

Source Water Assessment

A Hydrogeologic Susceptibility and
Vulnerability Assessment for
Mentasta Washeteria/14 plex
Drinking Water System,
Mentasta Lake, Alaska

PWSID # 381498.001

June 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1401
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 Mentasta Washeteria/14 plex Source of Public Drinking Water, Mentasta Lake Alaska

Drinking Water Protection Program Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

Mentasta Washeteria/14 plex has one Public Water System (PWS) well. It is assumed that the well (PWSID# 381498.001) has been used as a drinking water source since it was drilled in approximately 1989.

The well is a Class A (community and non-transient non-community) water system located in Mentasta Lake, Alaska. Available records indicate that drinking water is stored in 3 tanks for a combined volume of 4,200 gallons. Water is softened, but not disinfected. The dates of operation for this system are unknown, but it is assumed to operate year round. This system serves approximately 50 nonresidents and 34 residents through four service connections. The wellhead received a susceptibility rating of **Very High** and the aquifer received a susceptibility rating of **Low**. Combining these two ratings produce a **Medium** rating for the natural susceptibility of the well.

Identified potential and current sources of contaminants for the public drinking water source include: large capacity septic system, laundromat without dry cleaning, domestic wastewater collection system, domestic wastewater treatment plant disposal pond, aboveground fuel tanks, landfill, DEC recognized contaminated sites, rail corridors, and roads. These identified potential and existing sources of contamination 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 contaminant categories.

Overall, the water well received a vulnerability rating of **High** for the bacteria and viruses, nitrates and nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals contaminant categories.

PUBLIC DRINKING WATER SYSTEM

The Mentasta Washeteria/14 plex spring is a Class A (community/non-transient/non-community) public water system. The system is located in Mentasta Lake, Alaska (Sec. 07, T013N, R009E, Copper River Meridian; see Map A of Appendix A). Mentasta Lake is located 6 miles off the Tok-Slana Cutoff of the Glenn Highway on the west side of Mentasta Pass, 38 miles southwest of Tok Junction. The community has a population of 143 (ADCED, 2003). Average annual precipitation in Mentasta Lake is 16 inches, with 69 inches of snowfall. Temperatures range from -57 to 93°F.

About half of the community of Mentasta Lake obtains their water supply from individual wells, while most others utilize a public water system. About half of the residences utilize individual septic systems and the rest make use of honeybuckets or outhouses. Mentasta Lake receives electrical power from Alaska Power Company, which is privately operated. Power generating facilities are fueled by diesel (ADCED, 2003).

According to information supplied by ADEC for the Mentasta Washeteria/14 plex PWS, the depth of the primary water well is 351 feet below the ground surface. The well is screened and based on the well log, is confined by 134' of silty clay. Confined aquifers are less susceptible to groundwater impacts resulting from the downward migration of surface contaminants. The well is not located in a floodplain.

Information acquired from a January 2002 sanitary survey for the public water system indicated that the land surface was sloped away from the well. Generally, land surfaces that slope away from the wellhead promote surface water drainage, which reduces potential of contaminant migration down the well casing annulus. The well is grouted according to ADEC regulations. Proper grouting provides added protection against contaminants traveling along the well casing annulus and into source waters.

Mentasta Lake lies toward the east end of the Alaska Range, north of the Copper River basin, southeastern Interior Alaska. The Copper River basin, ranging from 500 to over 4,000 feet above sea level, is an intermontane basin rimmed by peaks of the Chugach, Alaska, Talkeetna, and Wrangell mountains. The terrain of the basin consists of two physiographic sub-units: the rolling, hummocky Copper River basin piedmont surface, and the Copper River basin trough. The Copper River basin trough is generally flat and lacks the hummocky, rolling character of the piedmont surface. Glaciers from the Chugach, Alaska, Talkeetna, and Wrangell ranges invaded the basin, perhaps at times filling it and flowing across the divides to the north, west, east, and south. This extensive glaciation has resulted in the deposition of a large thickness of coarse glacial boulder clays (till) and coarse outwash gravel and sand on the piedmont surface, with finer till and outwash interbedded with lake deposits in the basin trough (Nochols, 1956).

DRINKING WATER PROTECTION AREA

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

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

An analytical calculation was used to determine the size and shape of the DWPA for Mentasta Washeteria/14 plex PWS. The input parameters describing the attributes of the aquifer in this calculation were adopted from Groundwater (Freeze and Cherry, 1979). Available geology and groundwater contours were also considered to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful protection area.

The protection areas established for springs by the ADEC are usually separated into four zones, limited by the watershed. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well (Please refer

to the Guidance Manual for Class A Public Water Systems for additional information).

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

Table 1. Definition of Zones

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

The DWPA for the Mentasta Washeteria/14 plex PWS was determined using an analytical calculation and includes Zones A, B, and D (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 Mentasta Washeteria/14 plex DWPA. This inventory was completed through a search of agency records and other publicly available information. Potential sources of contamination to the drinking water aquifer include a wide range of categories and types. Potential drinking water contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development.

For the basis of all Class 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,
- Other organic chemicals.

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

RANKING OF CONTAMINANT RISKS

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

- Low,
- Medium,
- High, and
- Very High.

The time-of-travel for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zones A and B because of their short life span. Only “Very High” and “High” rankings are inventoried within the outer Zone D due to the probability of contaminant dilution by the time the contaminants get to the well. Tables 2 through 4 in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

VULNERABILITY OF THE DRINKING WATER SYSTEM

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

- Natural susceptibility, and
- Contaminant risks.

