Questions and Answers

Past practices at The Boeing Company's Fabrication Auburn facility at 700 15th Street SW in Auburn have resulted in chemical contamination of groundwater, the water that flows underground through the soil. As directed by the Washington State Department of Ecology (Ecology), The Boeing Company (Boeing) is working to understand the contamination and develop a plan for cleanup.

Site background

What is the problem?

The groundwater flowing away from the Boeing property is contaminated with volatile organic compounds (VOCs). Some of the contaminated groundwater (called a plume) flows north and northwest from the Boeing property, into portions of Algona and Auburn. The chemicals found in the plume include trichloroethene (TCE), a degreasing solvent commonly used to clean metal parts in the past, as well as tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE) and vinyl chloride.

Where are the contaminated groundwater plumes?

There are two plumes associated with the Boeing property, which are shown on Figure 1 (page 16). The groundwater in the vicinity generally flows to the north and northwest, so the plumes underlie the Boeing property, northeastern Algona and western Auburn.

The plumes join each other, as shown on the map, and are not entirely separate.

How might people come in contact with the contamination?

Because the area has a high water table, contaminated groundwater is fairly close to the surface in certain locations. If contamination is present, people could be exposed by:

- Touching, breathing and swallowing chemicals in ditches and ponded water.
- Breathing chemical vapors that concentrate in the soil under buildings

For more information:

Boeing Fabrication Auburn Site Website
https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=5049

Robin Harrover – Site Manager
Washington State Department of Ecology - Toxics Cleanup Program
3190 160th Ave. SE
Bellevue, WA 98008
Phone: (425) 649-7232
E-mail:boeingauburnsite@ecy.wa.gov

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and enter homes through crawl spaces, basements and/or openings in slab foundations. This is called "vapor intrusion."

Washington State Department of Health (Department of Health) conducted a health assessment and determined the public drinking water systems in Algona, Auburn and Pacific are safe. However, if you use a private well located in or near the plume, you could be exposed to contamination. We recommend you contact Ecology to discuss potential hazards of using the well.

When did the contamination occur?

Boeing does not know when the contamination occurred. TCE was used at the facility from the 1960s to the early 1990s, so Boeing believes the contamination occurred during this period. Use of TCE at the facility was phased out in the early 1990s. Therefore, it is not an ongoing release from current operations at the facility.

Boeing has identified two plumes associated with the contamination and is working to identify the source areas for each. One source has been identified as a vapor degreaser that operated in the former 17-05 Building. The degreaser was removed by Boeing in 1994.

Why haven't I heard about this contamination until now?

Ecology and Boeing signed an Agreed Order in 2002, under Washington's cleanup law – the Model Toxics Control Act (MTCA), and have been working since then to understand the contamination and develop a plan for cleanup. As part of the work in 2009, Ecology identified that contamination has spread beyond the Boeing Auburn facility property boundary. Ecology immediately began an expedited sampling plan to identify the extent of the contamination, and has been sharing those plans with the community. Ecology has been providing project updates to the cities of Algona, Auburn and Pacific since fall 2011.

What has been done to find out where the contamination is located?

Under Ecology direction, Boeing and its contractors have collected groundwater samples to understand which VOCs are present, their locations and concentrations. Boeing will continue sampling in the area to better understand the chemical contamination and the need for cleanup actions.

What are the contaminants and how do they move with groundwater?

TCE is colorless liquid used as an industrial degreaser, but it can also be found in common household products, such as paints, glues, spot removers and pepper spray. TCE can evaporate easily into the air. In water, it slowly breaks down into other VOCs, such as vinyl chloride.

TCE is an environmental contaminant found in groundwater, often associated with solvents used in industrial applications. When it comes in contact with water it dissolves and then moves

with the natural flow of groundwater. Since TCE is heavier than water, it will tend to move downward in addition to horizontally with groundwater flow through the aquifer, the underground zones of water-bearing rock or soil. Ecology has specific groundwater cleanup standards for TCE.

How does local geology and groundwater flow influence the contamination?

The Auburn valley, like much of the region, was shaped by past glacial and volcanic activities. Deep below the ground is a geologic layer of an old volcanic mudflow called the Osceola Mudflow. The clay-rich mudflow layer limits the infiltration of water between two aquifers, the underground zones of water-bearing rock or soil.

