Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for
Saltry
Drinking Water System,
Halibut Cove, Alaska
PWSID # 243161
June 2003

DRINKING WATER PROTECTION PROGRAM REPORT # 623
Alaska Department of Environmental Conservation

Source Water Assessment for Saltry Drinking Water System, Halibut Cove, Alaska PWSID # 243161

By Ecology & Environment, Inc.

DRINKING WATER PROTECTION PROGRAM REPORT # 623

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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APPENDICES

Source Water Assessment for Saltry Source of Public Drinking Water, Halibut Cove, Alaska

By Ecology & Environment, Inc.

Drinking Water Protection Program
Alaska Department of Environmental Conservation

Executive Summary

Saltry is a Class B (transient/non-community) water system consisting of one surface water source in Halibut Cove, Alaska. The surface water source received a susceptibility rating of **Very High**. Identified potential and current sources of contaminants for Saltry public drinking water source include septic systems, residential areas and active logging areas. 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 source for Saltry received a vulnerability rating of **Very High** for bacteria and viruses, a **Very High** for nitrates and nitrites, and a **Medium** for volatile organic chemicals.

Introduction

The Alaska Department of Environmental Conservation (ADEC) is completing source water assessments for all public drinking water sources in the State of Alaska. The purpose of this assessment is to provide owners and/or operators, communities, and local governments with information they can use to preserve the quality of Alaska's public drinking water supplies. The results of this source water assessment can be used to decide where voluntary protection efforts are needed and feasible, and also what efforts will be most effective in reducing contaminant risks to your water system. Ecology and Environment, Inc. has been contracted to perform these assessments under the supervision of ADEC.

This source water assessment combines a review of the natural conditions at the site and the potential and existing contaminant risks. These are combined to determine the overall vulnerability of the drinking water source to contamination.

Description of the Halibut Cove Area

Location

Halibut Cove adjoins the Kachemak Bay State Park on the southwestern end of the Kenai Peninsula. It lies on the south shore of Kachemak Bay, 12 miles across the Bay from the Homer Spit. (See Inset of Map 1of Appendix A).

Precipitation

The Halibut Cove area averages about 40 inches of precipitation per year, with approximately 88 inches of snowfall (ACRC 2002).

Topography and Drainage

The community of Halibut Cove is located at the base of the glacier-topped Kenai Mountains. Drainage is typically off the hillsides towards Kachemak Bay.

Groundwater Use

The majority of homes haul water from a central source or have water delivered; about 20% use individual water wells. Half of all residences have individual septic systems and are fully plumbed. Many homes in this area are used only seasonally (ADCED 2002).

Geology and Soils

The vast majority of sediments exposed along the western side of the Kenai Peninsula are Quaternary sediments (Magoon, Adkison, and Egbert 1976). These sediments are from former glacial streams, abandoned-channel deposits, glacial moraines and deposits from existing streams (Glass 1996). They generally consist of a combination of sand, gravel, silt, and clay. There can be significant variation in the composition of sediment layers over relatively small areas. As a

consequence, aquifers in the area may be either confined or unconfined, depending on the local sequence of sediment layers (Glass 1996). The bedrock on the southern shores of the Bay is primarily graywacke, siltstone, arkose sandstone, greenstone, metachert and argillite; it is quite different geologically from that on the northern coast of Kachemak Bay comprises limestone, shale, coal, peat and petrified wood (Harmon 1998).

Saltry Public Drinking Water System

Saltry is a Class B (transient/non-community) water system. The system consists of one surface water source drawing water from a surface impoundment of spring water south of Ismailof Island across The Narrows in Halibut Cove.

The system's intake is a stream in mountainous terrain with an estimated discharge of less than 20,000 cfs. The most recent Sanitary Survey (8/7/91) indicates the intake is adequately constructed, including a screen against debris entry and protection against siltation. Protection against ice build-up is not necessary since the water source is utilized only in summer.

This system operates year-round and serves approximately 15 residents and more than 60 non-residents.

Saltry 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. Some areas are more likely to allow contamination to reach the surface water source than others.

The most probable area for contamination to reach the drinking water source is the area that contributes water to the surface water source. This area is designated as the Drinking Water Protection Area (DWPA). Because a release of contaminants within the DWPA is most likely to impact the drinking water source intake, this area will serve as the focus for voluntary protection efforts.

The Drinking Water Protection Areas established for surface water bodies by the Alaska Department of Environmental Conservation (ADEC) are separated into zones. The Drinking Water Protection Areas for the Saltry source contains three zones, Zone A through Zone C (See Map 1 in Appendix A). These zones identify areas around the water impoundment. Contaminants released within these areas can potentially pollute the drinking water source.

Zone A corresponds to an area within 1000 feet of the water impoundment. Zone B identifies the area within one mile, and Zone C identifies the entire watershed. (Please refer to the Guidance Manual for Class B Water Systems for additional information).

The following is a summary of the four DWPA zones:

Table 1. Definition of Zones

Zone	Definition
A	1000 Feet from Surface Water Source
B	1 Mile from Surface Water Source
C	Entire Watershed of Surface Water Source

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 Saltry 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 water system assessments, three categories of drinking water contaminants were inventoried. They include:

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

Inventoried potential sources of contamination within Zones A through Zone C were associated with residential and light industrial type activities. The sources are displayed on Map 2 of Appendix C and summarized in the tables in Appendix B.

Ranking of Contaminant Risks

Once the potential and existing sources of contamination have been identified, they are sorted and ranked 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. Further, contaminant risks are a function of the number and

density of those types of contaminant sources as well as the proximity of those sources to the surface water source.

Ranking include:

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

The time-of-travel 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 C due to the probability of contaminant dilution by the time the contaminants get to the surface water intake.

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 Saltry Drinking Water Source

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

- Susceptibility of Surface Water Source; 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 Surface Water Source' to contamination by looking at the construction of the water intake, the potential for runoff in the protection area and the capacity of the water body to dilute contaminants. Chart 2 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 surface water intake. Lastly, Chart 3 contains the 'Vulnerability Analysis for Bacteria and Viruses'. Charts 4 through 7 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

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

Susceptibility of Surface Water Source Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

Table 2 shows the Susceptibility scores and ratings for Saltry (see Chart 1).

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Surface Water Source	40	Very High

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 or 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 (see Charts 2, 4, and 6).

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	40	Very High
Nitrates and/or Nitrites	50	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:

Susceptibility of Surface Water Source (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 (see Charts 3, 5, 7).

Table 4. Overall Vulnerability to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	80	Very High
Nitrates and Nitrites	90	Very High
Volatile Organic Chemicals	50	Medium

Bacteria and Viruses
The contaminant risk for bacteria and viruses is Very High with the septic systems and residential areas representing the risk to the drinking water source (See Chart 2 – Contaminant Risks for Bacteria and Viruses in Appendix D). After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the surface water source, the overall vulnerability of the water source to contamination is Very High.

Nitrates and Nitrites
The contaminant risk for nitrates and nitrites is Very High with the septic systems, residential areas and active logging areas representing the risk to this source of public drinking water (See Chart 4 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). Nitrates are very mobile, moving at approximately the same rate as water.

The last five years' sampling history for Saltry public water source indicates the most recent concentration detected was 2.00 mg/L on 5/21/01, which represents 20% of the Maximum Contaminant Level (MCL). (A value of ND means that no detectable concentrations of nitrates or nitrites were found within the last 5 years of samples.) While nitrates and nitrites can occur naturally in groundwater, a level greater than 20% of the MCL or is considered to be due to manmade sources. Water with levels of nitrates and nitrites below 100% of the MCL is considered safe to drink by ADEC. 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 Very High.

Volatile Organic Chemicals
The contaminant risk for volatile organic chemicals is Low with the septic systems, residential areas and active logging areas creating the risks for volatile organic chemicals (See Chart 6 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

Residents in the area typically heat their homes with various types of on-site fuel sources, including propane and heating oil stored in aboveground or underground storage tanks. Although this report does not address heating oil tanks (unless their location is known), they can pose a risk of volatile organic chemical contamination to drinking water sources. The most common causes of fuel leaks of these heating oil systems are overfilling the tank, ruptured fuel lines, leaking storage tanks, damaged or faulty valves and vandalism. Secondary containment around the tank and regular system maintenance can help prevent many of these harmful fuel leaks and help protect the drinking water supply.