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

contains the ‘Vulnerability Analysis for Bacteria and Viruses’. Charts 5 through 14 contain 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 is reached by considering the properties of the well and the aquifer.

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

+

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

=

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

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

Natural Susceptibility Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

The Mentasta Washeteria/14 plex Public Water System’s water well is completed in a confined aquifer. Confined aquifers are less susceptible to potential groundwater quality impacts posed by the migration of surface water contaminants downward from the surface. Table 2 shows the susceptibility scores and ratings for this PWS.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	20	Very High
Susceptibility of the Aquifer	2	Low
Natural Susceptibility	22	Medium

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This score has been derived from an examination of existing and historical

contamination that has been detected at the drinking water source through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as for the natural susceptibility

Contaminant Risk Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

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

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	50	Very High
Nitrates and/or Nitrites	50	Very High
Volatile Organic Chemicals	50	Very High
Heavy Metals, Cyanide and		
Other Inorganic Chemicals	46	Very High
Synthetic Organic Chemicals	50	Very High
Other Organic Chemicals	50	Very High

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

$$\begin{array}{r}
 \text{Natural Susceptibility (0 – 50 points)} \\
 + \\
 \text{Contaminant Risks (0 – 50 points)} \\
 = \\
 \text{Vulnerability of the} \\
 \text{Drinking Water Source to Contamination (0 – 100)}.
 \end{array}$$

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	70	High
Nitrates and Nitrites	70	High
Volatile Organic Chemicals	70	High
Heavy Metals, Cyanide and		
Other Inorganic Chemicals	70	High
Synthetic Organic Chemicals	70	High
Other Organic Chemicals	70	High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Very High**. The risk is primarily attributed to the presence of a landfill and large capacity septic systems in Zone A (see Table 2 – Appendix B).

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.

There have not been positive bacteria counts reported in recent (within five years) sampling events (See Chart 3 – Contaminant Risks for Bacteria and Viruses in Appendix D). Only a small amount of bacteria and viruses are required to endanger public health.

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 contaminant risk for nitrates and nitrites is **Very High**. The risk to this source of public drinking water is primarily attributed to the presence of a landfill and large capacity septic systems in Zone A (see Table 3 – Appendix B).

Nitrates are very mobile, moving at approximately

the same rate as water. The sampling history for this spring indicates that nitrates have been detected in recent sampling events. Nitrates and/or nitrites are found in natural background concentration at this site, as elsewhere in Alaska. Nitrate concentrations in uncontaminated groundwater are typically less than 2 mg/L; therefore, nitrate concentrations above 2 mg/L may be indicative of man-made sources (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

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

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Very High**. The risk is primarily attributed to the presence of a landfill and a DEC recognized contaminated sites in Zone A. Several other potential contaminant sources are also found within the protection area (see Table 4 – Appendix B).

All recent sampling data for VOCs were below the detection levels for the Mentasta Washeteria/14 plex Water System (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

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 **High**.

Heavy Metals, Cyanide and Other Inorganic Chemicals

The contaminant risk for heavy metals, cyanide and other inorganic chemicals is **Very High**. The risk is primarily attributed to the presence of a landfill in Zone A. Several other potential contaminant sources are also found within the protection area (see Table 5 – Appendix B).

Based on review of recent sampling records for this public water system, levels of arsenic have been detected in recent sampling events, but have not exceeded the MCL of 0.05 mg/L. Lead has also been detected, but below the MCL of 0.015 (see Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

The reported concentration of arsenic in a recent sampling event is likely to be naturally occurring and the lead is most likely attributable to the conveyance system. Arsenic is a naturally occurring element widely distributed in the earth's crust. In the

environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds.

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 **High**.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is **Very High**. The risk is primarily attributed to the presence of a landfill in Zone A. Several other potential contaminant sources are also found within the protection area (see Table 6 – Appendix B).

No recent sampling data was available in ADEC records for Mentasta Washeteria/14 plex (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

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 **High**.

Other Organic Chemicals

The contaminant risk for other organic chemicals is **Very High**. The risk is primarily attributed to the presence of a landfill in Zone A. Several other potential contaminant sources are also found within the protection area (see Table 7 – Appendix B).

No recent sampling data was available in ADEC records for Mentasta Washeteria/14 plex (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

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

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 community of Mentasta Lake 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.

