

Health Consultation

**TAILS A WAGGIN' PET RESORT –
ARSENIC SOIL CONTAMINATION**

210 41ST AVENUE DRIVE SW

CEDAR RAPIDS, LINN COUNTY, IOWA

AUGUST 29, 2006

**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
1-800-CDC-INFO

or

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

HEALTH CONSULTATION

TAILS A WAGGIN' PET RESORT – ARSENIC SOIL CONTAMINATION
210 41ST AVENUE DRIVE SW

CEDAR RAPIDS, LINN COUNTY, IOWA

Prepared by:

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

Table of Contents

Purpose.....	1
Background.....	1
Site Evaluation.....	1
Proposed Site Remediation.....	2
Contaminants of Concern.....	2
Discussion.....	2
Previous Uses of Property.....	2
Current and Proposed Uses of Site Property.....	2
Exposure to Site Soils.....	2
Data Gap in Surface Soil Samples.....	3
Toxicological Evaluation.....	3
Children’s Health Concerns.....	5
Community Health Concerns.....	5
Conclusions.....	5
Recommendations.....	6
Public Health Action Plan.....	6
Figure 1.....	7
Figure 2.....	8
References.....	9
Preparers of the Report.....	10
Certification.....	11

Purpose

The Iowa Department of Natural Resources (IDNR) requested the Iowa Department of Public Health (IDPH) Hazardous Waste Site Health Assessment Program to evaluate the health impacts of exposure to soil contaminated with heavy metals at a commercial property located in Cedar Rapids, Iowa. The specific request was to evaluate the health impacts from exposure to contaminants that were above IDNR statewide standards. This health consultation addresses potential health risks to people from exposure to the soil within the property. The information in this health consultation was current at the time of writing. Data that emerges later could alter this document’s conclusions and recommendations.

Background

Site Evaluation

In November 2005, Northern Environmental collected soil samples from a property located at 210 41st Avenue Drive SW, Cedar Rapids, Iowa. These soil samples were collected as part of a Phase II Environmental Site Assessment completed to determine levels of heavy metals and polycyclic aromatic hydrocarbons (PAHs) in soil at this property. The property is proposed to be developed as a pet boarding facility named Tails A Waggin’ Pet Resort. The site property and adjacent properties were once part of a salvage and junkyard. Records also indicate that coal combustion residue has been used as fill material on the site property. The use of the property as a salvage and junk yard, and the use of coal combustion residue as fill material on the property were the reasons that soil samples were collected for analysis for heavy metals and PAHs. The locations of the soil samples are included in Figure 1, located in the appendix. The table below includes the concentration of heavy metals in the soil samples (1).

Analyte	Soil Sample Analytical Results in milligrams per kilogram (mg/kg)					Statewide Soil Standards (mg/kg)
	TP-1 0-2 ft deep	TP-2 0-2 ft deep	TP-3 0-2 ft deep	TP-4 0-2 ft deep	TP-4 2-10 ft deep	
Arsenic	54.4	61.9	50.6	62.6	58.5	1.4
Barium	730	417	407	990	792	5,500
Cadmium	12.2	8.2	8.25	15.8	12.8	39
Chromium	49.8	46	42.1	49.7	48.4	230
Lead	109	95.5	106	106	97.7	400
Mercury	0.0629	0.0720	0.0606	0.0657	0.0757	23
Selenium	<16.2	<16.1	<15.7	<18.1	<18.4	390
Silver	<2.16	<2.14	<2.10	<2.42	<2.45	390

The results of these soil samples were compared to the IDNR statewide standards for soil (included in the table above). The IDNR statewide standards for soil are the standards used to

determine whether the IDNR will require any site cleanup for sites enrolled in the Iowa Land Recycling Program. The statewide soil standards are determined using risk-based calculations assuming exposure to children and adults in a residential setting and consider both carcinogenic and non-carcinogenic health effects. Analytical results for arsenic were the only results above the statewide standards for soil.

Proposed Site Remediation

At the time this consultation is being drafted, a discussion between the IDNR and the responsible party is continuing on the proposed remediation of the site. A layer of clean (non-contaminated) soil placed over those portions of the site not covered by the cement slab-on-grade building foundation, or asphalt paving is being discussed as a mechanism to eliminate exposure to surface soils.

