

Health Consultation

STATE OF ILLINOIS

HENNESSY/KEDZIE AND TOWER HILL ROAD SITES

GILBERTS, KANE COUNTY, ILLINOIS

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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

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Prepared by:

Illinois Department of Public Health
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
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Purpose

On June 11, 2004, the Illinois Environmental Protection Agency (Illinois EPA) requested that the Illinois Department of Public Health (IDPH) perform a health consultation for the Hennessy/Kedzie and Tower Hill Road sites to determine if metals in soil posed a public health hazard. IDPH has provided this information to Illinois EPA as a verbal technical assistance and this report summarizes our evaluation.

Background and Statement of Issues

The Hennessy/Kedzie site (Figures 1 and 2) is 22 acres in size. It is bound by a wetland area on the north, the town of Gilberts on the south, Galligan Road on the east, and the Chicago and Northwestern railroad tracks on the west. The site is relatively flat, with areas of vegetation and bare soil.

The Tower Hill Road site is southwest of the Hennessy/Kedzie site, across the railroad tracks (Figure 2). The eastern part of the Tower Hill Road site is part of a 100-foot-wide railroad right-of-way, which is owned by the railroad. The Village of Gilberts also owns part of the property (including part of a residential property), and NextMedia owns the western part of this land (Ribordy 2004).

Until 1929, the Hennessy/Kedzie site was used for making clay tiles. The top 4 to 6 feet of clay were stripped from a 64.4-acre area (including land across Galligan Road) and used to make tiles. The site has a marshy area on the north, probably created by clay mining. The site also has some depressions, including a lake. In the early 1960s, a 50-foot-deep water supply well was installed on the site, but vandals subsequently filled it to 13 feet (Range undated).

In 1968, a scrapping operation began at the Hennessy/Kedzie site. Lead acid batteries were preferred, but other scrap also was taken. Batteries were cracked open, the acid was drained onto the ground, and the lead was sold for recycling. Battery casings were dumped in low areas. In 1977, Illinois EPA first noted waste disposal violations at the site. Subsequent investigations also reported the disposal of barrels of waste. Contaminants in on-site liquid waste included cadmium, lead, phenolic compounds, sulfate, and zinc. Exposed battery casings were scattered over approximately 6.8 acres of the site. In May 1978, the operations were moved to the Tower Hill Road Site (Range undated).

On October 21, 2003, an underground peat and acid fire at the Hennessy/Kedzie site caused noxious smoke, which sickened two police officers. Differing media reports described the evacuation of 25 to 40 homes (Illinois EPA 2004, Karl 2004c, Seigle 2004, Wronski 2004).

Subsequently, Illinois EPA issued an administrative order to seal the Hennessy/Kedzie site from public access. Signs and yellow warning tape were placed at the site by Illinois EPA (Illinois EPA 2004). On April 1, 2004, USEPA fenced a 4-acre portion of the site that had the highest levels of lead-contaminated soil (Karl 2004b).

As of May 2005, a USEPA contractor was in the process of excavating, consolidating and treating the most contaminated soils at the Hennessy/Kedzie site with plans to finish the project

by mid-May. The Tower Hill Road site will be cleaned up next with plans to have it finished by the end of May 2005.

Currently, about five homes west of Tower Hill Road still have private wells. The Village estimated that extending the water line under the railroad tracks would cost \$240,000, which would be too expensive for the Village. Therefore, homes to the west on Tower Hill Road probably will remain on private wells.

Demographics

Table 1 lists the demographics of the community near the site. Before USEPA fenced the contaminated area of the Hennessy/Kedzie site, nearby residents reportedly rode dirt bikes on the property. IDPH assumes that teenagers and adults were the most likely to participate in riding dirt bikes on the site.

Site Visit

IDPH staff conducted a site visit on May 12, 2004. The contaminated part of the Hennessy/Kedzie site was surrounded by a 6-foot chain-link fence. The fence had signs warning of hazardous substances. The site perimeter was largely overgrown with brush and trees. The Tower Hill Road site was well vegetated with grass. Both sites appeared relatively flat.