Class 'B' public water systems generally are not required to sample for volatile organic chemicals, so there is no sampling history for this potential contaminant. After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is Medium.

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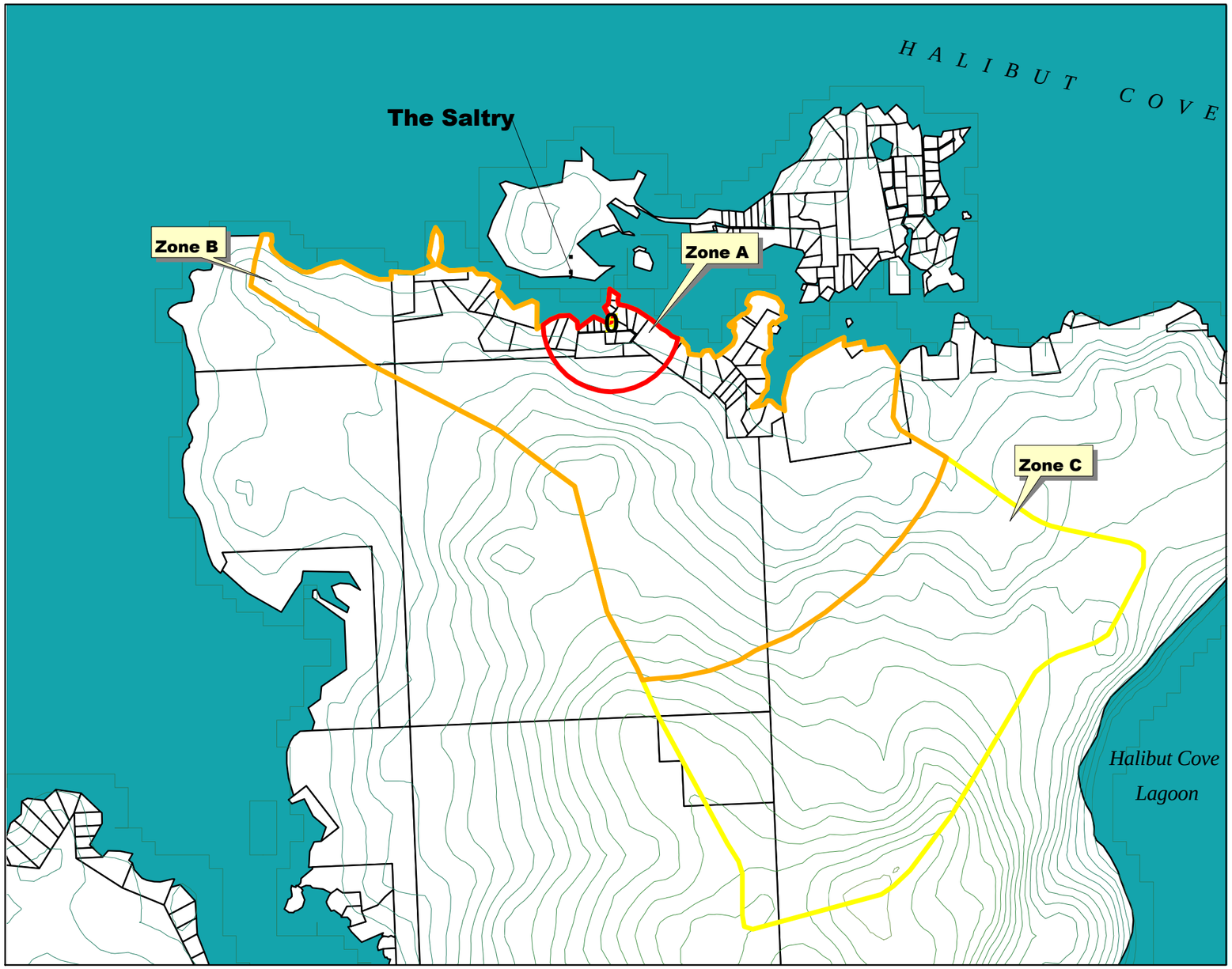
APPENDIX A

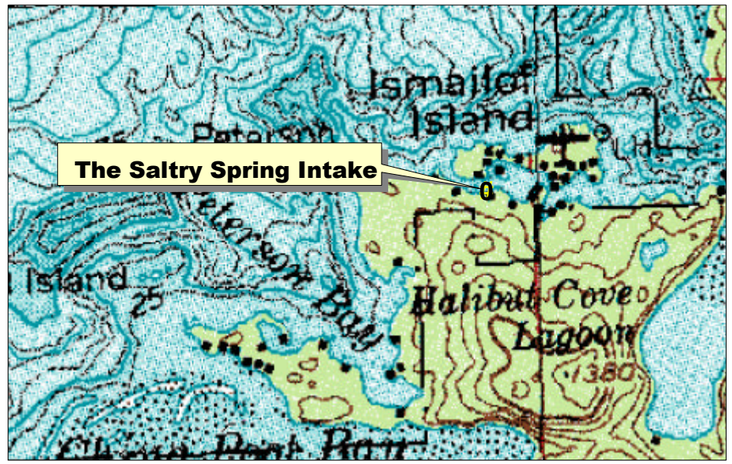
Saltry
Drinking Water Protection Area
(Map 1)

Drinking Water Protection Area for the Saltry Spring



0 Saltry Spring Intake
Zone A (1000' Feet From Spring Intake)
Zone B (1 Mile From Spring Intake)
Zone C (Entire Watershed)

N
W E
S



3000 0 3000 6000 9000 Feet

PWSID 243161.001

Map 1

APPENDIX B

Contaminant Source Inventory and
Risk Ranking for Saltry
(Tables 1-4)

Table 1 *Contaminant Source Inventory for* ***Saltry*** ***PWSID 243161.001***

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A		2	
Residential Areas	R01	R1-1	A		2	8 acres
Logging (active)	E02	E2-1	B	Seldovia Native Association	2	
Residential Areas	R01	R1-2	B		2	95 acres
Septic systems (serves one single-family home)	R02	R2-1	B		2	
Septic systems (serves one single-family home)	R02	R2-2	B		2	

Table 2

Contaminant Source Inventory and Risk Ranking for Saltry

Sources of Bacteria and Viruses

PWSID 243161.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High		2	
Residential Areas	R01	R1-1	A	Low		2	8 acres
Residential Areas	R01	R1-2	B	Low		2	95 acres
Septic systems (serves one single-family home)	R02	R2-1	B	Low		2	
Septic systems (serves one single-family home)	R02	R2-2	B	Low		2	

Table 3

Contaminant Source Inventory and Risk Ranking for Saltry

Sources of Nitrates/Nitrites

PWSID 243161.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High		2	
Residential Areas	R01	R1-1	A	Low		2	8 acres
Logging (active)	E02	E2-1	B	Low	Seldovia Native Association	2	
Residential Areas	R01	R1-2	B	Low		2	95 acres
Septic systems (serves one single-family home)	R02	R2-1	B	Low		2	
Septic systems (serves one single-family home)	R02	R2-2	B	Low		2	

