Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for

Yes Bay Lodge,

Yes Bay, Alaska

PWSID #120591

DRINKING WATER PROTECTION PROGRAM REPORT NO. 746

Alaska Department of Environmental Conservation

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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 Yes Bay Lodge, Yes Bay, Alaska

Drinking Water Protection Program
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EXECUTIVE SUMMARY

The public water system for Yes Bay Lodge is a Class B (transient/non-community) water system consisting of one surface water intake from Wolverine Creek. Yes Bay Lodge is a remote lodge located about 50 miles north of Ketchikan, Alaska. The surface water intake received a susceptibility rating of **Very High**. A rating of High to Very High is typical of all surface water systems. Identified potential and current sources of contaminants for Yes Bay Lodge public drinking water source include a septic system; logging; and a fish hatchery. Identified potential and existing sources of contamination include sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Contaminant sources could potentially contribute bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals into the source waters. Overall, the public water sources for Yes Bay Lodge received a vulnerability rating of **Very High** for bacteria and viruses and nitrates and nitrites; and **High** for volatile organic chemicals.

YES BAY LODGE PUBLIC DRINKING WATER SYSTEM

Yes Bay Lodge public water system is a Class B (transient/non-community) water system. The system consists of one surface water intake from Wolverine Creek, Alaska. Yes Bay is located about 50 miles north of Ketchikan, off the northwestern portion of Behm Canal and is included in the Tongass National Forest (please see the inset of Map 1 in Appendix A for location). The population of Yes Bay is approximately 25.

Yes Bay averages about 160 inches of precipitation per year; and approximately 32 inches of snow. The groundwater sources underlying the area are recharged through the infiltration of precipitation and surface water. Groundwater sources in the region generally occur in the fractured bedrock and unconsolidated sediments deposited by glaciers and/or rivers. The elevation for Yes Bay is near sea level.

According to a Sanitary Survey dated June 18, 1998, the surface water intake is located approximately 300 feet upstream of the lodge. The intake was adequately constructed, beginning operation in 1976-77. An adequately constructed intake may provide protection against debris and contaminants from entering the system. The raw material is treated by filtration and chlorination. There is a potential for runoff within the area surrounding the surface water. Potential sources of contamination identified in the survey consisted of animal waste and "fertilizer" which is used in McDonald Lake for fish rearing.

This system operates seasonally from May through September and serves approximately 25 residents and about 10 non-residents through one connection.

YES BAY LODGE 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 creek. These areas are determined by looking at the characteristics of the creek, surrounding contaminant sources, and the intake.

The most probable area for contamination to reach the drinking water system is the area that contributes water to the surface water body that water is being drawn from. 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 system, this area will serve as the focus for voluntary protection efforts.

The size and shape of the DWPAs were established based on aerial distances from the surface water body, and the watershed that recharges the surface water body. Please refer to the Guidance Manual for Class B Public Water Systems for additional information.

The DWPAs established for surface water systems by the ADEC are separated into three zones. These zones correspond to different distances from the surface water body, and the entire watershed that recharges the surface water body. The following is a summary of the three DWPA zones and their definitions.

Table 1. Definition of Zones

Zone	Definition
A	1,000 feet from the Surface Water Body
B	1 mile from the Surface Water Body
C	Entire Watershed

The DWPA for Yes Bay Lodge extends over the entire watershed. Development in the vicinity of the surface water intake 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 Yes Bay Lodge DWPA. 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.

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

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.

VULNERABILITY OF YES BAY LODGE DRINKING WATER SYSTEM

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

- Natural susceptibility; and
- Contaminant risks.

Each of the three categories of drinking water contaminants has been analyzed and an overall vulnerability score of 30 to 100 is ultimately assigned:

Natural Susceptibility (30 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the
Drinking Water Source to Contamination (30 – 100).

A score for the Natural Susceptibility is achieved by analyzing the properties of the surface water source.

Natural Susceptibility
(Susceptibility of the Surface Water Source)
(30 – 50 Points)

The surface water intake for Yes Bay Lodge is from Wolverine Creek. Because the creek is recharged by surface water runoff and precipitation, contaminants at or near the creek have the potential to adversely impact this drinking water source. Table 2 shows the Overall Susceptibility score and rating for Yes Bay Lodge.

Table 2. Natural Susceptibility

	Score	Rating
Natural Susceptibility	45	Very High

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This data 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. 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	50	Very High
Volatile Organic Chemicals	25	Medium

Appendix D contains seven 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 intake and its surrounding area and naturally-occurring attributes of the water source and influences on the groundwater system that might lead to contamination. 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 source. 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.

Table 4 contains the overall vulnerability scores (30 - 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	85	Very High
Nitrates and Nitrites	95	Very High
Volatile Organic Chemicals	70	High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Very High** with a septic system located within Zone A representing the risks to the drinking water (See Chart 2 – 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 Yes Bay Lodge. Combining the contaminant risks with the overall natural susceptibility of the surface water source, the vulnerability of the surface water source to contamination by bacteria and viruses is **Very High**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Very High** with a septic system, fish hatchery, and logging located within Zone A representing the risks to the drinking water (See Chart 4 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Sampling history for Yes Bay Lodge indicates that nitrates have not been detected in the water during the 1996 through 2002 sampling events. 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 surface water source, the overall vulnerability of the surface water source to contamination by nitrates and nitrites is **Very High**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Medium** with septic systems and logging creating the only known risks for volatile organic chemicals (See Chart 6 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

Sampling history for volatile organic chemicals was not available. Combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the surface water source, the overall vulnerability of the surface water source to contamination by volatile organic chemicals is **High**.

REFERENCES

Alaska Department of Community and Economic Development (ADCED), 2002 [WWW document]. URL http://www.dced.state.ak.us/mra/CF_BLOCK.cfm.

Alaska Geospatial Data Clearinghouse, 2003. URL: http://agdc.usgs.gov/data/datasets.html.

Gehrels, G.E., Berg, H.C., Geologic Map of Southeastern Alaska: U.S. Geological Survey Map (scale 1:600,000), Map I-1867, 1sheet.

