Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Lower Kuskokwim School District Kwigillingok School Water System

Kwigillingok, Alaska

PWSID #270964.001

February 2004

Drinking Water Protection Program Report #1111

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 (EPA), the 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 that 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 the Kwigillingok School Water System, Kwigillingok, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for the Lower Kuskokwim School District (LKSD) Kwigillingok School, in Kwigillingok, Alaska, is a Class A surface water system that obtains water from a rain catchment system located at the school. Raw water is stored in one of the storage tanks located at the school (75,000 gallon, and 30,000 gallon) until it is filtered and chlorinated. After treatment the water is stored in a 3,000 gallon tank before piped distribution to the school and teachers housing.

The Kwigillingok School protection area is limited to the roof at the school and has received a susceptibility rating of **High**. *A rating of High to Very High is typical for all systems with surface water intakes*. Potential and existing sources of the following contaminants were evaluated for the Source Water Assessment: bacteria and viruses, nitrates and/or nitrites, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, volatile organic chemicals, and other organic chemicals. No contaminant risk sources were identified in the protection area for this public water system.

This evaluation included all available water sampling data submitted to the Alaska Department of Environmental Conservation (ADEC) by the system operator. As stated previously, the samples were collected from post-treated water. Vulnerability ratings for the water system have been determined by combining the susceptibility of the surface water source with the contaminant risks. The system received a vulnerability rating of **Low** for all of the six contaminant categories: bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

This assessment can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of the LKSD and the community surrounding Kwigillingok School to protect public health.

DRINKING WATER SYSTEM AND AREA OVERVIEW

Kwigillingok School, near the village of Kwigillingok (Sec. 01, T004S, R081W, Seward Meridian), is located on the west bank of Kuskokwim Bay near the mouth of the Kuskokwim River. Eleven teachers live and teach at the school and 110 students are currently enrolled in grades Kindergarten through 12th (ADCED, 2003). The nearby community of Kwingillingok has a population of 337. This Yup'ik Eskimo community is approximately 77 miles southwest of Bethel and 388 miles west of Anchorage in the lower Yukon-Kuskokwim (Y-K) delta area. Kwigillingok average annual precipitation is 22 inches, including approximately 43 inches of annual snowfall. Summer temperatures range from 41 to 57°F and winter temperatures range from 6 to 24°F.

The public water system is a Class A surface water system that operates during the school year and obtains water from a rain catchment system located at the school. Raw water is stored in one of the storage tanks located at the school (75,000 gallon, and 30,000 gallon) until it is filtered and chlorinated. After treatment the water is stored in a 3,000 gallon tank before piped distribution to the school and teachers housing.

The LKSD Kwigillingok School operates the water system and uses the village washeteria sewage lagoon for waste disposal. The residents of Kwigillingok haul water from the washeteria to their homes and use honeybuckets for sewage disposal (ADCED, 2003).

The school generates it's own power and the Kwig Power Company provides electricity to the community. The facilities are fueled by diesel (ADCED, 2003). The village council also operates the local washeteria and landfill.

Information acquired from a September 2002 sanitary survey for the public water system indicated that the

surface water intake is adequately constructed and screened. Average daily production for the system is unknown.

The Kwigillingok School is located on the Yukon-Kuskokwim (Y-K) Delta. The Y-K Delta is located on the southwest coast of Alaska and primarily consists of lowlands formed by the deposition of fluvial sediment from the Yukon and Kuskokwim Rivers.

The Y-K Delta topography is relatively flat and approximately 40% to 50% of the delta surface is wet (Alaska Geographic Society). The lower delta area generally receives about 20 inches of precipitation annually. Areas of both discontinuous and continuous permafrost are present on the Y-K Delta. Permafrost is often present within 10 feet of ground surface and varies in thickness from 15 feet to 600 feet thick (R&M, 1979b). Thaw bulbs generally persist around areas of standing and flowing water.

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 pathways are initially determined by looking at the drainage area contributing overland water flow to a surface water source intake. The entire drainage area is also known as the "drinking water protection area." Please refer to pages 10-11 of the "Guidance Manual for Class A Public Water Systems" for additional information.

The protection area established for surface water sources by the ADEC is usually separated into three zones. These zones correspond to the overland-flow distance that water travels to get to the source. 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 lakes or streams
B	Areas within 1-mile of lakes or streams
C	The watershed boundary

The protection area for the Kwigillingok School water intake includes each of these Zones (See Map A 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 Kwigillingok School protection area. This inventory was completed through a search of agency records and other publicly available information. There is a wide array of potential contamination sources to surface water. These contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development.

For 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 Organic Chemicals.

No potential contaminant sources were identified in the Kwigillingok School protection area as displayed on Map C of Appendix C and in Table 1 of Appendix B.

RANKING OF CONTAMINANT RISKS

Once potential and existing sources of contamination have been identified, they are assigned a ranking according to what category and level of risk they represent. Ranking of contaminant risks for "potential" or "existing" sources of contamination is a function of the toxicity and the volume of specific contaminants associated with that source. Rankings include:

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

The time-of-travel for contaminants within the water is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zone A because of their short life span. Only "Very High" and "High" rankings are inventoried within Zones B and C due to the probability of

contaminant dilution by the time the contaminants reach the water intake.

As stated earlier, no potential contaminant sources were identified within the drinking water protection area for this public water system (Table 1 of Appendix B). Due to the lack of potential contaminant sources, no additional Tables were included in Appendix B detailing potential contaminant sources for each of the six categories of drinking water contaminants.

VULNERABILITY OF THE DRINKING WATER SYSTEM

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

- Surface Water Susceptibility and
- Contaminant risks.

Appendix D contains 13 charts, which together form the 'Vulnerability Analysis' for the public drinking water Source Water Assessment. Chart 1 analyzes the 'Susceptibility of the Surface Water Source' to contamination by looking at the climate, terrain, and intake location. 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 intake area. Chart 3 contains the 'Vulnerability Analysis for Bacteria and Viruses,' which is a composite score of the Vulnerability Analysis and the overall Susceptibility. Charts 4 through 13 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 Surface Water Susceptibility of the source is reached by considering the properties of the water intake and the surrounding area. The derivation of this information is presented below and the data for this source is shown in Chart 1 of Appendix D.

Susceptibility of the Surface Water Source – always considered to be "high" (30 points)

+

Adequate Construction of the Intake (0 – 5 Points)

+

Runoff Potential Within Zone B (0 – 5 Points)

+

Dilution Capacity of the Surface Water (0 – 10 Points)

=

Natural Susceptibility
(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 < 40 pts	High

Table 2. Susceptibility of the Water Source

	Score	**Rating**
Minimum Allowable Susceptibility	30	
Intake Construction Adequate	0	
Runoff Potential	0	
Dilution Capacity	0	
Overall Susceptibility	***0***	***High***

For contaminants, risks to a drinking water source depend on the type, number or density, and distribution of the contaminant sources. The Contaminant Risk score has been derived from an examination of existing, and historical contamination sources that have been detected in the protection area 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 the 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. Kwigillingok School Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	0	Low
Nitrates and/or Nitrites	3	Low
Volatile Organic Chemicals	0	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	0	Low
Synthetic Organic Chemicals	0	Low
Other Organic Chemicals	0	Low

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

Susceptibility of the 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 and ratings for each of the six categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Kwigillingok School Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	30	Low
Nitrates and Nitrites	35	Low
Volatile Organic Chemicals	30	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	30	Low
Synthetic Organic Chemicals	30	Low
Other Organic Chemicals	30	Low

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Low**. No contaminant risks sources for bacteria and viruses were identified in the protection area for this public water system.

Coliforms (a bacteria) are found naturally in the environment and although they aren't necessarily a health threat, they are 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. Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2003). Positive samples increase the overall vulnerability of the drinking water source, indicating that the source is susceptible to bacteria and virus contamination. Typically, coliform detection in raw water samples collected from surface water sources is normal. (See Chart 2 – Contaminant Risks for Bacteria and Viruses in Appendix D).

One positive bacteria count was detected in 2000, however, the following samples taken in 2001, 2002, and 2003 showed no detection of bacteria.

After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the source, the overall vulnerability of the source to bacteria and virus contamination remains **Low**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Low** (See Chart 4 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). No contaminant risks sources for nitrates were identified in the protection area for this public water system. Nitrates are very mobile, moving at approximately the same rate as water.

The Maximum Contaminant Level (MCL) for nitrates is 10 milligrams per liter (mg/L). 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 (EPA, 2003).

Sampling history for the water source indicates that a low concentration of nitrate (below the MCL) was detected in recent sampling events, but did not exceed the MCL. The low nitrate concentration is likely attributed to natural sources. No nitrates were detected in the most recent sampling events.

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

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Low** (See Chart 6 – Contaminant Risks for Volatile Organic Chemicals in Appendix D). No contaminant sources for volatile organic chemicals were identified in the protection area for this public water system.

Detectable concentrations of trihalomethanes were reported in recent sampling events for this public water system. However, the levels were well below the MCL of 0.08 mg/L for trihalomethanes. Trihalomethanes are considered byproducts of the water treatment process and are not from the source waters. Because the presence of trihalomethanes are not attributed to the source waters, contaminant risk points were not retained.

After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the source, the overall vulnerability of the source to contamination remains **Low**.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is **Low**.

Although recent samples have exceeded the MCL of 0.015 mg/L for lead, the LKSD has sampled the source waters (pre-treated water) to verify that the presence of lead is attributed to the water treatment process or water distribution network (LKSD 2004). No contaminant risks sources for heavy metals, cyanide, and other inorganic chemicals were identified in the protection area for this public water system.

Based on review of recent sampling records for this public water system, moderate levels of copper and high levels of lead have been detected in post-treated water. Copper has been detected in recent sampling history but has not exceeded the MCL of 1.3 mg/L. Lead has been detected at levels exceeding 100% of its MCL of 0.015 mg/L (see Chart 8 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

The reported concentrations of copper and lead in recent sampling events have been proven (by the operator) to not be representative of source water conditions, therefore, risk points were not retained.

After combining the contaminant risk for heavy metals with the natural susceptibility of the source, the overall vulnerability of the source remains **Low**.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is **Low**. No contaminant sources for synthetic organic chemicals were identified in the protection area for this public water system.

Review of historical sampling data found no recent sampling results for synthetic organic chemical contaminants.

After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to synthetic organic chemicals of the source remains **Low** (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

Other Organic Chemicals

The contaminant risk for other organic chemicals is **Low**. No contaminant risks sources for other organic chemicals were identified in the protection area.

Review of the historical sampling data found no recent sampling results for other organic chemicals.

After combining the contaminant risk with the natural susceptibility of the source, the overall vulnerability to other organic chemicals of the source remains **Low** (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

Using the Source Water Assessment

This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of the LKSD and the community surrounding Kwigillingok School to protect public health. It is anticipated that Source Water Assessments will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of the drinking water source.

REFERENCES

Alaska Department of Community and Economic Development (ADCED), 2003 [WWW document]. URL: http://www.dced.state.ak.us/cbd/commdb/CF_COMDB.htm

Alaska Geographic Society, 1979, The Yukon Kuskokwim Delta. Alaska Geographic, v. 6, no. 1, 95 p.

Lower Kuskokwim School District (LKSD), February 12, 2004. Personal communication with Pat De Smet and Laura Young (URS).

R&M Consultants, Inc., 1979b, Lower Kuskokwim School District School Site Investigation for Tununak, Alaska.

United States Environmental Protection Agency (EPA), 2003 [WWW document]. URL: http://www.epa.gov/safewater/mcl.html.

APPENDIX A

Drinking Water Protection Area Location Map
(Map A)

Public Water Well System for PWS #270964.001 LKSD Kwigillingok
Showing Potential and Existng Sources of Contamination

LEGEND

- Public Water System Well

Groundwater Protection Zones

- Zone C Protection Area– 5 Years Travel Time

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours

Transportation

- Primary Route (Class 1)
- Secondary Route (Class 2)
- Road (Class 3)
- Road (Class 4)
- Road (Class 5, Four-wheel drive)

Rain runoff is primary water source. No reported existing or potential contaminant sources found within the Protection Zone.