Discussion

Chemicals of Interest

IDPH compared the maximum level of each chemical detected during environmental sampling with appropriate screening comparison values. This was to select chemicals for further evaluation for both carcinogenic and non-carcinogenic health effects. Chemicals that exceeded comparison values were selected for further evaluation. A description of each of the comparison values is found in Attachment 1.

IDPH used the comparison values to screen for chemicals that warranted further evaluation. These comparison values do not represent thresholds of toxicity. Although some of these chemicals may exist at levels greater than comparison values, the chemicals can only affect someone exposed to sufficient doses. The amount of the chemical, the duration and route of exposure, and the health status of exposed individuals are important factors in determining the potential for adverse health effects.

Groundwater

On December 3, 2003, Illinois EPA sampled two private wells near the Hennessy/Kedzie site. One well served a home to the west, and the other well served a business to the north. Illinois EPA analyzed the samples for inorganic chemicals. None of the inorganic chemicals exceeded comparison values.

From November 8 to 10, 2004, Illinois EPA sampled newly installed monitoring wells around the Hennessy/Kedzie site (Figure 3, Table 2) and had the water analyzed for inorganic elements, volatile organic compounds, and semi-volatile organic compounds. Arsenic, lead, manganese, and sodium exceeded comparison values. No volatile organic compounds or semi-volatile organic compounds exceeded comparison values.

On November 8 and 9, 2004, Illinois EPA sampled ten private wells around the Hennessy/Kedzie and Tower Hill Road sites (Figure 3). Nine of the wells served residences and one well served a Village of Gilberts building (not used for human consumption). Illinois EPA had the water analyzed for inorganic chemicals, volatile organic compounds, semi-volatile organic compounds, and pesticides. Only sodium exceeded its comparison value, in eight of the wells (Table 2).

Sediments

On December 3, 2003, Illinois EPA took a sediment sample from the on-site pond. Thallium, at 7.5 parts per million (ppm), exceeded state background levels for soil (0.02 ppm to 2.8 ppm, Illinois EPA 1994). There is currently no comparison value for thallium in soil. None of the other inorganic chemicals exceeded either comparison values or state background levels for soil.

In early November, 2004, Illinois EPA took a sediment sample from a pond in Waitcus Park (a city park) and five sediment samples from four locations from the pond east of the Hennessy/Kedzie site (Figure 3). They analyzed the samples for inorganic chemicals, and none of those chemicals exceeded health based comparison values.

Soil

On December 3, 2003, Illinois EPA took two soil samples from the Hennessy/Kedzie site and analyzed them for inorganic chemicals (Table 3). Antimony, arsenic, lead, and thallium exceeded comparison values.

From March 10 to 11, 2004, Illinois EPA measured lead concentrations in surface soil at the site using an x-ray fluorescence (XRF) instrument. The XRF device detected levels up to 225,920 ppm of lead, with 33 of 36 locations exceeding 1,000 ppm of lead (Table 3).

In April 2004, USEPA took soil samples from the Hennessy/Kedzie site and analyzed them for inorganic chemicals (Table 3). Most of the contamination was within one foot of the surface (Karl 2004a).

In June 2004, Illinois EPA and USEPA measured lead concentrations in surface soil of the Tower Hill Road site using an XRF device. Five of nine samples exceeded 1,000 ppm of lead. USEPA also took soil samples and had them analyzed for metals. Arsenic, beryllium, cadmium, and lead were the chemicals of interest (Table 3).

In November 2004, Illinois EPA took soil samples from eight residential yards and two soil samples from Waitcus Park (Figure 3). They analyzed the samples for inorganic chemicals. None of these chemicals exceeded health based comparison values.

Exposure Evaluation

A hazardous chemical can affect people only if they contact it through an exposure pathway at a sufficient concentration to cause a toxic effect. This requires:

- A source of exposure,
- An environmental transport medium,
- A route of exposure, and
- A receptor population (point of exposure).

