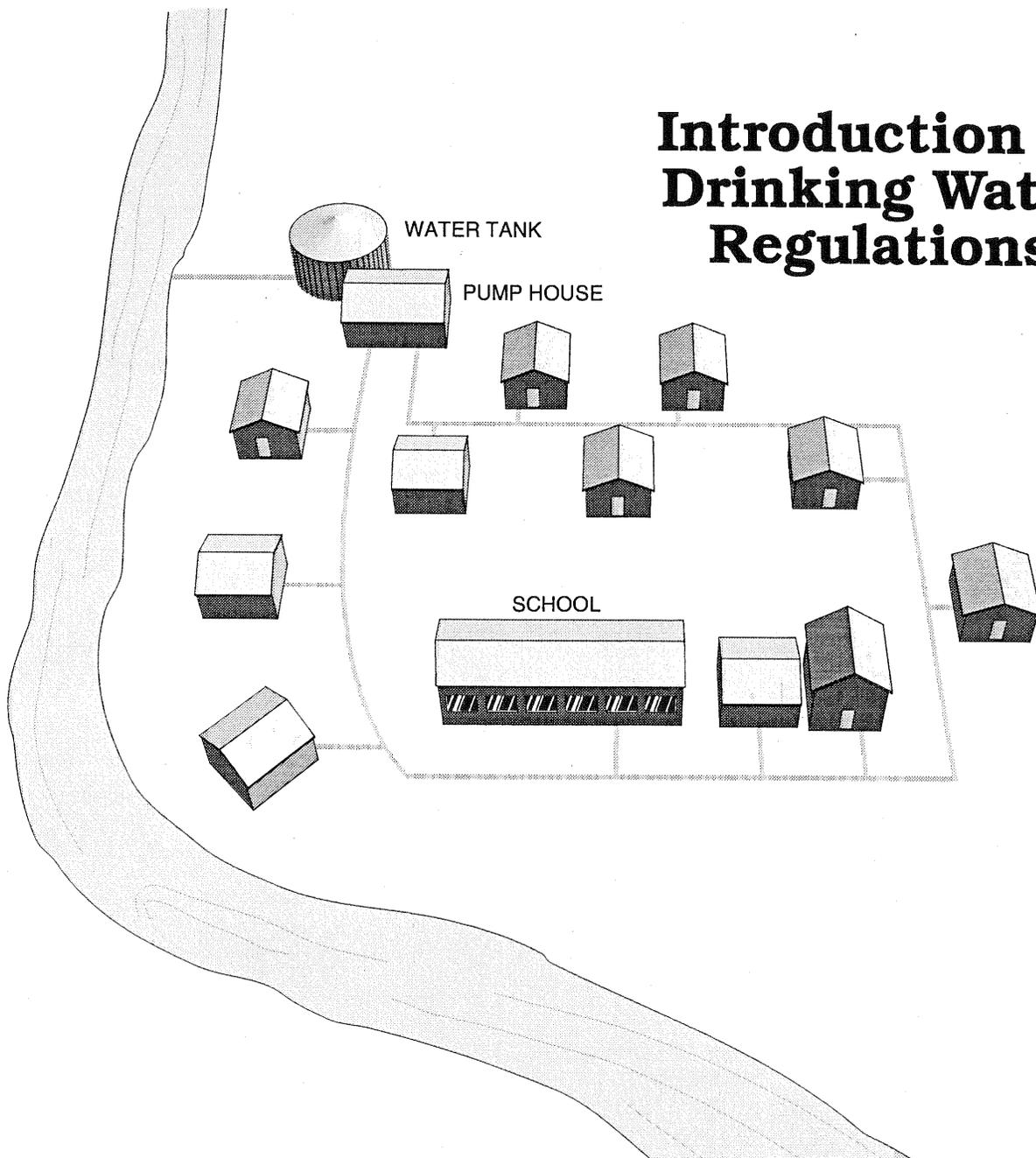


# O & M of Small Water Systems

## Introduction to Drinking Water Regulations



Alaska Department of Environmental Conservation  
Skeet Arasmith

## **O & M of Small Water Systems**

Funding for Development - Alaska Department of Environmental Conservation.

Development - Rolfe Stearns, Arasmith Consulting Resources Inc., Albany, Oregon.

Graphic Art - Kimon Zentz - Arasmith Consulting Resources Inc., Albany, Oregon.

Review team - Greg McPhee-Village Safe Water, Larry Strain-IHS Office of Environmental Health and Engineering, Linda Taylor-ADEC, Bill Fagan & Kerry Lindley-Department of Environmental Conservation, Jim Ginnaty-SEARHC.

Project Managers - Bill Fagan and Kerry Lindley.

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# INTRODUCTION TO DRINKING WATER REGULATIONS

## WHAT IS IN THIS MODULE?

1. What is a regulation?
2. Why have regulations?
3. Who makes them?
4. To whom do they apply?
5. When do they apply?
6. Who is responsible for following them?
7. Who enforces them?
8. The primary drinking water standards.
9. The secondary drinking water standards.
10. Brief overview of the implementing regulations.
11. The major contents of the Alaska Drinking Water Regulations.
12. The major contents of the Alaska Drinking Water Procedures Manual.
13. The major contents of the Alaska Water Treatment Guidance Manual.

## KEY WORDS

- Coliform Bacteria
- Inorganic Chemicals
- Repeat Monitoring
- Total Coliform
- VOC
- GUDISW
- MCL
- TTHM
- Turbidity

## MATH CONCEPTS DISCUSSED

- Does not apply

## SCIENCE CONCEPTS DISCUSSED

- Does not apply

## SAFETY CONSIDERATIONS

- Does not apply

## MECHANICAL EQUIPMENT DISCUSSED

- Does not apply

# INTRODUCTION TO DRINKING WATER REGULATIONS

## INTRODUCTION

### REASON FOR REGULATIONS

Regulations are typically established for two general reasons.

#### **Establish Minimum Service Levels**

One goal is to establish the minimum features or service level that a regulated product or service must provide.

#### **Protect the Public from Injury or Loss**

Another goal is to protect the public from some potential injury or loss, be it bodily injury, disease, financial loss or loss of natural resources. The cost of preventing injury or loss through the development and implementation of regulations is believed to be less than the social and financial cost of leaving a product, service or activity unregulated.

### ELEMENTS OF A REGULATION

A thoughtful set of regulations governing a service, like providing drinking water or an activity such as subdividing land, contains these elements:

- Introductory section including purpose, background, authorization and scope of the regulations.
- Measurable standards of performance.
- Required procedures for achieving the standards.

Regulators can rarely bully a water system into regulatory compliance through the use of penalties. The best route to compliance is through developing and communicating clear regulations so that the regulated parties can readily understand what is expected of them. The better the regulator organizes and writes each element of the regulation, the more the regulation is understandable and therefore more likely to be followed.

#### **Ideal Format**

The Alaska Drinking Water Procedures Manual is a good example of the ideal format. It does not include performance standards, because it specifically addresses procedures.

## INTRODUCTORY PROVISIONS

### PURPOSE

A comprehensive, yet clear statement of the purpose of the regulation shows what the legislator and the regulator expect to accomplish through the regulation. The purpose (sometimes called "objective") becomes the standard against which the regulation itself is measured. Just as the regulator monitors the utility for compliance, the citizenry needs to monitor the regulatory machine to see if it is producing the expected results at a cost that is worth the benefits of regulation.

### BACKGROUND

Sometimes regulations will include a brief background, history of events or findings which the legislators believed justify enacting statutes or the regulators believe will clarify the purpose and scope of the regulation.

