

# Health Consultation

## **City of Montesano - Vapor Intrusion Assessment Petroleum and Solvent Contaminated Soil and Groundwater Grays Harbor County, Washington**

April 21, 2009

### **Prepared by**

**The Washington State Department of Health  
Under a Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry**



## **Foreword**

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time of this health consultation, and should not necessarily be relied upon if site conditions or land use changes in the future.

For additional information or questions regarding DOH or the contents of this health consultation, please call the health advisor who prepared this document:

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For people with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY/TDD call 711).

For more information about ATSDR, contact the ATSDR Information Center at 1-888-422-8737 or visit the agency's Web site: [www.atsdr.cdc.gov/](http://www.atsdr.cdc.gov/).

## Glossary

<b>Acute</b>	Occurring over a short time [compare with <b>chronic</b> ].
<b>Agency for Toxic Substances and Disease Registry (ATSDR)</b>	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
<b>Aquifer</b>	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
<b>Carcinogen</b>	Any substance that causes cancer.
<b>Chronic</b>	Occurring over a long time (more than 1 year) [compare with <b>acute</b> ].
<b>Contaminant</b>	A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.
<b>Environmental Protection Agency (EPA)</b>	United States Environmental Protection Agency.
<b>Exposure</b>	Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [ <b>acute exposure</b> ], of intermediate duration, or long-term [ <b>chronic exposure</b> ].
<b>Groundwater</b>	Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].
<b>Hazardous substance</b>	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
<b>Indeterminate public health hazard</b>	The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.
<b>Inhalation</b>	The act of breathing. A hazardous substance can enter the body this way [see <b>route of exposure</b> ].

<b>Media</b>	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.
<b>Model Toxics Control Act (MTCA)</b>	The hazardous waste cleanup law for Washington State.
<b>Monitoring wells</b>	Special wells drilled at locations on or off a hazardous waste site so water can be sampled at selected depths and studied to determine the movement of groundwater and the amount, distribution, and type of contaminant.
<b>Organic</b>	Compounds composed of carbon, including materials such as solvents, oils, and pesticides that are not easily dissolved in water.
<b>Parts per billion (ppb)/Parts per million (ppm)</b>	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition size swimming pool, the water will contain about 1 ppb of TCE.
<b>Plume</b>	A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.
<b>Potentially liable person (PLP)</b>	Any person [or entity] that the Washington Department of Ecology finds based on credible evidence, to be liable under the state hazardous waste cleanup law (i.e. Models Toxic Control Act (RCW 70.105D.040)).
<b>Remedial investigation</b>	The CERCLA process of determining the type and extent of hazardous material contamination at a site.
<b>Route of exposure</b>	The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].
<b>Volatile organic compound (VOC)</b>	Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

## **Summary and Statement of Issues**

The Washington Department of Health (DOH) conducted this health consultation at the request of the Washington Department of Ecology (Ecology) (personal communication, e-mail message from Meg Bommarito, Ecology, to Barbara Trejo, DOH, dated December 15, 2008). The purpose of the health consultation is to assess whether petroleum and solvent contaminated soil and groundwater associated with three facilities (Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield Twidwell property), in the downtown area of the City of Montesano, pose an indoor air health threat to the nearby community.

When found in soil and shallow groundwater, volatile chemicals, like petroleum and solvents, evaporate. Those vapors move through the soil and can enter overlying buildings through cracks and other openings in the foundations. If indoor vapor concentrations are high enough, they can pose a health threat. DOH conducts health consultations in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR).

### **Background**

Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield Twidwell properties are located within a three block area in downtown Montesano, Grays Harbor County. The area where these properties are located is bounded by Pioneer Avenue to the north, Wynoochee Avenue to the south, Church Street to the east, and 1<sup>st</sup> Avenue South to the west. Underground storage tanks (USTs) exist, or were used in the past, at these three properties and appear to be the current source of soil and groundwater contamination in the area.

