Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Kachemak Selo #3 Fox River, Alaska PWSID 247953

June 2004

DRINKING WATER PROTECTION PROGRAM REPORT Report 1554
Alaska Department of Environmental Conservation

Source Water Assessment for
Kachemak Selo #3
Fox River, Alaska
PWSID 242929

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DRINKING WATER PROTECTION PROGRAM REPORT Report 1554

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 Kachemak Selo #3
Fox River, Alaska

Drinking Water Protection Program
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EXECUTIVE SUMMARY

This source water assessment provides an evaluation of the vulnerability to potential contamination of the public water system serving Kachemak Selo #3. This Class A (community) water system consists of a spring located east of the village of Fox River, Alaska. The spring received a natural susceptibility rating of **Medium**. This rating is a combination of a susceptibility rating of **Medium** for the spring intake and a **High** rating for the aquifer in which the water is coming from. Identified potential and current sources of contamination for the Kachemak Selo #3 public water system include: septic systems, residential areas, roads, and a logging area. These are considered as sources of bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals. Combining the natural susceptibility of the spring with the contaminant risk, the public water system for Kachemak Selo #3 received an overall vulnerability rating of **High** for bacteria and viruses, and a **Medium** for nitrates and/or nitrites, and heavy metals, cyanide, and other inorganic chemicals, and a **Low** for volatile organic chemicals, synthetic organic chemicals, and other organic chemicals.

KACHEMAK SELO #3 PUBLIC DRINKING WATER SYSTEM

The Kachemak Selo #3 public water system is a Class A (community) water system. Its spring intake is located east of the village of Fox River, Alaska (T4S, R10W, Section 30) (See Map 1 of Appendix A). Fox River is located 24 miles northeast of Homer, Alaska. It is within the Kenai Peninsula Borough which is located in south-central Alaska (Please see the inset of Map 1 in Appendix A for location). The Kenai Peninsula Borough is comprised of the Kenai Peninsula, Cook Inlet and a large unpopulated area northeast of the Alaska Peninsula The Borough's current population is almost 50,000 (ADCED, 2002). Communities located within the Borough include: Anchor Point, Grouse Creek Group, Beluga, Clam Gulch, Cohoe, Cooper Landing, Crown Point, Diamond Ridge, Fox River, Fritz Creek, Funny River, Halibut Cove, Happy Valley, Homer, Hope, Kachemak, Kalifornsky, Kasilof, Kenai, Lowell Point, Miller Landing, Moose Pass, Nanwalek, Nikiski, Nikolaevsk, Ninilchik, Port Graham, Primrose, Ridgeway, Salamatof, Seldovia, Seldovia Village, Seward, Soldotna, Sterling, Sunrise and Tyonek.

Most residents of Fox River are connected to the water system serving Homer and use individual septic systems. The remainder has water hauled and uses outhouses (ADCED, 2002). Residents primarily use heating oil (typically stored in both above and below ground 275 to 500-gallon tanks), but also wood or bottled gas to heat homes and buildings (ADCED, 2002). A Borough refuse transfer facility is available at mile 157 of the Sterling Highway, or Homer sanitation facilities are used (ADCED, 2002).

The Kachemak Selo #3 spring lies on the north shore of Kachemak Bay an elevation of approximately 150 feet above sea level.

Sediments in the area generally consist of a combination of sand, gravel, silt, and clay and were deposited by glacially-fed streams, abandoned-channel deposits, glacial moraines and alluvium from existing streams (Glass, 1996). There can be a significant variation in the composition of sediment layers over relatively small areas. Consequently, confinement of the aquifers in the area can vary over short distances (Glass, 1996).

The Kachemak Selo #3 public drinking water system serves approximately 150 residents through 36 service connections.

KACHEMAK SELO #3 DRINKING WATER PROTECTION AREA

Identifying the pathways most likely for surface contamination to reach water intake areas is the first step in determining the water system's risk. These are initially determined by looking at the drainage area contributing overland water flow to a spring source intake. The entire drainage area is also known as the "drinking water protection area". Please refer to pages 9-10 of the "Guidance Manual for Class A Public Water Systems" for additional information.

The protection area established for spring source intakes by the ADEC is usually separated into three zones, limited by the watershed boundary. These zones correspond to differing distances from the spring intake location. The ADEC Drinking Water Protection

Program's Technical Advisory Committee developed guidelines for derivation of these zones in 1998. The following is a summary of the three protection area zones:

Table 1. Definition of Zones

Zone	Definition
A	Areas within 1000-ft of the spring intake
B	Areas within 1-mile of the spring intake
C	The watershed boundary

The protection area for the Kachemak Selo #3 intake includes each of these Zones (See Map 1 of Appendix A).

The drinking water protection area outlined for the Kachemak Selo #3 on Map 1 of Appendix A will serve as the focus for voluntary protection efforts.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program (DWPP) has completed an inventory of potential and existing sources of contamination within the Kachemak Selo #3 protection area. This inventory was completed through a search of agency records and other publicly available information. 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 A public water system assessments, six categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites;
- Volatile organic chemicals;
- Heavy metals, cyanide, and other inorganic chemicals;
- Synthetic organic chemicals; and
- Other inorganic 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 each 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 combination of toxicity and volume associated with that source. Rankings include:

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

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 spring intake.

Tables 2 through 7 in Appendix B contain the ranking of inventoried potential and existing sources of contamination with respect to the six contaminant categories.

VULNERABILITY OF KACHEMAK SELO #3 DRINKING WATER SYSTEM

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

- Natural susceptibility of the spring; and
- Contaminant risks.

Appendix D contains 14 charts, which together form the 'Vulnerability Analysis' for the public drinking water Source Water Assessment. Chart 1 analyzes the 'Susceptibility of the spring outlet/intake" to contamination by looking at the climate, terrain, and intake location. Chart 2 analyzes the "Susceptibility of the Aquifer" by looking at some basic aquifer characteristics. 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 intake area. Chart 4 contains the 'Vulnerability Analysis for Bacteria and Viruses', which is a composite score of the Vulnerability Analysis and the overall Susceptibility. Charts 5 through 14 repeat the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals, respectively.

A score for the Natural Susceptibility of the spring is reached by considering the properties of the spring and the surrounding area. The derivation of this information is presented below and the data for this source is shown in Charts 1 and 2 of Appendix D.

Susceptibility of the Spring (0 - 25 points)

+

Susceptibility of the Aquifer (0 - 25 points)

=

Natural Susceptibility of the Spring
(0 – 50 Points)

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

Surface Water Source Susceptibility Ratings	
40 to 50 pts	Very High
30 to 39 pts	High
20 to 29 pts	Medium
0 to 19 pts	Low

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Spring	10	Medium
Susceptibility of the Aquifer	17	High
Natural Susceptibility	27	Medium

The Contaminant Risk has been derived from an evaluation of the routine sampling results of the water system and the presence of potential sources of contamination. Contaminant risks to a drinking water source depend on the type and distribution of contaminant sources. 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	50	Very High
Nitrates and/or Nitrites	29	Medium
Volatile Organic Chemicals	10	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	18	Low
Synthetic Organic Chemicals	10	Low
Other Organic Chemicals	10	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 six categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	75	High
Nitrates and/or Nitrites	55	Medium
Volatile Organic Chemicals	35	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	45	Medium
Synthetic Organic Chemicals	35	Low
Other Organic Chemicals	35	Low

Bacteria and Viruses

The septic systems represents the greatest risk of Bacteria and Viruses to this water system.

Only a small amount of bacteria and viruses are required to endanger public health. Coliforms (a bacteria) are found naturally in the environment and although they aren't necessarily a health threat, it is an indicator of other potentially harmful bacteria in the water, more specifically, fecal coliforms and E. coli which only come from human and animal fecal waste (EPA, 2002). Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2002). Routine sampling has detected coliforms in the water most recently on 2/27/04, 2/24/04, 2/5/03, and 1/9/03. Neither fecal coliforms nor E. coli have been detected.

After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the spring, the overall vulnerability of the spring to contamination is high.

Nitrates and Nitrites

The septic systems also represent the greatest risk of nitrates and nitrites for this source of public drinking water.

Nitrates are very mobile, moving at approximately the same rate as water. Nitrates have consistently been detected around 4 mg/L or about 40% of its Maximum Contaminant Level (MCL). An MCL is the highest concentration of a contaminant allowed in drinking water by the Environmental Protection Agency (EPA).

After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the spring, the overall vulnerability of the spring to contamination is medium.

Volatile Organic Chemicals

The septic systems, residential areas, and roads represent the identified risk for volatile organic chemical contamination to the spring.

Volatile Organic Chemicals have not been detected during routine sampling of this water system.

After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the spring, the overall vulnerability of the spring to contamination is low.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The septic systems, residential areas, and roads represent the identified risk to heavy metals for this source of public drinking water.

Arsenic was detected on 12/22/99 at a concentration of 0.008 mg/L, or 16% with respect to its current MCL of 0.05 mg/L. Barium, Chromium, and Fluoride were also detected on 12/22/99 but in an extremely low concentrations with respect to their MCL. No other heavy metals were detected during routine sampling.

After combining the contaminant risk for heavy metals, cyanide and other inorganic chemicals with the natural susceptibility of the spring, the overall vulnerability of the spring to contamination is medium.

Synthetic Organic Chemicals

The residential area and septic systems combine to represent the risk of synthetic organic chemicals for this source of public drinking water.

Synthetic Organic Chemicals have not recently been sampled for in this spring.

After combining the contaminant risk for synthetic organic chemicals with the natural susceptibility of the spring, the overall vulnerability of the spring to contamination is low.

Other Organic Chemicals

The residential septic systems, roads, and residential area combine to represent the risk of other organic chemicals for this source of public drinking water.

Other Organic Chemicals have not recently been sampled for in this water system.

After combining the contaminant risk for other organic chemicals with the natural susceptibility of the spring, the overall vulnerability of the spring to contamination is low.

REFERENCES

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

Freeze, R.A. and Cherry, J.A., 1979. Groundwater. Prentice-Hall, Englewood Cliffs, NJ.

Glass, R.L., 1996, Ground-water conditions and quality in the western part of Kenai Peninsula, southcentral Alaska, Prepared in cooperation with the Alaska Department of Natural Resources, Kenai Peninsula Borough, Kenai Soil and Water Conservation District, U.S. Geological Survey, Anchorage, AK, and Branch of Information Services, Denver, CO.

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

APPENDIX A

Kachemak Selo #3
Drinking Water Protection Area Location Map
(Map 1)

Map 1-Kachemak Selo #3-Drinking Water Protection Area

PWSID: 247953.001

Alaska Department of Environmental Conservation

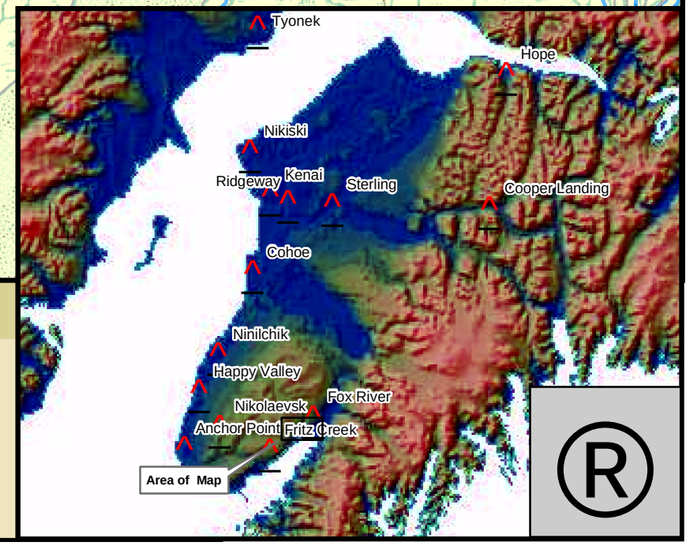
Alaska Drinking Water Protection Program

Feet
0 500 1,000 2,000

1:34,771

Data Sources:
Kenai Borough: Roads and parcels
63,000 Topographic map:USGS
Potential Sources of Contamination: ADEC

- Wells
- Zone A Protection Area
- Zone B Protection Area
- Zone C Protection Area
- Roads
- Rivers and Streams
- Water



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APPENDIX B

Contaminant Source Inventory and Risk Ranking for Kachemak Selo #3 (Tables 1-7)

Table 1

Contaminant Source Inventory for ***Kachemak Selo #3***

PWSID 247953.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	B	2	Zone B has 30 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-1-5	B	2	Zone B has 5 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-2	B	2	Zone B has 2 roads identified.
Logging	E02	E02-1	C	2	

Table 2

Contaminant Source Inventory and Risk Ranking for Kachemak Selo #3

Sources of Bacteria and Viruses

PWSID 247953.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	B	Low	2	Zone B has 30 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-1-5	B	Low	2	Zone B has 5 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-2	B	Low	2	Zone B has 2 roads identified.

Table 3

Contaminant Source Inventory and Risk Ranking for Kachemak Selo #3

Sources of Nitrates/Nitrites

PWSID 247953.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	B	Low	2	Zone B has 30 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-1-5	B	Low	2	Zone B has 5 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-2	B	Low	2	Zone B has 2 roads identified.
Logging	E02	E02-1	C	Low	2	

Table 4

Contaminant Source Inventory and Risk Ranking for Kachemak Selo #3

Sources of Volatile Organic Chemicals

PWSID 247953.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	B	Low	2	Zone B has 30 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-1-5	B	Low	2	Zone B has 5 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-2	B	Low	2	Zone B has 2 roads identified.
Logging	E02	E02-1	C	Medium	2	

Table 5

Contaminant Source Inventory and Risk Ranking for Kachemak Selo #3

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 247953.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	B	Low	2	Zone B has 30 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-1-5	B	Low	2	Zone B has 5 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-2	B	Low	2	Zone B has 2 roads identified.
Logging	E02	E02-1	C	Low	2	

Table 6

Contaminant Source Inventory and Risk Ranking for Kachemak Selo #3

Sources of Synthetic Organic Chemicals

PWSID 247953.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	B	Low	2	Zone B has 30 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-1-5	B	Low	2	Zone B has 5 residential septic systems identified.