Boeing's investigations of groundwater have identified VOC contamination in the upper aquifer. While the upper aquifer has TCE contamination, the mudflow layer helps slow the contamination from entering the deeper aquifer. In addition, the groundwater in the Auburn valley flows to the north-northwest until it eventually reaches the Green River.

Public drinking water systems in Algona and Auburn are served by drinking water wells located outside the plume and draw groundwater from the deeper aquifer. The City of Pacific draws water from the upper aquifer, but their wells are south of the plume, and groundwater is flowing to the north, away from Pacific's wells.

How do TCE and other VOC concentrations differ from the Boeing facility and offsite property?

In general, TCE concentrations in the groundwater under the Boeing facility are higher than they are offsite. However, many factors affect both on- and off-site concentrations, including variations in when the leaks occurred, variations in the natural chemical properties of the aquifer, and the natural breakdown of TCE in the aquifer system.

Are there schools that could be affected by the contamination?

There are no Auburn or Algona public schools overlying the contaminated groundwater plumes. However, there are educational facilities nearby – specifically the YMCA and Junior Achievement Center. Indoor air samples at those buildings did not contain detectable amounts of TCE or other VOCs.

Is the sheen seen in ditches related to the Boeing contamination?

No. TCE and its breakdown products are colorless and odorless at the concentrations found in groundwater and surface water. The sheen seen in ditches most likely relates to bacteria commonly found in wet areas, such as roadside ditches. The sheen may also be related to runoff from cars.

Recent sampling

What do the latest results tell us about levels and locations of contamination?

Under Ecology oversight, Boeing conducted groundwater sampling at 49 locations in Algona in April 2013. Many "shallow" samples were collected near the water table at depths of 5 to 10 feet, since human exposure is more likely to occur with shallow groundwater contamination.

Results from groundwater sampling showed no contamination at most of the sampling sites. TCE and vinyl chloride were detected in samples of shallow groundwater from a seven-block area in northeastern Algona (see Figure 2 on page 17).

The levels of TCE and vinyl chloride in the shallow groundwater were at or below the drinking water cleanup standard. However, at certain concentrations even below the drinking water standard, contaminated groundwater can release vapors into the soil. Given the high water table and potential for vapor intrusion into buildings, Ecology directed Boeing to sample indoor air in specific homes. The homes were selected based on the results of the April 2013 groundwater sampling, where concentrations of TCE and/or vinyl chloride were at or above the levels where vapors may be released in the soil.

To review the groundwater sample results, visit the project website.

What work is going on now to test for contamination?

Given the results of the recent groundwater sampling and the high water table in the area, Ecology has directed Boeing to:

- Conduct a vapor intrusion study by sampling indoor air quality in 23 homes in northeastern Algona.
- Also in northeastern Algona, complete and implement a work plan for surface water sampling in yards and ditches.
- In Auburn, complete the groundwater investigation initiated in Fall 2012
- Complete the vapor intrusion assessment and evaluation in Auburn.
- Complete the surface water investigations and characterization of the interaction between groundwater and surface water in Auburn

What is vapor intrusion?

Vapor intrusion occurs when chemicals in the shallowest groundwater (the water table) evaporate and move through the soil as a vapor. When that happens, the vapors can enter nearby buildings through crawl spaces, basements and/or openings in slab foundations, and can potentially affect indoor air quality.

Vapor intrusion is only possible if the shallowest groundwater is contaminated, and if the groundwater has enough contamination in it to make its way indoors as a vapor. The levels of TCE and vinyl chloride in Algona's groundwater are unlikely to lead to unhealthy

concentrations in indoor air, but Ecology wants to ensure vapor intrusion is not impacting indoor air quality.

How is vapor intrusion tested?

Vapor intrusion is investigated by focusing on buildings overlying or within a buffer zone near the contaminated groundwater. Some buildings are more susceptible to vapor intrusion than others due to foundation types and construction. Through physical inspection of the buildings and by collecting indoor air samples, investigators can determine what impacts, if any, vapor intrusion is having on indoor air quality.

If a home is identified for testing, two to three metal sampling canisters are set up in the home's living space, crawl space or basement, where they continuously and silently collect air over a 24-hour period. For more information about the vapor intrusion testing in Algona and Boeing's workplan, visit the project website to review Ecology's Vapor Intrusion Fact Sheet.

