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# Source Water Assessment

A Hydrogeologic Susceptibility and  
Vulnerability Assessment for  
Chilkoot Lake Park,  
Haines, Alaska  
PWSID #130350

DRINKING WATER PROTECTION PROGRAM REPORT NO. 705

Alaska Department of Environmental Conservation

# Source Water Assessment for Chilkoot Lake Park Haines, Alaska PWSID #130350

DRINKING WATER PROTECTION PROGRAM REPORT NO. 705

The Drinking Water Protection Program (DWPP) is producing Source Water Assessments in compliance with the Safe Drinking Water Act Amendments of 1996. Each assessment includes a delineation of the source water area, an inventory of potential and existing contaminant sources that may impact the water, a risk ranking for each of these contaminants, and an evaluation of the potential vulnerability of these drinking water sources.

These assessments are intended to provide public water systems owners/operators, communities, and local governments with the best available information that may be used to protect the quality of their drinking water. The assessments combine information obtained from various sources, including the U.S. Environmental Protection Agency, Alaska Department of Environmental Conservation (ADEC), public water system owners/operators, and other public information sources. The results of this assessment are subject to change if additional data becomes available. It is anticipated this assessment will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of public drinking water source. If you have any additional information that may affect the results of this assessment, please contact the Program Coordinator of DWPP, (907) 269-7521.

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# Source Water Assessment for Chilkoot Lake Park, Haines, Alaska

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## Drinking Water Protection Program Alaska Department of Environmental Conservation

### EXECUTIVE SUMMARY

The public water system for Chilkoot Lake Park is a Class B (transient/non-community) water system consisting of one well. The Chilkoot Lake Park is located near Haines, Alaska. The wellhead received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **Very High**. Combining these two ratings produces a **High** rating for the natural susceptibility of the well. Identified potential and current sources of contaminants for Chilkoot Lake Park public drinking water source include: a large-capacity septic system; water supply well; roads, salmon spawning streams; and placer mining. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, the public water sources for Chilkoot Lake Park received a vulnerability rating of **High** for both bacteria and viruses and nitrates and nitrites, and **Medium** for volatile organic chemicals.

### CHILKOOT LAKE PARK PUBLIC DRINKING WATER SYSTEM

Chilkoot Lake Park public water system is a Class B (transient/non-community) water system. The system consists of one 6-inch diameter well located at 10 miles northeast of Haines, Alaska (See Map 1 of Appendix A). Haines is located on Portage Cove, between the Chilkoot and Chilkat Inlets, on the upper arm of Lynn Canal, approximately 80 air miles northwest of Juneau (please see the inset of Map 1 in Appendix A for location). The population of Haines is approximately 2,300.

Haines averages about 60 inches of precipitation per year; and approximately 133 inches of snow. The groundwater aquifers underlying the area are recharged through the infiltration of precipitation and surface water. Groundwater aquifers in the region generally occur in the fractured bedrock and unconsolidated sediments deposited by glaciers and/or rivers. The elevation for Haines is at sea level.

According to a Sanitary Survey from July 19, 1997, the existing well was installed in 1992. The depth of the well is 100 feet below the ground surface and consists of 6-inch diameter casing. It is assumed that the length of the well screen is 10 feet.

The Sanitary Survey (7/17/97) for the water system indicates the land surface is appropriately sloped away from the well, providing adequate surface water drainage. Based on the age of the well (19872) it is unlikely that the well is grouted to ADEC standards. Proper grouting provides added protection against contaminants traveling along the well casing and into source waters.

This system operates from May through September and serves approximately 100 non-residents through 1 service connection.

### CHILKOOT LAKE PARK DRINKING WATER PROTECTION AREA

In order to evaluate whether a drinking water source is at risk, we must first evaluate what are the most likely pathways for surface contamination to reach the groundwater. These areas are determined by looking at the characteristics of the soil, groundwater, aquifer, and well.

The most probable area for contamination to reach the drinking water well is the area that contributes water to the well, the groundwater recharge area. This area is designated as the Drinking Water Protection Area (DWPA). Because releases of contaminants within the DWPA are most likely to impact the drinking water well, this area will serve as the focus for voluntary protection efforts.

An analytical calculation was used to determine the size and shape of the DWPA. The input parameters describing the attribute of the aquifer in this calculation were adopted from the U.S. Geological Survey (Patrick, Brabets, and Glass, 1989), and State of Alaska Department of Water Resources (*Jokela, et. al., 1991*). Additional methods were also used to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful DPWA (Please refer to the Guidance Manual for Class B Public Water Systems for additional information).

The DWPA's established for wells by the ADEC are usually separated into four zones. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well.

The TOT for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. The following is a summary of the four protection area zones for wells and the calculated time-of-travel for each:

**Table 1. Definition of Zones**

<b>Zone</b>	<b>Definition</b>
A	¼ the distance for the 2-yr. time-of-travel
B	Less than the 2 year time-of-travel
C	Less Than the 5 year time-of-travel
D	Less than the 10 year time-of-travel

Because of its proximity to the surface water source, the DWPA for Chilkoot Lake Park may extend over the entire watershed. Development in the vicinity of the well is limited to only Zone A (See Map 1 of Appendix A).

**INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES**

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within the Chilkoot Lake Park DWPA. This inventory was completed through a search of agency records and other publicly-available information. Potential sources of contamination to the drinking water aquifer 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.

For the basis of all Class B public water system assessments, three categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites;
- Volatile organic chemicals

The sources are displayed on Map 2 of Appendix C and summarized in Table 1 of Appendix B.

**RANKING OF CONTAMINANT RISKS**

Once the potential and existing sources of contamination have been identified, they are assigned a ranking according to what type and level of risk they

represent. Ranking of contaminant risks for a “potential” or “existing” source of contamination is a function of toxicity and volumes of specific contaminants associated with that source. Rankings include:

- Low;
- Medium;
- High; and
- Very High.

The TOT for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zones A and B because of their short life span. Only “Very High” and “High” rankings are inventoried within the outer Zone D due to the probability of contaminant dilution by the time the contaminants get to the well.

Tables 2 through 4 in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals.

**VULNERABILITY OF CHILKOOT LAKE PARK DRINKING WATER SYSTEM**

Vulnerability of a drinking water source to contamination is a combination of two factors:

- Natural susceptibility; and
- Contaminant risks.

Appendix D contains eight charts, which together form the ‘Vulnerability Analysis’ for a source water assessment for a public drinking water source. Chart 1 analyzes the ‘Susceptibility of the Wellhead’ to contamination by looking at the construction of the well and its surrounding area. Chart 2 analyzes the ‘Susceptibility of the Aquifer’ to contamination by looking at the naturally occurring attributes of the water source and influences on the groundwater system that might lead to contamination. Chart 3 analyzes ‘Contaminant Risks’ for the drinking water source with respect to bacteria and viruses. The ‘Contaminant Risks’ portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the well. Lastly, Chart 4 contains the ‘Vulnerability Analysis for Bacteria and Viruses’. Charts 5 through 8 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

A score for the Natural Susceptibility is reached by considering the properties of the well and the aquifer.

Susceptibility of the Wellhead (0 – 25 Points)  
(Chart 1 of Appendix D)

+

Susceptibility of the Aquifer (0 – 25 Points)  
(Chart 2 of Appendix D)

=

Natural Susceptibility (Susceptibility of the Well)  
(0 – 50 Points)

A ranking is assigned for the Natural Susceptibility according to the point score:

**Natural Susceptibility Ratings**

40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

The well for the Chilkoot Lake Park is completed in an unconfined aquifer. Because unconfined aquifers are recharged by surface water and precipitation that migrates downward from the surface, contaminants at the surface have the potential to adversely impact this aquifer. Table 2 shows the Susceptibility scores and ratings for Chilkoot Lake Park

**Table 2. Susceptibility**

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	25	Very High
Natural Susceptibility	30	Medium

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This score has been derived from an examination of existing and historical contamination that has been detected at the drinking water source through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as for the natural susceptibility:

**Contaminant Risk Ratings**

40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

Table 3 summarizes the Contaminant Risks for each category of drinking water contaminants.

**Table 3. Contaminant Risks**

Category	Score	Rating
Bacteria and Viruses	40	Very High
Nitrates and/or Nitrites	41	Very High
Volatile Organic Chemicals	12	Low

Finally, an overall vulnerability score is assigned for each water system by combining each of the contaminant risk scores with the natural susceptibility score:

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the  
Drinking Water Source to Contamination (0 – 100).

Again, rankings are assigned according to a point score:

**Overall Vulnerability Ratings**

80 to 100 pts	Very High
60 to < 80 pts	High
40 to < 60 pts	Medium
< 40 pts	Low

Table 4 contains the overall vulnerability scores (0 - 100) and ratings for each of the three categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

**Table 4. Overall Vulnerability**

Category	Score	Rating
Bacteria and Viruses	70	High
Nitrates and Nitrites	70	High
Volatile Organic Chemicals	40	Medium

**Bacteria and Viruses**

The contaminant risk for bacteria and viruses is **Very High** with a large-capacity septic system and roads located within Zone A representing the risks to the drinking water well (See Chart 3 – Contaminant Risks for Bacteria and Viruses in Appendix D).

Only a small amount of bacteria and viruses are required to endanger public health. Bacteria and viruses have not been detected during recent water sampling of the system at the Chilkoot Lake Park. Combining the contaminant risks with the overall natural susceptibility of the well, the vulnerability of the well to contamination by bacteria and viruses is **High**.

#### **Nitrates and Nitrites**

The contaminant risk for nitrates and nitrites is **Very High** with a large-capacity septic system and roads representing the risks to this source of public drinking water (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Sampling history for Chilkoot Lake Park well indicates that nitrates have been detected in the water, but only in very low concentrations (most recently at 0.115 mg/L on 6/16/1998) or 1% of the Maximum Contaminant Level (MCL). The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects. Due to the high solubility and weak retention by soil, nitrates are very mobile, moving at approximately the same rate as water.

After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the well, the overall vulnerability of the well to contamination by nitrates and nitrites is **High**.

#### **Volatile Organic Chemicals**

The contaminant risk for volatile organic chemicals is **Low** with a large-capacity septic system and roads creating the only known risks for volatile organic chemicals (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

Sampling history indicates that volatile organic chemicals have not been detected in the water. Combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination by volatile organic chemicals is **Medium**.

