
1,4-Dioxane and the Lowry Landfill Superfund Site

Lowry Landfill Superfund Site
Arapahoe County, Colorado

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Colorado Department
of Public Health
and Environment

Introduction

Groundwater monitoring is a key component of the overall remedy at the Lowry Landfill Superfund Site (Lowry Site, or the Site). Recent sampling results indicate that 1,4-dioxane is present in monitoring wells and surface water north of the Site at levels above the current Colorado water quality standard. 1,4-dioxane is a chemical associated with the Lowry Site. This fact sheet will provide you with information about 1,4-dioxane issues at the Lowry Site.

Site Background and History

The Lowry Site is located in Arapahoe County, Colorado, northeast of the intersection of East Quincy Avenue and Gun Club Road. The Site is approximately 15 miles southeast of downtown Denver and 2 miles east of Aurora (see Figure 1). From the mid-1960s until 1980, the City and County of Denver (Denver)

operated an industrial waste and municipal solid waste landfill at the Lowry Site. During that period, over 138 million gallons of liquid wastes were disposed of at the Lowry Site using a technique known as co-disposal, a common practice at the time. Disposers at the Site dumped wastes such as sewage sludge, metal plating wastes, paints, pesticides, and industrial solvents into about 78 unlined pits that were later covered with refuse, tires, and soil to absorb the liquids. Over time, some of the contaminated liquids seeped out of the pits and contaminated surrounding soils, groundwater, and surface water. The United States Environmental Protection Agency (EPA) placed the Lowry Site on the National Priorities List in 1984.

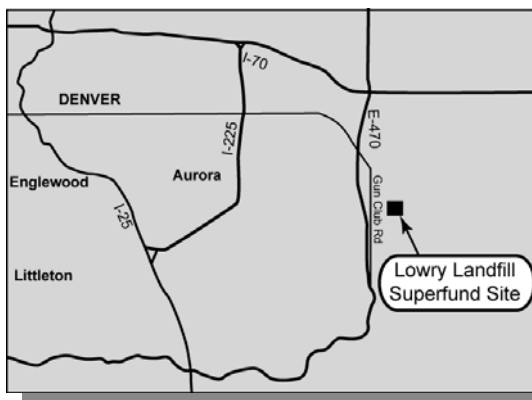


FIGURE 1. Site Location

EPA and others investigated the Site from 1975-1993 to determine the nature and extent of contamination, analyze the risks to human health and the environment, and evaluate remedial alternatives. In March 1994, EPA and the Colorado Department of Public Health and Environment (CDPHE) signed the Record of Decision, or ROD, that formally selected a comprehensive plan for the Lowry Site to protect human health and the environment. The plan for the Lowry Site uses containment, collection, and treatment to address contamination. The plan requires a



combination of engineered components to prevent movement off site of contamination above safe levels. Most of the components of the remedy are currently in place. At the time the ROD was issued, EPA identified about 50 chemicals of concern at the Lowry Site. 1,4-dioxane was not a chemical of concern at that time because the chemical was not a known contaminant and laboratory tests were not commonly performed for 1,4-dioxane.

Groundwater Monitoring

Groundwater monitoring at the Lowry Site is critical to ensuring that the containment portion of the remedy is effectively keeping contaminants from moving off site in groundwater. Monitoring performed in January 2006 detected the chemical 1,4-dioxane in samples from a shallow monitoring well approximately 1 mile north of the Lowry Site. In March 2006, seven surface water samples were collected from Murphy Creek in the area north of Yale Avenue. Two of the surface water samples contained 1,4-dioxane above the surface water standard. These findings triggered a larger sampling program in the area north of the Lowry Site to determine the geographic extent of the problem in groundwater and surface water. Results to date are illustrated on Figure 2.

EPA's goals are to ensure that no one is exposed to unsafe levels of 1,4-dioxane from groundwater or surface water, and to bring the groundwater monitoring wells back into compliance with standards. The first priority of the ongoing investigation is to determine the extent of the groundwater contamination. Investigations to determine the source or sources of the problem will be the second priority. Plans for addressing the problem will be developed and implemented as quickly as possible.