What happens if vapor intrusion is detected?

Ecology and Boeing will share the results of the vapor intrusion study with each resident whose home is tested, regardless if contaminants are present. Ecology and Department of Health will determine if vapor intrusion is causing potentially harmful air quality conditions (i.e., chemical concentrations at levels capable of causing unacceptable health risks).

If such risks are present, Ecology will direct Boeing to draw up a plan for the home to minimize vapor intrusion and reduce the indoor contaminant concentrations to acceptable levels.

Boeing will review this plan with the homeowner, and ask for approval to install the needed equipment and materials. The system will reduce the effects of vapor intrusion. Once the system is installed, Boeing will conduct additional indoor air tests to confirm that the system is working properly, and will continue indoor air monitoring and maintenance of the system until testing and the cleanup action indicate that the system is no longer needed. Boeing will cover all the costs of the system, testing, maintenance and final removal.

How were homes selected for sampling?

Ecology is focusing the first phase of the vapor intrusion study on the seven-block area in northeastern Algona where recent groundwater sampling detected contamination in the shallowest groundwater.

Ecology and Department of Health identified 23 homes for the first phase of testing based on their proximity to this groundwater contamination, as well as several homes near the contamination that have basements. Buildings located beyond the edge of the contaminated water table are unlikely to experience vapor intrusion. So, beyond where the shallowest groundwater samples indicate there is negligible contamination, no indoor air sampling is currently planned.

Why are you sampling my neighbor's home and not mine?

At this time, Ecology and Boeing are sampling indoor air of the homes located in areas where contaminant concentrations of TCE or vinyl chloride at the water table area are equal to or greater than "preliminary concern levels." These levels are chemical concentrations in groundwater that could be high enough to result in unacceptable indoor air impacts. Homes in a buffer zone around this area were included. In some cases, homes with basements near the buffer zone were also included.

Will Ecology sample additional homes for vapor intrusion?

It is possible that additional homes may be selected for indoor air testing. This could happen for different reasons. If sampling results from the 23 homes indicate unexpected chemical concentrations in indoor air, additional homes adjacent to the initially tested homes may be selected for testing to further investigate or confirm those results.

Additionally, Boeing will be installing more groundwater monitoring wells in the near future. If levels of contaminants at the water table begin to increase in areas where indoor air was not sampled, then we will want to sample homes in those areas to determine if the levels appear high enough to impact indoor air quality.

Why is surface water being tested?

Due to the area's high water table, contaminated groundwater is close to the surface. People could come into contact with contaminants in places like street ditches or ponds if contaminated groundwater discharges to those ditches or ground surface.

Previously, water from the Chicago Avenue ditch was sampled and some samples detected VOCs. Department of Health determined human contact in the ditch would not likely cause harmful effects. However, since this was based on limited information, Department of Health recommended further study to test surface water from more locations.

There are plans for Boeing to collect samples of standing water later this year in roadside ditches, ponded water in residential yards, and at other selected water bodies in locations where shallow contaminated groundwater may discharge to yards and ditches. Ecology will use these results to consult with Department of Health to determine potential health effects from contact with the surface water. These data will also help us better understand whether VOC concentrations in surface water change throughout the year, the location where contamination discharges from groundwater to surface water, and the interaction between the groundwater and surface water. For more information about surface water testing, visit the project website.

Where will the surface water samples be taken?

As directed by Ecology, Boeing's consultant, Landau Associates, will sample surface water at various locations in northeastern Algona and in Auburn later this year. Samples will be

collected from the Chicago Avenue ditch at 10th Avenue North and Chicago Avenue, road shoulders, City property, Mill Creek and in residential yards in Algona.

Cleanup process

During these investigations, what is the relationship between Ecology and Boeing?

Ecology directs, oversees and reviews the investigations, which Boeing pays for and conducts. Ecology provides overall oversight, and independently reviews investigation plans and reports. Ecology must approve all plans and proposals before Boeing can proceed with them. Boeing prepares the plans, performs the work – such as indoor air, groundwater and surface water sampling – and reports the results.

Is there any work now to clean up the contamination?

