A Source Water Assessment (SWA) for

PWSID #250427 – Evergreen Logging Camp – WL001, WL002, WL003

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 well is within the drinking water protection area (DWPA). The DWPA for a groundwater source is the area around the well (the area influenced by pumping) and also the area upgradient of the well, usually forming a parabola shape. Because releases of contaminants within the DWPA are most likely to impact the well, this area will serve as the focus for voluntary protection efforts.

The DWPAs established for wells by DEC are separated into 2 zones, limited by the watershed. The following is a summary of the two zones for wells and the estimated time-of-travel for each:

Zone	Definition
A	Several months time-of-travel
B	Less than the 2 year time-of-travel

Natural Susceptibility

Susceptibility of a groundwater source is a measure of a water supply's potential to become contaminated based on information gathered on the wellhead and the aquifer.

Table 1: Public Water System Source Information

PWS Name	**Evergreen Logging Camp**		
PWSID Number	250427		
Federal Designation	Community water system (CWS)		
State Assigned ID	WL001	WL002	WL003
Facility Name	Dangerous Bay Logging Camp	Dangerous Bay Logging Camp Well #2	Danger Bay Well #3
Source Type	Groundwater	Groundwater	Groundwater
Total Depth of Well (ft bls*)	204	444	304
Static Water Level (ft bls*)	22	0 - Artesian	21
Aquifer Type	Unconfined	Unconfined	Unconfined
Aquifer Formation	Shale	Shale	Shale
Description and Cumulative Thickness of Barrier (ft)	N/A	N/A	N/A
Date Well Completed	6/22/2007	11/22/2007	10/8/2010

**"ft bls" = feet below land surface

Executive Summary

The public water system (PWS) for EVERGREEN LOGGING CAMP is a Community water system (CWS) consisting of nine (9) wells (5 active wells and 4 inactive wells), at the time of this report, located in Wasilla, Alaska. This report is a combined assessment of wells WL001 (DANGEROUS BAY LOGGING CAMP), WL002 (DANGEROUS BAY LOGGING CAMP #2), and WL003 (DANGER BAY WELL #3). An assessment of the susceptibility of the wellheads and aquifer to contamination, and the vulnerability of the wells to potential and existing contamination were evaluated as of April 2015. All (WL001, WL002, and WL003) wellheads received a susceptibility rating of ***Low*** and the aquifer received a susceptibility rating of ***High***. Combining these two ratings produces a ***Low*** rating for the natural susceptibility of the wells and aquifer. Identified potential and existing sources of contamination for EVERGREEN LOGGING CAMP WL001, WL002, and WL003 include: a motor vehicle repair shop, logging activities, two (2) DEC recognized contaminated sites, residential areas and roads. These are considered sources one or more of the following six (6) contaminant risk categories: 1) bacteria and viruses; 2) nitrates and/or nitrites; 3) volatile organic chemicals (VOCs); 4) heavy metals, cyanide, and other inorganic chemicals (inorganic chemicals); 5) synthetic organic chemicals (SOCs); and 6) other organic chemicals (OOCs).

Combining the natural susceptibility of the wells and aquifer with the six (6) contaminant risk categories, EVERGREEN LOGGING CAMP WL001, WL002, and WL003 received an overall vulnerability rating of ***Low*** for bacteria and viruses; ***Low*** for nitrates and/or nitrites; ***Medium*** for VOCs; ***High*** for inorganic chemicals; and a ***Low*** for SOCs and ***Low*** for OOCs.

Introduction

Source Water Assessments (SWAs) are intended to provide 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 for the EVERGREEN LOGGING CAMP WL001, WL002, and WL003 is a tool to be used as the foundation or "stepping stone" to comprehensive management and protection of its groundwater resource. Protecting the quality of your drinking water is a sensible investment.

Drinking Water Protection Area

For groundwater sources, a combination of a numerical flow model and natural factors such as drainage divides, subsurface barriers, and manmade structures are used to determine the size and shape of the Drinking Water Protection Area (DWPA). The orientation of the DWPA is typically drawn using a groundwater surface, or a land surface, elevation map. Because of uncertainties and changing site conditions, a factor of safety is added in calculating the size of the DWPA. (See Map1 of the Appendices)

Natural Susceptibility (Wellhead and Aquifer)

The susceptibility of a wellhead to the introduction of contaminants to the drinking water is determined by, but not limited to, the following risk factors: presence of a sanitary seal, protection from flooding, drainage, and presence of adequate grouting.

