DEPARTMENT OF HEALTH

Water Gremlin

HEALTH ASSESSMENT SERIES I SOIL VAPOR AND HEALTH

At a Glance

- A vapor mitigation system was installed at the Water Gremlin facility after sampling showed high levels of TCE and t-DCE vapor beneath the building.
- Vapors captured by a mitigation system from beneath the Water Gremlin facility are exhausted to carbon filters to remove the contaminants before discharge to the air.
- Nearby homes are not affected by the soil vapor contamination based on data collected to date. Confirmation sampling will happen during the winter.
- Drinking water is not affected by the soil vapor contamination.

What is Vapor Intrusion?

Chemicals that have been spilled or dumped on the ground can pollute soil and groundwater. Volatile organic compounds (VOCs) are chemicals that easily evaporate into air. When VOCs evaporate from polluted soil and from groundwater, they rise toward the ground surface. If these vapors move and come in contact with a building, they may enter through cracks in the foundation, around pipes, or through a sump or drain system. The VOCs can then contaminate indoor air. This process - when pollution moves from air spaces in soil to indoor air - is called vapor intrusion.

The VOCs found most often during vapor intrusion investigations in Minnesota are the industrial degreaser trichloroethylene (TCE), the dry cleaning solvent tetrachloroethylene (perchloroethylene, PCE), and components of petroleum.

Intrusion Screening Values

MDH and MPCA develop Intrusion Screening Values (ISVs) to compare to indoor air or sub-slab soil vapor concentrations to help determine when actions may be needed to protect health.

An ISV is an amount of a chemical that is safe for people to breathe. A sub-slab ISV is an amount of a chemical beneath a building that is not expected to result in indoor air levels that exceed the ISV. These values are designed to be protective for sensitive people, including children, pregnant women, and people who already have health issues. There are two sets of ISVs, residential and commercial/industrial, based on the amount of time people may spend at home or work.

The table below lists the ISVs and sub-slab ISVs for TCE and trans-1,2-dichloroethylene (t-DCE). MDH developed the t-DCE ISVs in August 2019 in response to the Water Gremlin investigation.

Chemical	Residential ISV ($\mu g/m^3$)	Commercial/Industrial ISV ($\mu g/m^3$)	Residential sub-slab ISV ($\mu g/m^3$)	Commercial/Industrial sub-slab ISV ($\mu g/m^3$)
Trichloroethylene (TCE)	2.1	7	70	230
trans-1,2-dichloroethylene	73	250	2,400	8,300

Initial Water Gremlin Facility Soil Vapor Data

It is common for facilities that have used VOCs for decades to find contaminants in soil vapor beneath their buildings. Soil vapor was sampled underneath the Water Gremlin facility (called sub-slab sampling) in June 2019, and was reported to MPCA on July 30, 2019. This sampling was conducted as part of the remedial investigation, which was required as part of the settlement agreement for air quality violations signed in March 2019.

VOC concentrations beneath the Water Gremlin building greatly exceeded the sub-slab ISVs for TCE (up to 120,000 $\mu g/m^3$) and t-DCE (up to 530,000 $\mu g/m^3$). As a result, MPCA required the company to install a vapor mitigation system to protect their workers from the vapor intrusion risk.

Although TCE was expected to be found in sub-slab vapor, finding high levels of t-1,2-DCE in the samples was surprising. The consultant hired by Water Gremlin speculated that the t-DCE in soil vapor resulted from t-DCE in indoor air moving through the concrete floor. A more likely explanation is that the t-DCE vapor is from a spill or liquid overspray from the coating machines. Water Gremlin's coating machines were shut down by the MPCA on August 22, 2019, because the company lacked the ability to prevent further t-DCE releases to the subsurface.

Mitigation System Installation

A vapor mitigation system began operating at the end of August to address vapor intrusion at the Water Gremlin facility. Mitigation systems generally work by using a fan to continuously pull air and contaminant vapors from the soil and exhaust it outdoors. Typically, treatment of the exhaust air is not required. In this case, Water Gremlin is using two carbon filters to remove the soil vapor contaminants from exhaust air. Sampling of the mitigation system exhaust stream has shown that all of the t-DCE and nearly all the TCE (with exception of three early samples that ranged between 1.4 - 2.9 $\mu g/m^3$) have been captured by the carbon filters. The exhaust stream air is currently sampled every day and MPCA receives the results directly from the analytical lab. Continued consistent results will make daily testing of this filtered air unnecessary and less frequent sampling will be sufficient at some future point.

Concentrations of soil vapors in the sub-slab typically decline quickly once a mitigation system starts operating and then tend to level off. Vapors may remain in the sub-slab soil as long as a source remains, as is often the case when VOCs are present in the groundwater. Concentrations of TCE and t-DCE in the air exhausted to the carbon filters at Water Gremlin have declined significantly (to less than 300 $\mu g/m^3$) since operation of the mitigation system began and they appear to be leveling off.

Additional confirmation sampling to assure the mitigation system continues to operate as intended will be conducted in the heating season (November 1-March 31). This will include collecting pressure differential readings, and sub-slab, indoor air, and ambient air sampling.

Water Gremlin Facility Indoor Air

Water Gremlin notified their employees of the possibility of TCE exposure from vapor intrusion in August 2019 at the request of MPCA and MDH. Even with proper performance of the mitigation system, it is likely that residual TCE contamination from decades of use will continue to be detected in indoor air at the Water Gremlin facility for some time.

The ISVs are much lower than the occupational regulatory limits, and do not apply in workplaces where the same chemicals are used. The Minnesota Occupational Safety and Health Administration (OSHA) regulates the amount of certain chemicals that workers can be exposed to in indoor air. The MN OSHA indoor air standards for an eight-hour workday for TCE and t-DCE are 270,000 µg/m^3 and 790,000 µg/m^3, respectively.

Soil Vapor is Not a Risk to the Neighborhood

Fifteen additional soil vapor samples were collected on the Water Gremlin property surrounding the building to the north, west, northwest, and northeast on August 23 and 28, 2019, to determine if soil vapor was extending out towards or into the neighborhood. A map of sample locations can be found on the MPCA website: https://www.pca.state.mn.us/air/water-gremlin-remedial-investigation. Nine of the sampling locations did not detect TCE or t-DCE. The other six samples contained levels well below the residential sub-slab ISVs (up to 11 µg/m^3 TCE and up to 12 µg/m^3 t-DCE). These low concentrations in soil vapor and the additional distance to homes indicate that nearby homes are not affected by soil vapor from Water Gremlin. Additional soil vapor samples surrounding the property will be taken this winter to confirm that vapors are not a concern in winter conditions.

Groundwater contamination acts as a source for vapors that the mitigation system captures. Groundwater contamination from Water Gremlin is limited to a shallow aquifer that generally flows to the south and does not affect drinking water. MDH sampled private wells in the area earlier this year and did not detect any VOC contaminants.

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