Health Consultation

ROLFE ABOVEGROUND STORAGE TANK
PETROLEUM BULK PLANT

TARGETED BROWNFIELDS ASSESSMENT

RAILROAD STREET AND 300TH AVENUE

ROLFE, POCAHONTAS COUNTY, IOWA

MAY 20, 2005

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.

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HEALTH CONSULTATION

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TARGETED BROWNFIELDS ASSESSMENT

RAILROAD STREET AND 300TH AVENUE

CITY OF ROLFE, POCAHONTAS COUNTY, IOWA

Prepared by:
Iowa Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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Purpose

The Iowa Department of Natural Resources (IDNR) has requested the Iowa Department of Public Health (IDPH) Hazardous Waste Site Health Assessment Program evaluate future health impacts of exposures at a former aboveground storage tank site located in Rolfe, Iowa. The former aboveground storage tank site is located to the southwest of the intersection of Railroad Street and 300th Avenue in Rolfe, Iowa. This site is undergoing a Targeted Brownfields Assessment conducted by the Contaminated Sites Section of the IDNR. This health consultation addresses potential health risks to people from future exposure to the soil within the property boundary, and any health impacts resulting from contaminated groundwater beneath the site 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

The site is a former aboveground storage tank petroleum bulk plant that has been out of service for approximately 16 years. Photos 1 and 2, on page 9, show several views of the site. County assessment records indicate that five tanks were constructed in 1936 (one 17,000-gallon tank, three 10,000-gallon tanks, and one 4,000-gallon tank). The bulk plant was operated until 1989 and was abandoned at that time (1). The site is just less than 1 acre in size. Single home residential properties are located approximately 225 feet to the north of the site past an abandoned rail line and a city street and can be seen in the right-hand portion of Photo 1. The site vicinity is a mix of low-density residential and commercial properties.

At the present time the owners of the property owe more than $9,000 in back taxes to Pocahontas County. Pocahontas County can take title to the property, and the City of Rolfe would like to redevelop the site as a park and trailhead for a local bicycle trail planned along the north end of the property. There is no playground planned for this area. The city and county wish to gain a better understanding of any risks associated with any contamination that may exist at the site property prior to taking title of the site (1).

Site Evaluation

Based upon an evaluation of the site history by the IDNR, the contamination of concern was limited to petroleum and metals that might have been present as a result of fuel additives. In October, November, and December of 2004 and in February and March of 2005, the IDNR conducted site investigative activities collecting soil and groundwater samples within the site property boundary. Soil samples were collected with a truck-mounted direct-push soil probe, by hand auger, and by hand tools. In addition, temporary groundwater monitoring wells were installed for collection of groundwater samples.

Eleven of the soil samples were collected and sent for laboratory analysis for the following metals: lead, arsenic, barium, cadmium, chromium, mercury, selenium, and silver. Table 1, on the following page, is a summary of the metals analysis.

Table 1 – Soil Sampling Metals Analyses Results (1)

		Concentration (mg/kg)							
Sample	Depth	Lead	Arsenic	Barium	Cadmium	Chromium	Mercury	Selenium	Silver
HA2	0-8 in.	140	5.6	170	<2.0	14	<1.0	<1.0	<1.0
HA3	0-8 in.	440	5.7	490	<2.0	17	<1.0	<1.0	<1.0
HA4	0-8 in.	310	5.1	400	2.3	13	<1.0	<1.0	<1.0
HA5	0-8 in.	190	5.7	390	36	18	<1.0	<1.0	<1.0
HA6	0-8 in.	140	6.2	300	<2.0	14	<1.0	<1.0	<1.0
HA7	0-8 in.	190	5.4	270	<2.0	15	<1.0	<1.0	<1.0
HA9	0-3 ft.	ND	NA	NA	NA	NA	NA	NA	NA
HA10	0-3 ft.	22	NA	NA	NA	NA	NA	NA	NA
BL	0-1 ft.	56	NA	NA	NA	NA	NA	NA	NA
Grab 1	0-3 in.	300	5.4	230	2.3	9.9	<1.0	<1.0	<1.0
Grab 2	0-3 in.	86	NA	NA	NA	NA	NA	NA	NA

<1.0 and <2.0means metal was not detected at or above the laboratory method detection limit of 1.0 and 2.0 mg/kg.
BL means behind load-out area.
ND mean not detected at or above the laboratory method detection limit.
NA means not included in the list of chemical parameters analyzed.