The wellheads for the EVERGREEN LOGGING CAMP WL001, WL002, and WL003 received a ***Low*** susceptibility rating. The most recent sanitary survey (completed August 2014) indicates that the wells are capped with a sanitary seal, the wells are not in a floodplain, the land surface is sloped to drain away from the wellheads, and that a subsurface grout seal was installed to the required depth. A sanitary seal prevents potential contaminants from entering the well while sloping of the land surface and grouting help to prevent potential contaminants from traveling down the outside of the well casing, or through casing seams/cracks to the inside of the well casing, and into the well and/or aquifer.

The susceptibility of an aquifer to the introduction of contaminants is determined by, but not limited to, the following risk factors: whether the aquifer is confined or unconfined, whether the well is completed in unconsolidated or fractured bedrock, whether other nearby wells and bore holes are penetrating the aquifer and if applicable the characteristics of the confining layer(s).

The EVERGREEN LOGGING CAMP WL001, WL002, and WL003 draw water from an unconfined aquifer completed in varying proportions of shale. It received a ***High*** susceptibility rating primarily because of the unconfined nature of the aquifer, and low protective ability of the vadose (unsaturated) zone. A confined aquifer is generally more protected than an unconfined aquifer from the infiltration of surface water potentially carrying contaminants by migrating downward from the surface to the aquifer. However, other wells that penetrate the confining layers create a potential pathway for surface water and contaminants to the aquifer.

The Natural Susceptibility of the wells and aquifer to contamination is ***Low***. Table 2 summarizes the susceptibility ratings for the EVERGREEN LOGGING CAMP WL001, WL002, and WL003.

Table 2: Susceptibility Ratings

Susceptibility of the wellheads	***Low***
+	
Susceptibility of the aquifer	***High***
=	
Natural susceptibility	***Low***

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 EVERGREEN LOGGING CAMP WL001, WL002, and WL003. This inventory was completed through a search of agency records and other publicly available information. Potential sources of contamination 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 3 and are portrayed in Map 2 of the Appendices.

Table 3: Contaminant Source Inventory

Contaminant Source Type	Contaminant Source ID	Zone	Comments
Metals mining, open pit	E03-01	A	Evergreen Logging Camp - Danger Bay
Residential Areas	R01-01	A	Assumed less than 50 acres
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04-01	A	Afognak Koncor Logging Camp; Status: Cleanup Complete; Hazard ID: 3795; Contaminant of Concern: Benzene, Chromium (total), GRO; Groundwater Ingestion: N/A; http://dec.alaska.gov/Applications/SPAR/CCReports/Site_Report.aspx?Hazard_ID=3795
Highways and roads, dirt/gravel	X24-01-20	A	Assumed less than 20 roads
Accidental spill sites (not designated a Superfund or 'contaminated site')	U02-01	B	Koncor Logging Camp Afognak; Active cleanup; Spill # 12249904001; Diesel Spill 1 gallon; http://decjnusql1/ReportServer?/SPAR%2fSPILLS%2fSpill+Summary&SpillNumber=12249904001
Highways and roads, dirt/gravel	X24-21-70	B	Assumed less than 50 roads

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; 3) volatile organic chemicals (VOCs); 4) heavy metals, cyanide, and other inorganic chemicals (inorganic chemicals); 5) synthetic organic chemicals (SOCs); and 6) other organic chemicals (OOCs). The 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 4.

Table 4: Contaminant Risk Rankings

Contaminant Source Type	Contaminant	Zone	Bacteria	Nitrates	VOC	Metals	SOC	OOC
Metals mining, open pit	E03-01	A	N/A	Low	Medium	Very High	N/A	N/A
Residential Areas	R01-01	A	Low	Low	Low	Low	Low	Low
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04-01	A	N/A	N/A	Low	Low	N/A	N/A
Highways and roads, dirt/gravel	X24-01-20	A	Low	Low	Low	Low	N/A	Low
Highways and roads, dirt/gravel	X24-21-70	B	Low	Low	Low	Low	N/A	Low
Contaminant Category Risk Ranking			***Low***	***Low***	***High***	***Very High***	***Low***	***Low***

** Includes heavy metals, cyanide, and other inorganic chemicals.*
*** Scores based on additional factors, such as sampling history, and number/density of sources.*

The contaminant category risk ranking for Bacteria & Viruses is ***Low***. This ranking is driven primarily by roads, and residential areas located within the DWPA. A positive Total Coliform (which may include fecal coliform and *E. Coli*, but not a confirmation of the presence of either) has not been detected in recent years. Coliforms are naturally present in the environment, as well as feces; fecal coliforms and *E. Coli* only come from human and animal fecal waste. Total Coliforms is not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present.

