

Health Consultation

North Highlands Groundwater Highlands, Harris County, Texas

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Prepared by:

Texas Department of State Health Services
Under a Cooperative Agreement With the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry



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Summary

Introduction

Community members in Highlands, Texas, contacted the Environmental Protection Agency (EPA) in regards to concerns that water from their private wells was contaminated with heavy metals and bacteria and had consistently high pH levels. In response to these concerns, EPA sampled water from six private wells in the Highlands area. During the EPA water sampling event, Texas Department of State Health Services (DSHS) staff gathered information about diagnosed health problems and well usage and was available to address health-related concerns.

Conclusion

Based upon data collected from the six private wells there was no indication that using water from private wells would cause adverse health effects.

Basis for Conclusion

The only contaminant exceeding health based comparison values (CVs) was bis(2-ethylhexyl)phthalate. Using standard exposure assumptions, there was no increased risk for cancer and adverse health effects are not expected to occur.

Next Steps

- Well owners concerned about coliform bacteria and pH should have their well tested. Well owners can contact the Harris County Environmental Public Health Division at (713) 274-6300 to obtain information about submitting water samples for coliform testing. Testing strips for pH are commercially available. More information about maintaining private wells can be found at <http://water.epa.gov/drink/info/well/index.cfm> and <http://wellowner.org/>.
- Residents with health issues should consult with their personal physician.

For More Information

If you have concerns about your health, you should contact your health care provider. You may also call Texas Department of State Health Services at (800) 588-1248 and ask to speak with someone in the health assessment program.

Purpose and Health Issues

The Texas Department of State Health Services (DSHS) evaluated water sample data collected by the U.S. Environmental Protection Agency (EPA) from private wells in the Highlands, Texas, area to determine whether drinking the water could harm people's health.

A list of acronyms and abbreviations used in this report is included in the Appendix.

Background

Highlands is a community in Harris County, Texas, located north of Interstate 10, approximately 20 miles east of Houston. It is on the east bank of the San Jacinto River north of its confluence with the Houston Ship Channel. According to 2010 census data, there are 7,522 people living in the "census-designated place" [1].

Community members in Highlands contacted EPA with concerns that water coming from their private wells was contaminated with heavy metals and bacteria and had a consistently high pH level. They are concerned that health problems in their neighborhood are related to possible groundwater contamination.

In response to these concerns, on February 20-21, 2013, EPA sampled water from six private wells in the Highlands area and analyzed them for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and metals [2]. Bacteria and pH are not typically tested by the EPA.

During the water sampling event DSHS was present to help address residents' health-related concerns. DSHS also conducted a survey to obtain information about diagnosed health problems and/or concerns and well usage (i.e.; drinking water and other household uses, lawn maintenance, and/or animal water source). Blank copies of the survey were distributed to residents to record their health concerns. A total of 25 completed surveys were received by DSHS. The community health concerns that were obtained through the survey and DSHS responses are included below.

Discussion

Data Used

In this health consultation, data collected in February 2013 from six private wells sampled in the Highlands area were evaluated. Samples were tested for VOCs, SVOCs, pesticides, and metals.

In preparing this report, DSHS relied on the data provided to us as having been collected according to approved Quality Assurance Project Plans. Thus, DSHS assumed adequate quality assurance/quality control (QA/QC) procedures were followed with regard to data collection, chain of custody, laboratory procedures, and data reporting.

Evaluation Process

Environmental data are first evaluated by comparing the maximum result for each chemical to health protective comparison values (CVs), which are media-specific levels at which no adverse health effects are expected to occur. Exceeding this screening value does not indicate that a contaminant will cause adverse health effects; it only indicates that the contaminant needs further evaluation.

Estimated exposure doses are calculated for chemicals that exceed their respective CVs using a “worst-case scenario” to calculate the maximum amount of chemical that could get into the body. Estimated exposure doses are compared to health guidelines that are considered to be safe doses at which adverse health effects are not expected.

If an estimated exposure dose exceeds a health guideline the dose is refined to reflect actual exposures that have or could occur at a specific site. These are then compared to known carcinogenic and noncarcinogenic health effect levels found in scientific literature. These comparisons are used to determine if adverse health effects are possible and the exposure presents a health hazard.

Exposure Evaluation and Public Health Implications

People can be exposed to contaminants in water through ingestion (drinking water or using water to prepare food), inhalation (breathing chemicals that volatilized during showering, bathing, or other household uses), or dermal exposure (absorbing through the skin during showering, bathing, or other household uses).

