Letter Health Consultation

OLIN FORMER PETROLEUM BULK PLANT

OLIN, JONES COUNTY, IOWA

Prepared by the
Iowa Department of Public Health

MAY 17, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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Iowa Department of Public Health
Promoting and Protecting the Health of Iowans

Thomas Newton, MPP, REHS
Director

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April 15, 2010

Mel Pins
Brownfields Coordinator
Iowa Department of Natural Resources
Wallace State Office Building
Des Moines, IA 50319

RE: Health Consultation
Former Petroleum Bulk Plant – Olin, Iowa

Dear Mr. Pins:

This letter has been prepared as a consultation to evaluate human health impacts from residue contamination left from the operation of a bulk plant located in Olin, Iowa. The Iowa Department of Public Health's priority is to ensure the Olin community has the best information possible to safeguard its health. That information is included in following paragraphs.

Background and Statement of Issues

The site of a former petroleum bulk plant located in Olin, Iowa is being considered by the Jones County Conservation Board and the community of Olin for redevelopment as a trail-head for the Grant Wood nature/bike trail. According to county assessment records, the site was used as a bulk petroleum facility for 30 years. The site area is currently vacant. All the above-ground fuel tanks have been removed, but the concrete stands and saddle mounts still exist on the site.

The Iowa Department of Natural Resources has completed a Phase II: Site Specific Assessment at the location of the former petroleum bulk plant to determine the degree and extent of soil and groundwater contamination (1). Soil and groundwater samples were collected from various locations at the site and analyzed for various chemical parameters. Surface soil samples (0 to 6 inches in depth) were analyzed for gasoline, mineral spirits, kerosene, diesel fuel, waste oil, and total extractable hydrocarbons. In addition, some surface soil samples were analyzed for various metals using x-ray fluorescence. Groundwater samples were analyzed for gasoline, mineral spirits, kerosene, diesel fuel, waste oil, total extractable hydrocarbons, methyl-t-butyl ether, benzene, toluene, ethylbenzene, and total xylenes.

This letter consultation will evaluate the health impacts of exposure to the chemicals that were detected in the soil and the groundwater. The exposures that will be considered in this health consultation will include exposure to people using the proposed trail head for recreational purposes.

Discussion – Exposure to Surface Soil

The following is a discussion of the potential for exposure to surface soils at the site. There is a potential for exposure to surface soils through the inadvertent consumption of soil on hands or food items, through dermal absorption of soil from skin contact with the soils, and through inhalation of dust. The following table is a summary of the maximum concentration of contaminants found within the surface soils located at the Olin, Iowa site.

Table 1 – Maximum Concentration of Chemicals Found within Site Surface Soils (1)

Chemical Parameter	Concentration (mg/kg)
Gasoline	ND
Mineral Spirits	ND
Kerosene	ND
Diesel Fuel	ND
Waste Oil	3,700
Total Extractable Hydrocarbons	3,700
Antimony, Total	182.67
Tin, Total	ND
Cadmium, Total	ND
Silver, Total	62.52
Strontium, Total	134.76
Rubidium, Total	60.68
Lead, Total	396.37
Selenium, Total	ND
Arsenic, Total	44.64
Mercury, Total	ND
Zinc, Total	441.98
Copper, Total	ND
Nickel, Total	ND
Cobalt, Total	ND
Iron, Total	38,404.44
Manganese, Total	685.72
Chromium, Total	86.54
Vanadium, Total	ND
Titanium, Total	2,822.69
Scandium, Total	315.49
Calcium, Total	61,351.77
Potassium, Total	10,277.67

mg/day is milligram per day
ND means not detected by the laboratory analytical method

A comparison can be made between the levels of chemicals found within the site soils to levels of chemicals found within soils that have the potential to cause adverse health impacts to individuals. The Agency of Toxic Substances and Disease Registry (ATSDR) has determined and published a set of comparison values for substances that may be found in air, water and soil. Comparison values (environmental guidelines) are measures of substance concentrations that are set well below levels that are known or anticipated to result in adverse health effects. The following table is a list of comparison values for those chemicals found in the site surface soils that have corresponding published comparison values. The table also includes the maximum concentration found in site soils for theses chemical parameters

Table 2 – Comparison Values for Chemicals within Soil (2)

Chemical Parameter	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Exposure Frequency	Person
Antimony	182.67	20	Chronic	Child
		300	Chronic	Adult
Silver	62.52	300	Chronic	Child
		4,000	Chronic	Adult
Strontium	134.76	30,000	Chronic	Child
		400,000	Chronic	Adult
		4,000	Intermediate	Pica Child
Lead	396.37	400*	Chronic	Child
Arsenic	44.98	20	Chronic	Child
		200	Chronic	Adult
		10	Acute	Pica Child
Zinc	441.98	20,000	Chronic	Child
		200,000	Chronic	Adult
Manganese	685.72	3,000	Chronic	Child
		40,000	Chronic	Adult
Chromium (VI)	86.54	200	Chronic	Child
		2,000	Chronic	Adult

"Chronic" exposure is for longer that 1 year
"Intermediate" exposure is between 14 days and 1 year
"Acute" exposure is up to 14 days
"Pica Child" is a child beyond the age of 18 months that exhibits a behavior of eating non-food items such as soil
* EPA's screening level for lead in residential soils

Comparison values for chemicals found in soils are not available for rubidium, titanium, and scandium. These chemicals are naturally occurring in soil at the levels found at the site.