Contaminant of Concern

The contaminant of concern at the site further discussed in this health consultation is the arsenic detected in surface soil samples at the test pit locations. Although detected in the soil, exposure to barium, cadmium, chromium, lead, mercury, selenium, and silver will not be discussed further since these chemicals were detected in soil below IDNR statewide standards and are not of concern to the IDNR in terms of remediation of the site.

Discussion

Previous Uses of Property

According to information within IDNR files (1), the site is 1.4 acres in size and was developed into a salvage yard / recycling facility sometime between 1940 and 1957. Prior to the 1940’s the site was undeveloped. The site became vacant sometime after 1957. According to IDNR records, fill material were added to the site in 2000. The fill material was identified as coal combustion residue. According to IDNR files, the fill material may be up to 14 feet in depth in some portions of the site (1).

Current and Proposed Uses of Site Property

The site is currently in development as a pet boarding facility. This site is located in an area of Cedar Rapids that is currently zoned industrial. It is anticipated that all proposed uses of the site property would be of a commercial nature. The site is not anticipated to be utilized as residential property in the future and is planned to be zoned for only commercial or industrial uses.

Exposure to Site Soils

The proposed site has been divided into four areas as shown in Figure 2, located in the appendix. Area 1 is the area encompassing the proposed site building and asphalt parking lot. Area 2 will include the proposed storm water detention basin. Area 3 is the proposed dog exercise area. Area 4 is located to the north of the site building and will include an asphalt parking area. Areas 1, 2, and 4 will be covered with the site building, asphalt, or grass. There will be minimal or no

exposure to site soils in Areas 1, 2, and 4. Area 3 will be covered with pea gravel. The greatest potential for exposure to site soils will occur in Area 3.

According to information included in IDNR files, the proposed business will be operated 7 days per week. It is estimated that the site will include 2 employees. It is also estimated that employees will utilize the dog exercise area for one-half hour three times daily. The average time spent in the dog exercise area will be 12.5 hours per week, or 6.25 hours per employee per week. For the purposes of this health consultation it will be assumed that a person may be exposed to soils in Area 3 for 7 hours per week. Exposure to site soils will result in incidental ingestion of site soils and incidental ingestion of any contaminants that are found in site soils.

Data Gap in Surface Soil Samples

The on-site workers will normally be exposed to only the upper several inches of surface soil. Therefore, in order to accurately evaluate the risk of exposure to soil at a site it is necessary to obtain an analysis of soil contamination within the upper three inches of soil. The data that has been collected at the site, so far, includes composite soil samples from the upper two feet of the soil profile. Therefore, the analysis that has been completed is an estimate of the average concentration of contaminants in the upper two feet of soil deposited over the site, not necessarily the upper three inches of soil. Soil may also be disturbed during construction activities. Therefore the upper two feet of soil sampled as part of the site assessment, may not be part of the upper two feet of soil that will exist on-site after construction is completed. As a result, a definitive conclusion as to the health risks of on-site worker exposure to site soil cannot be made since soil samples were not exclusively obtained from the upper three inches of soil and after construction activities were complete.

Toxicological Evaluation

The following information has been prepared as a toxicological evaluation of exposure to surface soil containing arsenic at the concentrations detected on-site by Northern Environmental. For the purposes of this toxicological evaluation, it is assumed that the average arsenic concentration detected in the upper two feet of site soil will represent the concentration of arsenic that individuals would be exposed (the upper three inches of site soil).

The greatest potential for health impacts from the contaminated soil would be from incidental ingestion of surface soil by individuals that would be regularly working at this location. Since children will not be working at the site, exposure to children (the most sensitive portion of the population) will not be considered in this health consultation. Inorganic arsenic has a high affinity for soil and does not pose a significant inhalation hazard. In order to evaluate the potential health impacts, the average level of inorganic arsenic found in surface soils within the test pits of 57.4 mg/kg will be used as the exposure concentration.

The amount of soil a worker at the site would incidentally ingest on a daily basis can be estimated. The U.S. EPA has completed research on many exposure factors and included this information in their Exposure Factors Handbook (2). Within this handbook is a section on incidental ingestion of soil. According to this handbook, an adult involved in gardening activities would incidentally ingest approximately 20 mg/hour of soil. It is anticipated that employees at the site will not be conducting activities as exposure-intensive as gardening. It is

assumed that an average adult incidentally ingests 100 mg/day or approximately 4 mg/hour from all sources of soil (indoor and outdoor). In addition, the soil in Area 3 will be covered with pea gravel. Therefore, the incidental ingestion of soil of 20 mg/hour from the outside portions of the site property is a conservative estimate.