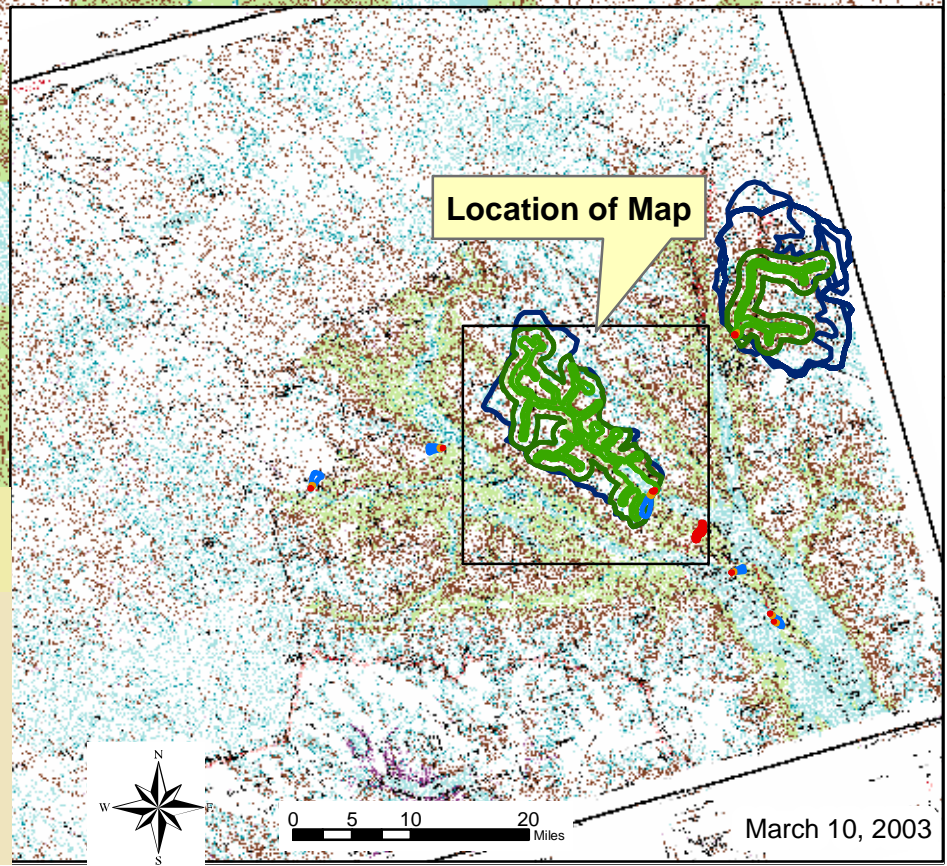
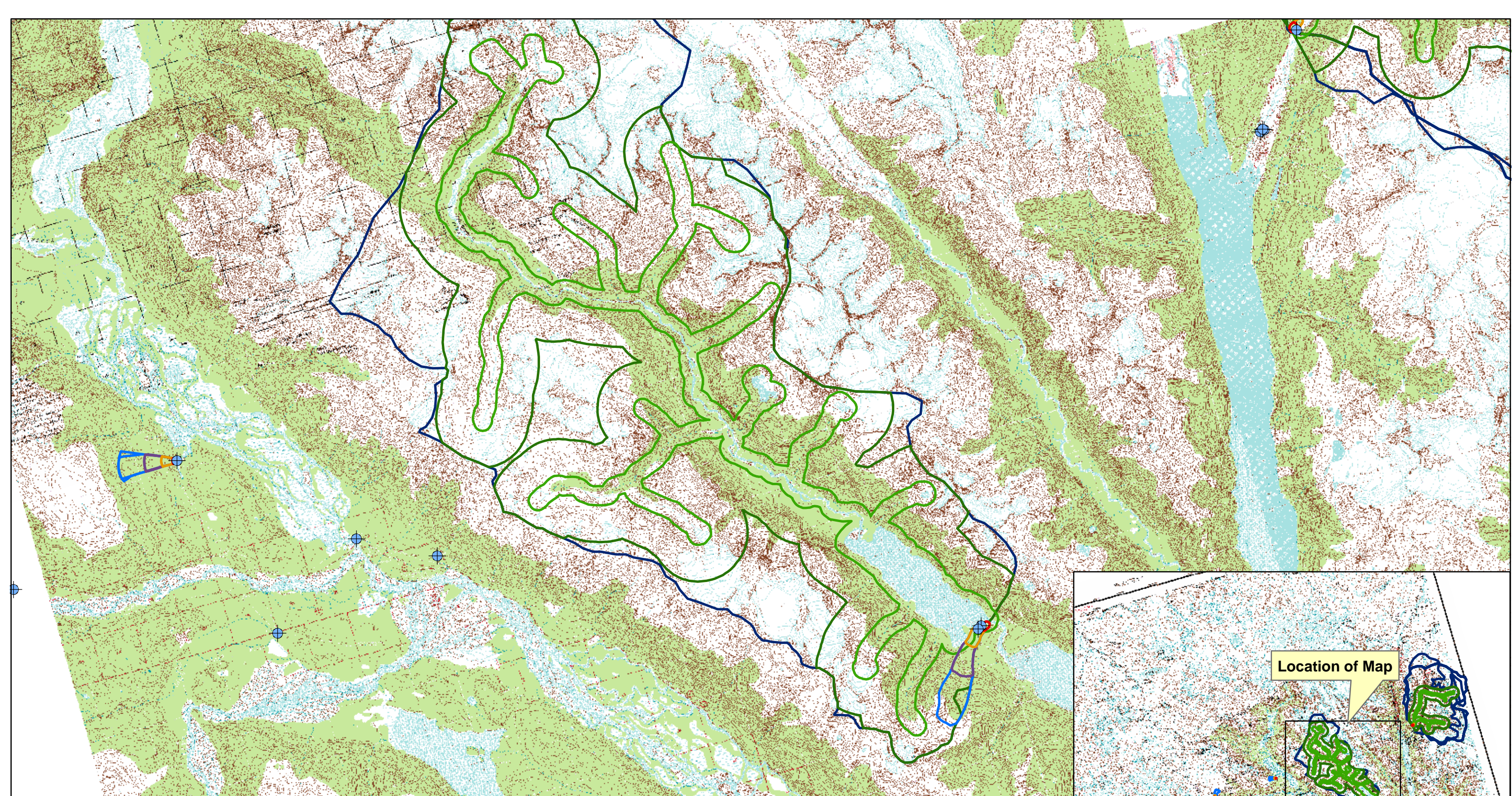
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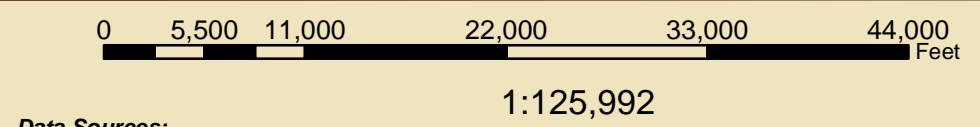
## **APPENDIX A**

### **Chilkoot Lake Park Drinking Water Protection Area Location Map (Map 1)**



Map 1: Ckilkoot Lake Park Drinking Water Protection Areas

PWSID: 110847.001



**Data Sources:**  
 Background image - USGS 1:63,000 mapping  
 Lakes & streams - U.S. Forest Service  
*Protection zones were delineated based upon streams noted on USGS 1:63,000 mapping.*

- Legend**
- Public Drinking Water Systems
  - Zone A Protection Area**  
 Several Months Travel Time
  - Zone B Protection Area**  
 Less than 2 Years Travel Time
  - Zone C Protection Area**  
 Less than 5 Years Travel Time
  - Zone D Protection Area**  
 Less than 10 Years Travel Time
  - Zone E Protection Area**  
 1000 Feet from Surface Water
  - Zone F Protection Area**  
 1 Mile from Surface Water
  - Zone G Protection Area**  
 Entire Watershed

March 10, 2003

## **APPENDIX B**

### **Contaminant Source Inventory and Risk Ranking for Chilkoot Lake Park (Tables 1-4)**

**Table 1**

**Contaminant Source Inventory for  
Chilkoot Lake**

**PWSID 110847.001**

<b>Contaminant Source Type</b>	<b>Contaminant Source ID</b>	<b>CS ID tag</b>	<b>Zone</b>	<b>Map Number</b>	<b>Comments</b>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	2	Chilkoot Lake State Rec Site Septic System
Water supply wells	W09	W09-1	A	2	Second Well in PDWS for Chilkoot Lake State Rec Site
Highways and roads, dirt/gravel	X24	X24-1	A	2	Road Leading to Chilkoot Lake State Rec Site
Salmon spawning streams	B10	B10-1	B	2	Salmon Spawning in the River and at Rec Site End of the Lake
Metals mining, placer (active or inactive?)	E04	E04-1	E	2	Chilkoot River Placer Mine

*Contaminant Source Inventory and Risk Ranking for*

*PWSID 110847.001*

*Chilkoot Lake*

*Sources of Bacteria and Viruses*

*Table 2*

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Chilkoot Lake State Rec Site Septic System
Highways and roads, dirt/gravel	X24	X24-1	A	Low	2	Road Leading to Chilkoot Lake State Rec Site
Salmon spawning streams	B10	B10-1	B	Medium	2	Salmon Spawning in the River and at Rec Site end of the Lake

*Contaminant Source Inventory and Risk Ranking for*

*PWSID 110847.001*

*Chilkoot Lake*

*Sources of Nitrates/Nitrites*

**Table 3**

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Chilkoot Lake State Rec Site Septic System
Highways and roads, dirt/gravel	X24	X24-1	A	Low	2	Road Leading to Chilkoot Lake State Rec Site

