Yukon River Inter-Tribal Watershed Council

SAFE DRINKING WATER

And

SANITARY

PRACTICES MANUAL FY 19

Ability to Drink Clean Water from Yukon River

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Is This Manual for YOU!

This manual is designed to give you a basic understanding of the need for safe drinking water and ways to ensure that water used for common domestic purposes is safe clean drinking water. Water sources must be protected at all cost from being contaminated for consumption, uses and for resources we greatly depend on.

Every Living Being needs clean drinking water to sustain healthy life.

Water is Life

Water is Essential to all Life

An adequate supply of safe drinking water must be accessible as needed to maintain health and sustain life within the Yukon Watershed. Water sources must be protected at all cost from contamination (batteries, trash, plastic trash, etc.).

One cannot live without water. It is an essential human need. Our bodies are made up of 60-70% water. It makes sense that we look at the water we drink, and how it is handled from its source to its resting place, once it has completed its use in our bodies.

Protect the Rivers, Streams and Lakes from actions like these

Water is most valuable resource on Earth and should not be taken for granted (do not trash river/stream banks with batteries, and plastic the most dangerous

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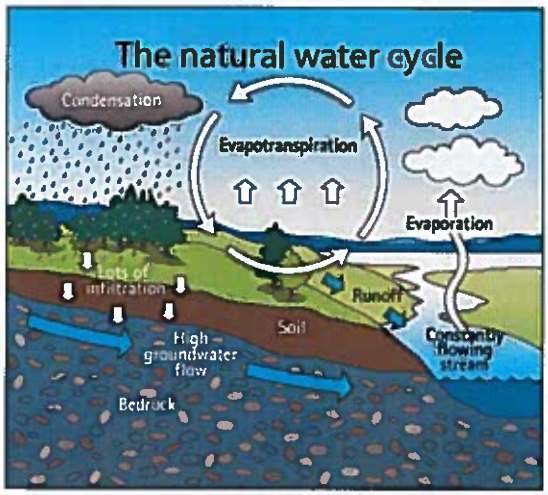
contaminates in the world). It is essential to all basic human needs, including food, drinking water, sanitation/hygiene, health, energy and shelter. Proper management is the most pressing natural resource challenge of all. Without water we have no society, economy, culture, tradition or life. By its very nature and multiple uses, water is a complex subject.

Natural Water Cycle



We cannot properly preserve our water resources without first understanding how water circulates throughout the environment. The water cycle refers to the movement of water on above, and below the surface of the Earth as ice, snow, liquid, and water vapor. Water constantly moves over or under the ground, evaporates into the atmosphere, mostly through plants, and then recycles as rain or snow.

Every ounce of water that has been drank has, at least already passed through fish, animals trees, bacteria, soil and many other organisms, including people. As water travels through the ecosystems, it is cleansed for human consumption. The undisturbed natural environment, with a few localized exceptions, provides water that is safe to drink from streams, lakes or wells. This supply of water is a benefit to humans and wildlife that the environment provides each and every one to sustain life.

Plants, soils and animals not only sustain the hydrological cycle, they also play a significant role in purifying water. Wetland plants commonly remove high levels of

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nutrients, such as phosphorous and nitrogen, preventing them from reaching drinking water; many wetland plants can also remove toxic substances, such as heavy metals, from water, accumulating them in their tissues at 100,000 times the concentration in the surrounding water.

Improving the quantity and quality of available safe drinking-water can result in many health benefits. Every effort should be made to achieve drinking-water that is as safe as practicable at all times, not just for human consumption but for all resources we rely on to practice our traditions, culture activities by harvesting the resources we all depend on to strife.

Safe Drinking Water Sanitary Practices for Healthy Life; How to Make Healthy Water

Health risk is elevated by the unclean and/or unsanitary conditions found in any living area lacking running water, piped wastewater services. Infants, Children, Elders are at the greatest risk of harm or illness from waterborne diseases and/or contaminants due to low immune systems. Anyone at risk of waterborne illness need to take additional steps (boiling the water, keep water jugs clean regularly, etc.) to protect themselves against exposure to waterborne pathogens.

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Having safe clean water involves many steps. Collection, transportation, storage and usage are all stages of having safe drinking water.

Many rural village residents obtain community monitored/treated drinking water from a facility (piped system) into their home faucet. While many residents still obtain water from traditional water sources (pristine streams, lakes) and/or transport (self-haul) from Water Plants/Washeteria's (water point to fill containers) to their home for use. In any case, sanitary practices for proper water hygiene will keep drinking water safely useable and promote the healthy and quality of life for each individual using the water.

The best way to ensure safe drinking water is to prevent contamination once drinking water quality has been established. Proper sanitary practices and controlling the waste stream are the key to maintaining safe drinking water quality.

Contaminates may be naturally present at the source or collection point of water. They may also be introduced by unsanitary utensils (dipper, pail, etc.), containers (bottle, jug, barrel, etc.), transportation devices (pipe, gutter, roof, vehicle, etc.) or any other item (pets, falling debris, etc.) coming into contact with the water being collected for use.

Often, drinking water becomes contaminated through contact from unsanitary utensils, containers or transportation devices/equipment that contain contaminates. All items coming into contact with or in close proximity to drinking water should be sanitized inside and out to prevent possible contaminated water.

When collecting water from a treated source (Water Facility, community well, school, Washeteria, etc.) it is very important to keep your containers cleansed/sanitized inside and out to prevent contamination from the collection

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point. Contamination from a collection point of water source is the surest path to spreading disease throughout a community and/or in a home, impacting the health and safety of infants, children, elders, family and friends.

Safe Potable Drinking Water

Potable water: What is potable water?

This is water fit to drink, bathing, dish washing and use in fish tanks. This potable water comes in several types, tap water, mineral water, filtered water and distilled water. Tap water is often treated with trace amounts of anti-bacterial chemicals such as chlorine, chloramine and fluoride by the water company to allow to stay potable for weeks or even months before bacteria has a chance to infect the water. Potable water is actually very rare in terms of water found on earth. It rarely occurs naturally except from some artisan springs. All water must be treated to be made potable by a filter at the very least to a water plant and distillation plant. One of many functions as an water plant operator is maintaining clean working environment which promotes clean healthy water and if your water plant has copper plumbing system advocate to replace plumbing with PEX pipe system which will promote cleaner water and during water sampling no copper or lead will be detected.

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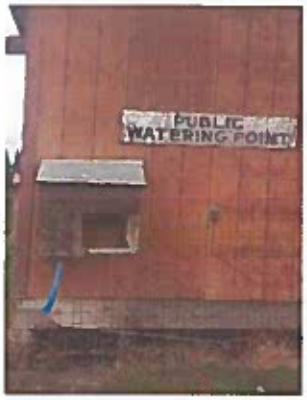
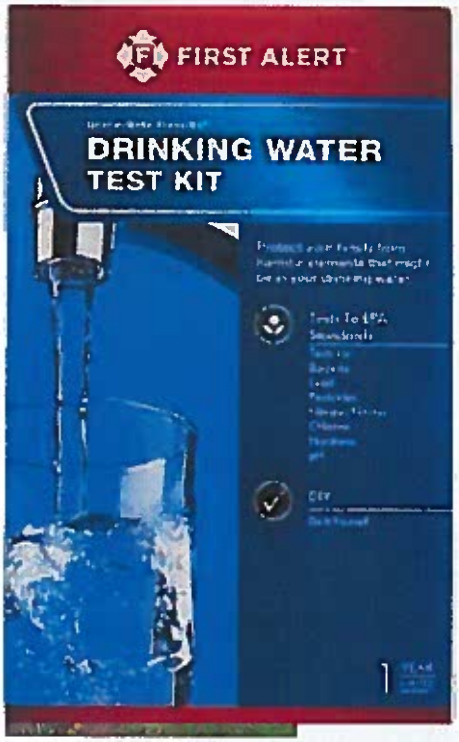



Palatable water: What is palatable water?

Palatable water has a clean, clear appearance with no bad taste or odor. Palatable water has the appearance and presentation of purity, is appealing and desirable to an individual and provides a pleasant, satisfying experience when used.



Water run-off from underground mountain.

Traditional or Alternative Water Sources

Drinking water can be collected from alternative water sources such as from precipitation (rain or snow, etc.), surface water (lake, stream, rain or snow roof runoff, pristine springs, etc.) or ground water (well, springs, etc.). These sources already provide drinking water or the water collected may need to be treated into safe drinking water. Best sanitary practices in keeping utensils, containers and transportation devices free of contaminants will ensure drinking water does not become contaminated and spread diseases that may severely affect the health and safety of infants, children, elderly, and family in the household.

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Ensuring Safe Drinking Water

How does one ensure safe drinking water? Testing, monitoring, treatment, sanitary practices and hygiene are the keys to safe drinking water. This is not as difficult as it may sound and you do not have to rely on an outside "expert" to test the water for you, especially if you and your family chooses to access water from an alternative source.