Table 7

Contaminant Source Inventory and Risk Ranking for Kachemak Selo #3

Sources of Other Organic Chemicals

PWSID 247953.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Residential Areas	R01	R01-1	B	Low	2	Zone B has 30 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-1-5	B	Low	2	Zone B has 5 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-2	B	Low	2	Zone B has 2 roads identified.

APPENDIX C

Kachemak Selo #3
Potential Contaminant Sources
(Map 2)

E02-1

Zone C has:
5 residential septic systems (R02)
35 residential acres (R01)

Zone B has:
5 residential septic systems (R02)
30 residential acres (R01)
2 roads (X20)

PRIVATE
BASARGIN
RAZDOLNA
UNKNOWN
VOZNESENKA
GOLDEN VIEW
EAST END RD
CHORUS
EAST END
Cabin
Lake Swift

Map 2 Kachemak Selo #3: Potential Sources of Contamination

PWSID: 247953.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 1,360 2,720 Feet

1:16,320

Data Sources:
Roads and parcels: Kenai Borough
Aerial Photo: USGS and Microsoft Terraserver
63K topographic map: USGS
Potential Sources of Contamination: ADEC

- Public Water System
- Zone A
- Zone B
- Zone C
- Water
- Rivers and Streams
- Roads
- Parcels

Inset

BASARGIN
UNKNOWN
CIRCLE LAKE
EAST END
LINDA
VOZNESENKA
CHORUS
EAST END RD
BIRCH
MORRISON

APPENDIX D

Vulnerability Analysis for Kachemak Selo #3 Public Drinking Water Source

(Charts 1-14)

Chart 1. Susceptibility of the spring outlet/intake - Kachemak Selo #3

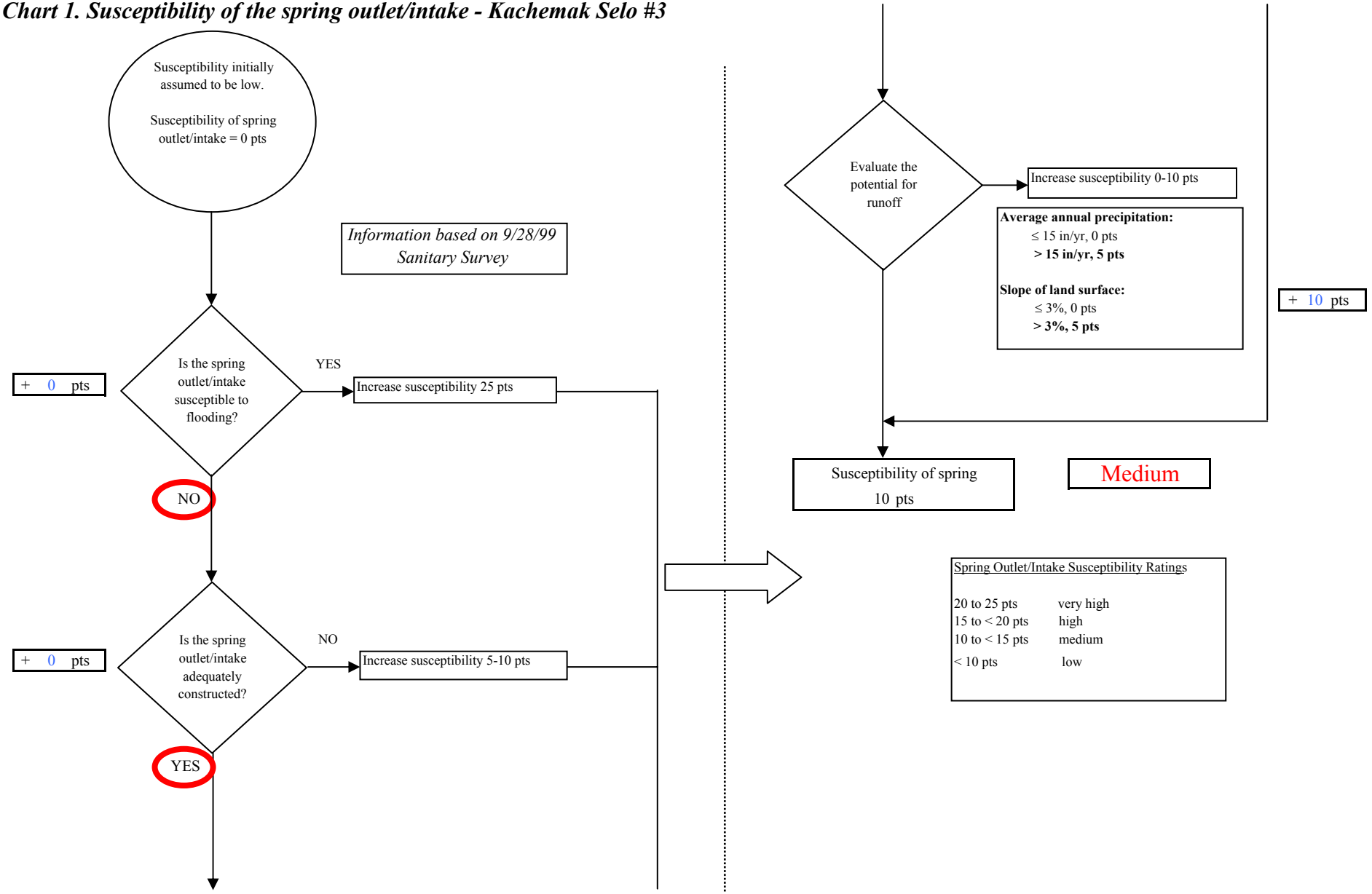


Chart 2. Susceptibility of the aquifer - Kachemak Selo #3

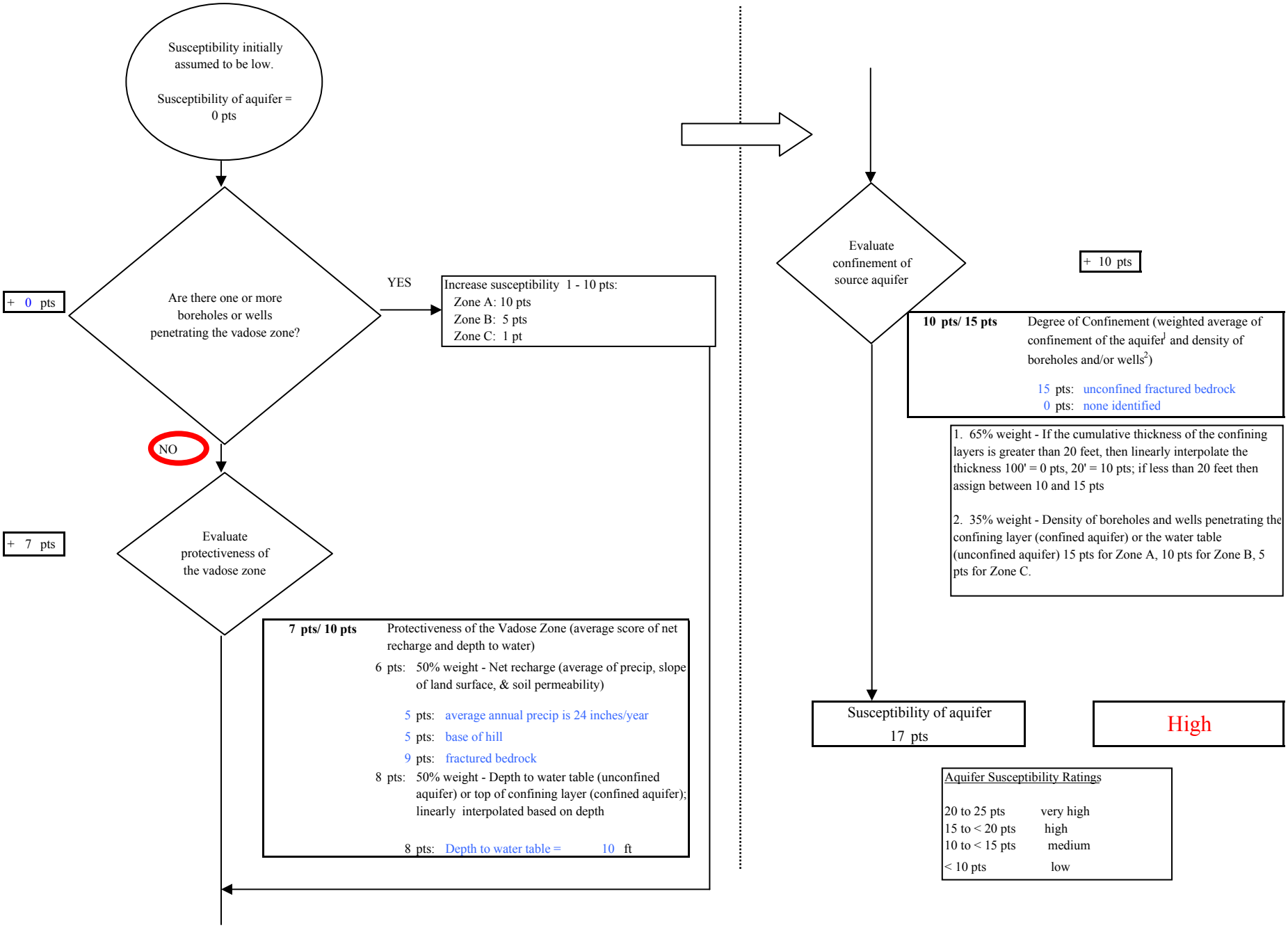
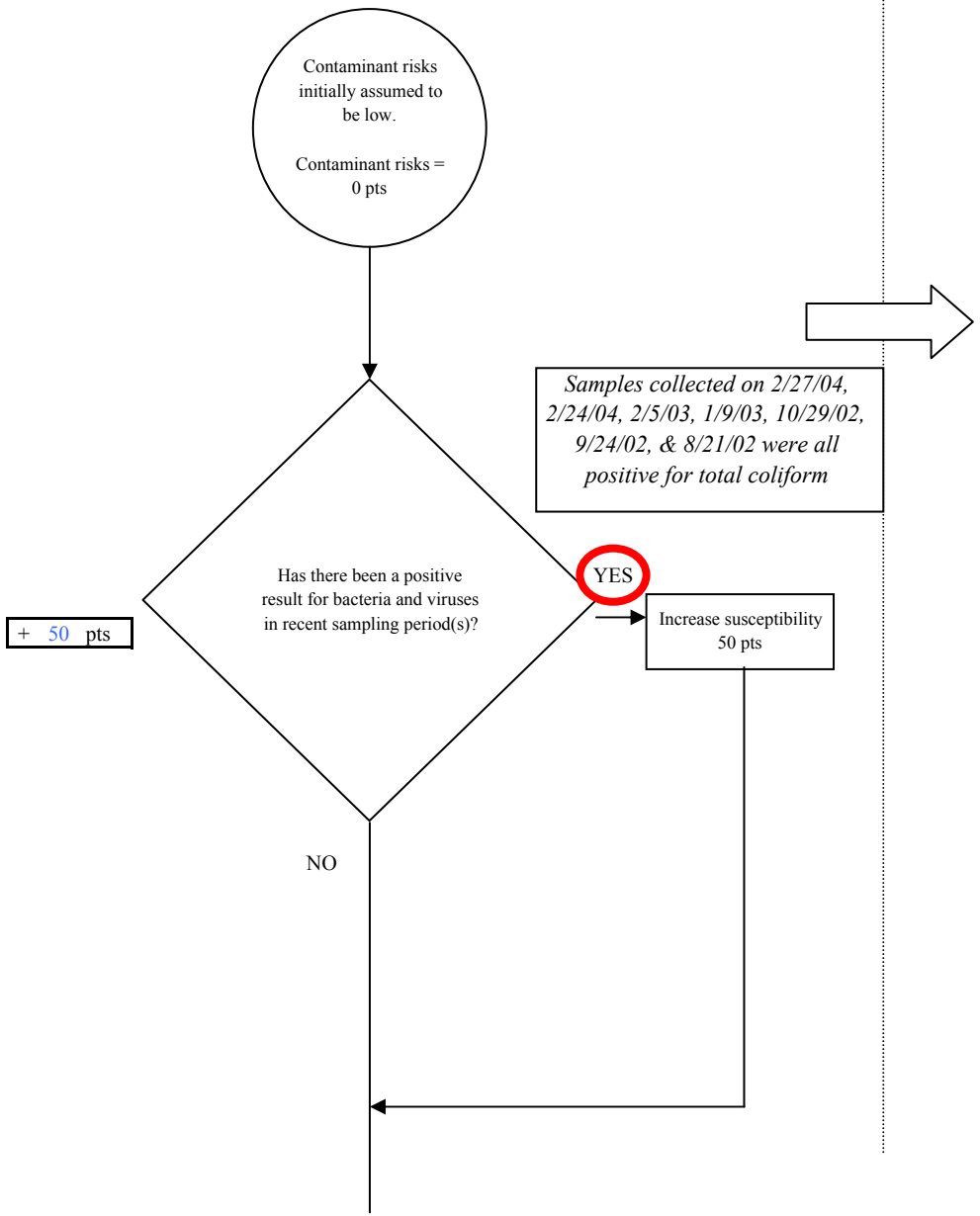
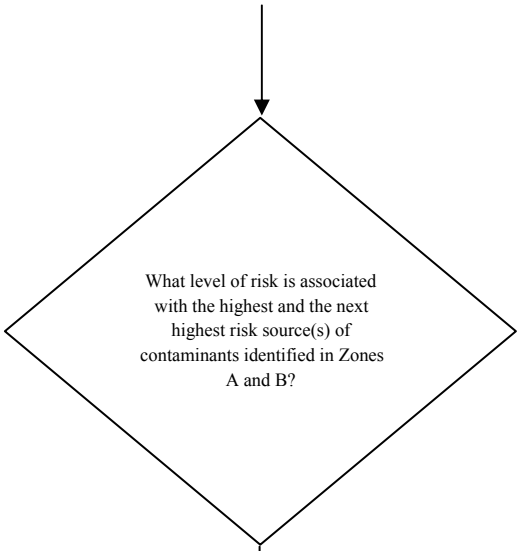