The concentration of two of the metals in the site soil is greater than at least one of the comparison values shown in the table above. These metals, their concentrations, and corresponding comparison values are as follows:

- Antimony at 182.67 mg/kg (comparison value of 20 mg/kg for chronic exposure to a child)
- Arsenic at 44.64 mg/kg (comparison value of 20 mg/kg for chronic exposure to a child, and 10 mg/kg for acute exposure to a child exhibiting pica behavior)

In order to determine potential health effects from exposure to antimony and arsenic within site surface soils, a closer look at the toxicological information and likely exposure to antimony and arsenic is needed. A toxicological evaluation of being exposed to these chemicals within site surface soils can be made by using assumed information on incidental ingestion, dermal adsorption, and inhalation of surface soils.

Incidental Ingestion of Soil

Since the site is proposed to be used for a recreational area, an estimate of the amount of soil a person could potentially ingest while using the recreational area needs to be completed. According to ATSDR's Public Health Assessment Guidance Manual (3), it is estimated that an average adult may incidentally ingest up to 100 mg/day of soil and dust from various sources, and an average child may incidentally ingest up to 200 mg/day of soil and dust from various sources. According to the same guidance manual, it is estimated that a child exhibiting pica behavior may ingest up to 5,000 mg/day of soil. However, the assumption of ingestion of soil by a child exhibiting pica behavior is only to be used to assess acute exposure less than 14 days in duration.

Since the proposed trail-head will be utilized as a recreational area, any person that uses this area will be exposed to site soils only a few hours each week. If a recreational visitor to the site would visit the trail-head one hour per day, seven days a week, 30 weeks per year, they would frequent the trail-head about 2.4 percent of the total time during that year's time period. Using these estimates, the amount of soil that a person would incidentally ingest from exposure to surface soils at the trail-head (averaged over one year of exposure) would be 2.4 mg/day (100 mg/day x 0.024) for an adult and 4.8 mg/day (200 mg/day x 0.024) for a child.

Dermal Absorption of Soil

Dermal absorption of contaminants from soil or dust depends on the area of contact, the duration of contact, the chemical and physical attraction between the contaminant and the soil, and the ability of the contaminant to penetrate the skin. ATSDR's Public Health Assessment Guidance Manual (3) provides several default values for the amount of soil that would adhere to a person during an exposure event, such as a fall into soil. The amount of soil that would adhere to an adult is estimated at 326 mg, and the amount of soil that would adhere to a child is estimated at 525 mg. If it is assumed that an adult or child using the trail-head had a dermal exposure to soil 30 times per year, the amount of soil an adult or child

would be exposed to on a daily basis would be 26 mg/day for an adult and 43 mg/day for a child, averaged over one year. According to the U.S. Environmental Protection Agency, approximately 1 percent of non-organic contaminants placed on the surface of skin are absorbed into the body (4). Therefore the amount of soil absorbed into the body would be 0.26 mg/day for an adult and 0.43 mg/day for a child.

Inhalation of Soil

Inhalation exposure depends upon the amount of dust in the air, the concentration of the chemicals within the dust, and the amount of time a person is breathing the dust. This in no data available on the concentration of dust particles at the site location, but monitoring data is available within the state of Iowa on the concentration of dust particles in outside air at locations throughout the state. This data is maintained by the EPA with their Air Data web site (5). This data indicates that the average concentration of particles of inhalation size is about 22 micrograms per cubic meter ($\mu g/m^3$). According to ATSDR's Public Health Assessment Guidance Manual (3) the average amount of air intake rates are 15 m^3/day for an adult and 10 m^3/day for a child. If we assume that a person will frequent the trail-head about 2.4 percent of their time during the course of a year, the average amount of amount of soil inhaled from the trail-head on a daily basis would be 0.008 mg/day for an adult and 0.005 mg/day for a child.

Example of calculation for adult:

$$\frac{22\ \mu g}{m^3} \times \frac{15\ m^3}{day} \times 0.024 \times \frac{mg}{1000\ \mu g} = 0.0079\ \frac{mg}{day}$$

Significance of Oral, Dermal, Inhalation Exposure to Soil

From the previous paragraphs it can be seen that the oral exposure, or incidental ingestion of the soil, is the most significant route of exposure to soil at the site. Table 3 demonstrates the estimated average daily amount of soil that an adult or child using the trail-head may be exposed.