King, P.B., compiler, 1969, Tectonic map of North America: US Geological Survey Map, (scale 1:5,000,000) 2 sheets.

United States Environmental Protection Agency (EPA), 2002 [WWW document]. URL: http://www.epa.gov/safewater/mcl.html.

APPENDIX A

Yes Bay Lodge
Drinking Water Protection Area Location Map
(Map 1)

Yes Bay Lodge

Location of Map

Map 1: Yes Bay Lodge Drinking Water Protection Areas

PWSID: 120591.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 3,500 7,000 14,000 21,000 28,000 Feet

1:67,135

Data Sources:

Background image - USGS 1:63,000 mapping
Lakes & streams - U.S. Forest Service, Tongass
Roads - Ketchikan Gateway Borough

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

For this PWS, Zone C (the entire watershed) covers the same area as Zone B (areas within 1-mile of the stream).

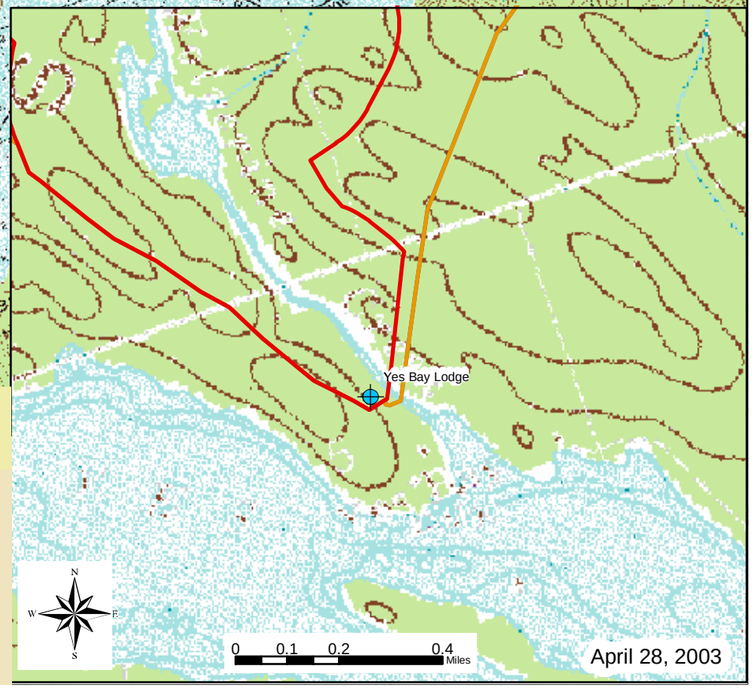
Legend

Public Drinking Water Systems

Zone A Protection Area
1000 Feet from Surface Water Body

Zone B Protection Area
1 Mile from Surface Water Body

Zone C Protection Area
Entire Watershed



April 28, 2003

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Yes Bay Lodge (Tables 1-4)

Table 1 *Contaminant Source Inventory for* ***PWSID 120591.001***

Yes Bay Lodge

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	2	Yes Bay Lodge
Logging (active or inactive?)	E02	E02-1	A	2	USFS Timber Stand South of Yes Bay Lodge
Logging (active or inactive?)	E02	E02-2	A	2	USFS Timber Stand Northwest of Yes Bay Lodge
Fish hatcheries	X47	X47-1	A	2	Fish Hatchery in Lake McDonald

Contaminant Source Inventory and Risk Ranking for

Table 2 ***PWSID 120591.001***

Yes Bay Lodge

Sources of Bacteria and Viruses

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method	D10	D10-1	A	High	2	Yes Bay Lodge

Contaminant Source Inventory and Risk Ranking for

Table 3 ***PWSID 120591.001***

Yes Bay Lodge

Sources of Nitrates/Nitrites

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Yes Bay Lodge
Logging (active or inactive?)	E02	E02-1	A	Low	2	USFS Timber Stand South of Yes Bay Lodge
Logging (active or inactive?)	E02	E02-2	A	Low	2	USFS Timber Stand Northwest of Yes Bay Lodge

Contaminant Source Inventory and Risk Ranking for

Table 4 ***PWSID 120591.001***

Yes Bay Lodge

Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*Risk Ranking CS ID tag*	*Map Zone*	*for Analysis*	*Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	Yes Bay Lodge
Logging (active or inactive?)	E02	E02-1	A	Medium	2	USFS Timber Stand South of Yes Bay Lodge
Logging (active or inactive?)	E02	E02-2	A	Medium	2	USFS Timber Stand Northwest of Yes Bay Lodge

APPENDIX C

Yes Bay Lodge
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

E 02-2

X47-1

Location of Map

Yes Bay Lodge

D10-1

E 02-1

W09-1

D10-1

Yes Bay Lodge

E 02-1

Map 2: Drinking Water Protection Areas for Yes Bay Lodge and Potential and Existing Sources of Contamination

PWSID: 120591.001

0 1,650 3,300 6,600 9,900 13,200 Feet

1:40,861

Data Sources:

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

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

For this PWS, Zone C (the entire watershed) covers the same area as Zone B (areas within 1-mile of the stream).

Legend

- Public Drinking Water Systems
- Large Capacity Septic System (D10)
- Private Water Supply Well (W09)
- Fish Hatchery (X47)

USFS Timber Stands

- Logging (E 02)

Zone A Protection Area
1000 Feet from Surface Water Body

Zone B Protection Area
1 Mile from Surface Water Body

Zone C Protection Area
Entire Watershed

0 0.1 0.2 0.4 Miles

April 29, 2003

APPENDIX D

Vulnerability Analysis for Yes Bay Lodge Public Drinking Water Source

(Charts 1-7)

