Letter Health Consultation

ALLIED EQUIPMENT, INC.

CHARLES CITY, IOWA

Prepared by the
Iowa Department of Public Health

MARCH 14, 2011

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.

You May Contact ATSDR Toll Free at
1-800-CDC-INFO
or
Visit our Home Page at: http://www.atsdr.cdc.gov

LETTER HEALTH CONSULTATION

ALLIED EQUIPMENT, INC.

CHARLES CITY, IOWA

Prepared By:

Iowa Department of Public Health
Hazardous Waste Site Health Assessment Program
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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

Thomas Newton, MPP, REHS
Director

Chester J. Culver
Governor

Patty Judge
Lt. Governor

March 10, 2011

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

RE: Health Consultation
Allied Equipment, Inc., Charles City, Iowa

Dear Mr. Pins:

This letter has been prepared as a consultation to evaluate future human health impacts from residue contamination left from the operation of a former power plant associated with a farm equipment manufacturing facility located in Charles City, Iowa. The Iowa Department of Public Health's priority is to ensure the Charles City community has the best information possible to safeguard its health. That information is included in the following paragraphs.

Background and Statement of Issues

The site, which was part of a former farm equipment manufacturing facility located in Charles City, Iowa, is being considered for redevelopment as a commercial property by the community of Charles City. According to historical records, a coal-fired power plant with a transformer yard was also located on the site. The site is bordered by an abandoned street, a parking lot, a grain elevator, and a business complex. The site area is currently vacant and covered with grass and trees. There is an existing abandoned and uncapped water supply well located on the site, which Iowa Department of Natural Resources has recommended be plugged.

The Iowa Department of Natural Resources has completed a Site Specific Assessment at the location of the former farm equipment manufacturing facility 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 TEH (total extractable hydrocarbons) as motor oil and various semi volatile organic chemicals. Groundwater samples were analyzed for volatile organic chemicals, semi volatile organic chemicals, polychlorinated biphenyls, nitrate + nitrite, ammonia, and metals. This letter consultation will evaluate the health impacts of exposure to the chemicals that were detected in the soil and groundwater. The exposures that will be considered in this health consultation will include exposure to people using the proposed area for commercial development.

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, dermal absorption of soil contaminants when skin contact occurs, and inhalation of dust. The table on the following page is a summary of the maximum concentration of contaminants found within the surface soils located at the Allied Equipment Site in Charles City, Iowa. Polychlorinated biphenyls (PCBs) were not detected within site surface soils.

The table also includes comparison values for the contaminants found within the site soils. Comparison values (environmental guidelines) are measures of substance concentrations that are set well below levels that are known to cause, or anticipated to result in, adverse health effects. 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.

Table 1 – Maximum Soil Concentrations and Comparison Values for Chemicals within Soil (1,2)

Chemical Parameter	Concentration (mg/kg)	Comparison Value (mg/kg)	Exposure Frequency	Person
Total Extractable Hydrocarbons (THE) as Motor Oil	100	180 [1]	Chronic	Child, Adult
Di-n-butyl phthalate	0.63	1,000 [2]	Acute	Pica Child
		5,000 [3]	Chronic	Child
		70,000 [3]	Chronic	Adult
Fluoranthene	0.38	300,000 [2]	Intermediate	Adult
		20,000 [2]	Intermediate	Child
		800 [2]	Intermediate	Pica Child
		2,000 [3]	Chronic	Child
		30,000 [3]	Chronic	Adult
Pyrene	1.2	2,000 [3]	Chronic	Child
		20,000 [3]	Chronic	Adult
Di-n-octyl phthalate	0.46	300,000 [2]	Intermediate	Adult
		20,000 [2]	Intermediate	Child
		6,000 [2]	Acute	Pica Child
		800 [2]	Intermediate	Pica Child
Benzo(a)pyrene	0.31	0.1 [4]	Chronic	Child, Adult
Phenanthrene	0.320	100 [5]	Chronic	Child, Adult
Benzo(a)anthracene	0.26	1 [5]	Chronic	Child, Adult
Chrysene	0.31	10 [5]	Chronic	Child, Adult
Benzo(b)fluoranthene	0.48	1 [5]	Chronic	Child, Adult
Benzo(k)fluoranthene	0.18	1 [5]	Chronic	Child, Adult
Arsenic	3.1	20 [3]	Chronic	Child
		200 [3]	Chronic	Adult
		10 [2]	Acute	Pica Child
		0.5 [4]	Chronic	Child, Adult
Barium	250	10,000 [2]	Chronic	Child
		100,000 [2]	Chronic	Adult
		400 [2]	Intermediate	Pica Child
Chromium	9.4	[6]		
Lead	162	400 [7]	Chronic	Child

"mg/kg" is milligrams per kilogram
"Chronic" exposure is for longer than 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
[1] Comparison value from Louisiana Department of Environmental Quality
[2] Comparison value is obtained from ATSDR Minimal Risk Level
[3] Comparison value obtained from the EPA Reference Dose
[4] This comparison value is the cancer risk evaluation guide
[5] Comparison valued is based upon toxicity equivalence factor compared to benzo(a)pyrene
[6] Comparison value has not been determined
[7] EPA's screening level for lead in residential soils

The comparison values shown in Table 1 for phenanthrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, and benzo(k)fluoranthene are based upon toxicity equivalent factors when compared to benzo(a)pyrene for which a comparison value has been determined. These toxicity equivalent factors are described within the Toxicological Profile for Polycyclic Aromatic Hydrocarbons (3).

