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Kathy Halbur  
On-Scene Coordinator  
U.S. EPA Region 5  
Emergency Response Branch  
c/o WDNR  
2984 Shawano Ave  
Green Bay, WI 54313-6727

Dear Ms. Halbur,

The Wisconsin Department of Health Services (DHS) and the Shawano-Menominee Counties Health Department (SMCHD) recommend time-critical removal actions take place to address existing human health hazards at the Aniwa Arsenic Site located on Marsh Road in Aniwa, Wisconsin.

DHS and SMCHD have evaluated health risks from direct contact with soils from the Aniwa Arsenic Site (the "site"). Based on the levels of arsenic found in surface and subsurface soils, DHS and SMCHD have concluded that arsenic in soils on the site could represent a **public health hazard** to people coming onto the site, primarily due to the risk posed by accidental ingestion of small amounts of these soils. Furthermore, DHS and SMCHD have concluded that contaminated groundwater at the site could represent a **future health hazard** if a residential drinking water well were drilled on the site. In order to protect trespassers and visitors to the site, as well as nearby residents, DHS and SMCHD recommend the removal and disposal of arsenic-contaminated soils from the site.

### **Purpose**

The U.S. Environmental Protection Agency (EPA) Emergency Response Branch asked DHS to evaluate human exposures to arsenic-contaminated soils on the Aniwa Arsenic Site in Aniwa, Wisconsin. DHS contacted the Shawano-Menominee Counties Health Department (SMCHD). DHS and SMCHD considered two exposure pathways, via soil and groundwater.

In preparing our response, DHS and SMCHD relied on several sources of information. These include soil and groundwater data collected as part of the site assessment, and a literature review of the toxicity of arsenic to humans through exposure to contaminated soil and water.

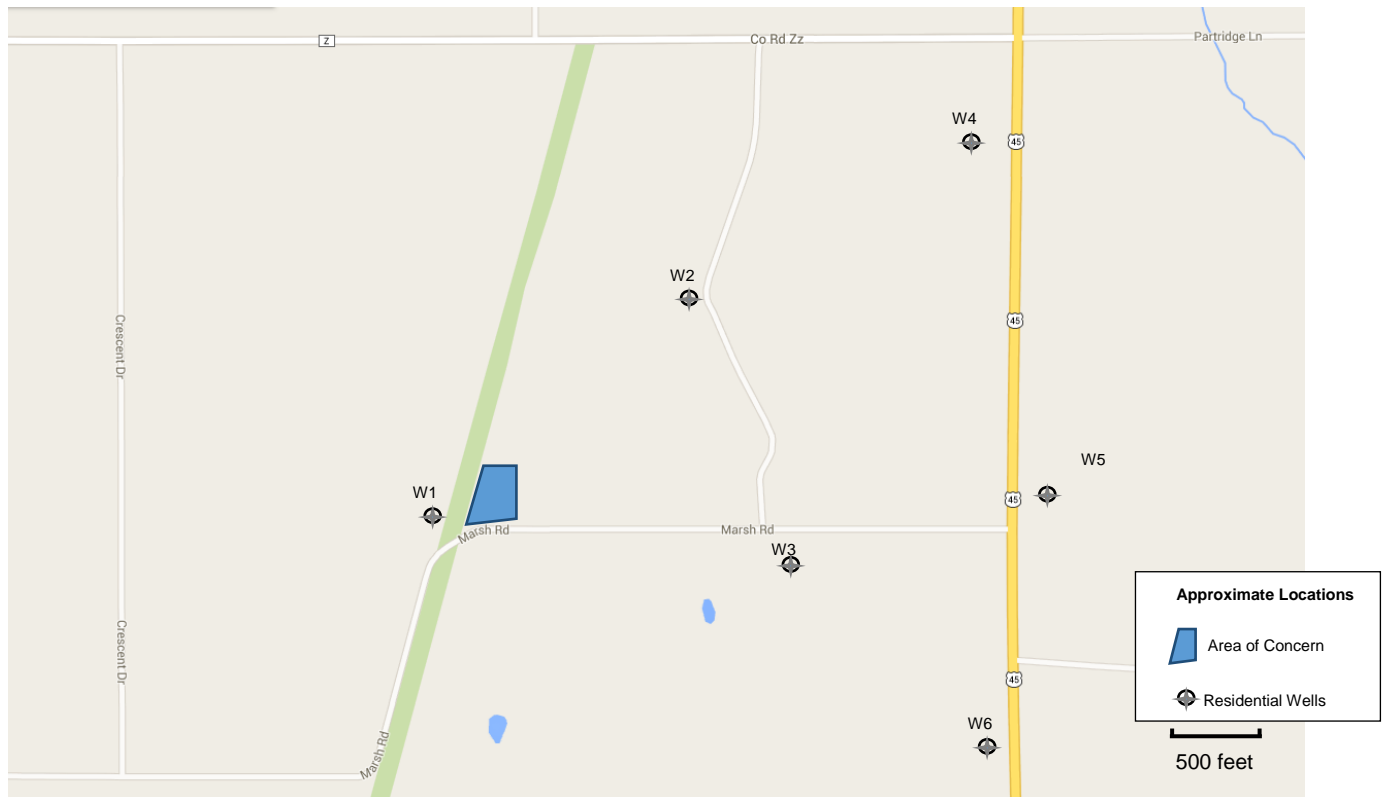


Figure 1. Approximate Area of Interest, Aniwa Arsenic Site, Town of Aniwa, Shawano County, Wisconsin.