### AUTHORITY

Regulations typically cite the statutes or other regulations which give the regulators authority to develop the regulations at hand.

### SCOPE

The statement of scope makes clear who is regulated and who must follow the regulations.

## PERFORMANCE STANDARDS

Standards explicitly state what counts as compliance. Performance standards are the targets to which the regulators and those regulated aim. Performance standards include both what a product or service must include and what it cannot include. For example in other states, public water systems must meet minimum service standards of pressure, volume and availability as well as not exceed the allowed concentrations for any **contaminant**<sup>1</sup>.

Performance standards are measurable and enforceable. They are written so that all parties can easily understand and know what counts as compliance. Where ever practical, regulations should allow those regulated the opportunity to determine their local means to meeting performance standards.

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<sup>1</sup> **Contaminant** - Microorganisms, chemicals and physical properties, which when present in sufficient concentration, make water unappealing or unsafe for human consumption.

## IMPLEMENTING RULES

These rules explicitly state how compliance will be achieved. The means to meet the performance standards is established by a written implementing rule. These rules may be both procedural rules covering operations and monitoring, and standards covering system design and construction. The following types of implementing rules are contained in the three-part set of administrative rules regulating drinking water in Alaska:

<b>Design &amp; Construction Standards</b>	Design and Construction Standards for water system sources, treatment and distribution.
<b>Operations &amp; Maintenance Procedures</b>	Operations and Maintenance Procedures including requirements for operator certification, procedures to protect surface and groundwater sources, and guidance on performing emergency repairs.
<b>Administrative Procedures</b>	Administrative Procedures including record keeping, plan review process and process for applying for a variance or exception from a performance standard or an implementing rule.
<b>Monitoring Procedures</b>	<b>Monitoring</b> <sup>2</sup> Procedures including methods and frequency of sampling, testing, reporting and notifying the public.

## WHO MAKES THE REGULATIONS?

### FEDERAL GOVERNMENT

#### CONGRESS

##### **Safe Drinking Water Act**

Congress enacted the Safe Drinking Water Act in 1974. The Act was amended in 1979 and 1986. As amended, the Act authorizes and requires the US Environmental Protection Agency to achieve the following:

- Establish national standards for the maximum allowable levels of contaminants in drinking water including adding additional contaminants on a regular basis and revising the allowable concentrations for contaminants already listed.
- Identify approved treatment techniques for each regulated contaminant.
- Establish filtration requirements for systems with surface water sources.

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<sup>2</sup> **Monitor** - In a narrow sense, to evaluate the quality of a process or product against a standard. The term is used in this module to broadly refer to the three stage process of:

- collection and analysis of a water sample to measure the presence of a contaminant,
- the comparison of the measurable amount of a contaminant to the Maximum Contaminant Level standard currently in effect, and
- the proper reporting and record keeping of that analysis and comparison.

- Establish regulations governing the disinfection of all water supplies.
- Prohibit the use of lead in products that are used to distribute drinking water.
- Require public water systems to sample and test their water and report any concentrations of identified contaminants.
- Offer state regulatory agencies the opportunity to assume the primary responsibility for enforcing the drinking water regulations.

#### **US ENVIRONMENTAL PROTECTION AGENCY**

The Safe Drinking Water Act is implemented through administrative rules written by the EPA. These laws are called administrative rules because they are detailed regulations developed by the administrative branch of government to carry out the acts or statutes passed by the legislative branch of government. The EPA administrative rules are usually referred to as regulations. These regulations may then be modified and adopted within each of the individual states that choose to assume primary responsibility for enforcing the drinking water regulations.

#### **Primary Drinking Water Standards**

To protect the public health, the EPA establishes achievable levels of drinking water quality. These standards are referred to as MCL's, Maximum Contaminant Levels. The primary standards set the maximum levels of each contaminant within five contaminant groups: Inorganic, organic, microbial, **turbidity**<sup>3</sup> and radiological contaminants. Primary standards are measurable levels intended to protect the public health and are therefore enforceable by law. These measurable standards have been established by the following EPA Rules: Volatile Organic Chemicals, Inorganics/Synthetic Organics - Phase II, Lead and Copper Rule, Disinfection by-products, Coliform Rule and Radio nuclides.

#### **Secondary Drinking Water Standards**

The National Secondary Drinking Water Regulations regulate those contaminants which affect the aesthetic qualities of drinking water and thereby affect the acceptability of the water. The health risk from high levels of these contaminants is indirect; that is, the public may substitute other supplies of drinking water that have higher health risks. At very high concentrations some of these contaminants may present a direct health risk.

The acceptable concentrations of these contaminants are called Secondary Maximum Contaminant Levels (SMCL's). These regulations are not federally enforce-

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<sup>3</sup> **Turbidity** - A condition in water caused by the presence of suspended matter, resulting in the scattering and absorption of light rays.

able; however states may choose to enforce any or all of the SMCL's. States may also modify the SMCL's by raising or lowering the acceptable levels of contamination.

**Surface Water Treatment Rule (SWTR)** This regulation establishes the specific treatment technique(s) required of systems using surface water sources or groundwater under the direct influence of surface water. These primary procedural rules require filtration and/or filtration in place of establishing primary standards (MCL's) for bacteria, turbidity, viruses and Giardia. The SWTR sets out requirements for determining which sources must be filtered. The rule sets measurable standards for the operation of filtered and non-filtered surface water systems, including operator qualifications, CT values, turbidity, disinfection residual and monitoring requirements.

**Other Primary Rules** Other primary procedural rules have been established by the EPA. These rules include the Public Notification Rule. Primary rules are enforceable by law.

## STATES

### STATE REGULATORY AGENCIES

The US Congress has given the states authority to modify the EPA regulations to meet unique local conditions, if the EPA has reviewed and agreed to the state's proposed modifications. The state then formally adopts both those federal rules it accepts without change, as well as those it has modified. Most state regulators may issue these rules without review by the legislators. However, some states require that their legislatures review any administrative rules before a state agency can (promulgate) set them forth.

**Time Period to Adopt EPA Rules** The time period for a state to adopt its own equivalent to the federal regulations once they have been published is 18 months. A state may be granted a 24 month extension for adopting rules if the state can demonstrate both special circumstances beyond its control and a good faith effort to develop state regulations.

### EPA RULES GOVERN IN THE ABSENCE OF STATE ADOPTED RULES

However, if a state does not adopt the EPA rules within 18 months of EPA publication, the federal rules directly apply to every public water system in the state until the state adopts its own rules. DO NOT assume that your water utility is not covered by the federal rule just because the state has not yet adopted its own equivalent to the federal rule.

## ALASKA ADMINISTRATIVE RULES

There are three sets of Alaska administrative rules established by the Alaska Department of Environmental Conservation which regulate water utilities and drinking water:

### **Administrative Code 18 AAC 80**

The Code contains the performance standards that public water systems must meet. It includes procedural rules governing treatment operations, monitoring and administrative procedures. The Code also includes general design standards.

### **Drinking Water Procedures Manual**

This manual contains additional procedural rules governing treatment operations and monitoring.

### **Water Treatment Guidance Manual**

This guide contains implementation standards and procedural rules governing the design and construction of water treatment facilities.

See pages 28-34 for summaries of the Code and supplemental Manuals.

## LOCAL GOVERNMENT

The local governing body legislates by ordinance additional rules regarding the use of water service and the rate and method of payment for that service.

- Eligibility and application for service.
- Connection requirements including plumbing and crossconnection control.
- Conditions of Use including rates charged for use.
- Conditions under which use may be terminated.
- Prohibition against tampering with the water utility's equipment.
- Prohibition of cross-connections.
- Prohibition against waste of water.