The contaminant category risk ranking for Nitrates and/or Nitrites is ***Low***. This ranking is driven primarily by logging activities, roads, and residential areas located within the DWPA. Nitrates and/or nitrites have been detected in samples collected in recent years, but an increasing or decreasing trend is not apparent; the most recent sample collected October 2013, showed a total nitrate-nitrite concentration of 0.191 milligrams per liter (mg/L), which is 1% of the maximum contaminant level (MCL) of 10 mg/L for nitrate. Sources of nitrate and/or nitrite may include runoff from fertilizer use, leaking from septic tanks, sewage, and/or erosion from natural deposits. A relatively low concentration and absence of a clear trend implies that the source is natural, rather than anthropogenic. Potential health effects include serious illness and, if untreated, death for infants below the age of six months; symptoms include a shortness of breath and blue-baby syndrome.

The contaminant category risk ranking for VOCs is ***High***. This ranking is driven primarily by the motor vehicle repair shop, logging activities, one of the DEC recognized contaminated sites, roads, and residential areas located within the DWPA. VOCs have been detected in samples collected in recent years but an increasing or decreasing trend is not apparent. The most recent sample collected December 2012 showed concentration of .780 micrograms per liter (µg/L) of dichloromethane which is 15% of the MCL of .005 µg/L for dichloromethane. Sources of dichloromethane may include discharges from drug and chemical companies. Potential health effects are liver problems and increased risk of getting cancer when consumed for many years in levels above the MCL.

The contaminant category risk ranking for Inorganic Chemicals is ***Very High***. This ranking is driven primarily by a motor vehicle repair shop, logging activities, one of the DEC recognized contaminated sites, roads, and residential areas located within the DWPA. Barium was detected at a concentration of .119 milligrams per liter (*mg*/L) (5.9% of the MCL of 2 mg/L) October 2013. Sources of barium may include discharge of drilling wastes, discharge from metal refineries, and erosion of natural deposits. A potential health effect from long-term exposure above the MCL may include an increase in blood pressure. Antimony was detected at a concentration of 7.17 micrograms per liter (*µ*g/L) (119.5% of the MCL of

6 mg/L) August 2011. Sources of antimony may include discharge from petroleum refineries, fire retardants, ceramics, electronics and solder. A potential health effect from long-term exposure above the MCL may include increases in blood cholesterol and decreases in blood sugar.

The contaminant category risk ranking for SOCs is ***Low***. This ranking is driven primarily by roads located within the DWPA. This PWS has received an SOC Monitoring Waiver for compliance period 2011-2013.

The contaminant category risk ranking for OOCs is ***Low***. This ranking is driven primarily by a motor vehicle repair shop, and roads and residential areas located within the DWPA. This PWS has received an SOC Monitoring Waiver for compliance period 2011-2013.

Overall Vulnerability of the Drinking Water Source to Contamination

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

Overall Vulnerability of the Drinking Water Source to Contamination = Natural Susceptibility + Contaminant Risks

Table 5 summarizes the overall vulnerability ratings for each of the six (6) contaminant categories.

Table 5: Overall Vulnerability

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

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 the EVERGREEN LOGGING CAMP PWS 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.

The EVERGREEN LOGGING CAMP PWS 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 different protection areas around the source;
  - Subdivision ordinance; and
  - Operating standards for industrial and other activities within the different protection areas around the source.

Source Water Assessments can be updated to reflect any changes in the vulnerability and/or susceptibility of the EVERGREEN LOGGING CAMP WL001, WL002, and WL003. The data that is used to generate the SWA 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 SWA is a comprehensive evaluation of the potential risk of contamination to the PWS and the source(s) of drinking water used by the system. Identifying potential sources of contamination and the vulnerability of the PWS 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 PWS owner and/or operator. The SWA can be used by the PWS 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 toll-free at #1-866-956-7656 (within Alaska only), or direct at #907-269-7656.

Other Resources

The Drinking Water Protection group, the Environmental Protection Agency (EPA), and local organizations are available to help you build on this SWA 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://cfpub.epa.gov/safewater/sourcewater/index.cfm
- Groundwater Foundation - http://www.groundwater.org
- Groundwater Protection Council- http://www.gwpc.org
- National Ground Water Association: http://www.ngwa.org/Pages/default.aspx

Appendices

- EVERGREEN LOGGING CAMP WL001, WL002, and WL003 Drinking Water Protection Area Location Map (Map 1);
- EVERGREEN LOGGING CAMP WL001, WL002, and WL003 Drinking Water Protection Area with Potential and Existing Contaminant Sources (Map 2);

- Example Best Management Strategies for Potential Contaminants Identified within a Drinking Water Protection Area.