

INTRODUCTION

March 31, 2023

Since the last report six months ago, the City and County of Denver, Waste Management of Colorado, Inc., and Chemical Waste Management Inc., collectively referred to as the Work Settling Defendants (WSDs) conducted routine operations and maintenance (O&M) activities at and north of the Superfund Site. Details of the O&M activities are presented in this Status Report.

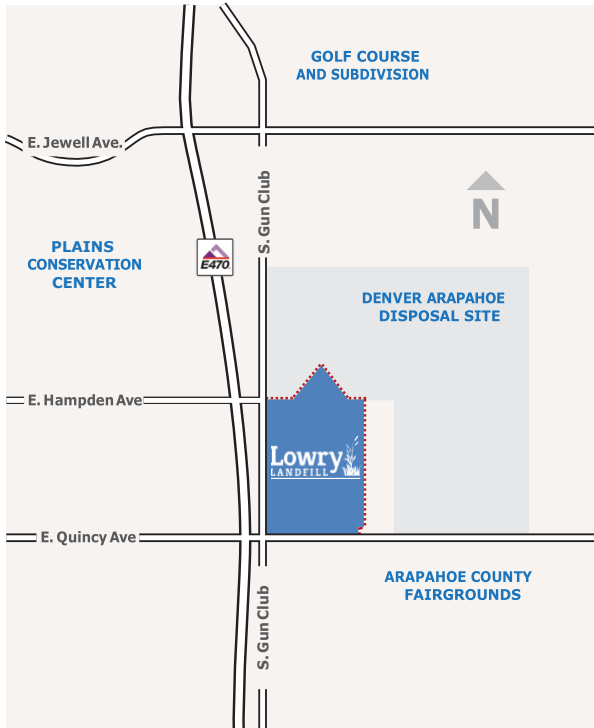
In summary, they consisted of extracting and treating approximately 8.7 million gallons of groundwater from several onsite and offsite extraction systems in full compliance with their Industrial Discharge Permit from the Metro Wastewater Reclamation District; collection and analyses of 209 samples from 90 groundwater monitoring wells; continuous operations of the Landfill Gas Extraction and Treatment system in full compliance with decision documents; collection and analyses of soil gas samples from 64 subsurface gas monitoring probes surrounding the Lowry Landfill; collection and analysis of one stormwater sample; maintenance of stormwater conveyance ditches; and inspection and maintenance of landfill covers and buffer properties contiguous to the Superfund Site.

Completed in early 2022, the Fifth FYR of the Site included the findings of several site inspections; interviews with the work settling defendants, local and state government officials and community members; and an assessment of all environmental data. The 2022 Fifth FYR found that the remedial components and institutional controls in place at the site are protective of human health and the environment.

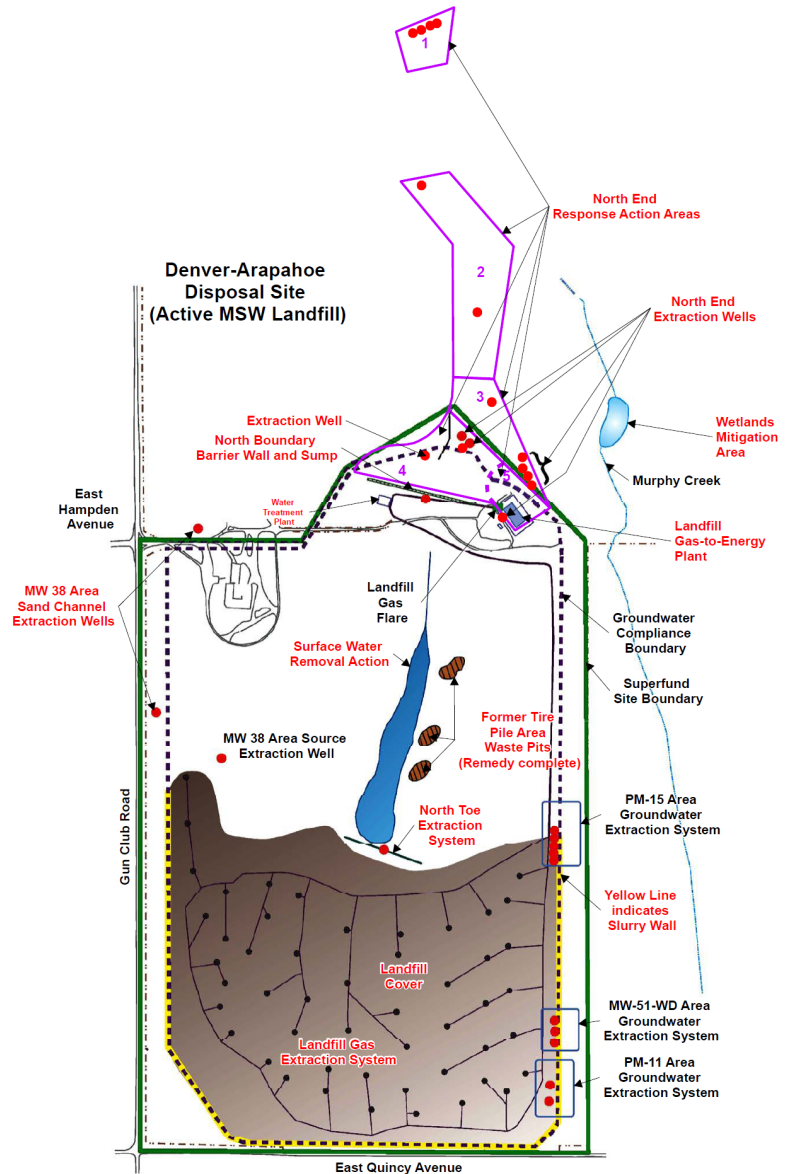
The area around the site consists of ongoing landfilling operations as well as residential and commercial areas. While monitoring and other operations and maintenance activities are ongoing, institutional controls, including deed restrictions, water rights, zoning, and ordinances ensure nearby residential areas are not impacted by the site contamination.