Ecology reports that other contaminant releases have occurred in the downtown area in the past. However, it appears that those other releases have been cleaned up or are in the process of being cleaned up. For example, a vapor extraction system operates at P.J. Maxi Mart property, which is located southeast of Whitney's Chevrolet.(1)

The investigation and cleanup of the contamination associated with the Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield Twidwell sites is being conducted under the authority of the Model Toxics Control Act (MTCA).(2,3,4)

#### Whitney's Chevrolet

Whitney's Chevrolet is located at 123 West Pioneer Avenue. Gasoline was stored in underground storage tanks and dispensed at the Whitney Chevrolet property in the past. Waste solvents, waste oil, and fuel oil for the heating system were also stored in underground storage tanks at the property. Environmental data collected by Ecology and the potentially liable person (PLP) indicate that releases of petroleum and solvents have occurred to soil and groundwater at this property and that the contamination extends beyond the property boundaries.(4,5)

#### Tony's Short Stop Texaco

Tony's Short Stop Texaco is located at 326 S. Main Street. The property has been used to operate service stations that sold gasoline and diesel fuels.(2,6) It is unknown whether waste oil was ever generated or stored at this property, but solvents were reportedly used.(1)

Environmental data collected by Ecology and the PLP indicate that gasoline releases have occurred to soil and groundwater at the site and that the contamination extends beyond the property boundaries.(2,5)

### Brumfield Twidwell

The Brumfield Twidwell property is located at 301 East Pioneer Avenue. In the past, auto dealerships and service stations that sold gasoline and diesel operated at this property.(7) It is unknown whether waste oil or solvents were ever used or stored at this property. Environmental data collected by Ecology and the PLP indicate that gasoline releases have occurred to soil and groundwater at the site, and like the other two properties, the contamination extends beyond the property boundary.(3,5)

### *Environmental Investigations*

Soil and groundwater investigations have been conducted by the PLPs and Ecology at the Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield Twidwell sites.(1,5)

Ecology reports that the PLPs have completed draft remedial investigation (RI) reports that address soil and groundwater contamination for the individual properties. However, they are uncertain, at this point, about the quality of the data collected by the PLPs during those investigations. DOH has not been provided nor reviewed any of these draft RI reports but Ecology indicates that none of those reports address any off-property contamination (e.g. soils, co-mingled groundwater plumes) or soil gas contamination.(8)

Ecology conducted an area-wide study of soils and groundwater and also conducted limited indoor air testing in August 2006 in the basement at the Sterling Savings Bank, located east of Whitney's Chevrolet, because of past reports of petroleum-like odors. Ecology has provided DOH with two reports that contain information about shallow petroleum and solvent contaminated groundwater obtained during those studies:

- Washington Department of Ecology. Montesano Groundwater Investigation of Leaking Underground Storage Tanks, October 2006 and March 2007(1), and
- GeoEngineers. Draft Letter Report, Additional Montesano Data Management, Montesano, Washington(5).

Ecology reports that all groundwater data obtained by Ecology and GeoEngineers during these two studies were analyzed and validated by Ecology's Manchester Laboratory.(8) Ecology has also provided DOH with information regarding the 2006 air sampling event at the Sterling Savings Bank building.

The two previously mentioned reports indicate that plumes of gasoline and benzene, toluene, ethylbenzene, and xylenes (BTEX) contaminated groundwater underlie a significant portion of the area bounded by Pioneer Avenue to the north, the Burlington Northern Santa Fe rail lines to the south, Church Street to the east, and 1<sup>st</sup> Avenue South to the west. Free-phase petroleum product has also been observed in some monitoring wells at Whitney Chevrolet, Tony's Short Stop Texaco, and Brumfield Twidwell properties.(1)

It is apparent from these two reports that some of the gasoline plumes (e.g. Whitney Chevrolet and Tony's Short Stop Texaco) have co-mingled.(5) Ecology reports that petroleum and related compounds have also been found at relatively low levels in samples collected from the storm drain and abandoned sanitary sewer during the summer months when water leaking into the line would consist of groundwater, rather than a mix of groundwater and stormwater.(1) Ecology also reports that the owners of the Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield Twidwell properties have been informed that further environmental investigation work is needed to address the off-site plumes and utility corridors.(8)