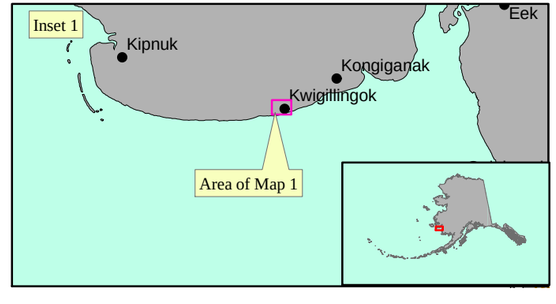
Data Sources:
Contaminant Sources, Public Water System Wells, Contours
Alaska Department of Environmental Conservation (ADEC)

Critical Facilities, Federal Emergency Management Agency (FEMA)

All other data:
United States Geological Survey (USGS)

Drinking Water Protection Areas based on "Alaska Drinking Water Protection Program - Guidance Manual for Class B Public Water Systems" published by ADEC

URS Corporation does not guarantee the accuracy or validity of the data provided.



0 0.25 0.5 1 1.5 2 Miles

LKSD Kwigillingok PWS 270964.001
Appendix A Map A

APPENDIX B

Contaminant Source Inventory and Risk Rankings (Table 1)

Table 1

Contaminant Source Inventory for ***LKSD Kwigillingok***

PWSID 270964.00

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Water supply wells	W09	W09-01	A	C	Surface water intake

APPENDIX C

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

Public Water Well System for PWS #270964.001 LKSD Kwigillingok
Showing Potential and Existng Sources of Contamination

LEGEND

- Public Water System Well

Groundwater Protection Zones

- Zone C Protection Area– 5 Years Travel Time

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours

Transportation

- Primary Route (Class 1)
- Secondary Route (Class 2)
- Road (Class 3)
- Road (Class 4)
- Road (Class 5, Four-wheel drive)

Rain runoff is primary water source. No reported existing or potential contaminant sources found within the Protection Zone.

Data Sources:
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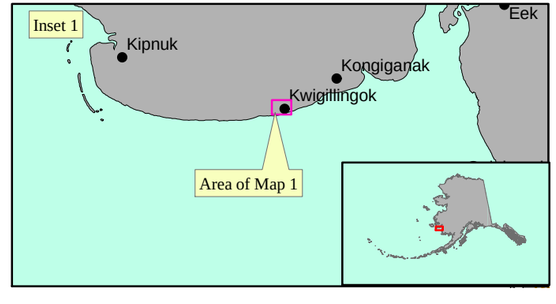


LKSD Kwigillingok **PWS 270964.001**
Appendix C **Map C**

APPENDIX D

Vulnerability Analysis and Contaminant Risks
(Charts 1-13)

Chart 1. Susceptibility of the Surface Water Source - LKSD Kwigillingok Water System (PWS No. 270964.001)

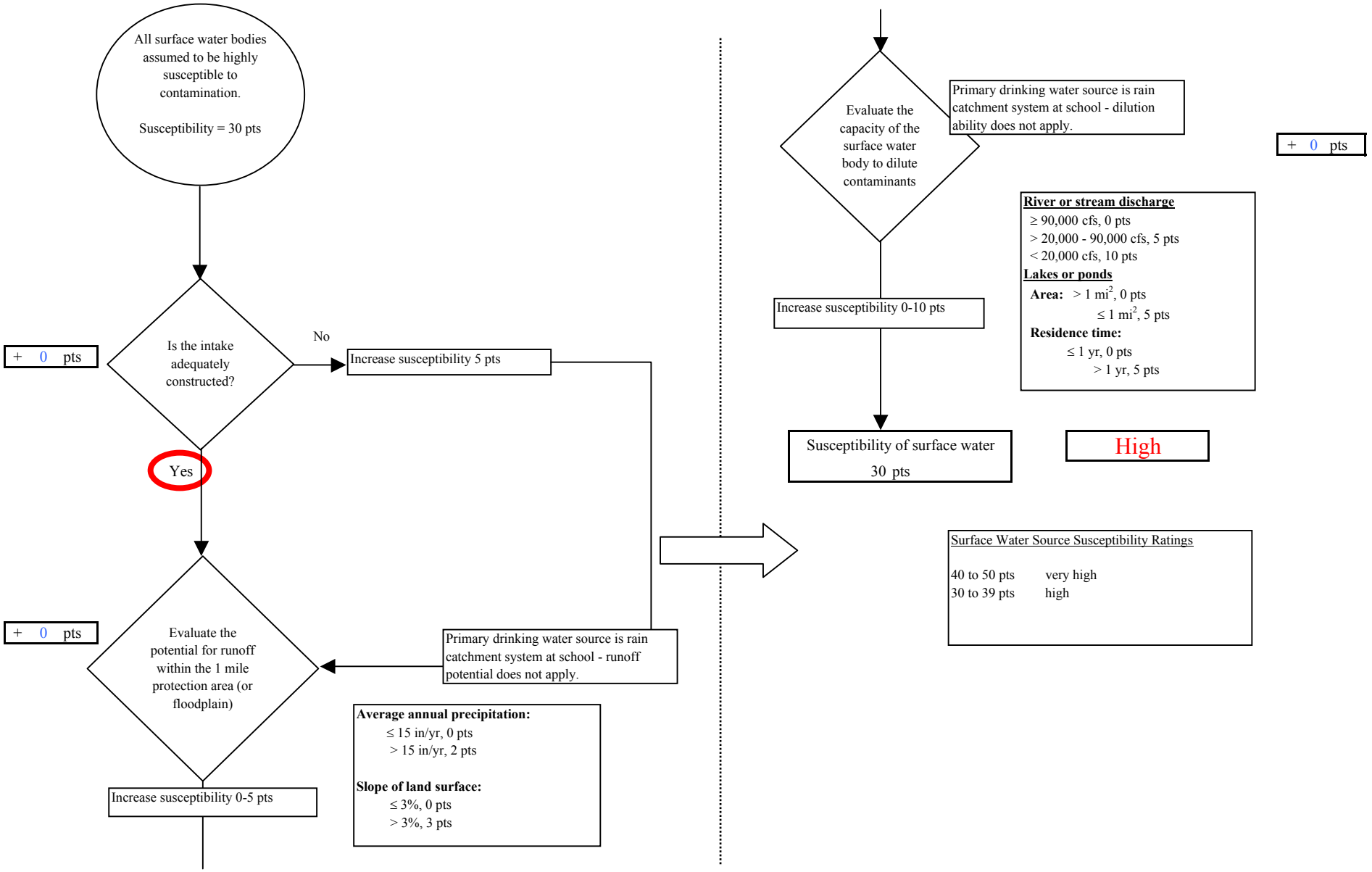
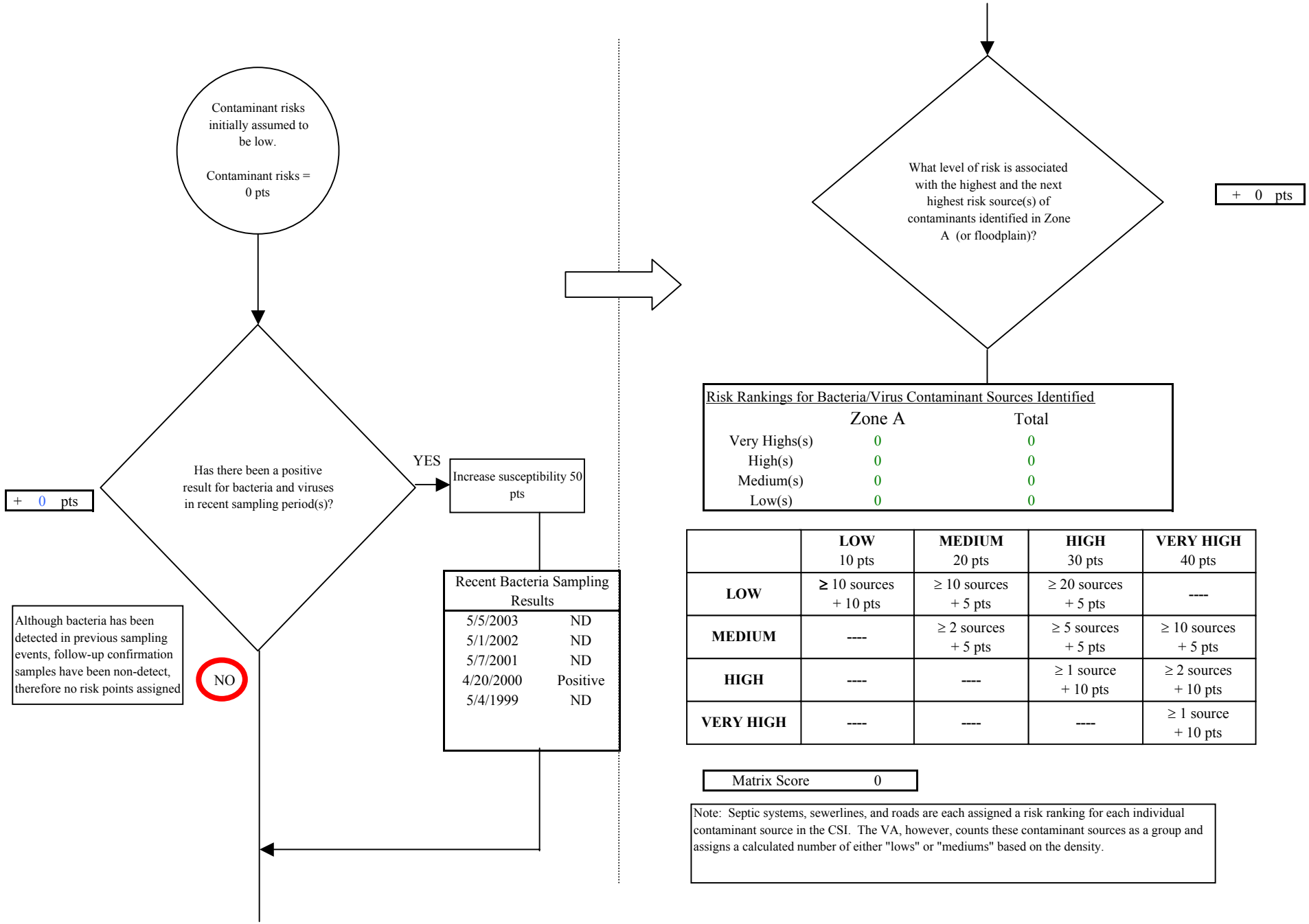


Chart 2. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Bacteria & Viruses



Risk Rankings for Bacteria/Virus Contaminant Sources Identified

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

	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 0

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 LKSD Kwigillingok Water System (PWS No. 270964.001) - Bacteria & Viruses