*Contaminant Source Inventory and Risk Ranking for*

*PWSID 110847.001*

*Chilkoot Lake*

*Sources of Volatile Organic Chemicals*

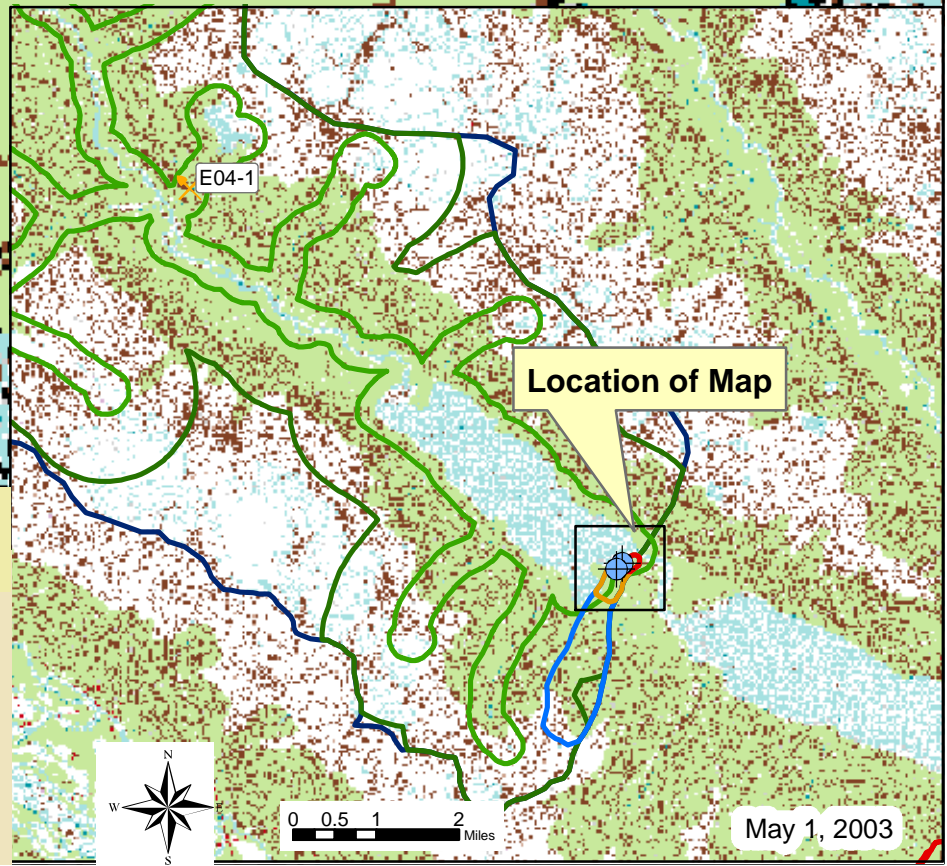
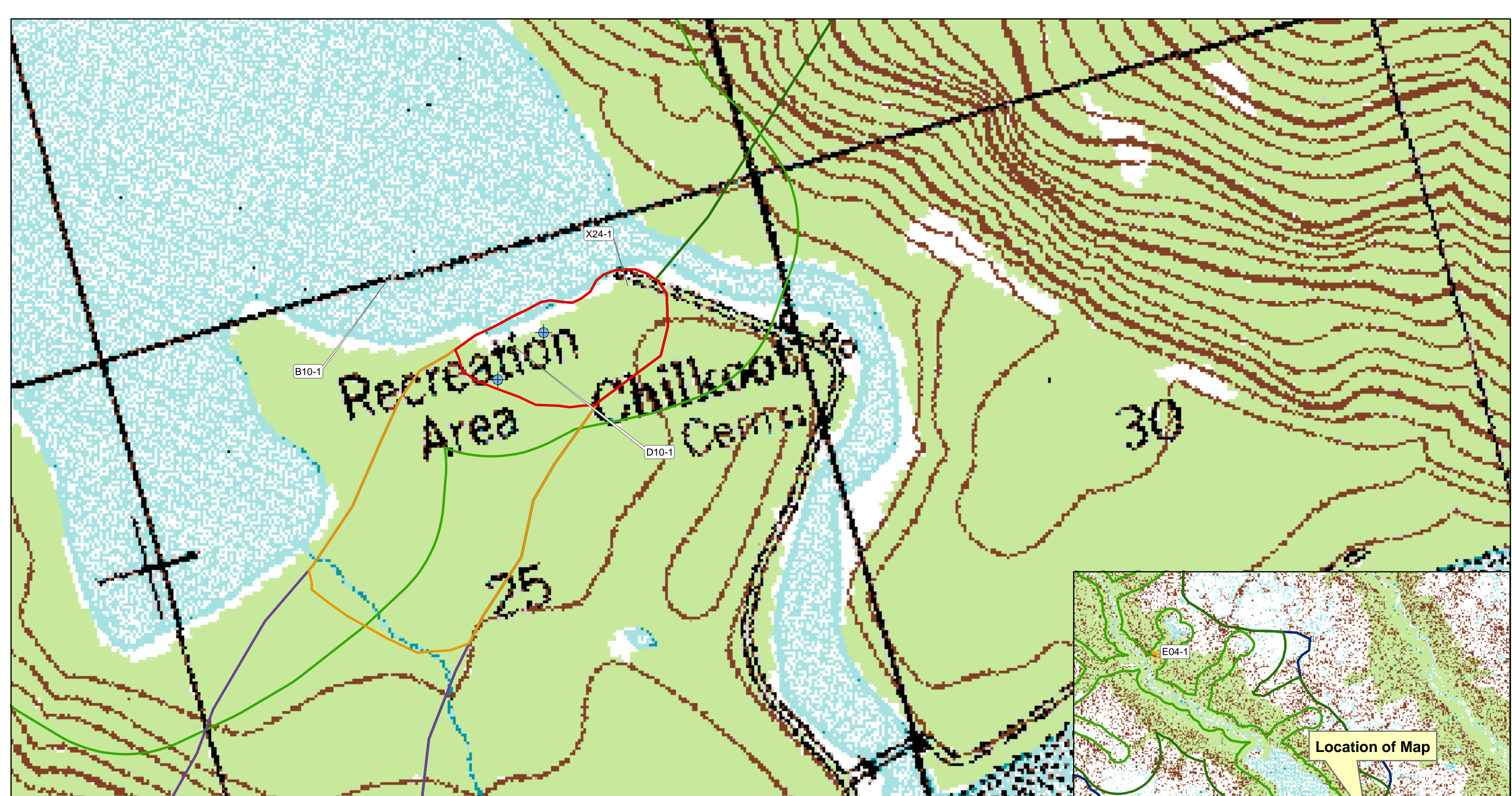
**Table 4**

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	Chilkoot Lake State Rec Site Septic System
Highways and roads, dirt/gravel	X24	X24-1	A	Low	2	Road Leading to Chilkoot Lake State Rec Site

## **APPENDIX C**

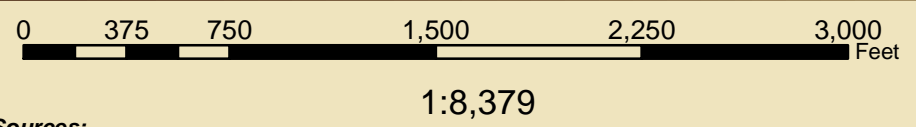
### **Chilkoot Lake Park Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map 2)**





**Map 2: Drinking Water Protection Areas for Ckilkoot Lake Park and Potential and Existing Sources of Contamination**

PWSID: 110847.001



**Data Sources:**  
 Background image - USGS 1:63,000 mapping  
 Lakes & streams - U.S. Forest Service

*Protection zones were delineated based upon streams noted on USGS 1:63,000 mapping.*

- Legend**
- Public Drinking Water Systems
  - Large Capacity Septic System (D10)
  - Placer Mine (E04)
  - Zone A Protection Area  
Several Months Travel Time
  - Zone B Protection Area  
Less than 2 Years Travel Time
  - Zone C Protection Area  
Less than 5 Years Travel Time
  - Zone D Protection Area  
Less than 10 Years Travel Time
  - Zone E Protection Area  
1000 Feet from Surface Water
  - Zone F Protection Area  
1 Mile from Surface Water
  - Zone G Protection Area  
Entire Watershed