Chart 3. Contaminant risks for Kachemak Selo #3 - Bacteria & Viruses



Samples collected on 2/27/04, 2/24/04, 2/5/03, 1/9/03, 10/29/02, 9/24/02, & 8/21/02 were all positive for total coliform



+ 10 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)	0	0	0
Medium(s)	0	0	0
Low(s)	0	3	3

	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 3. Contaminant risks for Kachemak Selo #3 - Bacteria & Viruses

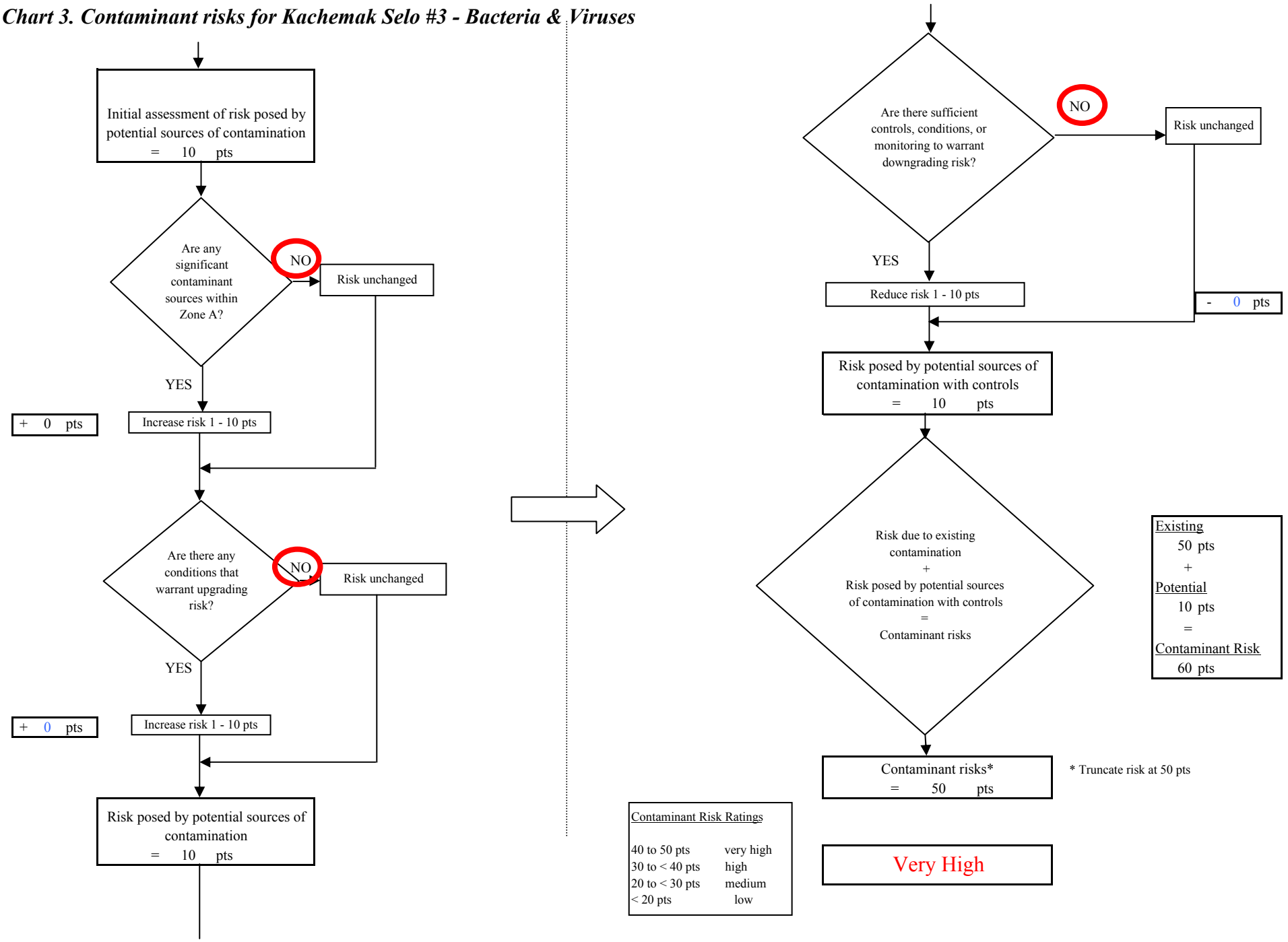


Chart 4. Vulnerability analysis for Kachemak Selo #3 - Bacteria & Viruses

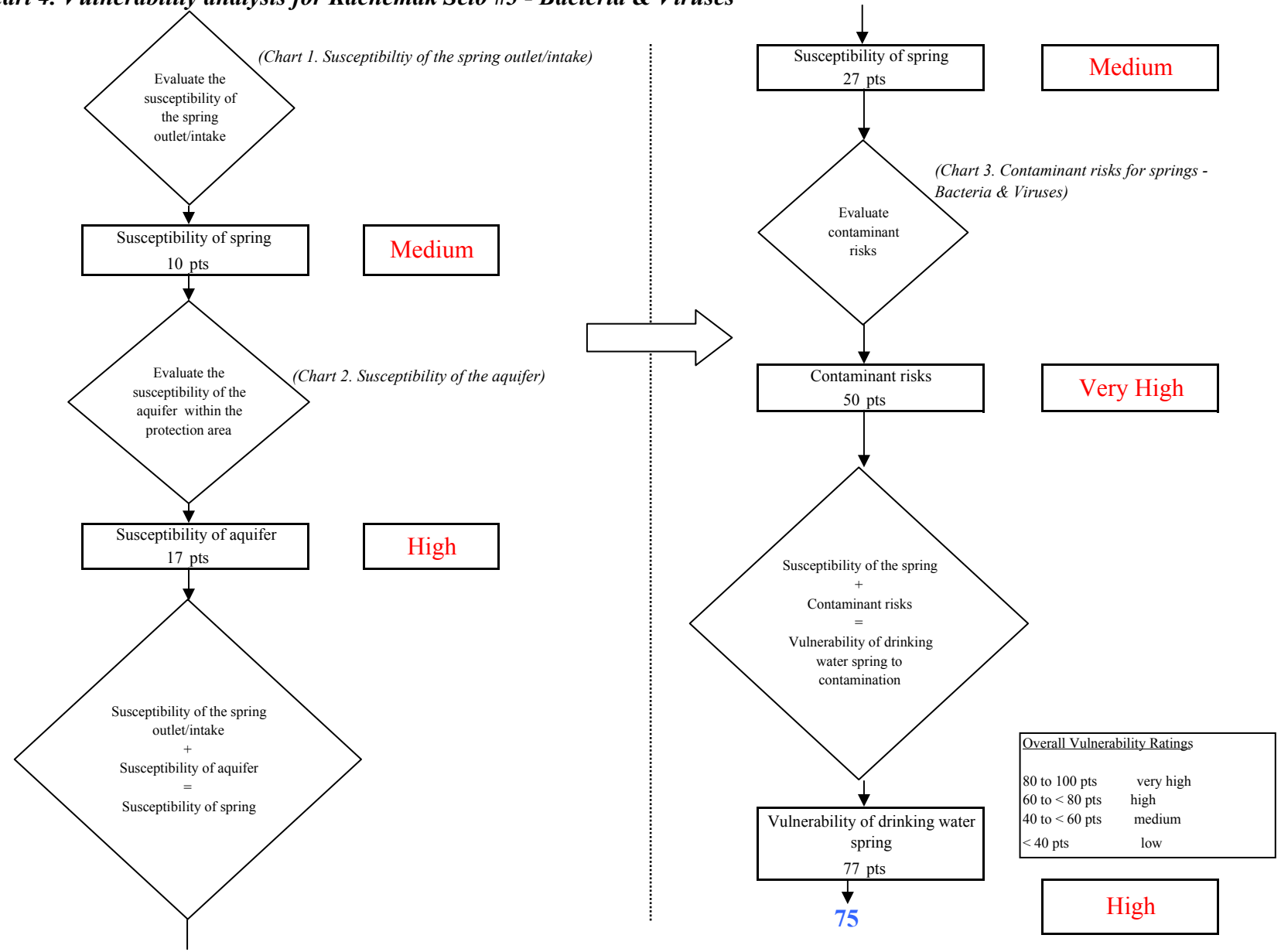


Chart 5. Contaminant risks for Kachemak Selo #3 - Nitrates and Nitrites

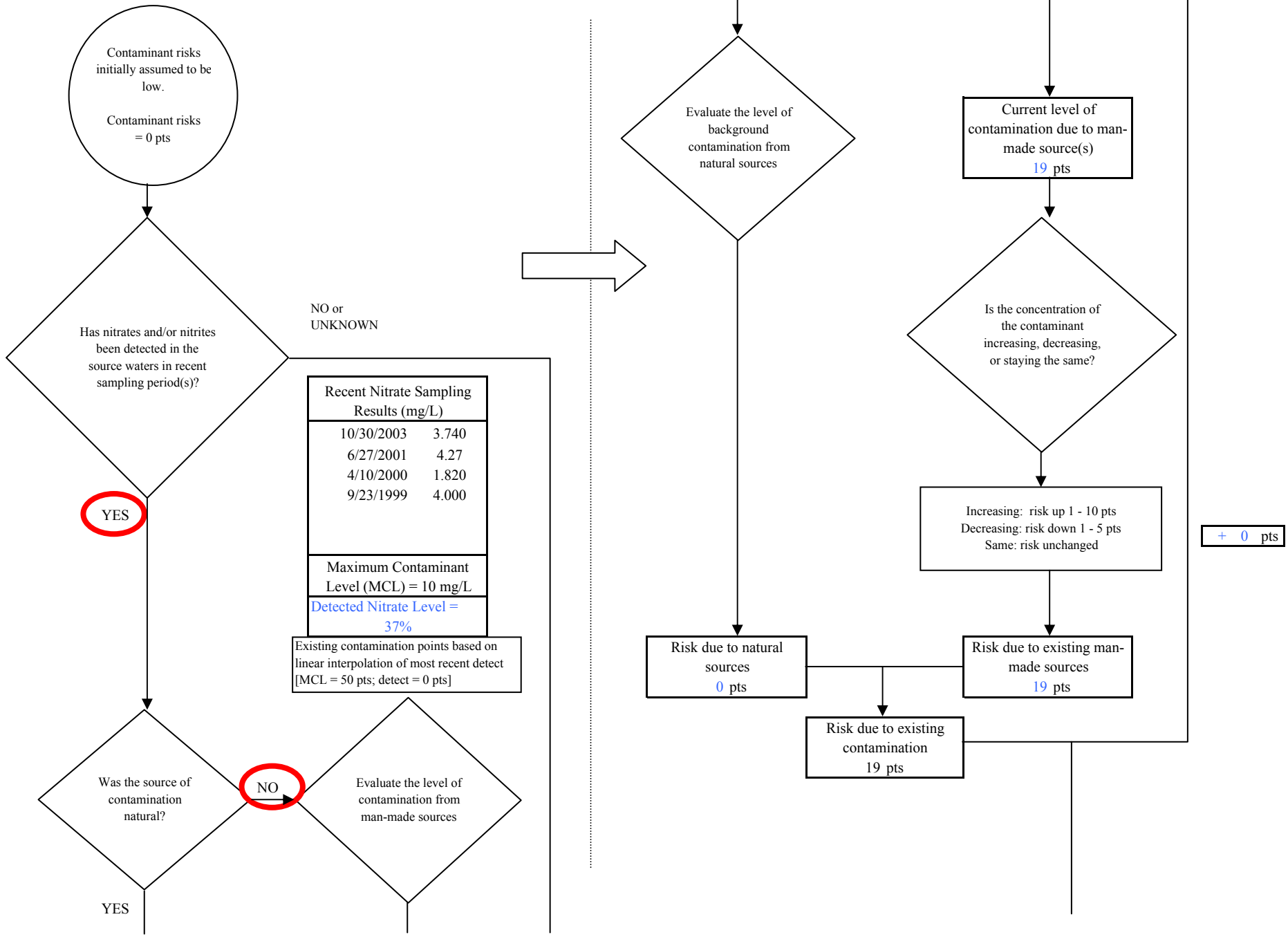


Chart 5. Contaminant risks for Kachemak Selo #3 - Nitrates and Nitrites

+ 10 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 contamination = 10 pts

Are any significant sources in Zone A?