A pathway is complete if all its components are present and exposure of people occurred in the past, is occurring, or will occur in the future. If parts of a pathway are absent, data are insufficient to decide whether it is complete, or exposure may occur at some time (past, present, future), then it is a potential pathway. If a part of a pathway is not present and will never exist, the pathway is incomplete and can be eliminated from further consideration.

The planned removal of the contamination will end the potential for future exposure at both the Hennessy/Kedzie site and the Tower Hill Road site. After removal, all exposure pathways will be incomplete.

For the Tower Hill Road site, IDPH considers exposure to have been minor due to vegetation preventing contact with chemicals in the soil. For a worst-case scenario at the Hennessy/Kedzie site, IDPH assumed that a 70 kg individual used the site before construction of the fence for recreation 4 hours per day, 4 days per week, 20 weeks per year, for 10 years. Exposure of an adult or older teenager was considered more likely than exposure of a small child.

Air

Antimony, arsenic, beryllium, lead, and thallium are all non-volatile. If present in air, they would be present in airborne dust. Airborne dust is inhibited by vegetation and is most likely in areas with bare soil.

The Hennessy/Kedzie site has areas with bare soil. Before fencing of the Hennessy/Kedzie site, trespassers probably were exposed to unknown levels of airborne dust. Dirt biking may have increased this exposure. However, IDPH cannot reconstruct these past exposure levels.

Because of the site fence, trespassing on the Hennessy/Kedzie site is very unlikely. Consequently, no one should currently be exposed to chemicals in airborne dust.

Part of the Tower Hill Road site is in front of a home. However, that yard and the rest of the Tower Hill Road site are well vegetated, which would minimize exposure to airborne dust.

Groundwater

On-site monitoring wells were found to contain elevated levels of arsenic, lead, manganese and sodium, but no one is drinking this water.

Sampling found that private wells west and north of the site did not contain any site-related chemicals greater than health based comparison values. Sodium was detected at elevated levels in eight of the nine private wells sampled. Sodium is a naturally occurring metal and is not believed to be related to the site.

Surface Soil

People may be exposed to chemicals in surface soil by incidental ingestion or skin contact. Exposure is more likely in areas of bare soil. Vegetation or pavement minimizes exposure to contaminated soil. The Tower Hill Road site is well vegetated, which would minimize exposure to contaminated soil. The Hennessy/Kedzie site has areas of bare soil. In the past, trespassers probably were exposed to surface soil on the Hennessy/Kedzie site. Dirt biking may have increased that exposure. Of the chemicals detected in surface soil only lead would have the potential to cause adverse health effects based on our exposure scenarios. All other estimated exposure doses were less than established health guidelines (Table 4). Because of the site fence, trespassing at the Hennessy/Kedzie site now is likely infrequent, resulting in little or no exposure to surface soil.

Toxicological Evaluation

Lead

No minimum risk level has been established for lead. Although lead is found naturally in soil, it is considered a no-threshold hazardous substance. Lead is not well absorbed through intact skin, but it can be absorbed after inhalation or ingestion. After ingestion, lead absorption is about 50 percent in young children (less than 6 years old), but only eight to 15 percent in adults. Fasting, fatty foods, or diets deficient in calcium, iron, selenium, or zinc result in increased lead absorption. In the body, lead is mostly deposited in bone, where it will stay for a long period of time. After exposure has ended, it takes about 27 years for half of the bone lead to be eliminated from the body. Lead in the bones of mothers is released during pregnancy and lactation. It can readily pass the placenta, and because of its persistence in bone, fetal uptake can occur long after maternal exposure has ended. Infants and children up to two years of age retain about 34 percent of absorbed lead, but adults retain only about one percent of absorbed lead (ATSDR 1999).

Lead affects nearly every organ and system in the body, but its main target in children and adults is the nervous system. Long-term exposure of adults to lead at work has resulted in decreased performance in some tests that measure functions of the nervous system. Lead exposure may also cause weakness in ankles, fingers, or wrists. Blood-forming tissues also may be affected, which may result in anemia. Evidence suggests that the reproductive system is affected. Some studies suggest that lead may cause increased blood pressure, but studies have not been consistent. As a result, possible effects of lead on blood pressure are uncertain (ATSDR 1999).