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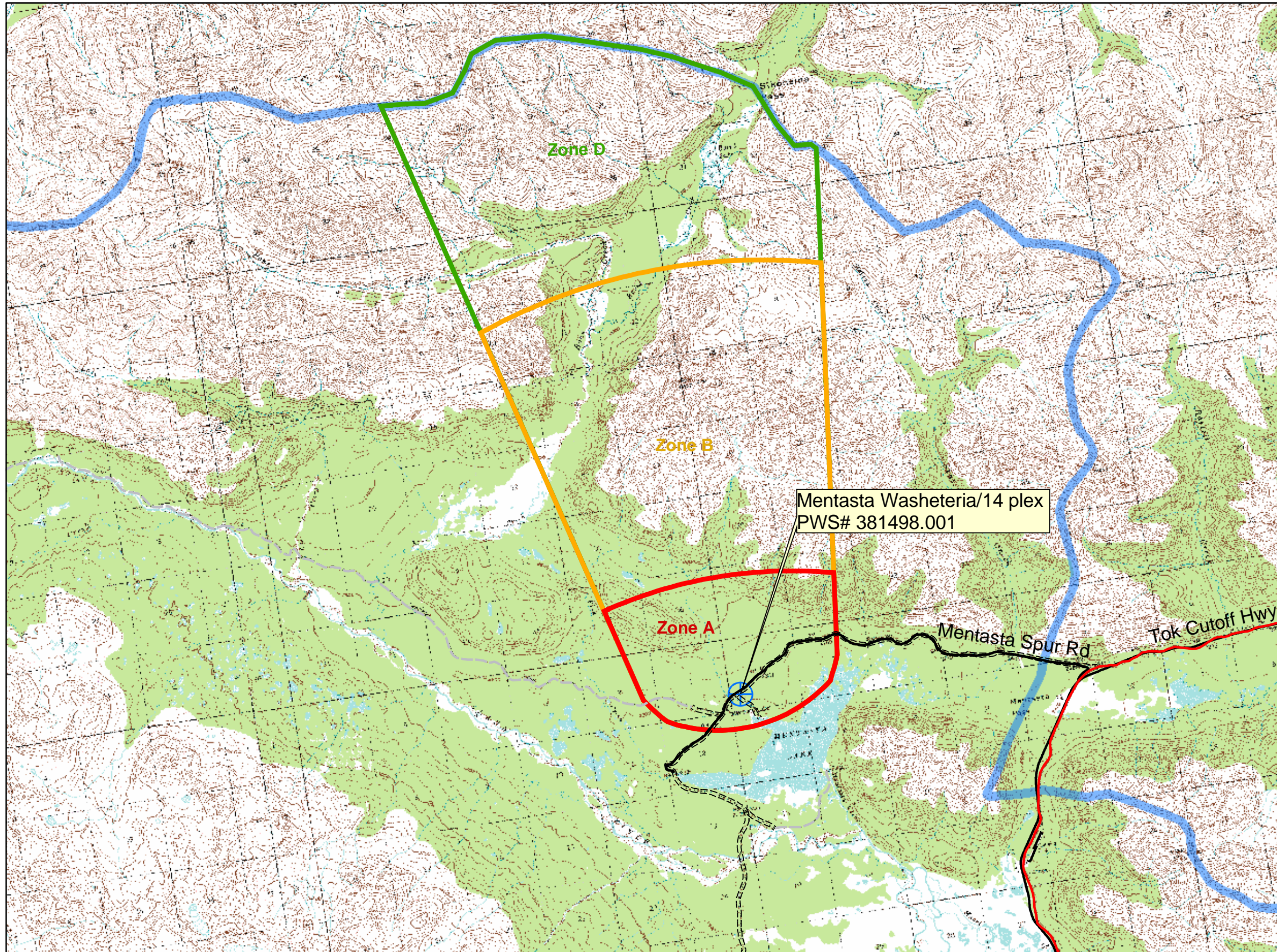
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APPENDIX A

Drinking Water Protection Area Location Map (Map A)

Public Water Well System for PWS# 381498.001 Mentasta Washeteria/14 plex



LEGEND

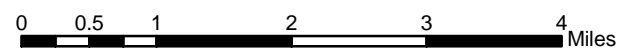
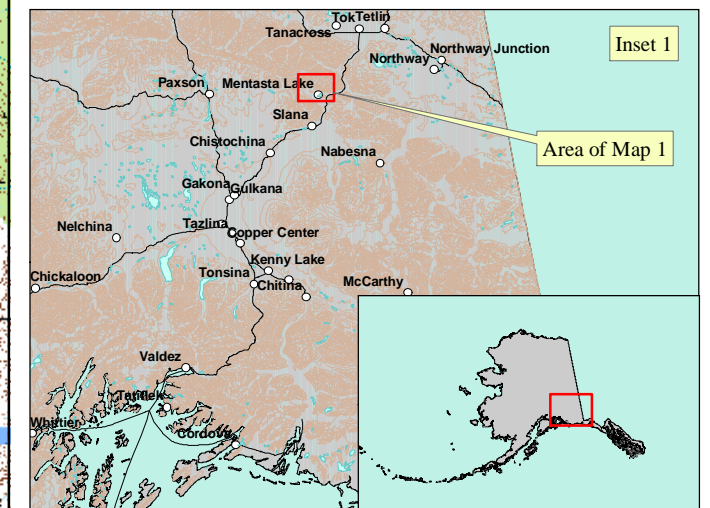
- ⊕ Public Water System Well
- | | |
|-----------------------------|------------------------------------|
| Hydrography/Physical | Transportation |
| ▭ Parcels | — Primary Route (Class 1) |
| ~ Stream | — Secondary Route (Class 2) |
| ▭ Lake or Pond | — Road (Class 3) |
| ~ Contours | ⋯ Road (Class 4) |
| ~ Watershed Boundary | ⋯ Road (Class 5, Four-wheel drive) |
- Groundwater Protection Zones**
- ▭ Zone A Protection Area— Several Months Travel Time
 - ▭ Zone B Protection Area— 2 Years Travel Time
 - ▭ Zone D Protection Area— 10 Years Travel Time or watershed boundary

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

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.