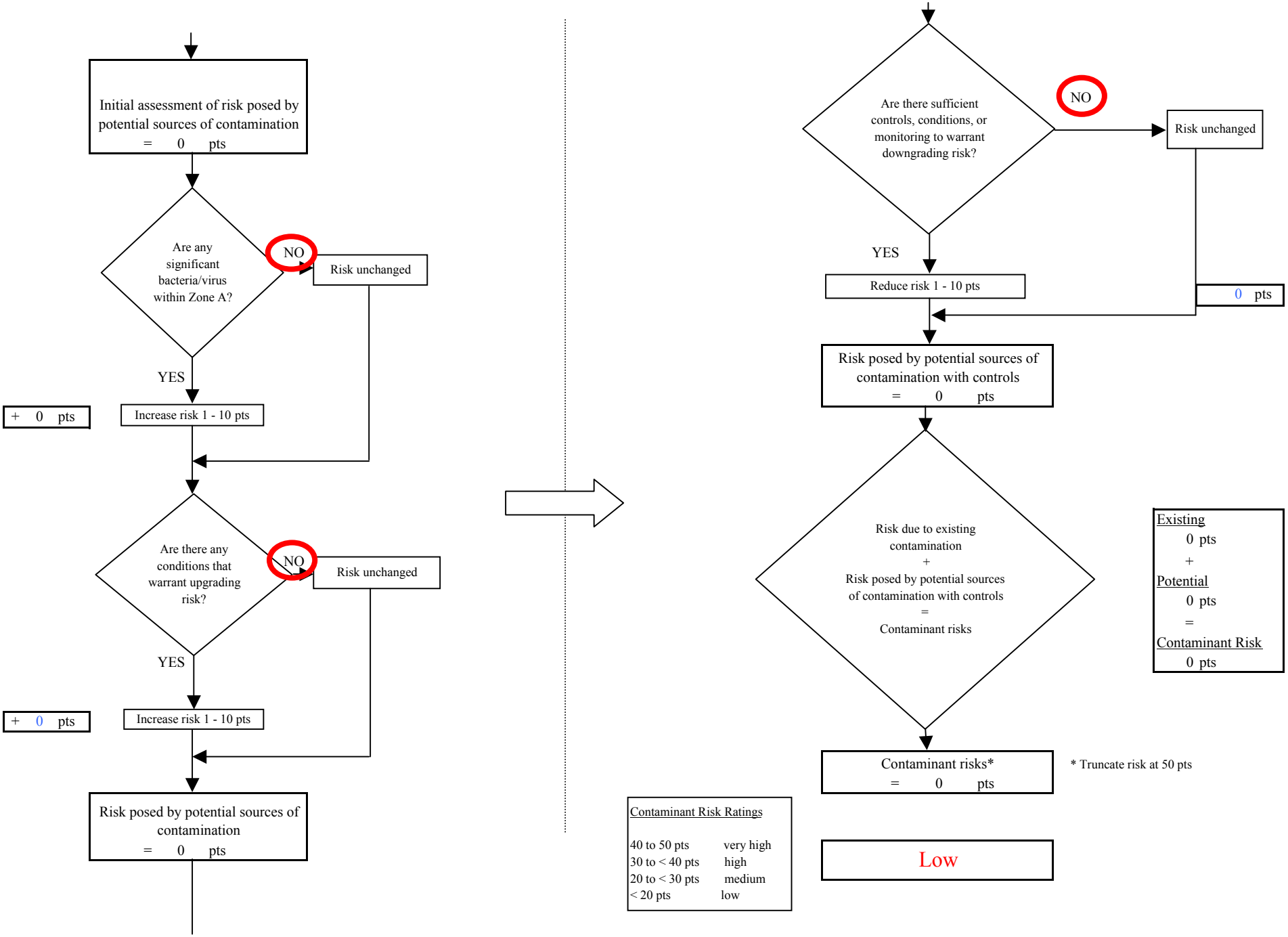


Chart 3. Vulnerability analysis for LKSD Kwigillingok Water System (PWS No. 270964.001) - Bacteria & Viruses

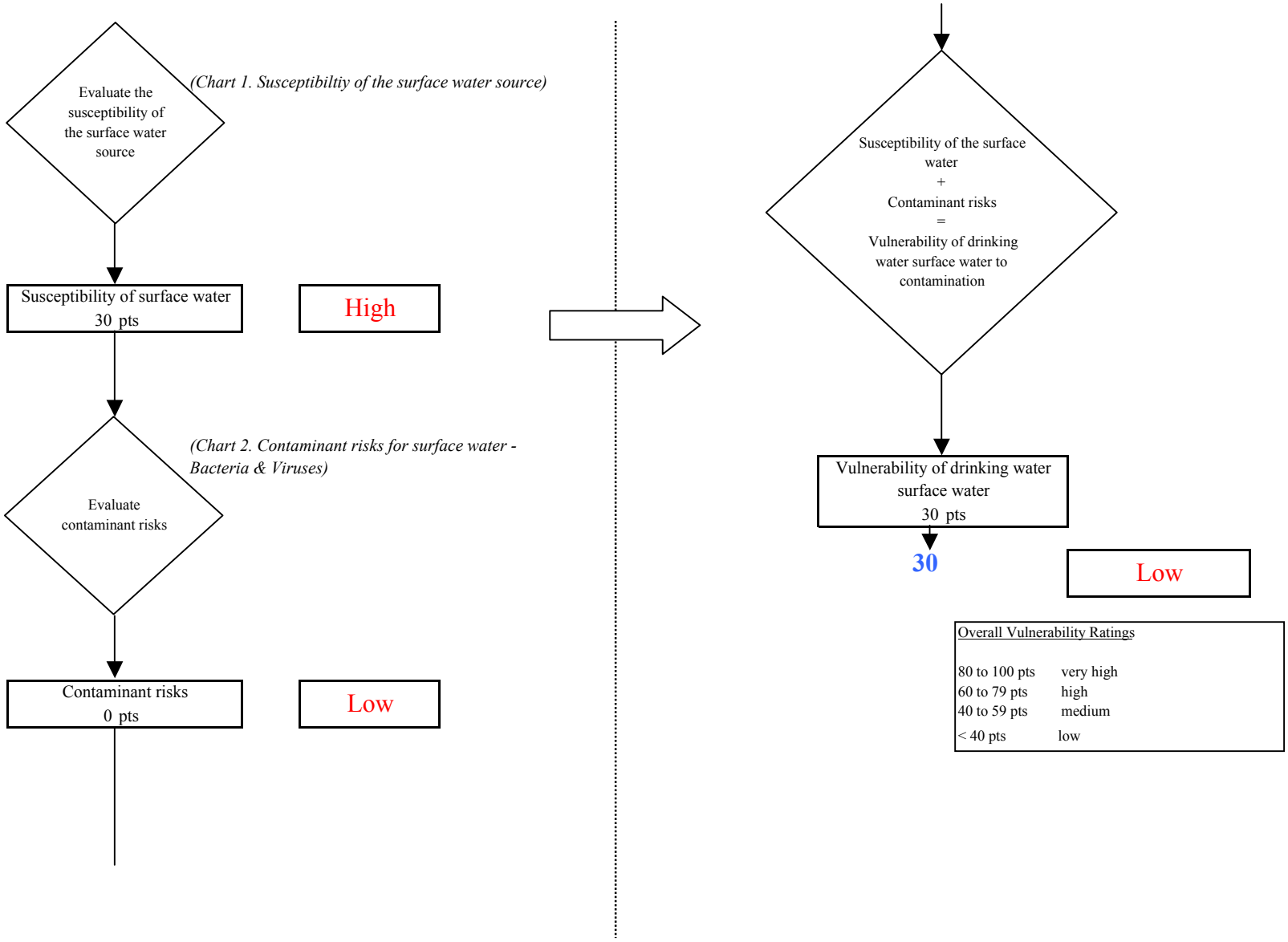


Chart 4. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Nitrates and Nitrites

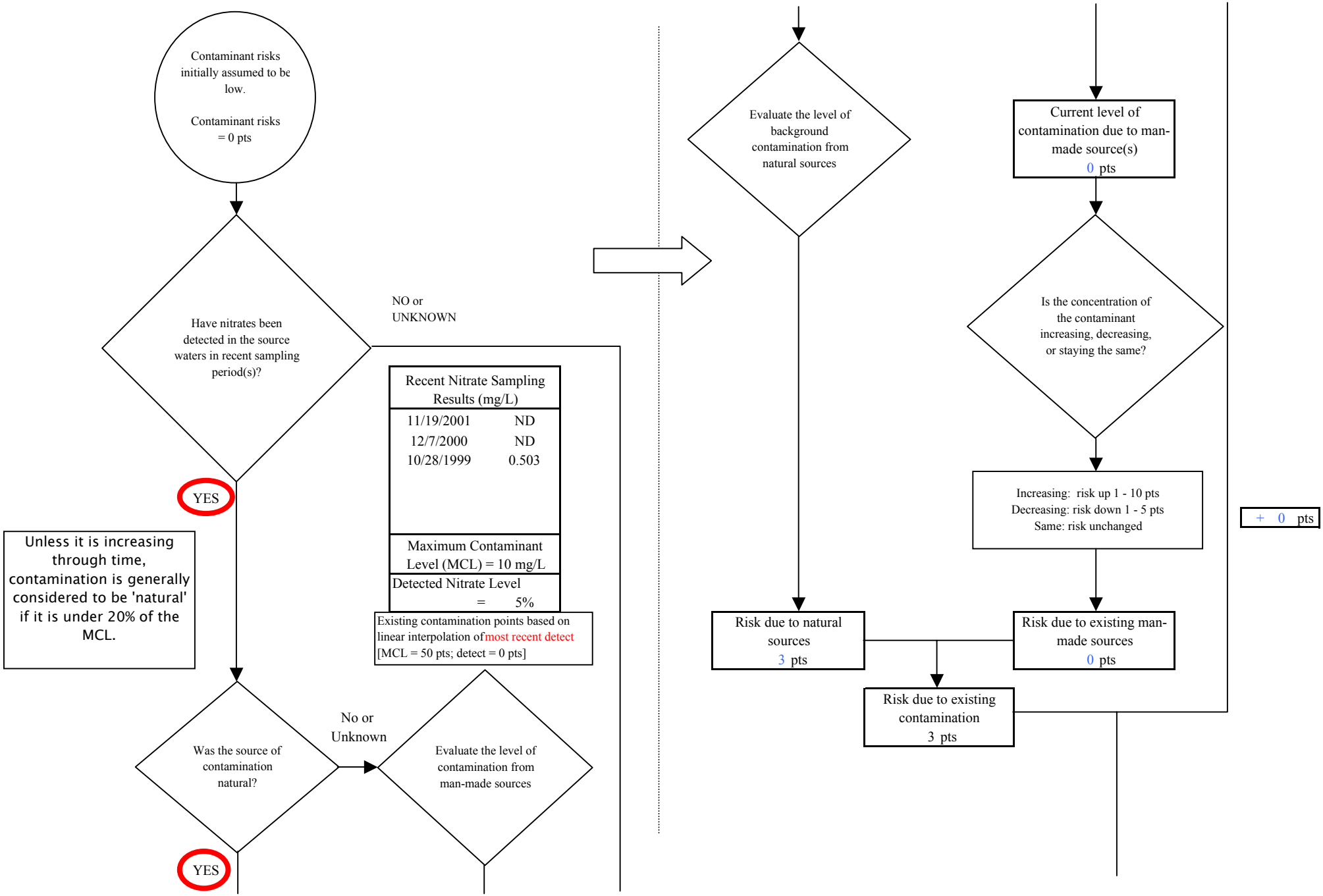
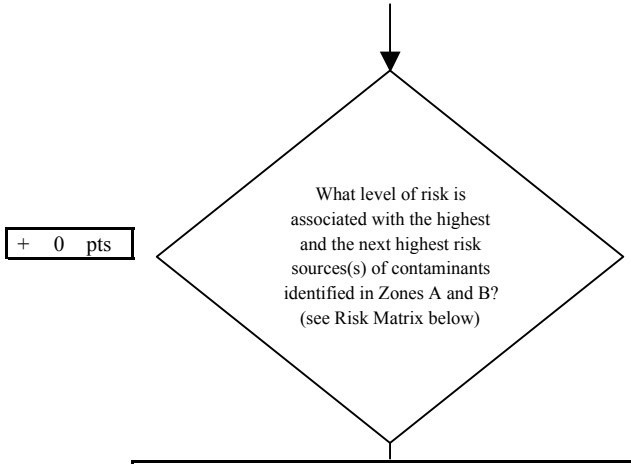


Chart 4. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Nitrates and Nitrites



+ 0 pts

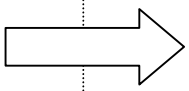
Risk Levels for Nitrate/Nitrite Sources identified in Zones A and B

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

	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 0

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.