Boeing completed an interim cleanup of the source of Plume 1 in late 2005. The cleanup treated contaminated groundwater below a former TCE degreaser in Building 17-05 and successfully lowered the VOC concentrations to comply with state cleanup standards. This location is now occupied by the AMB Distribution Center building.

Over the past year, Boeing has conducted groundwater and surface water testing to help identify the extent of the groundwater contamination. These studies have help identify areas of concern and information needs, which guide plans for further investigations. The need for additional cleanup actions will be decided once investigation efforts are completed.

What work is planned for the future?

As directed by Ecology, Boeing just began vapor intrusion testing in Algona, and is developing plans for surface water sampling in Algona and Auburn (anticipated later this year).

Ecology and Department of Health will use the results of these investigations to direct further investigations and develop health recommendations. In addition, Ecology has directed Boeing to continue to work to identify a source for the contamination in Plume 2.

What is the overall cleanup process and schedule?

Boeing's cleanup process must follow the Washington State Model Toxics Control Act (MTCA) hazardous waste cleanup law and related regulations. The process has several key milestones. The first is an Agreed Order, which is a legal agreement between Ecology and Boeing for the actions needed at the property which includes the Boeing facility and off-site areas contaminated from the Boeing facility. The Agreed Order for the Boeing property was signed in 2002.

There are four main cleanup phases:

1. Currently, Boeing is completing a **Remedial Investigation** (RI) to understand the source and extent of the contamination at the site.
2. After the RI is complete, a **Feasibility Study** will be conducted to identify appropriate cleanup alternatives.
3. Then a **Cleanup Action Plan** will be developed.
4. Finally, the **cleanup** will be implemented according to the final cleanup plan.

The remedial investigation, feasibility study and cleanup action plan are subject to public review and comment. Before deciding whether to approve each of these, Ecology will seek formal public comment.

Throughout the cleanup process, Boeing may conduct interim cleanup measure for groundwater and vapor intrusion.

What types of cleanup could occur?

Cleanup activities will vary depending on the results of the investigations. The type of cleanup actions and timing for implementation will be determined based on results of ongoing investigations. The final long-term cleanup for the contamination will be evaluated as part of the Feasibility Study. A final long-term remedy will be selected based on the results of the Feasibility Study and details specified in the Cleanup Action Plan.

Some of the types of cleanup actions include enhanced bioremediation, monitored natural attenuation, subsurface barrier walls and hydraulic control.

- **Enhanced bioremediation** involves injecting the aquifer with natural substances that promote the growth of naturally occurring bacteria. The bacterial activity changes the overall chemistry in the aquifer which enhances and speeds up the breakdown of the solvent chemicals in groundwater.
- **Monitored natural attenuation** is monitoring the aquifer as natural processes break down the chemicals. The monitoring provides the data needed to ensure that the concentrations and extent of contamination are decreasing on their own.
- **Subsurface barrier walls** are constructed in the shallow part of the aquifer to contain and prevent the spread of contamination in shallow groundwater. These barrier walls are made of clay materials that impede the flow of groundwater. They may also be constructed of materials that, when the contamination comes in contact with them, breakdown of the contamination into harmless byproducts takes place.
- **Hydraulic controls** are created by the manipulation of groundwater flow, often by extracting groundwater at key locations to prevent the expansion of the plume.

Frequently, Ecology selects a cleanup action which is a combination of several technologies. Ecology makes the decision on a final cleanup action with input from the supporting agencies, the public and Boeing.

If potential health risks are identified early on, can these risks be addressed right away?

Yes. As we learn more about the contamination, Ecology may direct Boeing to implement interim actions to reduce risk to human health and the environment rather than waiting to reach the final cleanup milestone.

An example of an interim action is an immediate measure, such as installation of a ventilation system or ducting, to reduce indoor air concentrations detected at a residence above levels of concern. Another example is the earlier interim cleanup action in 2005 that reduced groundwater contaminant levels through use of enhanced bioremediation as described above.

What are the levels for determining whether potentially harmful concentrations of VOCs are present in groundwater, surface water and indoor air?

When investigating contaminated sites, Ecology and Department of Health use precautionary pollution levels for initial testing. During the Remedial Investigation, Ecology sets or approves VOC concentrations called screening levels. These often are lower or more stringent than cleanup levels, which are approved in the Cleanup Action Plan, at a later phase of the overall process. Screening levels usually are set very low, even below safety, health or environmental standards. Scientists are very confident that chemical concentrations below a screening level poses no threat to public health, safety or the environment. If a chemical is at or above a screening level, it means more study is needed, because the chemical may or may not pose a health, safety or environmental threat.