Exposure to contaminants detected above their respective CVs is calculated by assuming a “worst-case” scenario in which people are exposed daily to the highest concentration found in the water. Standard exposure assumptions are that a 16 kilogram (kg) child drinks 1 liter (L) of water per day and a 70 kg adult drinks 2 L of water per day. The estimated exposure dose in milligrams per kilogram per day (mg/kg/day) is calculated using these assumptions and the contaminant concentration in milligrams per liter (mg/L) using the following formula:

$$\text{Dose} = [\text{contaminant concentration} \times \text{intake rate}] / \text{body weight}$$

While exposure to volatile compounds through ingestion can be estimated using standard assumptions to calculate exposure doses, exposure via inhalation or dermal contact through using water in the home is more difficult to determine because of differences between individual use patterns. One common estimation is to assume that exposure via non-ingestion sources are comparable to exposure via ingestion [3]. Therefore, the estimated exposure dose is doubled to account for exposure to volatile compounds via ingestion, inhalation, and dermal contact.

For contaminants that are considered to be carcinogens, the theoretical excess lifetime cancer risk is calculated using the following formula:

$$\text{Risk} = \text{Dose (mg/kg/day)} \times \text{cancer slope factor (mg/kg/day)}^{-1}$$

Sampling results for private wells tested in February 2013 and their corresponding CVs are included in the Table. While samples were tested for VOCs, SVOCs, pesticides, and metals, only those contaminants with detectable levels are included.

Table. Sampling results from six private drinking water wells tested in February 2013 [2]. Only those contaminants with detectable concentrations are included. Those contaminants in bold had levels that exceeded screening values and thus require further evaluation.

Contaminant	Maximum Concentration (µg/L)	Number of Wells Detected	Comparison Value (µg/L)	Number of Wells that Exceed Comparison Value
Barium	86.0	6	2,000 – MCL 2,000 – child EMEG 7,000 – adult EMEG	0 0 0
Benzoic acid	237	6	40,000 – child RMEG 140,000 – adult RMEG	0 0
Bis(2-ethylhexyl)phthalate	3.9	4	2.5 – CREG 6 – MCL 600 – child EMEG 2,100 adult EMEG	4 0 0 0
Lead	2.5	1	15 – MCL action level ^a	0
Manganese	52.0	6	500 – child RMEG 1,800 – adult RMEG	0 0
Zinc	81.0	4	3,000 – child EMEG 11,000 – adult EMEG	0 0

^a MCL action level – action must be taken if more than 10% of the tap water samples exceed this value

µg/L – micrograms per liter

MCL – Maximum Contaminant Level

EMEG – Environmental Media Evaluation Guide

CREG – Cancer Risk Evaluation Guide

RMEG – Reference Dose Media Evaluation Guide

Bis(2-ethylhexyl)phthalate was the only contaminant that exceeded a CV, and the only CV that was exceeded was for carcinogenic health effects. Bis(2-ethylhexyl)phthalate is a manufactured chemical that is used to make plastics flexible and is found in items such as tablecloths, furniture upholstery, shower curtains, garden hoses, rainwear, toys, packaging film, and medical tubing [4]. Environmental levels of bis(2-ethylhexyl)phthalate are not likely to cause adverse health effects. While exposure to bis(2-ethylhexyl)phthalate can cause cancer in rats and mice, this is based on laboratory exposures where animals are exposed to very high levels for a long period of time. The potential for bis(2-ethylhexyl)phthalate to cause cancer in humans has not been evaluated [4] and the CV for carcinogenic health effects is conservative, erring on the side of protecting public health.

Using standard exposure assumptions, the theoretical excess lifetime cancer risk for exposure to bis(2-ethylhexyl)phthalate through ingestion of drinking water as well as inhalation and dermal contact when using water in the home was calculated to be 3.12×10^{-6} . We interpret this to represent no increased risk for cancer, so adverse health effects are not expected to occur.

Children's Health Considerations

In communities faced with air, water, or soil contamination, children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. A child's lower body weight and higher intake rate result in a greater dose of hazardous substance per unit of body weight. Sufficient exposure levels during critical growth stages can result in permanent damage to the developing body systems of children. Children are dependent on adults for access to housing, for access to medical care, and for risk identification. Consequently, adults need as much information as possible to make informed decisions regarding their children's health.