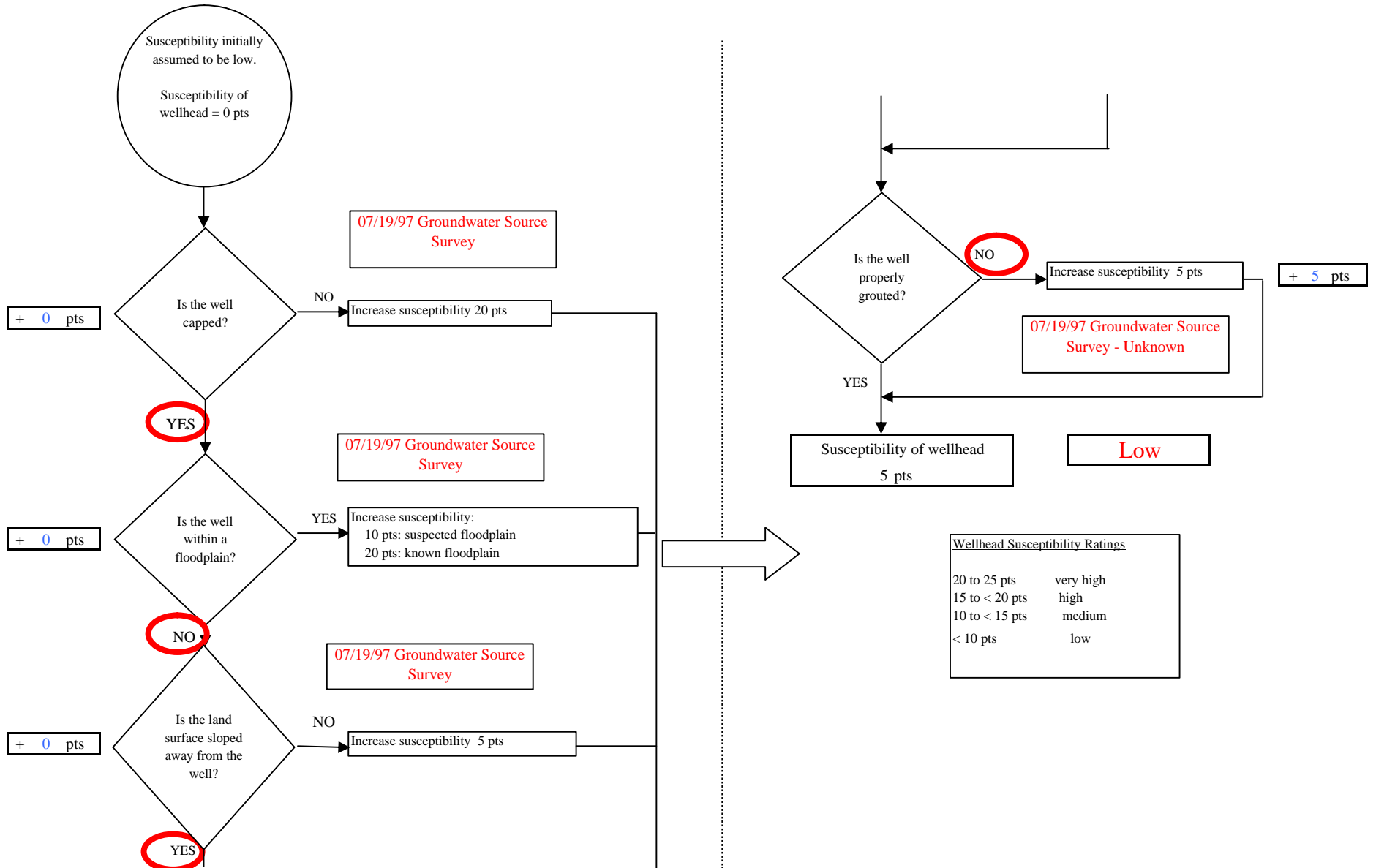


May 1, 2003

## **APPENDIX D**

### **Vulnerability Analysis for Chilkoot Lake Park Public Drinking Water Source (Charts 1-8)**

**Chart 1. Susceptibility of the wellhead - Chilkoot Lake Park**



**Chart 2. Susceptibility of the aquifer - Chilkoote Lake Park**

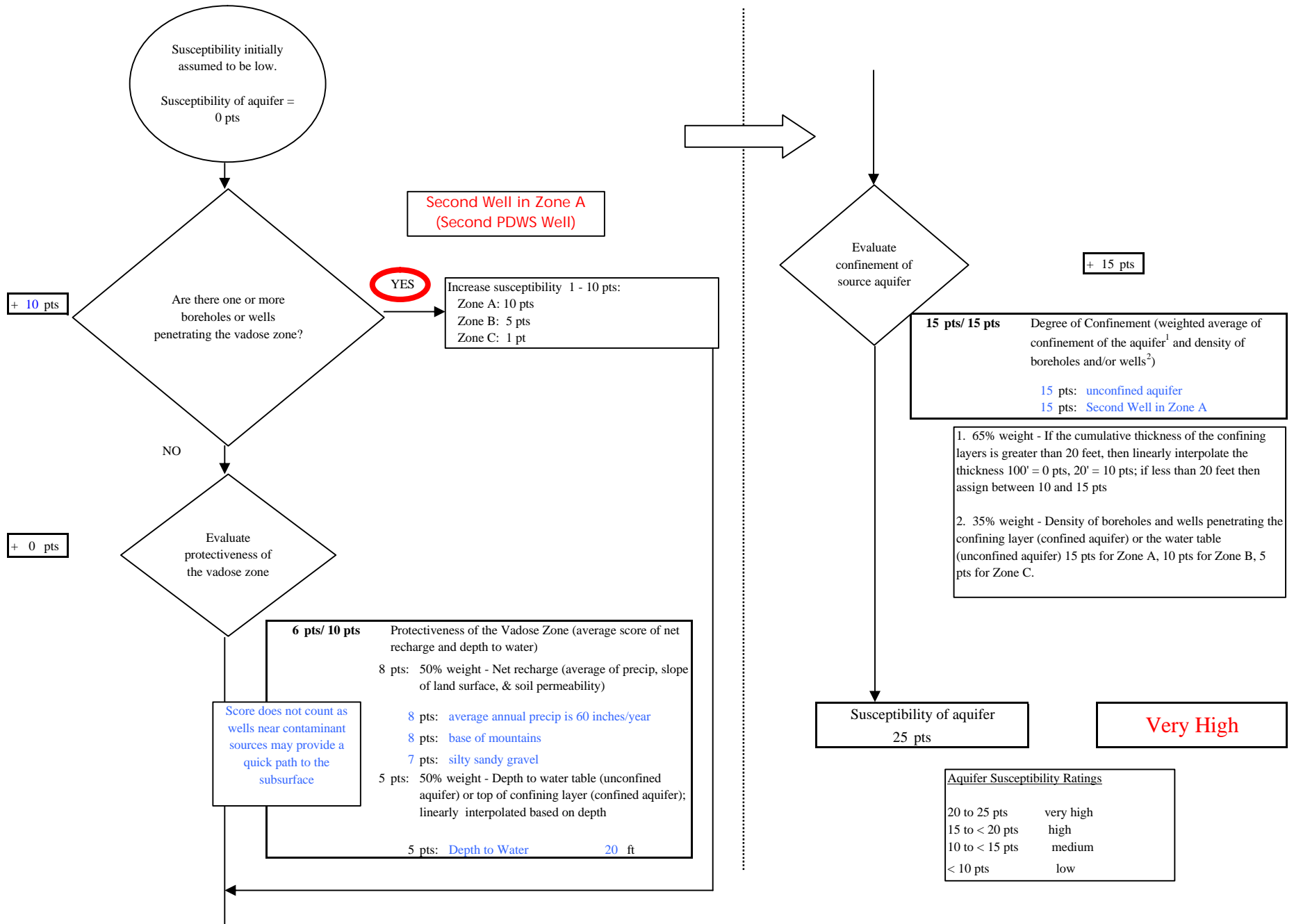


Chart 3. Contaminant risks for Chilkoote Lake Park - Bacteria & Viruses

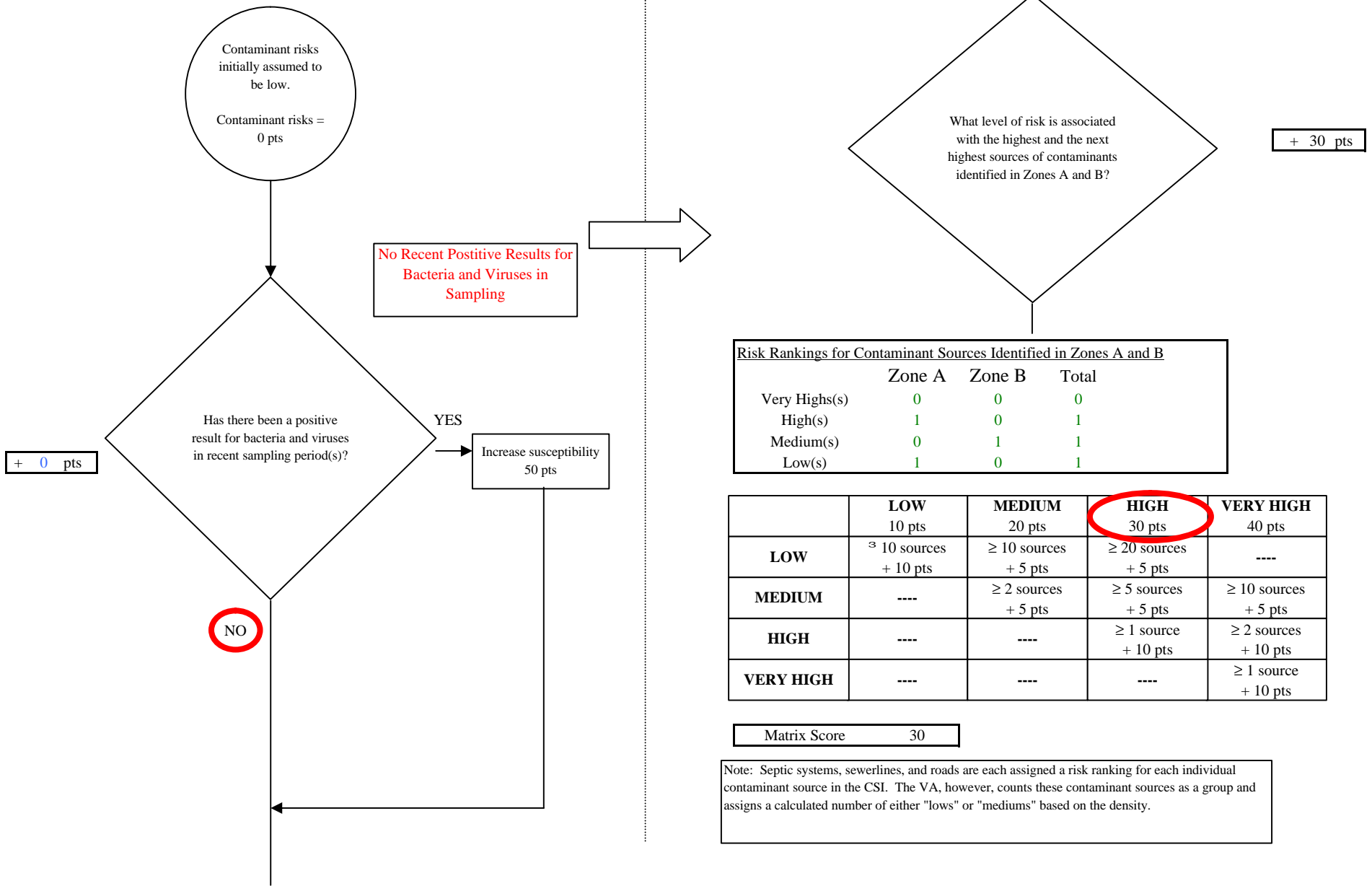
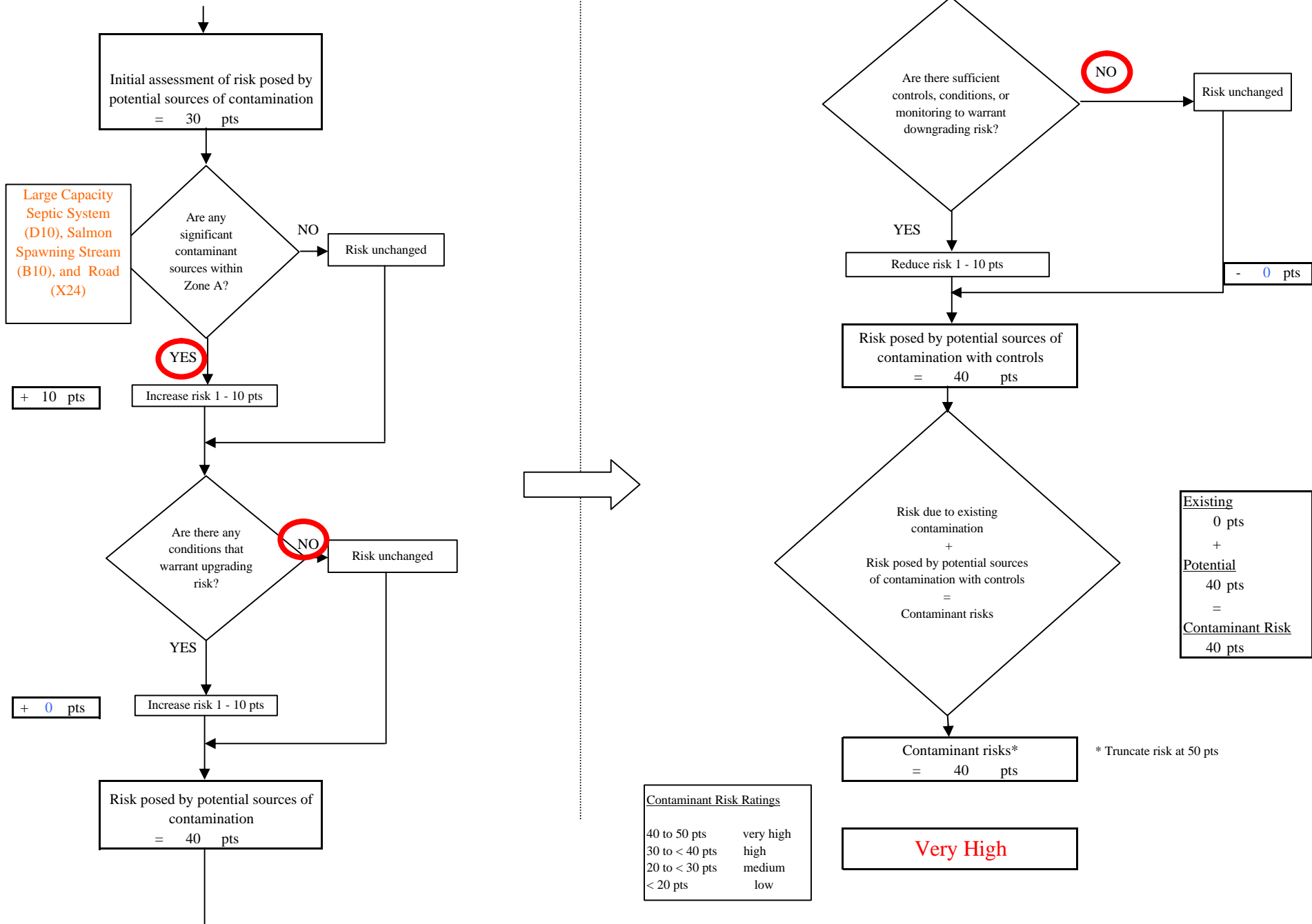
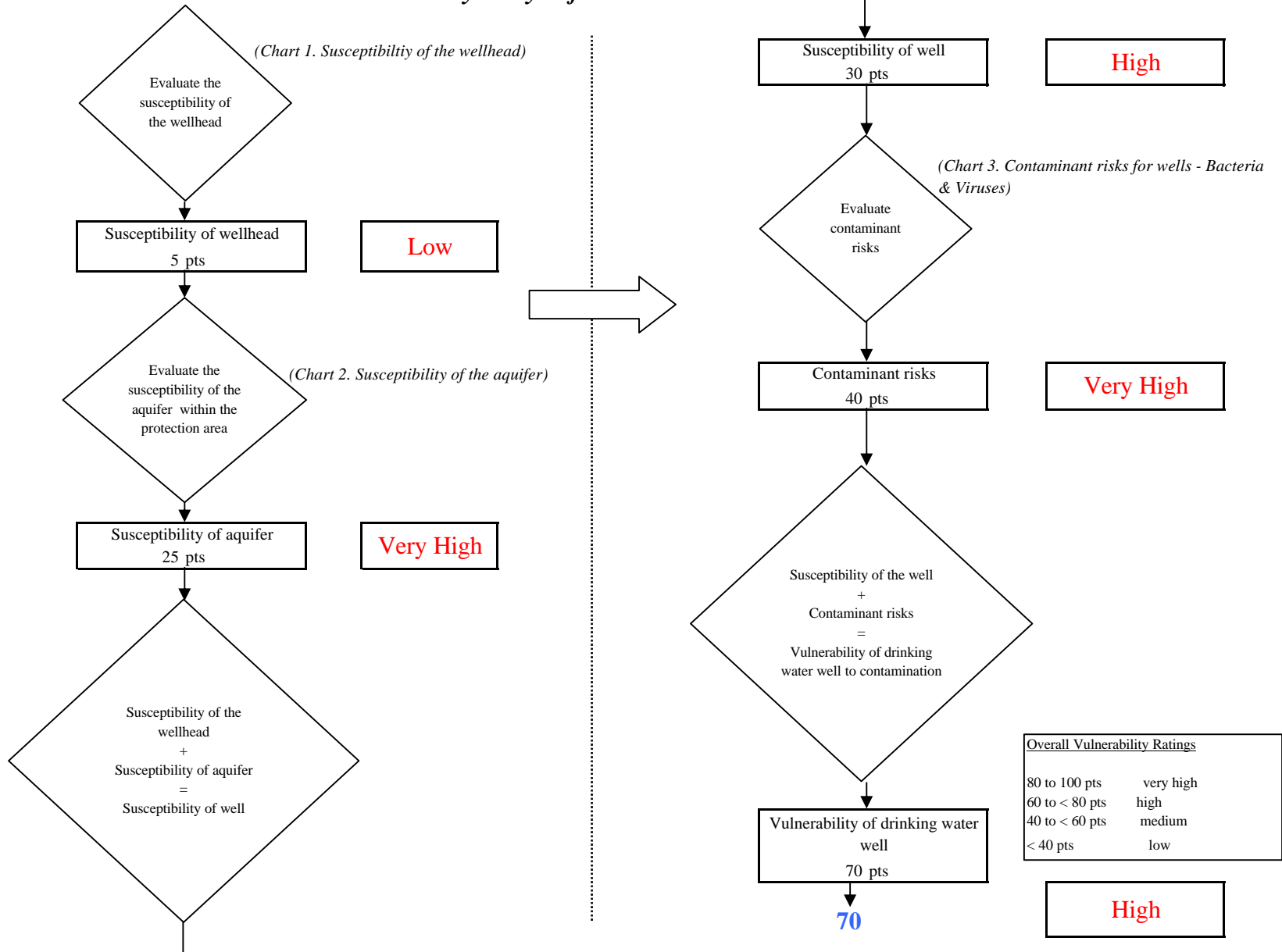