## TO WHICH WATER SYSTEMS DO THESE REGULATIONS APPLY?

### **ALL PUBLIC WATER SYSTEMS IN ALASKA ARE REGULATED**

A public water system includes any source of water, intake works, collection system, treatment works, storage facility, or distribution system including a vehicle or vessel used to distribute water, from which water is available for human consumption.

### **PUBLIC WATER SYSTEM**

A public water system is any water system providing water to more than one residential unit including a duplex, subdivision, trailer park, housing development, camp.

It is also a community wide water system.

It includes a system providing water to a factory, office building, restaurant, school or similar facility.

BUT

It does not include a system serving only a single family residence.

**Class A Public Water System**

A Class A water system is a public water system that is expected to serve, in the normal order of events for at least six months of the year:

1. At least 25 residents.

OR

2. At least 10 service connections used by residents.

OR

3. 13 or more bedrooms used by residents.

OR

A Class A public water system is a system that regularly serves the same 25 or more persons for at least six months of the year.

**Class B Public Water System**

A Class B water system is a public water system that is expected to serve, in the normal order of events, for at least 60 days of the year:

1. At least 25 persons each day.

OR

2. At least 10 service connections.

AND

3. Is not a Class A public water system.

**Examples:**

Some tourist facilities, campgrounds, restaurants, bars and seasonal camps.

**Class C Public Water System**

1. Not a Class A public water system.

2. Not a Class B public water system.

3. Not a private water system.

**Examples:**

Small housing development, small rural grocery stores and gas stations.

## **PRIVATE WATER SYSTEMS ARE EXEMPT FROM PUBLIC WATER SYSTEM REGULATIONS**

A potable water system serving one residence is not regulated by the public water system rules.

## **UNDER WHAT CIRCUMSTANCES DO REGULATIONS APPLY TO A SYSTEM?**

### **REGULATIONS THAT APPLY UNIFORMLY TO ALL WATER SYSTEMS**

The following regulations apply uniformly to all public water systems at all times, regardless of the water utility's size or circumstances.

1. Cross-connection Control when customers connect to the system or make modifications to their plumbing.
2. Disinfection after Emergency Repair.
3. Lab Procedures and Equipment for performing water quality tests.
4. Public Notification.

### **REGULATIONS THAT VARY BY SYSTEM CIRCUMSTANCES**

The **treatment, sampling, reporting and record keeping regulations** vary by system depending upon:

1. The contaminants.
2. The vulnerability of the system to contaminants.
3. Type of water source.
4. Type of water treatment.
5. Number of connections.
6. Population served.
7. Days of continual service annually.
8. The public health history of the system.
9. The age, condition and level of maintenance of the system.

See the module on Water Quality Sampling and Testing for a full discussion of the type and frequency of water quality sampling and testing.

### **UNDER WHAT CIRCUMSTANCES DO ADDITIONAL REGULATIONS APPLY?**

The following changes in a water system's normal circumstances trigger additional regulations.

1. When the system fails to meet drinking water standards.

2. When the regulatory agencies receive complaints from public.
3. When customers contract a waterborne illness.
4. When federal and/or states rules change.
5. When the source of water has become vulnerable to contaminants or the present level of treatment can no longer produce water that meets drinking water standards.
6. When designs are prepared for a new system or for rehabilitating or modifying an existing one.
7. During construction.

## WHO IS RESPONSIBLE FOR ENSURING A WATER SYSTEM'S COMPLIANCE WITH THE DRINKING WATER REGULATIONS ?

The Alaska Department of Conservation, the governing body of the water utility, the water utility superintendent and the utility's operators are all legally responsible for ensuring that the utility complies with state and federal regulations. The water users are also responsible for observing cross-connection controls.

## HOW DO WE DETERMINE WHETHER THE WATER UTILITY IS IN COMPLIANCE WITH THE REGULATIONS?

### PERFORMANCE STANDARDS (MCL'S)

#### Scheduled Monitoring

The water utility performs scheduled **routine monitoring**<sup>4</sup> and non routine monitoring to compare water quality to drinking water performance standards. Article 1 of the Alaska Drinking Water Regulations establishes the methods of determining compliance with the MCL's, the drinking water product standards. **Routine bacteriological sampling**<sup>5</sup> is the most frequently scheduled monitoring for systems supplied by groundwater.

#### Unscheduled Monitoring

Customer complaints, disease and death from **waterborne disease**<sup>6</sup> will trigger unscheduled monitoring.

### DESIGN AND CONSTRUCTION STANDARDS

#### State Design Review

State review and approval process for engineering design ensures that the utility's design engineers are following the design standards.

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<sup>4</sup> **Routine Monitoring** - Sampling and testing for immediate threats to public health, followed by reporting and public notification when necessary.

<sup>5</sup> **Routine Bacteriological Sampling** - Collection of water samples on a monthly/quarterly basis for analysis for the presence of coliform bacteria.

<sup>6</sup> **Waterborne Disease** - A disease caused by organisms or toxic substances which are carried by water. The most common waterborne diseases are typhoid fever, Asiatic Cholera, Dysentery and other intestinal disturbances.

**Construction Inspection**

State or local inspection and documentation of construction provides some measure of assurance that the system is being constructed according to the design using the materials, equipment and workmanship specified in the contract documents.

**OPERATING AND ADMINISTRATIVE PROCEDURES**

**Sanitary Survey**

The periodic sanitary survey includes an assessment of the vulnerability of the source and a review of the operation, maintenance and record keeping procedures practiced by the water utility. This survey is intended to detect problems before they become insolvable.

**Feedback from Regulators**

Informal visits and periodic reviews of monitoring reports can detect poor practices, which if left uncorrected, would degrade the water system.

**WHAT HAPPENS WHEN A SYSTEM IS NOT IN COMPLIANCE?  
VIOLATIONS**

**ACUTE MCL VIOLATIONS**

**Acute MCL**<sup>7</sup> violations present an acute health risk to humans and the public must be warned through radio and television or, where unavailable through individual notification.

**Coliform Positive**

- If a system had at least two separate bacteriological samples test positive for the presence of coliforms and one of those samples also tests **E. Coli**<sup>8</sup> or fecal positive, the system presents an acute health risk to humans, and the public must be immediately notified.

**Nitrates**

- If a system exceeds the MCL for nitrates, the system can retest within 24 hours. If the system does not retest or the retest exceeds the MCL, the water quality presents an acute health risk to humans, and the public must be immediately notified.

**NON-ACUTE MCL VIOLATIONS**

**Monthly MCL Violation**

- When the utility submits two (2) coliform positive samples, it is in violation of the Total Coliform MCL (also called the Coliform Rule).
- When the tested level of any contaminant (other than microbiological) exceeds its Maximum Contaminant Level, it is in non-acute violation of an MCL.

---

<sup>7</sup> MCL - Maximum Contaminant Level.

<sup>8</sup> E. Coli - A specific coliform bacteria also termed "Fecal Coliform". The coliform test will indicate the presence of contamination by warm blooded animal, because these bacteria live in the intestinal tract.

### TREATMENT TECHNIQUE VIOLATIONS

- The utility has failed to successfully provide a required treatment process or technique.
- The utility has failed to comply with the terms of a variance or exemption including timeliness of required actions.

### MONITORING VIOLATIONS

- The utility has failed to submit the required number of samples in any one month and is therefore in violation of the monitoring requirements.
- The utility has failed to submit any **repeat samples**<sup>9</sup> that might be required and is therefore in violation of the monitoring requirements.
- The utility has failed to comply with a testing (as opposed to a sampling) procedure.