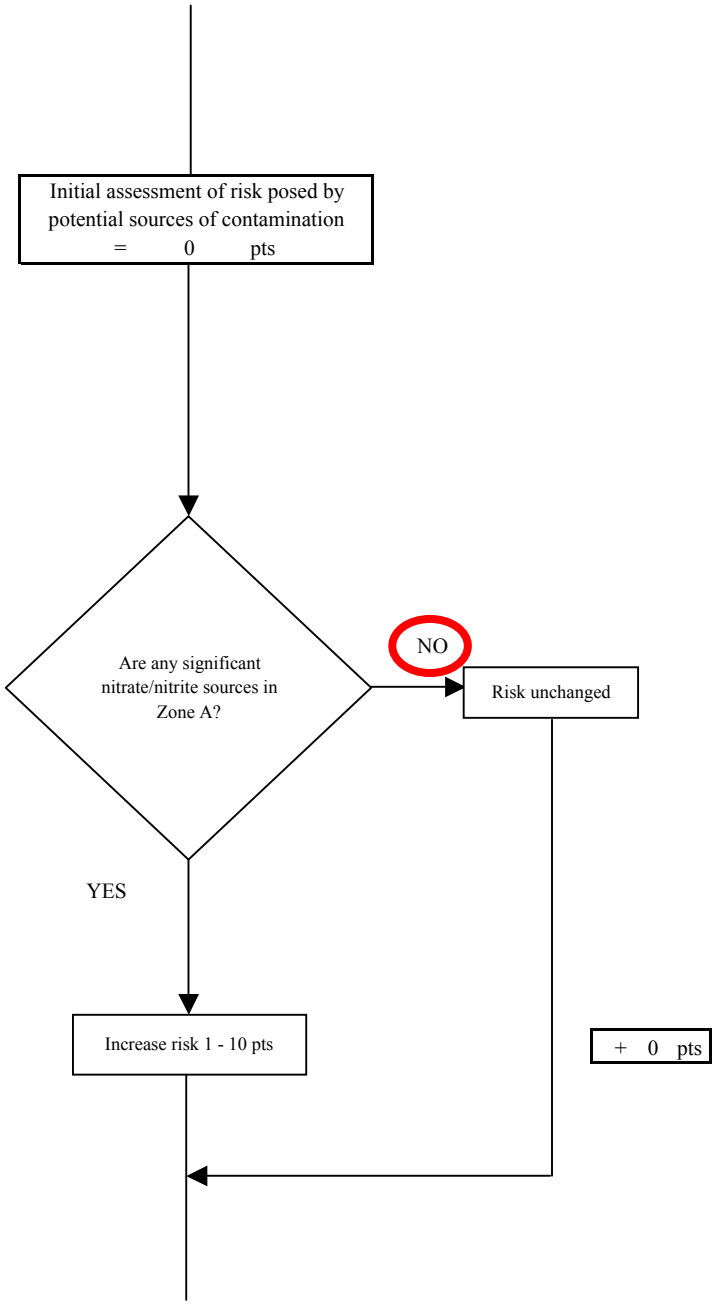


Chart 4. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Nitrates and Nitrites

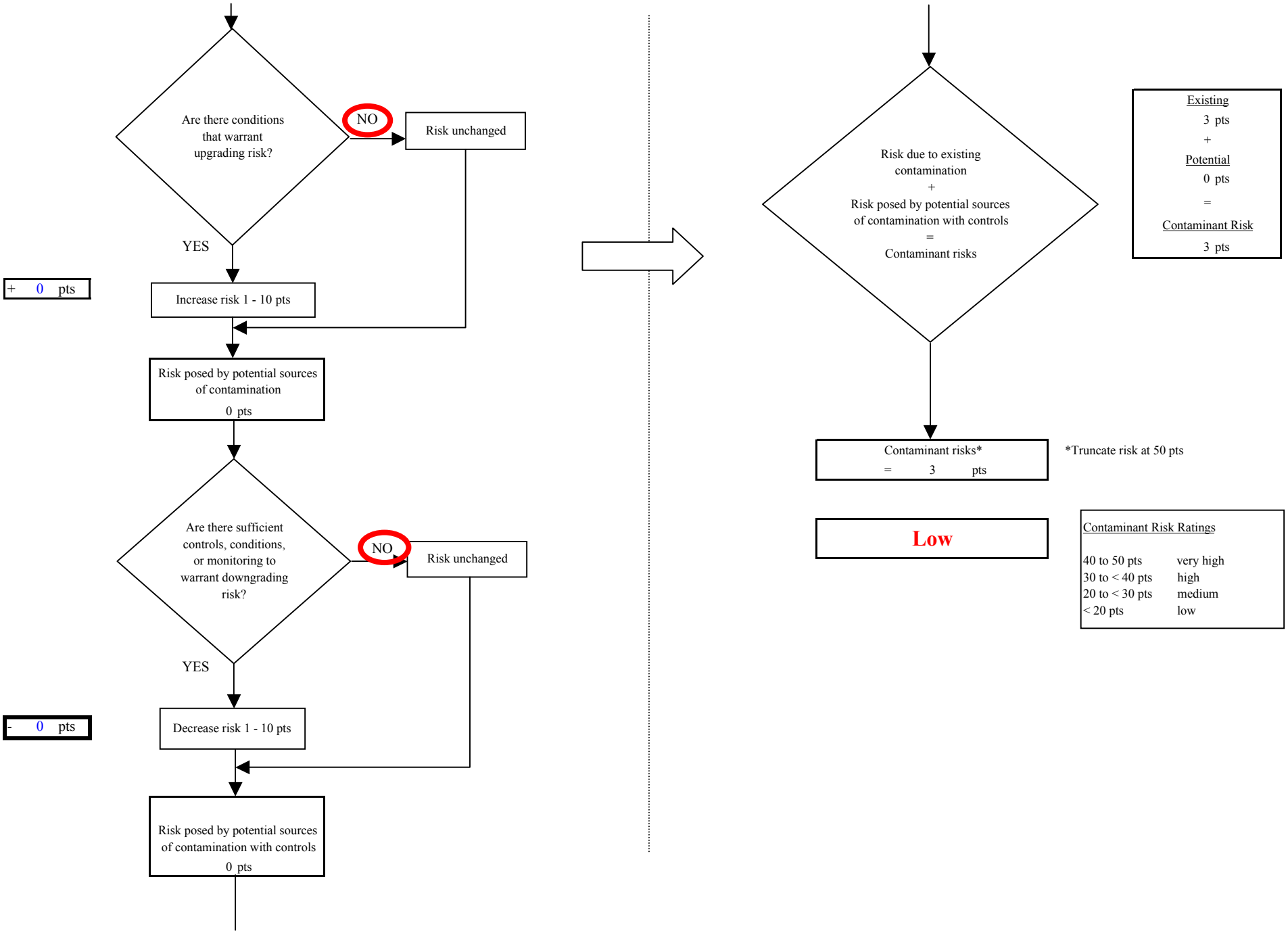


Chart 5. Vulnerability analysis for LKSD Kwigillingok Water System (PWS No. 270964.001) - Nitrates and Nitrites

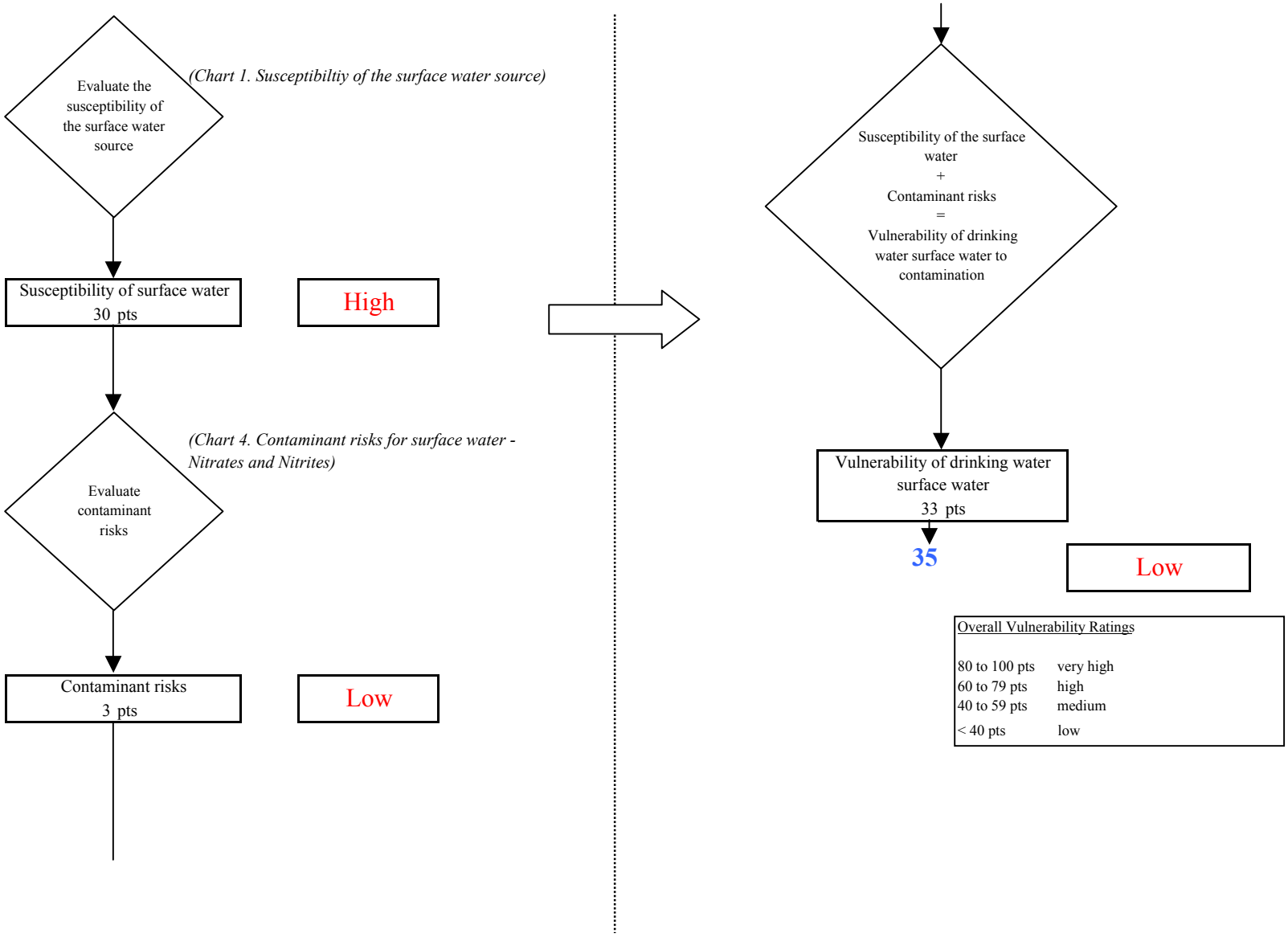


Chart 6. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Volatile Organic Chemicals

