A Source Water Assessment (SWA) for

PWSID #340484 SHISHMAREF - IN001 (SNOW MELT RESERVOIR)

What is an SWA?

The Drinking Water Protection group of the Drinking Water Program is producing Source Water Assessments (SWAs) in compliance with the Safe Drinking Water Act (SDWA) Amendments of 1996. Each SWA includes:

- A delineation of the drinking water source area;
- Inventory of potential and existing sources of contamination;
- Risk ranking for the identified contaminants;
- Evaluation of the overall vulnerability to the PWS source.

What is a Protection Area?

The most probable area for contamination to reach the drinking water intake is within the drinking water protection area (DWPA). The DWPA for a surface water source is determined by the drainage area contributing overland water flow to the surface water source intake. Because releases of contaminants within the DWPA are most likely to impact the intake, this area will serve as the focus for voluntary protection efforts.

The DWPAs established for surface water sources by DEC are separated into 3 zones, limited by the watershed. These zones correspond to the overland-flow distance that water travels to get to the source. The following is a summary of the three protection area zones:

Zone	Definition
A	Areas within 1000-ft of lakes or streams
B	Areas within 1-mile of lakes or streams
C	The watershed boundary

Natural Susceptibility

The natural susceptibility of a surface water source is a measure of a water supply's potential to become contaminated based on information gathered on the intake structure and conditions contributing to overland flow in the vicinity of the surface water body.

Table 1: Public Water System Source Information

PWS Name	SHISHMAREF
PWS ID Number	340484
State Asgn ID No.	IN001
Facility Name	SNOW MELT RESERVOIR
Source Type	Surface Water
Federal Classification	Community water system

*"cfs" = cubic feet per second

Executive Summary

The public water system (PWS) for SHISHMAREF is a Community water system that obtains surface water from one intake source, IN001 (Snow Melt Reservoir), in Shishmaref, Alaska. The drinking water protection area (DWPA) for IN001 is approximately 0.2 square miles in size and received a susceptibility rating of **Very High**. *A rating of High to Very High is typical for all systems with surface water intakes.* Potential sources of contamination identified within the DWPA for SHISHMAREF IN001 include: a washeteria, a domestic wastewater treatment plant and wastewater lagoon, a tannery, and the density of residential areas, heating oil tanks, and roads within the DWPA. Potential sources of contamination include those posing a risk of 1) bacteria and viruses; 2) nitrates and/or nitrites (nitrates); 3) volatile organic chemicals (VOCs); 4) heavy metals, cyanide, and other inorganic chemicals (inorganics); 5) synthetic organic chemicals (SOCs); and 6) other organic chemicals (OOCs).

Combining the natural susceptibility of the surface water source with the six (6) contaminant risk categories listed above, SHISHMAREF IN001 received an overall vulnerability rating of **Very High** for bacteria and viruses, **Very High** for nitrates, **Very High** for VOCs, **Very High** for inorganics, **Medium** for SOCs, and **Medium** for OOCs.

Introduction

Source Water Assessments (SWA) reports are intended to provide public water system (PWS) operators, owners, communities, and local governments with the best available information that may be used to protect the quality of their drinking water. The SWA report for SHISHMAREF IN001 is a tool to be used as the foundation or "stepping stone" to comprehensive management and protection of its surface water resource. Protecting the quality of your drinking water is a sensible investment.

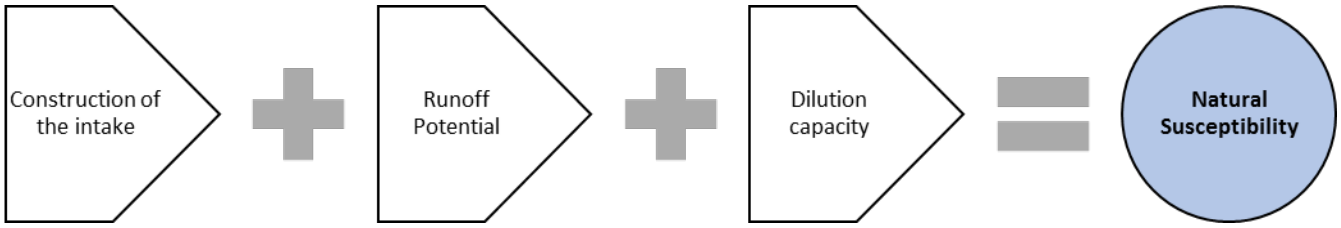
Drinking Water Protection Area (DWPA)

The size and shape of a DWPA varies with the specific characteristics of the source and the geography of the surrounding landscape. The DWPA is drawn by determining the area contributing water to the surface water source. This area consists of the watershed or basin that it is located in, plus all watersheds drained by tributaries flowing into the surface water source. (See Map1 of the Appendices)

Natural Susceptibility (Surface Water Source)

The natural susceptibility of a surface water source to the introduction of contaminants is determined by, but not limited to, the following risk factors: the general adequacy of intake construction, the potential for runoff or flooding, and the capacity of the surface water body to dilute contaminants.