Additional soil samples were collected and analyzed for the following petroleum components: benzene, toluene, ethylbenzene, xylenes, methyl tert-butyl ether (MTBE), and total extractable hydrocarbons (TEH). TEH is a measure of the total amount of low-volatility petroleum components, such as diesel fuel. Benzene, toluene, ethylbenzene, xylenes, and MTBE are all high-volatility petroleum components. Table 2 is a summary of the petroleum components in the soil samples.

Table 2 – Soil Sampling Petroleum Analyses Results (1)

		Concentration (mg/kg)					
Sample	Depth	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	Total Extractable Hydrocarbons (TEH)
HA1	0-8 in.	ND	ND	ND	ND	ND	180
HA1D	3 ft.	ND	1.6	1.3	32	470	13,000
HA8	0-3 ft.	NA	NA	NA	NA	NA	71
HA9	0-3 ft.	NA	NA	NA	NA	NA	280
HA10	0-3 ft.	NA	NA	NA	NA	NA	56
HA16	0-3 ft.	ND	ND	ND	ND	ND	82
SB1	3 ft.	ND	ND	ND	ND	ND	ND
SB1	8 ft.	ND	ND	ND	ND	ND	7
SB1	10 ft.	ND	ND	ND	0.016	0.046	770
SB1	12 ft.	ND	ND	ND	ND	ND	11
SB2	8 ft.	ND	ND	ND	ND	ND	8.3
SB3	16 ft.	ND	ND	0.002	0.067	0.071	170
SB3D	16-20 ft.	ND	ND	ND	ND	ND	5
SB5	8 ft.	ND	ND	ND	ND	ND	380
SB5	10 ft.	ND	ND	ND	ND	ND	560
SB5D	16-20 ft.	ND	ND	ND	ND	ND	8
SB7	3 ft.	ND	ND	ND	ND	ND	18
SB7	15 ft.	ND	ND	ND	ND	ND	90

ND means not detected at or above the laboratory method detection limit.
NA means not included in the list of chemical parameters analyzed.

Groundwater samples were collected in December 2004 and February and March 2005 from the groundwater monitoring wells installed during November 2004 and February 2005. These groundwater samples were analyzed for the following petroleum components: benzene, toluene, ethylbenzene, xylenes, MTBE, and TEH. Table 3, below, is a summary of the petroleum components in the groundwater samples.

Table 3 – Groundwater Sampling Petroleum Analyses Results (1)

			Concentration					
Sample	Sample Date	Depth to GW	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Total Extractable Hydrocarbons (TEH)
MW1	12/9/04	7.3 ft.	ND	ND	ND	ND	ND	570
MW2	12/9/04	8.6 ft.	ND	ND	ND	ND	ND	940
MW3	12/9/04	6.5 ft.	ND	ND	ND	ND	ND	ND
BG	12/9/04	8.1 ft.	ND	ND	ND	ND	ND	ND
MW1	2/17/05	5.6 ft.	ND	ND	ND	ND	ND	530
MW2	2/17/05	5.7 ft.	ND	ND	ND	ND	ND	760
BG	2/17/05	7.8 ft.	ND	ND	ND	ND	ND	ND
MW4	3/30/05	7.3 ft.	35	10	60	96	ND	81,000

GW means groundwater
BG means background sample
ND means not detected at or above the laboratory method detection limit.
NM means not measured

Contaminants of Concern

The contaminants of concern at the site further discussed in this health consultation are the metals detected within the soil samples – lead, arsenic, barium, cadmium, and chromium; and the petroleum components detected in the soil and groundwater samples – benzene, toluene, ethylbenzene xylenes, and TEH.

Discussion

Exposure to Chemicals of Concern

Exposure to the chemicals of concern at the former aboveground storage tank site is determined by examining human exposure pathways. An exposure pathway has five parts:

1. a source of contamination,
2. an environmental medium such as air, water, or soil that can hold or move the contamination,
3. a point at which people come in contact with a contaminated medium, such as, in drinking water, or in surface soil,
4. an exposure route such as, drinking water from a well, or eating contaminated soil on homegrown vegetable, and
5. a population who could come in contact with the contaminants.

An exposure pathway is eliminated if at least one on the five parts is missing and will not occur in the future. For a completed pathway, all five pathway parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur.