Table 4

Contaminant Source Inventory and Risk Ranking for Saltry

Sources of Volatile Organic Chemicals

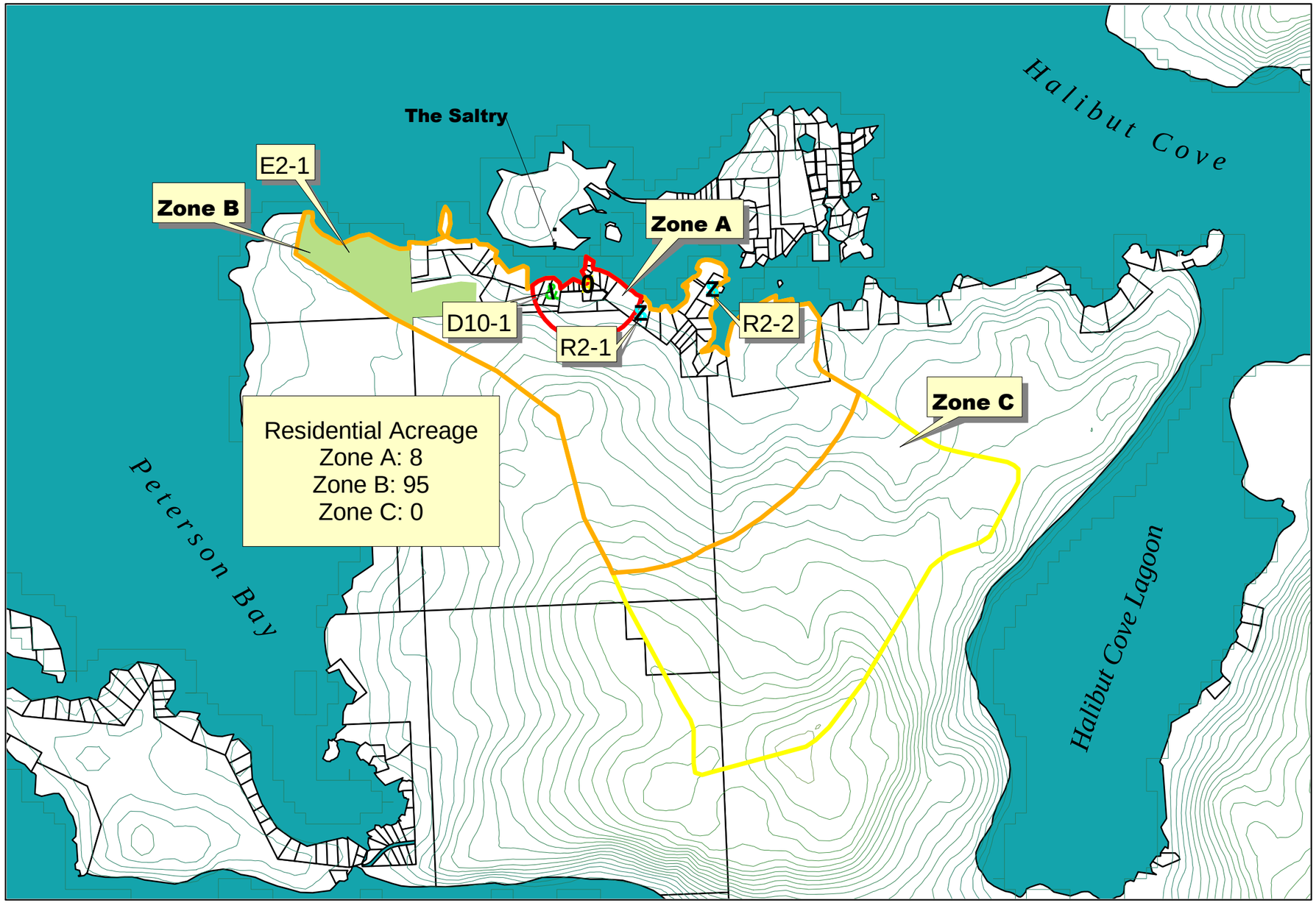
PWSID 243161.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low		2	
Residential Areas	R01	R1-1	A	Low		2	8 acres
Logging (active)	E02	E2-1	B	Medium	Seldovia Native Association	2	
Residential Areas	R01	R1-2	B	Low		2	95 acres
Septic systems (serves one single-family home)	R02	R2-1	B	Low		2	
Septic systems (serves one single-family home)	R02	R2-2	B	Low		2	

APPENDIX C

Saltry
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

Drinking Water Protection Area for The Saltry and Existing and Potential Sources of Contamination



0 Saltry Spring Intake

& Injection wells (Class V) Septic System (Drainfield Disposal Method)- D10

Septic systems (serves one single-family home and/or less than 20 people)- R2

Logged Areas - E2

Zone A (1000' Feet From Spring Intake)

Zone B (1 Mile From Spring Intake)

Zone C (Entire Watershed)

N W E S

3000 0 3000 6000 9000 Feet

PWSID 243161.001

Map 2

APPENDIX D

Vulnerability Analysis for Saltry
Public Drinking Water Source
(Charts 1-8)