Table 3 – Average Daily Exposure Amount from Site Surface Soils

Person	Exposure Amount – Route of Expoure (mg/day)		
	Oral	Dermal	Inhalation
Adult	2.4	0.26	0.008
Child	4.8	0.43	0.005

Since oral exposure to soil is the most significant source of exposure for both adults and children, we can use toxicological information on oral exposure to chemicals found in the soil to determine if exposure to site surface soils will impact the health of adults or children who plan to use the trail-head.

Health Effects from Chronic Exposure to Antimony

Toxicological information is available for antimony in the Toxicological Profile for Antimony (6). The lowest level of oral exposure to antimony, derived from evaluating human and animal health studies on chronic oral exposure to antimony, found to produce adverse health effects is 0.1 mg/kg/day (6). By using the average amount of 2.4 mg/day of soil ingested by an adult frequently using the trail-head, and an antimony soil concentration of 183 mg/kg, the daily amount of antimony ingested would be determined by the following equation:

$$\frac{183 \text{ mg antimony}}{\text{kg soil}} \times \frac{2.4 \text{ mg soil}}{\text{day}} \times \frac{1}{70 \text{ kg}} \times \frac{1 \text{ kg soil}}{10^6 \text{ mg soil}} = 0.000006 \text{ mg/kg/day}$$

The estimated amount of antimony that would be incidentally ingested by an adult exposed to the most contaminated surface soils at this site is more than 15,000 times lower than the lowest amount of antimony shown to produce adverse chronic health effects in human and animal health studies.

Using a similar equation, an estimate can be made of the amount of antimony ingested by an average sized child:

$$\frac{183 \text{ mg antimony}}{\text{kg soil}} \times \frac{4.8 \text{ mg soil}}{\text{day}} \times \frac{1}{15 \text{ kg}} \times \frac{1 \text{ kg soil}}{10^6 \text{ mg soil}} = 0.000058 \text{ mg/kg/day}$$

The estimated amount of antimony that would be incidentally ingested by an average sized child exposed to the most contaminated surface soils at this site is more than 1,700 times lower that the lowest amount of antimony shown to produce chronic adverse health effect in human and animal studies.

Health Effects from Chronic Exposure to Arsenic

From a review of the Toxicological Profile for Arsenic, the lowest level of oral exposure to arsenic that has been found to produce adverse health effects is derived by evaluating human health studies on chronic oral exposure to arsenic at 0.0014 mg/kg/day (7). If we assume that an adult would ingest 2.4 mg/day of soil containing arsenic at a concentration of 45 mg/kg, the daily amount of arsenic ingested would be determined by the following equation:

$$\frac{45 \text{ mg arsenic}}{\text{kg soil}} \times \frac{2.4 \text{ mg soil}}{\text{day}} \times \frac{1}{70 \text{ kg}} \times \frac{1 \text{ kg soil}}{10^6 \text{ mg soil}} = 0.0000015 \text{ mg/kg/day}$$

The estimated amount of arsenic that would be incidentally ingested by an adult exposed to the most contaminated surface soils at this site is roughly 900 times lower than the lowest amount of arsenic shown to produce adverse chronic health effects in human health studies.

Using a similar equation, an estimate can be made of the amount of arsenic ingested by a child:

$$\frac{45 \text{ mg arsenic}}{\text{kg soil}} \times \frac{4.8 \text{ mg soil}}{\text{day}} \times \frac{1}{15 \text{ kg}} \times \frac{1 \text{ kg soil}}{10^6 \text{ mg soil}} = 0.000014 \text{ mg/kg/day}$$

The estimated amount of arsenic that would be incidentally ingested by a child exposed to the most contaminated surface soils at this site is roughly 100 times lower than the lowest amount of arsenic shown to produce adverse chronic health effects.

Exposure to Site Surface Soils (Child Exhibiting Pica Behavior)

Since the site is proposed to be utilized as a recreational area, it is not expected that a child will have the ability to exhibit pica behavior, as they will only be exposed to the site for a short time during any visit. Although the highest concentration of arsenic in the site surface soils is above the comparison value for arsenic for acute exposure to a child exhibiting pica behavior, this exposure scenario is not considered to be relevant at this site.

Exposure to Waste Oil

Waste oil was detected in several of the surface soil samples collected at the site. The maximum concentration of waste oil detected in surface soils was 3,700 mg/kg. There are no comparison values for evaluating waste oil in soil, and there is very limited toxicological information available on exposure to waste oil. As a result, it is not possible to evaluate the potential adverse health effects from exposure to soil containing waste oil.

