

Health Consultation

Yeoman Creek Landfill

CERCLIS No. ILD980500102

Waukegan, Lake County, Illinois

Prepared by:

Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Purpose

A previous health consultation was completed for this site in February 2000. At that time, occupants and owners of buildings north of this site expressed concerns about the presence of flammable gases. The Illinois Department of Public Health (IDPH) agreed to review and evaluate additional flammable gas monitoring data gathered to address those concerns. In response to those concerns, additional data have been collected. Our review and evaluation of those data are contained in this document.

Background and Statement of Issues

The Yeoman Creek Landfill covers approximately 49 acres (Figure 1). The landfill is bordered by a marsh on the south, Butrick Avenue on the east, Elmwood and Lorraine Avenues on the west, and commercial and residential properties along Sunset Avenue on the north. Yeoman Creek flows along the western side of the landfill.

Several documents have been released for this site including:

- June 4, 1992: Interim Preliminary Health Assessment
- September 30, 1997: Final Public Health Assessment
- June 17, 1998: Health Consultation
- February 24, 2000: Health Consultation

Our 1998 health consultation concluded that Yeoman Creek Landfill was an urgent public health hazard because of the frequent presence of flammable concentrations of landfill gas in buildings north of the site. In response to this hazard, a landfill gas extraction system was installed and began operating on August 3, 1998.

Our 2000 health consultation concluded that the Yeoman Creek Landfill posed no apparent public health hazard because the landfill gas collection system prevented flammable levels of gases from accumulating in nearby buildings. IDPH made the following recommendations:

- Develop a safety plan to remove building occupants should a hazardous situation exist.
- Consider installing an alternate electrical power supply to allow continued operation of the landfill gas collection system during extended power outages.
- Continue monitoring flammable gas concentrations in the basements of buildings and boreholes north of the site.
- Find and implement a solution for flooding problems in parts of the landfill gas collection system.

On May 22, 2003, the U.S. Environmental Protection Agency (USEPA) agreed to temporarily halt all major remediation activities at the Yeoman Creek Landfill at the request of the Yeoman Creek Remediation Group and the U.S. Army Corps of Engineers. This was done to allow local, state, and federal agencies to evaluate the disposing of polychlorinated biphenyl-contaminated sediments from Waukegan Harbor in the Yeoman Creek Landfill (Karl 2004, USEPA 2003c). On October 8, 2003, the City of Waukegan instead proposed a new disposal cell on the Outboard Marine Company Plant 2 property for the dredged sediments (City of Waukegan 2003). On March 30, 2004, USEPA extended the deadline for a decision regarding Waukegan Harbor sediment disposal until April 15, 2004. Ultimately, the City of Waukegan determined that the sediments would not be placed at Yeoman Creek Landfill.

On January 30, 2004, USEPA gave permission to place the final cover on areas of the Yeoman Creek Landfill unaffected by the proposed Waukegan Harbor sediment disposal. That included the northern part of the landfill, near the buildings with past landfill gas infiltration problems. Installation of the final cover resumed in May 2004. The dredging of Waukegan Harbor may begin in 2004, and USEPA expects completion of the final cover of the Yeoman Creek Landfill by December 2004 (Karl 2004, Ohl 2004a, Ohl 2004b, Adler 2003).

The landfill gas collection system must be operated manually rather than automatically because of problems with insufficient methane, increasing oxygen concentrations, and water infiltration. To date, efforts to solve water infiltration problems have been unsuccessful (Ohl 2004a, USEPA 2004a).

Community Concerns

Before the installation of the landfill gas collection system, the occupants and owners of buildings north of the site expressed concern about the presence of flammable gases (Ohl 1998). That concern is the primary focus of this document.

Demographics

According to the 2000 Census, 21,639 people live within a 1-mile radius of the landfill. Of these, 11,582 are Caucasian, 4,146 are African-Americans, and 8,623 are Hispanic.

Discussion

Flammable Gas Migration into Buildings

The presence of potentially flammable levels of landfill gas in buildings is the primary hazard at this site. Organic matter in a landfill decomposes to produce, among other things, methane gas, which is flammable at levels between 5 and 15 percent in air. Peak gas production usually occurs five to seven years after waste disposal. Most methane generation by landfills usually occurs in the first 20 years after waste disposal but can last 50 years or more (ATSDR 2001). The Yeoman Creek Landfill was a former peat bog, and the subsurface decay of any remaining peat also could

produce methane gas. Methane is commonly used as “natural gas” for cooking, heating, and other purposes by homes and industry.