NO → Risk unchanged → + 0 pts

YES → Increase risk 1 - 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	0
Low(s)	0	3	3

	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 5. Contaminant risks for Kachemak Selo #3 - Nitrates and Nitrites

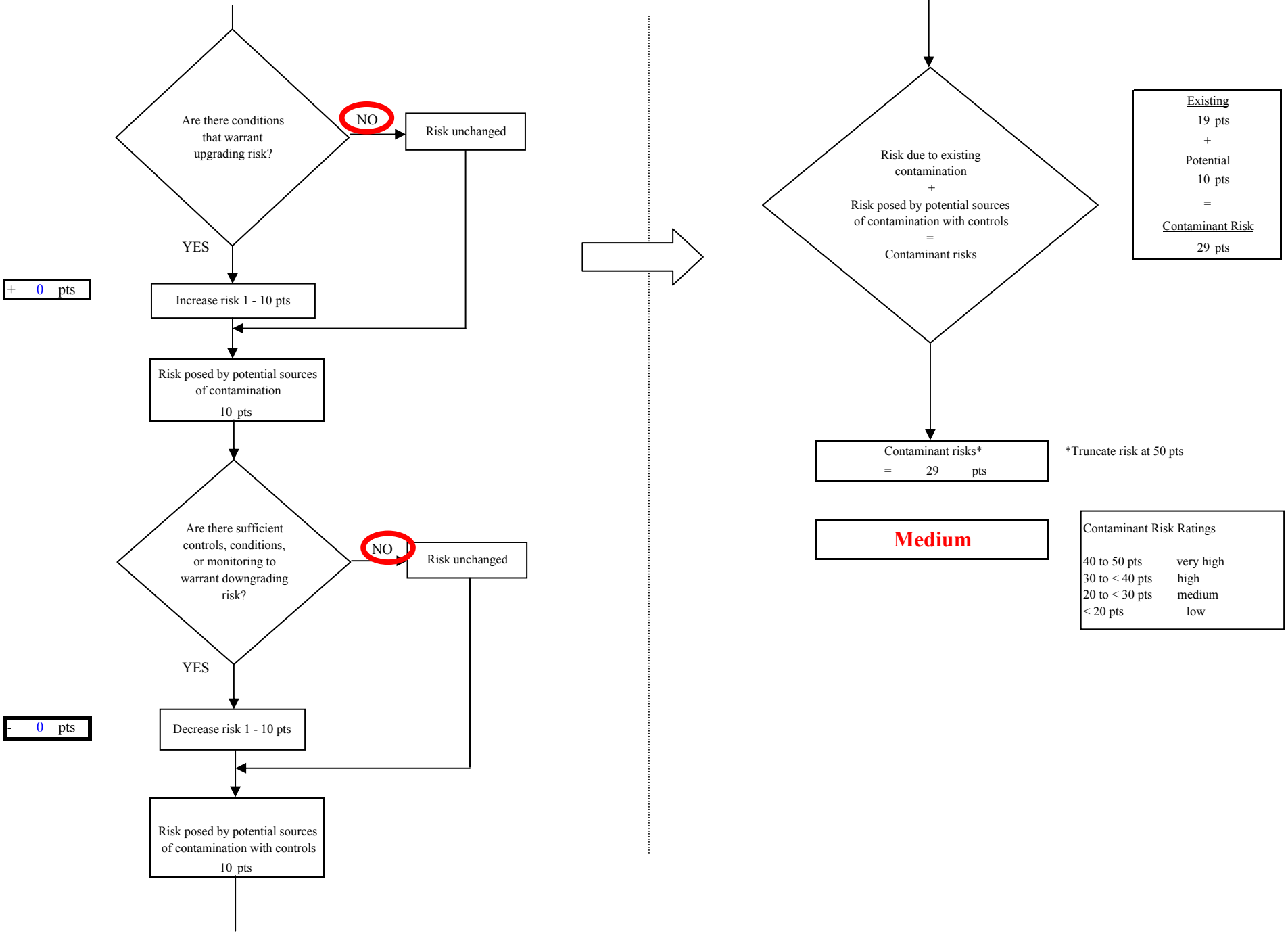


Chart 6. Vulnerability analysis for Kachemak Selo #3 - Nitrates and Nitrites

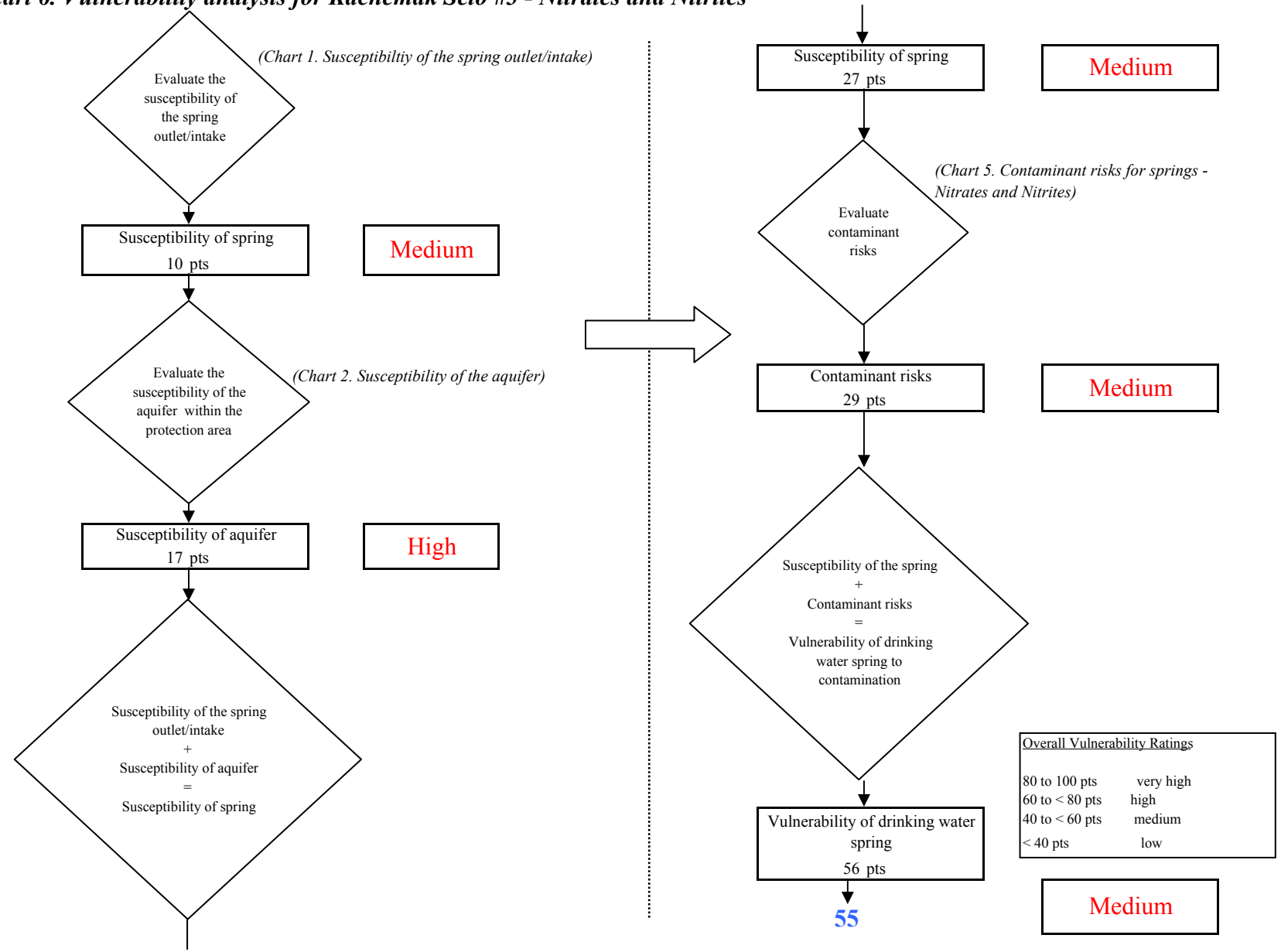


Chart 5. Contaminant risks for Kachemak Selo #3 - Volatile Organic Chemicals

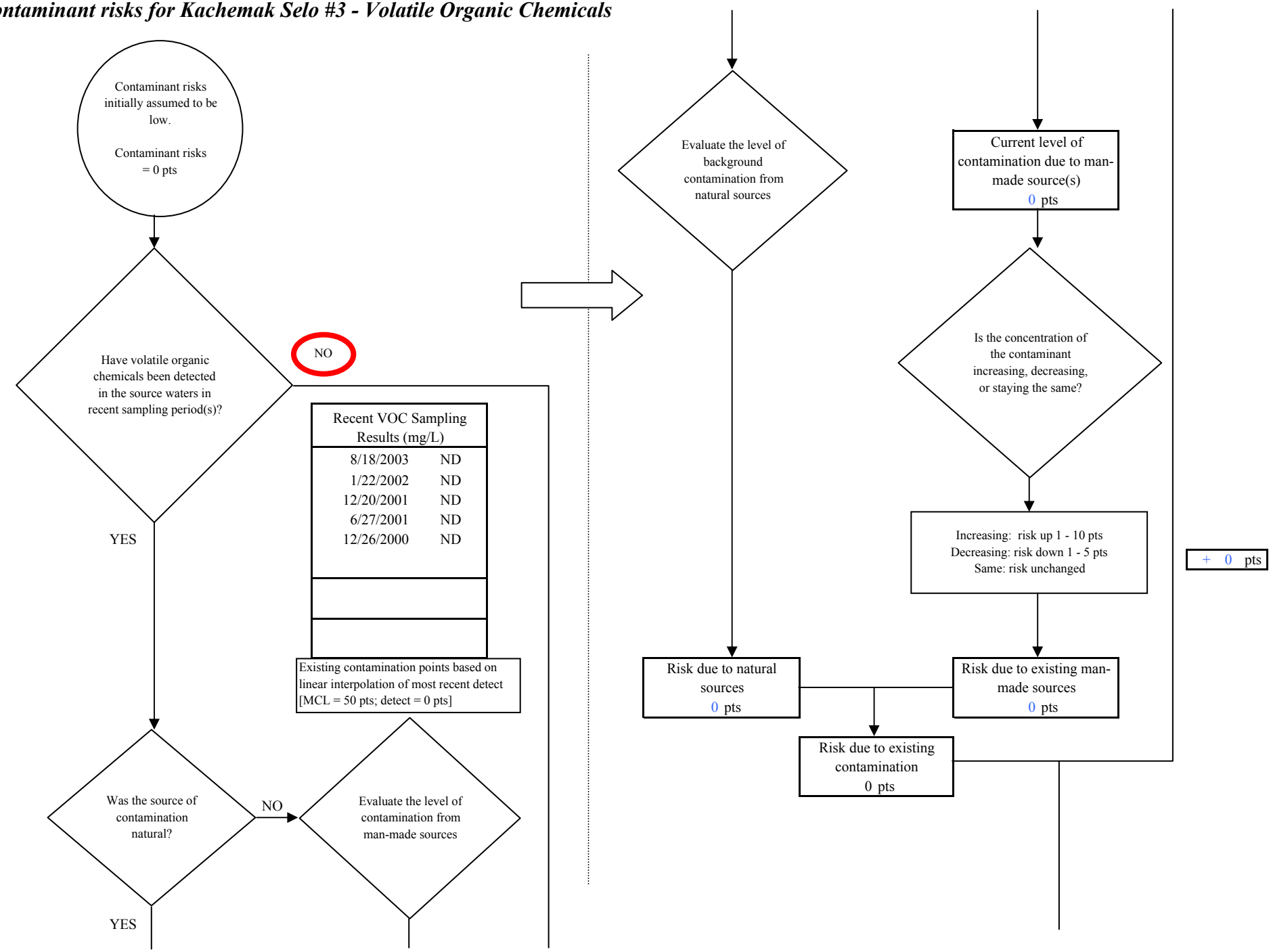
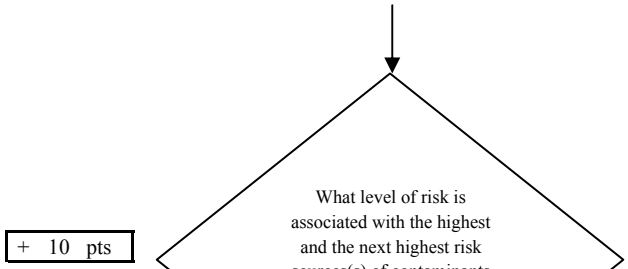


Chart 5. Contaminant risks for Kachemak Selo #3 - Volatile Organic Chemicals



+ 10 pts

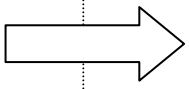
Risk Levels for Contaminant Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	0	3	3

	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.