The Iowa Department of Public Health recommends that soil samples be analyzed for potential components of waste oil such as individual poly-aromatic hydrocarbons (PAHs) which have comparison values. This would enable to Iowa Department of Public Health to provide an analysis of the potential impacts to human health from exposure to any PAHs that were detected in surface soils.

Discussion – Exposure to Site Groundwater

As reported in the Phase II: Site Specific Assessment completed by the Iowa Department of Natural Resources, petroleum hydrocarbons were detected in some of the groundwater samples collected at the site (1). A preliminary site assessment was also completed and included as Attachment E of the site specific assessment (1). The preliminary site assessment indicates that there are no water wells located on the site, which means that no one is currently exposed to drinking water supplied by groundwater located at the site. At the present time there is not a completed pathway for exposure to site groundwater, as people are not drinking the groundwater at this site. The City of Olin drinking water wells are located from 600 to 900 feet to the southeast of the site and are at least 150 feet deep. A review of all analytical testing results of the Olin public water supply was also completed. Antimony has always been below detected concentrations in the Olin public water supply. Arsenic has been detected in the Olin public water supply, but has always been below the EPA drinking water standard.

Discussion – Cancer Concerns

An increase of incidents in developing cancer from exposure to site contaminants would be a concern if people would be exposed to site contaminants on a daily basis over years of exposure. Since the site is

proposed to be used as a trail head and people will not be exposed to the site for long periods of time every day, evaluating cancer risks from exposure to site contaminants is not necessary.

Conclusions

Exposure to Site Soil

The Iowa Department of Public Health concludes that incidentally eating soil located at the site of the former petroleum bulk plant in Olin, Iowa is not expected to harm people's health. Other exposures to site soils such as getting the soil on the skin or breathing in dust from the site is not expected to harm people's health. The level of exposure to metals found within the site soils is below the level that has been shown to impact human health.

It is noted that waste oil was also detected within surface soils at the site. As previously discussed, there are no comparison values for evaluating the level of waste oil in the soil. As a result, the Iowa Department of Public Health cannot conclude whether incidentally eating or breathing in soil particles, or having skin contact with soil containing waste oil located at the former petroleum bulk plant in Olin, Iowa could harm people's health.

Exposure to Site Groundwater

The Iowa Department of Public Health concludes that the presence of petroleum hydrocarbons within the groundwater located at the site will not harm people's health because people are not drinking this water.

Recommendations

Since there is no information available on the potential adverse health effects from exposure to site soils containing waste oil, it is recommended that site soils identified as containing waste oil be removed and replaced with clean soil or pavement, in order to prevent exposure to people who will be using the site in the future. If the site is planned to be used for any other uses different from the proposed use as a trail head, such as for residential purposes, it is recommend that a separate health consultation be prepared that accounts for any other uses.

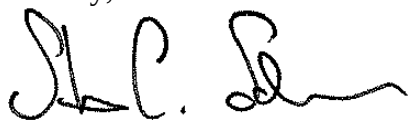
References

1. Brownfield Site Specific Assessment for the Former Petroleum Bulk Plant, Contaminate Sites Section, Iowa Department of Natural Resources, December 2008
2. Agency for Toxic Substances and Disease Registry. Comparison Values. Atlanta: US Department of Health and Human Services; May 2009.
3. Agency for Toxic Substances and Disease Registry. Public Health Assessment Guidance Manual – Appendix F. ATSDR web link: http://www.atsdr.cdc.gov/HAC/phamanual/appf.html
4. U.S. Environmental Protection Agency. Technical Guidance Manual – Mid-Atlantic Risk Assessment, EPA web link: http://www.epa.gov/reg3hscd/risk/human/info/solabsg2.htm

5. U.S Environmental Protection Agency. AirData: Access to Air Pollution Data, EPA web link: http://www.epa.gov/air/data/
6. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Antimony. Altanta: US Department of Health and Human Services; December 1992.
7. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Arsenic. Altanta: US Department of Health and Human Services; August 2007.

If you have any questions regarding the information in this letter please contact me at (515) 281-8707 or by email at sschmitz@idph.state.ia.us.

Sincerely,



Stuart C. Schmitz, M.S., P.E.
Principal Investigator / Environmental Toxicologist
Hazardous Waste Site Health Assessment Program

CERTIFICATION

The Iowa Department of Public Health, Hazardous Waste Site Health Assessment Program, has prepared this letter health consultation evaluating human health impacts from residue contamination left from the operation of a petroleum bulk pant located in Olin, Iowa under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). This document is in accordance with approved methodology and procedures existing when the health consultation was prepared. The editorial review of this document was completed by the cooperative agreement partner.

Technical Project Officer, CAT, CAPEB, DHAC,ATSDR

The Division of Health Assessment and Consultation has reviewed this health consultation and concurs with its findings.

Team Lead, CAT, CAPEB, DHAC,ATSDR