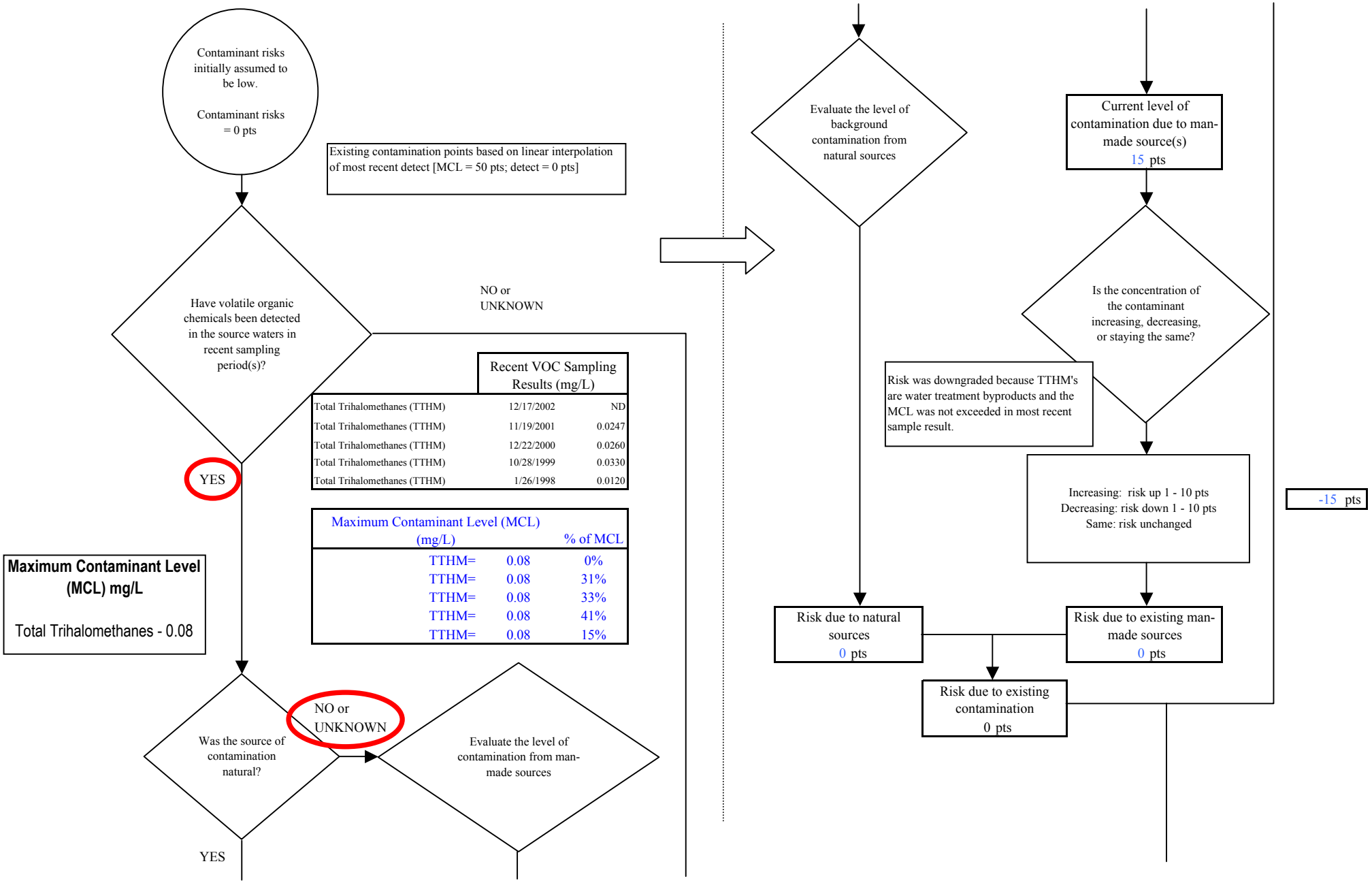


Chart 6. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Volatile Organic Chemicals

+ 0 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 VOC 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)	0		0

	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 0

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 = 0 pts

Are any significant VOC sources in Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 6. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Volatile Organic Chemicals

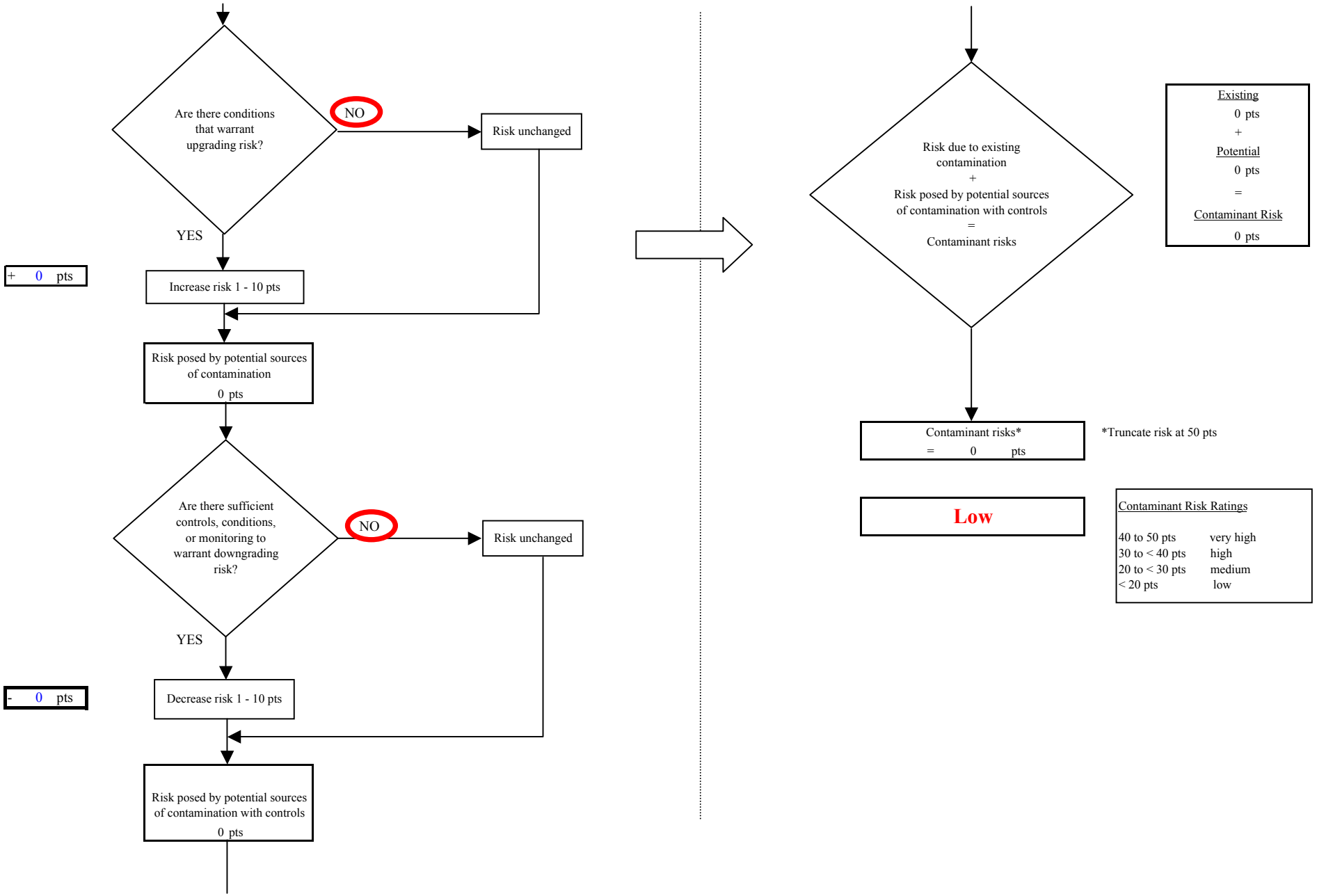


Chart 7. Vulnerability analysis for LKSD Kwigillingok Water System (PWS No. 270964.001) - Volatile Organic Chemicals