Sodium

Sodium has long been a major dietary factor affecting the risk of high blood pressure. Many studies have shown that reducing sodium intake can reduce blood pressure. The U.S. Food and Drug Administration (FDA) and National Research Council both recommend that people limit

their sodium intake to 2,400 milligrams per day (mg/d). Low sodium diets can range from 1,000 mg/d to 3,000 mg/d. Near the Hennessy/Kedzie and Tower Hill Road sites, a person drinking 2 liters of water per day from the residential well with the highest sodium level would consume 450 mg/d from this water.

Community Health Concerns

On May 12, 2004, the Village of Gilberts, Illinois EPA, USEPA, IDPH, the Illinois Attorney General, and the Kane County Health Department hosted a public availability session at Gilberts Village Hall. About 30 citizens attended. Several residents who live south of the site and once had private wells were concerned about past exposure to possible chemicals. One resident reported drinking water from their private well for 15 years, until the Village installed municipal water about a year ago.

Some people who live south of the site were concerned because they drank water from private wells before receiving municipal water. Limited sampling found no groundwater contamination to the north and west of the site, but the possible presence of chemicals south of the site is unknown. Illinois EPA is considering additional groundwater monitoring as part of an expanded investigation in 2005 (Range 2004a).

One resident expressed concerns about cancer and other illnesses. Cancer is very common, affecting about one in three people at some point in their lifetime. Lead may cause kidney cancer in animals, but human studies have been inconclusive (ATSDR 1999). Kidney cancer was not among the cancers listed by the concerned citizens. Furthermore, the multiple cancer types reported by community members suggest no one cause for all of the cancers.

Blood Lead Testing

At the May 12, 2004 public availability session, the Kane County Health Department offered to arrange free blood lead testing for anyone in the Village of Gilberts who:

- Biked, played, or walked on the contaminated land.
- Children (particularly those under 6 years old) and pregnant women in the vicinity of the site.

The Kane County Health Department tested the blood lead of three adults and four children. All had less than 5 micrograms per deciliter ($\mu\text{g}/\text{dl}$) of lead in their blood, which is less than the current lead intervention level of 10 $\mu\text{g}/\text{dl}$.

Child Health Considerations

IDPH recognizes that children are especially sensitive to some chemicals. Given the same chemical concentrations, children likely receive greater exposure than adults. This is because children play in soil, wash hands less frequently than adults, and commonly exhibit hand-mouth behavior. Children also have a smaller body size, meaning that they receive a greater dose from the same amount of absorbed chemical.

Children are more susceptible to the harmful effects of lead than adults. Symptoms observed in children after prenatal or postnatal exposure include: cognitive deficit (decreased IQ), decreased growth, reduced birth weight, and reduced hearing. There seems to be no threshold below which lead does not affect IQ or hearing, and the neurological effects seem to be permanent (ATSDR 1999).

IDPH considers the exposure of a small child to the contaminated area of the Hennessy-Kedzie site to be unlikely. At the Tower Hill Road site, vegetation would minimize exposure.

Conclusions

Before construction of the fence, the Hennessy/Kedzie property may have posed a public health hazard because of lead contamination. Trespassers at the site may have been exposed to elevated levels of lead. After construction of the fence, the site poses no apparent public health hazard because exposure has been significantly reduced. In the residential yard near the site, lead poses no apparent public health hazard because vegetation minimizes exposure. However, the lead remains a potential hazard, because vegetation can be removed. Removal of the contaminated soil will remove all potential environmental lead hazards.

Recommendations

IDPH recommends that:

- USEPA or responsible parties remove contaminated soil from the Hennessy/Kedzie and Tower Hill Road sites and from contaminated residential property.
- Young children (less than six years old) who play in the contaminated area have their blood tested for lead. The Kane County Health Department has offered to do this testing.
- The Kane County Health Department should investigate whether the abandoned well at the Hennessy/Kedzie site was sealed properly and by a licensed well contractor.