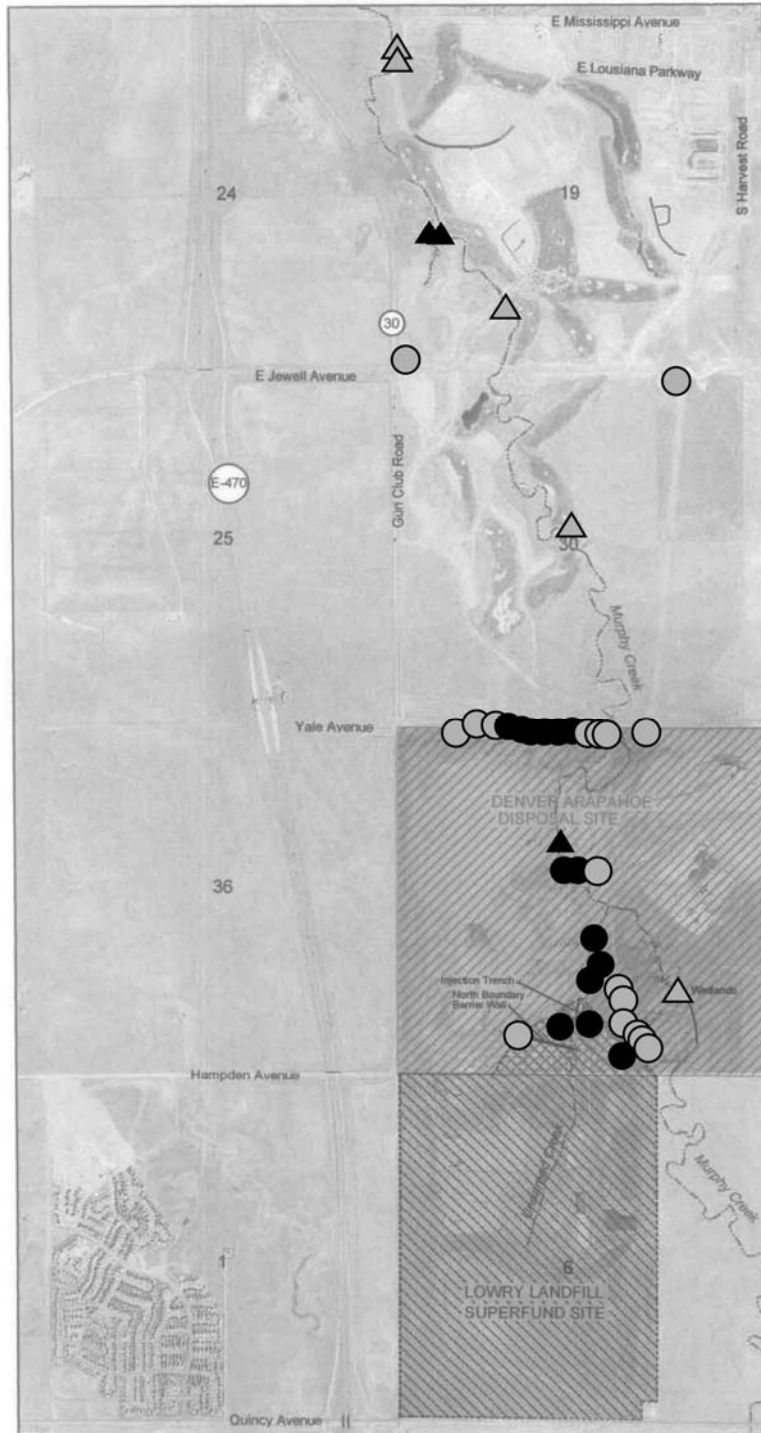
What is 1,4-Dioxane?

1,4-dioxane is a colorless liquid that dissolves easily in water. 1,4-dioxane does not bind well to soil and can evaporate from dry soil exposed to air, but does not evaporate readily from water or moist soil. In water, it is stable and does not degrade. It moves along with the groundwater.

The chemical is used primarily as a solvent in the manufacture of chemicals and as a laboratory reagent. Generally, most manufacturers now reduce 1,4-dioxane from these chemicals to low levels before they are made into products for household use.

Breathing air, drinking water, or eating foods that contain 1,4-dioxane are ways that people may be exposed to 1,4-dioxane. In addition, skin may come into contact 1,4-dioxane if cosmetics, detergents, and shampoos are used that contain the chemical.





LEGEND

- ▲ Surface Water Samples with 1,4-Dioxane > 6.1 µg/L Standard
- △ Surface Water Samples with 1,4-Dioxane < 6.1 µg/L Standard
- Shallow Groundwater with 1,4-Dioxane > 6.1 µg/L Standard
- Shallow Groundwater with 1,4-Dioxane < 6.1 µg/L Standard

Figure 2
North End Investigation Surface Water and
Groundwater 1,4-Dioxane Sampling Results
 Lowry Landfill Superfund Site



1,4-dioxane may also be found in cosmetics, detergents, and shampoos that contain the ingredients "PEG," "polyethylene," "polyethylene glycol," "polyoxyethylene," "polyethoxyethylene," or "polyoxynoethylene."