Only two of the soil contaminants, arsenic and benzo(a)pyrene, were found at levels above their corresponding comparison values. None of the other contaminants were found at levels above their corresponding comparison values and therefore were not evaluated any further. The concentration of arsenic and benzo(a)pyrene in the site soil is greater than at least one of the cancer risk comparison values shown in the table above. Their concentrations and corresponding comparison values are as follows:

- Arsenic at 3.1 mg/kg (cancer risk comparison value of 0.5 mg/kg for chronic exposure to a child and to an adult).
- Benzo(a)pyrene at 0.31 mg/kg (cancer risk comparison value of 0.1 mg/kg for chronic exposure to a child and to an adult).

Background Levels of Arsenic

Arsenic is a naturally occurring and is found within surface soil throughout Iowa. In 2004, the Iowa Geological Survey, in cooperation with a project funded by the U.S. Geological Survey, collected shallow surface soils throughout the state and analyzed these samples for various metals. Natural background soil concentrations were established by using the mean plus three standard deviations. In the case of arsenic, a natural background soil concentration was determined to be 17 mg/kg (4). The maximum concentration of arsenic found in soils at the site is less than this natural background value of 17 mg/kg. Therefore, it can be concluded that exposure to arsenic in soils at the former Allied Equipment site does not present any additional human health risk when compared to other areas throughout the state.

Exposure to Benzo(a)pyrene

In order to determine potential health effects from exposure to benzo(a)pyrene within site surface soils, a closer look at the toxicological information and likely exposure to benzo(a)pyrene is needed. A toxicological evaluation of exposure to benzo(a)pyrene within site surface soils can be made using assumed information on incidental ingestion, dermal adsorption, and inhalation of dust from surface soils.

Incidental Ingestion of Soil

Since the site is proposed to be used for commercial development, an estimate of the amount of soil a person could potentially ingest while visiting the area needs to be completed. According to ATSDR's Public Health Assessment Guidance Manual (5), 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 non-carcinogenic exposure (less than 14 days in duration). Because the site is proposed to be utilized as a commercial property, children's exposure to site contaminants will be very limited. As a result, it is not necessary to complete exposure calculations utilizing exposure factors developed for a pica child .

The opportunity exists for workers and visitors to be exposed to the site soils at the former farm equipment manufacturing site. If a person working on the site would work 10 hours a day, 5 days a week, and 50 weeks a year, they would frequent the proposed commercial site about 28 percent of the total time during that year's time period. Using these estimates, the amount of soil that a worker would incidentally ingest from exposure to surface soils at the proposed commercial development site (averaged over one year of exposure) would be 28 mg/day (100 mg/day x 0.28) for an adult.

A child, who might occasionally visit the proposed commercial development site, would be exposed infrequently and intermittently to the site. If a child would visit the proposed commercial development site for one hour, three times a week, for 20 weeks, they would frequent the site about two percent of the total time during that year's time period. Using these estimates, the amount of soil that a visiting child would incidentally ingest from exposure to surface soils at the proposed site would be about 4 mg/day (200 mg/day x 0.02) for a child.

Dermal Absorption of Soil Contaminants

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 (5) 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 during an exposure event 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 worker using the proposed commercial site would have a dermal exposure to site soil 20 times per year, the amount of soil an adult worker would be exposed to on a daily basis would be about 18 mg/day.

If it is assumed that a child would have a dermal exposure to site soil 5 times per year, the amount of soil a child would be exposed on a daily basis would be about 7 mg/day. According to the U.S. Environmental Protection Agency, approximately 10 percent of semi volatile organic contaminants placed on the surface of skin are absorbed into the body (6). Therefore the amount of soil absorbed into the body would be 1.8 mg/day for an adult and 0.7 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. There is 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 (7). 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 (5), the average air intake rates are 15 m^3/day for an adult and 10 m^3/day for a child. If we assume that an adult worker will frequent the proposed commercial development area about 28 percent of the their time during the course of a year, and a child will frequent the proposed commercial development area about 2 percent of their time during the course of a year, the average amount of soil inhaled from the proposed commercial site on a daily basis would be 0.09 mg/day for an adult and 0.004 mg/day for a child.

Example of calculation for adult:

$$\frac{22\ \mu g}{m^3} \times \frac{15\ m^3}{day} \times 0.28 \times \frac{mg}{1000\ \mu g} = 0.0924\ \frac{mg}{day}$$

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 to which an adult or child using the proposed commercial site may be exposed.

Table 3 – Average Daily Exposure Amount from Site Surface Soils

Person	Soil Exposure Amount – Route of Exposure (mg/day)		
	Oral	Dermal	Inhalation
Adult	28	1.8	0.09
Child	4	0.7	0.004

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 proposed commercial area.