As previously discussed, an adult working at the site may be involved in up to 7 hours of outside work per week in Area 3. Utilizing this information, an employee at the site may incidentally ingest up to 20 mg/day of soils from the outside portions of the site property during routine duties. If we assume that an average adult weighs 70 kg, then the estimated amount of arsenic incidentally ingested on a per kilogram per day basis is calculated as shown below:

$$\frac{20 \text{ mg soil}}{\text{day}} \times \frac{\text{kg soil}}{10^6 \text{ mg soil}} \times \frac{57.4 \text{ mg As}}{\text{kg soil}} \times \frac{1}{70 \text{ kg}} = 1.64 \times 10^{-5} \text{ mg/kg/day}$$

This toxicological evaluation will compare this estimated daily ingestion amount to the following comparison values: Agency for Toxic Substances and Disease Registry (ATSDR) Oral Minimum Risk Levels (MRLs), the U.S. Environmental Protection Agency (EPA) Chronic Reference Dose (RfD), and the level of exposure that translates to a one-in-ten-thousand (10^{-4}) increased risk of cancer utilizing an EPA oral slope factor.

Minimum Risk Levels

Minimum risk levels (MRLs) are established by the Agency for Toxic Substances and Disease Registry (ATSDR). The MRL is defined as, “an estimate of daily exposure to a human being to a chemical that is likely to be without an appreciable risk of deleterious effects (non-carcinogenic) over a specified period of time (3).” MRLs are based upon human and animal studies, include several safety factors, and are reported for acute exposure (≤ 14 days), intermediate exposure (15 – 364 days), and chronic exposure (≥ 365 days). The MRL for chronic oral exposure to inorganic arsenic is 3×10^{-4} mg/kg/day (4).

Chronic Oral Reference Dose

The EPA chronic oral RfD is defined as “an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime (5).” The chronic oral RfDs are based upon human and animal studies, include safety factors, and are reported for lifetime exposures. The chronic oral RfD for inorganic arsenic is 3×10^{-4} mg/kg/day (6).

Increased Risk of Cancer

The EPA has developed oral slope factors for evaluating increased risk of cancer from a lifetime of exposure to certain chemicals. The slope factor is defined as “an upper bound, approximating a 95% confidence limit, on the increased cancer risk from a lifetime exposure to an agent. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg/day (7).” The interpretation of slope factor would be as follows: if slope factor = 1.5×10^{-2} (mg/kg/day)⁻¹,

1.5 excess cancer incidences are expected to develop per 100 people if exposed daily for a lifetime to 1 mg of the chemical per kg of body weight. The oral slope factor for inorganic arsenic is $1.5 \text{ (mg/kg/day)}^{-1}$ (8).

This slope factor for inorganic arsenic can be converted to a daily ingestion rate that would equate to an excess cancer incidence risk of one-in-ten-thousand as shown below:

$$\text{Ingestion Rate} = 1 \times 10^{-4} / 1.5 \text{ (mg/kg/day)}^{-1} = 6.7 \times 10^{-5} \text{ mg/kg/day}$$

Evaluation of Highest Oral Exposure Levels

The level of the estimated amount ingested daily for inorganic arsenic is below all health effect levels discussed above (the MRL for chronic oral exposure, the chronic oral RfD, and the one-in-ten-thousand increased risk for cancer). The conclusion of the toxicological evaluation is that adult employees at the site, daily exposed to the average level of arsenic detected in surface soils within the test pits during the November 2005 sampling event, would not be expected to have any adverse health effects including cancer.

Children's Health Concerns

Children have unique vulnerabilities to some environmental chemicals, and IDPH's Hazardous Waste Site Health Assessment Program evaluated the potential impact of the presence of the chemical of concern (arsenic) detected in the soil samples during the November 2005 sampling event on children's health. Since the site has been utilized as a commercial/industrial area in the past and is proposed to be utilized as a commercial property, exposure of site soils to children will be very small or negligible. It is concluded that children's health would not be negatively impacted by the presence of arsenic detected within the site soil samples.