### EXCEPTIONS PROCESS

Article 9 of the Alaska Drinking Water Regulations contains the procedures for applying for a variance or exception to certain performance (MCL) or procedural (treatment technique) regulations. This article also contains the procedure for appealing a decision by the Department of Environmental Conservation.

### PENALTIES

The Department of Environmental Conservation makes every effort to assist those utilities not in compliance who are making diligent efforts to comply. In the event a utility resists compliance, the department has enforcement actions and penalties at its disposal.

### WHO IS RESPONSIBLE FOR ENFORCING THE REGULATIONS?

The US Environmental Protection Agency, the Alaska Department of Environmental Conservation and the City Council are responsible for enforcing their respective regulations. In other words, ADEC will not enforce the regulations established by a city council.

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<sup>9</sup> **Repeat Samples** - Water samples collected after a routine sample has tested coliform positive.

# ALASKA DRINKING WATER STANDARDS

## PRIMARY DRINKING WATER QUALITY STANDARDS (MCL)

Articles 1, 4 and 6 of the Alaska Drinking Water Regulations set the safe limits on the concentration of contaminants permitted in drinking water.

Primary Standards are the Maximum Contaminant Level allowed for substances that are believed to be an immediate threat to public health or present a long term risk to the public health. Primary standards are measurable and enforceable by law.

### MICROBIOLOGICAL CONTAMINANTS

Many pathogenic microorganisms can enter the water system at its source or through flaws in distribution mains and storage. Because there are so many types of pathogenic waterborne microorganisms, it would be expensive to test for each one of them. Moreover, some of these microorganisms are difficult, if not impossible, to detect in a test.

#### **Total Coliform as Indicator**

Therefore, water utilities are required to meet the MCL for the presence of a group of microorganisms called "Coliforms" or "**Coliform bacteria**<sup>10</sup>". Since these microorganisms are commonly found in the intestinal tract of warm blooded animals, their presence in a water sample is an indicator of contamination that may include **waterborne pathogens**<sup>11</sup>.

#### **Total Coliform Bacteria MCL**

For a system that collects less than 40 routine and repeat samples in a month, if no more than one sample collected during a month is total coliform-positive, the system is in compliance with the MCL for Coliforms.

#### **Violations of Total Coliform MCL**

Any fecal coliform positive or E. coli positive repeat sample, or any **total coliform**<sup>12</sup> positive repeat sample following a fecal coliform positive or E. coli positive routine sample, is an acute risk violation of the MCL for total coliforms for the purposes of public notice requirements.

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<sup>10</sup> **Coliform Bacteria** - The coliform group of bacteria is a bacterial indicator of contamination. This group has as one of its primary habitats the intestinal tract of human beings. Coliforms also may be found in the intestinal tract of warm-blooded animals, in plants, soil, air and the aquatic environment.

<sup>11</sup> **Waterborne Pathogens** - Bacteria, virus and protozoa which can cause disease and are carried by water.

<sup>12</sup> **Total Coliform** - A bacterial species that is used as an indicator of bacterial safety in drinking water.

## PHYSICAL CONTAMINANTS

### TURBIDITY MCL

As specified under 18 AAC 80.070(a) (3), the Turbidity Maximum Contaminant Level applies to Class A, Class B and Class C water systems that use surface water or groundwater under the direct influence of surface water (as described in 18AAC 80.505).

HOWEVER

#### **Limited to systems that must filter but have not yet installed filtration**

Because of the treatment technique requirements specified in the Surface Water Treatment Rules of 18 AAC 80.500 - 590, this turbidity MCL of 18 AAC 80.070 (a) (3) has little significance except for systems that must filter but have not yet installed filtration.

#### **Turbidity MCL**

The system is in compliance if turbidity, measured as a nephelometric turbidity unit (ntu) does not exceed:

1. 1.0 ntu as a monthly average of samples required, except that a level of 5 or fewer ntu's may be allowed if the water utility can demonstrate that the higher turbidity does not:
  - a. Interfere with disinfection;
  - b. Prevent maintenance of a detectable residual disinfectant concentration throughout the distribution.
  - c. Interfere with microbiological determinations.OR
2. 5.0 as an average for two consecutive days.

#### **Violation of Turbidity MCL**

Exceeding either measure is a violation of the turbidity MCL.

## RADIOLOGICAL CONTAMINANTS

### **Radiological Contaminants Sources**

Customers could be exposed to radiological contaminants in their drinking water from two different types of sources:

- Natural radioactivity resulting from the flow of groundwater through naturally radioactive materials which might include radon, radium or uranium elements.
- Contamination of surface waters and groundwater as a consequence of man-made radioactivity from nuclear power plants, industrial wastes, hospitals and research laboratories.

### **Radiological Contaminant MCL's**

The MCL's for radiological contaminants are grouped into two categories:

- Natural Radioactivity which includes Gross Alpha Activity and Radium.
- Man-made Radioactivity which includes Gross Beta Activity, Strontium-90 and Tritium.

Contaminant	MCL - pCi/L	Health Effects	Source
Gross Alpha .....	15 .....	Cancer.....	Radioactive waste, uranium deposits; geological/natural
Combined Radium-226 and 228.....	5.....	Bone cancer .....	Radioactive waste, geological/natural
Gross Beta .....	50 .....	Cancer.....	Radioactive waste, uranium deposits; nuclear facilities
Strontium-90 .....	8		
Tritium.....	20,000		

## CHEMICAL CONTAMINANT STANDARDS

### INORGANIC CHEMICAL CONTAMINANTS

Inorganic chemicals are salts, metals and other chemical compounds that do not contain carbon. Scientific studies indicate that these constituents of water must be held to safe concentrations to prevent long term risks to health in the form of learning disorders and damage to the liver, kidney and nervous system. Some Inorganics are used in agriculture and manufacturing; others are naturally occurring mineral deposits.

#### Violation of Inorganic<sup>13</sup> Chemical MCL's

Small system compliance is based on the analytical result obtained at each sampling point collected annually or less frequently. The system is in violation of the MCLs for IOC's if:

- The level of a contaminant at any sampling point is greater than the MCL.
- A confirmation sample is required by the department.
- The determination of compliance will be based on the average of two samples.

#### Violation of Nitrate and Nitrite MCL's

Compliance with the MCLs for nitrate and nitrite will be determined based on one sample if the levels of these contaminants are below the MCLs. If the levels of nitrate or nitrite exceed the MCLs in the initial sample, a confirmation sample is required, and compliance will be determined based on the average of the initial and confirmation samples.

<sup>13</sup> Inorganic - Chemical substances of a mineral origin.