How can I help my family understand and respond to the risks from this contamination?

- If your home is located in an area where the water table is contaminated, please permit us to collect indoor air samples if we have notified you that this should be done. This can be done quite quickly, and then we will know if there is, or is not, a vapor intrusion problem.
- If your home is located in an area where the water table is contaminated, please permit us to collect yard water samples if we have notified you that this should be done. We will then know if there are any detectable levels of TCE or vinyl chloride in that water. In the meantime you can minimize your exposure to yard water by staying out of it (as much as possible) and wearing protective clothing (like water resistant shoes/boots) when coming into contact with it.

Will Ecology add signs to the Chicago Avenue ditch?

At this time, Department of Health has concluded touching and accidentally ingesting Chicago Avenue ditch water would result in low-level exposure to VOCs. This exposure is not expected

to result in harmful health effects to children or adults. So, at this time there are no plans to add signs to the Chicago Avenue ditch. However, please keep in mind children should not be in the ditch due to potential drowning hazards and possible contamination unrelated to the Boeing facility.

Health questions

Is it safe to drink tap water?

The public water systems in Algona, Auburn and Pacific provide water that is safe to drink.

How can chemicals affect my health or my children's health?

People respond to chemical exposure in different ways. Some people can have contact with a chemical and never be harmed. Others may be more sensitive and get sick. Whether you have a reaction or get sick from contact with chemicals depends on many things, including:

- The kind of chemicals you were exposed to; some are more harmful than others. Some chemicals are more toxic than others.
- How much of the chemical you were in contact with. For some chemicals, it takes a lot to be harmful. For others, it takes only a little.
- How long you were in contact with the chemical.
- How often you were exposed.
- How the chemical entered your body (breathing, swallowing, or absorbed through the skin).
- Your overall health.

Because of their growing bodies, children are potentially more sensitive to chemical exposures than adults. Play activities may lead to more contact with water, soil and dust. Children are more likely to play in contaminated areas because they do not read warning signs and are unaware of the dangers.

What are the chemicals I should know about?

For this area, we are monitoring TCE and the chemicals it becomes when it breaks down ("breakdown products"). Some of the breakdown products we've found include vinyl chloride, cis- and trans-1,2-dichloroethene (DCE). Perchloroethylene (PCE) was also found in the Chicago Avenue ditch. The source of the PCE is unknown. Not all of these chemicals have the same potential to cause harm.

TCE and vinyl chloride are the only two chemicals that have been found in ground and surface water at concentrations closest to health-protective standards. PCE and DCE are also present in some locations but at levels much lower than their health-protective standard. Concentrations higher than these standards tell us we need more evaluation to see whether people could be exposed to unsafe amounts of the chemicals.

How can TCE affect my health?

How a chemical will affect someone is hard to determine, especially without knowing exactly how much that person was exposed and for how long and how often. **Exposures known to occur near the plume are not expected to be high enough to result in the health effects described below.** More sampling will be done in the future to confirm that these levels remain low.

- The U.S. Environmental Protection Agency and the National Toxicology Program say TCE can cause cancer. Worker exposure to TCE has been associated with liver cancer, non-Hodgkin's lymphoma, and kidney cancer.
- Human and animal studies show that exposure to low levels of TCE may cause effects to the immune system and heart-related health effects to unborn babies.
- Human studies show that people exposed to very high levels of TCE may have headaches, lung irritation, dizziness, poor coordination, and difficulty paying attention.
- Breathing high amounts of TCE could cause improper heart function, unconsciousness, and death.

How can vinyl chloride affect my health?

How a chemical will affect someone is hard to determine, especially without knowing exactly how much that person was exposed and for how long and how often. **Exposures known to occur near the plume are not high enough to result in the health effects described below.** More sampling will be done in the future to confirm that these levels remain low.

- The U.S. Environmental Protection Agency and the National Toxicology Program say vinyl chloride can cause cancer. Worker exposure to vinyl chloride has been associated with cancer of blood vessels of the liver and the liver itself. Less convincing evidence showed that worker exposure may be associated with cancer of connective and soft tissues and cancers of the lung, brain, and blood/lymph tissues.
- Infants and young children might be more susceptible than adults to vinyl chloride-induced cancer.
- Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes.
- Breathing high levels can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out.