The likelihood for children to be exposed to contaminants in private wells at levels of health concern was evaluated. For these residences, the most likely way children would be exposed to contaminants was from the consumption of contaminated drinking water. Exposure scenarios specific to children were used to determine the possible negative effects of this exposure. As children exposed to contaminants have higher exposure doses than adults because of their body weight, conclusions based on children exposed to contaminants are also protective for adults.

Community Health Concerns

As part of the health consultation process, DSHS tries to learn what health-related concerns people in the area might have about their neighborhood. Consequently, we actively gathered information and comments from people who live at and near the residences tested during our visit. The following are the community health concerns that we have received and our response to those concerns.

Are the health effects of family members and neighbors directly connected to something in the water?

Community members reported various health concerns, including cancers, chronic kidney and digestion problems, unexplained joint problems, a high number of birth defects, thyroid problems, unexplained rashes, and neurological symptoms such as dizziness, numbness and tingling, memory loss, temporary paralysis, seizures, and headaches. Based upon the data collected from the six private wells tested, there was no indication that water from private wells would cause adverse health effects.

Are the levels of coliform bacteria, pH, and heavy metals in the drinking water safe?

Based upon the data collected from six private wells, the levels of metals found were well below health protective comparison values, and therefore are not likely to result in adverse health effects. Coliform bacteria and pH are not typically tested by the EPA. Well owners concerned about coliform bacteria can contact the Harris County Environmental Public Health Division at (713) 274-6300 to obtain information about submitting water samples for coliform testing. Testing strips for pH are commercially available. More information about maintaining private wells can be found at <http://water.epa.gov/drink/info/well/index.cfm> and <http://wellowner.org/>.

Conclusion

Based upon the data collected from six private wells there was no indication that water from private wells would cause adverse health effects. The only contaminant exceeding health based comparison values (CVs) was bis(2-ethylhexyl)phthalate. Using standard exposure assumptions, there was no increased risk for cancer and adverse health effects are not expected to occur.

Recommendations

Based upon DSHS' review of the North Highlands Groundwater data and the concerns expressed by community members, the following recommendations are appropriate and protective of public health:

1. Well owners concerned about coliform bacteria and pH should test their well. Well owners can contact the Harris County Environmental Public Health Division at (713) 274-6300 to obtain information about submitting water samples for coliform testing. Testing strips for pH are commercially available. More information about maintaining private wells can be found at <http://water.epa.gov/drink/info/well/index.cfm> and <http://wellowner.org/>.
2. Residents with health concerns should speak with their personal physician about their concerns.

Public Health Action Plan

This public health action plan contains a description of actions that have been or will be taken by DSHS and other government agencies. The purpose of the public health action plan is to ensure that this health consultation both identifies public health hazards and provides a plan of action designed to mitigate and prevent harmful human health effects resulting from breathing, drinking, or touching hazardous substances in the environment. Included is a commitment on the part of DSHS to follow up on this plan to ensure that it is implemented.

Actions Completed

1. EPA collected samples from six private wells in February 2013.
2. DSHS used a survey to collect community health concerns in February 2013.

Actions Planned

1. This document will be made available to community members and the EPA, as well as other interested parties.
2. DSHS will continue to work with the EPA to address community health concerns.

Report Preparation

This Health Consultation for the North Highlands Groundwater wells was prepared by the Texas Department of State Health Services (DSHS) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner.

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2. United States Environmental Protection Agency Region 6 Laboratory. Final Analytical Report: North Highlands Groundwater. April 1, 2013.
3. Agency for Toxic Substances and Disease Registry. Public Health Assessment Guidance Manual. January 2005.
4. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Di(2-ethylhexyl)phthalate. U.S. Department of Health and Human Services. Agency for Toxic Substances and Disease Registry. September 2002.

Appendix: Acronyms and Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
CREG	Cancer Risk Evaluation Guide
CV	Comparison Value
DSHS	Texas Department of State Health Services
EMEG	Environmental Media Evaluation Guide
EPA	United States Environmental Protection Agency
kg	kilogram
L	liter
MCL	Maximum Contaminant Level
µg/L	microgram per liter
mg/kg/day	milligram per kilogram per day
mg/L	milligram per liter
QA/QC	Quality Assurance/Quality Control
RMEG	Reference Dose Media Evaluation Guide
SVOC	Semivolatile Organic Compounds
VOC	Volatile Organic Compounds