APPENDIX B

Contaminant Source Inventory and Risk Ranking (Tables 1-7)

Table 1

**Contaminant Source Inventory for
Mentasta Washeteria/14 plex**

PWSID381498.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Laundromats without dry cleaning	C22	C22-01	A	C	
Domestic wastewater collection systems (sewer lines or lift stati	D01	D01-01	A	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	A	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfie Disposal Method)	D10	D10-01	A	C	AK GATEWAY SD-MENTASTA LAKE SCHOOL
Injection wells (Class V) Large-Capacity Septic System (Drainfie Disposal Method)	D10	D10-02	A	C	
Landfills (municipal; Class III)	D51	D51-01	A	C	Mentasta Lake
Tanks, gasoline (above ground)	T10	T10-01	A	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	C	
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	A	C	Mentasta Village Clinic, Reckey# 1990330112901, Status: Inactive - A history of leakage from a 300 gallon heating fuel tank located behind the clinic building and next to clinic's well house resulted in fuel contaminated soils. Samples don't show contam
Highways and roads, dirt/gravel	X24	X24	A	C	Assume 1-20 roads in Zone A
Rail corridors	X30	X30-01	A	C	

*Contaminant Source Inventory and Risk Ranking for
Mentasta Washeteria/14 plex
Sources of Bacteria and Viruses*

PWSID 381498.001

Table 2

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Laundromats without dry cleaning	C22	C22-01	A	Low	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Medium	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	A	High	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	High	C	AK GATEWAY SD-MENTASTA LAKE SCHOOL
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	High	C	
Landfills (municipal; Class III)	D51	D51-01	A	High	C	Mentasta Lake
Highways and roads, dirt/gravel	X24	X24	A	Low	C	Assume 1-20 roads in Zone A

*Contaminant Source Inventory and Risk Ranking for
Mentasta Washeteria/14 plex
Sources of Nitrates/Nitrites*

PWSID 381498.001

Table 3

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Laundromats without dry cleaning	C22	C22-01	A	Low	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Medium	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	A	High	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	High	C	AK GATEWAY SD-MENTASTA LAKE SCHOOL
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	High	C	
Landfills (municipal; Class III)	D51	D51-01	A	Very High	C	Mentasta Lake
Highways and roads, dirt/gravel	X24	X24	A	Low	C	Assume 1-20 roads in Zone A

*Contaminant Source Inventory and Risk Ranking for
Mentasta Washeteria/14 plex
Sources of Volatile Organic Chemicals*

PWSID 381498.001

Table 4

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Laundromats without dry cleaning	C22	C22-01	A	Low	C	
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Low	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	A	Low	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	C	AK GATEWAY SD-MENTASTA LAKE SCHOOL
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	Low	C	
Landfills (municipal; Class III)	D51	D51-01	A	High	C	Mentasta Lake
Tanks, gasoline (above ground)	T10	T10-01	A	Medium	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	C	
Contaminated sites, DEC recognized, non-Superfund non-RCRA	U04	U04-01	A	High	C	Mentasta Village Clinic, Reckey# 1990330112901, Status: Inactive - A hi of leakage from a 300 gallon heating fuel tank located behind the clinic building and next to clinic's well house resulted in fuel contaminated soils. Samples don't show contam
Highways and roads, dirt/gravel	X24	X24	A	Low	C	Assume 1-20 roads in Zone A
Rail corridors	X30	X30-01	A	Medium	C	

*Contaminant Source Inventory and Risk Ranking for
Mentasta Washeteria/14 plex*

PWSID 381498.001

Table 5

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Low	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	A	Low	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	C	AK GATEWAY SD-MENTASTA LAKE SCHOOL
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	Low	C	
Landfills (municipal; Class III)	D51	D51-01	A	High	C	Mentasta Lake
Tanks, gasoline (above ground)	T10	T10-01	A	Medium	C	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	C	
Contaminated sites, DEC recognized, non-Superfund non-RCRA	U04	U04-01	A	Low	C	Mentasta Village Clinic, Reckey# 1990330112901, Status: Inactive - A hi of leakage from a 300 gallon heating fuel tank located behind the clinic building and next to clinic's well house resulted in fuel contaminated soils. Samples don't show contam
Highways and roads, dirt/gravel	X24	X24	A	Low	C	Assume 1-20 roads in Zone A
Rail corridors	X30	X30-01	A	Low	C	

*Contaminant Source Inventory and Risk Ranking for
Mentasta Washeteria/14 plex
Sources of Synthetic Organic Chemicals*

PWSID 381498.001

Table 6

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Low	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	A	Low	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	C	AK GATEWAY SD-MENTASTA LAKE SCHOOL
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	Low	C	
Landfills (municipal; Class III)	D51	D51-01	A	Very High	C	Mentasta Lake
Contaminated sites, DEC recognized, non-Superfund non-RCRA	U04	U04-01	A	Low	C	Mentasta Village Clinic, Reckey# 1990330112901, Status: Inactive - A hi of leakage from a 300 gallon heating fuel tank located behind the clinic building and next to clinic's well house resulted in fuel contaminated soils. Samples don't show contam
Rail corridors	X30	X30-01	A	Medium	C	

*Contaminant Source Inventory and Risk Ranking for
Mentasta Washeteria/14 plex
Sources of Other Organic Chemicals*