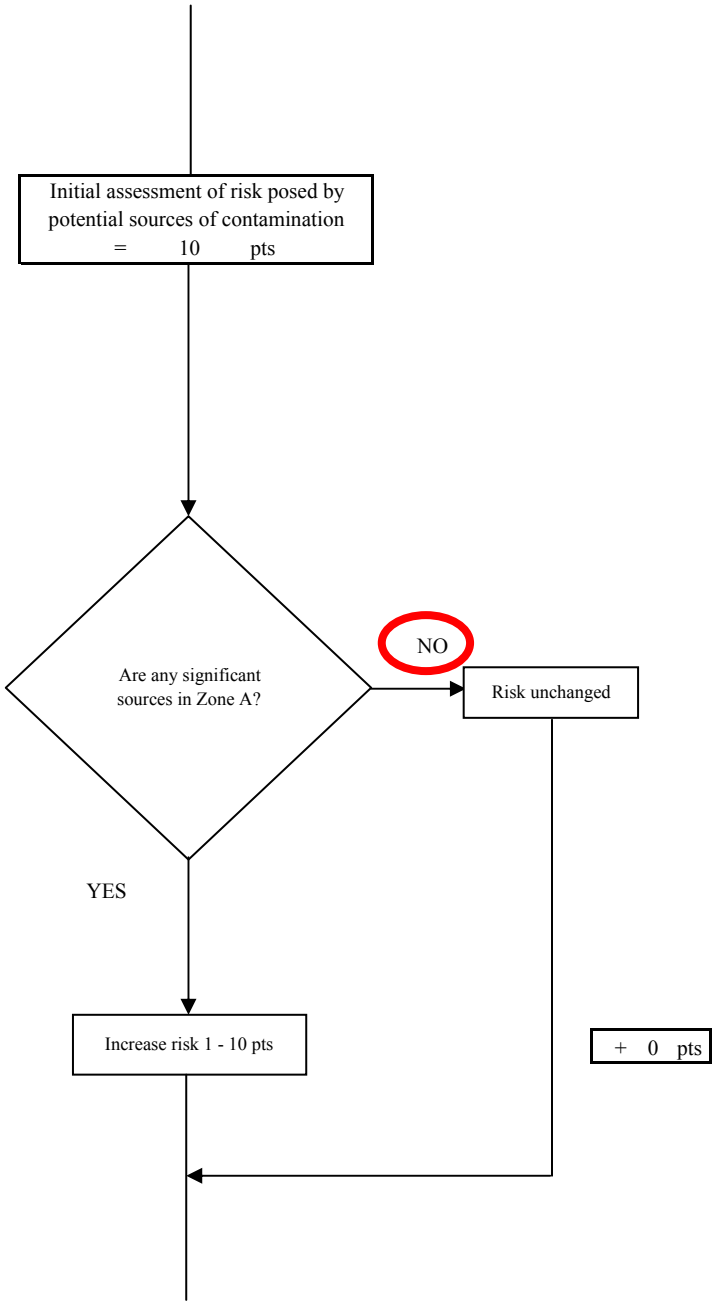
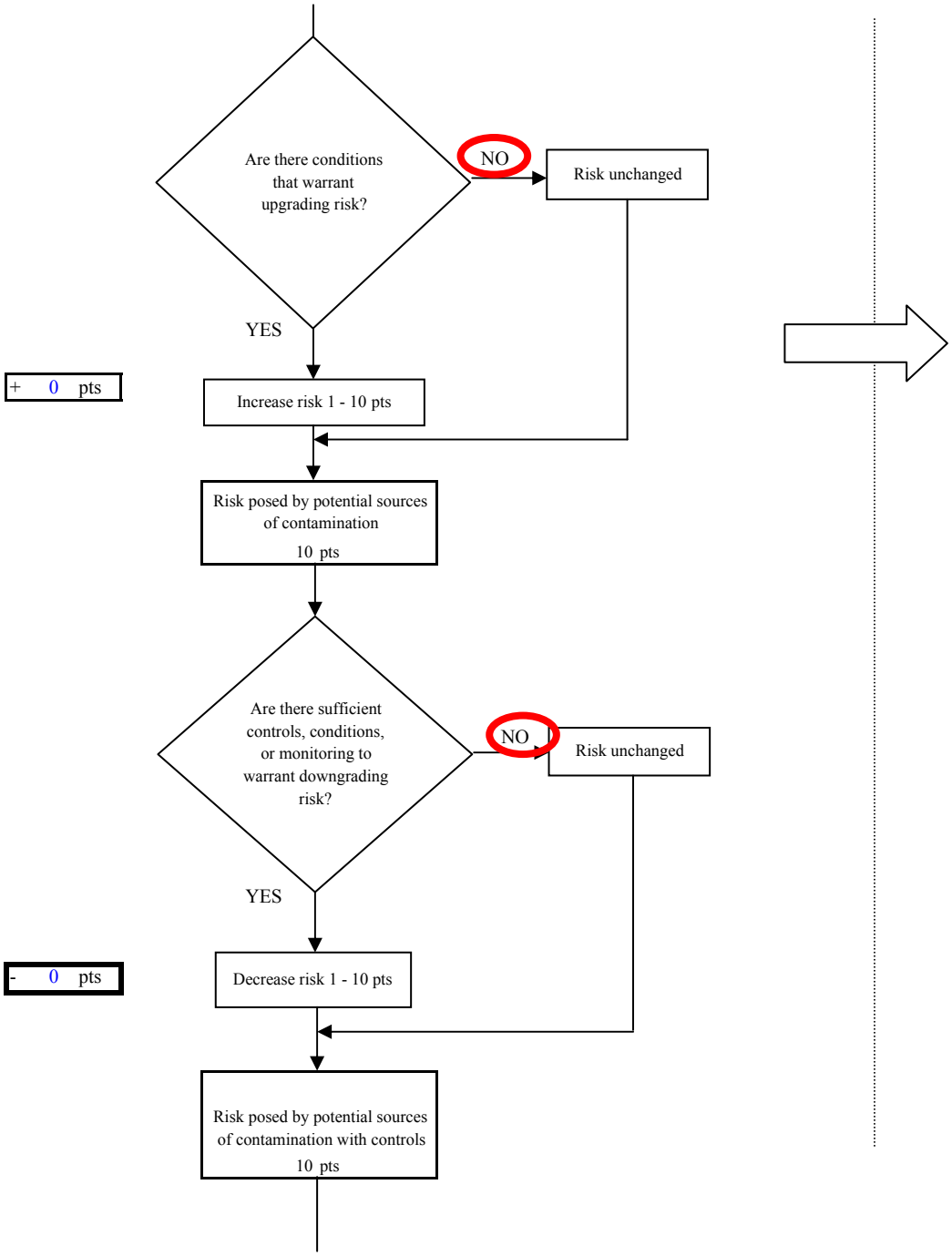


Chart 5. Contaminant risks for Kachemak Selo #3 - Volatile Organic Chemicals



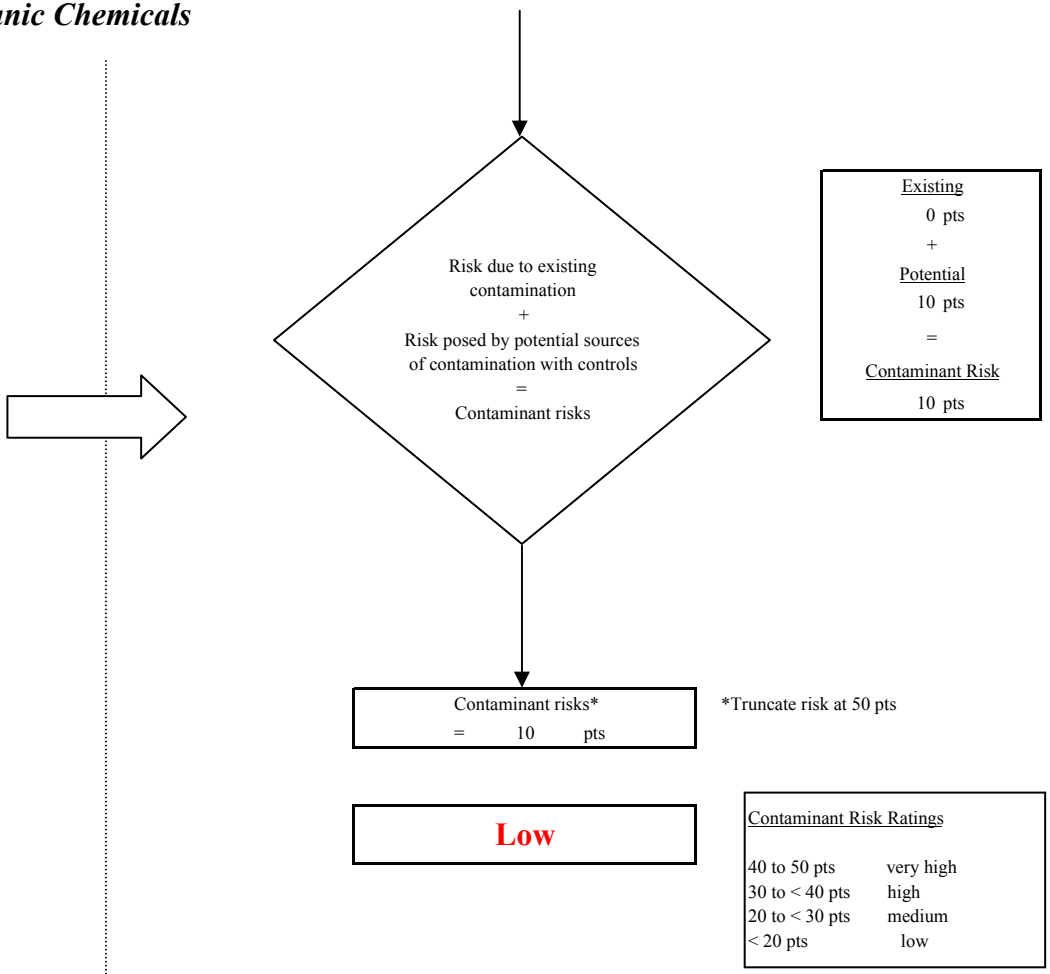


Chart 8. Vulnerability analysis for Kachemak Selo #3 - Volatile Organic Chemicals

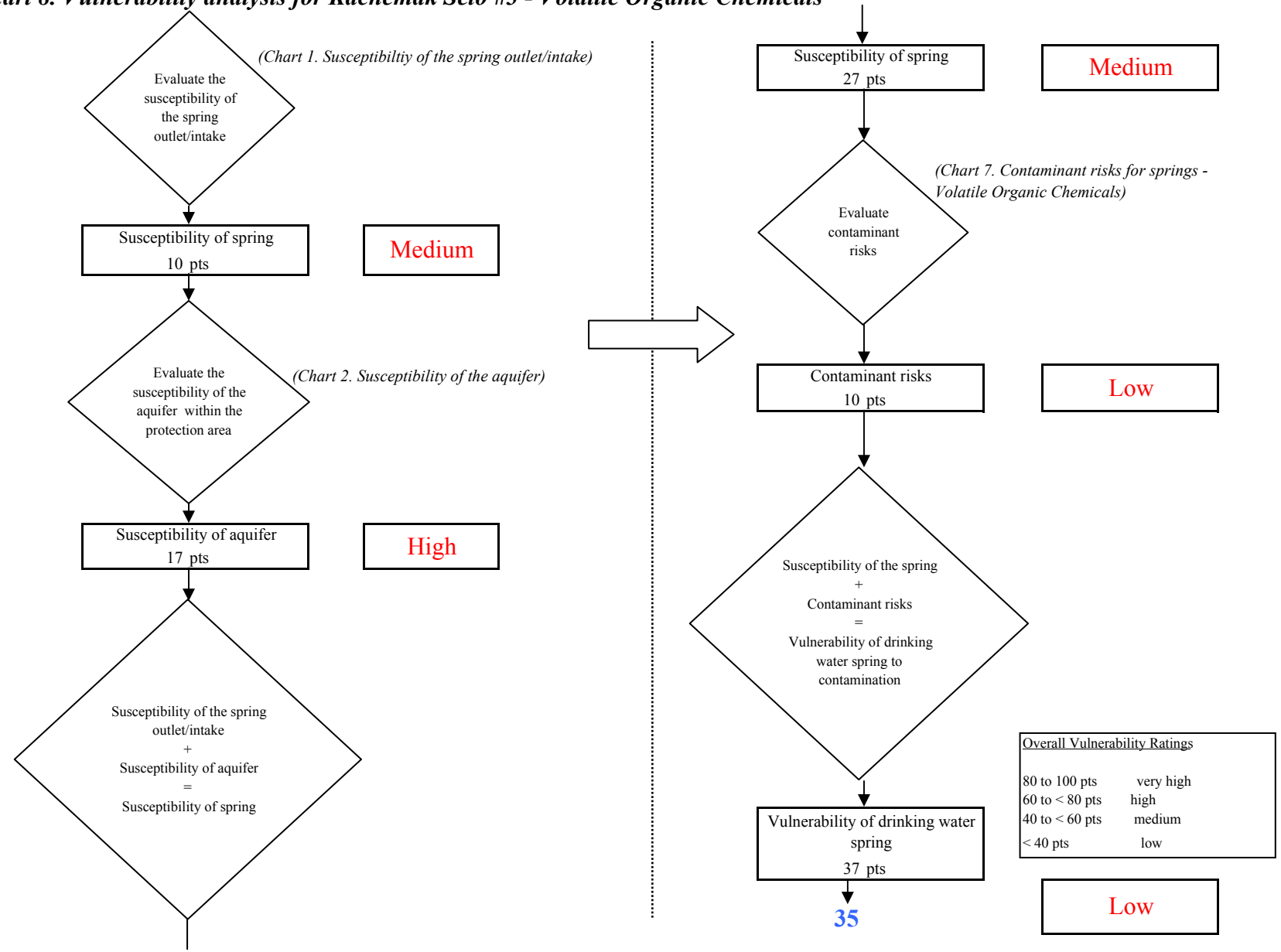


Chart 5. Contaminant risks for Kachemak Selo #3 - Heavy Metals, Cyanide and Other Inorganic Chemicals