Testing

Drinking water supply should be tested on a periodically basis. If water is collected from a known drinking water source (community well, surface water, groundwater school, water plant/Washeteria, etc.) testing and treatment should be performed by the utility system operator on a regular basis and is required by Alaska law. Nonetheless, you may still wish to test your drinking water at the point of use to ensure no contaminants have been introduced between the monitored point of treatment and your point of use. Even water from a monitored, treated source delivered by pipe system to your faucet may become contaminated by the pipes or fixtures (microorganisms, etc.) in your old building.

credit, Thomas Brower

If you collect water from an unmonitored source you can test the water yourself. This is not a difficult, complex or expensive process and many different home water testing kits are available in large retail stores. Detailed directions for accurate testing are included with these test kits and should be closely followed to obtain accurate results. Example of Drinking Water Test Kit: Product called "First Alert Drinking Water Test Kit" (tests to EPA Standards and provides results for: Bacteria, Lead, Pesticides, Nitrates/Nitrites, Chlorine, Hardness and pH). These test kits can easily be purchased at large retail stores or can be ordered on-line.

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Threats

Although water may look clear and clean, there are many substances that may be dissolved that you cannot see. These substances can cause serious health problems. It is vital that you take care to avoid drinking water that has excessive levels of any of the following:

Chemicals (organic and inorganic) Fuel Spills

Organic chemicals (petroleum, benzene, dioxin, acrylamide, Benzpyrene, (Benzpyrene is primarily found in gasoline, diesel and exhaust from equipment, cigarette smoke, etc.) may appear from many sources including refuse and waste disposal, community activities, water systems, waste water processing, construction and industrial activities, and/or during fuel transfer.

Inorganic chemicals (minerals and metals, lead, mercury, fluoride, copper, etc.) may result from erosion of natural deposits, corrosion of water handling/processing systems, refuse and waste disposal, industrial and community activities, mining, refining, construction, abandoned BIA Schools and fuel tanks with flaking lead paint.

Some of these chemicals (lead, mercury, etc.) may contaminate the water after it reaches your location. Older buildings are especially "at risk" for containing hazardous chemicals (lead paint, asbestos) that can potentially contaminate your safe drinking water and pose significant health risks. Removal of lead paint,

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asbestos from old building should be done by certified contractor. The lead dust can get into water and soil. People in communities nearby can also be exposed if work is not done right. This means that painters, contractors and other have to take special course that teaches them how to remove paint safely and how to dispose of it properly. Warning Sign's should be posted to keep children out of these buildings and barracked by blocking the door ways, windows with plywood.

Not all organic and/or inorganic chemicals need to be removed from water to make it potable. Iron, calcium and sulfur in water may not harm an individual that drinks it but, they can affect the taste of the water. Iron may give the water a reddish-orange appearance; calcium adds to the "hardness" of water creating deposits (bottom of pots where white spots are seen) where evaporation occurs and sulfur causes water to possess an "old, over-boiled egg" odor. Chloride used to treat water for microorganisms may give the water the scent of bleach.

Many chemicals are very dangerous and should never be ingested. Petroleum or its distillates may give the water an oily sheen, feel or taste and a fuel-like scent but, some chemicals are completely undetectable by any of the human senses. Ingestion of these chemicals usually affects an individual's organs and/or systems, resulting in permanent damage, disability or death.

If you find undesirable levels of a chemical in your water, the treatment process must be tailored to meet the chemical found and the result desired. While you gather the proper information and take the appropriate action to create safe drinking water at your source of water, you should use an alternate proven source for safe drinking water.

Whether you are removing chemicals to make your water potable; filtration is the primary process available. Distillation may remove some chemicals that filtration cannot but, it also usually requires a greater investment to the facility. Some

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chemicals are very difficult to remove from water and is cost prohibitive to a small rural facility. Protecting the water source from contamination is the best practice.

Threat: ***Lead*** (Inorganic Chemical): Potential health effects from long term exposure for infants and children can include delays in physical or mental development; slight deficits in attention span and learning disabilities. For adults, problems can include kidney problems and high blood pressure.

Environmental Protection Agency: 40 CFR Parts 141 and 143: (EPA-HQ-OW-2015-0680, FRL-9958-23-OW), Action: Proposed Rule.

Summary: The EPA proposes to make conforming changes to existing drinking water regulations based on Reduction of Lead in Drinking Water Act of 2011 (RLDWA) and Community Fire Safety Act of 2013 (CFSA). Section 1417 of the Safe Drinking Water Act (SDWA) prohibits the use and introduction into commerce of certain plumbing products that are not lead free. The RLDWA revised the definition of lead free to lower the allowable maximum lead content from 8.0 percent to a weight average of 0.25 percent of the wetted surfaces of plumbing products and established a statutory method for calculating lead content. In addition, the RLDWA created exemptions from lead free requirements for plumbing products that are used exclusively for nonpotable services. The CFSA further amended section 1417 to exempt fire hydrants from these requirements.

EPA proposes to establish new requirements to assure that individuals purchasing, installing or inspecting potable water systems can identify lead free plumbing materials. Specifically, EPA proposes to establish labeling requirements to differentiate plumbing products that meet the lead free requirements from those that are exempt from the lead free requirements and to require manufacturers to certify compliance with the lead free requirements. These proposed requirements would reduce inadvertent use of non-lead free plumbing products in potable use applications and, consequently, reduce exposure to lead in drinking water and associated adverse health effects.

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Action: Final Rule will be out in 06/00/2019

Common sources of lead contamination in drinking water include corrosion of household plumbing or erosion of natural deposits. Lead found in tap water usually comes from older household plumbing, old fixtures, and from the solder that connects pipes (lead based solder was banned in June 1986).

Lead can enter drinking water through corrosion of plumbing materials, especially where the water has high acidity or low mineral content that corrodes pipes and fixtures. Homes built before 1986 are more likely to have lead pipes, fixtures and solder. However, new homes are also at risk: even legally "lead-free" plumbing may contain up to eight percent lead.

Test your home's drinking water for lead

Testing your home's drinking water is the only way to confirm if lead is present. Most piped water systems test for lead at a certain number of homes as a regular part of water monitoring. These tests give a system-wide picture of whether or not corrosion is being controlled but do not reflect conditions at each home served by that water system. Since each home has different plumbing pipes and materials, test results are likely to be different for each home. Communities that are in water & sewer piped system, the service provider does a random selection of homes to do water samples for lead, copper and/or other contaminates. Then the water sample is sent to laboratory for analysis to be done. Once this water sample is received by the community it should be posted in public places and also the city/tribe councils should have this on the meeting agenda for general discussions on the status of the water, after receiving the water sample report

You may want to test your water if:

- your home has old copper piping system installed before 1986 and potentially may have used 50-50 solder which was banned for using in

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potable water pipes, (lead is a dull gray metal that is soft enough to be easily scratched with a house key), or

• your copper plumbing was installed before 1986. Photo sample below to recognizing a dull gray solder (50/50).

If your home tests positive for lead: Test your water with Watersafe test kit

Watersafe WS425W Well Water Test kit, identifies harmful levels of ten different common contaminants in water: bacteria, lead, pesticides, copper, iron, nitrates, nitrites, chlorine, pH, and hardness. Watersafe test kits are easy to use and produce results on the spot. Tests bring the accuracy of laboratory procedures into any home or business. EPA standardized, laboratory certified water test kit includes 1 Bacteria Test, 1 lead / Pesticide Test. 1 Nitrate / Nitrite Test, 1 pH / Hardness / Chlorine, 1 Copper Test, and 1 iron Test. These test kits can be purchased from Amazon, Walmart, Sears, eBay. Prices range around $29.95 to $49.99 a kit, depends where it is purchased from.

• **Flush your pipes before drinking, and only use cold water for cooking and drinking.** Anytime the water in a particular faucet has not been used for six hours or longer, flush your cold-water pipes by running the

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water until it becomes cold. Contact your water plant operator to verify flushing times for your area.

• **Consider replacing lead-containing plumbing fixtures.** If you live in an older (pre-1986) home, contact the local housing authority to learn about options for retrofitting lead-containing plumbing fixtures. Keep in mind that the Safe Drinking Water Act (SDWA) requires that only lead-free pipe, solder, or flux may be used in the installation or repair of a public water system, or any plumbing in residential or non-residential facility providing water for human consumption. "Lead-free" under the SDWA means that solders and flux may not contain more than 0.2 percent lead, and pipe, pipe fittings, and well pumps may not contain more than 8.0 percent lead. October 2016, changes to the Safe Drinking Water Act was developed: Please visit the web site. EPA Office of Water, October 2016, Lead and Copper Rule Revisions White Paper.