As part of the WSDs ongoing commitment to transparency and community engagement, outreach opportunities were provided. During this reporting period, the WSDs provided community outreach by participating in one meeting with the Lowry Landfill Community Advisory Group (CAG) to discuss the latest Semiannual Status Report. The Lowry CAG has since been defunded; however, the WSDs continue to provide updates on activities at the Site on a publicly available website.

LOCATION & CONTAINMENT REMEDY MAPS



Lowry Landfill Superfund Site Containment Remedy Components



GROUNDWATER MONITORING

More than 500 monitoring wells extending into both shallow and deep aquifers have been installed within and outside the site to ensure the community is protected. Well inspections are a routine part of the monitoring program. Data shows that the monitoring system continues to be effective.

Groundwater remedy component effectiveness evaluations conducted in 2021 as part of the fourth five-year review determined that the remedial components are effective and achieve objectives. Specifically, the slurry wall – a vertical barrier wall made of clay that prevents groundwater flow – continues to effectively contain contamination inside the eastern, southern and western limits of the landfill as designed. The North Toe Extraction System, which collects and pumps water to the treatment plant at less than 1 gallon per minute, continues to capture the most contaminated groundwater emanating from the landfill. The 960-foot long North Boundary Barrier Wall (NBBW) located at the north end of the site is the most significant groundwater extraction feature, removing 6 to 10 gallons per minute, which effectively prevents contamination from migrating offsite. Finally, groundwater extraction in the northwest corner of the site, known as the MW38 area, captures contaminated groundwater flowing through this area and prevents offsite migration.

Vertical migration monitoring shows vertical migration wells are in compliance with groundwater performance standards and that contaminated groundwater has not migrated to the deeper aquifers.

There are 60 compliance wells in the network, which are monitored for 29 different chemicals. There are 53 wells in compliance or potentially in compliance, and 7 wells are out of compliance, potentially out of compliance, or indeterminate for chemicals such as 1,4-dioxane, PCE, nitrate, nitrite, TCE, and chloroform. The 6 wells that are out of, or potentially out of, compliance are being addressed by continuing to pump contaminated water to the treatment plant and monitoring, as discussed above. This method has proven to be effective at stopping groundwater flow in these areas and reducing chemical concentrations.

FACTORS AFFECTING CONTAMINANTS IN GROUNDWATER

1,4-dioxane and the North End

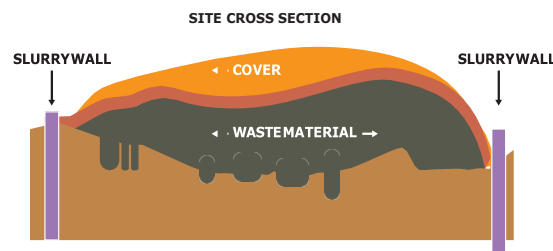
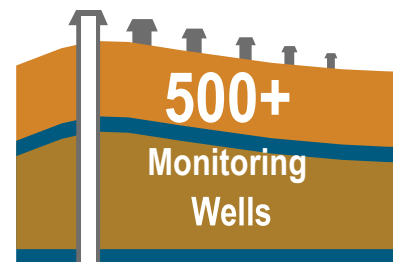
In 2005, the Colorado Water Quality Control Commission established a new groundwater standard for 1,4-dioxane. At that time, new technological advancements capable of detecting and measuring 1,4-dioxane at the new standards found 1,4-dioxane north of the site. That standard has been revised over the past 13 years, and the current standard is now 0.35 parts per billion (ppb). Current best available analytical technology is not able to reliably detect 1,4-dioxane at this concentration in site groundwater so a site-specific standard for Lowry Landfill is set at 0.9 ppb.