Are TCE or vinyl chloride stored in the body?

TCE and vinyl chloride can get into the body, but tend to leave quickly. TCE or vinyl chloride can get in your body if it's in the water you drink or the air you breathe. It can also be absorbed through your skin. You will exhale most of the TCE you take in. However, some will get absorbed into the bloodstream and organs. Most of the vinyl chloride that you breathe or swallow enters your blood rapidly, and then travels throughout your body. However, it is gone

from your body a day after you breathe or swallow it. Your body changes the TCE and vinyl chloride into other chemicals, or breakdown products. These products typically leave your body in urine within a day. You will also quickly breathe out much of the TCE or vinyl chloride that is in your bloodstream.

Are there chemicals in my drinking water and could they have been there in the past?

The water for most, if not all, homes in the area is supplied by public water systems. People are not drinking or using water contaminated by Boeing. Boeing is continuing to collect new water quality data to confirm this.

Public drinking water systems are regularly monitored by the Department of Health to make sure they are safe for people. The public water sources give their monitoring data to the Department of Health to review. Health has looked at public drinking water data for Auburn, Algona and Pacific dating back to 1970. None of that data has shown any levels above the standards established to protect public health.

Private wells are not monitored like the public drinking water systems. They may have been affected by the contamination in the past depending on their location. Boeing is working to identify where private wells may exist. If you have information about a well that may be unrecorded or may have existed in the past, please contact Ecology via email at boeingauburnsite@ecy.wa.gov or call (425) 649-7232.

Are the chemicals in the surface water (ponded water, ditches, wetlands or streams)?

People could come in contact with the TCE and vinyl chloride where contaminated groundwater reaches the surface. These include ponded water, ditches, wetlands and streams that interact with groundwater. Not all water you see (surface water) comes from groundwater, some of it comes from rain. Boeing plans to sample surface water in yards, ditches, wetlands and streams.

Is the standing water in my yard safe?

We don't yet know if contaminated groundwater influences surface water in yards. Ecology has directed Boeing to collect surface water samples in yards affected by the shallow contaminated groundwater (sampling anticipated later this year).

Preliminary data show the levels of chemicals in shallow groundwater do not pose a health risk if you touch or accidentally ingest them. Ecology and the Department of Health are working with Boeing to assure data collected is helpful for understanding the exposure risk to people.

I've seen kids play in the Chicago Avenue ditch water. Are they being exposed?

Based on limited sampling, the Department of Health found that touching and accidentally ingesting Chicago Avenue ditch water would result in low-level exposure to PCE, TCE, DCE and vinyl chloride. This exposure is not expected to result in harmful health effects to children. The amount of exposure through breathing in vapors coming off of the water is also unlikely to cause harmful effects. Parents may want to urge children not to go in the ditch to be certain that no exposure happens. Check the Department of Health website (www.doh.wa.gov/consults) for the full report.

Ditches are not safe places to play, especially for young children. Water levels in ditches may be a drowning hazard for young children. There is always the possibility of contamination unrelated to the Boeing facility (e.g., fecal contamination from animals and birds, stormwater overflow, residential waste). Mud in the ditch north of 11th Avenue is quite deep and may present a hazard to children who could get stuck.

How could people come in contact with the contaminants?

The chemicals have been found in the groundwater beneath certain areas of Algona and Auburn (see Figure 1). The contaminated groundwater is called a "plume." You have to come into contact with the chemicals before there is a possibility of harm. If you're not near the plume, you won't be exposed and the chemicals can't harm you.

Near the plume, contamination may or may not be present in surface water, outdoor air and indoor air. (Testing is planned to see whether these contain contaminants and, if so, how much.)

If contamination is present, exposure could occur by:

- Touching, breathing and swallowing chemicals in ponded water and ditches.
- Breathing chemical vapors in indoor air that have risen from the groundwater through the soil, and into buildings through cracks or other openings in crawl spaces, basements and floor slabs.
- Also, if you use a private well in or near the plume, you could be exposed to contaminants in the water.