The movement of landfill gas is influenced by the landfill cover, natural and man-made pathways, wind speed and direction, moisture, groundwater levels, temperature, barometric (atmospheric) pressure, and soil gas pressure. If a landfill cover is permeable sand and gravel (allowing air and water through), landfill gas can easily escape to the atmosphere. However, if a landfill cover is impermeable clay, landfill gas can be trapped underground and migrate horizontally (ATSDR 2001). Consequently, the final cover of the Yeoman Creek Landfill may enhance the off-site migration of landfill gas. This may increase soil gas concentrations around buildings north and northeast of the site, and increase the probability that landfill gas may enter buildings near the site, especially if the landfill gas extraction system should fail. USEPA believes that the present landfill gas collection system will keep methane out of buildings near the site (Ohl 2004b); however, that assumes proper operation of the system.

Natural pathways (e.g., buried stream channels and fractures in rock) and man-made pathways (e.g., utility conduits) can be channels for landfill gas migration. Utility conduits may provide pathways for landfill gas migration to buildings. Although a landfill itself generally maintains a consistent temperature, freezing and thawing cycles can cause soil cracks, allowing landfill gas to migrate upward or horizontally (ATSDR 2001).

The New York State Department of Health studied landfill gas migration at 38 landfills. Landfill gas migrated underground up to 1,000 feet at one landfill, 500 feet at four landfills, and only 250 feet from the landfill boundary at 33 landfills. Another study reported landfill gas migration more than 1,500 feet from a landfill (ATSDR 2001). The buildings north of the Yeoman Creek Landfill are within 100 feet of the landfill. The buildings with past landfill gas infiltration problems all have basements.

Flammable Gas Monitoring

Flammable gas monitoring in basements of buildings near the site has continued since the landfill gas extraction began operating in August 1998. From February 2002 - December 17, 2003, monitoring results indicated that methane levels in buildings north of the site were consistently at 0% of the lower explosive limit (LEL). From November 26 - December 17, 2003, monitoring found 0% of the LEL in buildings east of Butrick Avenue (Ohl 2004a, USEPA 2004a, USEPA 2004b).

From February 2002 - December 17, 2003, flammable gas monitoring continued in soil borings near buildings north of the site and near buildings east of Butrick Avenue (Table 1 and Figure 2). Flammable gas concentrations in some soil borings continued to equal or exceed 10% of the LEL, with a maximum of more than 1,000% of the LEL. The concentrations equaled or exceeded 10% of the LEL 129 times (which represents 23% of the samples) and 100% of the LEL 56 times (which represents 10% of the samples). Gas concentrations were variable with no obvious patterns in time or location.

One building north of the site is a nursing home and another building has businesses on the first floor, including a restaurant, and apartments on the second floor. Several employees work at the restaurant and in these businesses. The highest level detected in the nursing home on March 1998 was 1 percent of the LEL in the sump area and a floor drain. In the other building, the level of flammable gases in the floor cracks, floor drains, and sumps, frequently equaled or exceeded the LEL on 9 of 12 sampling dates (75%).

Public Health Implications

The migration and infiltration of landfill gas into buildings may cause an explosion or fire if the methane reaches a flammable concentration. The U.S. Occupational Safety and Health Administration (OSHA) considers confined spaces with flammable gas concentrations greater than 10% of the LEL to be an explosion hazard (OSHA 2004). Before the landfill gas collection system was installed, one building north of the Yeoman Creek Landfill had flammable gas concentrations that frequently exceeded 10 percent of the LEL, and flammable concentrations frequently occurred in floor cracks and drains. Sump motors and other electrical equipment in these buildings may not be spark-proof, so a danger of fire or explosion existed.

From December 26, 2002 to December 17, 2003, monitoring did not find combustible gases exceeding 10% of the LEL in buildings north of the site. This suggests that the landfill gas collection system effectively prevented flammable methane concentrations. However, monitoring frequently found up to, or more than, 100% of the LEL in several boreholes near these buildings.

Because of a high water table, flooding has inhibited gas collection in parts of the landfill gas collection system. This includes the section near buildings north of the site, where elevated flammable gas concentrations often occur. The water also has inhibited the movement of flammable gases into buildings north of the site. Because of the water problems, USEPA does not consider the present landfill gas collection system to be a permanent solution (Ohl 1999). To date, attempts to solve the water infiltration problem have been unsuccessful (Ohl 2004a).

Between August 3, 1998 and March 29, 1999, electrical power outages twice shut down the active landfill gas collection system for 48 minutes and 4.5 hours, respectively (Conestoga-Rovers and Associates 1999; Conestoga-Rovers and Associates 1998). Once the landfill gas collection system stops operating, it is unknown how quickly flammable gases may accumulate in buildings near the site. This is of particular concern because longer power outages are possible. Because of settling, cracks could develop in buildings near the site in the future. These could enhance the infiltration of flammable gases resulting in flammable concentrations in the buildings. No backup electrical supply currently exists (Ohl 2004b). Also, no safety plan currently exists for the evacuation of building occupants should a flammable gas hazard develop (Ohl 2004b). In May 2004, USEPA requested that the potentially responsible parties (PRPs) develop an evacuation plan and establish a backup electrical supply.