PEX Pipe Vs Copper Pipe, Village Transportation Considerations

Consider replacing with color coded PEX pipe, easy to install, no solder required, use of simple tools. Price comparison 2018 (Lowes, Anchorage, ½ inch by 100 feet red (hot water), blue (cold water) $31.37), Copper ½ inch by 60 ft, $144.21. Home Depot, Anchorage, ½ inch by 100 ft, $33.54 (red), ½ inch by 100 ft, $58.44 (blue), and ½ inch by 20 ft, $74.34. Based on this price comparison using copper pipe can add up to thousands of dollars over the course of a house project. Potential risk using copper pipes fire hazard, use of wrong solder by inexperience plumper.

PEX is also lightweight, flexible, easy to transport and install and built to be long lasting. Like copper, it can carry hot water without melting. There may even be environmental benefits: production, use and disposal of PEX products uses far less energy and produce less carbon dioxide than copper. PEX pipe is much more resistant to freeze-breakage than copper. **Benefit to rural Alaska**

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OLD ABANDONED BIA BUILDINGS & OLD BIA FUEL TANKS Dangers of Flaking Lead Based Paint:

Lead has been recognized as a harmful pollutant. In late 1981, the secretary of the Department of Health and Human Services called lead the "**number one environmental threat to the health of children in the United States,**" There are many ways in which humans are exposed to lead: through air, drinking water, food, contaminated soil, deteriorating paint, and dust. Airborne lead enters the body when individual breathes or swallows lead particles or dust once it has settles. Before it was known how harmful lead could be, it was used in paint, gasoline, water pipes, and many other products

Old lead-based paint is the most significant source of lead exposure in the U.S. today. Most homes built before 1960 contain heavily leaded paint. Some homes built as recently as 1978 may also contain lead paint. This paint could be on window frames, walls, the outside of homes, or other surfaces. Harmful exposures to lead can be created when lead-based paint is improperly removed from surfaces by dry scraping, sanding, or open-flame burning. High concentrations of airborne lead particles in homes can also result from lead dust from outdoor sources, including contaminated soil tracked inside, and use of lead in certain indoor activities such as soldering and stained glass making.

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Health Effects of Exposure to Lead

Lead effects practically all systems within the body. At high levels it can cause convulsions, coma, and even death. Lower levels of lead can adversely effect the brain, central nervous system, blood cells, and kidneys

The effects of lead exposure on fetuses and young children can be severe. They include delays in physical and mental development, lower IQ levels, shortened attention spans, and increased behavioral problems. Fetuses, infants, and children are more vulnerable to lead exposure than adults since lead is more easily absorbed into growing bodies, and the tissues of small children are more sensitive to the damaging effects of lead. Children may have higher exposures since they are more likely to get lead dust on their hands and then put their fingers or other lead-contaminated objects into their mouths.

Get your child tested for lead exposure. To find out where to do this, call your doctor or local health clinic. For more information on health effects, get a copy of the Centers for Disease Control's, Preventing Lead Poisoning in Young Children (October 1991).

Ways to Reduce Exposure to Lead

- **Keep areas where children play as dust-free and clean as possible**

Mop floors and wipe window ledges as chewable surfaces such as cribs with either a general all-purpose cleaner or a cleaner made specifically for lead. Wash toys and stuffed animals regularly. Make sure that children wash their hands before meals, nap time and bedtime. These practices are important at all times, however, pay special attention during remodeling work.

- **Reduce the risk from lead-based paint.**

As mentioned above, most homes built before 1960 contain heavily leaded paint, and some homes built as early as 1978 may also contain lead paint. This paint could

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be on window frames, walls, the outside of homes, or other surfaces. Do not burn painted wood since it may contain lead.

- **Leave lead-based paint undisturbed if it is in good condition** – do not sand or burn off paint that may contain lead.

Lead paint in good condition is usually not a problem except in places surfaces rub against each other and create dust (for example, opening a window).

- **Do not remove lead paint yourself.**

Individuals have been poisoned by scraping or sanding lead paint because these activities generate large amounts of lead dust. Consult your state health or housing department for suggestions on which private laboratories or public agencies may be able to help test your home for lead in paint. Home test kits cannot detect small amounts of lead under some conditions. Hire a person with special training for correcting lead paint problems to remove lead-based paint. Occupants, especially children and pregnant women, should leave the building until all work is finished and clean-up is done.

- **Do not bring lead dust into the home.**

During remodeling, avoid tracking dust from the work area throughout the rest of the home. It is also important to avoid bringing lead in from other sources. If you work in construction, demolition, painting, with batteries, in a radiator repair shop or lead factory, or your hobby involves lead, you may unknowingly bring lead into your home on your hands or clothes. You may also be tracking in lead from soil around your home. Soil very close to homes may be contaminated from lead paint on the outside of the building. Soils by roads and highways may be contaminated from years of exhaust fumes from cars and trucks that used leaded gas. Use door mats to wipe your feet before entering the home. If you work with lead in your job or a hobby, change your clothes before you go home and wash these clothes separately. Encourage your children to play in sand and grassy areas instead of dirt

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which sticks to fingers and toys. Try to keep your children from eating dirt, and make sure they wash their hands when they come inside.

- **Eat right.**

A child who gets enough iron and calcium will absorb less lead. Foods rich in iron include eggs, red meats, and beans. Dairy products are high in calcium. Do not store food or liquid in lead crystal glassware or imported or old pottery. If you use old plastic bags to store or carry food. Keep the printing on the outside of the bag.

More Information

- Contact the National Lead Information Center call and speak with a specialist Monday through Friday, 8:00 am to 6:00 pm eastern time (except Federal holidays) at **1 (800) 424-LEAD (5323).** The Hotline provides a basic information packet on lead in English. The EPA website contains additional information on where lead can be found and how to protect your family.
- **Alaska,** Please note that these contacts are able to assist with work-related lead exposure questions only. If you have other public health-related questions, please contact the CDC Infoline at 800-CDC-INFO, (800-232-4636). Alaska Department of Health and Social Services website at: dhss.alaska.gov

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Threat: ***Copper*** *(*inorganic chemical): Potential health effects include gastrointestinal distress for brief exposure and the potential for liver or kidney damage for long term exposure. People with Wilson's Disease, a rare condition that causes too much copper to accumulate in your liver, should consult their personal doctor if the amount of copper in their water exceeds the action level of 1,300 ppb (parts per billion). Common sources of contaminant in drinking water include corrosion of household plumbing and erosion of natural deposits

Test your home's drinking water for copper

Communities that are in water & sewer piped system, the service provider does a random selection of homes to do water samples for lead, copper and/or other contaminates. Then the water sample is sent to laboratory for analysis to be done. Once this water sample is received by the community it should be posted in public places and also the city/tribe councils should have this on the agenda for general discussions on the status of the water.

If your home tests positive for high copper levels:

- **Flush the taps prior to drinking:** Copper works its way into the water by dissolving from copper pipes in the household plumbing. The longer the water has stood idle in the pipes, the more copper it is likely to have absorbed. (Newer homes with copper pipes may be more likely to have a problem. Over time, a coating forms on the inside of the pipes and can insulate the water from the copper in the pipes. In newer homes, this coating has not yet had a chance to develop.) Thus, anytime the water has not been used for more than six hours-overnight, for example, or during the day when people have been gone to work or school-it should be cleared from the pipes before being used for drinking or cooking. This can be achieved by letting

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the cold water faucet run until you can feel the water getting colder-usually 30 to 60 seconds. This must be done before taking drinking water from any faucet in the house.

- **Draw water for consumption only from the cold water tap:** Hot water dissolves copper more quickly than cold water; as a result, water to be used for drinking or cooking should not be drawn from the hot water tap. If you need hot water for cooking or drinking, take water from the cold tap and heat it. *It is especially important not to use the hot water for making baby formula*.

Threat: ***Benzene:***(Organic Chemical) The Maximum contaminate level goals (MCLG) for Benzene is zero. EPA has set this level of protection based on the best available science to prevent potential health problems. EPA has set an enforceable regulation for benzene, called a Maximum Contaminate Level (MCL) at 0.005 parts per billion. MCLs are set as close to the health goals as possible, considering cost, benefits and the ability of public water systems to detect and remove contaminates using suitable treatment technologies.

Public Health Goal: ZERO; Public Safety signs should be posted to keep the children from playing around old fuel tanks in the area of the contaminated soils area to protect them from exposure of Benzene.

Common sources of contaminant in drinking water: Discharge from factories; leaching from gas storage tanks and landfills.

How will I know if benzene is in my drinking water?

When routine monitoring indicates that benzene levels are above the MCL, your water supplier must take steps to reduce the amount of benzene so that it is below that level. Water suppliers must notify their customers as soon as practical, but no later than 30 days after the system learns of the violation. Additional actions, such as providing alternative drinking water supplies, may be required to prevent serious risks to public health. Each rural Alaska community should know their alternative

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drinking water source and have protective measures to keep it safe from contaminates.

Where benzene is found and how it is used

- Benzene is formed from both natural processes and human activities.
- Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What benzene is

- Benzene is a chemical that is a colorless or light yellow liquid at room temperature. It has a sweet odor and is highly flammable.
- Benzene evaporates into the air very quickly. Its vapor is heavier than air and may sink into low-lying areas.