Community Health Concerns

The IDPH is aware that there is a concern of health impacts to employees of the proposed pet boarding facility and health impacts to any animals that would be boarded at the facility. As previously discussed in this health consultation, there is not expected to be any adverse health effects to employees working at the site if they are daily exposed to the average level of heavy metals detected in surface soils during the November 2005 sampling event. If there is a significant change in amount of time an employee spends working in the outdoor areas of the property from what has been indicated in this consultation, then it may be necessary to revisit the exposure calculations to determine any changes in potential health impacts.

Conclusions

From the soil sampling and analytical data collected during the November 2005 sampling event, it is concluded that:

- Employee exposure to the soils through incidental ingestion at the average levels detected during the November 2005 sampling would not be expected to produce any adverse health effects, however; definitive conclusions as to the health risks of employees

working at the site cannot be made since samples were not exclusively obtained from the upper three inches of surface soil. The site is categorized as posing no apparent health hazard.

- Since children will not be routinely exposed to soils at the site, the site will not pose any adverse health effects for children.

Recommendations

- If possible, soil samples should be obtained from the upper three inches of the soil profile after construction is completed to provide a more accurate determination of potential exposures to site contaminants.
- Although employees will only be exposed to arsenic contaminated soils for short periods of time per day, it is recommended that they wash their hands immediately after returning indoors from outside areas to further reduce their incidental exposure to arsenic, as part of prudent public health practice. Eating drinking, or smoking in the outdoor areas are also not recommended since these activities increase the amount of incidental ingestion of soils.
- If the use of the site property will be changed from that of a pet boarding facility, it would be necessary to revise this health consultation to evaluate on-site health risks due to other uses of the property.
- A revised health consultation should be completed if additional soil samples are obtained from with the top three inches of the site soil profile, and the concentration of site contaminants are greater than the site contaminants identified in the top two feet of soil.

Public Health Action Plan

- IDPH will provide assistance with community health education as needed and requested.
- IDPH will review any additional sampling data and update health recommendations as necessary.
- IDPH will complete a revised health consultation if the proposed use of the site changes from that of a pet boarding facility.
- IDPH will continue to address and evaluate community concerns.