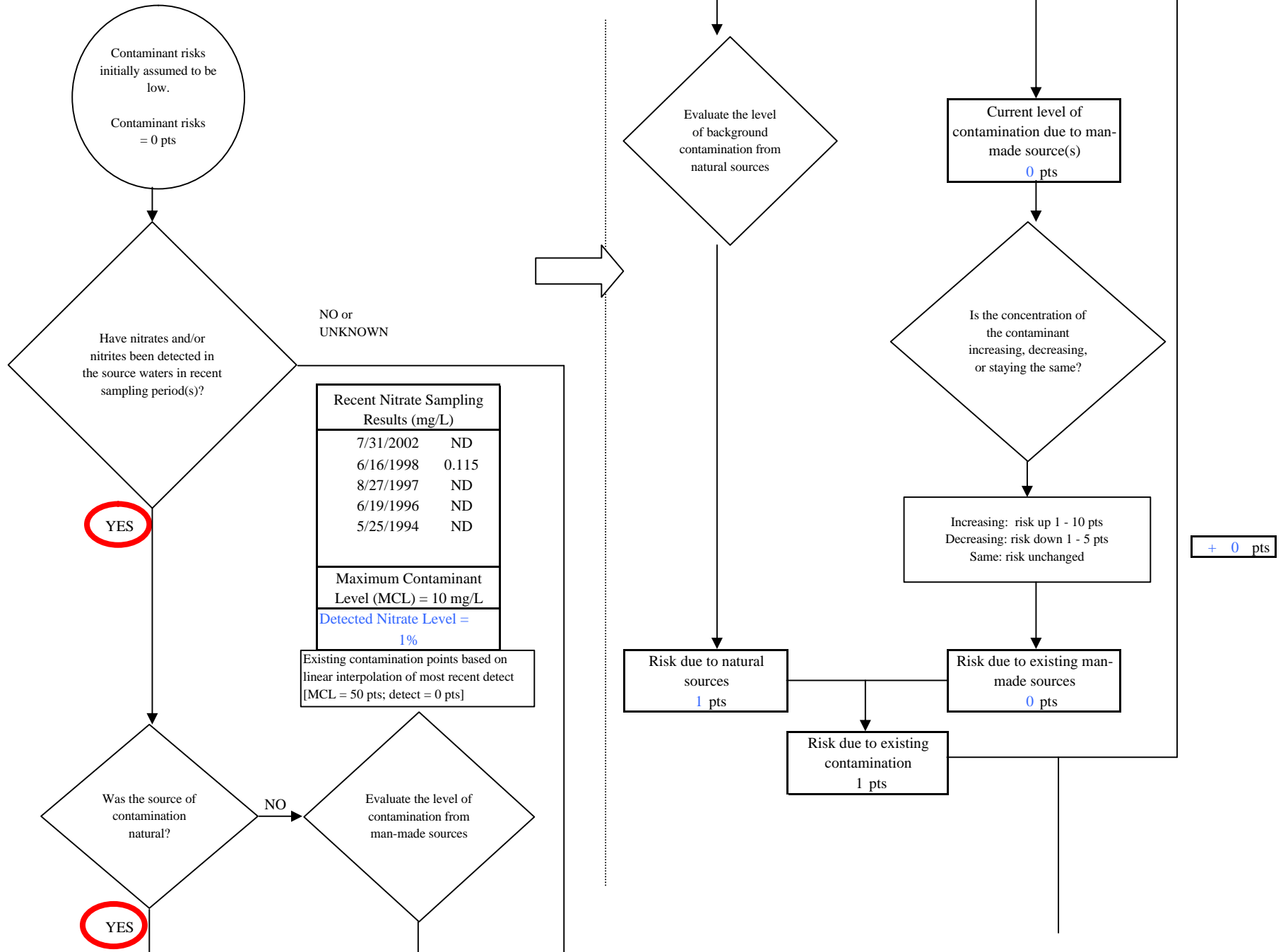
Chart 3. Contaminant risks for Chilkoote Lake Park - Bacteria & Viruses