**INORGANIC CHEMICAL CONTAMINANTS**

<b>Contaminant</b>	<b>MCL - mg/L</b>	<b>Health Effects</b>	<b>Source</b>
Antimony	0.006		
Arsenic	0.05	Dermal & nervous system toxicity effects	Geological, pesticide residues, industrial waste and smelter operations
Asbestos	7 Million Fibers/liter longer than 10µm	Benign tumors	Natural mineral deposits; also Asbestos/Cement pipe
Barium	2	Circulatory system	Natural mineral deposits; oil/gas drilling operations; paint and other industrial uses
Beryllium	0.004	Bone & lung damage, induction of cancer	Mining, processing plants & improper waste disposal
Cadmium	0.005	Kidney	Natural mineral deposits; metal finishing; corrosion product from galvanized plumbing
Chromium	0.1	Liver, kidney, skin and digestive system	Natural mineral deposits; metal finishing, textile, tanning and leather industries
Cyanide	0.2	Spleen, brain & liver	Used in electroplating, steel processing, plastics & fertilizer
Fluoride	4.0	Skeletal damage	Geological; additive to drinking water; toothpaste; foods processed with fluoridated water
Mercury	0.002	Kidney & nervous system	Industrial/chemical manufacturing; fungicide; natural mineral deposits
Nickel	0.1	Heart & Liver damage	Used in electroplating, stainless steel & alloy products
Nitrate	10 as Nitrogen	Methemoglobinemia "blue-baby syndrome"	Fertilizers, feedlots, sewage; naturally in soil, mineral deposits
Nitrite	1 as Nitrogen	Methemoglobinemia "blue-baby syndrome"	Unstable, rapidly converted to nitrate; prohibited in working metal fluids
Total Nitrate and Nitrite	10 as Nitrogen		
Selenium	0.05	Nervous system	Natural mineral deposits; by-product of copper mining/smelting
Thallium	0.002	Kidney, liver, brain & intestines	Geologic, used in manufacture of electronics, pharmaceuticals, glass & alloys

**ORGANIC CHEMICAL CONTAMINATES**

Organic chemicals are compounds that contain carbon. They are either naturally occurring or manufactured by humans. Man-made organic chemicals are called synthetic organic chemicals (SOC's). These synthetic Organics are further classified into three categories: Disinfection by-products, Pesticides, and Volatile Organic Chemicals (**VOC**<sup>14</sup>).

**Disinfection By Products**

These contaminants are formed during the disinfection of water containing dissolved organic material by using chlorine. When free chlorine is added during disinfection, it reacts with any naturally occurring organic material in the water to form a group of synthetic chemicals called Trihalomethanes (**THM's**)<sup>15</sup>. Compounds in this class of Organics have had a replacement of three hydrogen atoms in the methane molecule with three halogen atoms.

**Disinfection by-products MCL**

Total Trihalomethanes (**TTHM's**)<sup>16</sup> is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform), and trichloromethane (chloroform). The MCL is 0.10 mg/L for those public water systems serving 10,000 or more persons.

**PESTICIDES**

Contaminant	MCL - mg/L	Health Effects	Sources
Alachlor .....	0.002 .....	Probable cancer .....	Herbicide on corn and soybeans; under review for cancellation
Aldicarb .....	0.003 .....	Nervous system .....	Insecticide on cotton, potatoes; restricted in many areas due to groundwater contamination
Aldicarb sulfoxide.....	0.004 .....	Nervous system .....	Degrade from aldicarb by plants
Aldicarb sulfone .....	0.002 .....	Nervous system .....	Degrade from aldicarb by plants
Atrazine .....	0.003 .....	Reproductive & cardiac .....	Widely used herbicide on corn and on non-crop land
Carbofuran .....	0.04 .....	Nervous system & reproductive system .....	Soil fumigant/insecticide on corn/cotton; restricted in some areas
Chlordane .....	0.002 .....	Probable cancer .....	Soil insecticide for termite control, corn, potatoes; most uses cancelled in 1980

<sup>14</sup> **VOC** - Volatile organic chemical - A carbon-based compound with the property of escaping easily from water into the air.

<sup>15</sup> **THM's** - Compounds formed when natural organic substances from decaying vegetation and soil (such as humic and fluvic acids) react with chlorine.

<sup>16</sup> **TTHM'S** - The sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform).

**PESTICIDES - CONTINUED**

<b>Contaminant</b>	<b>MCL - mg/L</b>	<b>Health Effects</b>	<b>Sources</b>
Dalapon .....	0.2 .....	Kidney & liver .....	Herbicides
Dibromochloropropane .....	0.0002 .....	Probable cancer .....	Soil fumigant on soybeans, cotton; cancelled in 1977
Dinoseb.....	0.007 .....	Thyroid & reproduction.....	Pesticide
Diquat.....	0.02 .....	Liver, kidney & gastrointestinal..	Herbicide
Endothall .....	0.1 .....	Liver, kidney, gastrointestinal & reproductive.....	Herbicide
Endrin .....	0.002 .....	Nervous system & kidney effects	Insecticide used on cotton, small grains, orchards (cancelled)
Ethylene dibromide .....	0.00005 .....	Probable cancer .....	Gasoline additive; soil fumigant, solvent cancelled in 1984; limited uses continue
Glyphosate .....	0.7 .....	Liver & Kidneys .....	Herbicide
Heptachlor .....	0.0004 .....	Probable cancer .....	Insecticide on corn; cancelled in 1983 for all but termite control
Heptachlor epoxide.....	0.0002 .....	Probable cancer .....	Soil and water organisms convert heptachlor to the epoxide
Lindane.....	0.0002 .....	Nervous system, liver & kidney ..	Insecticide for seed/lumber/livestock pest control; most uses restricted in 1983
Methoxychlor .....	0.04 .....	Nervous system, liver & kidney ..	Insecticide on alfalfa, livestock
Oxamyl (Vydate) .....	0.2 .....	Kidney .....	Pesticide
Pentachlorophenol.....	0.001 .....	Probable cancer, liver & kidney ..	Wood preservative and herbicide; non-wood uses banned in 1987
Picloram.....	0.5 .....	Kidney & Liver damage .....	Pesticide
Simazine .....	0.004 .....	Cancer.....	Herbicide
Toxaphene .....	0.003 .....	Probable cancer .....	Insecticide/herbicide for cotton, soybeans; cancelled in 1982
2, 4-D .....	0.07 .....	Liver, kidney & nervous system..	Herbicide for wheat, corn rangelands
2, 4, 5-TP .....	0.05 .....	Nervous system, liver & kidney ..	Herbicide on rangelands, sugar cane, golf courses; cancelled in 1983

## SECONDARY DRINKING WATER QUALITY STANDARDS

### Aesthetic

These secondary contaminant levels represent reasonable targets for drinking water quality and provide a general guideline for water utilities. These secondary contaminants affect the aesthetic qualities of drinking water, at considerably higher concentrations health problems might occur. The Alaska Department of Conservation may, at its discretion, require a water utility to meet the secondary MCL if public health is threatened or if there is a strong public objection to the drinking water when it exceeds a listed secondary MCL.

### Effects on treatment

The water system may also be required to monitor secondary contaminants if there is an indication that any of them exist in concentrations sufficient to interfere with water treatment processes.

## SECONDARY CONTAMINATES

Contaminant	MCL	Health Effects
Aluminum.....	0.2 mg/L .....	Discoloration of water
Chloride .....	250 mg/L .....	Taste; corrosion of pipes
Color.....	15 color units .....	Aesthetic
Copper .....	1.0 mg/L .....	Taste; staining of porcelain, stomach and intestinal distress; Wilson's disease
Corrosivity .....	Noncorrosive.....	Aesthetic and health related (corrosive water can leach pipe material, such as lead into drinking water)
Fluoride .....	2.0 mg/L .....	Dental fluorosis (a brownish discoloration of the teeth)
Foaming Agents .....	0.5 mg/L .....	Aesthetic
Iron.....	0.3 mg/L .....	Taste; staining of laundry
Manganese.....	0.05 mg/L .....	Taste; staining of laundry
Odor .....	3 threshold odor number .....	Aesthetic
pH .....	6.5 min - 8.5 max .....	Water is too corrosive
Silver .....	0.1 mg/L .....	Argyria (discoloration of the skin)
Sodium .....	250 mg/L .....	Possible increase in blood pressure in susceptible individuals
Sulfate .....	250 mg/L .....	Taste; laxative effects
Total Dissolved Solids	.500 mg/L .....	Taste and possible relationship between low hardness and cardiovascular disease; also an indicator of corrosivity (related to lead levels in water); can damage plumbing and limit effectiveness of soaps and detergents
Zinc.....	5 mg/L .....	Taste

## **ALASKA DRINKING WATER IMPLEMENTING RULES**

### **ALASKA DESIGN AND CONSTRUCTION STANDARDS**

The design standards are established as strict guides for new or rebuilt facilities. When a technology is complex or when there is no direct way to measure whether a water system has met all of its targets as in the treatment of surface water, implementing rules will also specify the contamination control strategies, the treatment processes, the treatment equipment, its manner of installation and when and how to treat surface waters.