Chart 1. Susceptibility of the surface water source - Saltry

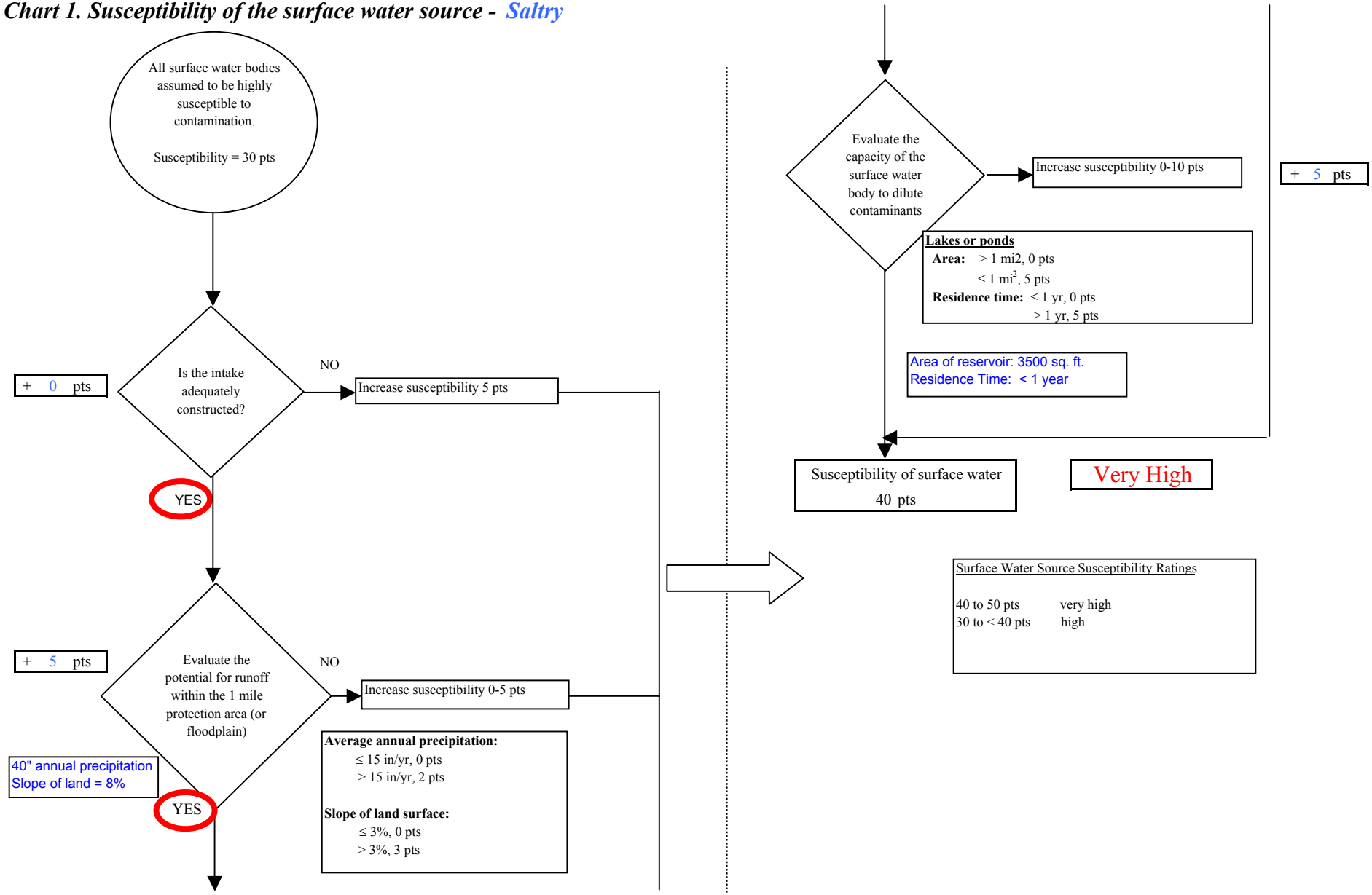
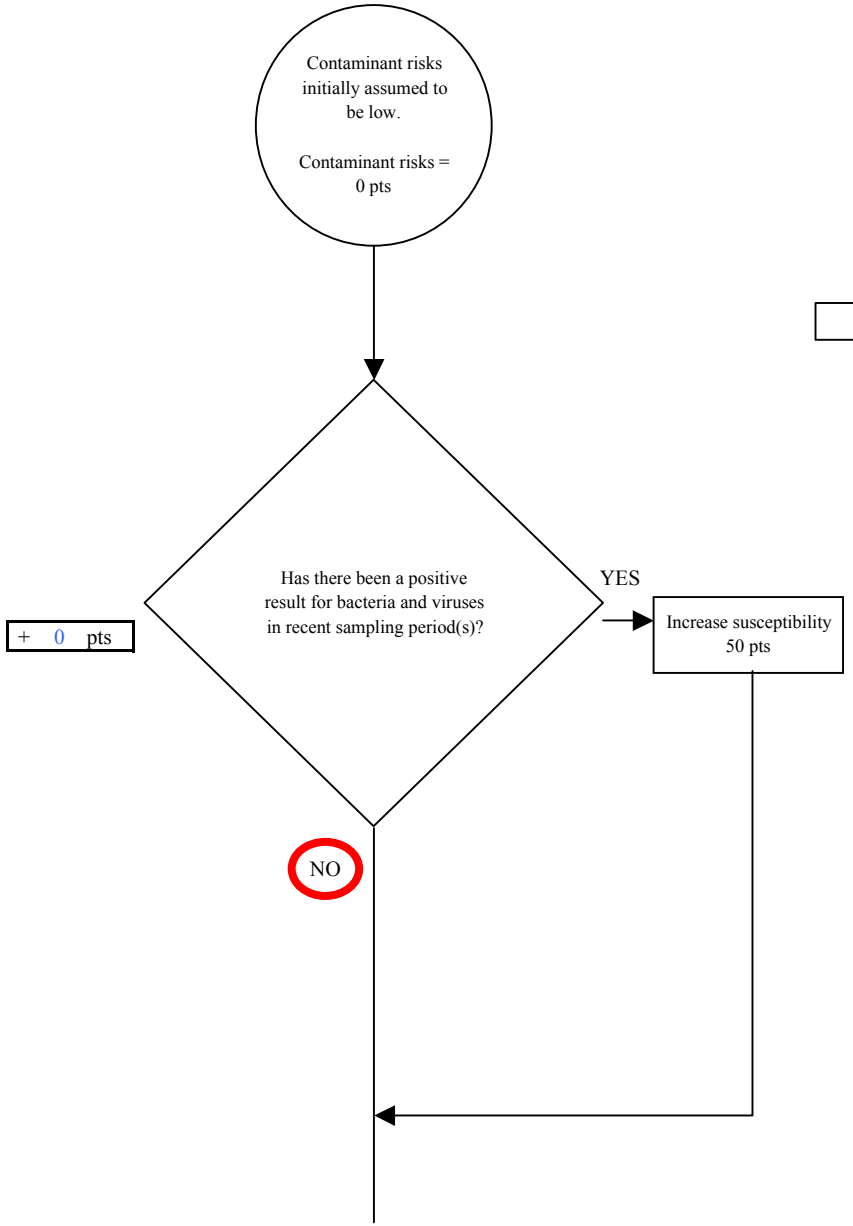
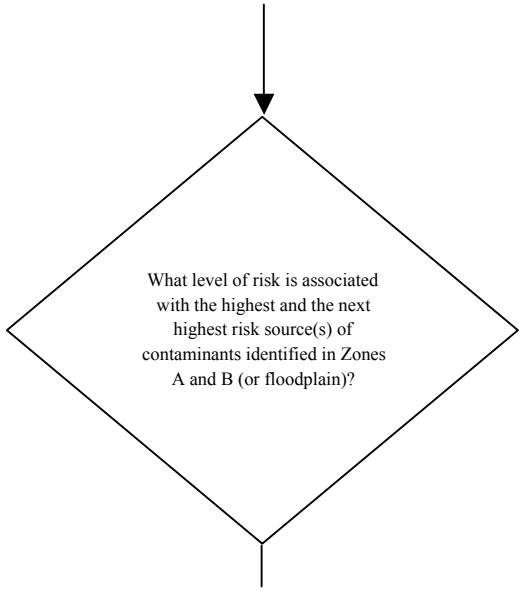


Chart 2. Contaminant risks for Saltry - Bacteria & Viruses





+ 30 pts

Risk Rankings for Contaminant Sources Identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	1	0	1
Medium(s)	0		0
Low(s)	1		1

	LOW 10 pts	MEDIUM 20 pts	HIGH 30 pts	VERY HIGH 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score 30

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Chart 2. Contaminant risks for Saltry - Bacteria & Viruses