## Background

The Village of Aniwa is a small rural community along the western border of the county with a population of about 260 people (2010 US Census). The site is located 2 miles south of the Village of Aniwa, Wisconsin in Shawano County. Within a half mile of the site itself there are 8 households and 22 people. About 30% of the residents within a half mile are under the age of 18.

The 4-acre site, owned by the Town of Aniwa, is located on Marsh Road, between Highway 45 to the east and Crescent Drive to the west. There are currently no buildings on the site. The site is fenced along the southern edge only (Marsh Road). Thick groves of trees grow along the eastern and western edges of the property. The site is bordered to the north by a swamp.

The closest residential properties to the site are to the west (private well W1) and to the northeast (private well W2). The western edge of the site is separated from the neighboring property by an abandoned portion of the Chicago and Northwest Railroad (now a trail). Across Marsh road and to the east of the property is another property with a private well (W3).

The site was purchased in 1935 for pesticide storage. From the 1930's to the 1970's, drums of a grasshopper pesticide, sodium arsenite powder, were stored on-site in a storage shed and, in the mid 1970's, those drums were buried on-site. In the early 1980's, soil samples taken at the site identified arsenic contamination. Although 19 drums and 45 cubic yards of contaminated soil were removed from the site in the mid 80's, continued groundwater monitoring and additional soil investigations have identified that arsenic contamination problems remain at the site. Impacted soils were found in a larger area than just the former storage shed and disposal pit

areas. In 2014, the Wisconsin Department of Natural Resources (DNR) requested that EPA conduct an emergency removal at the site.

On September 23, 2014, staff from SMCHD, DHS, EPA and DNR conducted a site visit. During this visit, EPA staff screened site soils for arsenic and other metals, secured the front gate to the site, and posted signs on the front gate alerting the public to potential arsenic hazards on the site.

### Environmental data

Soils on the site were sampled or screened for arsenic between 1983 and 2014. Because contaminated soils and waste were removed from the site in 1984, only the data from 1990 and later has been used in our analysis of exposure pathways. Soil sampling results are summarized in Table 1.

**Table 1.** Arsenic Concentrations in Soils at the Aniwa Arsenic Site, Aniwa, Shawano County, Wisconsin, 1990-2014.

Soil Depth (in feet)	Range of Arsenic Concentrations (in mg/kg)
0-2	1.18 – 1,410
2-4	ND – 8,360
4-6	1.30 – 110
6-10	1.6 - 256
Greater than 10	ND – 465

Note: ND – Non-Detect  
mg/kg - milligrams per kilogram

**Table 2.** Arsenic Concentrations in Groundwater, Aniwa Arsenic Site, Aniwa, Shawano County, Wisconsin, 1990-2013.

#### *On-Site (Monitoring Wells)*

Well Location	Years of monitoring (# of samples over that time)	Range of arsenic levels (ug/L)
B12	2004 – 2012 (36)	394 – 1,475
B13	2004 – 2012 (40)	246 - 72,000
B21	2004 – 2012 (41)	13.9 - 444

#### *Off-Site (Residential Wells)*

W1	1990 – 2013 (32)	ND – 9.2
W2	2004 – 2013 (9)	ND – 4.7
W3	1990 – 1996 (9)	ND – 2.4
W4-6	2004-2005 (3)	ND

Note: ND – Non-Detect  
ug/L – micrograms per liter

Groundwater monitoring occurred at the site and at nearby private residences between 1990 and 2013. Six private wells in the area were tested for arsenic, however, three of these wells (W4, 5 and 6) did not have detectable levels of arsenic during sampling. Table 2 summarizes the results of groundwater monitoring at three on-site monitoring wells and the six off-site private wells.

## **Discussion**

Arsenic is a naturally occurring element found in the earth's crust, but can also be found combined with other elements in both inorganic and organic compounds. The majority of the arsenic at this site is thought to be due to an inorganic arsenic pesticide, sodium arsenite, that was stored on the site and later buried on-site. Arsenic from this pesticide has contaminated both groundwater and soils on the site.

### *Health effects of exposure to arsenic*

Ingestion of inorganic arsenic is associated with multiple health effects. Long-term ingestion of inorganic arsenic may result in nausea and vomiting, blood vessel damage, abnormal heart rhythm, nerve damage, decreased production of blood cells, and skin changes. Arsenic is classified as a known human carcinogen and there is evidence that long-term exposure to arsenic is associated with increased risk of skin, bladder, lung, liver, colon, and kidney cancer.