When the water system owner and operator follows these standards, the newly constructed water system will produce water that meets water quality standards. The system can be successfully operated and maintained in the natural and cultural environment in which it is built. The system scale, operating budget and debt service are appropriate to the size and economic strength of the community. The system can be successfully operated by staff from within the local community. The system design has been adapted to the climate and other features of the natural environment.

#### **Source Construction**

The method of constructing wells, filtration galleries and surface water intakes are governed by the drinking water regulations.

#### **Disinfection Techniques & Facilities**

Disinfection destroys or inactivates pathogenic microorganisms in drinking water. Various methods are available. The most commonly used disinfectant in Alaska is chlorine, applied as a gas or in solution.

#### **Filtration Techniques & Facilities**

Most sources which use surface water or groundwater under the direct influence of surface water must provide filtration to remove pathogens and the minute particles in which they incubate. These are pathogens in various life stages which cannot otherwise be destroyed or inactivated by disinfection. Article 5 of the Alaska Drinking Water Regulations describes which waters must be filtered, how the determination is made and how to avoid filtration. The article also describes the various disinfection and filtration requirements necessary to meet the procedural Surface Water Treatment Rules. This article includes the tables that are used to determine CT values.

#### **Distribution System**

Cross-connection control and separation distances of distribution lines from sources of potential contamination are established in the Alaska Code.

## **SURFACE WATER TREATMENT TECHNIQUE TURBIDITY RULES**

### **SYSTEMS USING CONVENTIONAL OR DIRECT FILTRATION**

Systems that use conventional filtration or direct filtration are in compliance with treatment technique rules if:

**Turbidity Limits**

1. The turbidity level of representative samples of system's filtered water is less than or equal to 0.5 ntu in at least 95 percent of the measurements taken each month. AND
2. The turbidity level of representative samples of the system's filtered water does not exceed 5 ntu at any time.

**Required Monitoring Frequency**

Turbidity samples must be taken and tested every four hours or continuously.

**Waiver of Monitoring Frequency**

Waivers to reduce the monitoring frequency to once a day may be granted to systems serving fewer than 500 persons. This waiver must be obtained in writing from the regional DEC office.

### **SYSTEMS USING SLOW SAND, DIATOMACEOUS EARTH OR OTHER FILTRATION**

Systems that use slow sand, diatomaceous earth or other filtration techniques (cartridge filters) are in compliance if:

**Turbidity Limits**

1. The turbidity level of representative samples of system's filtered water is less than or equal to 1.0 ntu in at least 95 percent of the measurements taken each month. AND
2. The turbidity level of representative samples of the system's filtered water does not exceed 5 ntu at any time.

**Required Monitoring Frequency**

Turbidity samples must be taken and tested every four hours or continuously.

**Waiver of Monitoring Frequency**

Waivers to reduce the monitoring frequency to once a day may be granted to systems serving fewer than 500 persons. This waiver must be obtained in writing from the regional DEC office.

### **SYSTEMS MEETING CRITERIA TO AVOID FILTRATION**

Systems that have met the criteria for filtration avoidance are in compliance with treatment technique rules if:

**Source Reliability**

1. Meets source vulnerability requirements.

**Turbidity Limits**

2. Turbidity does not exceed 5 ntu's at anytime.

**Required Monitoring Frequency**

Turbidity measurements must be taken at least every four hours or continuously at the source water imme-

diately before the first or only point of disinfectant application.

**No Waiver of Monitoring Frequency** NOTE: No waivers for this monitoring frequency may be granted regardless of system size.

**Special Coliform Sampling Required** Any time the turbidity of the source water exceeds 1 ntu, special coliform samples must be taken.

#### **SYSTEMS THAT MUST FILTER BUT HAVE NOT YET INSTALLED FILTRATION**

Systems that must filter but have not yet installed filtration are in compliance with treatment technique rules if:

#### **Turbidity Limits**

1. 1.0 ntu as a monthly average of samples required, except that a level of 5 or fewer ntu's may be allowed if the water utility can demonstrate that the higher turbidity does not:

- a. Interfere with disinfection.
- b. Prevent maintenance of a detectable residual disinfectant concentration throughout the distribution.
- c. Interfere with microbiological determinations.

OR

2. 5.0 as an average for two consecutive days.

#### **Required Monitoring Frequency**

Turbidity samples are taken and tested daily.

## WATER QUALITY AND SYSTEM MONITORING PROCEDURES

### REFERENCES TO MONITORING REQUIREMENTS

Monitoring requirements are scattered throughout the Alaska Administrative Code. Additional specifics are included in the Alaska Drinking Water Procedures Manual.

#### ALASKA ADMINISTRATIVE CODE

##### Article 2

Article 2 establishes:

- Sampling intervals for the various MCL's.
- Laboratory requirements for testing water samples.
- Identifying which tests an operator is allowed to perform.
- Identifying which testing procedures must be used.
- The reporting procedures that must be adhered to by each public water system.

##### Article 4

This article includes details on the sampling and testing requirements for VOC's.

##### Article 5

This Surface Water Rule includes:

- Sampling and testing requirements for filtered and unfiltered systems.
- Reporting and record keeping requirements for filtered and filtered systems.

##### Article 6

This Coliform Rule describes:

- The frequency of coliform sampling.
- The testing procedures.
- The procedure that must be followed should a sample fail.

##### Article 9

This article includes:

- Provisions and procedures for notifying the public in case of a violation of one or more of the MCL's.
- Procedures for public notification associated with fluoride and certain unregulated contaminants.
- Mandatory health effects language that must be included in the public notice for each MCL violation.
- Process for notifying the public when the water system is in violation of sampling, testing or reporting requirements.
- Procedures for obtaining a variance or exception to certain regulations.
- Procedures for appealing a department decision.
- Record keeping requirements.

## ALASKA DRINKING WATER PROCEDURES MANUAL

- Approval and training requirements for conducting **pH**<sup>17</sup>, temperature, turbidity and **chlorine residual**<sup>18</sup> testing.
- The use of continuous turbidity monitoring in lieu of grab samples.
- How to deal with the logistical problems for obtaining coliform samples from remote sites.
- The method of obtaining approval of alternate disinfection residual concentration sampling plans.
- Under what conditions a reduction of turbidity monitoring may be allowed.
- Under what conditions a reduction in reporting can be allowed.
- The conditions that reduced monitoring frequency may be allowed.
- The procedure for development and approval of sample site plans.
- Various waivers for coliform testing.
- Alternative repeat monitoring for single services connections.

## SAMPLE SITE PLANS

The Alaska Drinking Water Procedures Manual requires that each utility prepare a written plan for sampling water quality, including a map showing the location of all **sampling sites**<sup>19</sup> and a schedule of routine and non-routine sampling and testing. This plan must be reviewed and approved by the Department of Environmental Conservation.

## SAMPLE ANALYSIS

### In-house Lab

The public expects and the regulators require that the operators of the water system have the equipment and skills sufficient to monitor the utility's production processes and perform the in-house testing to determine water quality.