It is important to note that some gasoline components associated with these three site have not been analyzed (e.g. MTBE, naphthalenes).(9) In addition, no information is available about the concentrations of waste oil, diesel, and heating fuel in groundwater. Some low levels of solvents (e.g. PCE) were found at Whitney's Chevrolet, Tony's Short Stop, and the nearby Sterling Savings Bank.(1) However, it is unknown whether any plumes of solvents exist. DOH understands that Ecology plans to have the PLPs fill these data gaps.(8)

Given the types of products used, stored, and potentially released at the three properties and previously mentioned data gaps, the nature and extent of shallow groundwater contamination is likely underestimated. However, we do know that groundwater gasoline concentrations in the downtown area have been found ranging from not detected to 490,000 ug/l, while benzene in groundwater ranged from not detected to 28,300 ug/l. The highest levels of gasoline and benzene levels appear to have been detected at Tony's Short Stop Texaco in early 2007. Significant levels of various benzene compounds, toluene, ethylbenzene, xylenes, and naphthalenes were also found in a number of monitoring wells at the three properties in early 2007.(1) Wet season contaminant levels are reported to be lower than dry season levels, which is attributed to dilution by rainwater or biodegradation.(5)

The only known reports of petroleum odors occurred at the Sterling Savings Bank building. That complaint originated in the early 1990s when the building was occupied by Key Bank. As a precaution, although no recent complaints had been received, Ecology collected one indoor air sample (and a duplicate) at the Sterling Savings Bank using a 6-liter SUMMA canister in August 2006.(8) Those samples, however, were only collected for 45-minutes rather than 8-hours, which is a typical occupational exposure.(10) The petroleum analysis was limited to only benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds using Modified EPA Method TO-15 GC/MS SIM. No hydrocarbon fractions were analyzed. The samples were also analyzed for typical chlorinated solvents (e.g. trichloroethylene (TCE); tetrachloroethylene (PCE), and 1,1,1-trichloroethane (1,1,1-TCA)). Low levels of BTEX and 1,1,1-TCA were found in the sample. No 1,1,1-TCA was found in the duplicate.(11) No background outdoor air samples were collected during the indoor air testing at the bank.

### *Geology/Hydrogeology*

Ecology reports that the geology of the area is comprised mostly of unconsolidated to partly consolidated alluvial deposits, consisting of sand and gravels with lenses of clay and silt up to 20 feet thick. The alluvial deposits are reportedly underlain by a relatively impermeable silt or clay

unit of unknown thickness. Regional groundwater flow is to the south-southeast toward the Chehalis River with the water table reportedly occurring approximately 3 to 15 feet below the ground surface.(1)

Some well logs provided by Ecology for Whitney's Chevrolet and Tony's Short Stop Texaco and the nearby Pederson and Montesano Farm and Home properties (copies sent by Dom Reale, December 24, 2008) provide a little more information about subsurface conditions, which are important to understand when evaluating the vapor intrusion pathway. The well logs suggest that sands, silty sands, and sandy gravels (native and fill) lie directly below the ground surface. The depths of these soils vary across the investigation areas and generally are described as moist. However, some of these soils are reported to be wet. In many cases, it appears that these upper soils are underlain by a clay or silt unit. The clay/silt unit thickness varies across the area and is absent in some areas. Some wet soils appear to exist over the clay/silt unit suggesting localized perched groundwater conditions. The extent of such perched zones cannot be determined. Moist to wet sands or gravels with some silty sand layers underlie the clay/silt unit. This is the unit where the monitoring well screens have been placed suggesting this is the first aquifer. In some cases, the borings have penetrated the sands and gravels and encountered dense, silty sands.