**Chart 4. Vulnerability analysis for Chilkoote Lake Park - Bacteria & Viruses**

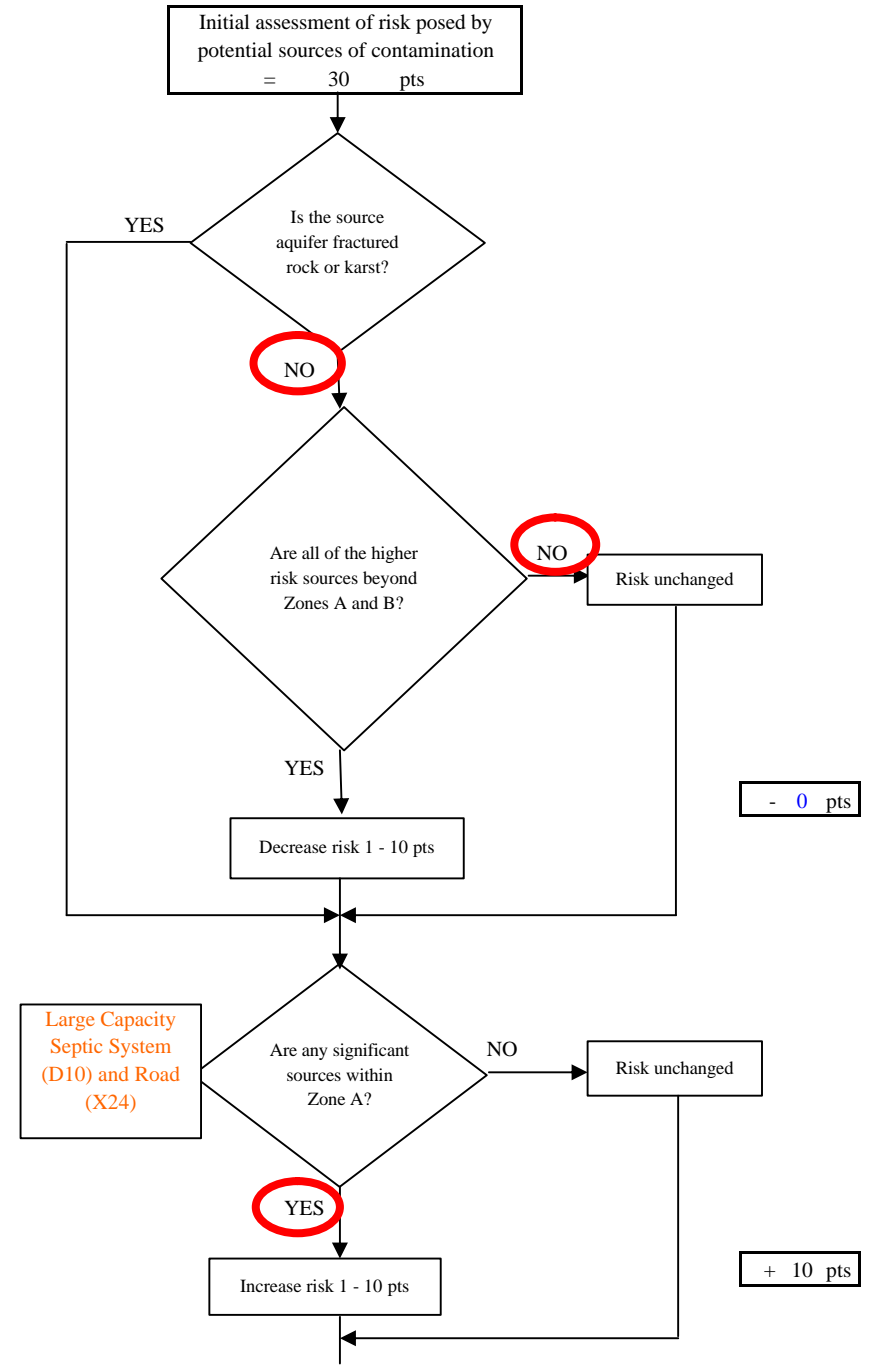
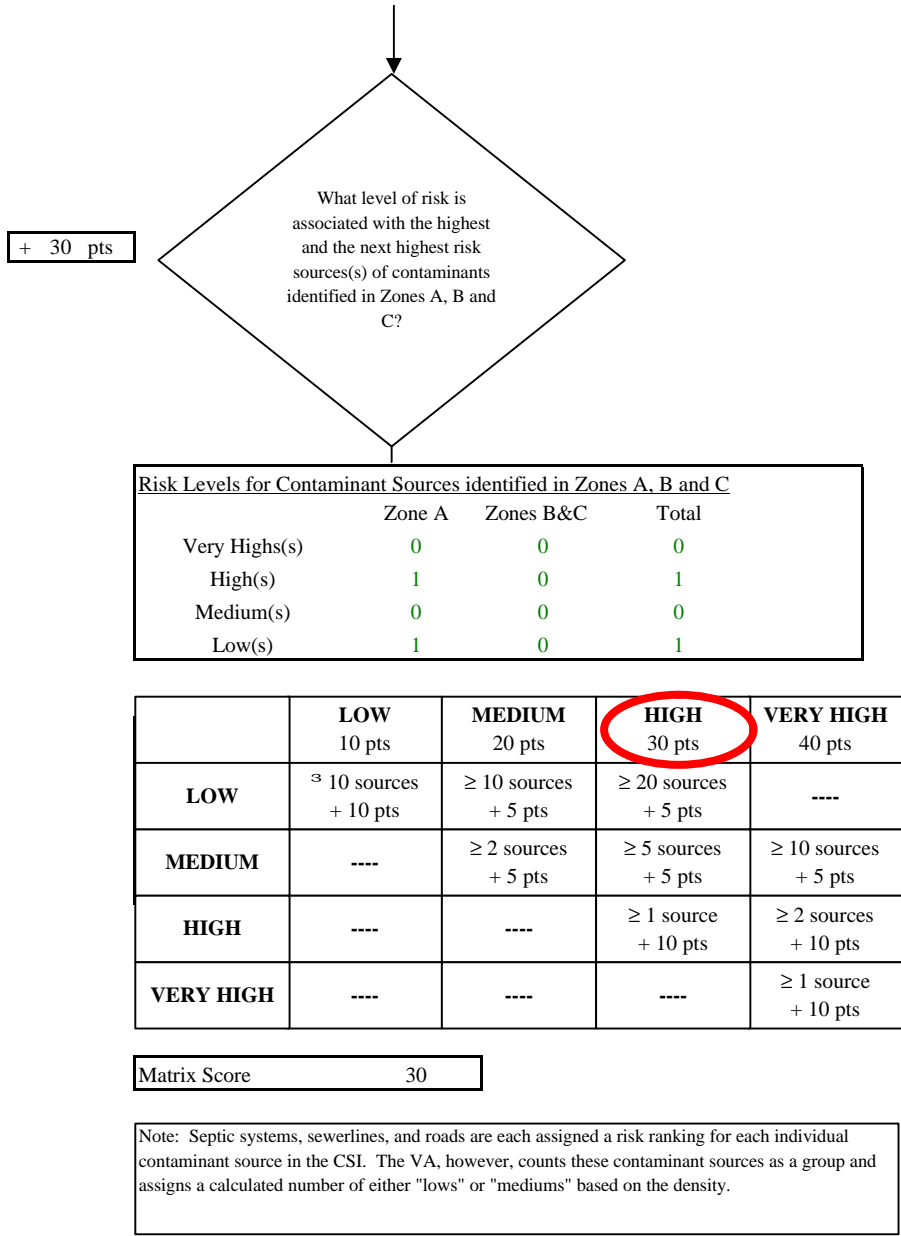