What happens to benzene when it enters the environment?

Benzene is commonly found in the environment. Industrial processes are the main source of benzene in the environment. Benzene levels in the air can be elevated by emissions from burning coal and oil, benzene waste and storage operations, motor vehicle exhaust, and evaporation from gasoline service stations. Tobacco smoke is another source of benzene in air, particularly smoking indoors. Families are encouraged not to smoke in their house, in enclosed environments, or near their children. Industrial discharge, disposal of products containing benzene, and gasoline leaks from underground storage tanks release benzene into water, and soil breaks down more slowly. Benzene is slightly soluble in water and can pass through the soil into underground water. Benzene in the environment does not build up in plants or animals.

Living near gasoline fueling stations or hazardous waste sites may increase exposure to benzene. People are advised not to have their children/families play near fueling stations, manufacturing plants or hazardous waste sites.

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Prevent and Cleanup Spills

One of the best practice to prevent contamination to water source is to prevent spills, and clean up the site "As Soon as Possible" even if it is couple of gallons, Why? It's the law!

Threats

Fuel Tank Stands for Flood Prone Areas and Fuel Leaks from fuel Tanks that are not maintained

Yukon River Basin has many flood prone communities and has experienced these floods and will continue to do so. The floods are unavoidable when there is ice jams or flash floods from accelerated snow melt.

- Flash flooding and ice jams are a fact of life in many parts of Alaska
- Unanchored heating oil tanks can be easily moved during flask floods and ice jams
- Floating tanks can cause serious damage to buildings and the environment

Secure Fuel Tanks and Hazardous Materials

Above-ground fuel tanks are common throughout Alaska. Earthquakes and floods sometimes cause fuel tanks to fall or float from their supporting structures. Drinking water sources often become contaminated and community recovery may be significantly delayed. Accidental releases of other hazardous materials also can cause serious health, safety and environmental problems during and after disasters. Fortunately, simple mitigation measures can reduce or eliminate most of these problems. Secure the chemicals in locked containers to avoid toxic mixture during and after flood.

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Oil spill and loss of heating capacity occurred when this unsecured tank fell from wood cradle.

This used oil tank was not elevated or secure.

These stored chemicals became a toxic mixture during and after the flood! Elevated, safe and secure storage of hazardous material is critical. Keep them in original containers, with labels.

Types of Fuel Tank Support Structures

There are three main types of tank support structures that are found in Alaska: hand-built wood support, timber cradle support and fabricated steel support systems.

Timber Cradle Fuel Tank Stand

This elevated tank is protected from falling snow and ice. The diagonal wood bracing may be inadequate during a large earthquake. Steel framing connectors would add strength.

Steel Fuel Tank Stand

Leaks and small spills are very common—consider adding a containment area under the tank with a soil or sand berm and fuel resistant liner

One gallon of spilled oil can contaminate over 1 million gallons of fresh water!

Build Stronger, Safer, Smarter to prevent accidental release Fuel and Chemical Storage Requires an extra Level of Care

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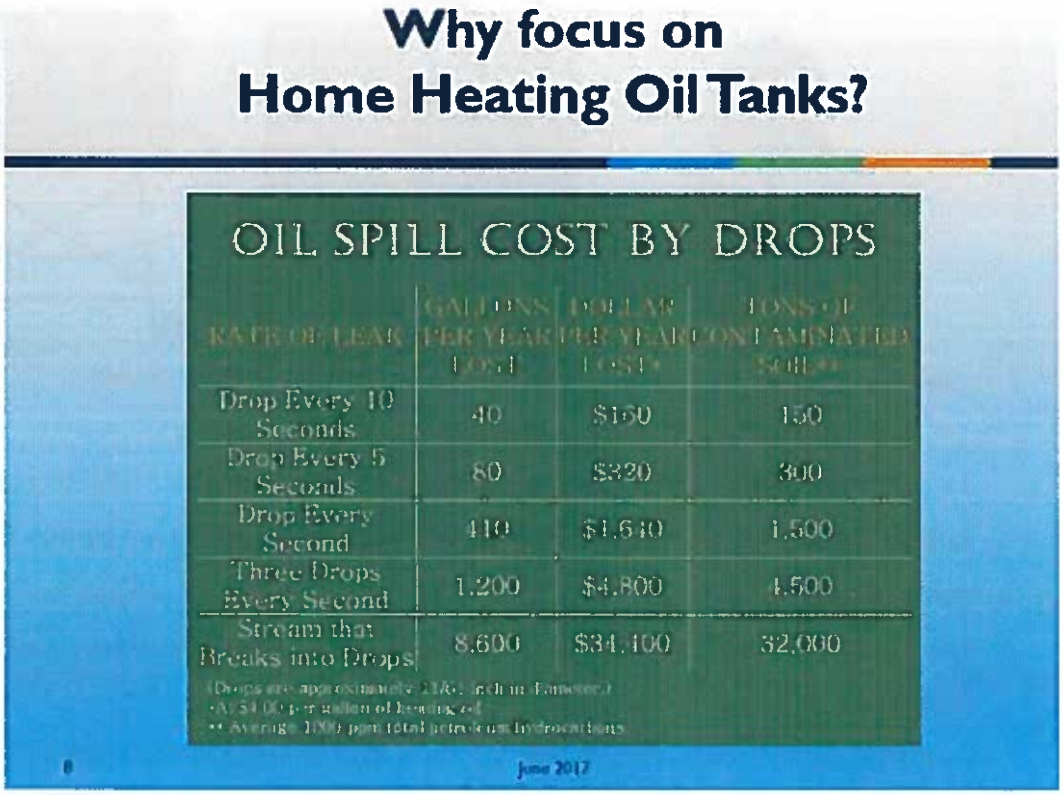
Causes and Corrections

- Overfills
- Sudden Accidents
  - Kids climbing on tanks, lines and filters
  - Vehicles run into tanks or exposed lines
  - Bears stretch out on tanks
  - Moose step on exposed lines
- Vandalism/Theft
- Earthquakes/Floods

- Most of these causes are preventable if you routinely:
  Inspect & Correct = cash/dollars



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Information and Resources:

Alaska Division of Homeland Security and Emergency Management
http://www.ready.alaska.gov/

Alaska Department of Commerce, Community and Economic Development, Division of Community and Regional Affairs
http://commerce.state.ak.us/dnn/dcra/Home.aspx

State of Alaska Department of Environmental Conservation publication:
Alaska Heating Oil Tanks—A Complete Guide for Property Owners
http://dec.alaska.gov/spar/perp/docs/HHOT%20Guide.pdf

Environmental Protection Agency publication:
Managing Your Hazardous Waste
http://www.epa.gov/epawaste/hazard/generation/sqg/handbook/k01005.pdf

Credit of FEMA, State of Alaska, Department of Military and Veterans Affairs, Homeland Security & Emergency Management.

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IT'S THE LAW!

AS 46.03.755 and 18 AAC 75.300

REPORT OIL AND HAZARDOUS SUBSTANCE SPILLS

During Normal Business Hours

call the nearest response team office:

Central Alaska: Anchorage	(907) 269-3063 Fax: (907) 269-7648
Northern Alaska: Fairbanks	(907) 451-2121 Fax: (907) 451-2362
Southeast Alaska: Juneau	(907) 465-5340 Fax: (907) 465-5245
Alaska Pipeline: Fairbanks	(907) 451-2121 Fax: (907) 451-2362

Outside Normal Business Hours

Toll Free	1-800-478-9300
International	1-907-269-0667

Alaska Department of Environmental Conservation
Division of Spill Prevention and Response
www.dec.alaska.gov/spar/spillreport.htm

Hazardous Substance

Any hazardous substance spill, other than oil, must be reported immediately.

Oil – Petroleum Products

To Water

- Any amount spilled to water must be reported immediately.

To Land

- Spills in ***excess of 55 gallons*** must be reported immediately.
- Spills in ***excess of 10 gallons, but 55 gallons or less,*** must be reported within 48 hours after the person has knowledge of the spill.
- Spills of ***1 to 10 gallons*** must be recorded in a spill reporting log submitted to ADEC each month.

To Impermeable Secondary Containment Areas

- Any spills in ***excess of 55 gallons*** must be reported within 48 hours.

Additional Requirements for Regulated Underground Storage Tank Facilities

Regulated Underground Storage Tank (UST) facilities are defined at 18 AAC 78.005 and do not include heating oil tanks.

If your release detection system indicates a possible discharge, or if you notice unusual operating conditions that might indicate a release, you must notify the ADEC UST Program within 7 days.

UST Program: (907) 269-3055 or 269-7679

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Threat: ***Asbestos (fibers>10 micrometers):*** (Inorganic Chemical) Potential Health effects from long term exposure above the Million Fibers per Liter (MFL): Increased risk of developing benign intestinal polyps.

Common sources of contaminant in drinking water: Decay of asbestos cement in water mains (water pipes that are covered with outdated materials); erosion of natural deposits, and old buildings that has old asbestos based vinyl floor tiles, coverings of old water pipes. These should be avoided or disturbed due to asbestos fibers become airborne.