Based on the most recent sanitary surveys (completed July 2007) and properties of the surrounding area, the Natural Susceptibility of the surface water source for SHISHMAREF IN001 received a rating of Very High.



Inventory of Potential and Existing Sources Contamination

The Drinking Water Protection (DWP) group has completed an inventory of potential and existing sources of contamination within the DWPA for the SHISHMAREF IN001 surface water source. This inventory was completed through a search of agency records and other publicly available information. Potential sources of contamination to the drinking water source include a wide range of categories and types. Potential drinking water contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development. The identified potential sources of contamination are summarized in Table 2 and are portrayed in Map 2 of the Appendices.

Table 2: Contaminant Source Inventory

Contaminant Source Type	Contaminant Source ID	Zone	Comments
Laundromats without dry cleaning	C22-01	A	Laundromat/Washeteria
Domestic wastewater treatment plant disposal ponds/lagoons	D02-01	A	Domestic Wastewater Treatment Plant disposal pond/lagoon
Domestic wastewater treatment plants	D05-01	A	Domestic wastewater treatment plants
Tanneries	I44-01	A	Tanneries
Residential Areas	R01-01-20	A	Residential areas Approx 20 acres
Tanks, heating oil, residential (above ground)	R08-01	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-02	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-03	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-04	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-05	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-06	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-07	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-08	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-09	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-10	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-11	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-12	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-13	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-14	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-15	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-16	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-17	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-18	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-19	A	Tanks, heating oil, residential (above ground)

Tanks, heating oil, residential (above ground)	R08-20	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-21	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-22	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-23	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-24	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-25	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-26	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-27	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-28	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-29	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-30	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-31	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-32	A	Tanks, heating oil, residential (above ground)
Tanks, heating oil, residential (above ground)	R08-33	A	Tanks, heating oil, residential (above ground)
Highways and roads, dirt/gravel	X24-01-20	A	Highways and Roads dirt/gravel. Less than 20. About 5

Contaminant Risks

Inventoried contaminant sources are sorted by the Drinking Water Protection (DWP) group according to the six (6) major categories of contaminants regulated for drinking water: 1) bacteria and viruses; 2) nitrates and/or nitrites (nitrates); 3) volatile organic chemicals (VOCs); 4) heavy metals, cyanide, and other inorganic chemicals (inorganics); 5) synthetic organic chemicals (SOCs); and 6) other organic chemicals (OOCs). The potential contaminant sources are then given a ranking (within each category) according to the density of sources within the DWPA, the PWS sampling history, as well as the degree of risk posed to human health based on the volume, toxicity, persistence, and the mobility of the contaminants involved. The contaminant risk rankings are summarized in Table 3.

Table 3: Contaminant Risk Rankings

Contaminant Source Type	Contaminant	Zone	Bacteria	Nitrates	VOCs	Inorganics	SOCs	OOCs
Laundromats without dry cleaning	C22-01	A	Low	Low	Low	N/A	N/A	N/A
Domestic wastewater treatment plant disposal ponds/lagoons	D02-01	A	High	High	Low	Low	Low	Low

Contaminant Source Type	Contaminant	Zone	Bacteria	Nitrates	VOCs	Inorganics	SOCs	OOCs
Domestic wastewater treatment plants	D05-01	A	Medium	Medium	Low	Low	Low	Low
Tanneries	I44-01	A	N/A	N/A	Very High	Very High	N/A	N/A
Residential Areas	R01-01-20	A	Low	Low	Low	Low	Low	Low
Tanks, heating oil, residential (above ground)	R08-01	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-02	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-03	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-04	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-05	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-06	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-07	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-08	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-09	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-10	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-11	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-12	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-13	A	N/A	N/A	Low	N/A	N/A	N/A