Water Treatment






1.5 million
gallons per month

In compliance with
discharge standards



1,4-dioxane

-  Synthetic industrial chemical sometimes added to solvents to prolong their useful life
-  Used in some consumer products such as cosmetics, deodorants, soaps, toothpaste, anti-freeze and paint
-  Site groundwater standard = .9 ppb

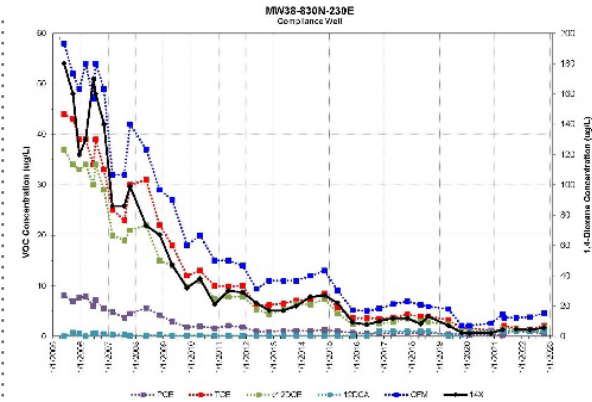
Numerous response action have been implemented that have effectively reduced the extent of 1,4-dioxane in the North End Area, and there is a comprehensive monitoring program in place. Of the 37 current North End monitoring wells where trend analysis was performed, 91% are decreasing and 9% have no trend. The observed concentration declines in all areas shows the effectiveness of the ongoing response actions and demonstrates that groundwater quality in this area is improving. Data shows that the groundwater extraction response at the site continues to significantly decrease the 1,4-dioxane concentrations, as well as the width and length of the contamination to the north. An animation of the North End plume over time is available at www.lowrylandfillinfo.com. As stated in the 2022 Five Year Review, “Based on the results of the North End investigation, groundwater contamination from the Site is not affecting these residential areas.” Furthermore, the report states, “There are no complete exposure pathways from 1,4-dioxane in shallow groundwater. Monitoring results indicate concentrations are decreasing or stable in most off-site wells. Monitoring and extraction will continue to reduce 1,4-dioxane concentrations and prevent further migration of the plume to the north.”

MW38 Sand Channel


Remedial actions to contain groundwater and reduce contaminant concentrations in the sand channel have also been successful. Water is pumped out of the sand channel to maintain inward groundwater flow ensuring the surrounding groundwater is always flowing inward, and to prevent offsite migration of contaminants. The extracted water is sent to the treatment plant for treatment and disposal. Levels of 1,4-dioxane have been reduced by 97% since May 2005 in this area. Chloroform and trichloroethene concentrations have also been reduced by 92% and 95%, respectively. See graph at right.

Nitrate in the NBBW Area

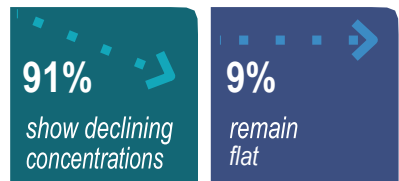
One well is exceeding the nitrite and nitrate standards in an area where sewage sludge was historically land farmed to cultivate and enhance microbial degradation of the sludge. This well is located along the northern boundary of the Site. There does not appear to be a potential for significant off-Site migration of nitrate or nitrite at concentrations greater than the performance standard and monitoring is ongoing. Additionally, groundwater extraction from the North End wells further downgradient would capture any potential migration of these compounds if it were to occur.



At Lowry

 Extraction and treatment continue to decrease concentrations.

 North End Area: 37 Wells



 MW38 Channel:



WATER TREATMENT PLANT

The water treatment plant uses a natural biological process and advanced oxidation treatment to destroy more than 92% of the organic compounds coming into the plant. An ion-exchange system is used to reduce molybdenum by an average of 97%. The pretreated water is then discharged to a publicly owned wastewater treatment plant for further treatment. The on-site treatment plant removes all site chemicals to safe standards and leaves a minimal environmental footprint. It treats approximately 1.5 million gallons of contaminated groundwater every month. The data show the plant continues to operate as designed in compliance with discharge standards.

LANDFILL GAS REMEDY

Landfill gas—made up of methane, carbon dioxide, nitrogen and other gases—is created naturally by the biological decomposition of organic matter in landfills under low-oxygen conditions. The Site's landfill gas extraction, collection and treatment system continues to be effective and in compliance, including the gas-to-energy treatment plant, which removes roughly 5,000 tons of methane annually. This equates to removing more than 22,000 cars from the road each year. The on-site power plant, constructed in 2008, uses landfill gas to fuel four internal combustion engines that generate electricity for a local utility company. The electrical power generated is enough to supply 2,500 to 3,000 households.

LANDFILL COVER

The former landfill is covered by 4 to 12 feet of compacted clay and soil. The "cap" reduces infiltration of rain and snow into the soil, which minimizes further groundwater contamination. The cover continues to effectively drain rain and snow, keeping it from penetrating the soil. The cap is routinely monitored for any depressions that may form due to settlement that would cause rainwater to pond, among other issues. No cap settlement issues were identified in this report.

Gas to Energy Process