Chart 1. Susceptibility of the surface water source - Yes Bay Lodge

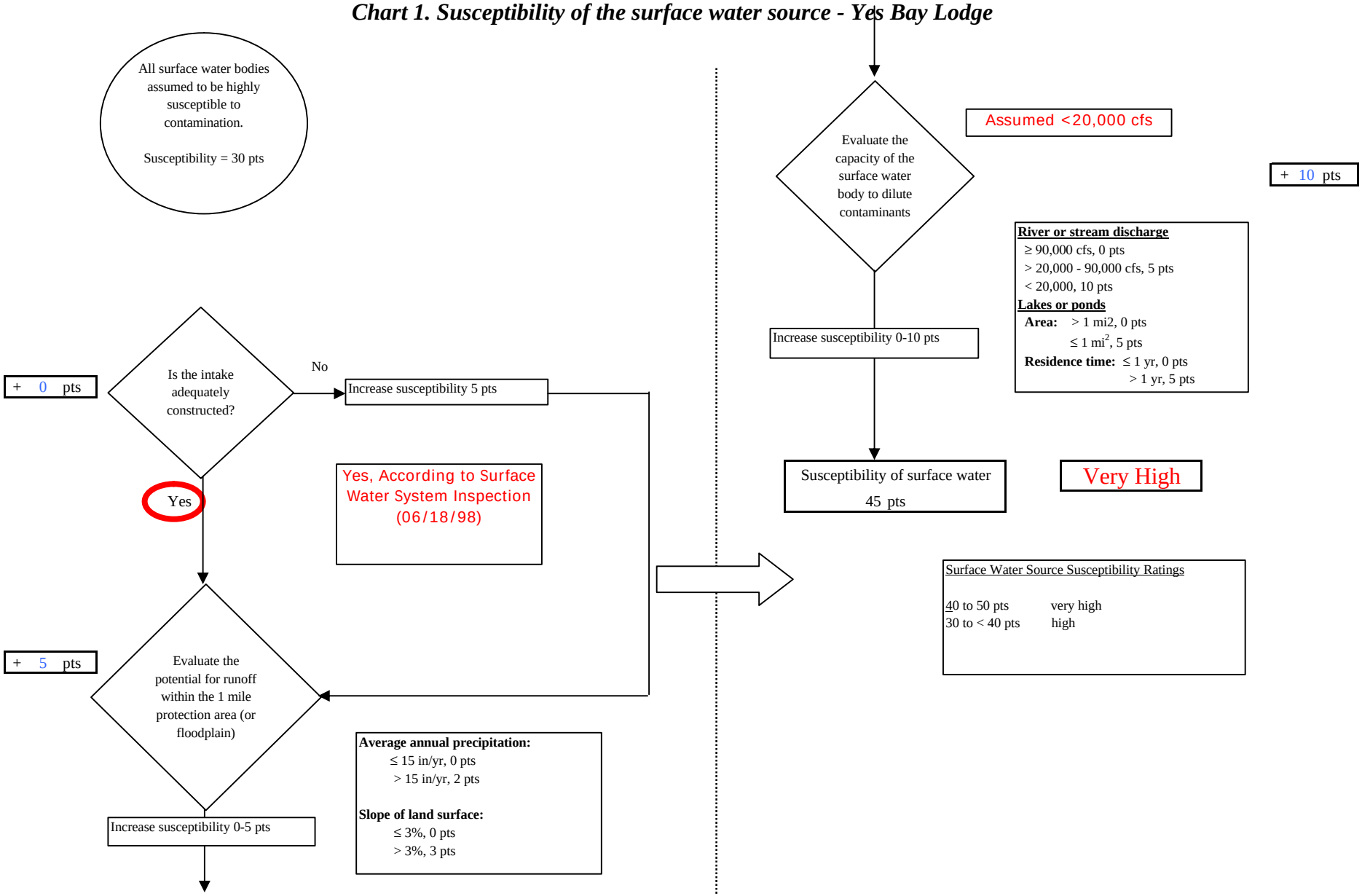
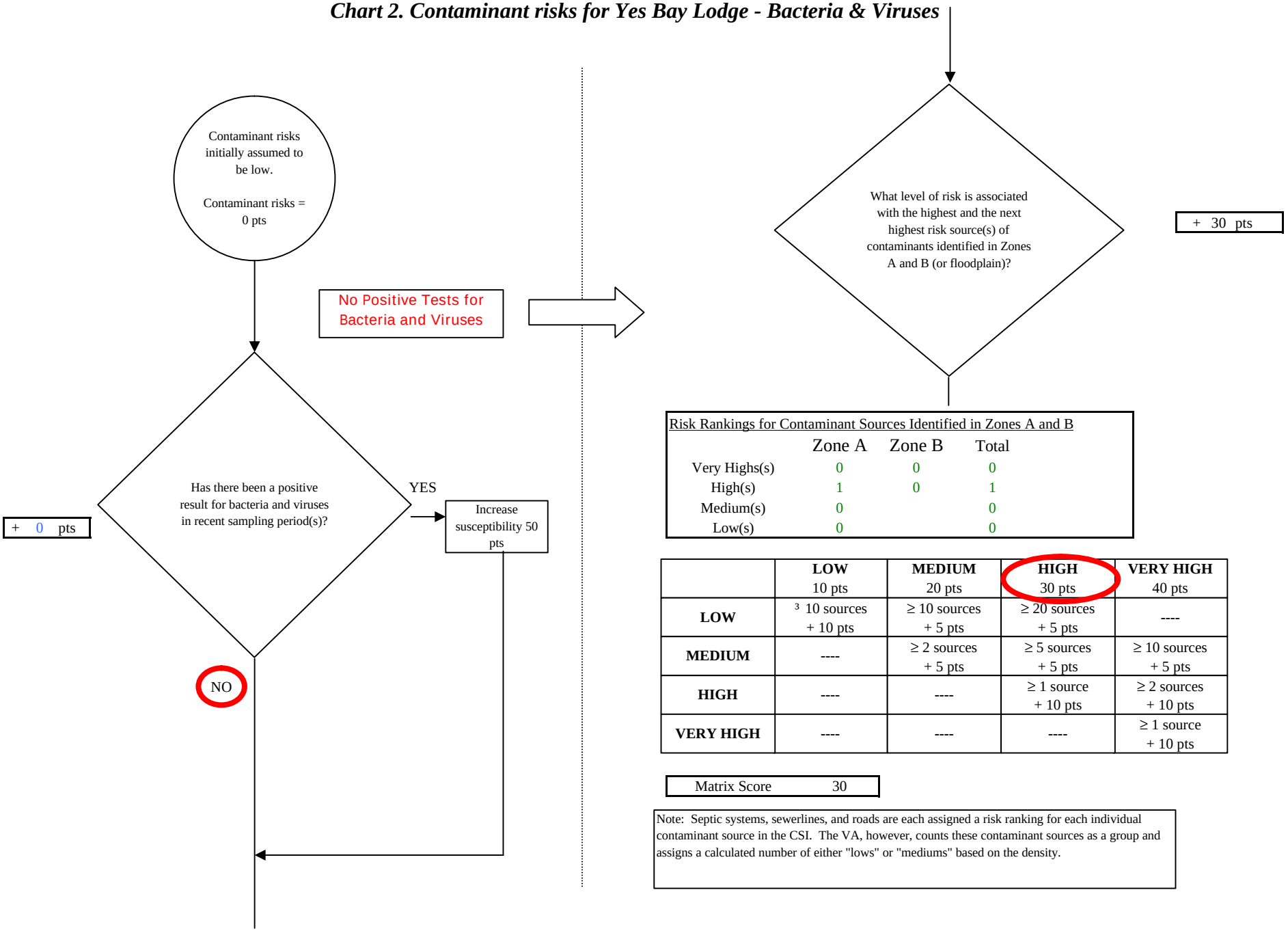