Figure 1

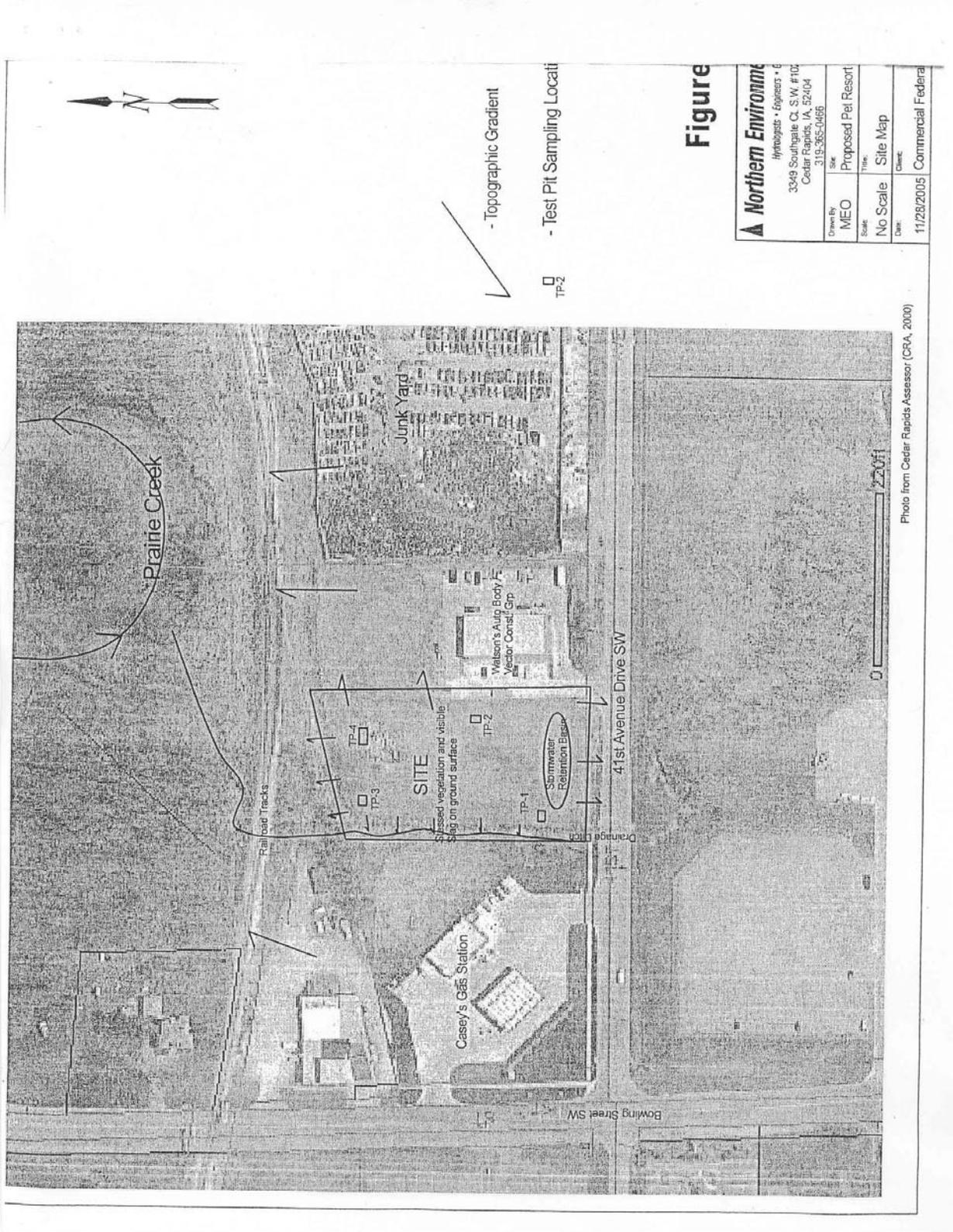
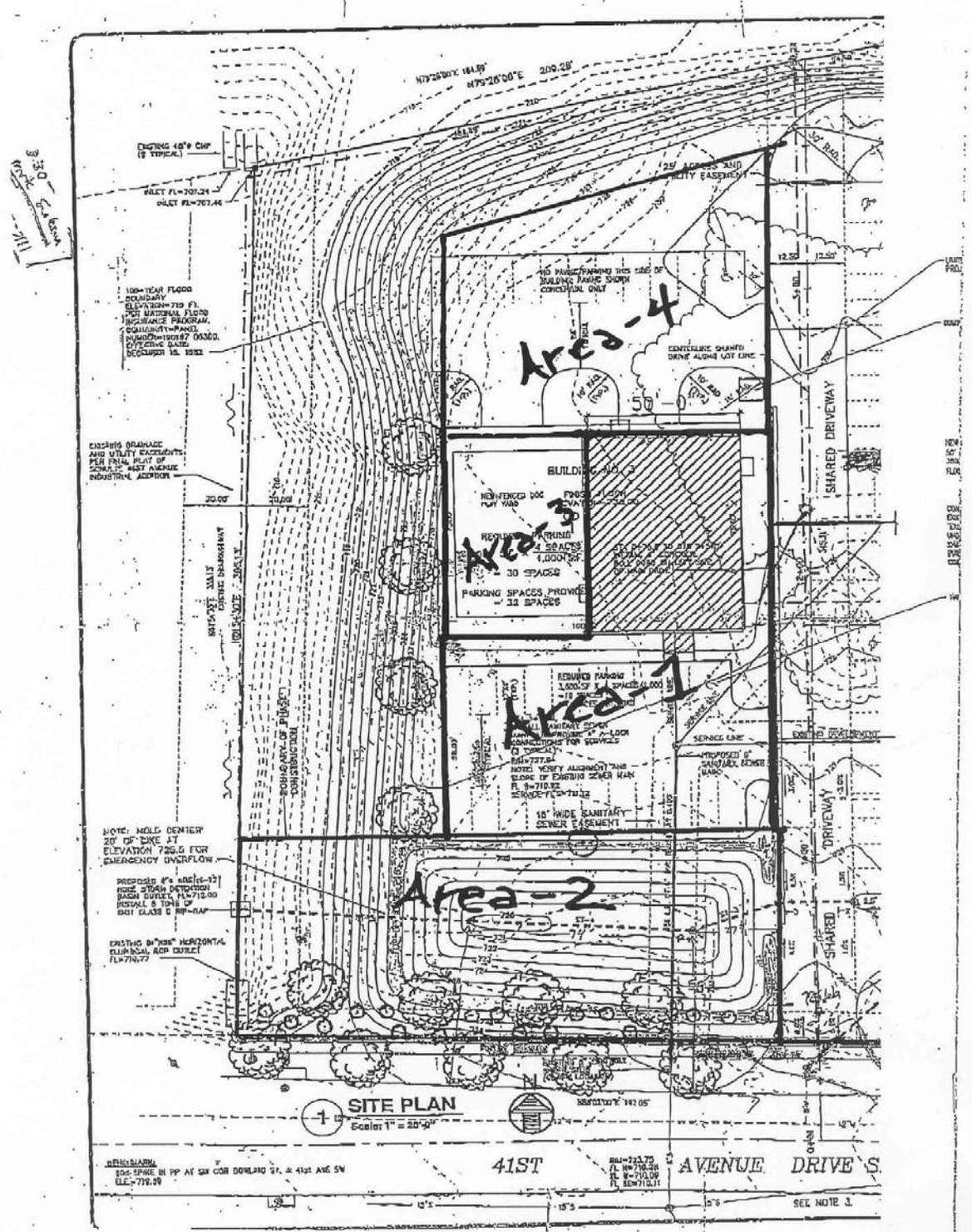