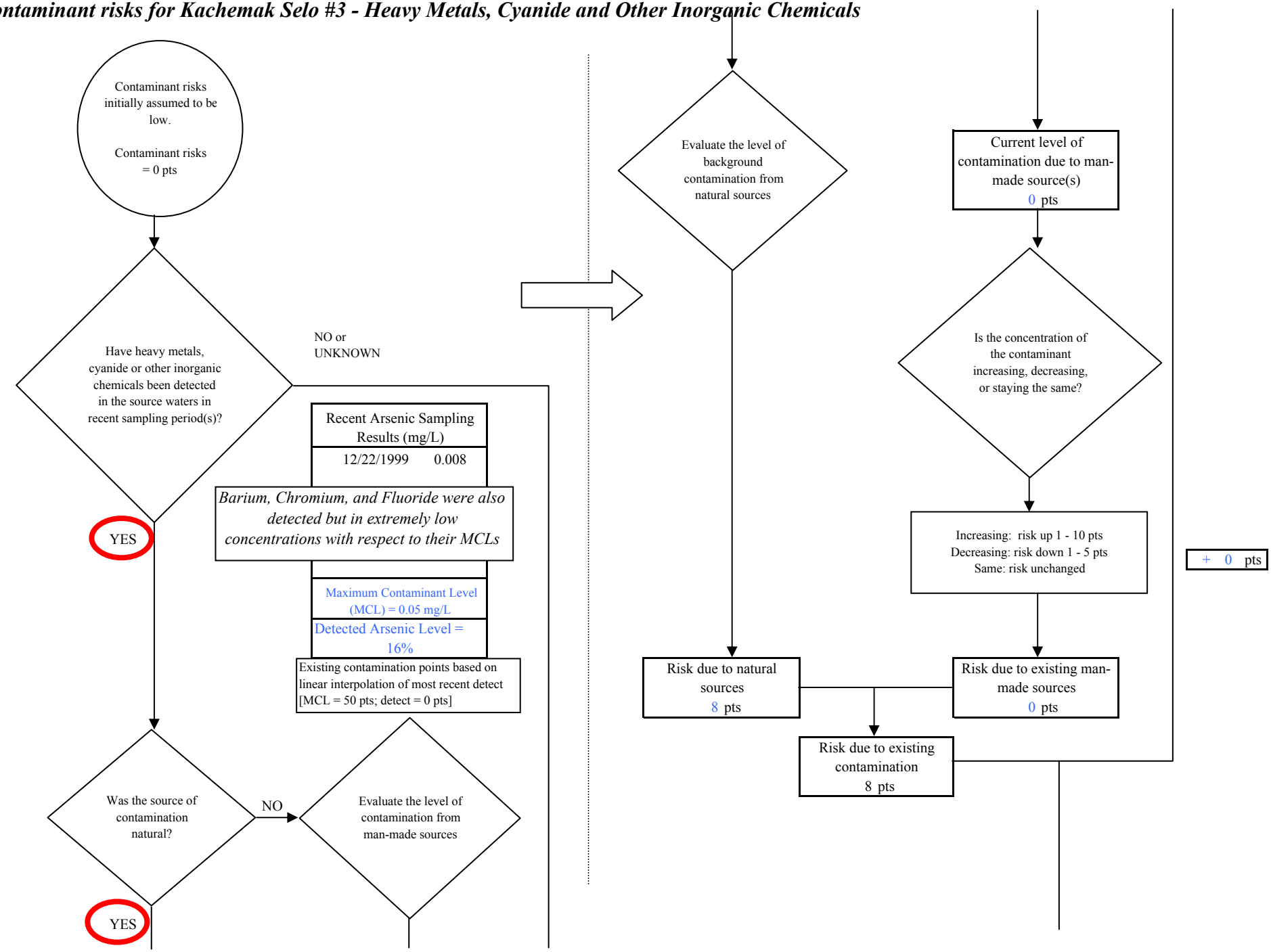
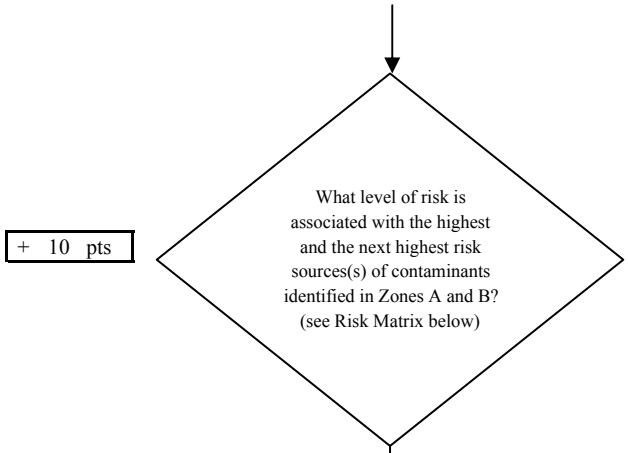


Chart 5. Contaminant risks for Kachemak Selo #3 - Heavy Metals, Cyanide and Other Inorganic Chemicals



+ 10 pts

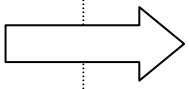
Risk Levels for Contaminant Sources identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	0	3	3

	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.



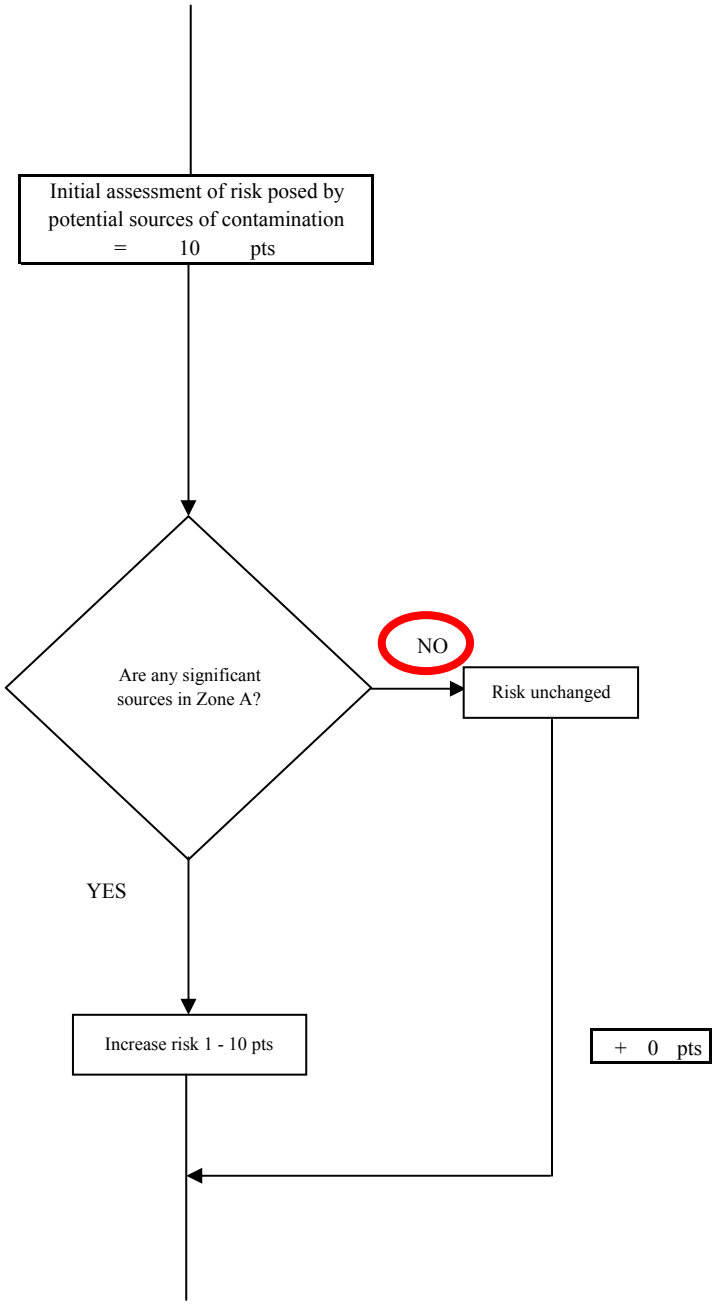


Chart 5. Contaminant risks for Kachemak Selo #3 - Heavy Metals, Cyanide and Other Inorganic Chemicals

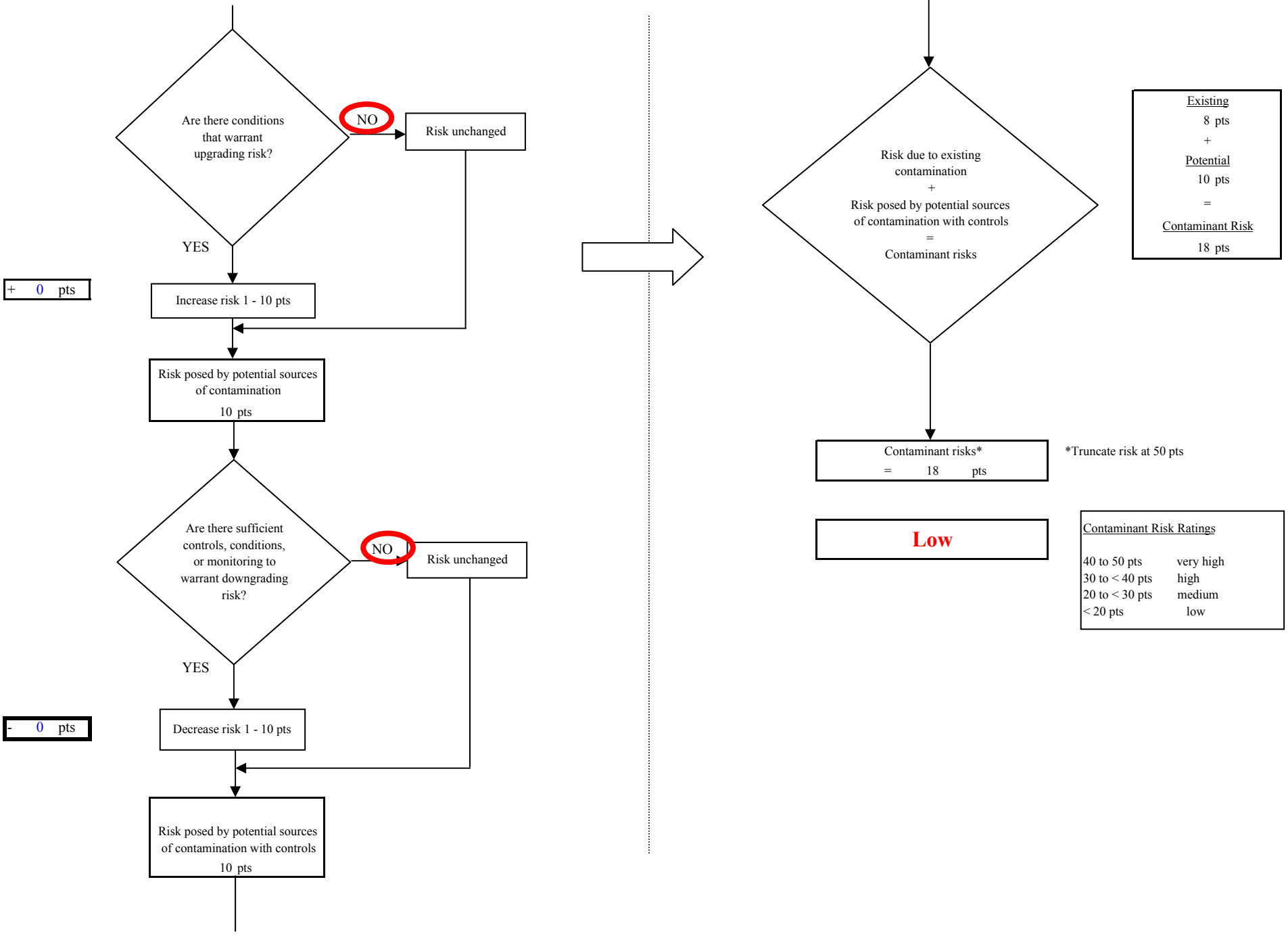


Chart 10. Vulnerability analysis for Kachemak Selo #3 - Heavy Metals, Cyanide and Other Inorganic Chemicals