Child Health Considerations

IDPH recognizes that children are especially sensitive to some contaminants. At this site, the primary hazard is the potential presence of flammable concentrations of landfill gas, which is a hazard to young and old alike.

Conclusions

The Yeoman Creek Landfill currently poses no apparent public health hazard because the landfill gas collection system has been preventing hazardous levels of flammable gases in nearby buildings. However, the landfill gas collection system lacks a backup electrical supply. If an extended power outage occurs, flammable concentrations of landfill gases may accumulate in buildings near the site.

Elevated flammable gas concentrations often occur in boreholes near these buildings. Water has sometimes flooded parts of the landfill gas collection system, inhibiting its operation. The water may also have inhibited the movement of flammable gases into buildings near the site. Because of the water problems, USEPA does not consider the present landfill gas collection system to be a permanent solution. There is no safety plan for evacuating the building occupants should a flammable gas hazard develop.

Recommendations

IDPH makes the following recommendations:

- Continue monitoring flammable gas concentrations in the basements of buildings and boreholes near the site. A contractor for the potentially responsible party conducts weekly monitoring as defined in the Record of Decision and will continue to do so until conditions no longer warrant monitoring.
- Find and implement a solution for flooding problems in parts of the landfill gas collection system. USEPA is working to develop a plan. USEPA has asked the potentially responsible party to address this situation. IDPH is not aware of a timeframe to complete this action.
- Develop a safety plan to remove building occupants should a hazardous situation exist.
- Consider installation of an alternate electrical power supply, so the landfill gas collection system will continue to operate during an extended power outage.

Public Health Action Plan

IDPH will continue to monitor the site and will evaluate the public health implications of any data resulting from future sampling activities.

Author

Thomas A. Baughman, Ph.D.
Environmental Toxicologist
Illinois Department of Public Health


References

- Adler, K. 2003. Email to T. Baughman, Illinois Department of Public Health. U.S. Environmental Protection Agency. March 13.
- City of Waukegan. 2003. Waukegan City Council Takes First Step Toward Comprehensive Lakefront Cleanup; Rejects Proposal to Dump at Yeoman Creek Landfill Superfund Site. October 8.
- Conestoga-Rovers and Associates. 1999. Monthly Progress Report/Landfill Gas Collection System - Yeoman Creek Landfill. January 27 to June 7.
- Conestoga-Rovers and Associates. 1998. Monthly Progress Report/Landfill Gas Collection System - Yeoman Creek Landfill. August 25 to December 28.
- Illinois Department of Public Health. 2000. Health Consultation for the Yeoman Creek Landfill. February 24.
- Illinois Department of Public Health. 1998. Health Consultation for the Yeoman Creek Landfill. June 17.
- Illinois Department of Public Health. 1997. Public Health Assessment for the Yeoman Creek and Edward Fields Landfills. September 30.
- Illinois Department of Public Health. 1992. Interim Preliminary Health Assessment for the Yeoman Creek Landfill. June 4.
- Karl, R. C. 2004. Letter to S. Doss. U.S. Environmental Protection Agency. January 30.
- Ohl, M. 2004a. Email to Thomas A. Baughman of January 14. U.S. Environmental Protection Agency.

- Ohl, M. 2004b. Email to Thomas A. Baughman of February 17. U.S. Environmental Protection Agency.
- Ohl, M. 1999. U.S. Environmental Protection Agency. Telephone log sheets. May 4, June 15, and June 24.
- Ohl, M. 1998. U.S. Environmental Protection Agency. Telephone log sheets. May 1 and 26.
- U.S. Agency for Toxic Substances and Disease Registry. 2001. Landfill Gas Primer: An Overview for Health Professionals. November.
<<http://www.atsdr.cdc.gov/HAC/landfill/html/intro.html>>
- U.S. Environmental Protection Agency. 2004a. November 2003 Monthly Progress Report, Remedial Action Phase, Yeoman Creek Landfill Superfund Site, Waukegan, Illinois. January 2.
- U.S. Environmental Protection Agency. 2004b. Yeoman Creek Landfill Superfund Site Gas Probe Monitoring Results (% LEL).
- U.S. Environmental Protection Agency. 2003a. Great Lakes: Waukegan Harbor Area of Concern. April 9. Accessed May 14, 2003.
<http://www.epa.gov/grtlakes/aoc/waukegan.html>
- U.S. Occupational Safety and Health Administration. Code of Federal Regulations 1910.146. Accessed March 2, 2004.
<http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9797>

CERTIFICATION

The Illinois Department of Public Health, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), prepared this Yeoman Creek Landfill health consultation. It was prepared in accordance with approved methodology and procedures existing at the time.