Public Health Actions

IDPH provided a letter containing an individual interpretation of environmental sampling results to all residents who had their soil tested. IDPH recommended that children not play in areas with lead-contaminated soil and that young children (less than six years old) who play in the yard have their blood tested for lead. Limited testing completed to date has not found anyone with elevated blood lead levels.

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Table 1. Demographics of the population within 1 mile of the Hennessy/Kedzie site (U.S. Bureau of the Census, 2000).

		Percent
Total population	774	
White	747	97
Black	0	0
American/Eskimo native	5	0.6
Asian	3	0.4
Hawaiin/Pacific islander	0	0
Other	12	2
Multi-race	7	0.9
Hispanic	21	3
Males	386	50
Females	388	50
Age less than 5	51	7
Ages 5-17	163	21
Ages 18-21	37	5
Ages 22-29	62	8
Ages 30-39	106	14
Ages 40-49	160	21
Ages 50-64	155	20
Ages 65+	40	5

Table 2. Concentrations of metals in groundwater from the Hennessy/Kedzie Site and the Tower Hill Road Site (Gorrill 2004, Illinois EPA 2004).

Chemical	Monitoring Wells (ppb)	Private Wells (ppb)	Comparison Value (ppb)	Source of Comparison Value
Arsenic	N.D.-11.5	N.D.-4.9	10	MCL
Lead	N.D.-60.2	N.D.-2.6	15	Action Level
Manganese	64.3-1,050	4.2-145	300	LTHA
Sodium	5,640-54,700	18,700-225,000	20,000	DWEL

MCL = Maximum Contaminant Level

LTHA = Lifetime Health Advisory

DWEL = Drinking Water Equivalent Level

N.D. = Not detected

Table 3. Concentrations of metals in soil from the Hennessy/Kedzie Site and the Tower Hill Road Site (Gorrill 2004, Illinois EPA 2004).

Inorganic Element	Hennessy/Kedzie Property Concentration (ppm)	Tower Hill Road Site Concentration (ppm)	Comparison Value (ppm)	Source of Comparison Value	Illinois Soil Background¹ (ppm)	Eastern U.S. Soil Background² (ppm)
Antimony	4-910	--	20	RMEG	0.18-8.6	--
Arsenic	9.7-290	11-60	0.5	CREG	0.18-8.6	N.D.-73
Cadmium	N.D.-69	0.54-4.5	10	EMEG	N.D.-8.2	--
Lead	360-226,000	1,900-67,000	400	IDPH LPPC	4.7-647	N.D.-300
Thallium	3.4-30	--	--	--	0.02-2.8	--

ppm = Parts per million

N.D. = Not detected

-- = Data not available

¹ILLINOIS EPA (1994)

²Shacklette and Boerngen (1984)