Available groundwater flow maps suggest that shallow groundwater flows from the northwest to the southeast. However, groundwater flow near the Brumfield Twidwell property appears to flow from the northeast to the southwest. It has been suggested that this change in flow direction might be caused by preferential flow along utility corridors as a possible result of the backfill or the storm drain.(5) Ecology reports that earlier groundwater gradient maps indicate that some slight variations in flows from season to season and year to year in limited areas, but all have shown a consistent northwest to southeast flow direction over a period of time.(8) The soil boring logs provided to DOH suggest that in some cases, groundwater might be semi-confined, and in other cases not. Groundwater appears to fluctuate seasonally with the highest levels occurring during the winter months when rainwater infiltrates.(5)

### *Groundwater Resource*

Ecology reports that there are no drinking water wells potentially affected by contaminated groundwater.

## **Discussion**

Petroleum, and possibly solvent, contaminated soil and groundwater, as well as free-phase petroleum floating on the groundwater surface, have been found associated with the Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield/Twidwell properties. These releases pose a potential threat to indoor air in downtown Montesano.

The nature and extent of the soil and soil gas contamination associated with the Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield/Twidwell sites is unknown and only very limited indoor air testing has been conducted in these areas to date. The volatile contaminants (petroleum constituents and solvents) released to groundwater at these properties



have moved beyond the property boundaries and pose a potential indoor air health threat to the overlying community. The contaminated groundwater might also be traveling along preferential pathways such as utility corridors and storm drains.

It appears that not all the chemicals of potential concern (e.g. diesel range hydrocarbons, chlorinated solvents, MTBE, naphthalenes) have been tested at all locations in the various environmental media. However, there is clear evidence that groundwater in the downtown Montesano area contains high levels of gasoline range hydrocarbons, including benzene, ethylbenzene, xylenes, and toluene. Free-phase petroleum product has been found floating on the water table. The lateral extent and thickness of the free-phase petroleum has not yet been fully delineated. Low levels of solvents have also been found in groundwater and indoor air at the bank.

Available boring logs suggest that a shallow clay/silt unit exists in the subsurface in at least part of downtown Montesano, but this unit appears absent in some areas. It is possible the clay/silt unit might block vapors from reaching overlying buildings. However, there is no soil gas or indoor air data available to assess that scenario making it impossible to determine the level of threat posed by the contaminated soil and groundwater.

The Johnson and Ettinger (J&E) groundwater model is one tool for assessing the possible vapor intrusion threat when VOC contaminated groundwater exists. However, that model is not suitable for the Whitney's Chevrolet, Tony's Short Stop Texaco and the former Brumfield/Twidwell sites because the model cannot be used when free-phase product is floating on the groundwater surface. Soil gas and/or indoor air testing should be conducted instead. The J&E model is also not suitable for assessing buildings with crawlspaces.(12)

As a result of the previously mentioned data gaps and issues, the health threat posed by the vapor intrusion pathway associated with the Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield/Twidwell sites in downtown Montesano cannot be assessed at this time. The following list summarizes information that needs to be collected or compiled so the vapor intrusion pathway can be assessed:

- Conduct a building survey in the area currently known to be affected by releases from Whitney's Chevrolet, Tony's Short Stop Texaco, and the former Brumfield/Twidwell properties. The purpose of the building survey is to begin identifying buildings potentially vulnerable to the shallow petroleum and solvent contaminated soil and groundwater. The building survey may need to be expanded in the future if contamination extends beyond the current boundaries.
- Identify all the chemicals of potential health concern associated with the three properties.
- Determine whether there are adequate data to assess the nature and extent of contamination in the various environmental media. Part of that work would include conducting or obtaining quality assurance/quality control (QA/QC) reports for the datasets and then compiling representative data into a database. The database would include soil, soil gas, groundwater, indoor air, and outdoor air data.
- Develop a monitoring well summary table describing depths and elevations of wells, screen depths, unit where well is screened, and other relevant information

- Compile current groundwater level data into a database and develop maps showing seasonal groundwater flow direction.
- Develop maps showing soil, groundwater, soil gas, and air sampling locations.
- Develop maps showing soil sampling results for chlorinated solvents and petroleum compounds, particularly for vadose and smear zone, to determine whether the nature and extent of contamination has been determined.
- Develop maps showing solvent and petroleum constituent levels in shallow groundwater in addition to the gasoline /BTEX levels that have been mapped.
- Develop a map showing clay/silt unit thickness and depth across the area.