Contaminant Source Type	Contaminant	Zone	Bacteria	Nitrates	VOCs	Inorganics	SOCs	OOCs
Tanks, heating oil, residential (above ground)	R08-14	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-15	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-16	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-17	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-18	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-19	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-20	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-21	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-22	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-23	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-24	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-25	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-26	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-27	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-28	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-29	A	N/A	N/A	Low	N/A	N/A	N/A

Contaminant Source Type	Contaminant	Zone	Bacteria	Nitrates	VOCs	Inorganics	SOCs	OOCs
Tanks, heating oil, residential (above ground)	R08-30	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-31	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-32	A	N/A	N/A	Low	N/A	N/A	N/A
Tanks, heating oil, residential (above ground)	R08-33	A	N/A	N/A	Low	N/A	N/A	N/A
Highways and roads, dirt/gravel	X24-01-20	A	Low	Low	Low	Low	N/A	Low
*Contaminant Category Risk Ranking**			*Very High*	*Very High*	*Very High*	*Very High*	*Low*	*Low*

** Scores based on additional factors, such as sampling history, and number/density of sources.*

The contaminant risk ranking for Bacteria and Viruses is ***Very High***. This risk ranking is driven primarily by the presence of identified potential and existing contaminants. These contaminant sources include a washeteria, a domestic wastewater treatment plant and lagoon, and the density of residential areas and roads in the DWPA.

The contaminant risk ranking for Nitrates is ***Low***. This risk ranking is driven primarily by the presence of identified potential and existing contaminants. These contaminant sources include a washeteria, a domestic wastewater treatment plant and lagoon, and the density of residential areas and roads in the DWPA.

The contaminant risk ranking for VOCs is ***Low***. No VOCs have been detected in recent years. This risk ranking is driven primarily by the presence of identified potential and existing contaminants. These contaminant sources include a washeteria, a tannery, a domestic wastewater treatment plant and lagoon, and the density of residential areas, fuel tanks, and roads in the DWPA.

The contaminant risk ranking for Inorganics is ***Low***. This risk ranking is driven primarily by a domestic waste water treatment plant and lagoon, a tannery, and the density of residential areas and roads within the DWPA. Arsenic was detected in previous sampling events with the most recent sample having a concentration of 1.67 µg/L (micrograms per liter) which is 16.7% of the maximum contaminant level (MCL) of 10 µg/L. Sources of arsenic include erosion of natural deposits; runoff from orchards; and runoff from glass & electronics production wastes. Potential health effects of consuming water with levels of arsenic above the MCL for many years could include skin damage or problems with the circulatory system, and may include an increased risk of getting cancer.

The contaminant risk ranking for SOCs is ***Low***. The risk ranking is driven primarily by a domestic wastewater treatment plant and lagoon and the density of residential areas within the DWPA. The PWS has not sampled for SOCs and received a monitoring waiver for the 2005-2007, 2008-2010, 2011-2013 compliance period.

The contaminant risk ranking for OOCs is ***Low***. The risk ranking is driven primarily by a domestic wastewater treatment plant and lagoon and the density of residential areas and roads within the DWPA. The PWS has not sampled for OOCs and received a monitoring waiver for the 2005-2007, 2008-2010, 2011-2013 compliance period.

Overall Vulnerability of the Drinking Water Source to Contamination

An overall vulnerability is determined by combining each of the contaminant risk scores with the natural susceptibility score:

Overall Vulnerability = Natural Susceptibility + Contaminant Risks

Table 4 summarizes the overall vulnerability ratings for each of the six (6) categories of drinking water contaminants.

Table 4: Overall Vulnerability

Category	*Rating*
Bacteria and Viruses	**Very High**
Nitrates and/or Nitrites	**Very High**
Volatile Organic Chemicals	**Very High**
Heavy Metals, Cyanide, and Other Inorganic Chemicals	**Very High**
Synthetic Organic Chemicals	**Medium**
Other Organic Chemicals	**Medium**

Using the Source Water Assessment

This assessment of contaminant risks and source vulnerability can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of SHISHMAREF to protect public health. Communities can use the Source Water Assessment (SWA) to create a drinking water protection plan to manage the identified potential and existing sources of regulated drinking water contaminants and to prevent or minimize new contaminant threats in the drinking water protection area.

SHISHMAREF can use a number of different drinking water protection methods to limit or prevent contamination of its drinking water source.