RMEG = Reference Dose Media Evaluation Guide

CREG = Cancer Risk Evaluation Guide

EMEG = Environmental Media Evaluation Guide

IDPH LPPC = Illinois Department of Public Health Lead Poisoning Prevention Code

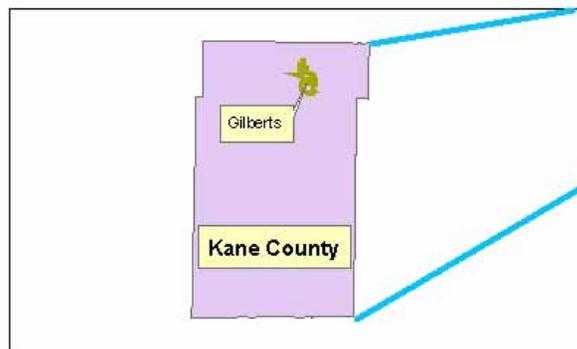
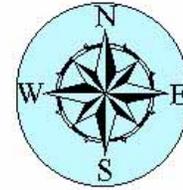
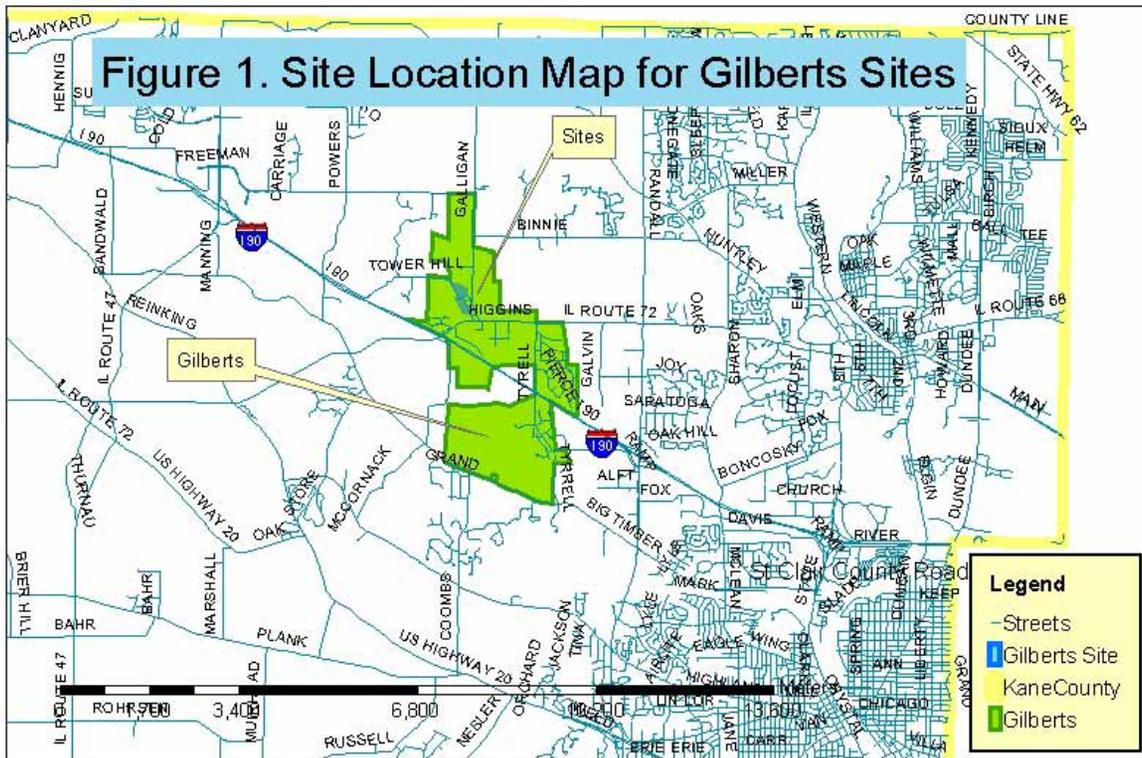
Table 4. Estimated Doses for a Trespasser on the Hennessy/Kedzie Property.

Chemical	Estimated Dose (in milligrams per kilogram-day)	Health Guideline (in milligrams per kilogram-day)
Antimony	0.000095	0.0004 RfD
Arsenic	0.000030	0.0003 Chronic MRL
Cadmium	0.0000072	0.0002 Chronic MRL
Thallium	0.0000031	0.00008 RfD ¹