### State Certified Lab

A state certified lab, under contract to the small utility, will analyze the bacteriological and non-routine samples.

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<sup>17</sup> **pH** - An expression of the intensity of the alkaline or acidic strength of water. Mathematically, pH is the logarithm (base 10) of the reciprocal of the hydrogen ion concentration. pH may range from 0 to 14, where 0 is the most acid, 14 most alkaline, and 7 neutral. Natural waters usually have a pH between 6.5 and 8.5.

<sup>18</sup> **Chlorine Residual** - The amount of chlorine left in solution after a period of time. For instance with new water lines, the reaction time is 24 hours. The residual is usually expressed in mg/L.

<sup>19</sup> **Sampling Site** - The location within the water system where a sample of water may be collected. This location may also be referred to as a "sampling point."

## **REPORTING THE RESULTS TO THE STATE**

### **REPORTS OF BACTERIOLOGICAL TESTS**

#### **Routine Bacteriological Tests**

The water utility must send ADEC a copy of the bacteriological test results within seven (7) days of receiving the results from the laboratory.

#### **Repeat Bacteriological Tests within 24 Hours of Notice of Violation**

The water utility must send ADEC a copy of all repeat bacteriological test results within seven (7) days of receiving the results from the laboratory.

### **REPORTS OF ROUTINE IN-HOUSE PROCESS CONTROL TESTING**

Within ten (10) days of the following month, the utility must send a monthly report to ADEC covering disinfectant residuals, pH, temperature, fluoride and turbidity. ADEC will provide your utility with sample forms for preparing monthly reports. Your utility may develop its own format as long as all of the ADEC required information is included.

### **REPORTS OF NON-ROUTINE TESTS**

The water utility must send ADEC a copy of the non-routine test results within (14) days of receiving the results from the laboratory.

### **VIOLATION REPORTS**

The water utility must provide a monthly report to ADEC, after any month in which it was in violation of regulations, indicating the violation and the days the utility was in non-compliance for each violation.

The utility must include copies of any and all public notices within ten (10) days of when they were issued.

## **NOTIFYING THE PUBLIC**

### **WHEN PUBLIC NOTIFICATION IS REQUIRED**

When the water utility fails to comply with drinking water regulations, it must notify its consumers. Article 9 of the Alaska Drinking Water Regulations contains the conditions and procedures for notifying the public when:

- The drinking water fails to meet one or more MCL's.
- The water utility fails to meet the requirements for monitoring.
- The water utility is granted a variance or exemption from a MCL or a procedural requirement, including treatment techniques.
- The water utility fails to comply with the provisions, including the timing of activities established in variance or exemption agreements.

## PROMPTNESS OF NOTIFICATION

### **Acute Violation**

The utility must notify its public in accordance with the state regulations within 72 hours of the receipt of a notification of violation from the certified laboratory or the state, whichever is sooner.

### **Non-Acute Violation**

When the system violates the Coliform Rule, it must notify its public within 14 days of the receipt of a notification of violation from the certified laboratory or the state, whichever is sooner.

## LANGUAGE REQUIRED IN PUBLIC NOTIFICATION

Article 9 includes the EPA required mandatory health effects language for public notice. The health effects language must be used word for word in a public notice to provide information on potential adverse health effects for each contaminant involved in each violation.

## RECORD KEEPING

### REMOVING ERRONEOUS TEST RESULTS FROM THE RECORD

There are two approaches to removing a coliform positive test result from the utility's records. Under either approach, you should work closely with your local ADEC Drinking Water Program representative.

#### **Invalidate a Sample**

The test result of a coliform positive sample may be removed from the records if:

- All repeat samples are coliform negative.
- The following month routine samples are coliform negative.
- The utility can explain how the positive result from that specific routine sample is not representative of the system's water quality.

#### **Negative Repeat Samples**

The test result of a coliform positive sample and even a repeat positive sample may be removed from the records if:

- All other sets of repeat samples are coliform negative.
- The following month routine samples are coliform negative.
- The utility can explain how the positive result from that specific routine sample is not representative of the system's water quality.

**RETAINING WATER QUALITY RECORDS**

The water utility must keep records regarding water quality, production process (including treatment, if any) and the condition of the physical components of the system. These records should be kept at a convenient and safe location within or near the area served by the water system. Every water utility must retain the following:

- |   |   |
|---|---|
| <b>Disinfectant Residual Measurements</b>       | Records of disinfectant residuals for at least twelve (12) months.                                      |
| <b>Corrective Actions</b>                       | Reports of actions taken to correct violations for three (3) years after the action was taken.          |
| <b>Variance, Exemption &amp; Permit Records</b> | Agreements and communications for five (5) years after expiration of the variance, exemption or permit. |
| <b>Bacteriological Test Results</b>             | Copy of each routine and repeat bacteriological test for five (5) years.                                |
| <b>Turbidity Measurements</b>                   | The results of such tests must be retained for ten (10) years.  |
| <b>Chemical Test Results</b>                    | The results of inorganic and organic tests must be retained for ten (10) years.                         |
| <b>Radioactive Substances</b>                   | The results of such tests must be retained for ten (10) years.  |
| <b>Secondary Contaminants</b>                   | The results of such tests must be retained for ten (10) years.  |
| <b>Sanitary Survey Reports</b>                  | Reports, communications and background material for ten (10) years.                                     |

# ALASKA DRINKING WATER REGULATIONS

## ALASKA ADMINISTRATIVE CODE 18 AAC 80

### Introduction

The Alaska Drinking Water Regulations are contained in 18 AAC (Alaska Administrative Code) chapter 80. These regulations are composed of 9 articles and are enforced by the Alaska Department of Environmental Conservation. These regulations describe the proper construction, operation and monitoring of water systems in the State of Alaska. The following summary is based on the amended regulations dated March 18, 1993.

### Article 1

Article 1, describes the general requirements with which a public water system must comply. This article includes information on:

- Source protection requirements.
- Distances required between wells and potential sources of contamination and separation distances between water and other piping.
- Cross-connection protection requirements.
- Conditions under which a groundwater supply would be required to use a disinfectant.
- The Maximum Contaminant Levels (MCL's) for each contaminant for which each system is required to test.
- Requirements that a system must meet to be in compliance with the MCL standards.

### Article 2

Article 2 establishes:

- Sampling intervals for the various MCL's.
- Laboratory requirements for testing water samples.
- Identifying which tests an operator is allowed to perform.
- Identifying which testing procedures must be used.
- The reporting procedures that must be adhered to by each public water system.

### Article 3

The Design and Construction of each new system as well as major changes to existing systems must be approved by the State before the system is built or changes made. Article 3 describes the procedure for obtaining this approval.

### Article 4

Article four is dedicated to identifying the Volatile Organic Chemicals for which each public water system must test. This article gives details on the sampling and testing requirements for VOC's.

**Article 5**

Article 5 is often referred to as the **Surface Water Treatment Rule**; it regulates the operation of systems supplied by surface water sources or by groundwater under the direct influence of surface water. This article includes:

- Criteria for determining which waters must be filtered, how the determination is made and how to avoid filtration.
- Filtration requirements necessary to meet the SWTR.
- Disinfection requirements for unfiltered and filtered systems. An important component of this article is the tables used to determine CT values.
- Sampling and testing requirements for filtered and unfiltered systems.
- Reporting and record keeping requirements for filtered and filtered systems.

**Article 6**

Article 6 is often referred to as the **Coliform Rule**. This article describes:

- The frequency of coliform sampling.
- The testing procedures.
- The procedure that must be followed should a sample fail.

**Article 7**

There is **no Article 7**.