**Chart 5. Contaminant risks for Chilkoot Lake Park - Nitrates and Nitrites**

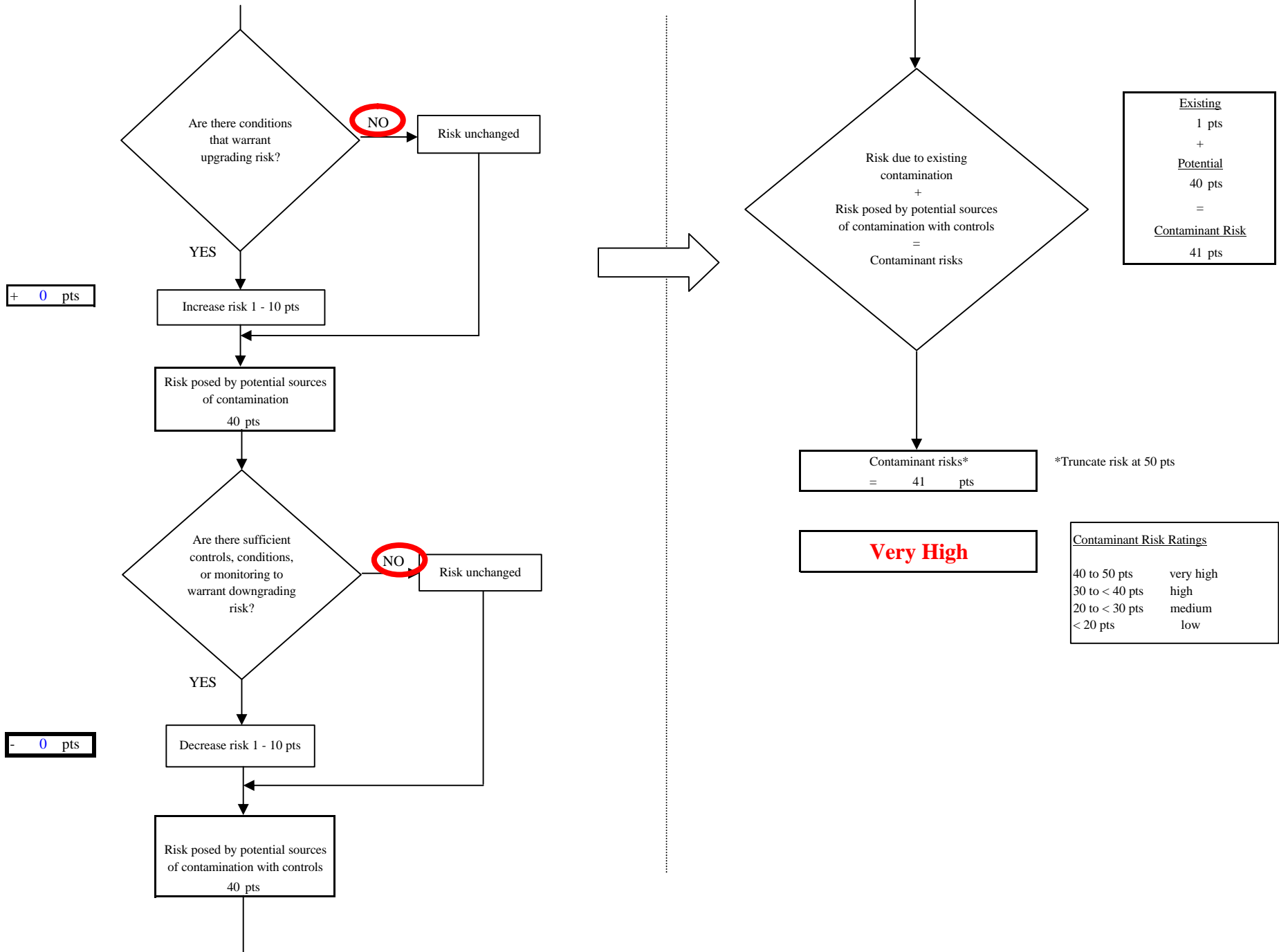




**Chart 5. Contaminant risks for Chilkoot Lake Park - Nitrates and Nitrites**



**Chart 5. Contaminant risks for Chilkooot Lake Park - Nitrates and Nitrites**



**Chart 6. Vulnerability analysis for Chilkoote Lake Park - Nitrates and Nitrites**

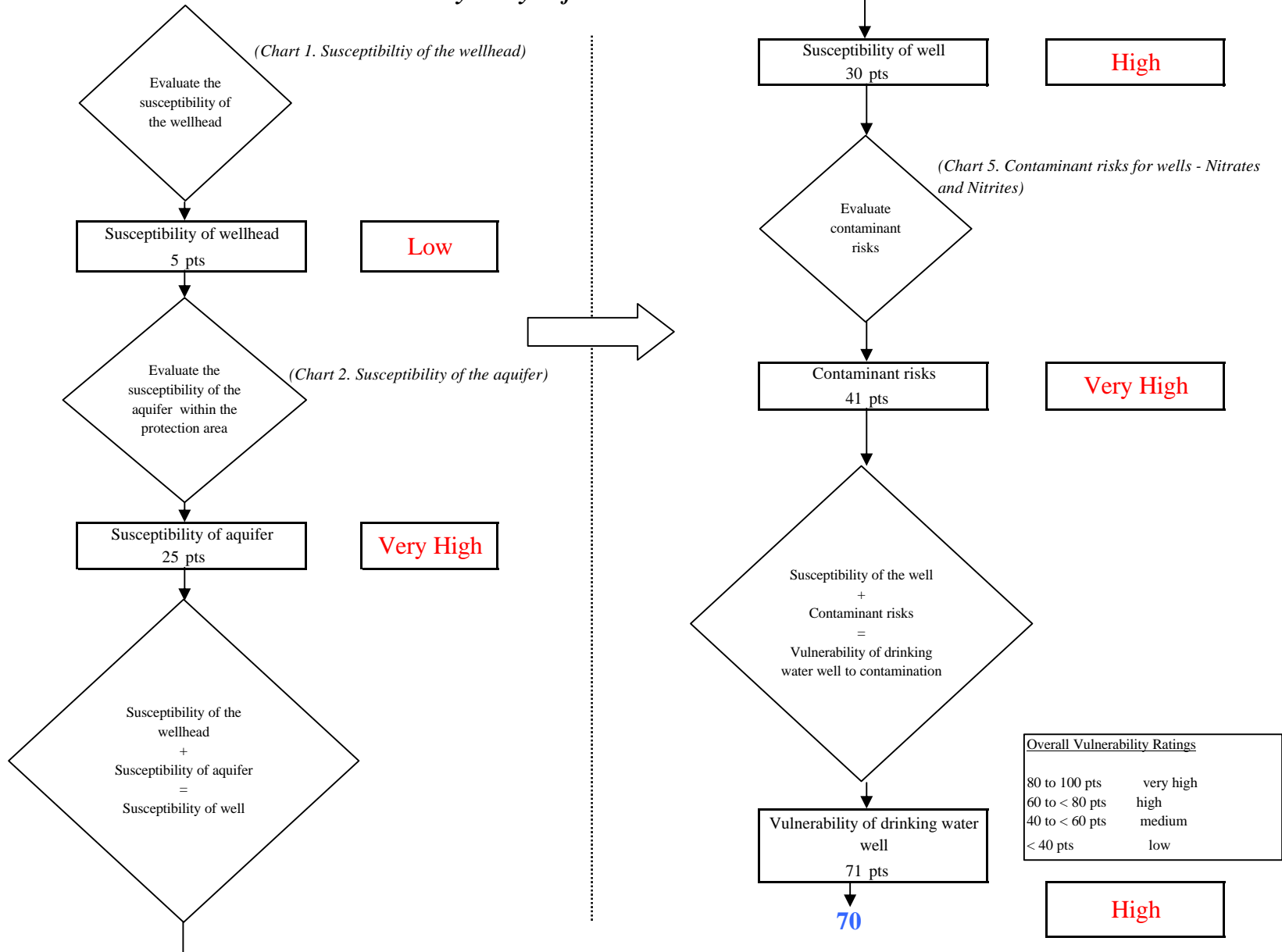
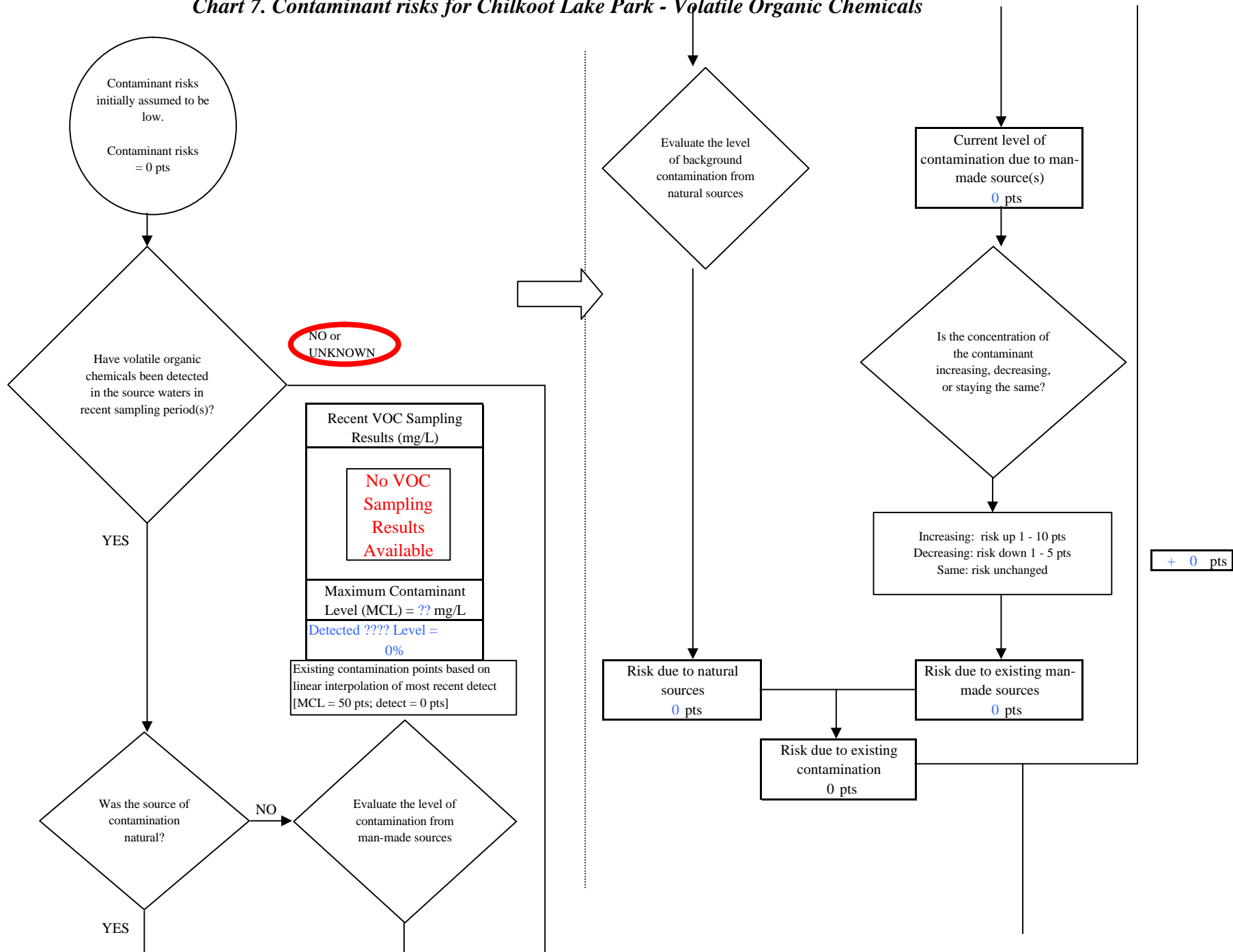
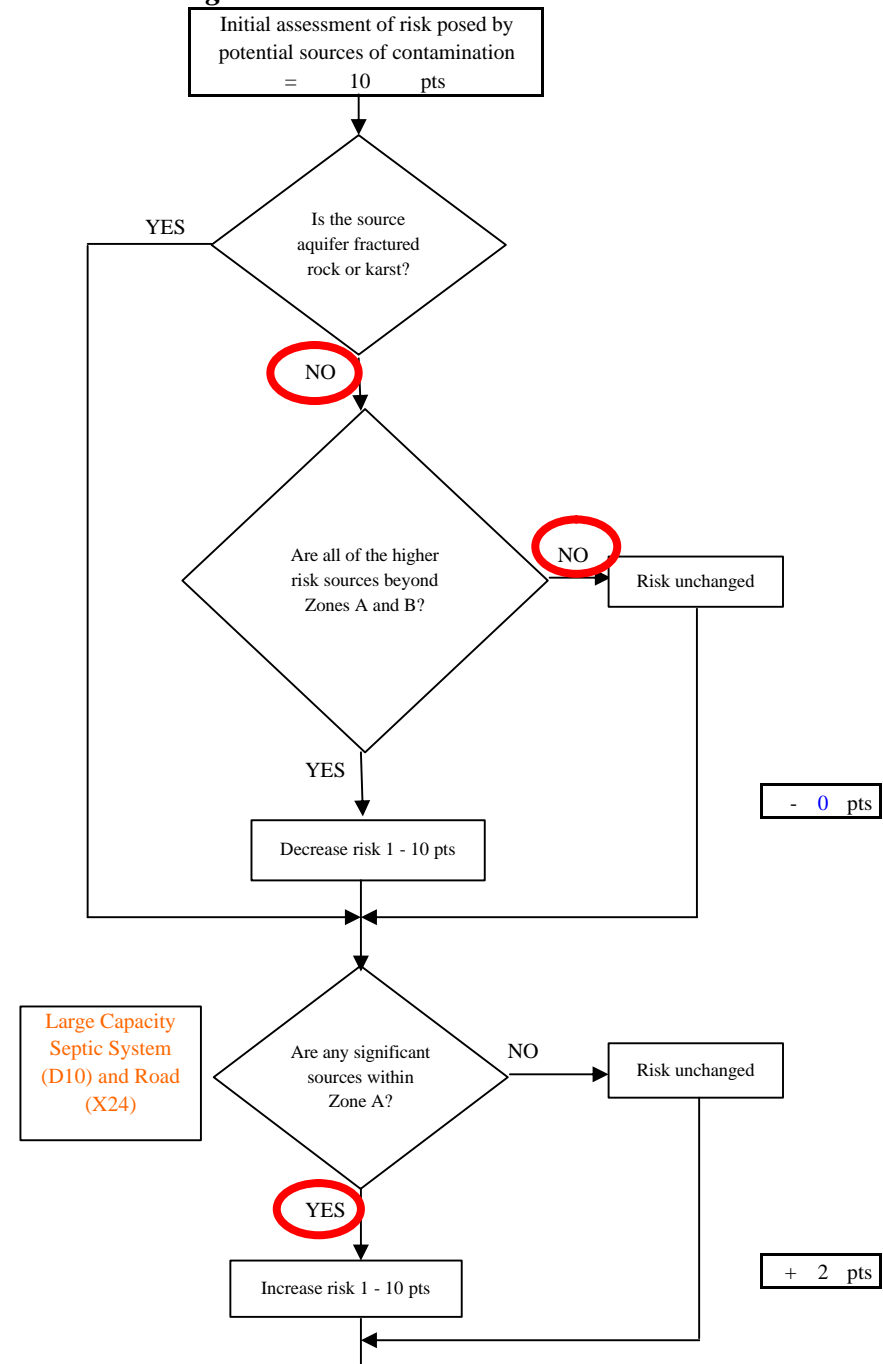
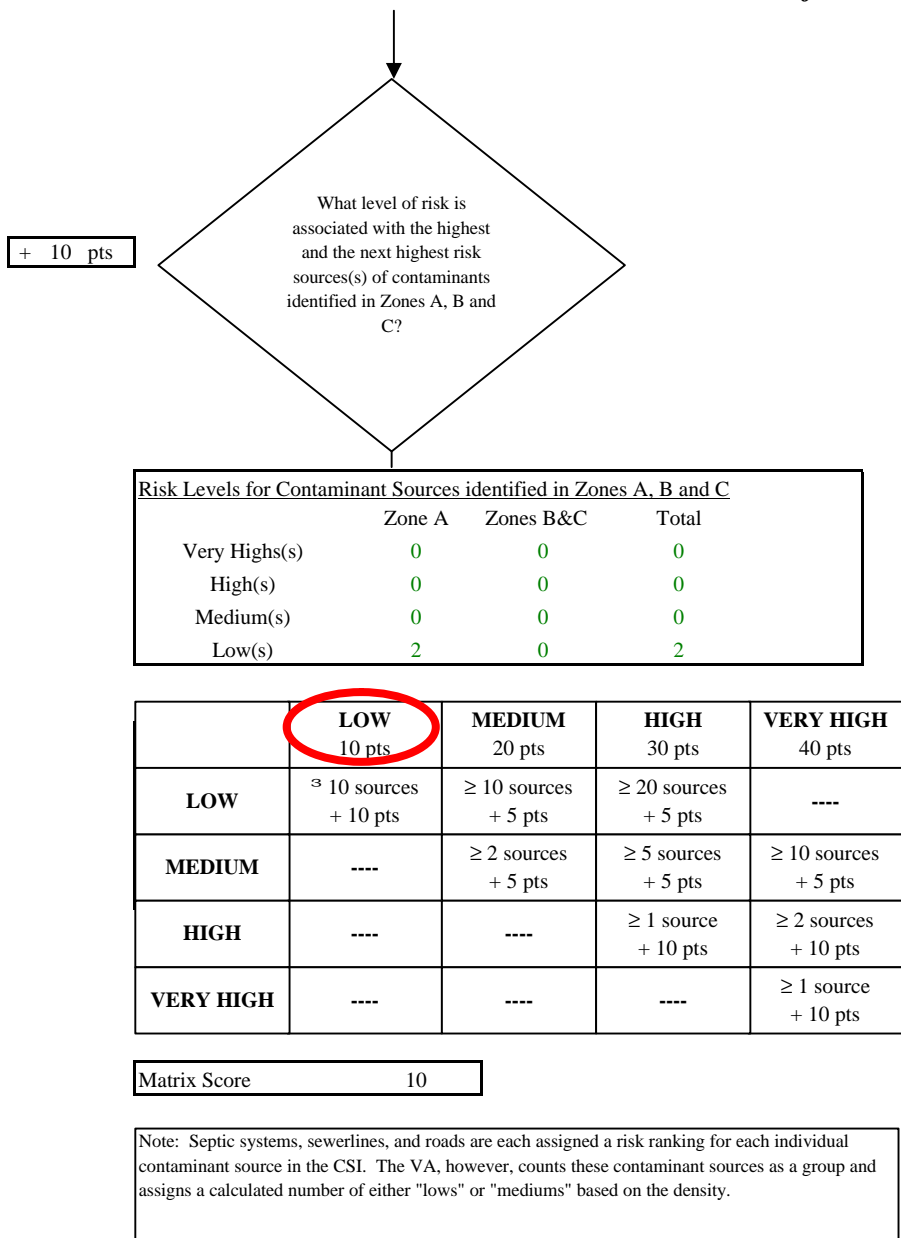