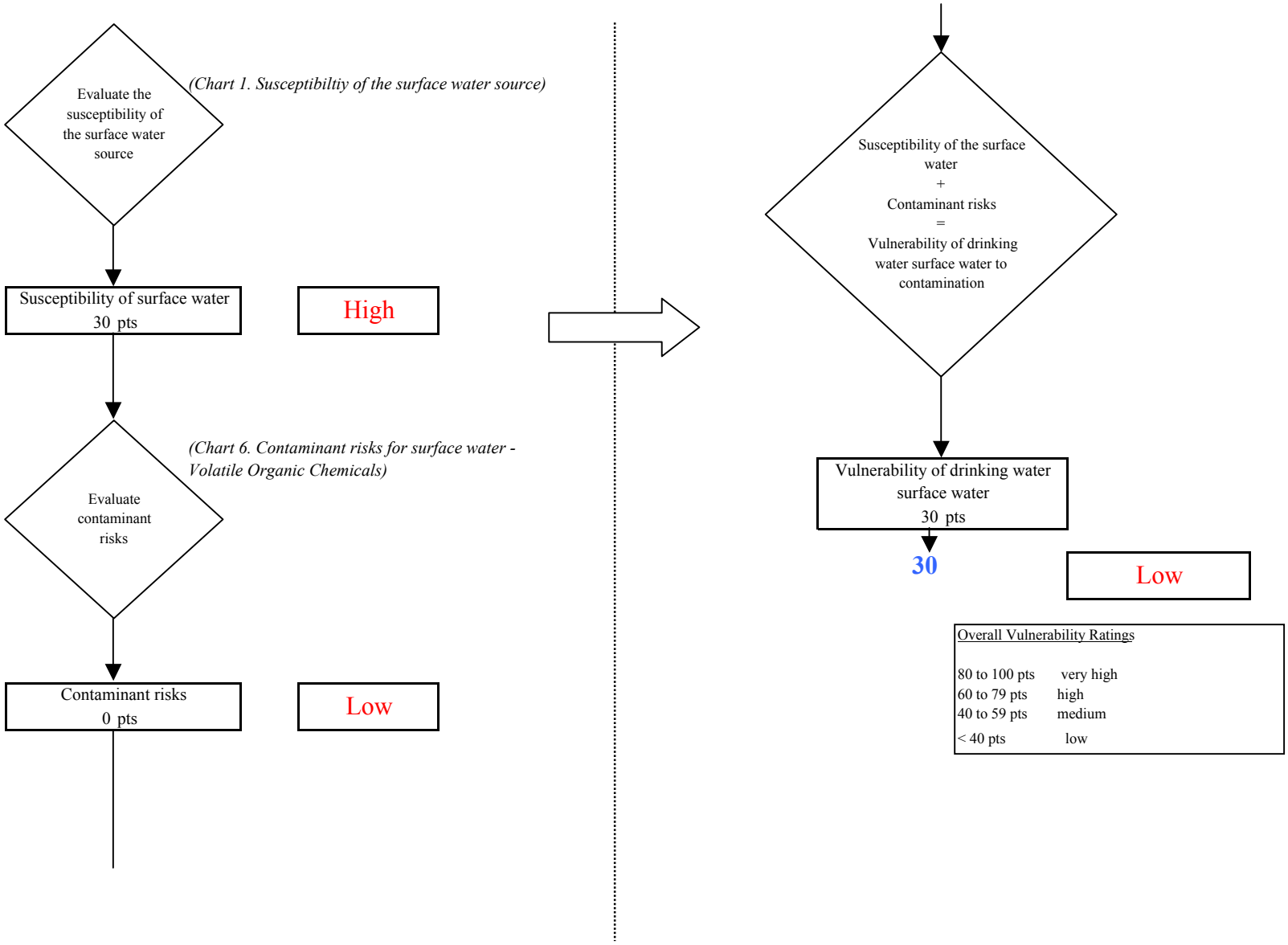


Chart 8. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

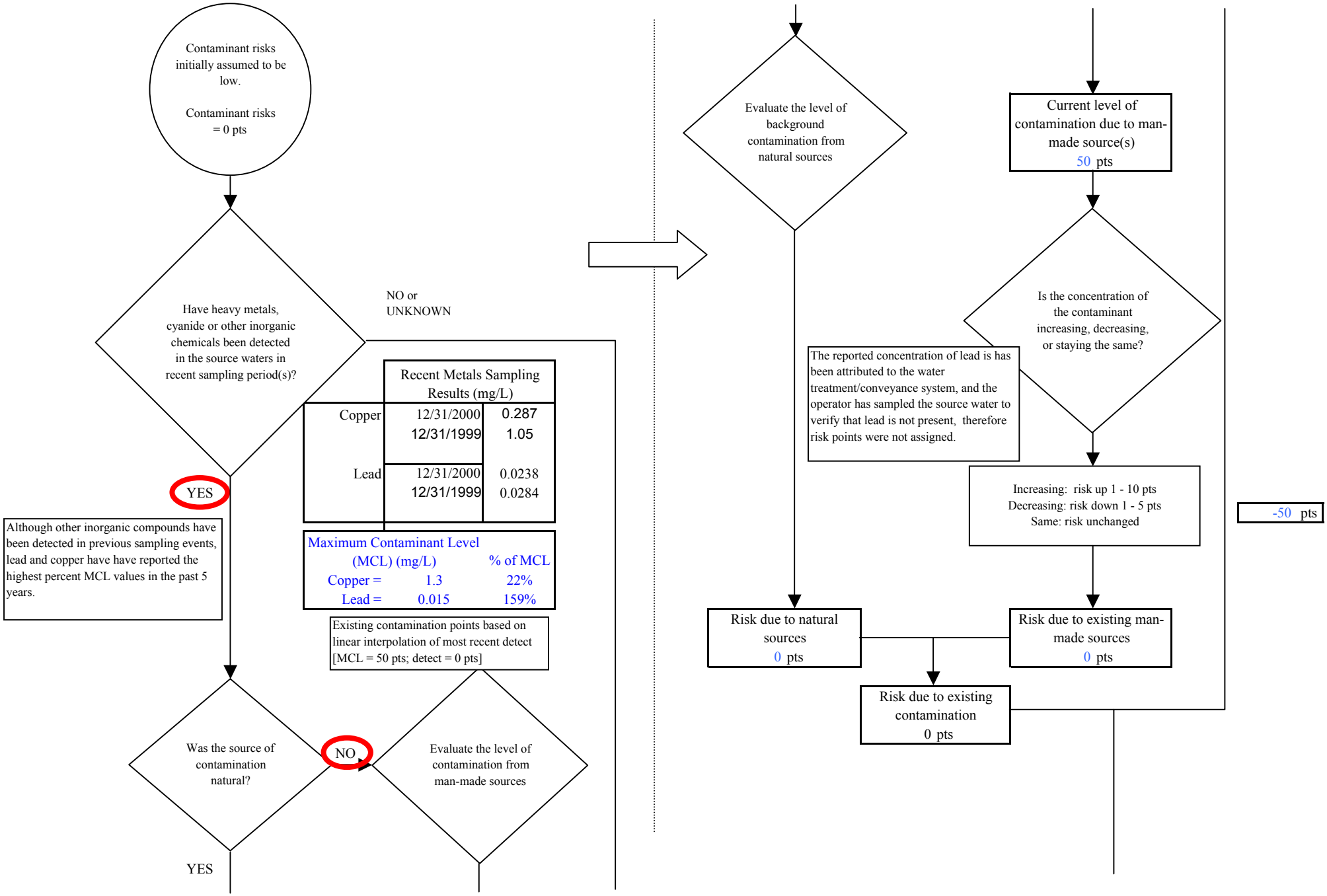


Chart 8. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 0 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 = 0 pts

Are any significant HM, Cyanide, or OIC sources in Zone A?

NO → Risk unchanged → + 0 pts

YES → Increase risk 1 - 10 pts

Risk Levels for HM, Cyanide, or OIC 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)	0		0

	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 0

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 8. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

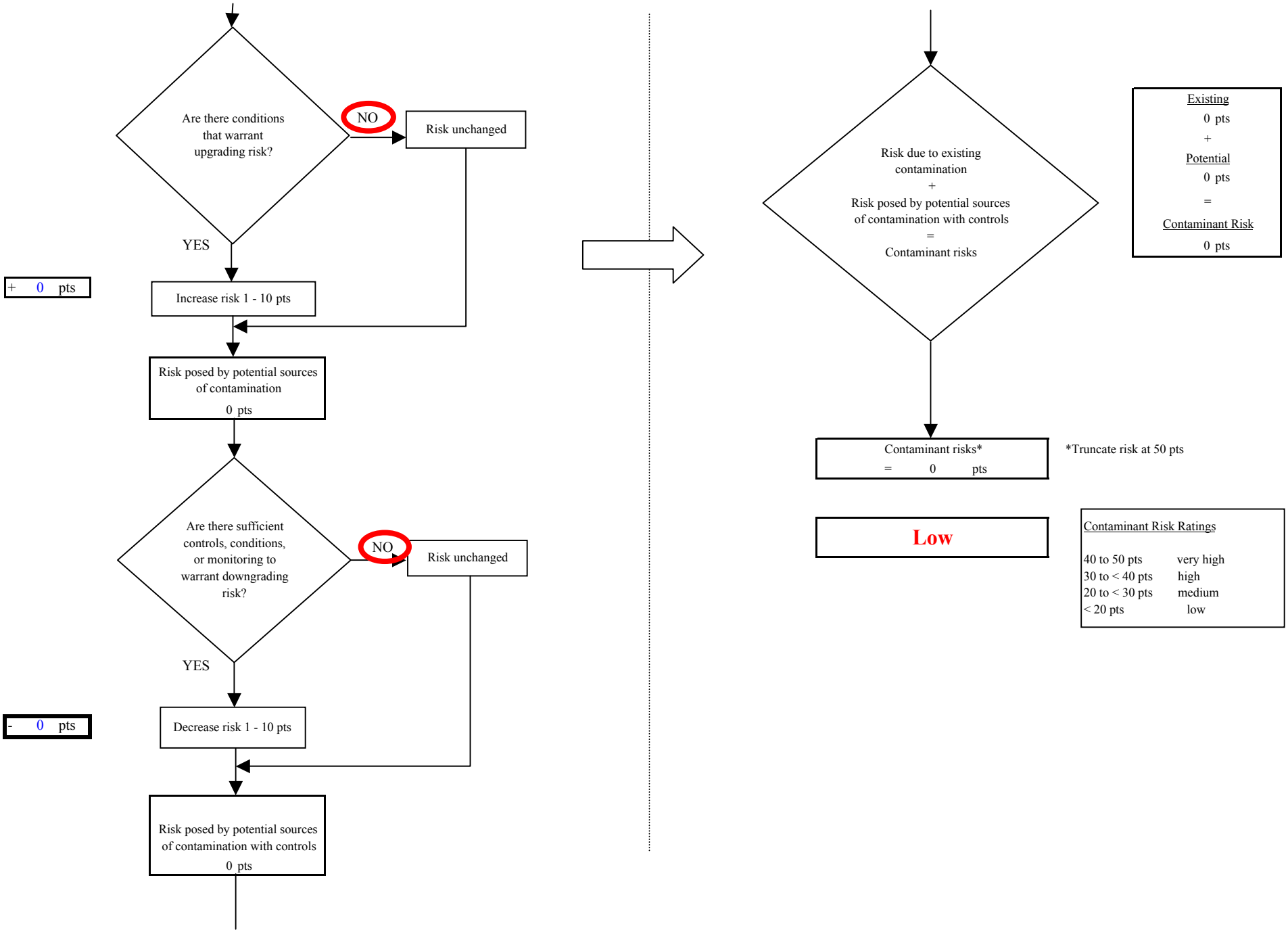


Chart 9. Vulnerability analysis for LKSD Kwigillingok Water System (PWS No. 270964.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

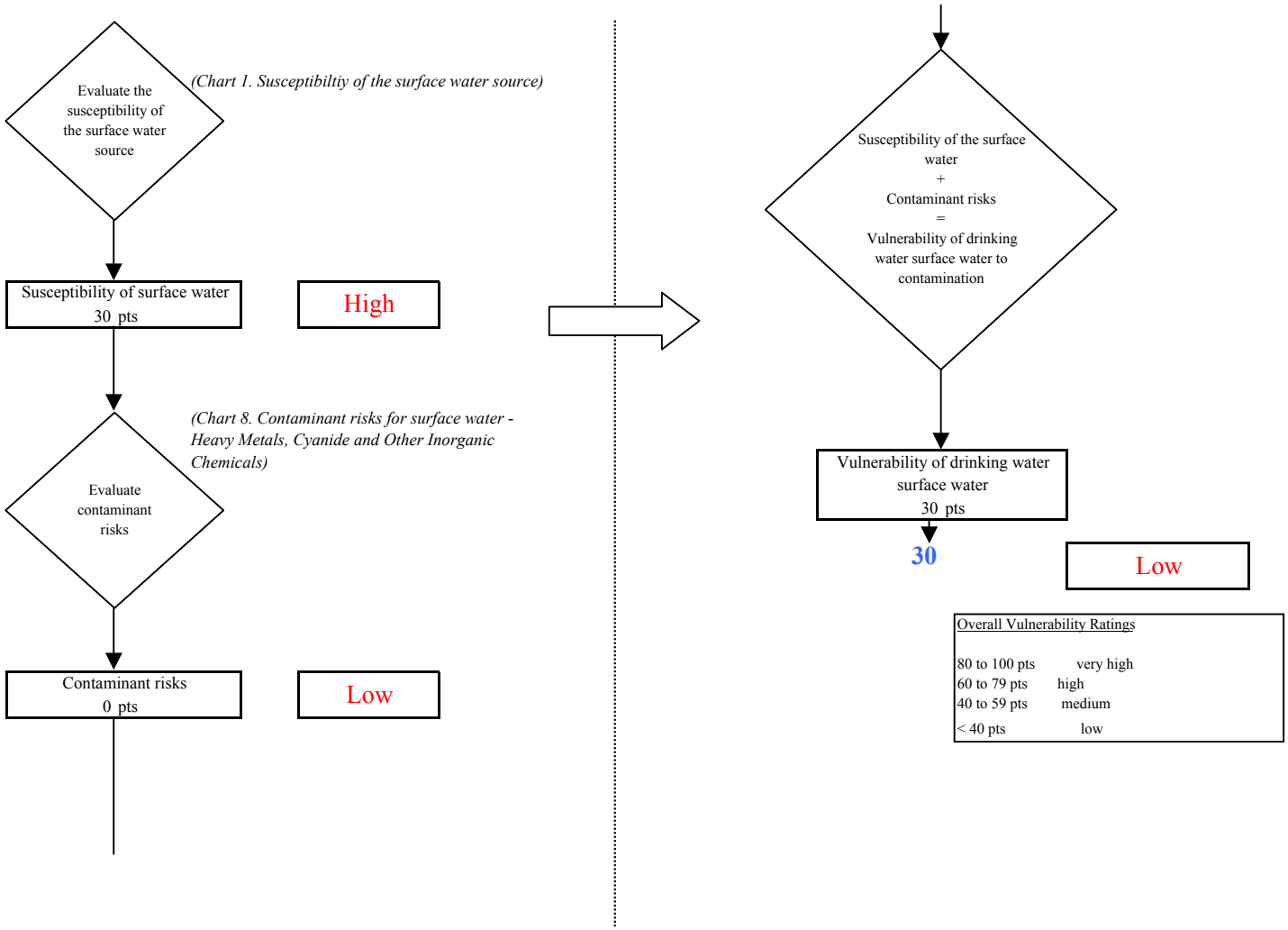


Chart 10. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Synthetic Organic Chemicals