**Article 8**

Article 8 is called **Miscellaneous Provisions** and carries the language that prohibits the use of 50/50 lead solder on household plumbing as well as information on the approval process of chemicals used in water treatment.

**Article 9**

Article 9 contains the **Notifications, Variance and Record keeping** requirements.

- Provisions and procedures for notifying the public in case of a violation of one or more of the MCL's.
- Procedures for public notification associated with fluoride and certain unregulated contaminants.

Mandatory health effects language that must be included in the public notice for each MCL violation.

- Process for notifying the public when the water system is in violation of sampling, testing or reporting requirements.
- Procedures for obtaining a variance or exception to certain regulations.
- Procedures for appealing a department decision.
- Record keeping requirements.

- A listing of definitions, abbreviations and symbols used in the regulations.

## ALASKA DRINKING WATER PROCEDURES MANUAL

### Introduction

This description is based on the manual dated February 12, 1993. This manual contains procedures on how the State and the public water systems will accomplish the drinking water regulations and meet the requirements of primacy as set forth in 40 CFR 142.16 (b) & (c). (CFR - Code of Federal Regulations) This manual contains critical information on the following items:

### Procedures

- Operator qualifications.
- How to determine if a source is groundwater under the direct influence of surface water.
- Filtration and disinfection combinations that will meet removal and inactivation of Giardia and viruses requirements.
- The contents of a watershed control program for unfiltered water sources.
- The process for certifying on-site inspectors.
- Approval and training requirements for conducting pH, temperature, turbidity and chlorine residual testing.
- Appropriate filtration technologies.
- Requirements for disinfection of surface water and **GUDISW**<sup>20</sup> prior to the installation or completion of a filter.
- Alternative turbidity limits for various filter technologies.
- Alternate filtration technologies and how they are approved.
- Alternate methods of disinfection and the approval process.
- The use of continuous turbidity monitoring in lieu of grab samples.
- What modifications must be made to a system if there is a waterborne disease outbreak in the system.
- Procedures for using a disinfectant other than chlorine.
- How to deal with the logistical problems for obtaining Coliform samples from remote sites.
- Alternatives for determining adequate disinfection

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<sup>20</sup> **GUDISW** - Groundwater Under the Direct Influence of Surface Water - Water under the earth's surface with significant occurrence of insects or other microorganisms or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity or pH that closely correlate to climatological or surface water conditions.

when HPC normally used but not now possible.

- The method of obtaining approval of alternate disinfection residual concentration sampling plans.
- Under what conditions a reduction of turbidity monitoring may be allowed.
- Under what conditions a reduction in reporting can be allowed.
- A description of unusual and unpredictable circumstances that may occur in Alaska that do not require filtration.
- How to determine treatment deficiencies.
- How to determine if shutting off water to a distribution system will cause a health risk.
- The conditions that reduced monitoring frequency may be allowed.
- The procedure for development and approval of sample site plans.
- Various waivers for coliform testing.
- Approval process for inspectors that perform Sanitary Surveys.
- Waiver procedure for high turbidity limits.
- Alternative repeat monitoring for single services connections.
- The "Consensus Method for Determining Groundwater Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA)."
- The "Consensus Protocol for Evaluation and Acceptance of Alternate Surface Water Filtration Technologies in Small System Applications."

**Appendix A**

**Appendix B**

## ALASKA WATER TREATMENT GUIDANCE MANUAL

### Introduction

This description is based on the manual dated June 23, 1993. The design and construction guide contains critical information on the following items:

### Plan Submittal and Review Process

- Pre-design meetings and application for permits.
- Facilities planning and pre-design process for upgrading existing facilities.
- **Format of design submittal** including Drawings, Technical and Construction Specifications, Manufacturer's Specifications and Quality Control Submittals.
- Treatment process **design and review checklists** including location, layout, sub processes and equipment.

### Surface Water Source Issues

- Types of surface water sources.
- Watershed survey.
- Assessing available quantity.
- Assessing water quality.

### Overall Project Design Considerations

- Geotechnical, hydraulic and structural issues and criteria.
- System reliability.
- Safety.

### Implication of Operation and Maintenance Procedures and Practices on Plant Design

- Operation plan for treatment facility including operating budget; development of O & M manuals; plant start up; operator qualifications, training and certification and emergency operation.
- Sampling, testing and reporting requirements for filtered systems.
- Chemical feeding.
- Filters.
- Facility disinfection.
- Interruptions in service.
- Intermittent operations.
- Fill and draw operations.

### Water Treatment

- Treatment and monitoring regulations.
- Effects of temperature on water treatment.
- Coagulation.
- Flocculation.
- Sedimentation.

- Filtration including rapid rise gravity filters, direct filtration, slow sand gravity filters, diatomaceous earth filtration, reverse osmosis, membrane filters and cartridge filters.
- Aeration.
- Chemical Oxidation.
- Ion Exchange.
- Desalinization.
- Activated Carbon Filtration.
- Corrosion Control.
- Disinfection including disinfectants, TTHM's, disinfectant application, chlorination equipment, chlorine safety and disinfectant residual monitoring.
- Storage and use of fuels and antifreeze.
- Waste Disposal and Recycling, including wastes generated by treatment processes, requirements for disposal and recycling options.

**Best Available Technologies**

For Organic and Inorganic Chemicals.

For Total Coliform Rule.

# DRINKING WATER REGULATIONS

## WORKSHEET

1. What are elements of a written regulation?

2. What are the purposes of regulations?

3. Who makes the drinking water and water utility regulations?

4. Give three instances of EPA regulations which are part of the primary drinking water standards and enforceable by federal law.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

5. List two primary EPA procedural rules.

a. \_\_\_\_\_

b. \_\_\_\_\_

6. Define each of the three classes of public water systems in Alaska.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

## O & M of Small Water Systems

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7. Name two of regulations which apply uniformly to all public water utilities.

a. \_\_\_\_\_

b. \_\_\_\_\_

8. What are the four kinds of state drinking water regulations that may vary from system to system?

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

9. List six of the circumstances which can change how regulations apply to a water system.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

e. \_\_\_\_\_

f. \_\_\_\_\_

10. Describe the four types of standards and rules which explicitly state how water systems will achieve compliance with the Maximum Contaminant Levels and performance standards, that is, the primary rules.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

11. Compliance with performance standards are measured by scheduled \_\_\_\_\_ and \_\_\_\_\_.

12. Compliance with design and construction standards are measured by \_\_\_\_\_ and by \_\_\_\_\_.

13. Describe the four types of violations.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

14. List the four contaminant categories of MCL's.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

15. List the types of chemical contaminants.

a. \_\_\_\_\_

b. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## O & M of Small Water Systems

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16. Under what conditions might the Department of Environmental Conservation require a system to meet secondary standards?
  
  
  
  
  
  
  
  
  
  
17. What mineral compounds can constitute an acute health risk when present in excess of their MCL?
  
  
  
  
  
  
  
  
  
  
18. When must a water utility notify the public that its water fails to comply with drinking water regulations?
  
  
  
  
  
  
  
  
  
  
19. The utility must notify its public within \_\_\_\_\_ of the receipt of a notification from the certified lab.
  
  
  
  
  
  
  
  
  
  
20. Records of disinfectant residuals must be retained for \_\_\_\_\_ , and bacteriological test results must be retained for \_\_\_\_\_.
  
  
  
  
  
  
  
  
  
  
21. The water utility must send ADEC a copy of bacteriological test results within \_\_\_\_\_ of receiving the results from the lab, and the utility must send ADEC a monthly report of in house process control testing within \_\_\_\_\_ of the end of the month.