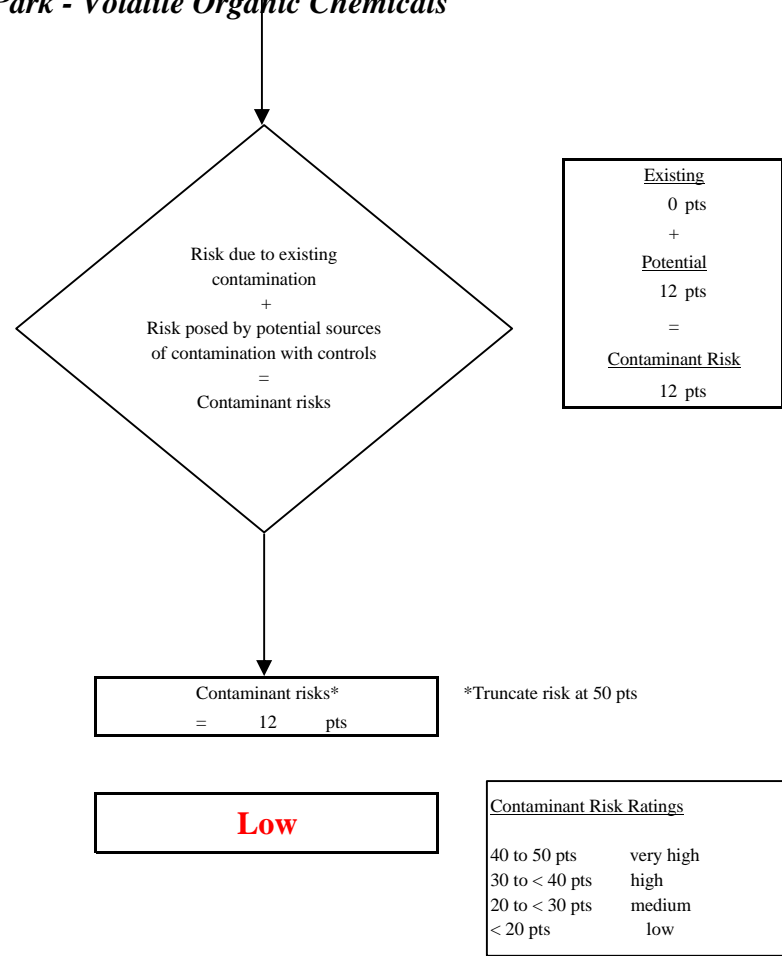
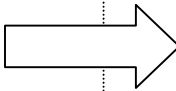
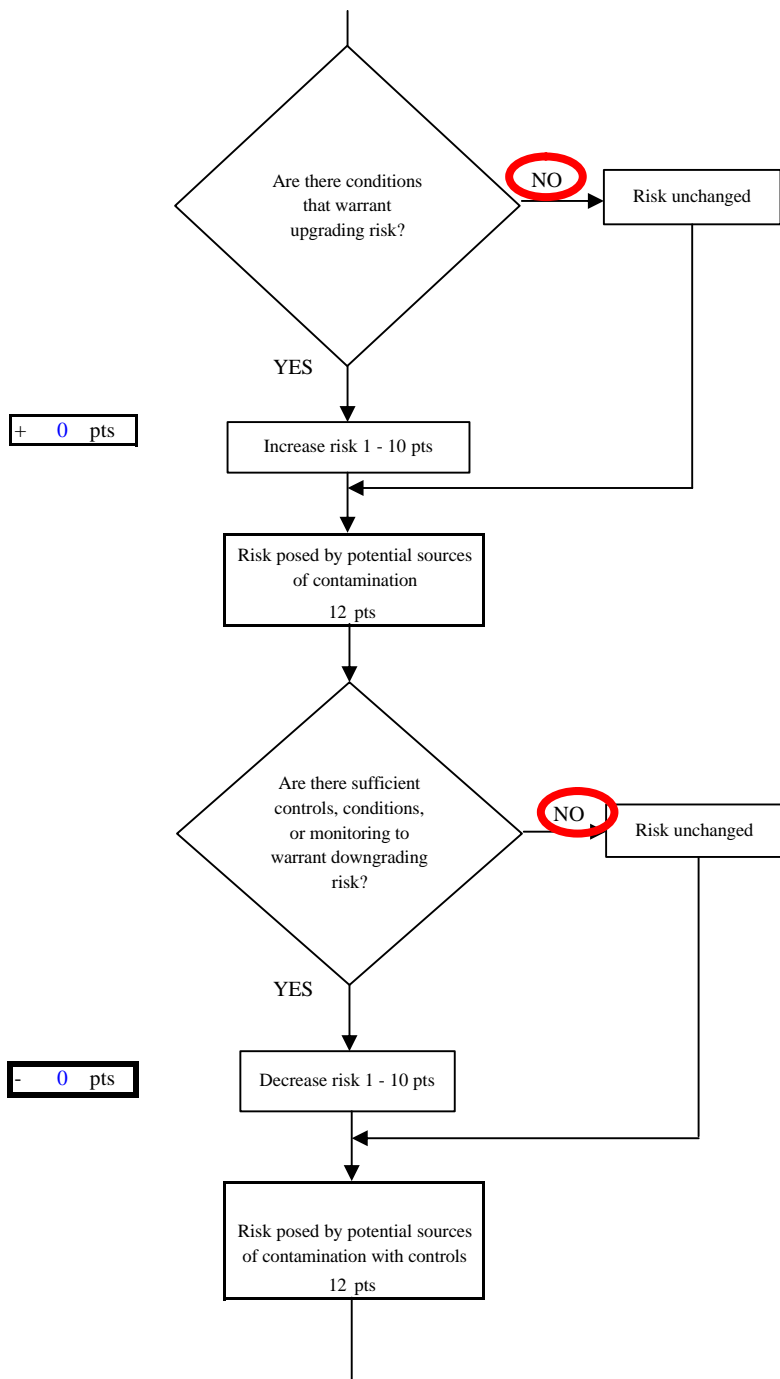
Chart 7. Contaminant risks for Chilkoot Lake Park - Volatile Organic Chemicals



**Chart 7. Contaminant risks for Chilkoote Lake Park - Volatile Organic Chemicals**



**Chart 7. Contaminant risks for Chilkooot Lake Park - Volatile Organic Chemicals**



**Chart 8. Vulnerability analysis for name of the PWSID - Volatile Organic Chemicals**