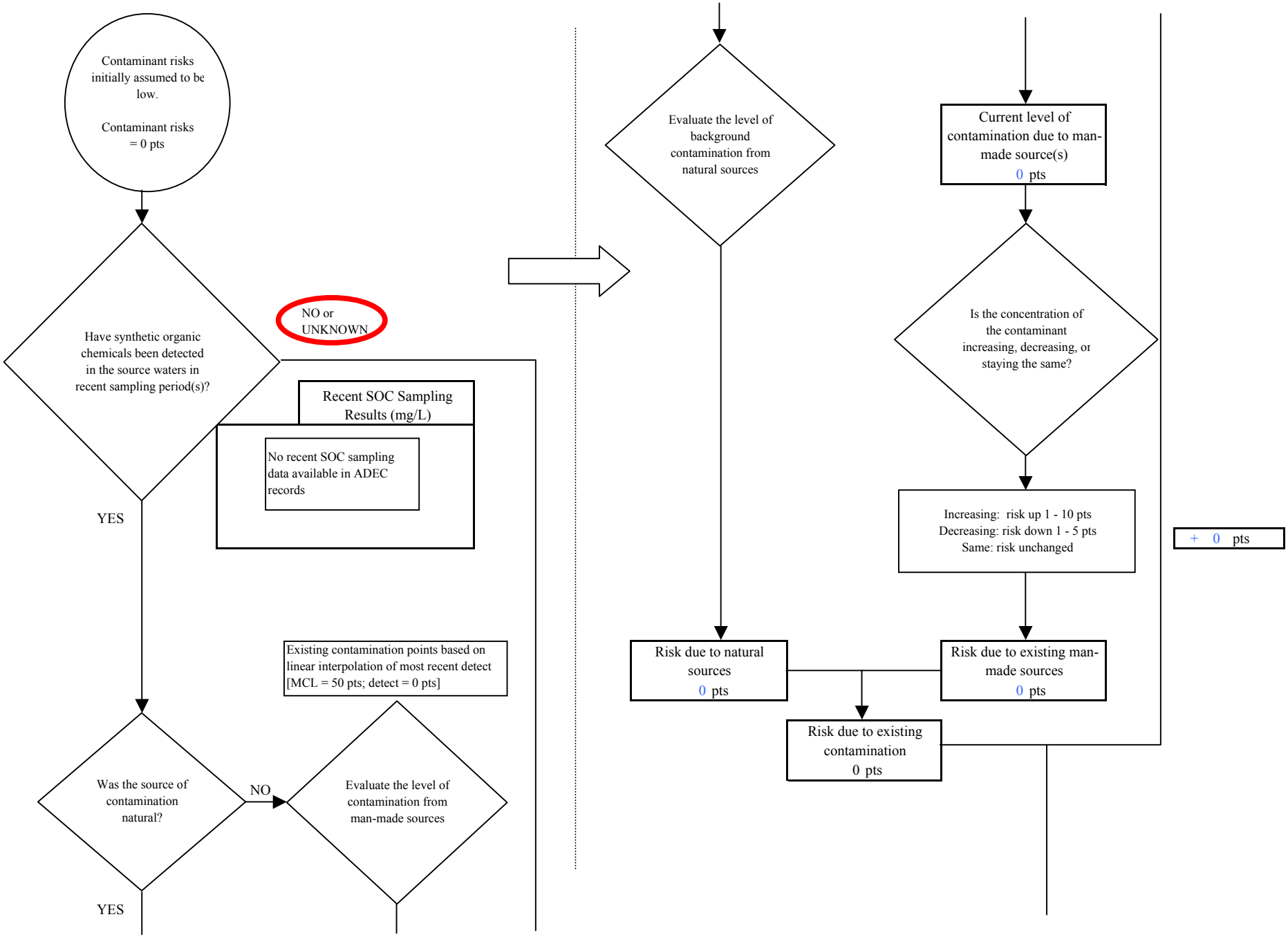


Chart 10. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Synthetic Organic Chemicals

+ 0 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 = 0 pts

Are any significant SOC sources in Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 0 pts

Risk Levels for SOC Sources identified in Zones A and C

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

	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 0

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 10. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Synthetic Organic Chemicals

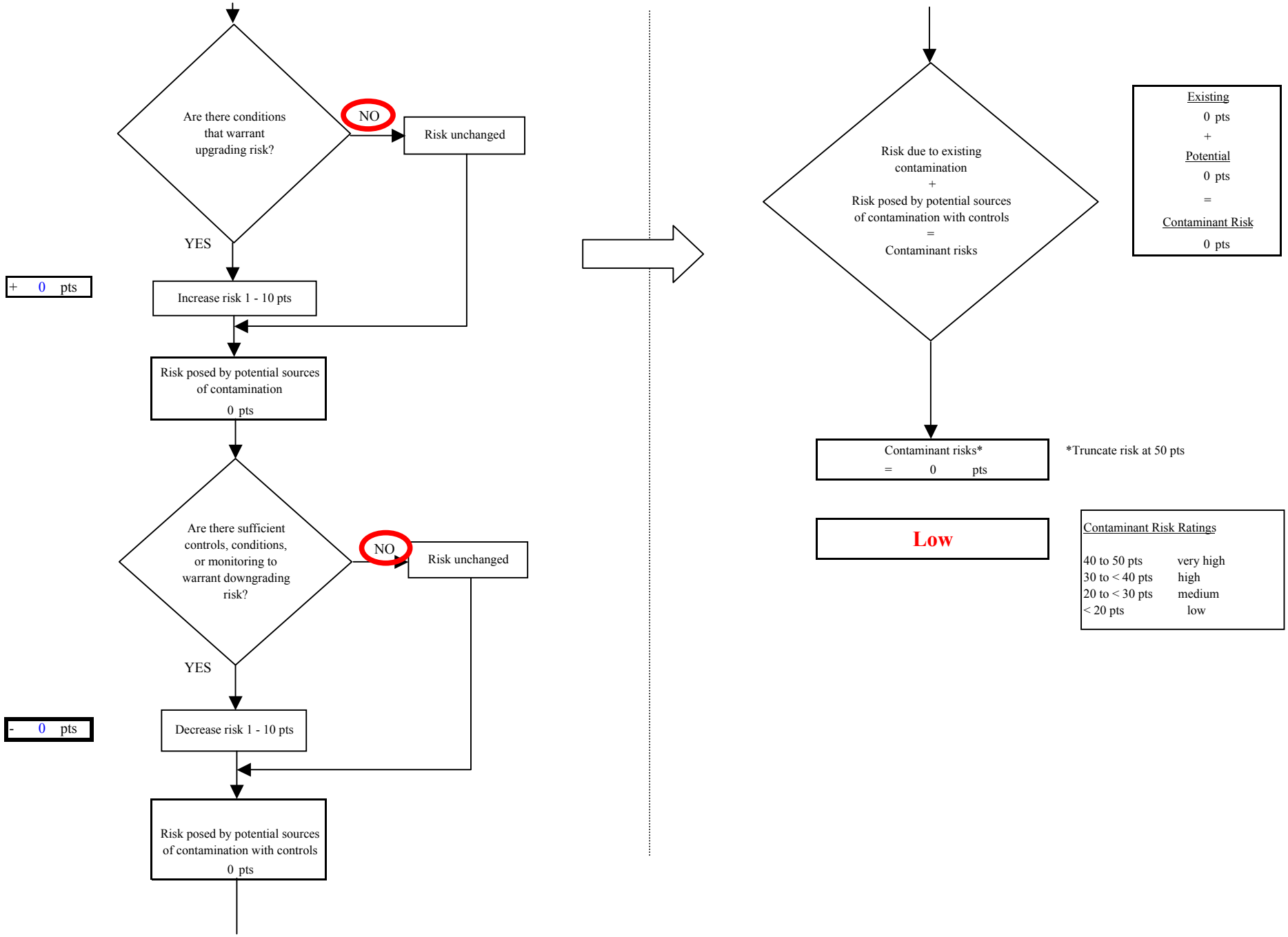


Chart 11. Vulnerability analysis for LKSD Kwigillingok Water System (PWS No. 270964.001) - Synthetic Organic Chemicals

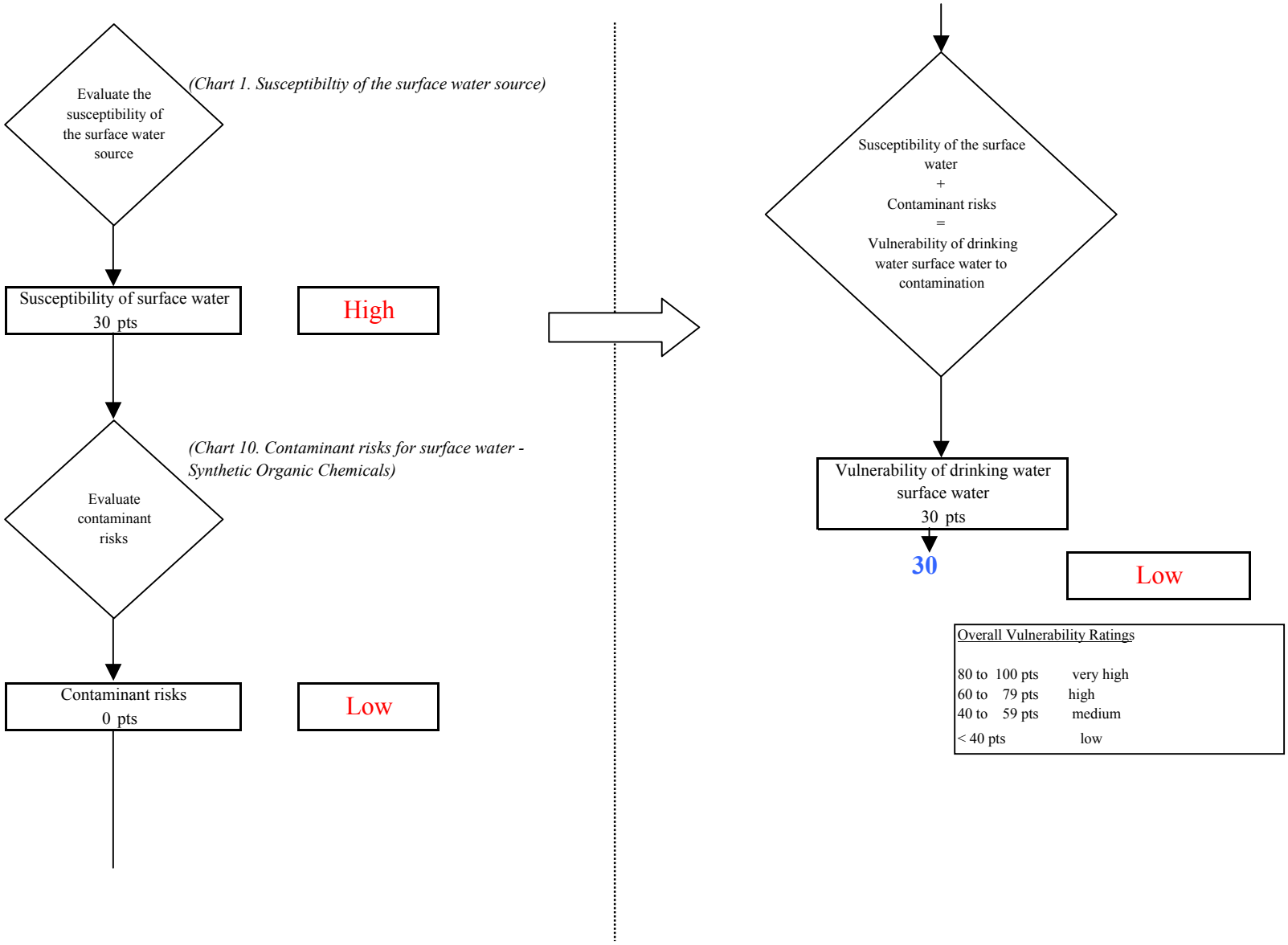


Chart 12. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Other Organic Chemicals