Allen Robison
Technical Project Officer
Superfund and Program Assessment Branch
Division of Health Assessment and Consultation

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



Bobbi Erlwein
Team Leader, Cooperative Agreement Team
Superfund and Program Assessment Branch
Division of Health Assessment and Consultation
ATSDR

Table 1. Range of flammable gas concentrations in soil borings north of the Yeoman Creek Landfill (%LEL, USEPA 2004b). Figure 2 gives the boring locations.

Date	Borings 201, 218R, 219, 306, 310, 311, 312	Borings 202, 223, 304	Borings 224, 300, 301, 302, 303	Borings 203, 307, 308, 309	Number (%) 10% LEL or Greater	Number (%) 100% LEL or Greater
12/26/02	0-192	0-158	0-12	0	4 (33%)	3 (25%)
1/3/03	0-150	0-136	0-4	0	3 (18%)	2 (13%)
1/7/03	0-122	0-102	0-4	0	3 (20%)	2 (13%)
1/17/03	0-60	0	0	0	2 (13%)	1 (7%)
1/23/03	0-8	0	0-88	0	1 (6%)	0 (0%)
1/28/03	0-18	0	0	0	1 (7%)	0 (0%)
2/5/03	0-52	0	0	0	1 (7%)	0 (0%)
2/12/03	0-100	0	0	0	2 (13%)	1 (7%)
2/20/03	0-70	0	0-66	0	4 (24%)	0 (0%)
2/28/03	0-82	0-28	0	0	3 (20%)	0 (0%)
3/6/03	0	0-58	0	--	1 (20%)	0 (0%)
3/12/03	0-82	0-88	0	0	3 (20%)	0 (0%)
3/20/03	0-134	0-124	0-180	0-4	5 (28%)	3 (17%)
3/27/03	0-96	0-178	0	0-4	3 (19%)	2 (13%)
4/3/03	0-52	0-236	0	0	3 (25%)	1 (8%)
4/10/03	28-86	300	6	16	4 (80%)	1 (20%)
4/17/03	0-30	0-344	0	0	3 (20%)	1 (7%)
4/24/03	0-30	0-186	0-224	0	4 (24%)	2 (12%)
5/2/03	0-80	0-380	0	0	2 (13%)	1 (6%)
5/8/03	0-58	0-37	0	0-14	3 (19%)	0 (0%)
5/16/03	0-42	0-282	0	0	2 (13%)	1 (6%)
5/23/03	0-8	0-200	0-168	0-84	3 (19%)	2 (13%)
5/29/03	0-58	0	0	0-6	2 (13%)	0 (0%)
6/5/03	0-96	0-14	0-4	0-40	4 (25%)	0 (0%)
6/12/03	0-94	0-150	0-6	0-38	4 (25%)	1 (6%)
6/19/03	0-48	0-124	0-128	0-290	6 (33%)	3 (17%)
6/26-27/03	0-100	0-112	0-6	0-8	3 (19%)	2 (13%)
7/2/03	0-160	0-116	0	0	4 (25%)	4 (25%)
7/8-9/03	0-224	0-96	0-148	0-664	6 (33%)	4 (22%)
7/17-18/03	0-252	0-92	0-94	0-186	6 (33%)	2 (11%)
7/25/03	0-180	0-94	0-134	0-240	5 (28%)	4 (22%)
7/31/03	0-176	0-98	0-138	0-326	6 (33%)	4 (22%)
8/6/03	--	--	0-68	0-42	6 (33%)	0 (0%)
8/7/03	0-266	0-144	0-156	0-88	5 (28%)	4 (22%)
8/13/03	--	--	4-118	0	1 (13%)	1 (13%)
8/14/03	0-284	0-222	0-98	0	4 (22%)	3 (17%)
8/19/03	--	--	2-76	0	1 (13%)	0 (0%)
8/21/03	0-248	0-420	0-18	0	4 (22%)	3 (17%)
8/28/03	0-374	0-740	0-6	0	3 (17%)	3 (17%)
9/3/03	--	--	0-8	0	0 (0%)	0 (0%)
9/5/03	0-434	0-904	0-8	0	3 (17%)	3 (17%)
11/26/03	0-832	0->1000	0	0-170	4 (21%)	4 (21%)
12/10/03	0-808	0-780	0-780	0->1000	6 (32%)	5 (26%)

LEL = Lower Explosive Limit

Figure 1. Locations of the Yeoman Creek and Edwards Field Landfills (Golder Associates 1994).