Chart 2. Contaminant risks for Yes Bay Lodge - Bacteria & Viruses



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)	0		0

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	[3] 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 Yes Bay Lodge - Bacteria & Viruses

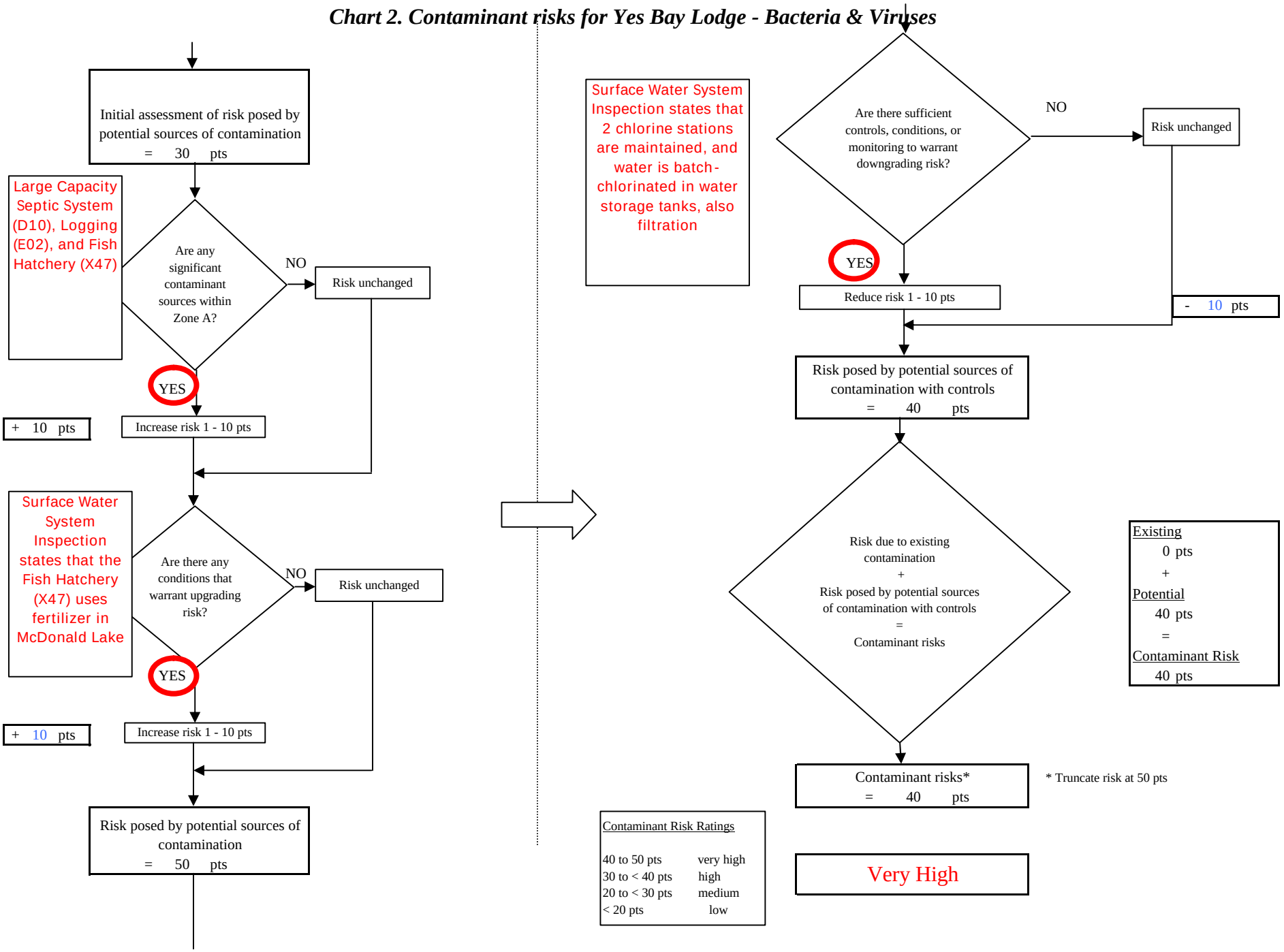


Chart 3. Vulnerability analysis for Yes Bay Lodge - Bacteria & Viruses

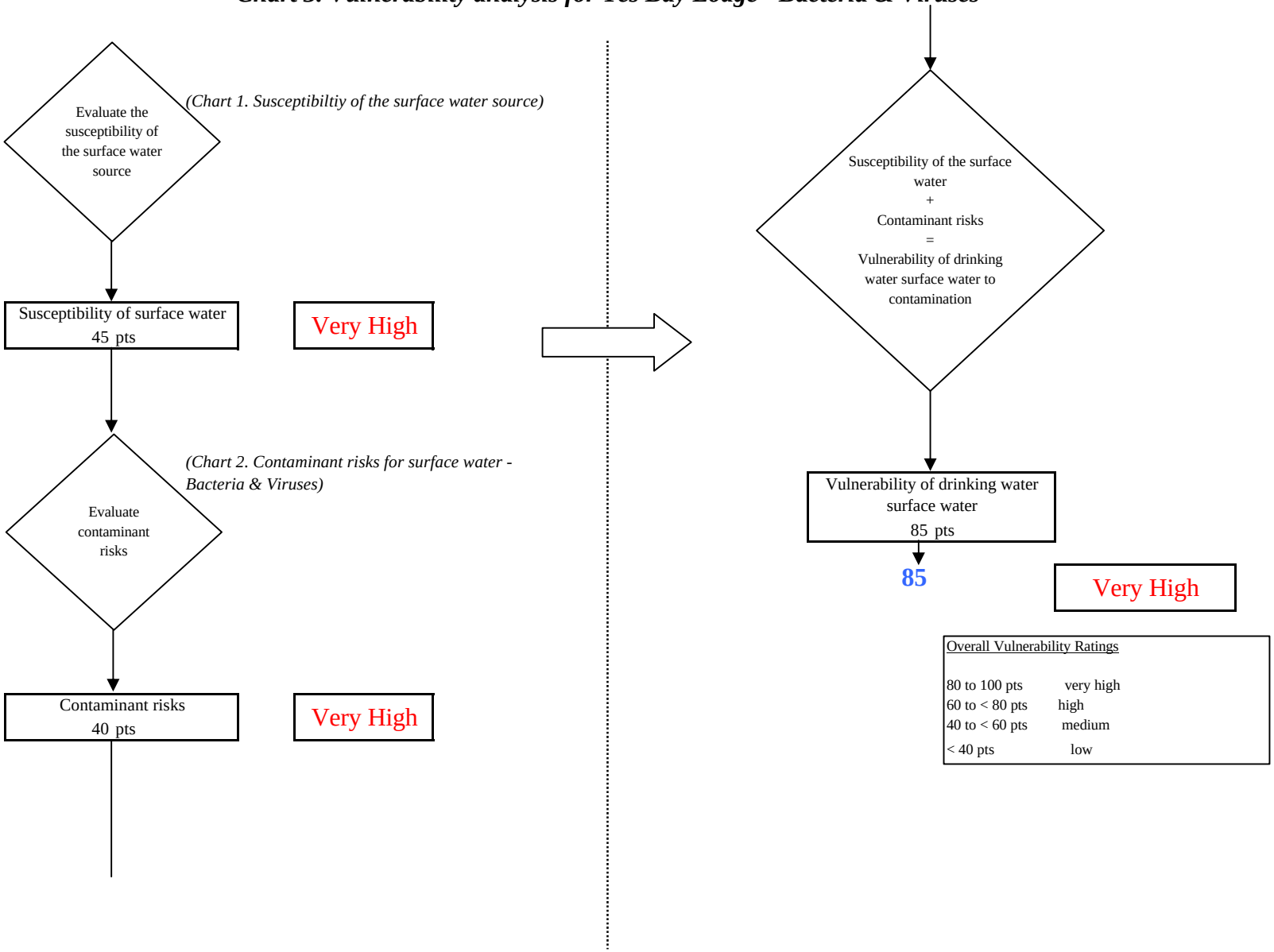


Chart 4. Contaminant risks for Yes Bay Lodge - Nitrates and Nitrites

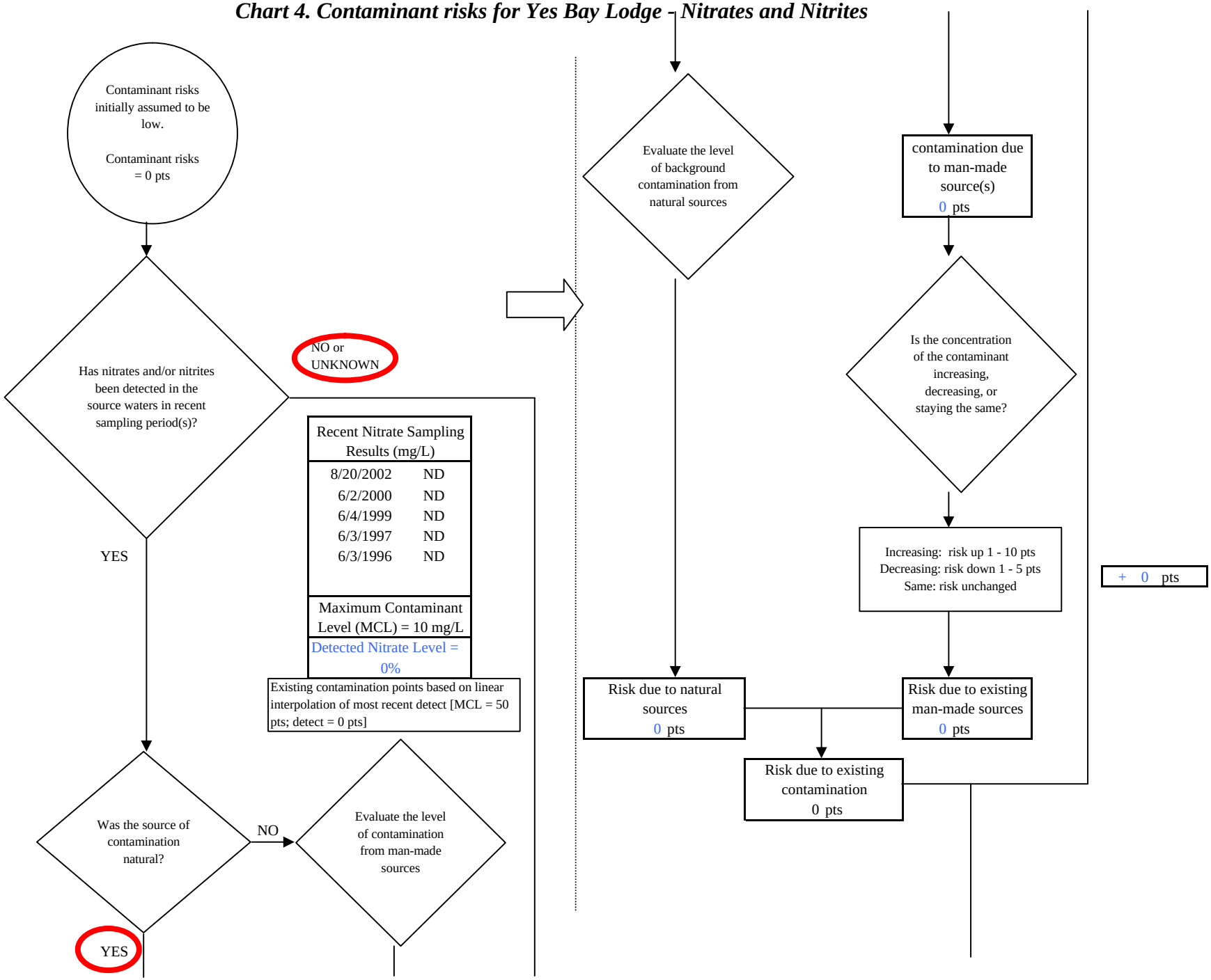


Chart 4. Contaminant risks for Yes Bay Lodge - Nitrates and Nitrites

+ 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)

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

Are any significant sources in Zone A?

NO → Risk unchanged

YES

Large Capacity Septic System (D10), Logging (E02), and Fish Hatchery (X47)

Increase risk 1 - 10 pts

+ 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)	1	0	1
Medium(s)	0		0
Low(s)	2		2

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	³ 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 4. Contaminant risks for Yes Bay Lodge - Nitrates and Nitrites