Figure 2



References

1. Tails A Waggin’ Contamination File, Iowa Department of Natural Resources, Des Moines, Iowa.
2. Exposure Factors Handbook: US Environmental Protection Agency; August 1997. EPA Web Link: <http://www.epa.gov/ncea/pdfs/efh/front.pdf>
3. Agency for Toxic Substances and Disease Registry. Minimum Risk Levels (MRLs) for Hazardous Substances. ASTDR Web Site Link: <http://www.atsdr.cdc.gov/mrls.html>
4. Agency for Toxic Substances and Disease Registry. Draft Toxicological Profile for Arsenic. Atlanta: US Department of Health and Human Services; September 2005. <http://www.atsdr.cdc.gov/toxprofiles/tp2-c6.pdf>
5. United States Environmental Protection Agency, Integrated Risk Information System. EPA Web Site Link: <http://www.epa.gov/iris/gloss8.htm#r>
6. United States Environmental Protection Agency, Integrated Risk Information System. EPA Web Site Link: <http://www.epa.gov/iris/subst/0278.htm#reforal>
7. United States Environmental Protection Agency, Integrated Risk Information System. EPA Web Site Link: <http://www.epa.gov/iris/gloss8.htm#s>
8. United States Environmental Protection Agency, Integrated Risk Information System. EPA Web Site Link: <http://www.epa.gov/iris/subst/0278.htm#quaoral>

Preparers of the Report

Authors

Stuart Schmitz, P.E., Sara Colboth, and Charles Barton, Ph.D., DABT
Hazardous Waste Site Health Assessment Program
Iowa Department of Public Health

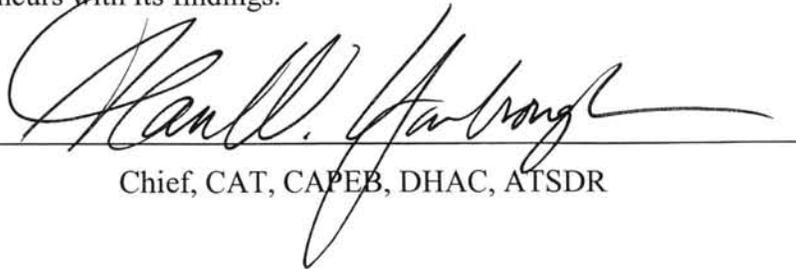
CERTIFICATION

The Iowa Department of Public Health, Hazardous Waste Site Health Assessment Program, has prepared this health consultation evaluating arsenic contamination in soil at a commercial property in Cedar Rapids, Iowa under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). The document is in accordance with approved methodology and procedures existing when the health consultation was being 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, ATSDR, has reviewed this health consultation and concurs with its findings.



Chief, CAT, CAPEB, DHAC, ATSDR