Health Effects from Exposure to Benzo(a)pyrene

Toxicological information is available for benzo(a)pyrene in the Toxicological Profile for Polycyclic Aromatic Hydrocarbons (3). Toxicological data indicates that benzo(a)pyrene is carcinogenic to rodents following oral exposure at high doses. In addition, the U.S. Environmental Protection Agency has developed an oral slope factor for benzo(a)pyrene. A slope factor is an upper bound estimate of the increased cancer risk from a lifetime exposure to a chemical. The slope factor is expressed in units of proportion (of a population) affected per (mg/kg/day). Specifically, the oral slope factor for

benzo(a)pyrene is calculated from studies that showed incidences of stomach cancer in mice that were orally exposed to benzo(a)pyrene. The oral slope factor for benzo(a)pyrene is 7.3 per (mg/kg/day) (8).

The oral slope factor can be used to determine the theoretical estimated risk of cancer at the estimated exposure dose. In previous paragraphs it has been estimated that an adult working at the site will be orally exposed to, at most,28 mg/day of soil. Using 28mg/day of soil ingested by an adult working at the site, and a benzo(a)pyrene soil concentration of 0.31 mg/kg, the daily amount of benzo(a)pyrene ingested would be determined by the following equation:

$$\frac{0.31 \text{ mg benzo(a)pyrene}}{\text{kg soil}} \times \frac{28 \text{ mg soil}}{\text{day}} \times \frac{1}{70 \text{ kg}} \times \frac{1 \text{ kg soil}}{10^6 \text{ mg soil}} = 0.0000001 \text{ mg/kg/day}$$

By using the oral slope factor and the estimated amount of benzo(a)pyrene ingested on a daily basis, an estimate of the risk of obtaining cancer can be determined by the following equation.

Risk = slope factor x dose

Risk = 7.3 per (mg/kg/day) x 0.0000001 = 7.3×10^{-7}

This calculated risk means that the theoretical estimated risk of obtaining cancer by an adult from exposure to benzo(a)pyrene at the site is less than one in one million or less than 10^{-6} risk. The U.S. Environmental Protection Agency and other health and environmental agencies generally consider that any risk less than one in one million is an acceptable risk.

Discussion – Exposure to Site Groundwater

As reported in the Site Specific Assessment completed by the Iowa Department of Natural Resources, nitrate + nitrite, various metals, and methyl tert-butyl ether were detected in some of the groundwater samples collected at the site (1). PCBs were not detected within any of the groundwater samples. A preliminary site assessment was also completed and included as Attachment B of the site specific assessment (1). The preliminary site assessment indicates that there are no active potable water wells located on the site, which means that no one is currently exposed to drinking water supplied by groundwater located at the site. There is an existing and uncapped well that was most likely used for cooling water for the former power plant located on 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. In addition, Charles City has an ordinance in place that prohibits new private potable water wells to be installed within the city limits, which would apply to this site location. The prohibition would prohibit the currently uncapped well from being re-activated for use as a potable water well. The nearest drinking water wells, which supply the municipality of Charles City, are located about 900 feet to the northeast of the site and are at least 245 feet deep. A review of all analytical testing results of the Charles City public water supply was also completed. The Charles City public water supply does not have any violations to water quality standards.

Conclusions

Exposure to Site Soil

The Iowa Department of Public Health concludes that incidentally ingesting soil located at the site of the former farm equipment manufacturing facility in Charles City, Iowa is not expected to harm peoples' health. Furthermore, 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 peoples' health. The level of exposure to contaminants found within the site soils is below the level that has been shown to impact human health. This conclusion is based upon the future use of the site property for commercial purposes.

Exposure to Site Groundwater

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

Recommendations

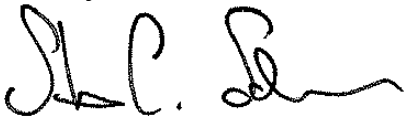
Along with the Iowa Department of Natural Resources, the Iowa Department of Public Health recommends that the existing abandoned and uncapped water supply well located on the site, be properly plugged. The Iowa Department of Public Health also recommends that an additional health consultation be completed if the end use of the former farm equipment manufacturing facility changes from the proposed commercial use.

References

1. Brownfield Site Specific Assessment for the Allied Equipment, Inc. Site, Iowa Department of Natural Resources, April 2009.
2. Agency for Toxic Substances and Disease Registry. Comparison Values. Atlanta: US Department of Health and Human Services; June, 2009.
3. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Polycyclic Aromatic Hydrocarbons. Atlanta: US Department of Health and Human Services; August 1995.
4. Iowa Department of Natural Resources Cumulative Risk Calculator Supporting Information, IDNR web link: https://programs.iowadnr.gov/riskcalc/pages/background.htm
5. 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
6. 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
7. U.S Environmental Protection Agency. AirData: Access to Air Pollution Data, EPA web link: http://www.epa.gov/air/data/
8. U.S. Environmental Protection Agency. Integrated Risk Information System Summary for Benzo(a)pyrene. EPA web link: http://www.epa.gov/ncea/iris/subst/0136.htm

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 former farm equipment manufacturing facility located in Charles City, 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