Exposure to Groundwater

Exposure to any contaminated groundwater from the site would be possible if individuals were drinking water supplied by private wells located in the vicinity of the site. According to officials at the City of Rolfe, all individuals and businesses within Rolfe are supplied by municipal water (Janice Young, City Clerk, City of Rolfe, personal communication, January 28, 2004). The sources of the municipal water supply are public wells; the closest of these wells to the site is located approximately 1,500 feet to the northwest of the site (2). The concentration of petroleum contaminants in the site groundwater is very low or non-detectable with the exception of one of the groundwater monitoring locations. Since these concentrations are generally low at the site, it is not expected that petroleum contaminants would impact the public water supply wells located 1,500 feet away. Petroleum components such as benzene, toluene, ethylbenzene, and xylenes have not been detected within the Rolfe public water supplies (3). It is expected that individuals within Rolfe will not be exposed to groundwater at the site through ingestion as long as water supply wells are not installed at the site; therefore the groundwater exposure pathway has been eliminated from further consideration.

Exposure to Soils

Exposure to soils at the site is possible through incidental ingestion of the soils from ingestion of dust and hand to mouth activities. Due to the proposed future use of the site as a park and trailhead for a local bicycle trail, it is anticipated that exposure to soils below the top several inches will be eliminated. Therefore, only the soils samples collected from the surface (0-8 inches below ground) will be considered in the evaluation of exposure to the chemicals of concern.

Toxicological Evaluation

The following information has been prepared as a toxicological evaluation of exposure to the chemicals of concern in surface soils at the average and maximum detected concentration. The Agency for Toxic Substances and Disease Registry (ATSDR) has developed a set of soil comparison values that are levels of chemicals in soil that are unlikely to cause harmful (adverse) health effects in exposed people (4). These levels utilize health effect levels developed by ATSDR and the US Environmental Protection Agency (EPA). These health effect levels include the ATSDR Oral Minimum Risk Levels (MRLs), the EPA Chronic Reference Doses (RfD), and the EPA oral slope factors that estimate risks to cancer.

Table 4, on the following page, is a list of soil comparison values for all the chemicals of concern, along with the maximum and average detected concentration of the chemicals of concern detected in soil samples. The comparison value included in Table 4 for lead is obtained from the EPA and is a concentration of lead in bare soil within play areas below which is determined to be a lead hazard level. This level is utilized as a cleanup and remediation standard for bare soils located in areas where children play. (5).

There are no comparison values for total extractable hydrocarbons or TEH, since TEH is a measure the total concentration of many chemicals within a specified volatility range. The analytical method for TEH utilized in the analytical work from the sampling by the IDNR determined the total amount of extractable hydrocarbons in the diesel range of volatility. According to the ATSDR Toxicological Profile for fuel oil, one of the largest components of diesel fuel is naphthalene. According to this profile, diesel fuel may contain up to 8 percent naphthalene (6). In order to utilize the ATSDR soil comparison values, the average TEH level of 133.8 mg/kg and the maximum TEH level of 180 mg/kg were converted to 11 and 14 mg/kg naphthalene (8% of 133.8 and 8% of 180).

Table 4 – Comparison Values and Chemicals of Concern in On-Site Soils

Chemical and Comparison Value	Comparison Value Concentration (mg/kg)	Ave. and Max. Detected Conc. (mg/kg)
Lead – EPA Standard for Play Areas	**400**	187 and 440
Arsenic – Acute EMEG Pica Child	10	5.6 and 6.2
Arsenic – Chronic EMEG Child	20	
Arsenic – Chronic EMEG Adult	200	
Arsenic – CREG 10^{-6} Risk	**0.5**	
Arsenic – RMEG Child	20	
Arsenic – RMEG Adult	200	
Barium – RMEG Child	4,000	321 and 490
Barium – RMEG Adult	50,000	
Cadmium – Chronic EMEG Child	**10**	14 and 36
Cadmium – Chronic EMEG Adult	100	
Cadmium – RMEG for Child	50	
Cadmium – RMEG for Adult	700	
Chromium – RMEG Child	200	14 and 18
Chromium – RMEG Adult	2,000	
Naphthalene – Acute EMEG Pica Child	1,000	11 and 14 *
Naphthalene – Inter. EMEG Pica Child	1,000	
Naphthalene – Inter. EMEG Child	30,000	
Naphthalene – Inter. EMEG Adult	400,000	
Naphthalene – RMEG Child	1,000	
Naphthalene – RMEG Adult	10,000	

EMEG means Environmental Media Evaluation Guide
Pica means a craving to eat non-food items. Some children exhibit pica-behavior
CREG means Cancer Risk Evaluation Guide
RMEG means Reference Dose Media Evaluation Guide
Inter. means intermediate
* TEH levels of 133.8 (ave.) and 180 (max.) mg/kg was converted to 11 and 14 mg/kg naphthalene (8%).