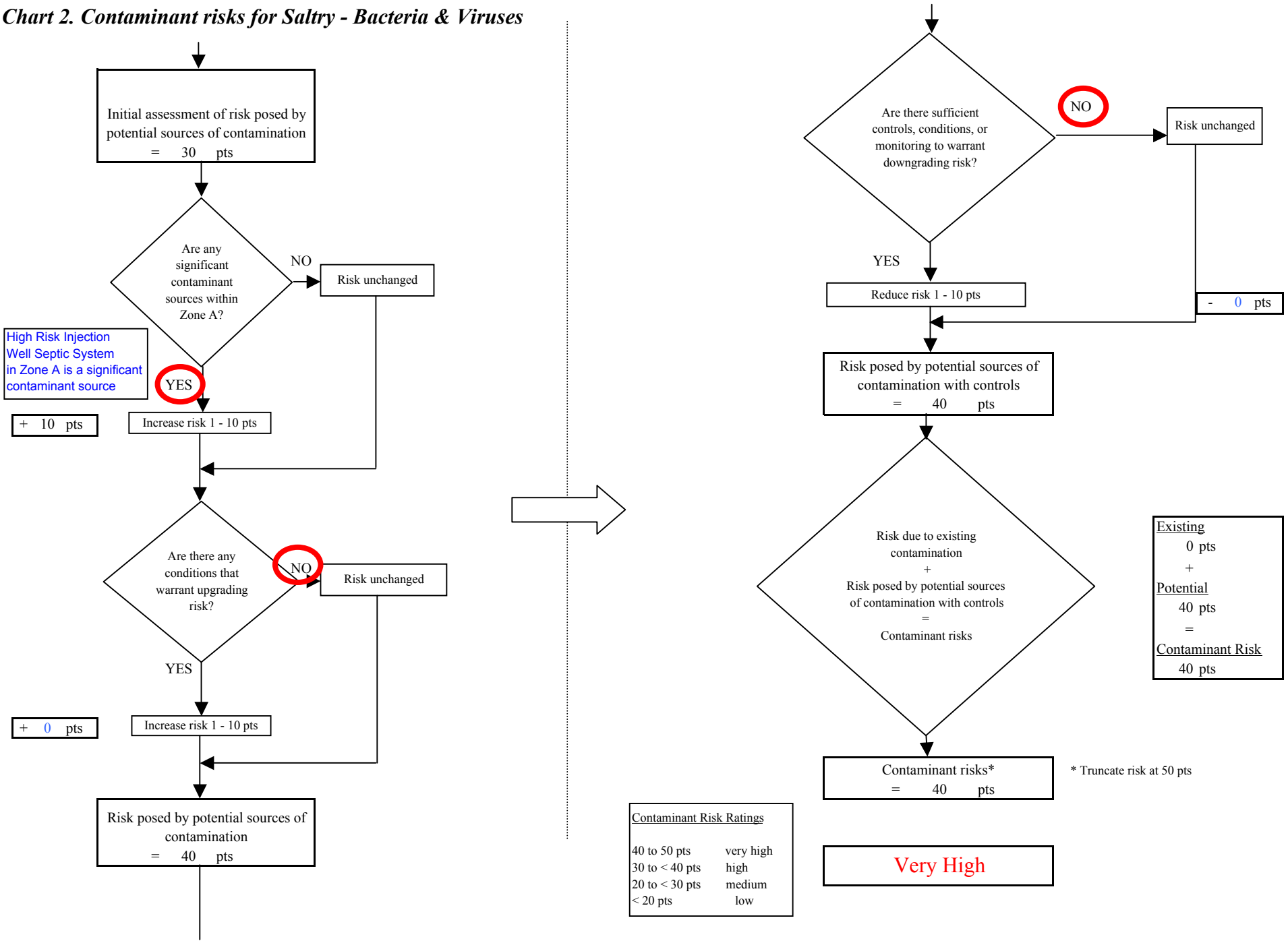


Chart 3. Vulnerability analysis for Saltry - Bacteria & Viruses

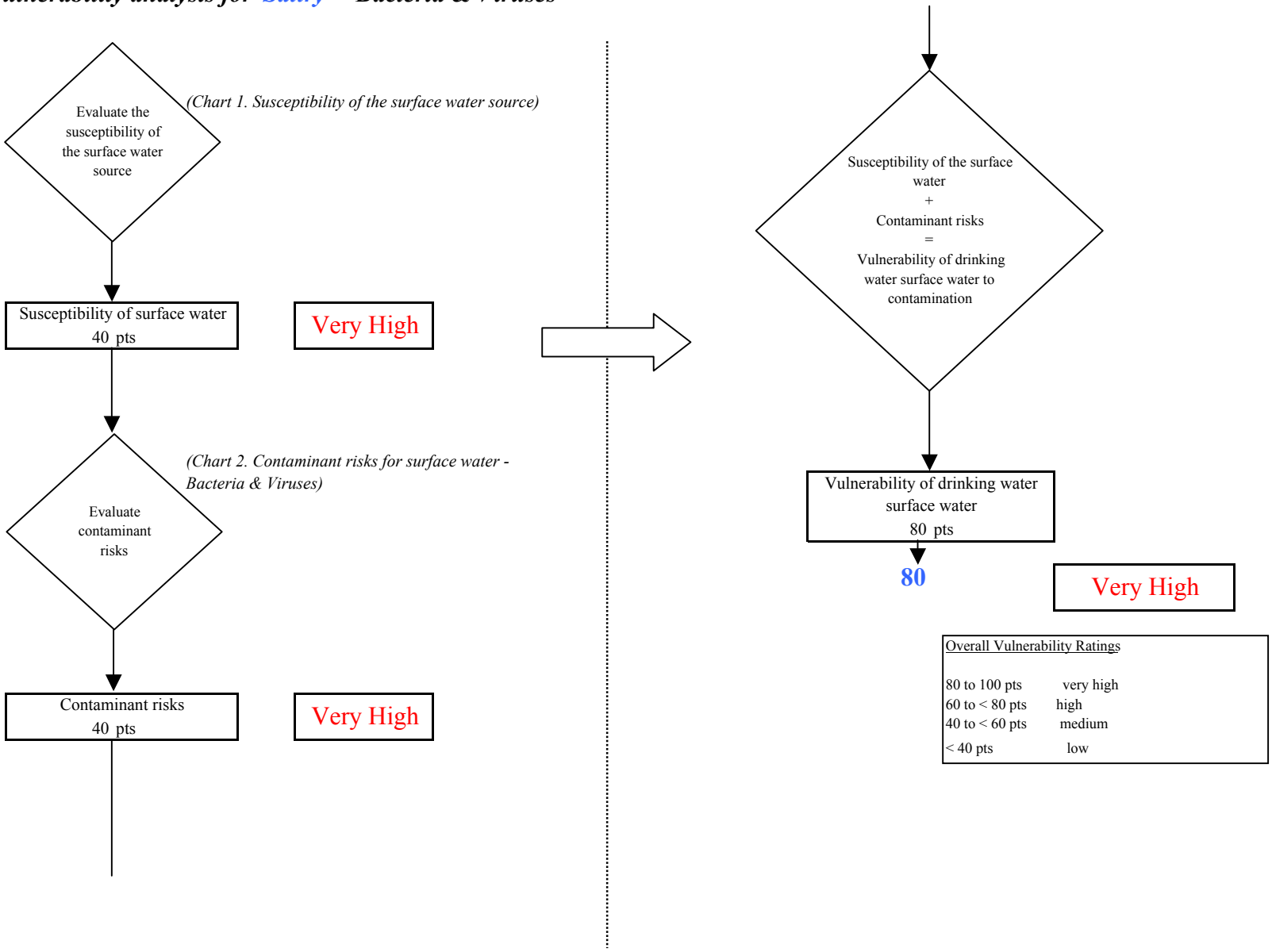


Chart 4. Contaminant risks for Saltry - Nitrates and Nitrites

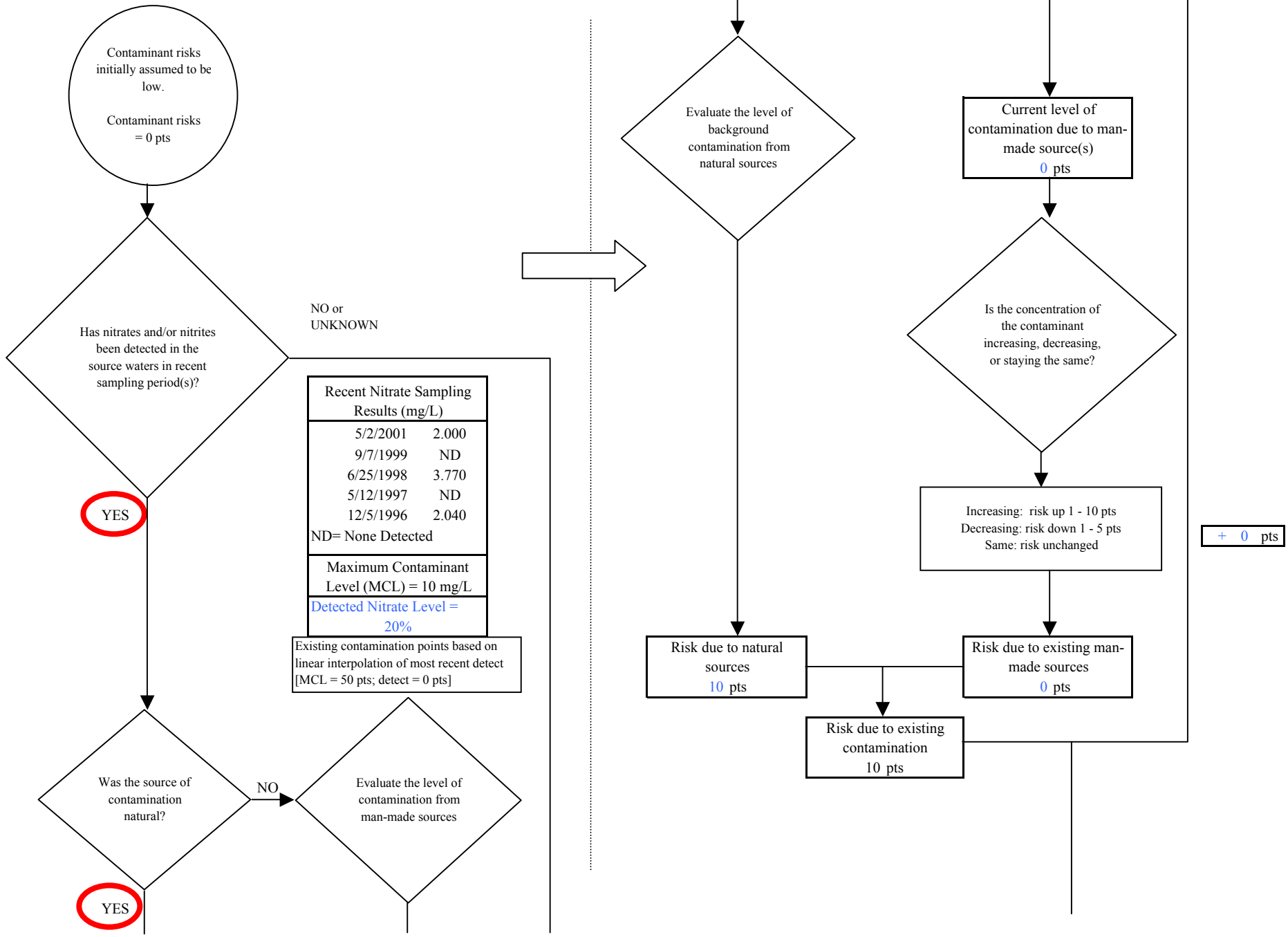


Chart 4. Contaminant risks for Saltry - Nitrates and Nitrites

+ 30 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A and B? (see Risk Matrix below)

Risk Levels for Contaminant Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	1	0	1
Medium(s)	0		0
Low(s)	1		1

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score 30

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.

