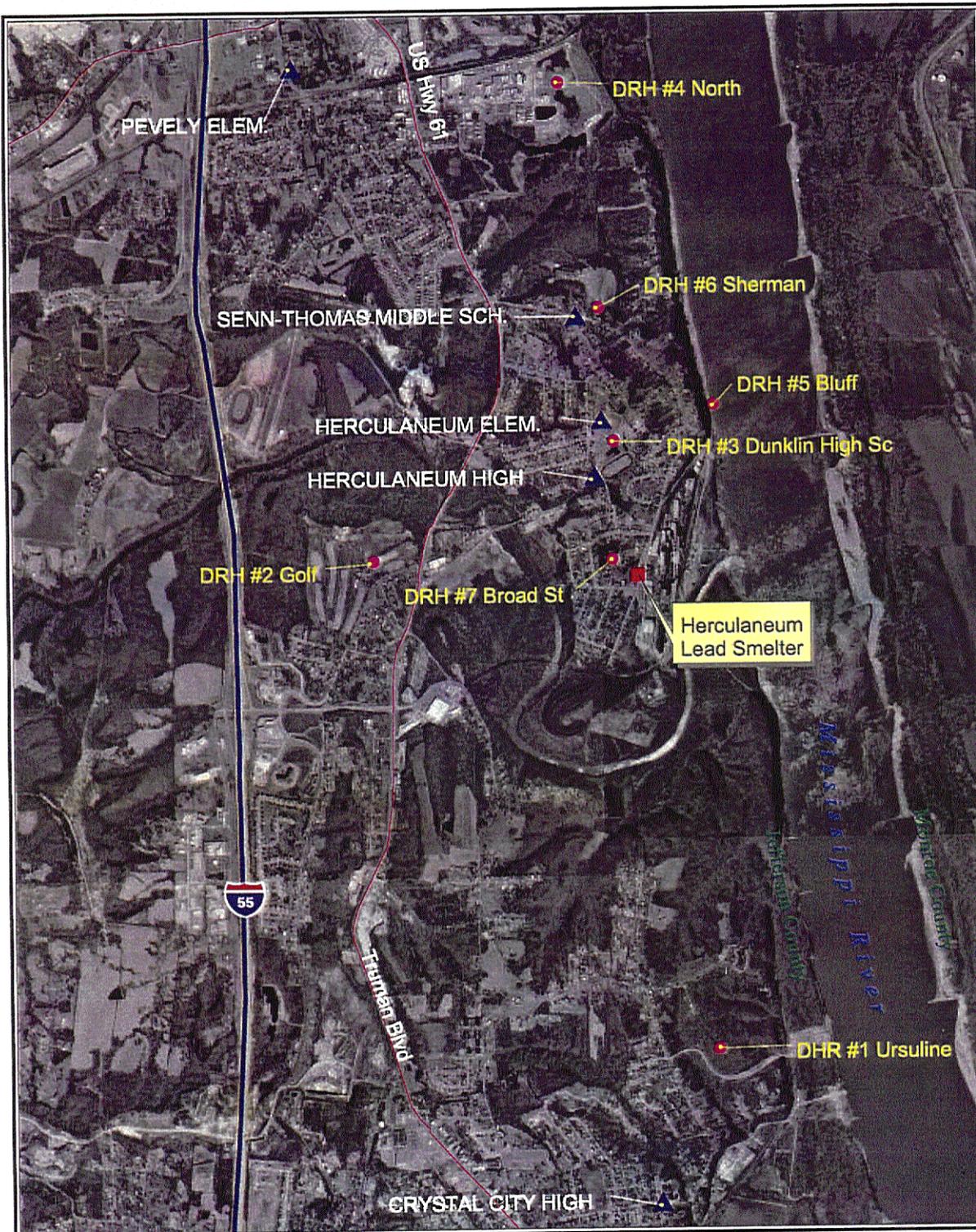
Herculaneum Lead Smelter

Herculaneum, MO
 CERCLIS No. MOD006266373

VICINITY MAP



ATSDR SAAGIS



Map Projection: UTM - 1983 ; Zone 15

Herculaneum Lead Smelter

Herculaneum, MO
 CERCLIS No. MOD006266373

VICINITY MAP



Jefferson County, MO



ka1061201