PWSID 381498.001

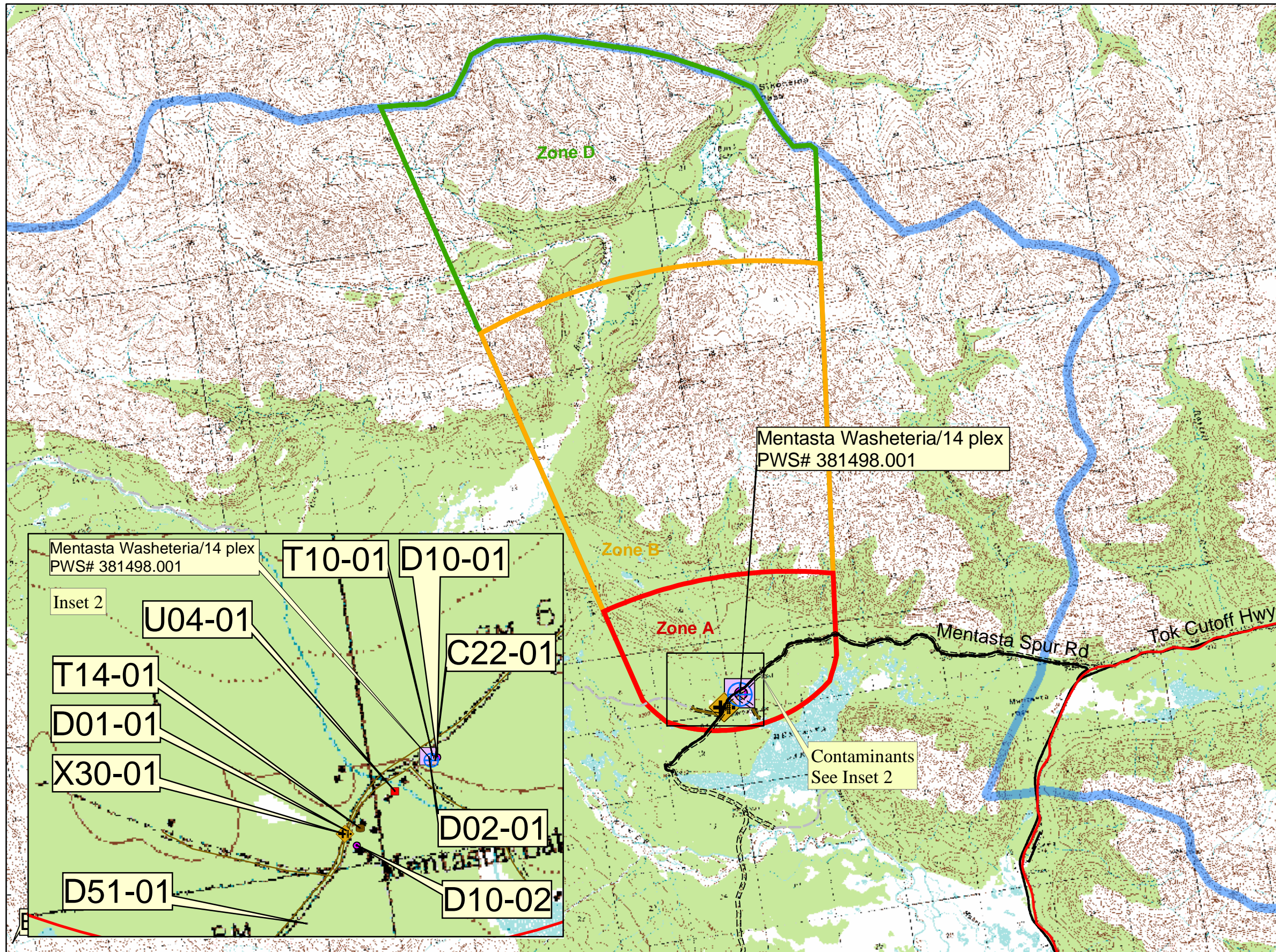
Table 7

<i>Contaminant Source Type</i>	<i>Contaminant Source ID</i>	<i>CS ID tag</i>	<i>Zone</i>	<i>Risk Ranking for Analysis</i>	<i>Map Number</i>	<i>Comments</i>
Domestic wastewater collection systems (sewer line or lift stations)	D01	D01-01	A	Low	C	
Domestic wastewater treatment plant disposal ponds/lagoons	D02	D02-01	A	Low	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	C	AK GATEWAY SD-MENTASTA LAKE SCHOOL
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	Low	C	
Landfills (municipal; Class III)	D51	D51-01	A	Very High	C	Mentasta Lake
Contaminated sites, DEC recognized, non-Superfund non-RCRA	U04	U04-01	A	Low	C	Mentasta Village Clinic, Reckey# 1990330112901, Status: Inactive - A hi of leakage from a 300 gallon heating fuel tank located behind the clinic building and next to clinic's well house resulted in fuel contaminated soils. Samples don't show contam
Highways and roads, dirt/gravel	X24	X24	A	Low	C	Assume 1-20 roads in Zone A
Rail corridors	X30	X30-01	A	Low	C	

APPENDIX C

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

**Public Water Well System for PWS# 381498.001 Mentasta Washeteria/14 plex
Sources of Potential and Existing Contamination**

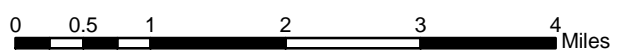


LEGEND

Public Water System Well	
Hydrography/Physical	
Parcels	
Stream	
Lake or Pond	
Contours	
Watershed Boundary	
Transportation	
Primary Route (Class 1)	
Secondary Route (Class 2)	
Road (Class 3)	
Road (Class 4)	
Road (Class 5, Four-wheel drive)	
Groundwater Protection Zones	
Zone A Protection Area– Several Months Travel Time	
Zone B Protection Area– 2 Years Travel Time	
Zone D Protection Area– 10 Years Travel Time or watershed boundary	
Existing or Potential Contaminant Sources	
C22- Laundromats without dry cleaning	
D01- Domestic wastewater collection systems (sewer lines or lift stations)	
D02- Domestic wastewater treatment plant disposal ponds/lagoons	
D10- Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	
D51- Landfills (municipal; Class III)	
T10- Tanks, gasoline (above ground)	
T14 - Nonresidential aboveground heating oil tank	
U04- Contaminated sites, DEC recognized, non-Superfund, non-RCRA	
X30- Rail corridors	
Data Sources: Contaminant Sources, Public Water System Wells, Contours Alaska Department of Environmental Conservation (ADEC)	
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.	