Safe Maximum Contaminate Level (MCL); 7 million fibers per liter, this is the Public Health Goal, if there is a suspect of asbestos in an old home, consult with Health Department Provider and/or community housing department with the community, so an expert can evaluate your home.

1 quart = 0.946 liters

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ASBESTOS

FACT SHEET ON A DRINKING WATER CHEMICAL CONTAMINATE

GENERAL INFORMATION

Synonyms: None

Chemical Description:

- Generic name for a group of naturally occurring hydrated silicate minerals of the amphibole or serpentine groups which are characterized by fibers or bundles of fine single crystal fibers.

Properties:

- Asbestos fibers have a high tensile strength, flexibility, heat and chemical resistance, low heat and electrical conductance, low porosity, and favorable frictional properties.
- White, gray, green, or brown fibers that do not clump together.
- Slightly soluble in water

Production and Use:

- Properties of the fibers determine their uses
  1. Asbestos cement pipe and sheet
  2. Flooring, roofing, friction products
  3. Packing and gaskets
  4. Thermal, and electrical insulation
  5. Coating and compounds
  6. Filtration media and asbestos paper and plastics
- Chrysotile (serpentine group) accounts for approximately 94% by weight of asbestos use in U.S.

Environmental Profile

Occurrence:

- Common contaminate of domestic water supplies, but EPA has concluded that about 95% of water consumers are exposed to asbestos fiber concentrations of less than one million fibers per liter (MFL)
- Occurs naturally through erosion of mineral deposits of serpentine and other asbestos-containing materials in surface water systems

Releases:

- Contamination of drinking water may be attributed to erosion of natural mineral deposits runoff from tailings from mining operations, improper disposal of

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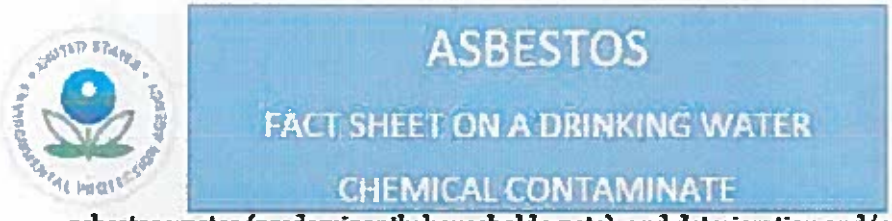

asbestos wastes (predominantly household waste), and deterioration and/or tapping of asbestos/cement (A/C) pipes in municipal water distribution systems

Environmental Fate:

- Highly persistent in water
- Low potential for bioaccumulation
- Asbestos wastes are discharged predominantly to land, and least to water
- Not likely to migrate to ground water if released to soil

HEALTH EFFECTS

Humans:

- Little data on experiments with humans
- Case studies have indicated that inhalation of asbestos fibers causes cancer in humans, also causes asbestosis (diffuse interstitial fibrosis of the lung)

Experimental Animals:

- Exposure via inhalation or ingestion (inhalation is the more common exposure pathway and the more detrimental to health)
- Low acute toxicity:
    1. the bulk of inhaled asbestos (the longer fibers) is rapidly cleared from the respiratory tract to the gastrointestinal tract)
    2. most fibers entering the gastrointestinal tract are passed through the digestive system and are excreted with the feces; however, evidence indicates that they may penetrate the walls of the tract
- Chronic exposure to asbestos via inhalation causes asbestosis and cancer (lung cancer, cancer in the chest cavity, may also cause cancer of the abdominal wall, digestive system, larynx, ovaries, and uterus)

REGULATORY PROFILE

Existing Standards:

- **Clean Air Act (CAA):** Regulated
- **Clean Water Act (CWA):** Criteria established
- **Resource Conservation and Recovery Act (RCRA):** not regulated
- **Superfund (CERCLA):**
    1. Hazardous waste
    2. **SARA:** Toxic substance
- **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):**
    1. Not registered
- **Toxic Substances Control Act (TSCA):** Regulated

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ASBESTOS

FACT SHEET ON A DRINKING WATER CHEMICAL CONTAMINATE

HEALTH INFORMATION

Maximum Contaminant Levels Goals (MCLG):

- Non-enforceable levels based solely on an evaluation of possible health risks and exposure, and taking into consideration a margin for public safety
- Set at 7 MFL to protect against cancer
  MCLG for Asbestos = 7 Million Fibers per liter (MFL) (effective July 1992)

EPA Health Advisories (HA):

- **Short-term Has:** Provide acceptable concentrations of contaminants in water for up to 10 day exposure, primarily to evaluate the public health risk resulting from an accidental spill or an emergency contamination situation
- **Longer-term Has:** provide guidance for persistent water contamination situations to cover a period of up to 7 years
- **Lifetime Has:** Derived in the same way as a, MCLG

Health Advisories (EPA has not established Has for asbestos in water)

Analytical Methods

- **Transmission Electron Microscopy EPA-600/4-83-043**

Water Treatment

Permanent Treatment:

Best Available Technology (BAT);

- Coagulation/Filtration
- Direct Filtration
- Diatomite Filtration
- Corrosion Control

Short-Term Hazard Elimination

- If the drinking water standards are exceeded, install BAT or use alternative drinking water supply such as bottle water

Additional Help

- State or health officials can indicate a certified laboratory for testing
- Experts in the state department of Environmental Conservation or Natural Resources may also be of help

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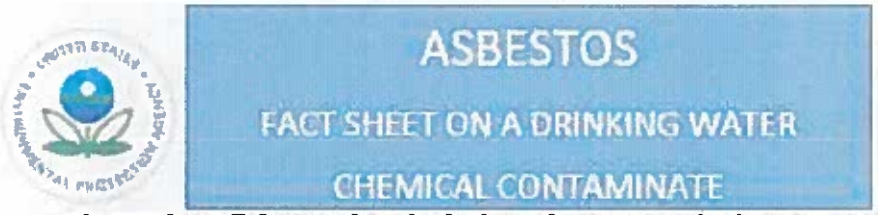

- The EPA has toll-free numbers for further information on drinking water quality treatment technologies, for obtaining Health Advisories, and for other regulatory information
- EPA Hotlines are available Monday through Friday
- **Safe Drinking Water: 800-426-4791**
- **National Pesticides: 800-858-7378**
- **Superfund/RCRA: 800-424-9346**
- For information on the Clean Water Act, call (202) 260-7301
- For information on the Toxic Substances Control Act, call (202) 554-1404
- For Information on the Clean Water Act, call (919) 541-2777
- For information **State of Alaska, Village Safe Water,**
  Web site: Alaska Department of Environmental Conservation, Division of Water and download staff contact information by community name (PDF)

Thanks to EPA for valuable information on Asbestos Fact Sheet on a drinking water chemical contaminate

Threat: Microorganisms (viruses, bacteria, parasites, etc.)

Contaminants in this category may cause relatively well known illnesses, such as Beaver Fever (*giardia lamblia*), Legionnaire's Disease (*legionella*), E. coli (*Escherichia coli*) viral infections and various parasitic worm infestations. Symptoms may originate in the gastrointestinal system beginning with nausea, cramps, vomiting, diarrhea, dehydration, anemia, etc. and usually require medical treatment. However, some microorganisms will quickly migrate to the blood stream, liver or lungs and initial symptoms may be associated with those areas.

Because microorganisms are generally too small to be seen by the unaided human eye, water that appears clean and clear may still pose a significant health risk.

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The general approach to eliminating microorganisms is to disinfect the water. Common disinfectants include boiling the water (at least 1 minute at sea level and at least 3 minutes at altitudes over 3000') or adding chemical additives (chlorine (bleach), iodine, etc.) that are readily available. Most of the chemicals used to treat water for microorganisms will evaporate with simple aeration (**Aeration** is the process by which air is circulated through, mixed with or dissolved in a liquid or substance). but, some require special processing. When using a chemical disinfectant process, it is very important to follow the specific directions provided by the manufacturer for that particular product to avoid subsequent chemical contamination.

Particulate matter (organic and inorganic)

Many inactive ingredients may be found suspended in water. They will generally be visible as cloudiness, murky, cloudy, roiled, muddy (turbidity) that can usually be settled or filtered out of the water. The suspension may consist of vegetation, glacial silt or other matter that may not be harmful to consume but, usually affects the taste of the water.

Particulate matter suspended in water will separate rather easily with time. Some of the suspended particulate matter (glacial silt, etc.) will sink to the bottom and other suspended particulate matter (cellulose fibers, etc.) will rise to the surface, depending upon the density of the matter. One may then isolate the clear water for use and dispose of the unwanted material. A quicker method is filtration. Many filtration methods are available that will readily clear water.

WATER TREATMENT

Once you have the water test samples from the testing laboratory and or Alaska Department of Conservation (ADEC), (this test report should be posted to the public) you will know if there are any contaminants that must be removed from your water to have an adequate safe drinking water supply for the community.