So far, we know that people can only come into contact with water containing these chemicals in the Chicago Avenue ditch north of 7th Avenue. People are not drinking contaminated groundwater. Unless you have been in the ditch, you are not being exposed. People entering the ditch who touch or accidentally swallow the water are exposed at levels that are not expected to harm health.

In areas near contaminated shallow groundwater, indoor air testing will help us determine if there is a health threat.

Is the indoor air of my home or basement affected by the groundwater contamination?

Vapors can be released from shallow groundwater, travel through the soil, get into the air, and possibly into buildings. Whether the indoor air in your home or basement is potentially affected depends on a few things:

- The location of your property compared to the shallow groundwater contamination.
- The type and condition of your home's foundation.
- The type and amount of chemicals in shallow groundwater near your home.

Boeing, under Ecology direction, is offering indoor air testing to homeowners and tenants of 23 homes in the northeastern corner of Algona. This work began in June 2013. Ecology and Department of Health will evaluate the air data to determine if chemicals are found in indoor air and if they are at levels that would be a health problem.

Can I still eat the vegetables in my garden?

You can eat fruits and vegetables grown in your garden. There are two peer reviewed studies that suggest the chemicals found in surface water and groundwater associated with the Boeing site do not accumulate in plants or fruit tissue. Both of these studies had VOC concentrations higher than those found at this site. These studies conclude that eating homegrown produce irrigated with well water (or groundwater) containing low levels of VOCs is safe for both adults and children.

- Groundwater contaminated with TCE migrated off-site into communities surrounding Hill Air Force Base in northern Utah. Utah State University conducted a multi-year monitoring program to find out how plants take up and transfer TCE into fruit (Doucette et al. 2007).
- Oregon State Department of Environmental Quality (DEQ) evaluated the safety of homegrown produce irrigated with contaminated groundwater near the Eugene Rail Yard. Oregon DEQ compiled a comprehensive fact sheet that communicates the issues with plants and VOCs. It can be found at: www.deq.state.or.us/lq/cu/wr/UPRREugene/HomegrownProduceFS.pdf

Are there medical tests I can take to see if I've been exposed to TCE and vinyl chloride?

If you have been exposed to TCE recently, it can be detected in your breath, blood or urine. For small amounts of TCE, breath testing must occur within an hour or two of exposure. For large amounts of TCE, blood and urine tests can find TCE and its byproducts up to a week after exposure. Because exposure to other chemicals can produce similar byproducts in the body, test results do not prove exposure to TCE. Only a doctor or other medical professional familiar with these tests should give them. Vinyl chloride is similar but stays in the body for an even shorter amount of time.

What can I do to reduce exposure for my family?

Because we can come into contact with harmful chemicals in a number of places, it's a good idea to know what health actions you can take to reduce exposure to you and your family. These actions include:

- Be aware of contamination and studies being done around your home.
- Avoid or limit time spent in the Chicago Avenue ditch north of 7th Street.
- If you live hear the plume and have a home with a crawl space, keep your crawlspace vents open. It may help dilute any chemicals evaporating from the shallow groundwater.

Are the cancers that people have in the neighborhood caused by the release of chemicals from the site?

Cancer is a term used for diseases in which abnormal cells divide without control then invade other tissues. Often, doctors cannot explain why one person develops cancer and another does not. Cancer develops over many years and has many causes. Several factors, both inside and outside the body, contribute to cancer development. The most common risk factors that increase the chance for cancer include: growing older, tobacco, sunlight, ionizing radiation, viruses, bacteria, hormones, family history of cancer, alcohol, poor diet, lack of physical activity, being overweight, and some environmental chemicals.

We cannot determine if any cancers in the neighborhood were caused by a chemical released from the Boeing site. The individual chance that someone will develop cancer in response to a particular, single environmental exposure depends on 1) the potential of the chemical to cause cancer and 2) how long or how often that person was exposed, and 3) the kind of cancer the chemical causes.

At this time, we are only aware that people might be exposed to contaminants associated with the Boeing site by touching contaminated water in the ditch on Chicago Avenue. However, these exposures are so low the chance of developing cancer is estimated to be insignificant. Boeing is continuing to collect groundwater, surface water and indoor air samples to further evaluate the potential cancer threat.

What are the risks for pets and wildlife?