Only three comparison values (shown as bold numbers) were below the maximum detected concentration of any of the chemicals of concern. These three comparison values were the EPA

Lead Standard for Play Areas, the Cancer Risk Evaluation Guide (CREG) at a 10^{-6} risk for arsenic, and the Chronic Environmental Media Evaluation Guide (EMEG) for a Child for cadmium.

EPA Lead Standard for Play Areas

The EPA Lead Standard for Play Areas was established as a level of lead within bare soil located in places where children play. The standard is 400 mg/kg lead in soil. Young children are especially vulnerable to the toxic effects of lead to their nervous system and many of the health effects can be irreversible. Because of this, efforts have been made to reduce or eliminated exposure of children to harmful levels of lead. The EPA standard recommends that effective measure should be taken to reduce or prevent children's exposure to lead in bare soil that exceeds the 400 mg/kg level. Effective measures include removal of the soil, or covering of the bare soil. Covering of the soil can include mulch, sod, or grass and will limit the exposure to children that may be playing in these areas.

It is understood that the soils at the site, for the most part, are covered by grass. If site soils remain covered after the development of the site into a park and trailhead, then the exposure to any soils above the EPA standard will be minimized. There was only one soil sample that contained lead at a concentration above the EPA standard of 400 mg/kg. A lead exposure hazard to children is not expected to take place if bare exposed soils do not exist on the site property.

Cancer Risk Evaluation Guide

The CREG utilizes the EPA slope factor for evaluating the cancer risk of exposure to a chemical. 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 slope factor is then used in the calculations to determine a CREG along with assumptions for exposure levels to soil for adults and children. The assumptions for exposure utilized in the calculation of the CREG are 10 kilogram body weight and a soil ingestion rate of 200 mg/day for a child and 70 kilogram body weight and a soil ingestion rate of 100 mg/day for an adult.

A CREG has been developed for arsenic, since ingestion of arsenic at certain levels over a *lifetime* of exposure is suspected to be a risk of cancer. The CREG for arsenic in soil is 0.5 mg/kg for an addition risk of cancer of one in one-million. That is, if a population was exposed on a daily-basis to soil at 0.5 mg/kg arsenic over a lifetime, it is estimated that an additional one person out of a population of one-million would develop cancer due to the arsenic exposure.

Since the site has not been utilized as a residential property and is not expected to be utilized as a residential property in the future, it is not expected that a person would be exposed on a daily basis to surface soil at the site. Current residential properties are not located adjacent to the site. Therefore, any exposure to soils at the site would not be expected to cause any increased risk of developing cancer from arsenic exposure.

Chronic Environmental Media Evaluation Guide

An EMEG is an estimate of an exposure level in a particular media below which a negative health impact is not expected. In the case of cadmium, a chronic EMEG for a child has been determined to be 10 mg/kg in soil (2). The assumptions for exposure utilized in the calculation of the chronic EMEG for a child is 10 kilogram body weight and a soil ingestion rate of 200 mg/day exposed on a daily basis.

It is unlikely that any child will be chronically exposed to site soils; that is, exposed on a daily basis. Therefore, it is not expected that a child's health will be negatively affected by exposure to cadmium in the soil at the levels measured by the IDNR, since children are not expected to visit the site on a daily basis.

Acute and Intermediate Exposures to Soil

Included in Table 5, on the previous page, are several acute and intermediate EMEGs for several of the chemicals of concern. These EMEGs have been developed to account for exposures to soil on a less frequent than chronic or daily basis. An acute exposure is defined by ATSDR as an exposure for a short duration – up to 14 days (8). An intermediate exposure is defined by ATSDR as an exposure for more than 14 days and less than one year (8). The levels of all chemicals of concern in the site soil sampled by the IDNR were below the acute and intermediate EMEGs. It is expected that only acute and maybe some intermediate exposure to site soils will be experienced by individuals utilizing this site as a recreational area. Since the average levels of chemicals of concern in site soils are below all acute or intermediate EMEGs, it is not expected that human health will be impacted by the site if the site is utilized as a recreational area.