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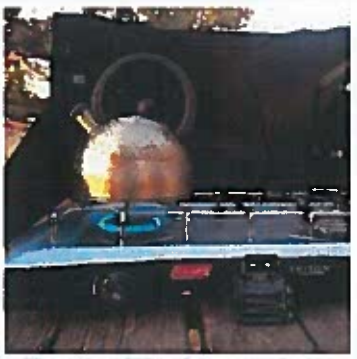
These contaminants may be broadly grouped as microorganisms, chemicals and particulate matter.

Emergency Disinfection of Drinking Water

In an emergency situation where regular water service has been interrupted – like a flood, or water pipe breakage – local authorities may recommend using only bottled water, boiled water/boil water notice, or disinfected water until regular water service is restored. The instructions below show you how to boil and disinfect water to kill most disease-causing microorganisms that may be present in the water. However, boiling or disinfection will not destroy other contaminants, such as heavy metals, salts, and most other chemicals.

- Use **bottled water** or water you have properly prepared and stored as an emergency water supply.
- Look at the water carefully. How clear is it? Cloudy water is not safe to drink. If water is cloudy, let it settle and filter it with a Brita and/or through a clean cloth, paper towel, or coffee filter.

- **Boil water**, if you do not have bottled water. Boiling is sufficient to kill pathogenic bacteria, viruses and protozoa (protozoa a tiny organism whose body is a single cell).
- Bring water to a rolling boil for at least for three minutes.
- Let water cool naturally and store it in clean containers with covers.
- To improve the flat taste of boiled water, add one pinch of salt to each quart or liter of water, or pour the water from one clean container to another several times.



- **Disinfect water using household bleach**, if you can't boil water. Only use regular, unscented chlorine bleach products that are suitable for

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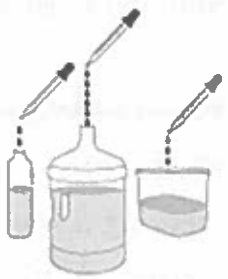
disinfection and sanitation as indicated on the label. Do not use scented, color safe, or bleaches with added cleaners. If water is cloudy, let it settle and filter it through a clean cloth, paper towel, or coffee filter.

- Locate a clean dropper from your medicine cabinet or emergency supply kit.
- Locate a fresh liquid chlorine bleach or liquid chlorine bleach that is stored at room temperatures for less than one year. The label should say that it contains 8.25% of sodium hypochlorite (bleach).
- Use the table below as a guide to decide the amount of bleach you should add to the water, for example, add 6 drops of bleach to each gallon of water. Double the amount of bleach if the water is cloudy, colored, or very cold.
- Stir and let stand for 30 minutes. The water should have a slight chlorine odor. If it doesn't, repeat the dosage and let stand for another 15 minutes before use.
- If the chlorine taste is too strong, pour the water from one clean container to another and let it stand for a few hours before use.

Volume of Water	Amount of Bleach to Add*
1 quart/liter	2 drops
1 gallon	6 drops
2 gallons	12 drops (1/8 teaspoon)



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4 gallons	1/4 teaspoon
8 gallons	1/2 teaspoon

Water Tools

Collection, transportation, treatment, storage or use of water generally requires the assistance of tools generally classified as containers. The type of container to be used will be determined by the function it must perform. The function, size, material and even shape of the container can affect its ability to maintain safe water quality. It need not be complex; simple common sense can guide proper container selection.

Types of Water Filters: What Do I Need?

What are the different types of water filters? This guide makes the process of choosing a water filter more straightforward. It can help in making a big decision, a little bit easier.

Choosing a water filter can be a confusing experience, because of all the different types of water filters available. There are many types of water filters for home use, and all water filter types offer something different. Some are easy to look after and to install, while some require a bit more maintenance and care.

This page to make the process of choosing a water filter a bit easier. Your choice of the proper type of water filters will depend on your specific needs.

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Without reliable advice from a knowledgeable source, the question "what water filter do I need?" can seem insurmountable. It's easy to get overwhelmed by all the options available, but with this guide, we hope the choice is much more straightforward.

So, What Types of Water Filters Are There?

What are the methods used to purify water? How do water filters work?

Water purification methods include physical processes such as filtration, sedimentation, and distillation; biological processes such as slow sand filters or biologically active carbon; chemical processes such as flocculation and chlorination and the use of electromagnetic radiation such as ultraviolet light. All of these water treatment methods are used by various water filter types and filtration systems to produce pure water.

How does activated charcoal filter water?

Activated charcoal is charcoal (carbon) that has been treated with oxygen to open up millions of tiny pores between the carbon atoms. These "activated" charcoals are so porous that they are extremely efficient at absorbing polluting substances from gases or liquids. Activated carbon is the key element in many water purification systems, with activated carbon filters providing pure water, improving the taste and smell of tap water in a huge proportion of the water supply. Even the producers of commercial grade distilled water and bottled spring water use such filtration as part of their process.

What are the different types of water filters?

Activated Carbon Filters (also known as carbon filters, sediment filters, or pre-filters) remove larger particles like sediment and silt (and larger bacteria) from your filtered water.

Reverse Osmosis Filters use a series of graduated filters and a semi-permeable membrane to screen water under pressure and remove even the smallest particles (like heavy metals) from the water supply.

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Alkaline/Water Ionizers use electrolysis, passing water over electrically charged plates to separate it into two filtered water streams, one alkaline and one acidic.

UV Filters use ultraviolet radiation to treat water. UV has the ability to destroy various forms of dangerous bacteria to clean water.

Infrared Filters are similar to alkaline filters. Infrared uses heat and light to negatively charge hard water, giving it a softer feel.

Which water filter removes the most contaminants?

Reverse Osmosis Filters usually remove the most contaminants, minerals, and particles. However RO water purifiers can be expensive to install and maintain, and might not be the best water treatment solution for your particular needs. Flow rate is also a concern. RO filters seldom have as rapid a water flow as other, less comprehensive filtration systems for water.

Which Water Filter Do I Need?

There are two ways that you can base your decision. You can choose the best water filtration method for your home according to:

A) The type of water filtration that will fit your lifestyle & budget.

If for example, you need to filter ALL of the household water, then you need a whole house water filter. However whole-house filters tend to be expensive. If money is tight, then a faucet filter would be a good choice. Faucet-mounted filters can improve your water quality more economically.

OR

B) The specific contaminants that you are worried about.

If you are particularly worried about lead contamination (for example), then you can choose a filter that specializes in this problem.

We recommend always going with option B unless circumstances force you otherwise.

Ok, let's deal with each of these methods of choosing from the different kinds of water filters in a bit more detail.

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Method A – Choosing based on lifestyle & budget

There are a few important questions that need to be answered here. Rather than ramble on, we've put together an infographic below that should help you arrive at a decision. You can click on the links in the image to learn more about each method of filtration or read on for a brief introduction into each type of water filter.

Designed by Freepik

best-whole-house-water-filter-reviews-2 - types of water filters Whole House Water Filter

Installation: Medium to Hard

Price: $ to $$$$$

Effectiveness: Medium to Very

A whole house filtration system is installed where the main water line enters the home. Therefore, it filters ALL of the household water (drinking and bathing). However, this means installation is a bit more complicated, and basic DIY skills are needed.

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These systems can be very cheap for a simple 1-stage of filtration, and the price increases with each extra stage of water filtration (usually up to 3-filtration stages).

They can filter particles down to 0.35 microns in size, but more commonly 1-5 microns. This is a very good level of water filtration that is only beaten by reverse osmosis.

types of water filters Reverse Osmosis Water Filter

Installation: Medium

Price: $$ to $$$$

Effectiveness: Extremely

A reverse osmosis system offers the most effective form of home water filtration available. It is usually installed under the kitchen sink and will filter the water at the kitchen faucet. Installation is not difficult and usually takes a couple of hours.

These units offer incredible water filtration of around 0.0001 microns. That means your drinking water is as pure as possible. This is achieved using the multiple filtration stages (usually 5 or 6), which include the reverse osmosis membrane.

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best-faucet-water-filter-reviews-2017-new - types of water filters Faucet Water Filter

Installation: Easy

Price: $

Effectiveness: Medium

A faucet filter attaches directly onto your kitchen faucet. Installation usually requires no tools, and replacing a filter is simple.

They are not as effective as reverse osmosis systems, but they are cheap in comparison. The filters are also very well priced.

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countertop-water-filter-review-compilation-smaller - types of water filters

Countertop Water Filter

Installation: Easy

Price: $ to $$

Effectiveness: Medium to Good

These attach to your faucet head. No tools are required for the installation, which will just take a few minutes. These can offer more thorough filtration than the faucet and pitcher filters.

Some models have multiple filter stages, and pH balancing to make the water more alkaline. They offer a pretty good balance of value, effectiveness, and ease of use.