RfD = Reference Dose

MRL = Minimal Risk Level

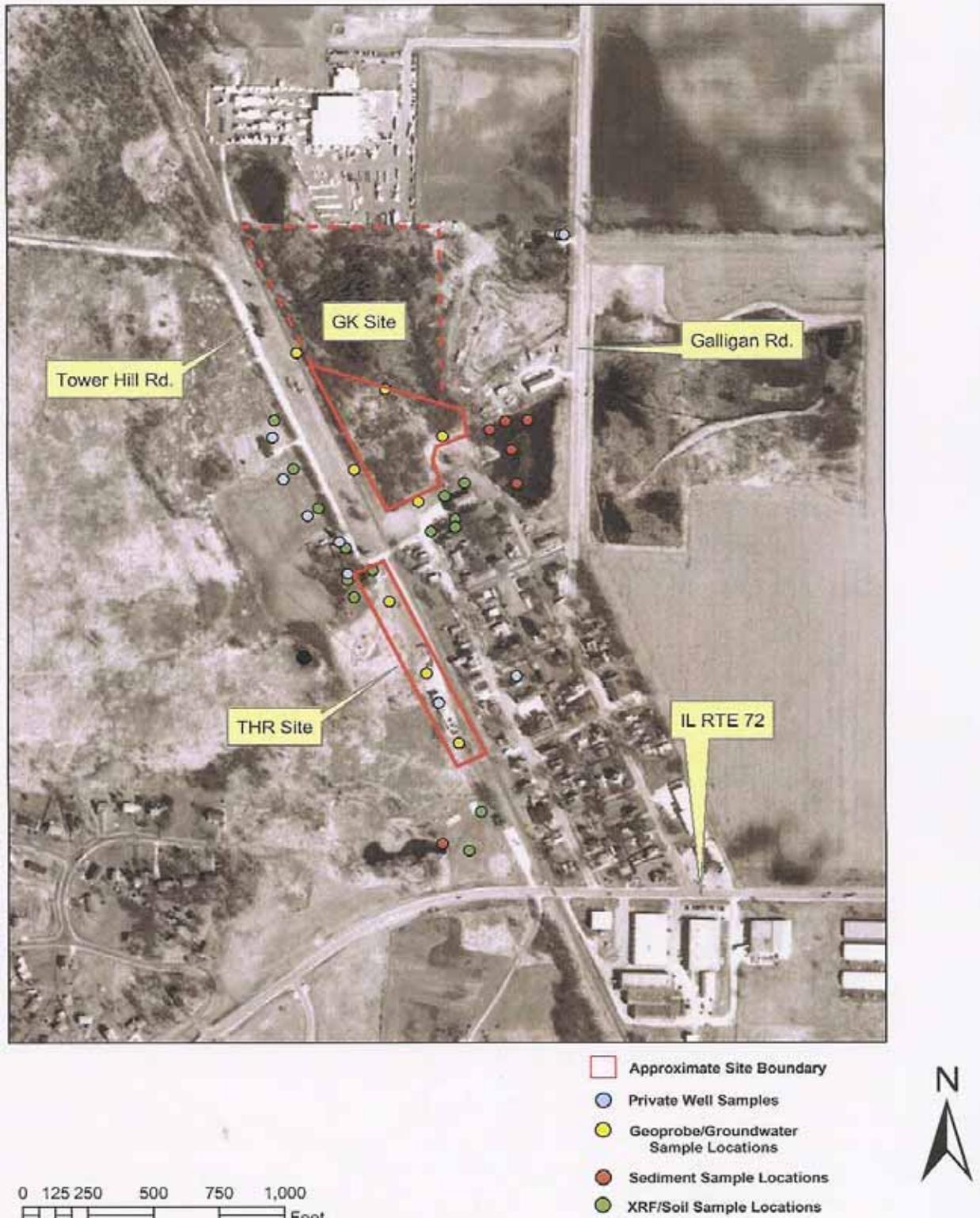
¹ Health Guideline for Thallium Carbonate.



IDPH, 11/04

Figure 3. Groundwater, soil, and sediment sampling locations (Salch 2005c).

Sample Location Map



GK Site = Hennessy/Kedzie Site.
THR Site = Tower Hill Road Site.

Comparison Values Used In Screening Contaminants For Further Evaluation

Environmental media evaluation guides (EMEGs) are developed for chemicals on the basis of their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive populations and are not action levels, but rather comparison values. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Reference dose media evaluation guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Cancer risk evaluation guides (CREGs) are estimated contaminant concentrations that are based on a probability of 1 excess cancer in 1 million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.

Maximum contaminant levels (MCLs) have been established by USEPA for public water supplies to reduce the chances of adverse health effects from contaminated drinking water. These standards are well below levels for which health effects have been observed and take into account the financial feasibility of achieving specific contaminant levels. These are enforceable limits that public water supplies must meet.

Lifetime health advisories for drinking water (LTHAs) have been established by USEPA for drinking water and are the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects over a lifetime of exposure. These are conservative values that incorporate a margin of safety.