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 chemicals of concern detected in the soil samples collected during the 2004 site investigation on children's health. The levels of the chemicals of concern were below published comparison values for acute or intermediate exposures. Only acute or intermediate exposures to soils are expected at the site, since the proposed future use of the site is recreational. These comparison values are considered protective, even to the most sensitive individuals including children. As previously stated, a lead exposure hazard to children is not expected to take place at the site property since bare exposed soils do not currently exist on the site property, and are not anticipated to exist once the property is developed for the park and trailhead. It is concluded that children's health would not be negatively impacted by the presence of these chemicals at the levels detected within the soil samples.

Community Health Concerns

The IDPH is aware that there are concerns about the health impacts to the residents and visitors of Rolfe who will use the site after it is developed into a park and trailhead. The data utilized in this health consultation was obtained prior to any site remedial or cleanup activities. The levels

of all chemicals detected in the soil and groundwater and the potential for human exposure suggest that the site, as it exists now, will not pose any human health risks. During the development of the site, care should be take in the removal of the remaining aboveground tanks and associated structures to ensure that any petroleum products that may have been left within the tanks or associated structures are contained and properly removed prior to razing the site.

Conclusions

From evaluating the soil and groundwater sampling and analytical data collected during October, November, and December 2004, and the February and March 2005 sampling events; and other background information on the site it is concluded that:

- Human exposure to the soils through incidental ingestion would not be expected to produce any adverse health effects, even to sensitive portions of the human population including children.

- It is anticipated that individuals within Rolfe will not be exposed to any contaminated groundwater, since all residences are supplied with water from the City of Rolfe Public Water Supply.

- The site poses no human health hazard if used as a public park and trailhead.

Recommendations

- Care should be taken in the removal of the remaining aboveground storage tanks and associated structures to ensure that any petroleum products that may have been left within the tanks or associated structures are contained and properly removed prior to razing the site. Confirmatory sampling of the soil may be warranted if petroleum is spilled during site cleanup activities.

Public Health Action Plan

- IDPH will provide assistance with community health education as needed and requested.

- IDPH will continue to review sampling and analytical data provided by the IDNR and update health recommendations as necessary.

- IDPH will continue to address and evaluate community concerns.