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best-water-water-filter-pitcher-reviews-of-the-year - types of water filtersWater Filter Pitcher

Installation: None

Price: $

Effectiveness: Medium

These are the ultimate in convenience as there is no installation required. Pitcher filters are probably the cheapest method of water filtration (though faucet systems can be cheap too). The more advanced models make alkaline mineral water that tastes good.

Method B – Choosing based on the water contaminants

If you know exactly what is hiding in your water, then choosing a water filter that actively targets these pollutants is a great idea.

If you're not sure what contaminants are in your water, then you should check out our guide to water testing. We highly recommend testing your water before choosing a water filter.

The most common water contaminants that we get asked about are:

Lead

Chlorine

Fluoride

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Luckily, there are various types of water filter that target exactly these things. We've put together some resources that recommend the best filters to deal with these particular contaminants. We cover a range of filtration methods that should suit every home, budget, and lifestyle. Plus we also delve into the backgrounds of these pollutants to see where they come from, and how they happen to be present in our water.

What's the Best Water Filter for Lead Removal?

Quick Comparison: The Best Water Filters for Lead Removal

iSpring RCC7 Reverse Osmosis System

- Features: Amazing value
- > Cheap filters
- > Easy to install

WaterChef C7000

- Features: NSF certified
- > Lifetime warranty
- > Intelligent filter life monitor

Filtrete Maximum

- Features: NSF certified
- > Reduces 99% of lead
- > Installs in less than 30 minutes

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Find the perfect filter for lead removal with 3 of the best. Find out why lead is so bad, and what else you can do to prevent it from being a threat to your home.

So, why get a lead water filter?

Here's some information on the background of lead. We discuss why you should be worried about it, and the steps you can take to make sure you limit your exposure to it.

Lead is a chemical element that is particularly poisonous to us. Throughout history it has been valued as being very useful in many ways, but more recently it has been highlighted as being very dangerous.

Lead is actually a neurotoxin that is particularly damaging to children and pregnant women. Studies have linked it to causing learning difficulties through brain disorders.

Lead was long used as a building material, and that is where our recent problems stem from. It has recently grabbed headlines worldwide because of the water crisis in Michigan, USA.

How does lead get into our water supply?

It's important to note that lead is odorless, colorless, and traces will probably not be visible to the naked eye. This makes identifying it a problem.

There are 3 ways in which you can find out though:

1. Local water systems are required by law to publish an annual water quality report. Those of you whose water comes from a private source would have to check with their local health department or test for yourself.

Note that the results of these reports are accurate for the point of testing (usually the water plant). They do not take into account any contamination that lead based plumbing in your home might cause, or even lead in pipes that line the route from the plant to your home.

2. Have your water tested by a certified laboratory. This is the best option as it takes into account any plumbing in your home. The water is tested at the

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point of use, so the results are more conclusive. Testing can cost between $20-$100 and local laboratories can be found by contacting your local water authority.

3. Test your water yourself. Find out how using our guide.

What can we do about lead contamination?

1. Use a water filter. Look for filters that are certified by NSF and WQA to reduce lead. Most reverse osmosis systems will be capable of reducing lead contamination.

You want to be looking for NSF/ANSI Standard 53 for pitcher, faucet, countertop, refrigerator, or in-line filters.

For reverse osmosis systems NSF/ANSI Standard 58 deals with lead reduction.

2. Flush your pipes before use. The longer that water lies stagnant in your pipes, then the higher levels of lead will be in it. You should run your faucet long enough for the water to get as cold at possible, before using it.

Note this should not replace the use of a filter. It can help alongside the use of a filter.

3. Only use cold water for any cooking or drinking. Hot water will contain higher levels of lead. It should be noted that more traditional methods of "purifying" water like boiling, have absolutely no effect on lead. It is reasonably safe to shower in lead contaminated water, as lead is not absorbed by human skin.

What's the Best Chlorine Filter?

Worried about chlorine in your water? Today, we recommend 4 of the best chlorine water filters available. We also discuss the backstory of water chlorination, and how it came to pass.

chlorine-in-water

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Chlorine is knowingly added to water supplies to prevent bacteria from growing. The chlorination of water began long ago when illnesses like typhoid, cholera, and dysentery were commonplace. However, chlorine itself is actually very toxic. Chlorine gas is even used as a chemical weapon, and has been labeled as a "choking agent". Furthermore, chlorine in water is known to combine with organic matter to form harmful Trihalomethanes (THMs). These have been linked with negative health effects, including cancer.

So, what can we do to limit our exposure to harmful chlorine?

Well, one of the most effective ways to combat chlorine is by using a water filter.

In this section, we recommend 4 of the best water filters that remove chlorine.

The four types of water filter that recommend are:

A reverse osmosis system that is incredibly effective in removing over 1000+ harmful contaminants.

A whole house system that will filter all of your household water (drinking & bathing).

A water filter pitcher that is less expensive and requires no installation

A chlorine shower filter that will protect your skin, hair, and lungs.

The Top 4 Chlorine Filters

These are the chlorine filters that we feel offer some of the best protection out there.

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1. Reverse Osmosis – iSpring RCC7

ispring-rcc7-larger-imageReverse osmosis is the most effective form of home water filtration available. This method of filtering water can remove 1000+ pollutants from water by up to 99%.

This particular system is one of the best, and is certified to remove 94-95% of chlorine, and over 90% of chlorine's harmful THM by-product.

It has been awarded a WQA Gold Seal to prove its effectiveness in filtering drinking water.

It is installed under the kitchen sink, and provides clean drinking water at the kitchen faucet.

The iSpring brand is one of the best in the business of water filtration. They have a great reputation, and offer an amazing one year satisfaction guarantee, and lifetime support from their team of specialists.

2. Whole House System – Aquasana Rhino EQ-400

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aquasana-rhino-chloramine-filterThis is a whole house system that will filter all of the household water. That means clean drinking water, and also bathing water that is safe from chlorine.

This model specializes in the removal of chlorine and its by-products. It has been independently tested to remove an amazing 97% of chlorine, as well as chloramines. It also removes dangerous heavy metals such as mercury and lead, as well as herbicides, pesticides, VOCs, and industrial solvents.

Being a whole house system, it is the most expensive of our recommendations. However, the chlorine filter can last up to 6 years, which surpasses anything else I have seen.

It takes a bit of extra work to install, but it will protect your whole home from harmful contaminants.

3. Water Filter Pitcher – ZeroWater 10 Cup Pitcher

zerowater-10-cup-pitcher-small-imageThis water filter pitcher is the only one certified to reduce lead, chromium, and chlorine. It also removes over 99% of mercury, copper, and arsenic. It's also the cheapest of the drinking water filters that we have included, by some margin.

It uses a 5-stage filter that removes up to 99.6% of total dissolved solids (TDS) from the water. A nice touch is the inclusion of a digital TDS meter which allows you to measure the quality of the water.

This water filter is completely portable, and doesn't require any installation. Despite its simplicity, it's still an effective filtration tool.

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4. Shower Chlorine Filter – Culligan WSH-C125

Culligan-WSH-C125This chlorine filter shower head is really easy to install and requires no tools. The filter cartridge lasts for around 6 months, and protects against chlorine and sulfur. It is NSF certified and meets the EPA Water Sense certification standard. The filter media is also patented to inhibit bacterial growth.

The chlorine filter shower head has anti-clog rubber spray nozzles that give 5 different spray settings, for maximum comfort. It is also available in wall mount or handheld options.

This model has some of the best chlorine shower filter reviews we have seen. But, best of all it is really attractively priced.

Fact Sheet

Water storage tank requirements by, State of Alaska, Department of Environmental Conservation for Alaska water storage tanks. Periodic maintenance is required for storage tank, itself. Materials that is too small to be removed during the treatment process will enter the tank. In time, these fine particles settle out of the water forming a layer of sediment at the bottom of the tank that must be removed. Examples of sediments:

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Importance of cleaning the water storage tank, the taste of water might taste rusty, and will clog up the water plants filtration system more frequently, thus creating costly maintenance. Cleaning intervals of the water storage tank will vary depending on the quality of water being treated and efficiency of the treatment process.

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Your Water Storage Tank

The water storage tank (WST) is an integral part of most small water systems. It serves not only as a vessel to store water after it is treated, but also provides time for disinfecting chemicals to act against microorganisms before the water is distributed to consumers. Chlorine is the most popular and widely used disinfecting agent in Alaska. Given enough time to react, chlorine will kill most disease-causing organisms. This "contact time" or "CT", is critical to maintaining safe drinking water supplies. The WST also provides a readily available source of water for fire protection and, during certain times of the year, may be the only source of water available to the community for fire fighting purposes. The WST is critical to the public health and safety of the community.

Many parts of Alaska experience extremely cold temperatures during winter months, presenting a special challenge to small system operators. Most water storage tanks are insulated, but would eventually freeze during Alaska's long winters unless the water is heated and circulated within the tank. The water is normally circulated from the tank to the treatment plant through an "add-heat system" -- a series of pipes, boilers, heat exchangers and temperature sensors -- and then back to the tank. The water temperatures must be closely monitored by the system operator to avoid freezing and damage to the tank. The "add-heat system" must also be carefully operated and maintained to avoid potentially catastrophic system failure.