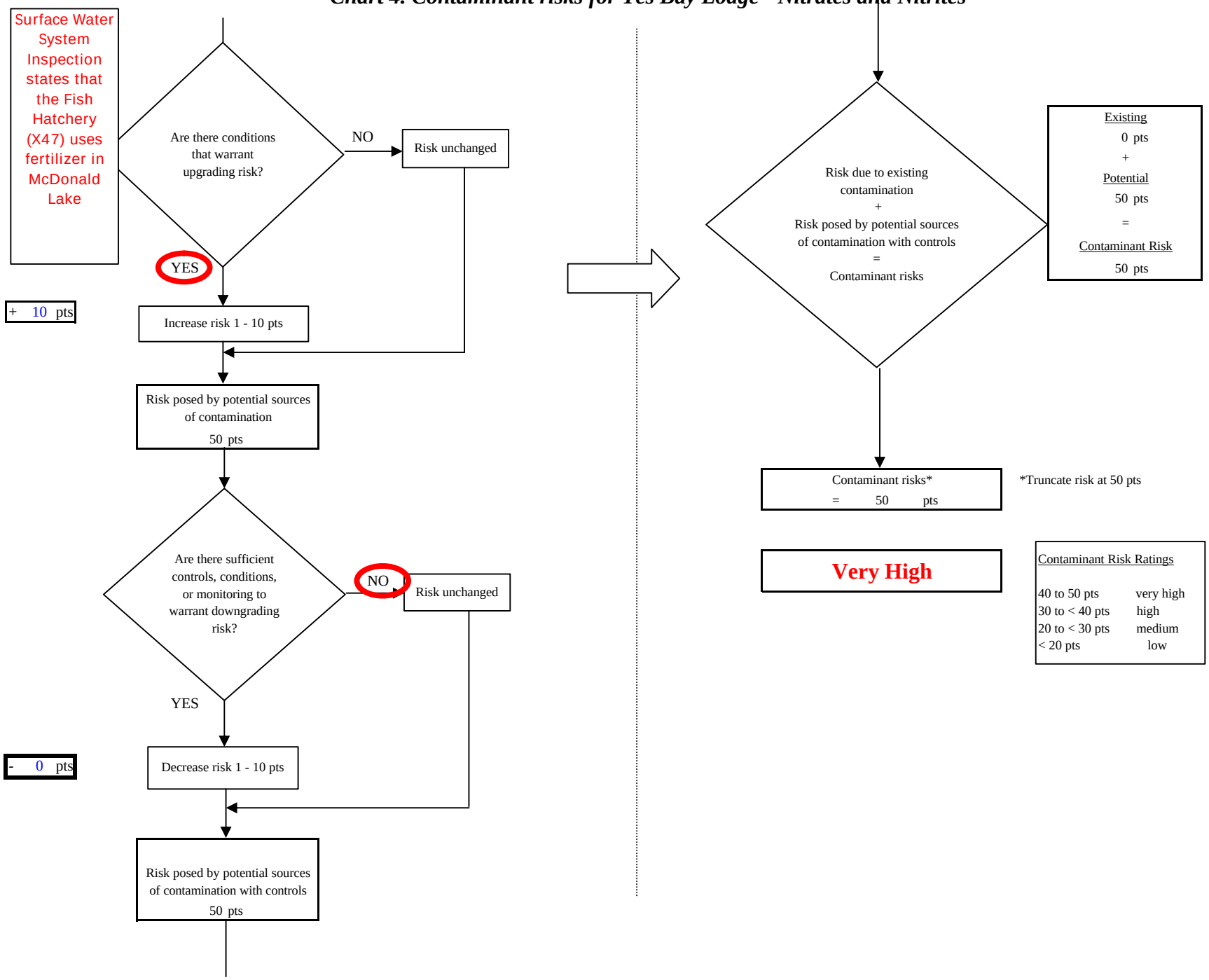


Chart 5. Vulnerability analysis for Yes Bay Lodge - Nitrates and Nitrites

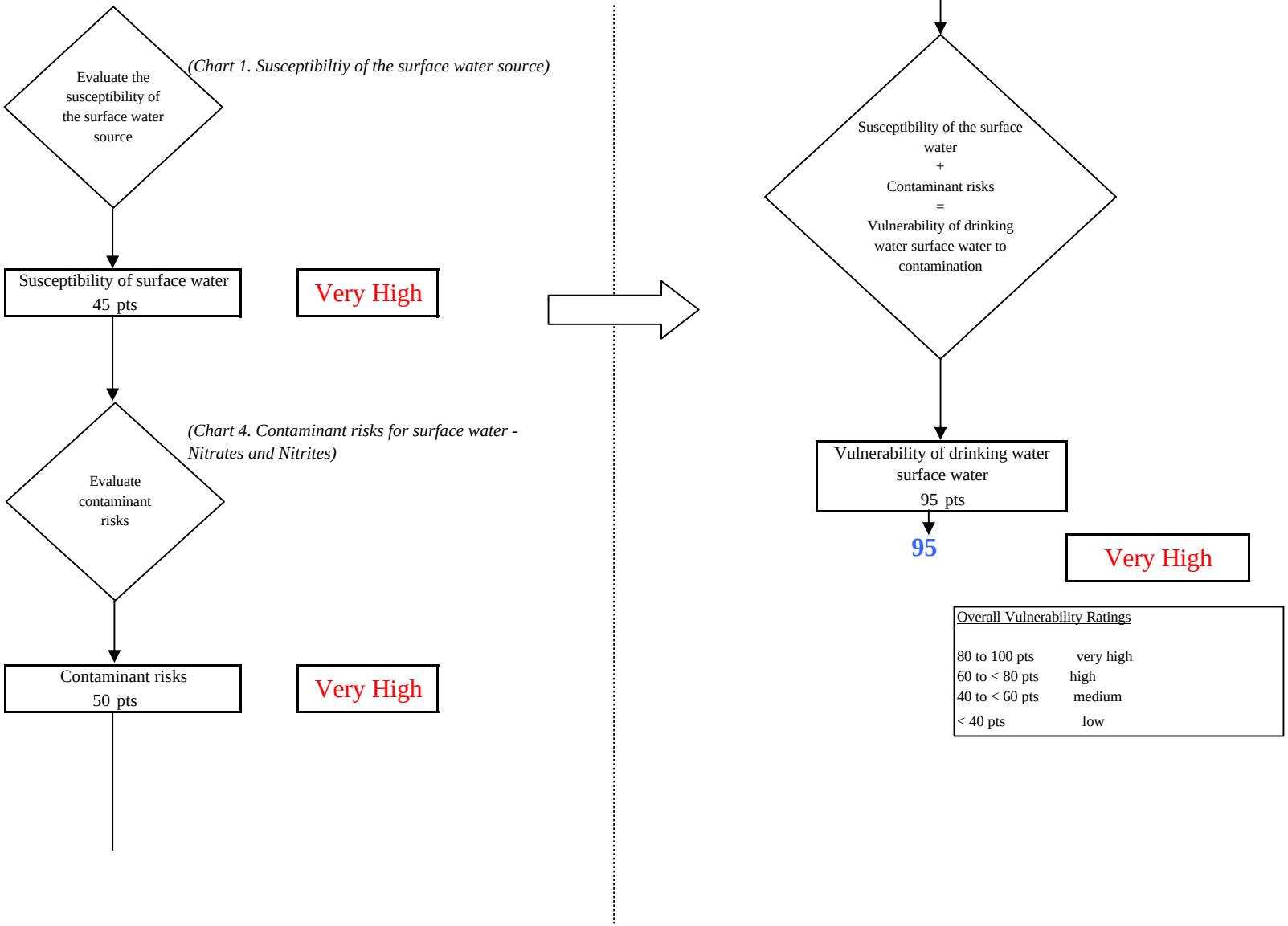


Chart 6. Contaminant risks for Yes Bay Lodge - Volatile Organic Chemicals

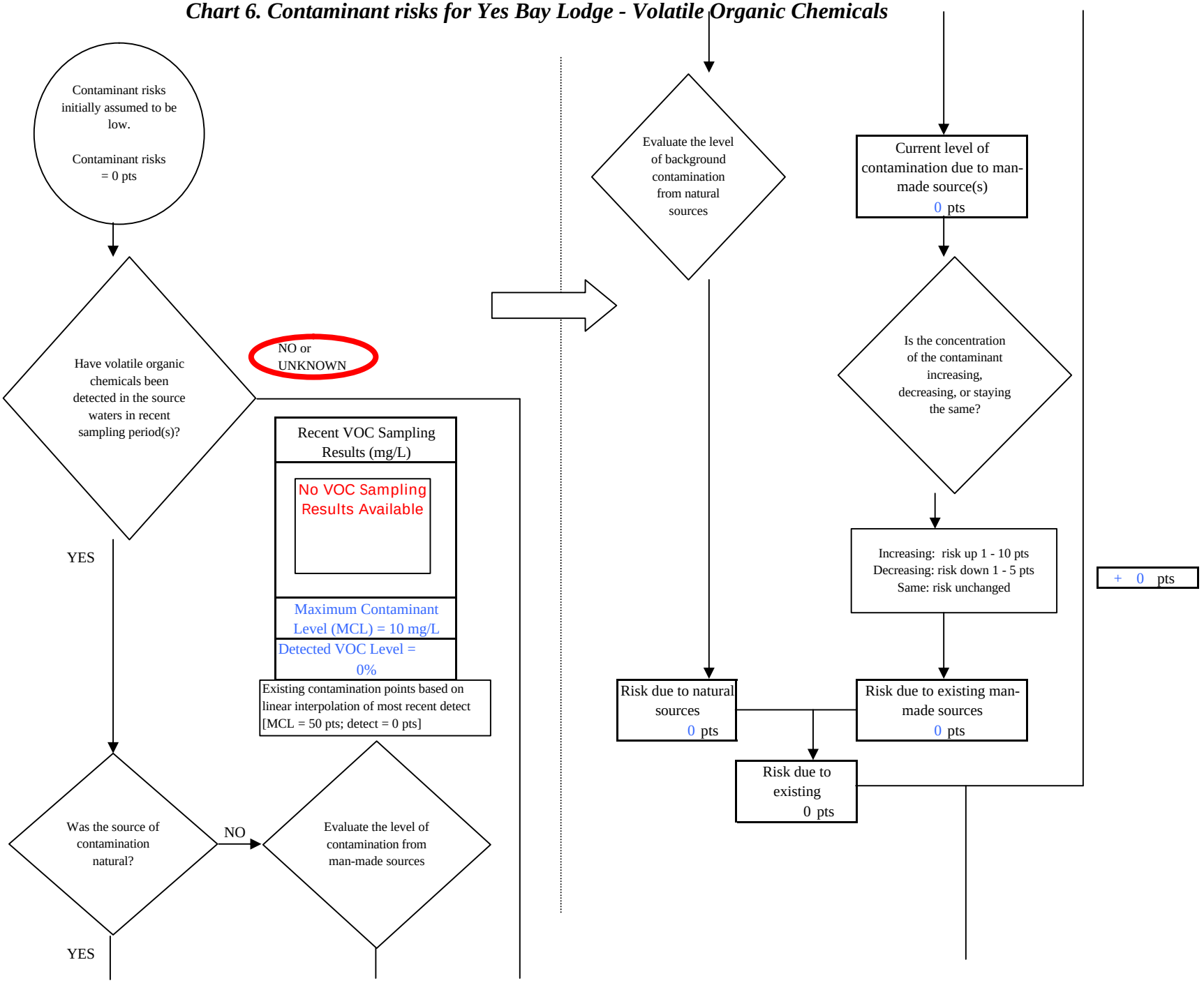


Chart 6. Contaminant risks for Yes Bay Lodge - Volatile Organic Chemicals