Non-Regulatory Options include:

- Public education about where drinking water comes from and the effects of contaminants is probably the most effective and least costly method of protection;
- Household hazardous waste collection - household hazardous wastes are usually generated in small amounts but can have a big impact on the environment;
- The source water assessment report is a tool that can be used to prioritize protection strategies identified in a drinking water protection plan;
- Taking proactive measures towards proper waste storage and disposal can help eliminate the need to find an alternative drinking water source by preventing source water contamination;
- Conservation easements - easements can assist in protecting the area by limiting development;
- Make a written plan on what you will do if an accidental spill happens that could contaminate your source of drinking water; and
- Local drinking water protection plan (an example or template is available from DEC).

Regulatory Options include:

- Source protection regulations prohibiting the presence or use of all or specific chemicals within the drinking water protection area;
- Zoning ordinances to control development within the protection areas around the source;
- Subdivision ordinance; and
- Operating standards for industrial and other activities within the protection areas around the source.

Source Water Assessments can be updated to reflect any changes in the vulnerability and/or susceptibility of the SHISHMAREF IN001 drinking water source. The data that is used to generate the Source Water Assessment is updated on an on-going basis as identified in the field or if changes are identified and brought to the attention of the Drinking Water Program.

Where to go from here?

The Source Water Assessment (SWA) is a comprehensive evaluation of the potential risk of contamination to the public water system and the source(s) of drinking water used by the system. Identifying potential sources of contamination and the vulnerability of the public water system is an important first step in protecting the drinking water source from contamination. However, in order to prevent contamination from occurring, action must be taken by the water system owner and/or operator. The SWA can be used by the public water system to educate the local community and to prioritize community-driven protection strategies. Inviting community members, council members, and local government officials to help develop a Drinking Water Protection Plan is one essential component towards successful drinking water protection efforts. For questions regarding, or assistance to begin, the process of developing a Drinking Water Protection Plan, please contact the Drinking Water Protection group at #1-866-956-7656.

Other Resources

The Drinking Water Protection group, the EPA, and local organizations are available to help you build on this Source Water Assessment report as you continue to improve drinking water protection in your community.

DEC, Drinking Water Protection - http://dec.alaska.gov/eh/dw/DWP/DWP_main.html
EPA, Drinking Water Protection - http://water.epa.gov/infrastructure/drinkingwater/sourcewater/protection/
ARWA (Alaska Rural Water Association) - http://www.arwa.org

Appendices

- SHISHMAREF IN001 Drinking Water Protection Area Location Map (Map 1)
- SHISHMAREF IN001 Drinking Water Protection Area with Potential and Existing Contaminant Sources (Map 2)
- Best Management Strategies for Potential Contaminants Identified within a Drinking Water Source Protection Area

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1 inch = 398.26 feet

Source Water Assessment Report

Map 1 - *Contaminant Source Inventory*

340484: Shishmaref Water System

IN001 (Snow Melt Reservoir)

DW Regulated Public Water System Sources

- Community Water System (Active)
- Community Water System (Inactive)
- NonCommunity Water System (Active)
- NonCommunity Water System (Inactive)
- NonPublic Water System (Active)
- NonPublic Water System (Inactive)
- NonTransient/NonCommunity Water System (Active)
- NonTransient/NonCommunity Water System (Inactive)

Identified Drinking Water Protection Areas (DWPAs)

- Zone A (GW-Several Months Time of Travel or SW 1000 ft buffer)
- Zone B (GW-2 Yr Time of Travel or SW-1 mile buffer)

Star indicates location of Public Water System

Data sources: Alaska DEC: Public Water System sources and Drinking Water Protection Areas; Alaska Mapped Best Data Layer Web Map Service: Aerial imagery.

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Source Water Assessment Report

Map 1 - *Contaminant Source Inventory*

340484: Shishmaref Water System
IN001 (Snow Melt Reservoir)

DW Regulated Public Water System Sources

- Community Water System (Active)
- Community Water System (Inactive)
- NonCommunity Water System (Active)
- NonCommunity Water System (Inactive)
- NonPublic Water System (Active)
- NonPublic Water System (Inactive)
- NonTransient/NonCommunity Water System (Active)
- NonTransient/NonCommunity Water System (Inactive)

Identified Drinking Water Protection Areas (DWPAs)

- Zone A (GW-Several Months Time of Travel or SW 1000 ft buffer)
- Zone B (GW-2 Yr Time of Travel or SW-1 mile buffer)

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Data sources: Alaska DEC: Public Water System sources and Drinking Water Protection Areas; Alaska Mapped Best Data Layer Web Map Service: Aerial imagery.

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