Results of studies done by the National Park Service, when applied to the surface water in Algona and Auburn, indicate the concentrations of chemicals are not high enough to harm wildlife or domestic pets (www.nature.nps.gov/water/ecencyclopedia/).

Figure 1: Shallow and intermediate contaminated groundwater plumes as of April 2013.

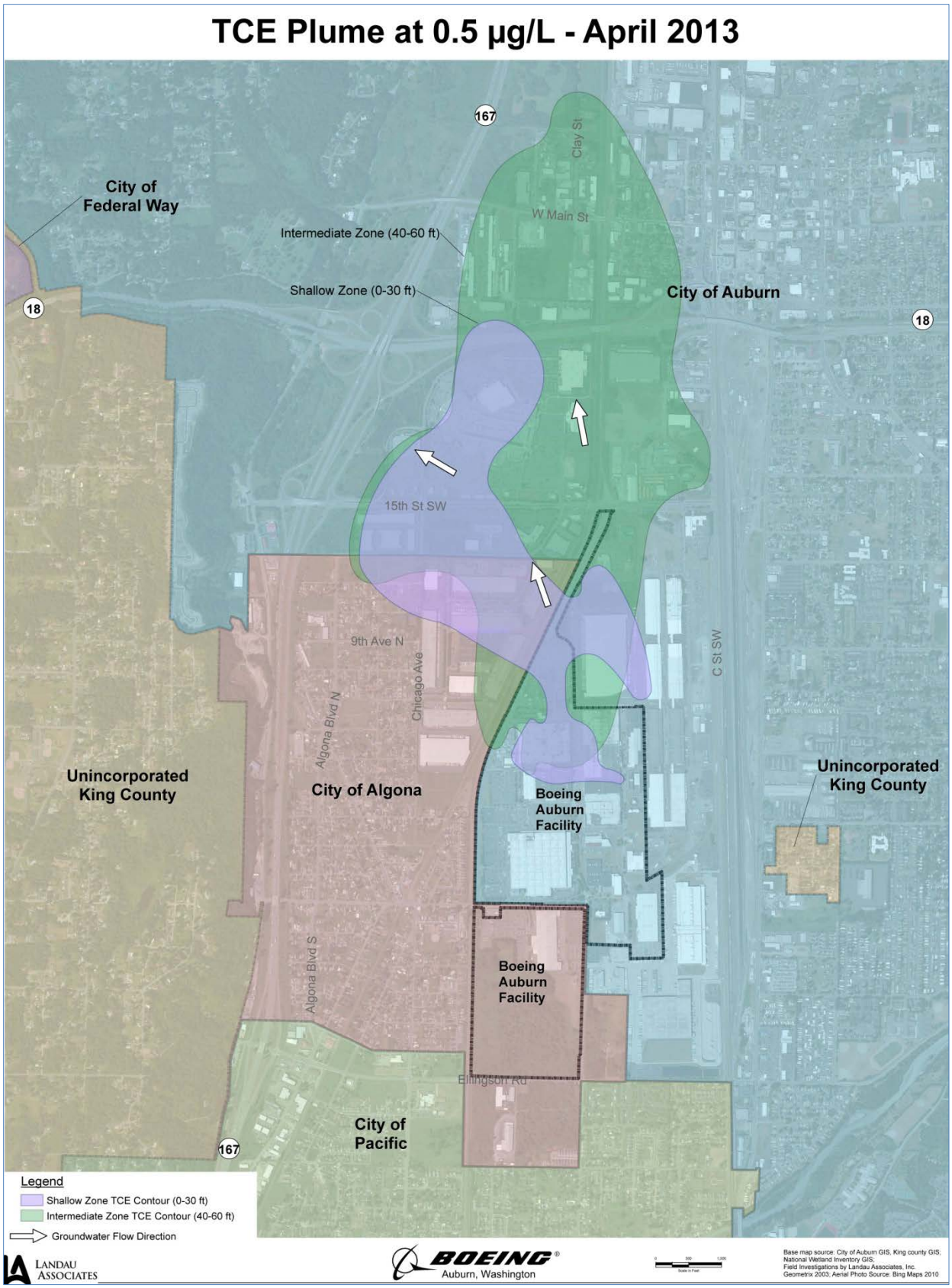

Figure 2: TCE detections in groundwater and resulting vapor intrusion testing area.