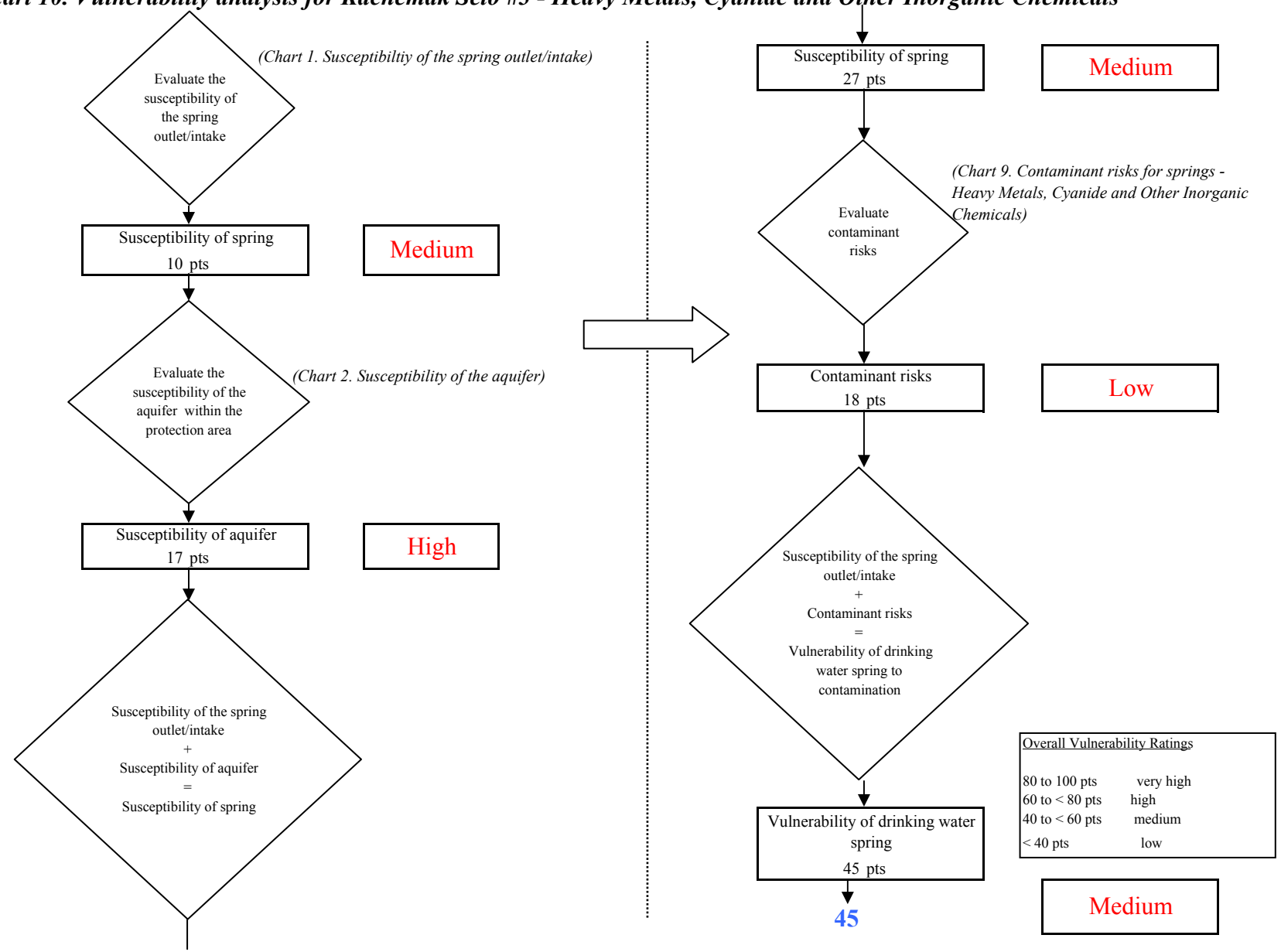


Chart 5. Contaminant risks for Kachemak Selo #3 - Synthetic Organic Chemicals

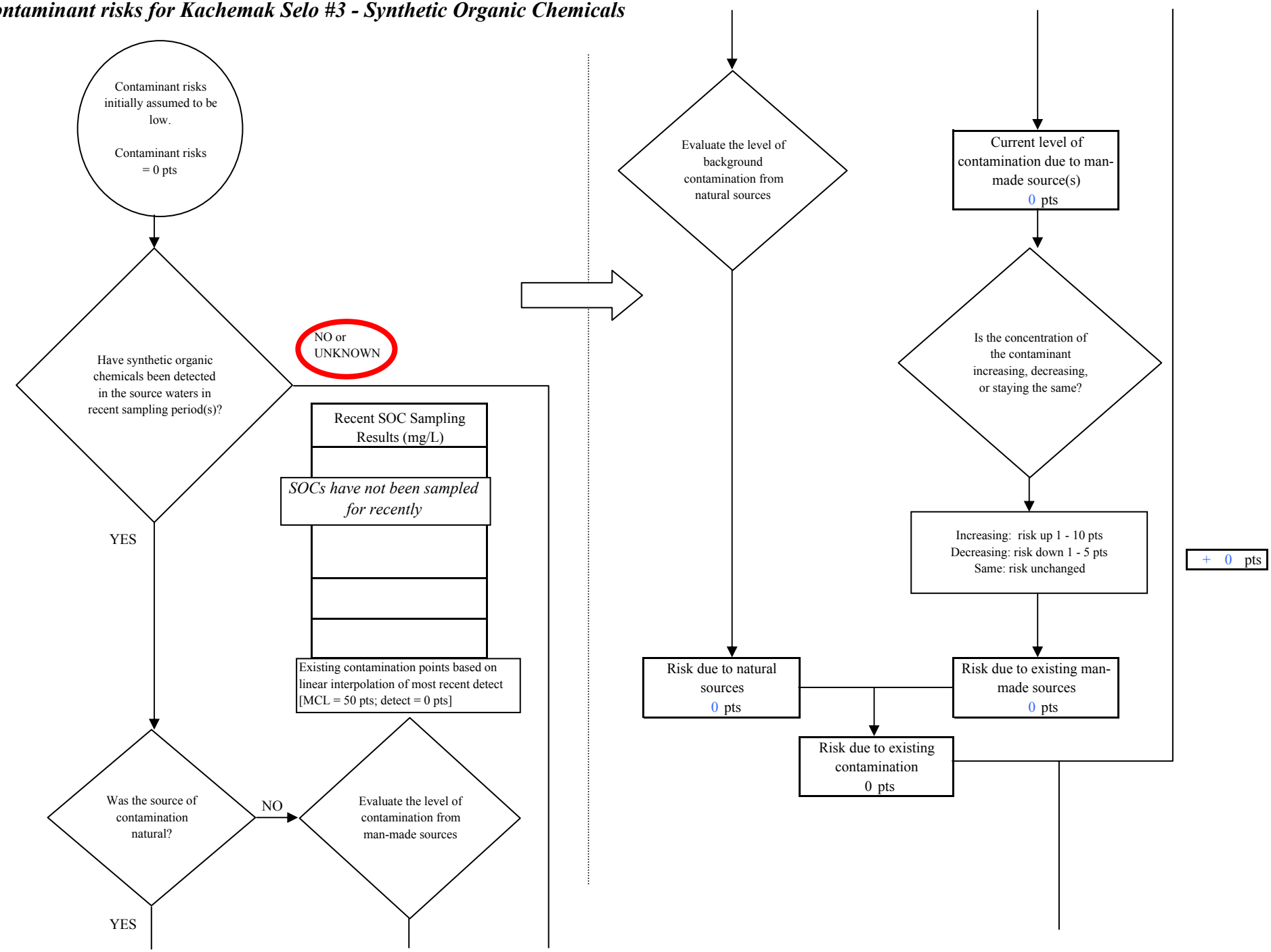
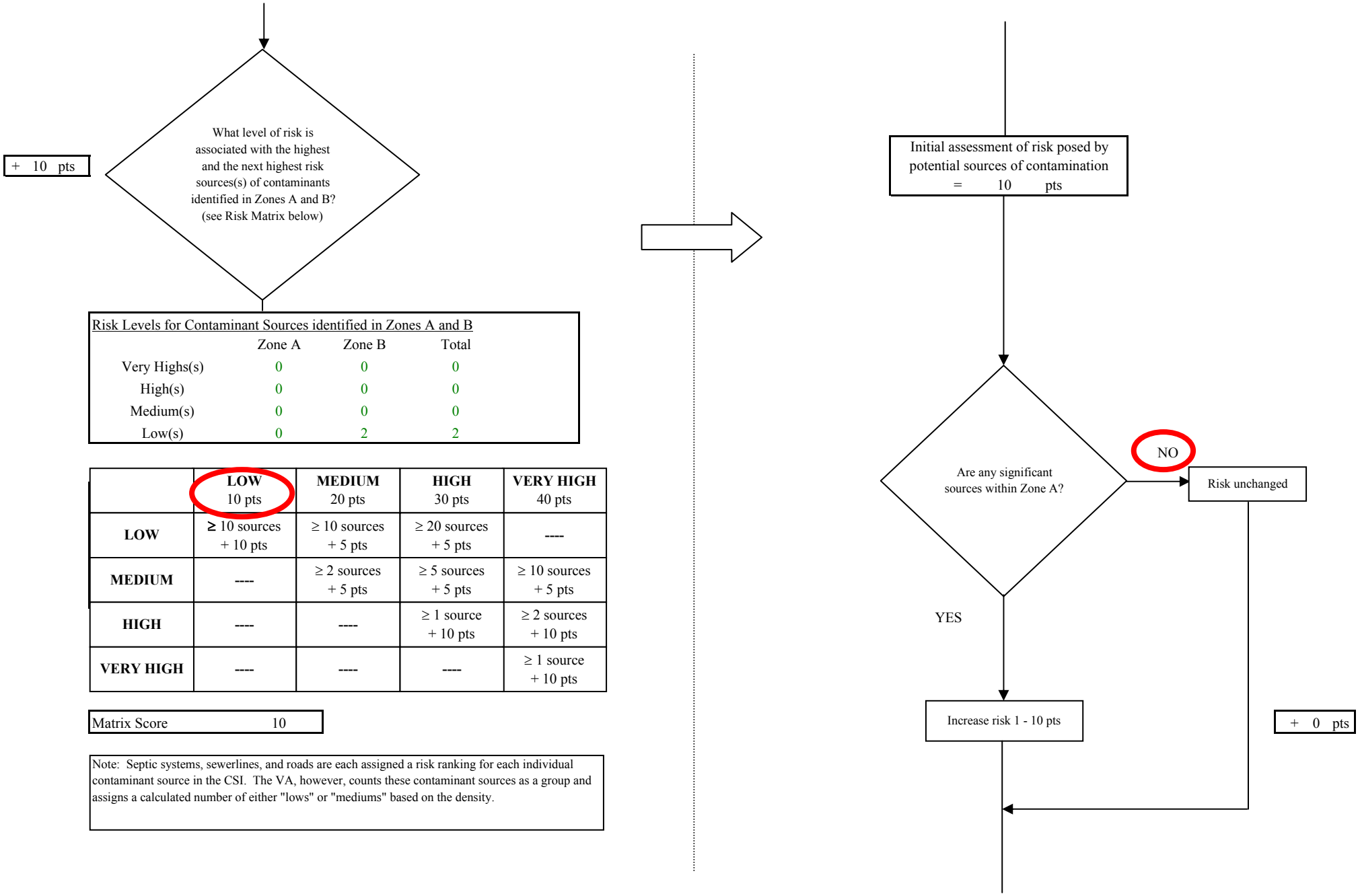


Chart 5. Contaminant risks for Kachemak Selo #3 - Synthetic Organic Chemicals



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	0
Low(s)	0	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 5. Contaminant risks for Kachemak Selo #3 - Synthetic Organic Chemicals

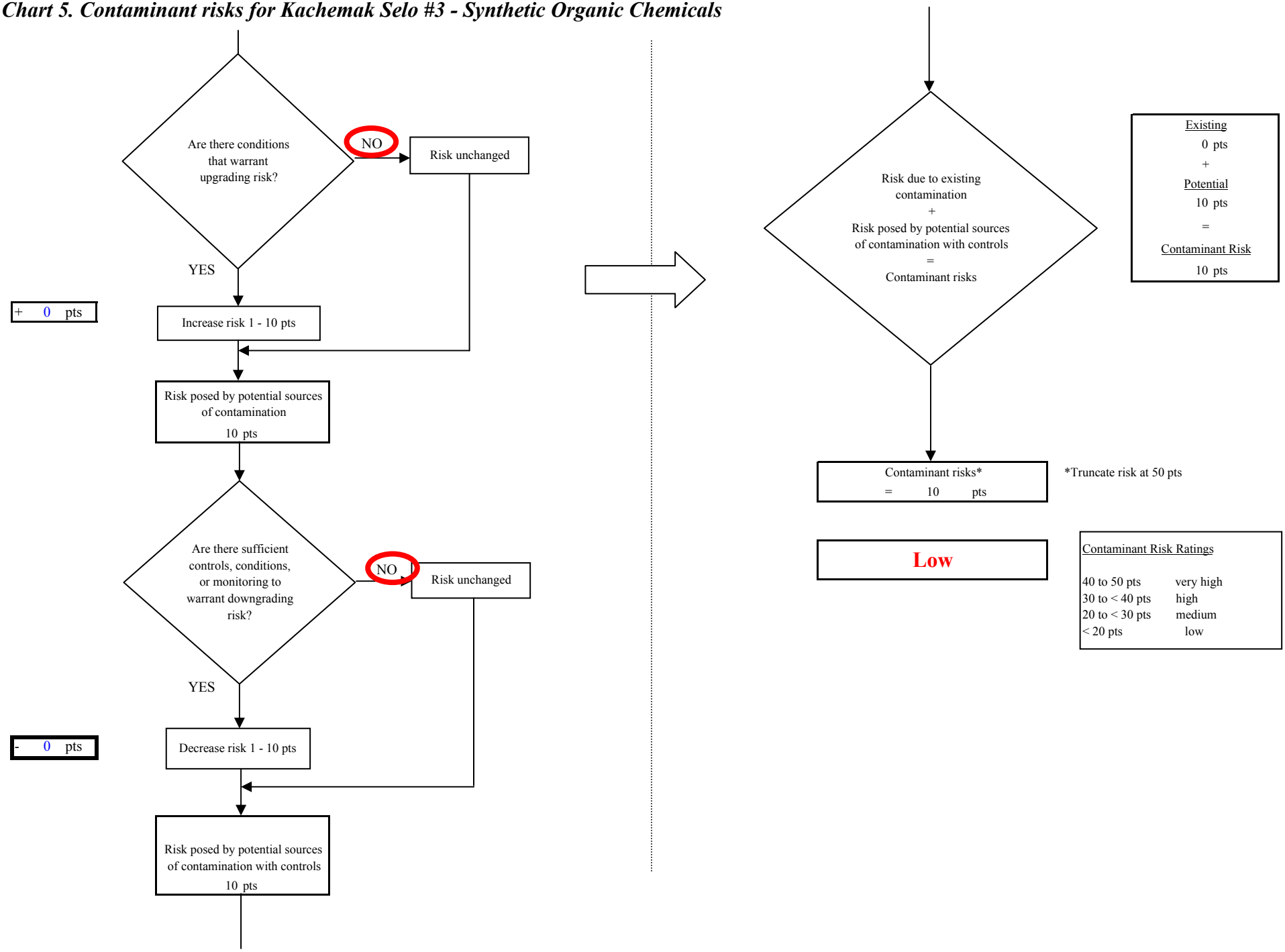


Chart 12. Vulnerability analysis for Kachemak Selo #3 - Synthetic Organic Chemicals