Photos

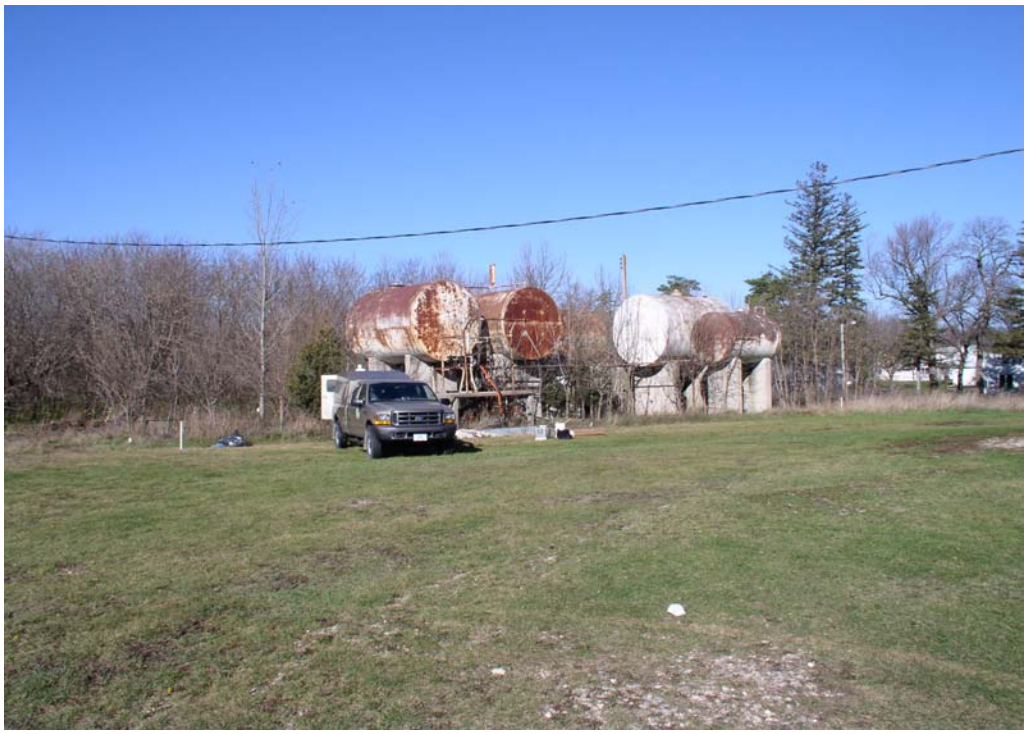

Photo 1 – View of Former AST Bulk Plant from the Southeast

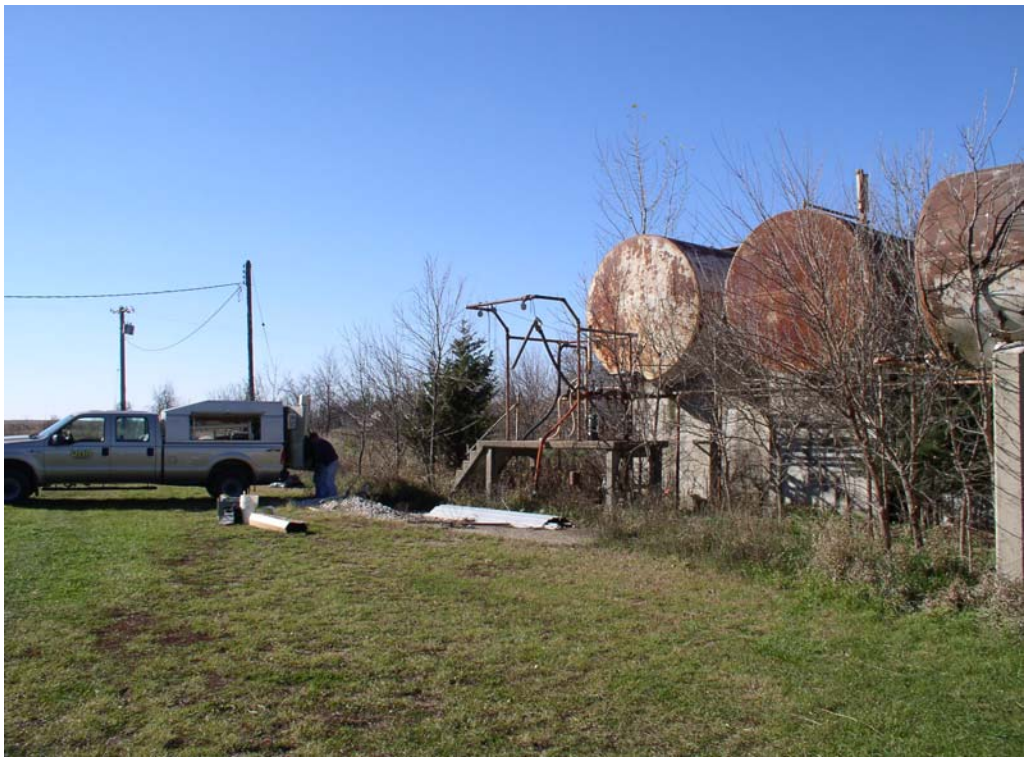

Photo 2 – View of Former AST Bulk Plant from the Northeast

References

1. Rolfe AST Petroleum Bulk Plant Targeted Brownfield Assessment File, Iowa Department of Natural Resources, Des Moines, Iowa.

2. Source Water Protection Evaluation, Rolfe – Mississippian Aquifer, Iowa Department of Natural Resources – Geological Survey Bureau, Iowa City, Iowa.

3. Analytical Results – Rolfe Water Supply, Water Supply Section of Iowa Department of Natural Resouces.

4. Soil Comparison Values, Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry; 2004.

5. Federal Register; Friday January 15, 2005. EPA Web Site Link: http://www.epa.gov/lead/403_final.pdf

6. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Fuel Oils. Atlanta: US Department of Health and Human Services; June 1995.

7. United States Environmental Protection Agency, Integrated Risk Information System. EPA Web Site Link: http://www.epa.gov/iris/gloss8.htm#s

8. Agency for Toxic Substances and Disease Registry. ATSDR Glossary of Terms. ASTDR Web Site Link: http://www.atsdr.cdc.gov/glossary.html

Preparers of the Report

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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 site information and soil and groundwater sampling data at a former aboveground storage tank bulk petroleum site in Rolfe, 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. Editorial review was completed by the Cooperative Agreement Partner.

Technical Project Officer, CAT, SPAB, DHAC, ATSDR

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

for Team Lead, CAT, SPAB, DHAC, ATSDR