Initial assessment of risk posed by potential sources of contamination = 30 pts

Are any significant sources in Zone A?

NO

Risk unchanged

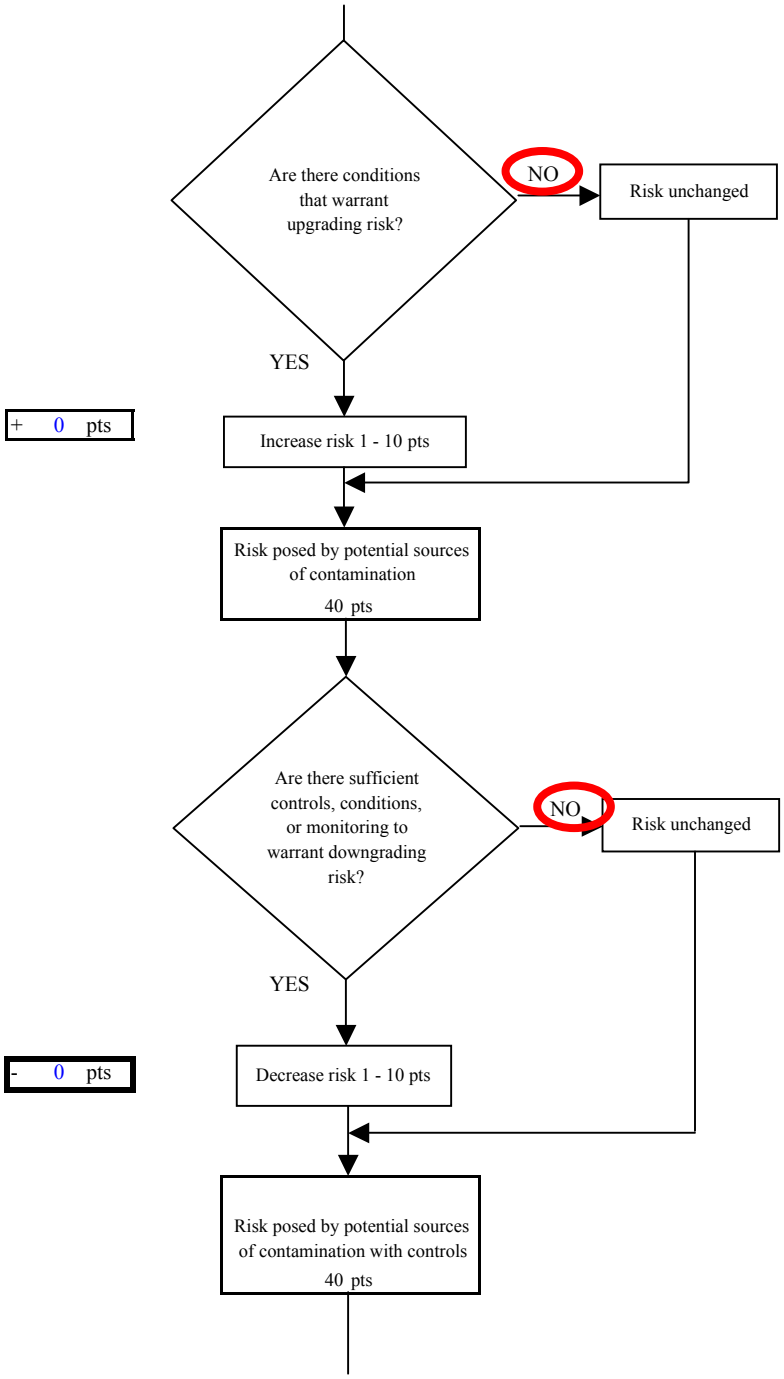
YES

High Risk Injection Well Septic System in Zone A is a significant contaminant source