Inset 2

Inset 1



APPENDIX D

Vulnerability Analysis for Public Drinking Water Source (Charts 1-14)

Chart 1. Susceptibility of the wellhead - Mentasta Washeteria/14 plex (PWS No. 381498.001)

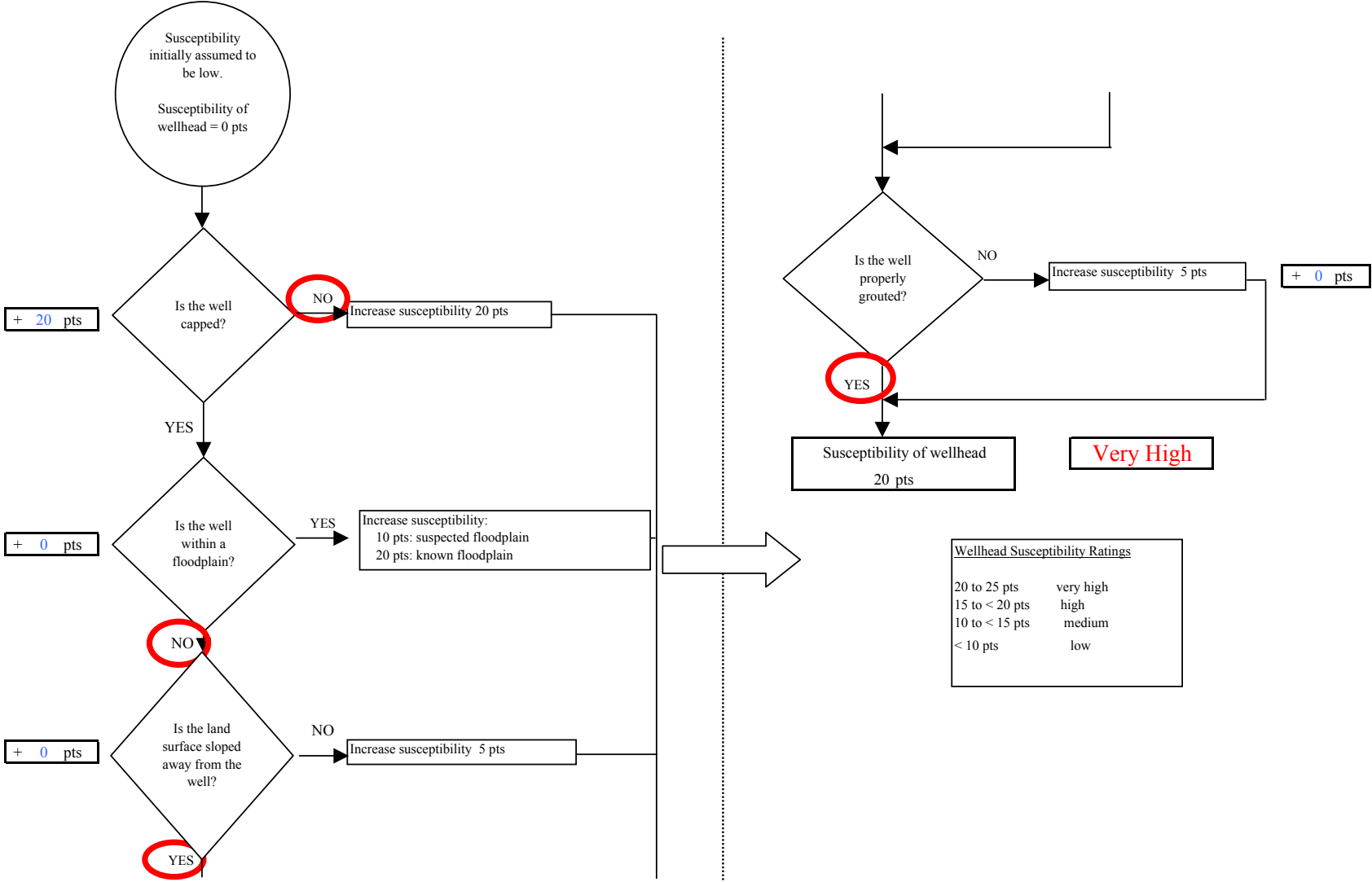


Chart 2. Susceptibility of the aquifer Mentasta Washeteria/14 plex (PWS No. 381498.001)