This information will also help with the preparation of plans for conducting soil gas and/or indoor air testing. Such testing should be conducted as soon as possible to begin assessing whether the contaminant releases from Whitney’s Chevrolet, Tony’s Short Stop Texaco, and the former Brumfield/Twidwell sites pose an indoor air health threat to the community.

### **Children’s Health**

Children can be uniquely vulnerable to the hazardous effects of volatile environmental contaminants, like petroleum products and solvents, if exposed to these chemicals in indoor air. When compared to adults, pound for pound of body weight, children breathe more air. This could lead to an increased exposure to contaminants. Additionally, the fetus is highly sensitive to many chemicals, particularly with respect to potential impacts on childhood development. For these reasons, DOH considers the specific impacts that contaminated soil and groundwater might have on children, as well as other sensitive populations. It is currently unknown whether children, or other sensitive populations, are being exposed to soil or groundwater contaminants in indoor air via the vapor intrusion pathway.

### **Conclusions**

The gasoline and solvent contaminated soil and groundwater and free-phase petroleum product floating on the groundwater table below downtown Montesano, pose a potential threat to indoor air quality via the vapor intrusion pathway. Currently, it is unknown whether the vapor intrusion pathway is complete because neither soil gas nor indoor air data is available to make such an assessment. Because free-phase petroleum exists on the water table in some areas of the site, it is not appropriate to use the Johnson and Ettinger vapor intrusion model to make such a prediction. Because of these issues, gasoline and solvent contaminated soil and groundwater, and free-phase petroleum floating on the groundwater surface in downtown Montesano, pose an *indeterminate public health hazard*.

### **Recommendations**

1. A building survey should be conducted in downtown Montesano within 60 days of the release of this health consultation report to begin identifying buildings that may be potentially vulnerable to the shallow petroleum and solvent contaminated soil and groundwater.

2. Existing data quality assessments, data compilations, and maps showing distribution of contaminants across the area should be compiled within 90 days of the release of this health consultation report. This information will help determine where data gaps remain, as well as help when selecting locations for soil gas or indoor air testing.
3. Soil gas and/or indoor air testing should be conducted within the next 180 days of the release of this health consultation report to determine if contaminated soil or groundwater poses an indoor air health threat. If it is suspected that an immediate or short term health concern exists, such testing should occur sooner.

### **Public Health Action Plan**

1. Ecology will conduct a building survey in downtown Montesano within 60 days of the release of this health consultation report.
2. Ecology will consider existing data, including building survey results, collected across downtown Montesano to develop an indoor air sampling plan within 120 days of the release of this health consultation report.
3. Ecology will direct the PLPs to conduct soil gas and/or indoor air testing within 180 days of the release of this health consultation report to determine if contaminated soil or groundwater poses an indoor air health threat. If it is suspected that an immediate or short term health concern exists, Ecology will direct the PLPs to conduct the testing sooner.
4. DOH will provide copies of the final health consultation report to Ecology, the PLPs and city and county agencies. The final report will also be posted on DOH's website.
5. DOH will assist Ecology, if needed, in developing the building survey and evaluating and interpreting the findings.
6. DOH will assist Ecology, if needed, in developing plans and interpreting results from soil gas and/or indoor air testing.

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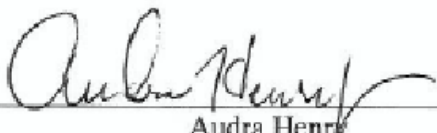
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## Certification


This City of Montesano Health Consultation Report was prepared by the Washington State Department of Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and a procedure existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.



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The Division of Health Assessment and Consultation (DHAC) ATSDR, has reviewed health consultation report and concurs with the findings.



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