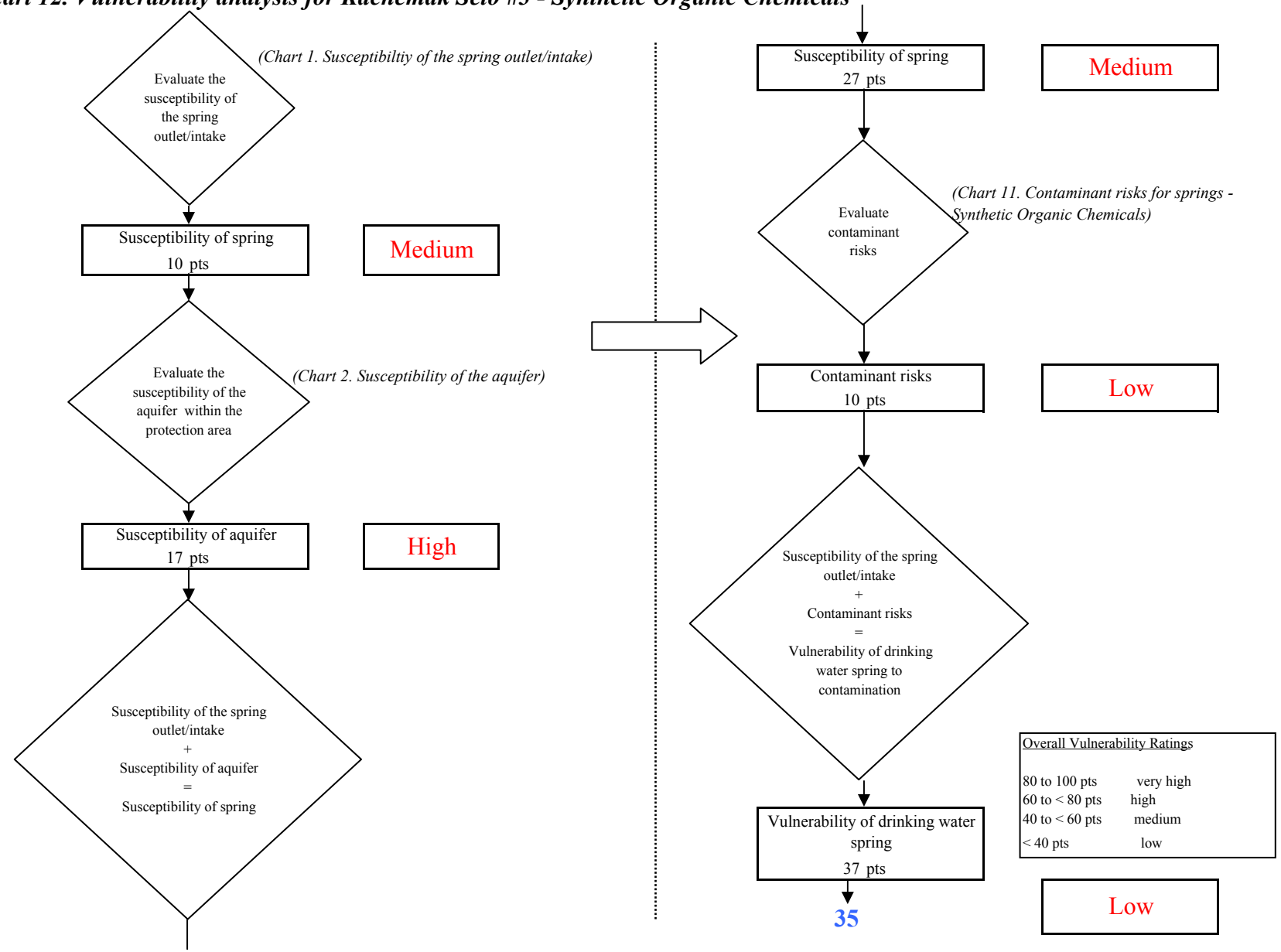


Chart 5. Contaminant risks for Kachemak Selo #3 - Other Organic Chemicals

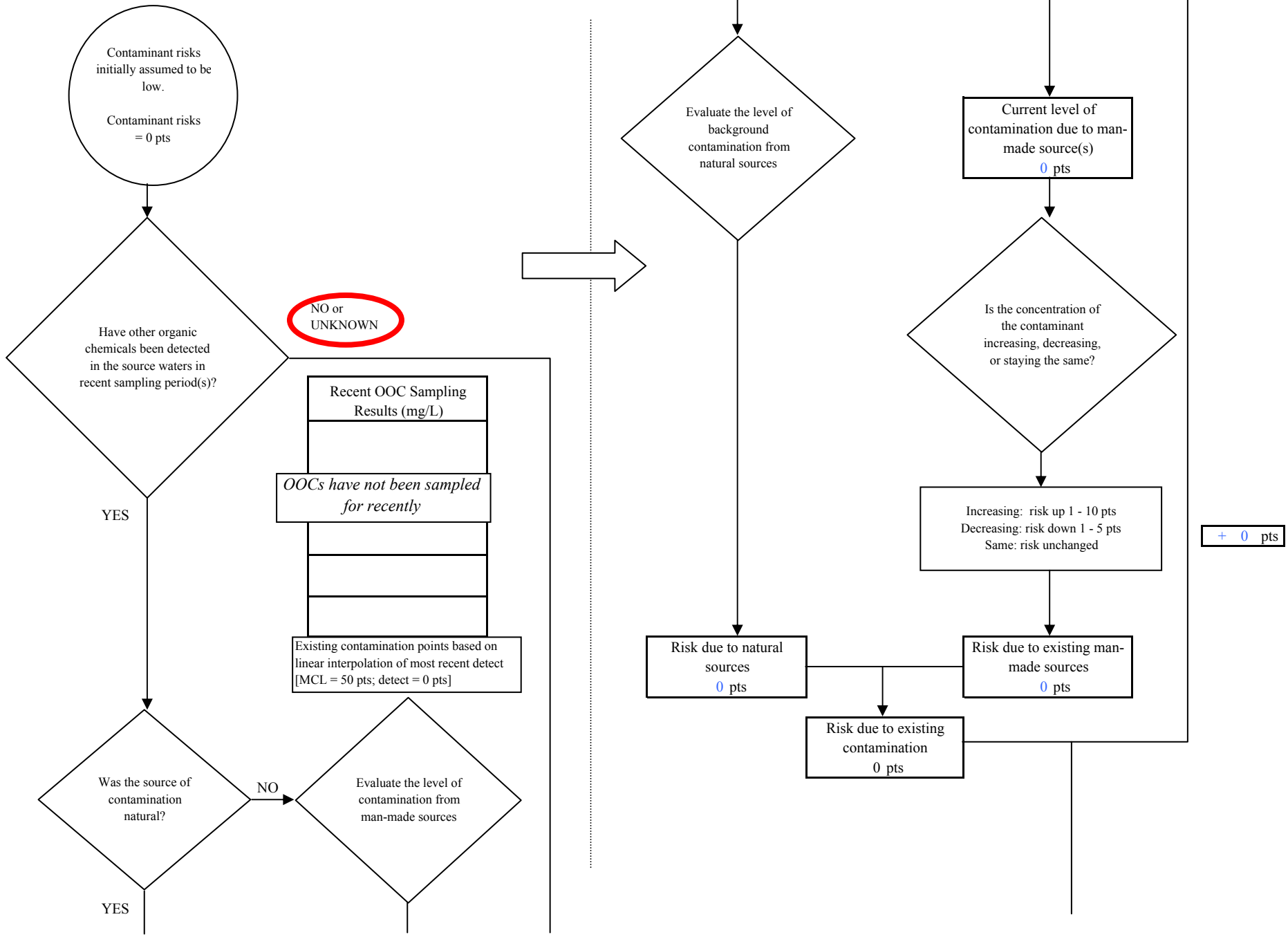


Chart 5. Contaminant risks for Kachemak Selo #3 - Other Organic Chemicals

+ 10 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 contamination = 10 pts

Are any significant sources in Zone A?

NO → Risk unchanged → + 0 pts

YES → Increase risk 1 - 10 pts

Risk Levels for Contaminant Sources identified in Zones A and B

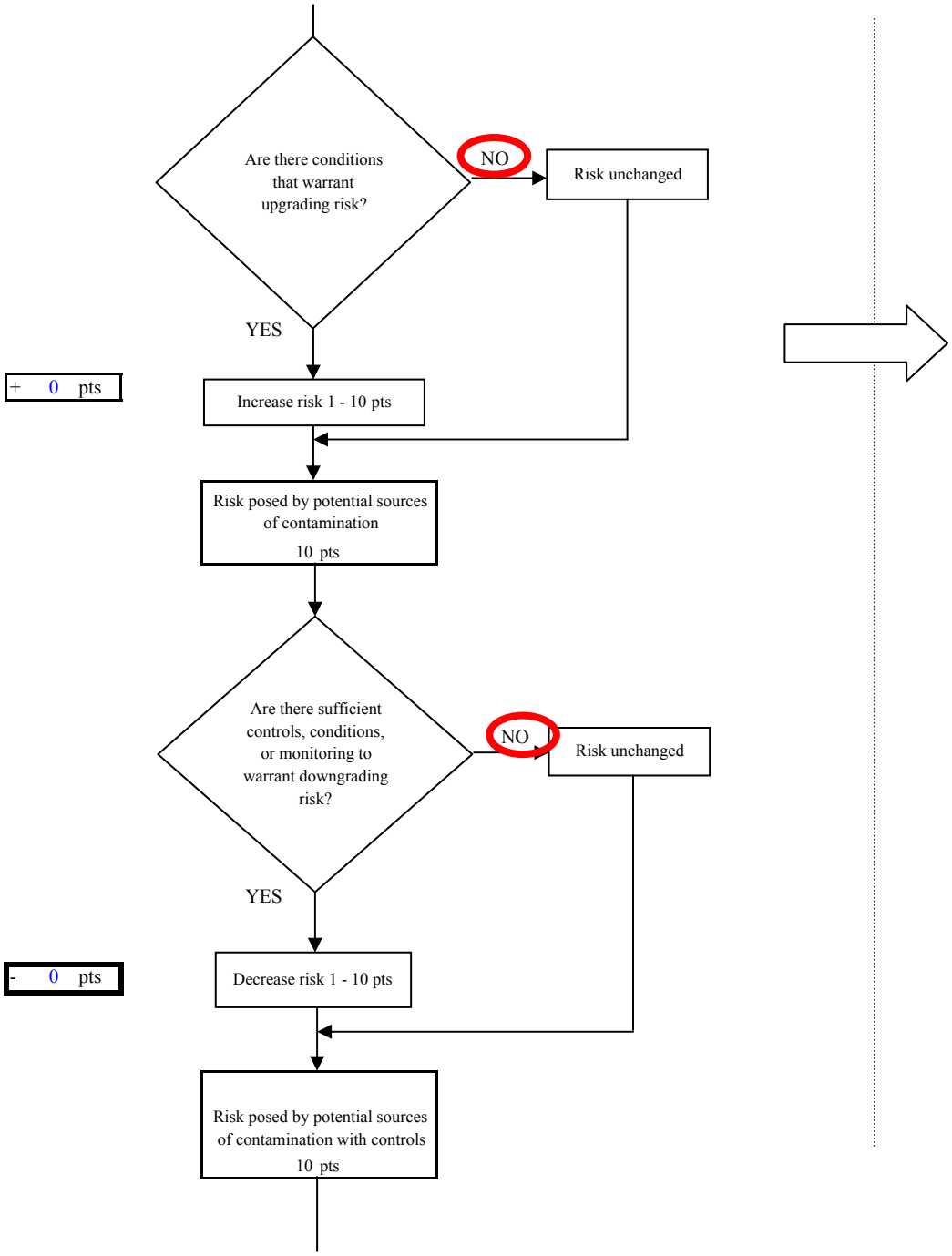
	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	0	3	3

	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 5. Contaminant risks for Kachemak Selo #3 - Other Organic Chemicals



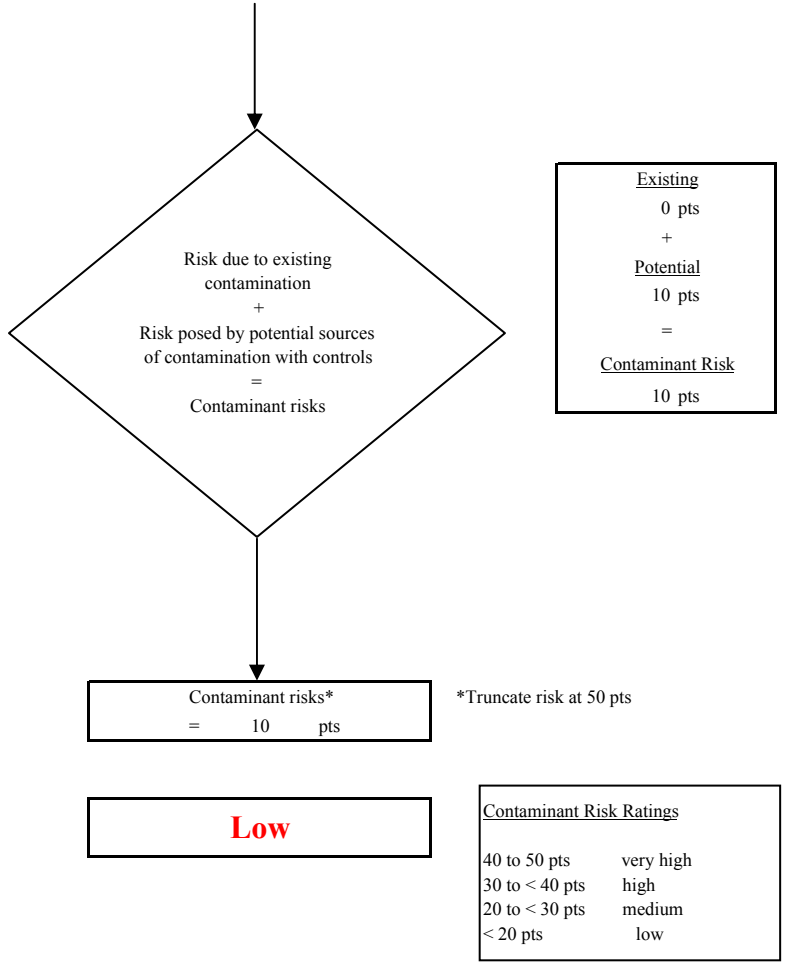


Chart 14. Vulnerability analysis for Kachemak Selo #3 - Other Organic Chemicals