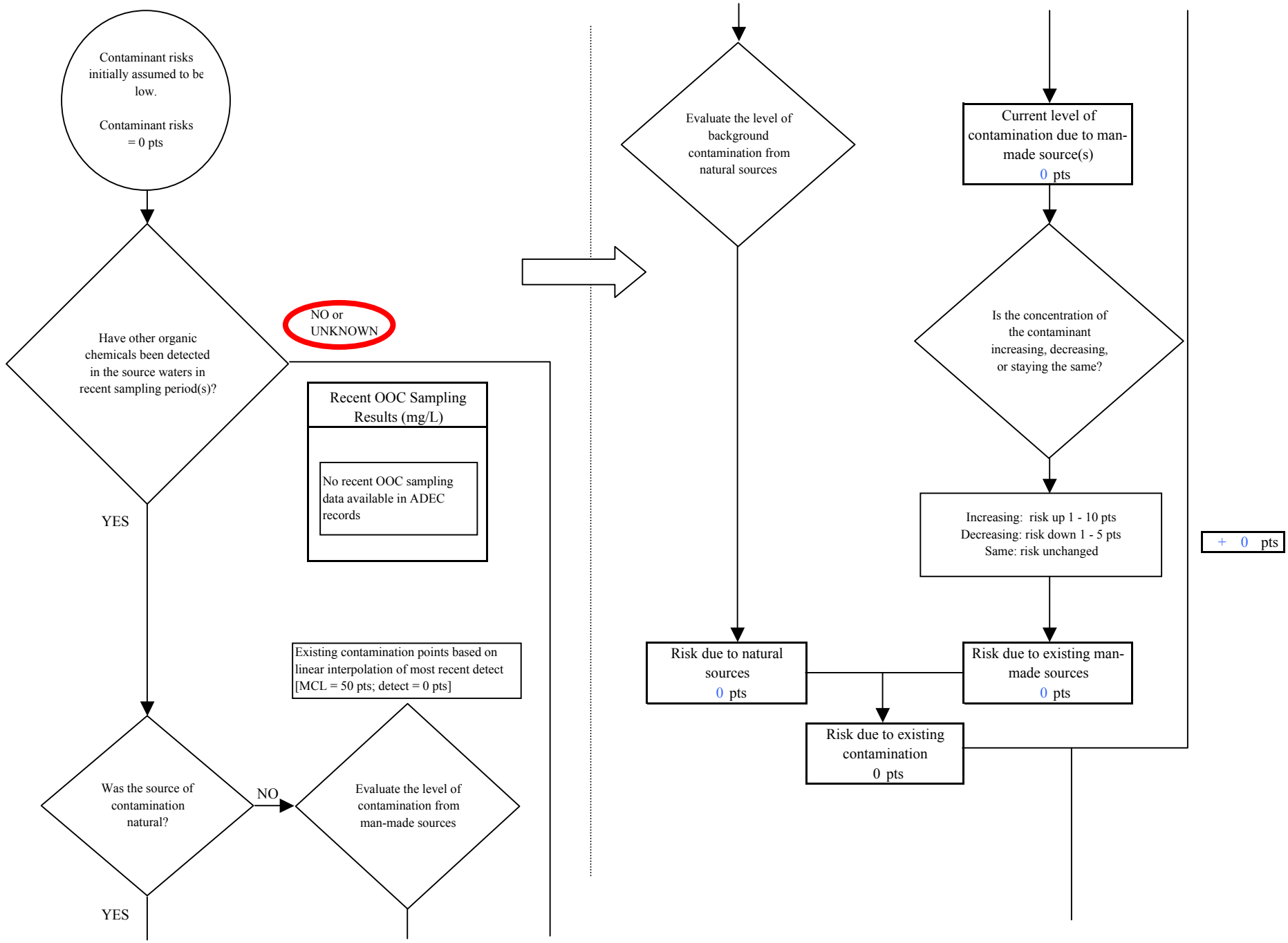
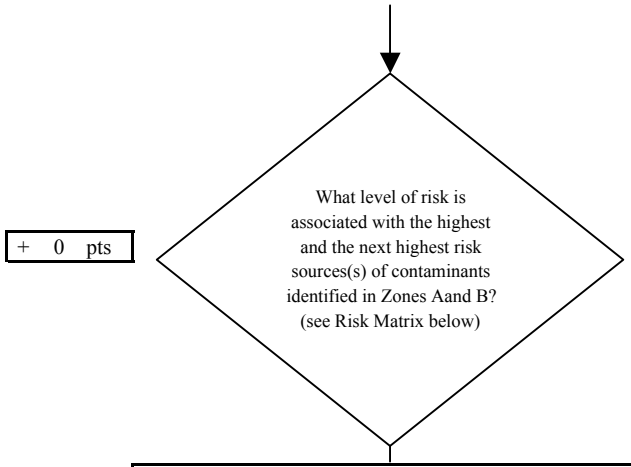


Chart 12. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Other Organic Chemicals



+ 0 pts

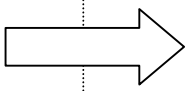
Risk Levels for OOC Sources identified in Zones A and B

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

	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 0

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.



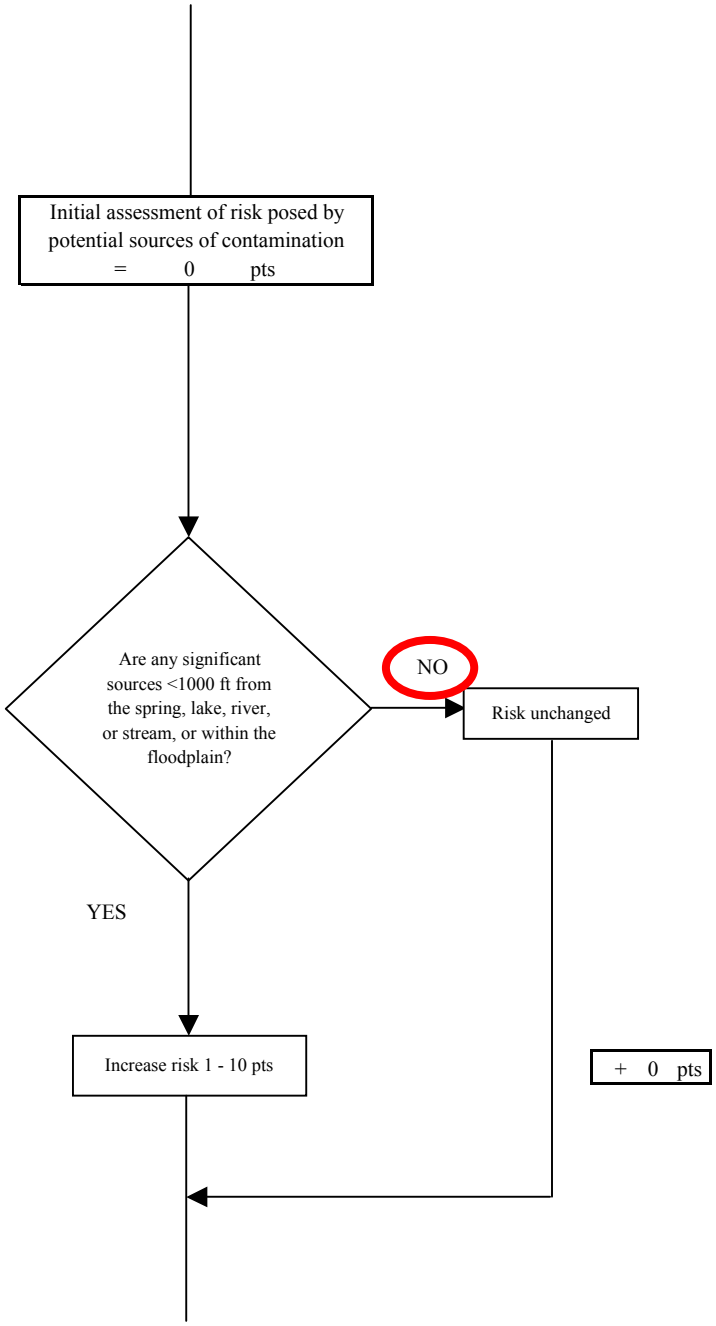


Chart 12. Contaminant risks for LKSD Kwigillingok Water System (PWS No. 270964.001) - Other Organic Chemicals

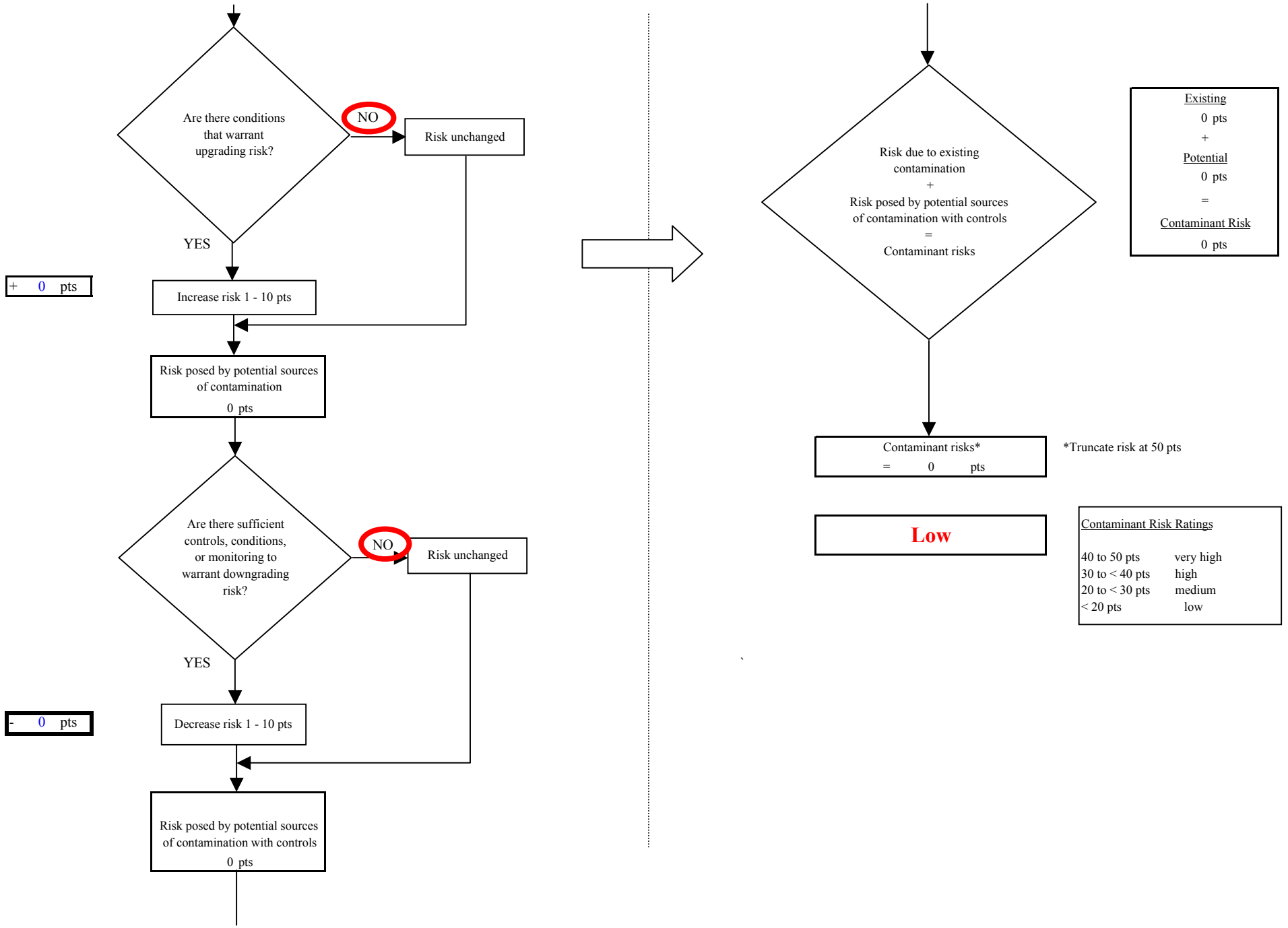


Chart 13. Vulnerability analysis for LKSD Kwigillingok Water System (PWS No. 270964.001) - Other Organic Chemicals