+ 20 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)

Initial assessment of risk posed by potential sources of = 20 pts

Are any significant sources in Zone A?

NO → Risk unchanged

YES → Increase risk 1 - 10 pts

Large Capacity Septic System (D10), and 2 Logging Timber Stands (E02)

+ 5 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)	2		2
Low(s)	1		1

	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	³ 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 20

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 Yes Bay Lodge - Volatile Organic Chemicals

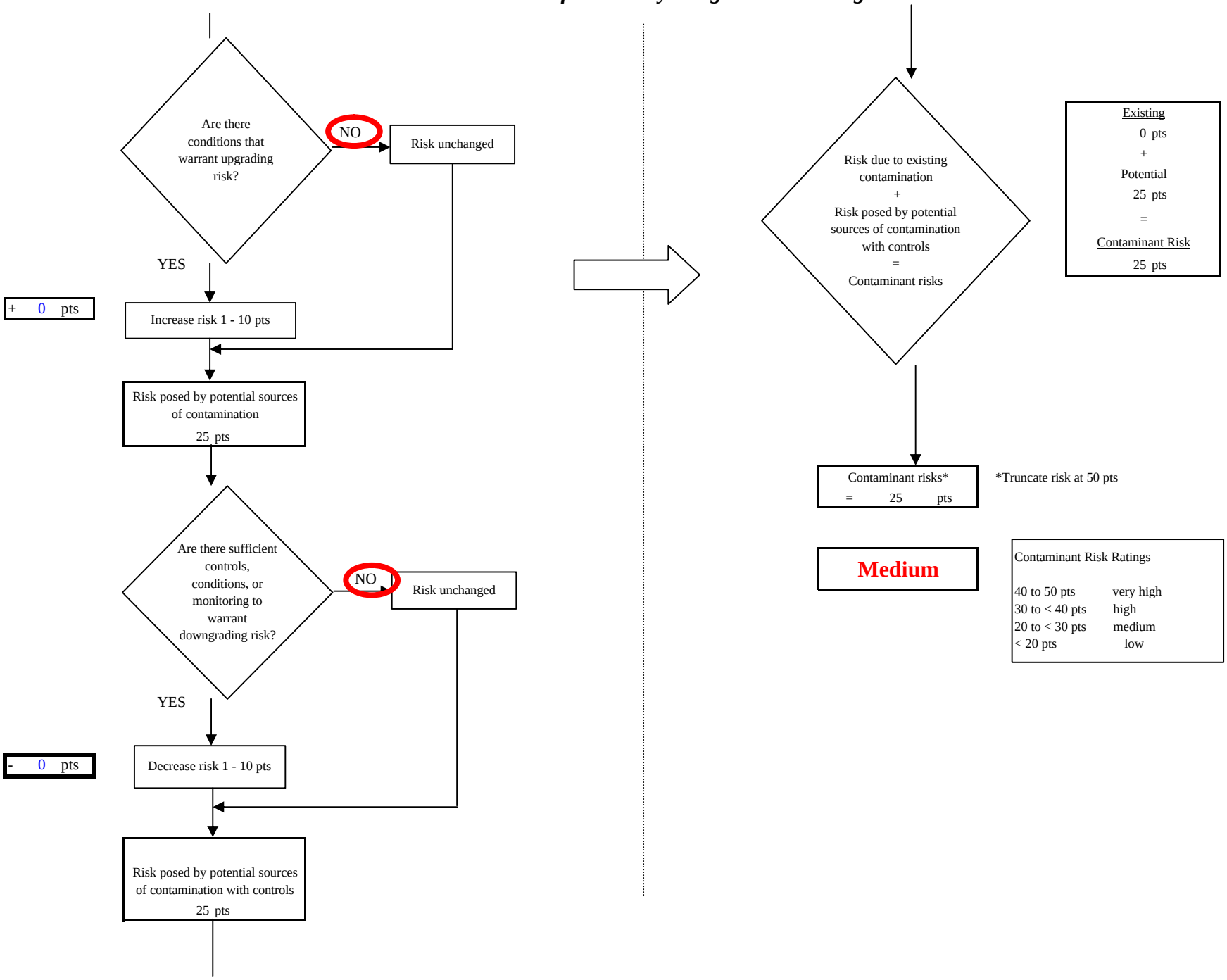


Chart 7. Vulnerability analysis for Yes Bay Lodge - Volatile Organic Chemicals