Increase risk 1 - 10 pts

+ 10 pts

Chart 4. Contaminant risks for Saltry - Nitrates and Nitrites



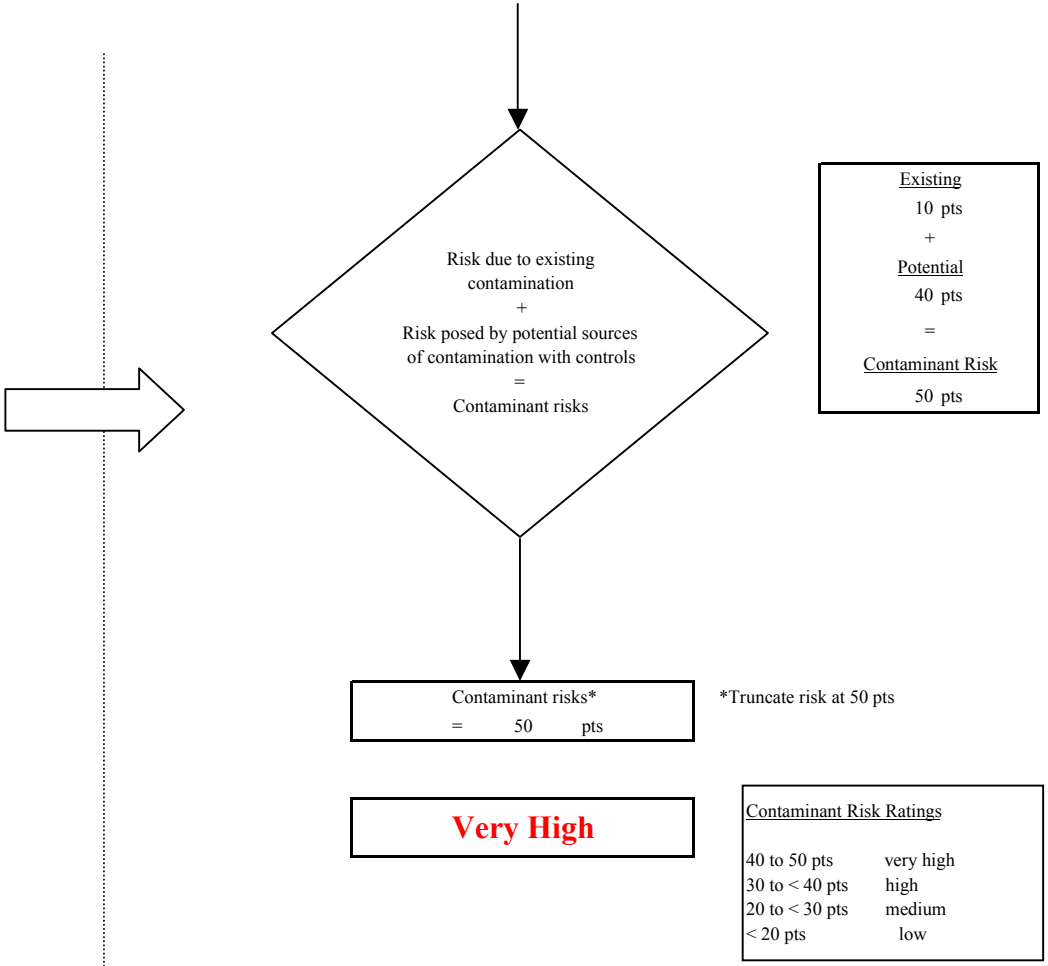


Chart 5. Vulnerability analysis for Saltry - Nitrates and Nitrites

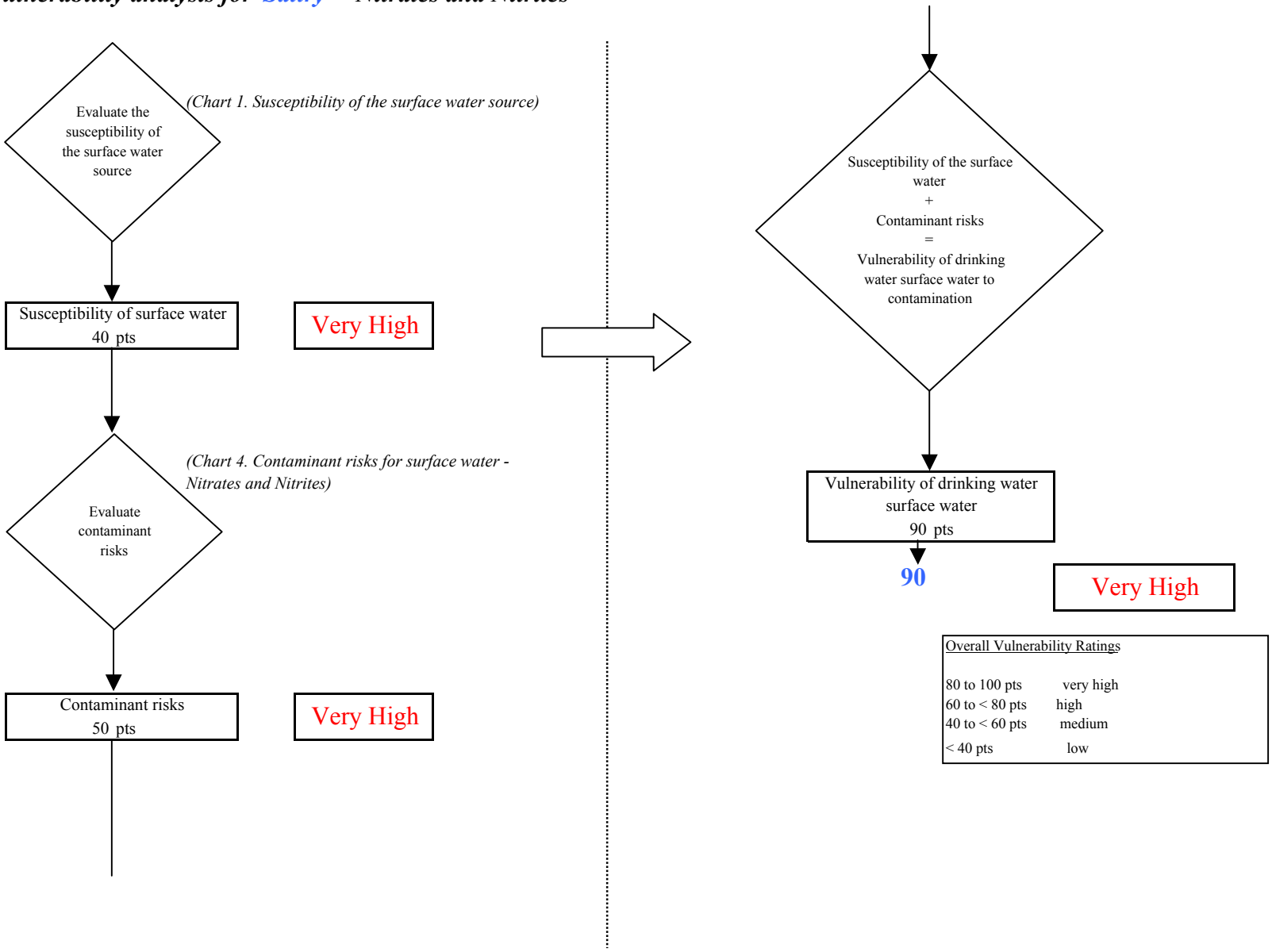


Chart 6. Contaminant risks for Saltry - Volatile Organic Chemicals

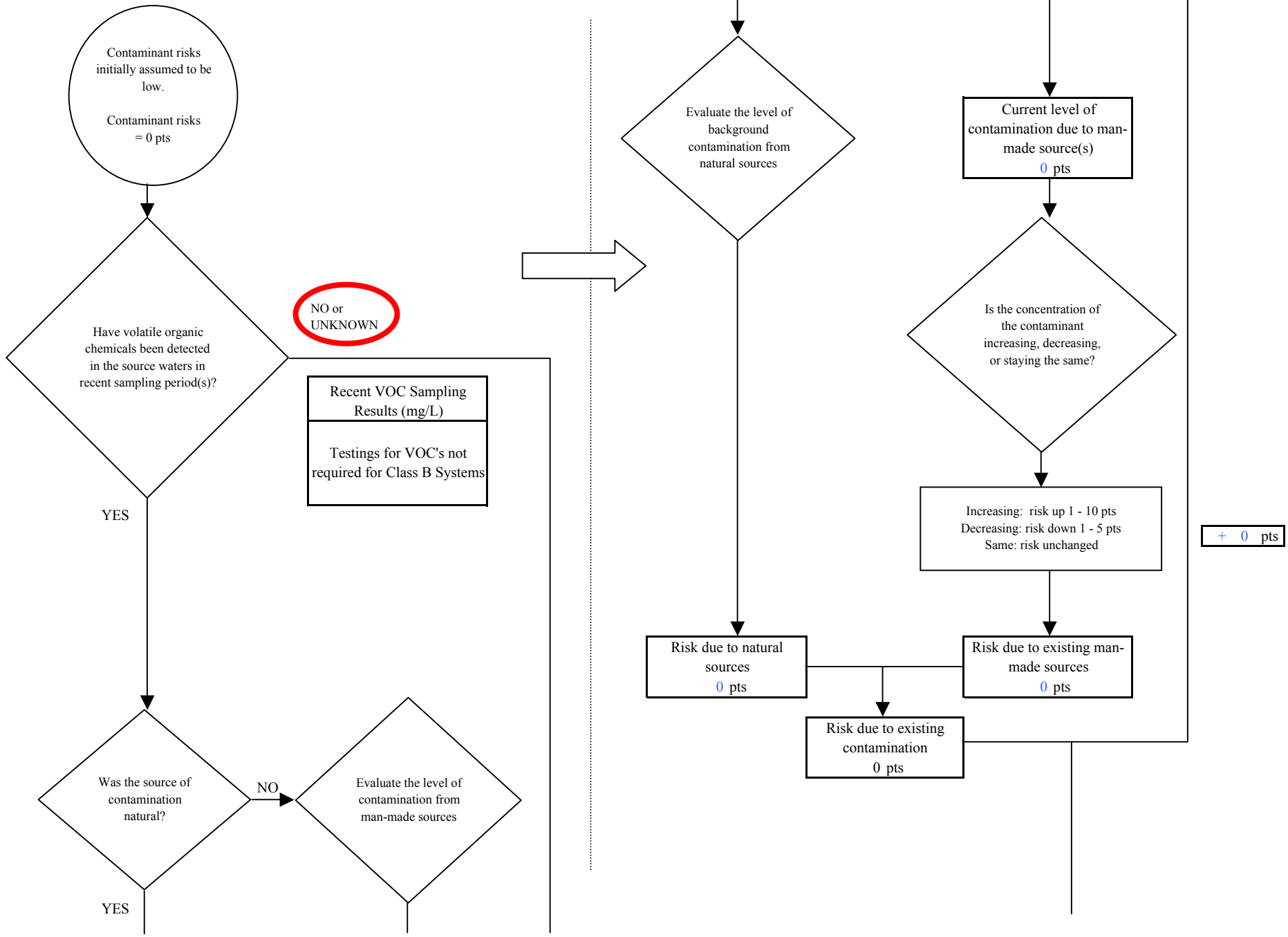
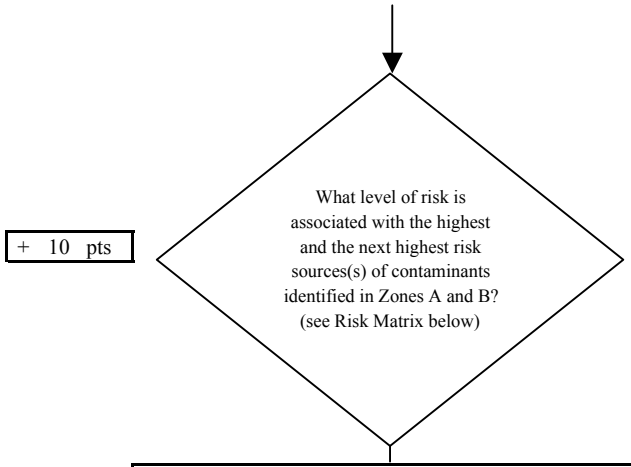


Chart 6. Contaminant risks for Saltry - Volatile Organic Chemicals



+ 10 pts

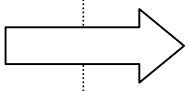
Risk Levels for Contaminant Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0		0
Low(s)	2		2

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source + 10 pts

Matrix Score 10

Note: Septic systems, sewerlines, and roads are each assigned a risk ranking for each individual contaminant source in the CSI. The VA, however, counts these contaminant sources as a group and assigns a calculated number of either "lows" or "mediums" based on the density.