"The water temperatures must be closely monitored by the system operator to avoid freezing and damage to the tank."

Periodic maintenance is required for the storage tank, itself. Material that is too small to be removed during the treatment process will enter the tank. In time, these fine particles settle out of the water forming a layer of sediment at the bottom of the tank that must be removed. This requires draining the tank to gain access, manually removing the material, and cleaning the tank.

Cleaning intervals will vary depending on the quality of the water being treated and the efficiency of the treatment process.

Many systems in Alaska utilize streams and lakes as a source of water. "Surface water" is often less desirable than "groundwater" but in many cases is the best resource available. Surface water has a higher potential for being contaminated than water pumped from underground wells, or "ground water." Surface water has special regulatory requirements if used as a public drinking water supply. It can also introduce more sediments to the storage tank, thereby prompting more frequent cleaning intervals. Water storage tanks are usually cleaned twice a year, but may need to be accessed more often for the inspection and maintenance of other internal system components.

Large storage tanks will also have a chlorine injection port to enable the operator to maintain a good chlorine residual in the tank. This is especially important when water is pumped during the

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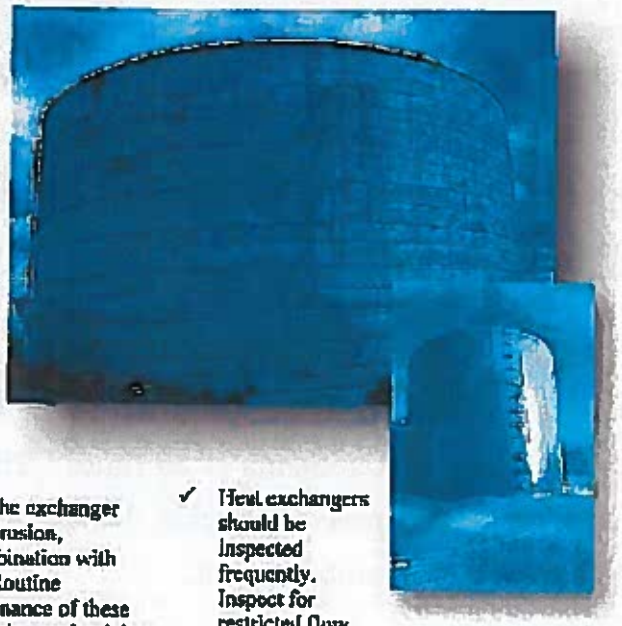
summer months and stored for winter use. The chlorine injection port is commonly plumbed into the add-heat line.

Water quality is also an important consideration when using an "add-heat system." Pipes, valves, heat exchangers and even pumps can become clogged with mineral deposits and corrosion. This build-up of material can be very rapid in some systems, especially in the heat exchanger. Corrosion warrants special attention to the heat exchanger as well. Corrosion can quickly erode the tubing walls in the exchanger and threaten the system with glycol contamination. High water velocity through the exchanger increases tubing erosion, especially in combination with corrosive water. Routine preventive maintenance of these systems is essential to maintaining a safe and reliable water supply. An operator must know the characteristics of the water to develop a scheduled maintenance plan and checklist for the tank and "add-heat system."

Most rural communities have access to a Remote Maintenance Worker (RMW) who can provide assistance with storage tank cleaning and inspection. The RMW can also provide tips regarding other preventive maintenance activities associated with the storage tank and "add-heat system", as well as the treatment plant.

The following is a general checklist that all operators of small systems that rely on water storage tanks for continuous year round service need to be aware of.



- ✓ Heat exchangers should be inspected frequently. Inspect for restricted flow due to excessive deposits or buildup. Pressure test the exchanger to protect against the introduction of untreated water or contamination.
- ✓ Special safety precautions should be taken to protect workers whenever the tank is entered. Confined space entry regulations must be followed. Personal protective equipment (PPE) should be worn by all personnel.
- ✓ On initial entry to the tank, make sure the electrical source for lights and equipment is protected by a Ground Fault Circuit Interrupter (GFCI) device to prevent electrocution.
- ✓ Always provide an adequate fresh air supply.
- ✓ Any time the tank is accessed, inspect internal plumbing for damage or blockage. Make sure flow is completely unrestricted in the "add heat system."
- ✓ Ice formation is not uncommon in these tanks. Check structural members for damage caused by the ice.
- ✓ Inspect temperature sensing devices for accuracy and damage.
- ✓ Take pictures to provide a means to compare internal tank condition from year to year and make note of any discrepancies.

For more information contact Kerry Lindley at 465-5143 or klindley@envircon.state.ak.us

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Containers

Barrels, bottles, jugs, etc. are all examples of holding devices. If drinking water will be held for an extended period of time, it should be a container that includes a cover that will prevent airborne or falling contaminants from entering the water. These devices and covers should be constructed of material that will not leak or leach into the water with time. Glass, stainless steel, porcelain, ceramic and some plastics are good materials for this purpose.

If water is to be extracted in single use quantities, an outlet at the bottom should be available to control the release of water without exposing the remaining water to possible contaminants. This avoids the need to dip another item into the water which can easily introduce unseen contaminants into safe drinking water.

If you must use a container that requires dipping to obtain water, keep it covered when the water is not being accessed and always keep the dipping tool far away from any possible contaminants at all times. This includes contact with other items such as insects, animals, hands, used towels, counters, walls, etc. that may harbor contaminates.

Safe Drinking Water Costs

Safe drinking water may take time, effort and even some money. Many times, it may seem to be a boring, inconvenient or troublesome process. In reality, the cost of ensuring safe drinking water quality is quite small and usually need only occur at periodic intervals. When put in perspective, the investment is minimal and the return can be quite substantial. Your communities health and the health of your family and friends requires adequate safe drinking water.

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Contaminated Drinking Water Costs

The cost of safe drinking water is easily calculated in measurements of time, effort and money. The cost of contaminated drinking water may be much higher and more difficult to calculate. How much is your health and safety worth?

For example, one encounter with Beaver Fever may require emergency transportation to a medical facility, treatment with antibiotics and rehydration therapy, days in the hospital, more time at home in bed for recovery, loss of income and productivity, misery, pain, suffering, etc. The list could go on. Now, multiply that "cost" by the number of people served by that water.

Different contaminants affect one's health differently. Many health effects are permanent. Potential effects of contaminated drinking water include cancer, permanent damage to organs (brain, skin, eyes, liver, kidneys, heart, lungs, thyroid gland, stomach, etc.), permanent systemic damage (reproductive system, immune system, nervous system, circulatory system, digestive system, etc.), hair loss and fingernail loss.

Some pay the ultimate price for using contaminated drinking water, life itself. Infants, children, elderly and anyone with a compromised immune system (those suffering from illness) are at the greatest risk of damage from contaminated water. It becomes quite clear that the cost of safe drinking water is much lower than the eventual cost of unsafe drinking water.

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Now, Pass it on!

To your family, friends, neighbors and community.

Adequate safe drinking water is everyone Responsibility.

Water is Essential to Life

Save our future, preserve our past, protect the infirm and live well.

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More Information

If you desire more information regarding adequate safe drinking water, here are a few of the many good web sites available to begin your quest for knowledge.

Alaska Department of Environmental Conservation
http://www.dec.state.ak.us/

DEC-Drinking Water Program Main webpage:
http://dec.alaska.gov/eh/dw/index.htm

DEC-Drinking Water Watch:
http://dec.alaska.gov/DWW/

Drinking Water Program-Fairbanks Compliance Contacts:
1-800-770-2137
1-907-451-2108

DEC-Drinking Water Program General contacts all regions
http://dec.alaska.gov/common/index.htm#dw

Drinking Water Program Engineering Contacts:
http://dec.alaska.gov/eh/docs/dw/Engineering%20Forms/DWEng-Contacts.pdf

Environmental Protection Agency
http://www.epa.gov/

World Health Organization (English language)
http://www.who.int/en/

Service providers for the community can provide vital information by contacting them.
Alaska Native Tribal Health Consortium, Clean Water & Sanitation

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4000 Ambassador Drive

Anchorage, Alaska 99508

(907) 729-1900

Web site: anthc.org

Tanana Chief Conference (TCC)

122 1st Avenue

Fairbanks, Alaska 99701

(907) 452-8251

Web site: tananachiefs.org

History of Safe Drinking Water Manual

1. Original Manual created August 13, 2013, Safe Drinking Water Practices Manual
2. Manual revised and renamed, August 2016, Safe Drinking Water and Sanitary Practices Manual
3. Manual revised FY 17, Risk and Threats
4. Manual revisions FY18, to include fact sheets
5. Manual revision FY19, added BIA Schools, old abandoned fuel tanks (risk from flaking lead paint)
6. Manual revision FY19, added types of filtration system, (May, 2019)

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