Many of the health effects related to arsenic exposure that may affect adults may also affect children. There is also some evidence that long-term exposure of children to arsenic may result in lower IQ scores. Additionally, there is some evidence that exposure in the womb and during early childhood may increase mortality in young adults. Even though many of the potential health effects are similar for children and adults, behavioral differences, such as normal hand-to-mouth activity in children that results in incidental or intentional ingestion of contaminated soils, mean that children may be at higher risk of exposure.

### *Exposure Scenarios*

People coming onto the site could be exposed to arsenic in soils on the site. During the September 23, 2014 site visit, there was evidence that people are frequently coming onto the site. A well-defined foot path was observed, leading from the front gate on the southern border of the site (Marsh Road), through the middle of the site, and out to the northeastern boundary of the property. The observed path led directly through the area of the original shed and burial pit area where the highest arsenic concentrations have been found in soils on the site. The most likely scenario is that residents in the area are cutting across the site to access their own land, or coming through or onto the site as part of hunting activities.

Exposure to site soils could happen either during the trespasser's time on the site (through incidental ingestion of soils such as from hand to mouth activities, or eating while on the site) or by tracking contaminated soils off of the site. In this latter scenario, people walking across the site can track contaminated soils back to their homes. If people handle their footwear or clothing that is contaminated with soils from the site and then eat or prepare foods before washing their hands, they may accidentally ingest site soils that were on their hands.

Soil arsenic concentrations on the site from all depths exceed the Agency for Toxic Substances and Disease Registry (ATSDR) health-based comparison value for chronic exposures to arsenic in soils (Environmental Media Evaluation Guideline, or EMEG), as well as the ATSDR soil screening value for lifetime cancer risk (Cancer Risk Evaluation Guideline, or CREG). The relevant EMEG and CREG levels are 15 milligrams of arsenic per kilogram soil (mg/kg) and 0.47 mg/kg, respectively. The EMEG represents a concentration of arsenic in soil that children may be exposed to long term (a year or longer) without experiencing adverse health effects.

ATSDR has also developed an acute EMEG for arsenic exposures in children with pica behavior (10 mg/kg). The EMEGs are used as a guideline comparison to quickly screen soil concentrations. The CREG is a comparison value used to screen a contaminant to identify concentrations of arsenic that are unlikely to result in an increase in cancer rates in the exposed population. Because the on-site soils exceed these screening values, a more thorough evaluation of the possible exposure pathways is needed.

The highest concentration of arsenic in on-site soils is 8,360 mg/kg. Surface soils had arsenic concentrations as high as 1,400 mg/kg. An accidental ingestion of 200 mg of soils containing 8,360 mg As/kg would compare to an arsenic exposure of 0.08 mg/kg in a 20 kg child, which exceeds the lowest observable adverse level (LOAEL) for serious gastrointestinal effects (0.05 mg/kg/day) from arsenic exposure. DHS and SMCHD considers such exposures a public health hazard due to the possibility of acute effects from accidental ingestion of soils. Remediation of contaminated soils is recommended as a long-term solution to this hazard.

Although concentrations of arsenic in area residential wells have not exceeded drinking water enforcement standards (ES), arsenic concentrations in samples from private well W1 have been as high as 9.2 micrograms per liter (ug/L) in 2012. This is just below the ES of 10 ug/L. Although drinking water from residential wells near to the site does not currently pose a health hazard to residents from arsenic exposure in that water, removal of contaminated soils on site is recommended to control contaminant flow to groundwater.

Concentrations of arsenic in on-site monitoring wells have been much higher than concentrations in residential wells (see Table 2), and the concentrations in monitoring well B-13 appear to be increasing. Additional monitoring of on-site wells and of the closest residential wells is recommended to ensure that arsenic levels do not become a health concern.

Finally, if the site is to be sold as a residential property in the future, contaminated soils and groundwater on site would represent an immediate health threat to residents if left unmitigated.

## Conclusions

Based on the levels of arsenic found in surface and subsurface soils through soil screening and past sampling, DHS and SMCHD conclude that:

- 1) Arsenic concentrations in site soils represent a **public health hazard** to people coming onto the site. Accidentally eating arsenic in soil or dust from the site could harm people's health.
- 2) Arsenic-contaminated groundwater at the site could represent a **future health hazard** if a drinking water well was drilled on the site, and to nearby residential properties.

## Recommendations

- In order to protect trespassers and visitors to the site, as well as nearby residents, DHS and SMCHD recommend the removal and disposal of soils at the site that are contaminated with arsenic.
- Additional monitoring of on-site wells and of the closest residential wells is recommended to ensure that arsenic levels do not become a health concern.

- Engineering and or other controls are recommended to protect future users of the site.

Please contact Liz Evans at DHS (608-266-3393) if you have any questions regarding the conclusions or recommendations in this letter.

Sincerely,



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cc: Tauren Beggs, Wisconsin Department of Natural Resources