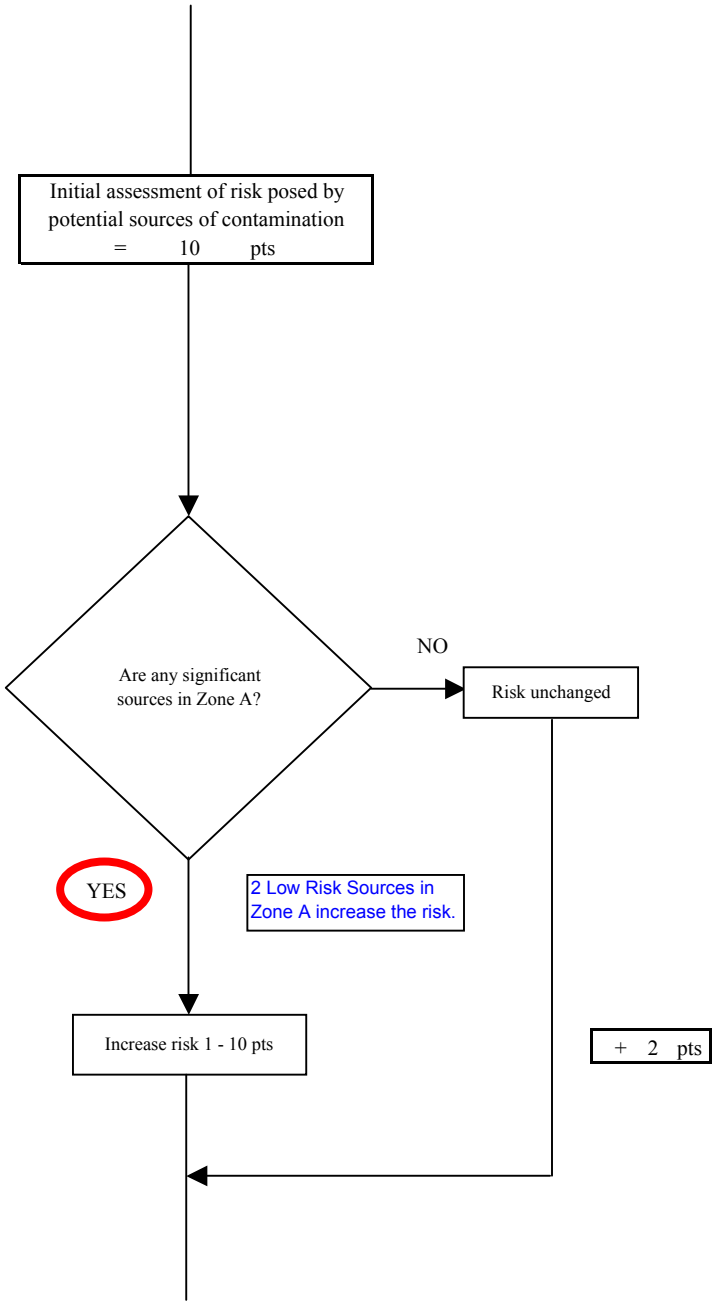


Chart 6. Contaminant risks for Saltry - Volatile Organic Chemicals

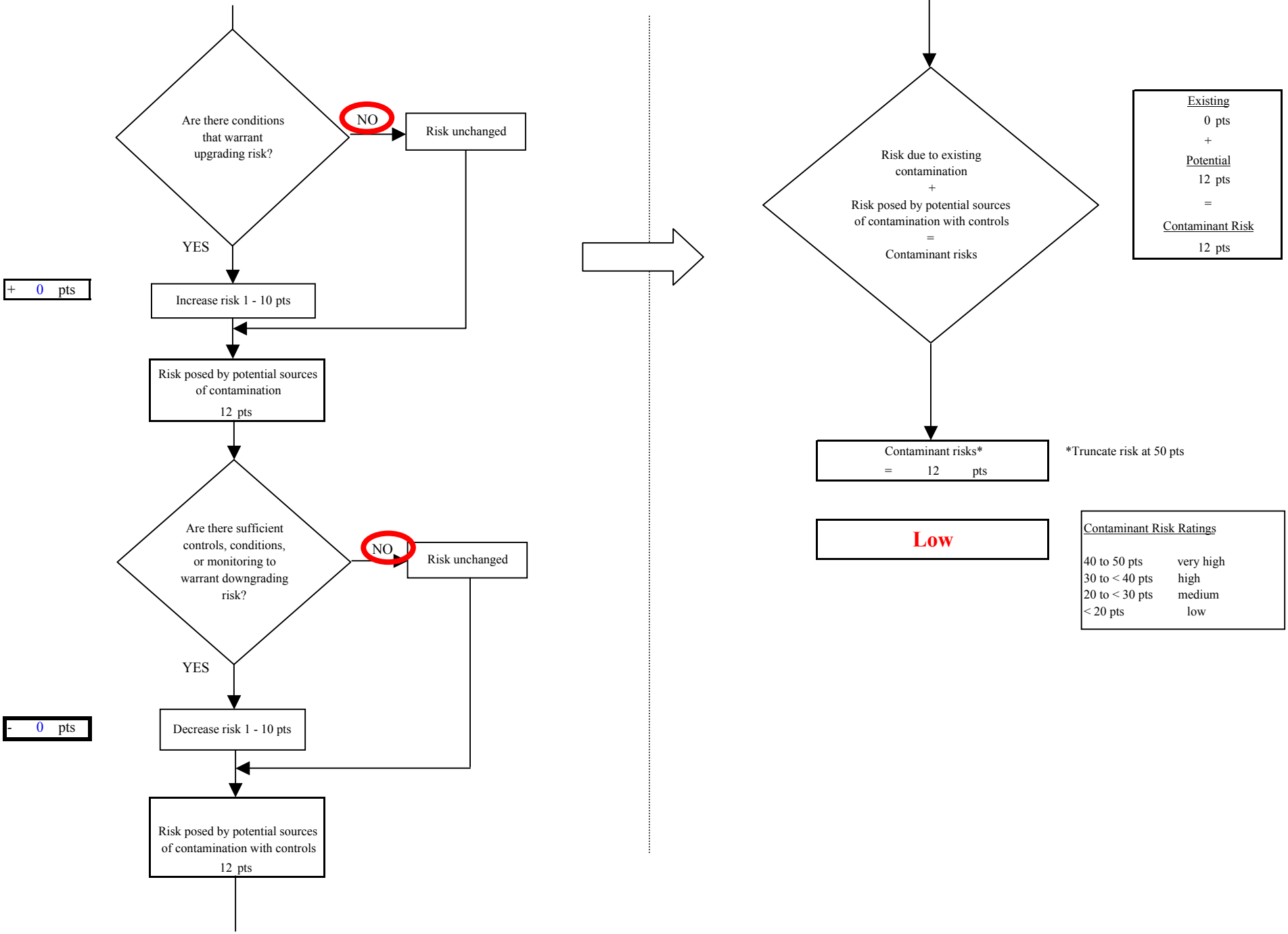


Chart 7. Vulnerability analysis for Saltry - Volatile Organic Chemicals