Health Effects of 1,4-Dioxane

EPA classifies 1,4-dioxane as a probable human carcinogen based on evidence that the chemical can cause certain types of cancer in animals. EPA estimates that if an individual, over his or her entire lifetime, were to drink 2 liters of water daily that contains 1,4-dioxane at levels of 3 micrograms per liter ($\mu\text{g}/\text{L}$), that person would theoretically have a one-in-a-million increased chance of developing cancer. Lifetime exposure to concentrations of 1,4-dioxane in water at levels between 3 $\mu\text{g}/\text{L}$ and 300 $\mu\text{g}/\text{L}$ would present a cancer risk that is within EPA's acceptable range. In addition, available data suggest that plants and animals are not likely to store 1,4-dioxane, and it has low toxicity to aquatic life.

EPA has not established a federal drinking water standard for 1,4-dioxane. Most of the residents in the vicinity of the Lowry Site drink water provided by the City of Aurora, and its water achieves acceptable drinking water standards. Very few wells in the area where 1,4-dioxane has been found in groundwater and surface water are used for drinking water, and these wells have been tested. Test results show that these wells do not contain detectable levels of 1,4-dioxane.

The Lowry Site Performance Standards Changed in December 2005

In September 2005, the State of Colorado set a new 1,4-dioxane standard for groundwater and surface water of 6.1 $\mu\text{g}/\text{L}$. Up until December 2005, EPA required that groundwater at the Lowry Site meet a standard of 200 $\mu\text{g}/\text{L}$ because that was the lowest level laboratories were able to detect and a level that EPA considers protective of human health and the environment. In response to the State's action, newly developed laboratory methods were selected in December 2005 for use at the Lowry Site to detect low levels of the chemical. 1,4-dioxane may have been present north of the Lowry Site for some time, but would not have shown up in the data because the laboratory would only have reported levels detected above the older 200- $\mu\text{g}/\text{L}$ detection limit.

Possible Sources of 1,4-Dioxane North of the Lowry Site Boundary

There are several possible sources of the 1,4-dioxane in water north of the Lowry Site. First, groundwater containing the chemical may have been transported beyond the engineered remedy components in the past, either before or after they were constructed. Second, past injection of water from the onsite water



treatment plant (WTP) may have resulted in 1,4-dioxane contamination of groundwater. Prior to 2000, water from the onsite WTP that was not treated to remove 1,4-dioxane was injected into a trench north of the Lowry Site. At that time, the old WTP would have removed volatile organic compounds but would not have removed 1,4-dioxane. Injection of treated water from the WTP stopped in 2000, and the WTP has been upgraded to treat groundwater for 1,4-dioxane. Another possible source is movement of contaminated groundwater from the Lowry Site within a groundwater migration pathway that is not cut off by the existing engineered components. All possibilities will be evaluated.

Other information routinely collected at the Site indicates that the underground barrier wall and groundwater collection system constructed at the north end of the Site are effective in containing shallow groundwater contamination within the Lowry Site; therefore, EPA does not expect ongoing migration of 1,4-dioxane to occur.

There is no information indicating that anyone is currently being exposed to unsafe levels of 1,4-dioxane in the groundwater or surface water north of the Lowry Site.

Next Steps

EPA's top priority is to ensure that no one is exposed to unsafe levels of 1,4-dioxane. The ongoing investigation is expected to be completed in the summer of 2006. After the extent of the problem in groundwater and surface water is determined, strategies will be developed and evaluated to address 1,4-dioxane above performance standards in this area. EPA will take steps to prevent potential exposure to 1,4-dioxane at levels that could present unacceptable health risks, prevent further migration of contaminants, and restore water quality to performance standards.



Where to Find More Information on the Lowry Site

INFORMATION CENTERS

EPA Superfund Records Center
(Complete Site Files and Administrative Record)
999 18th Street
Denver, CO 80202
(303) 312-6473



Aurora Public Library
(Selected Documents)
14949 East Alameda Drive
Aurora, CO 80012
(303) 739-6600

Additional information about the Lowry Site can also be obtained on the Internet at:
<http://www.epa.gov/region8/superfund/sites/co/lowry.html>

Key Contacts

If you have questions about 1,4-dioxane or the Lowry Site, please contact any of the following individuals:

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