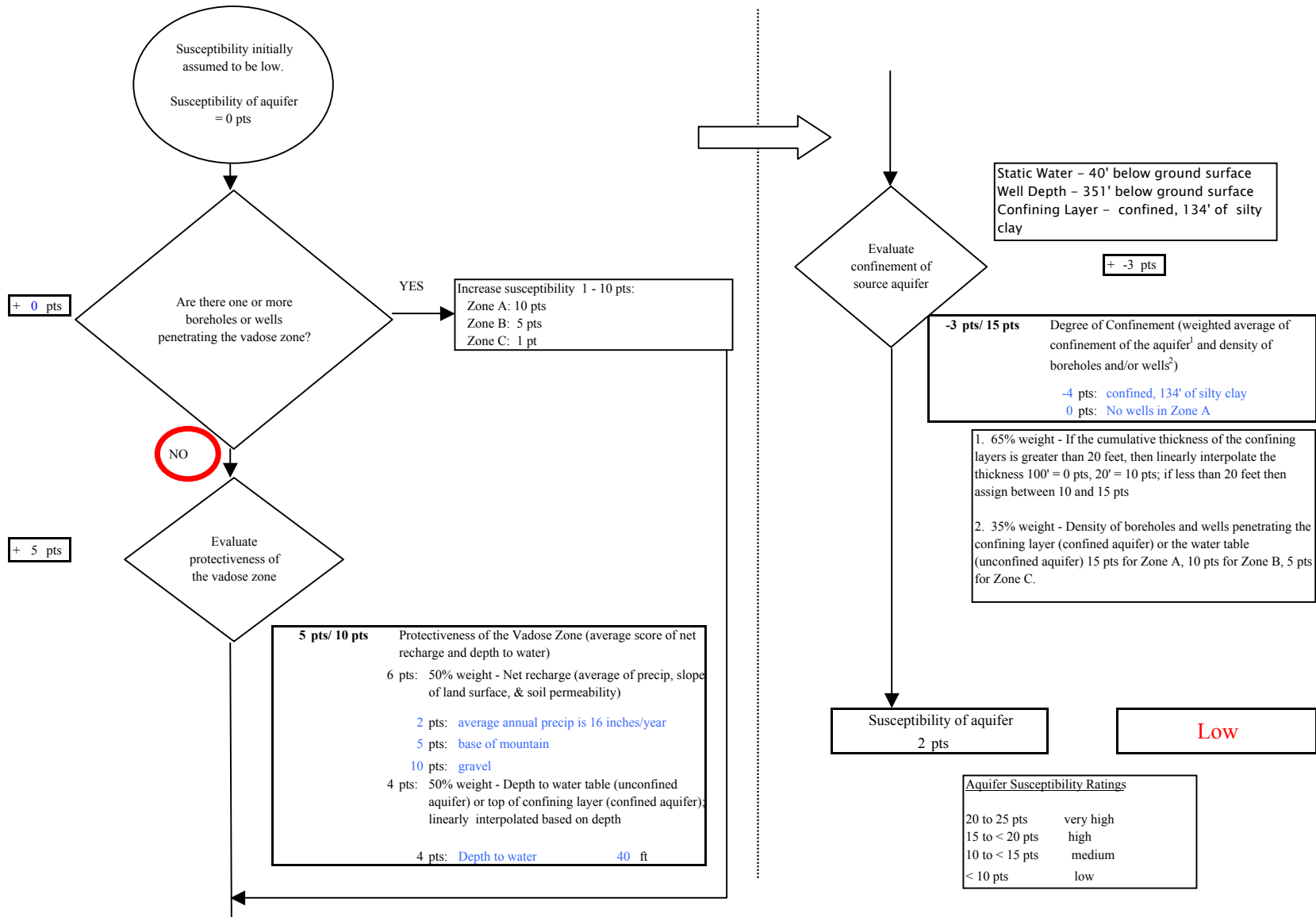


Chart 3. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Bacteria & Viruses

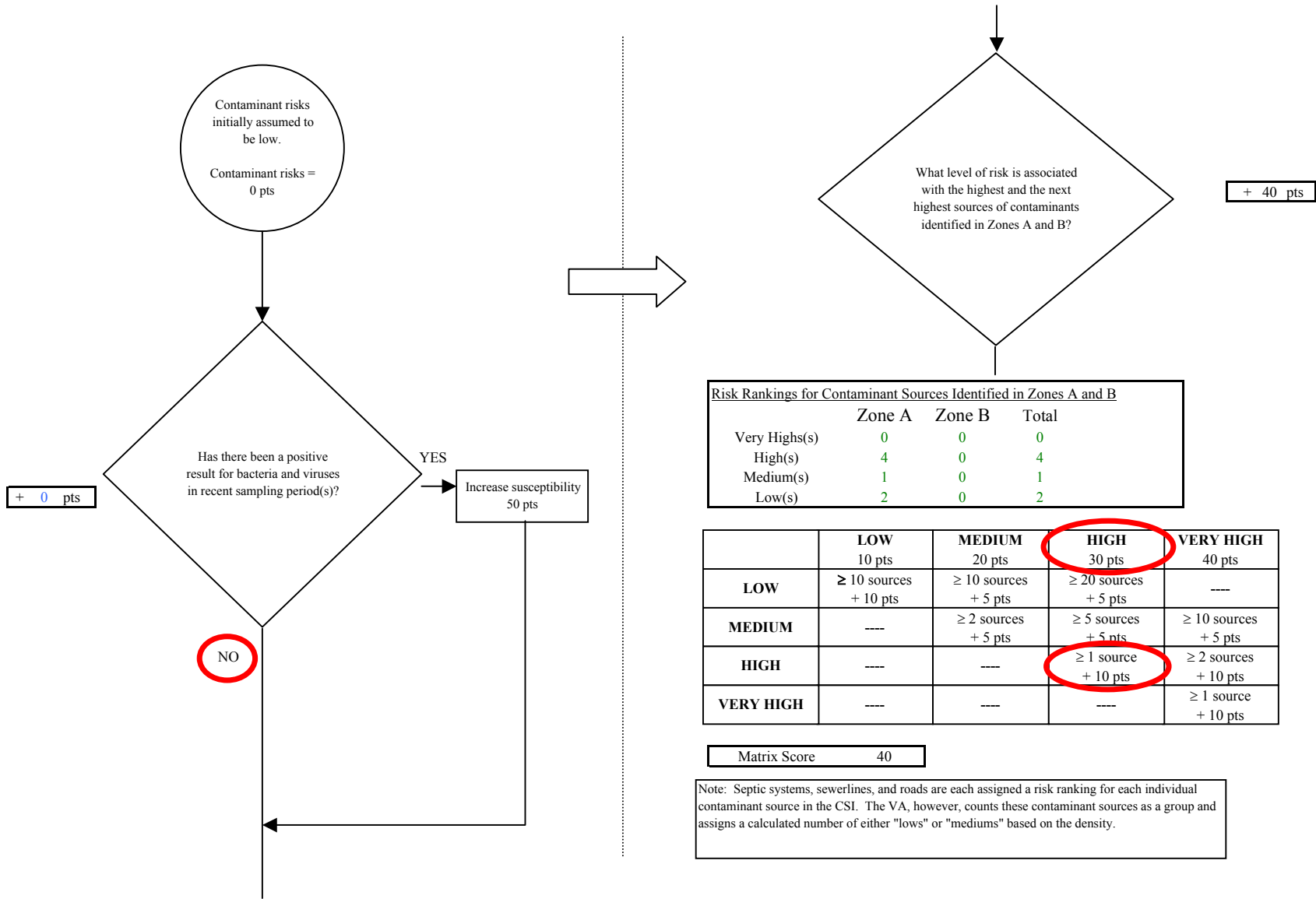


Chart 3. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Bacteria & Viruses

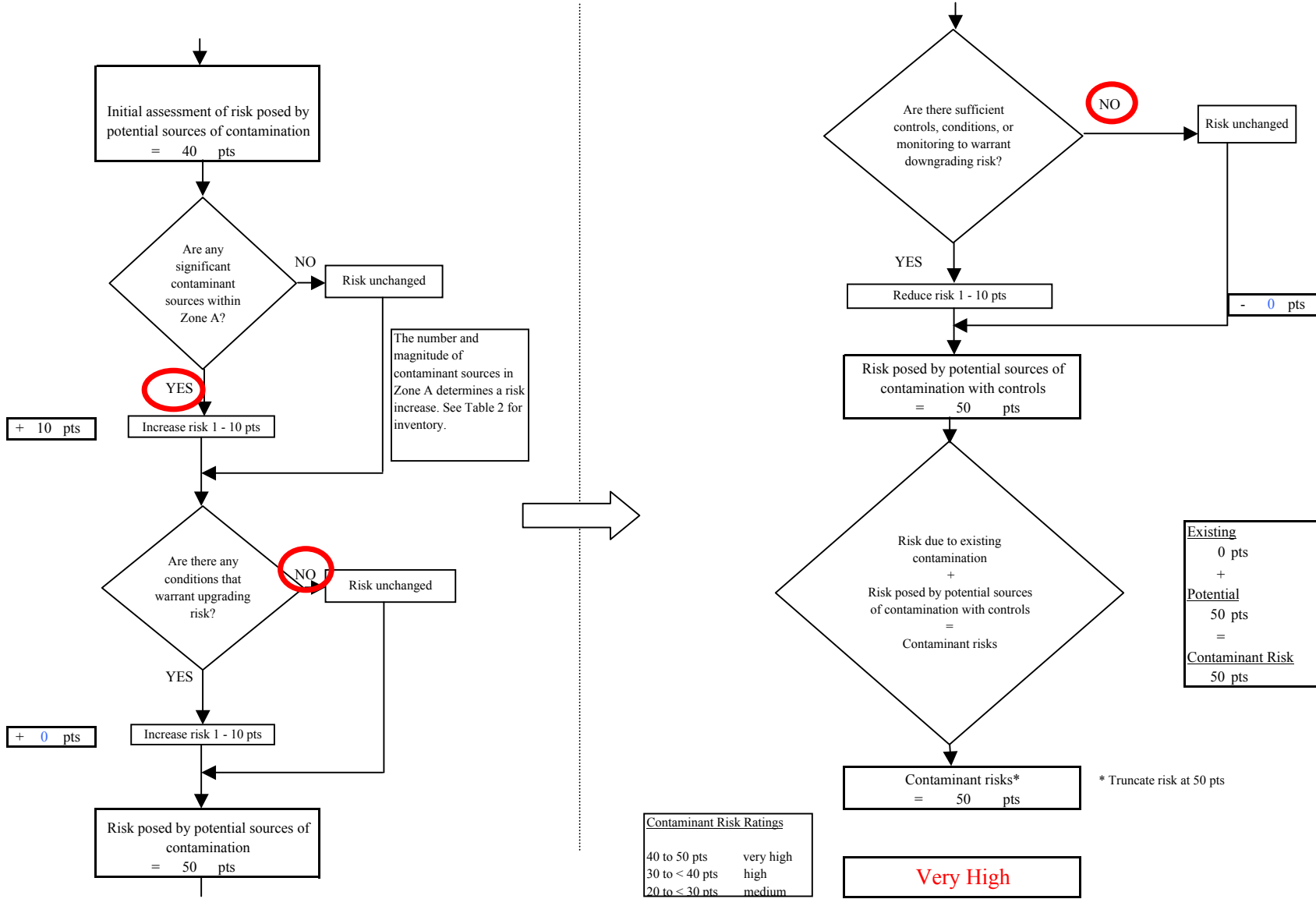


Chart 4. Vulnerability analysis for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Bacteria & Viruses

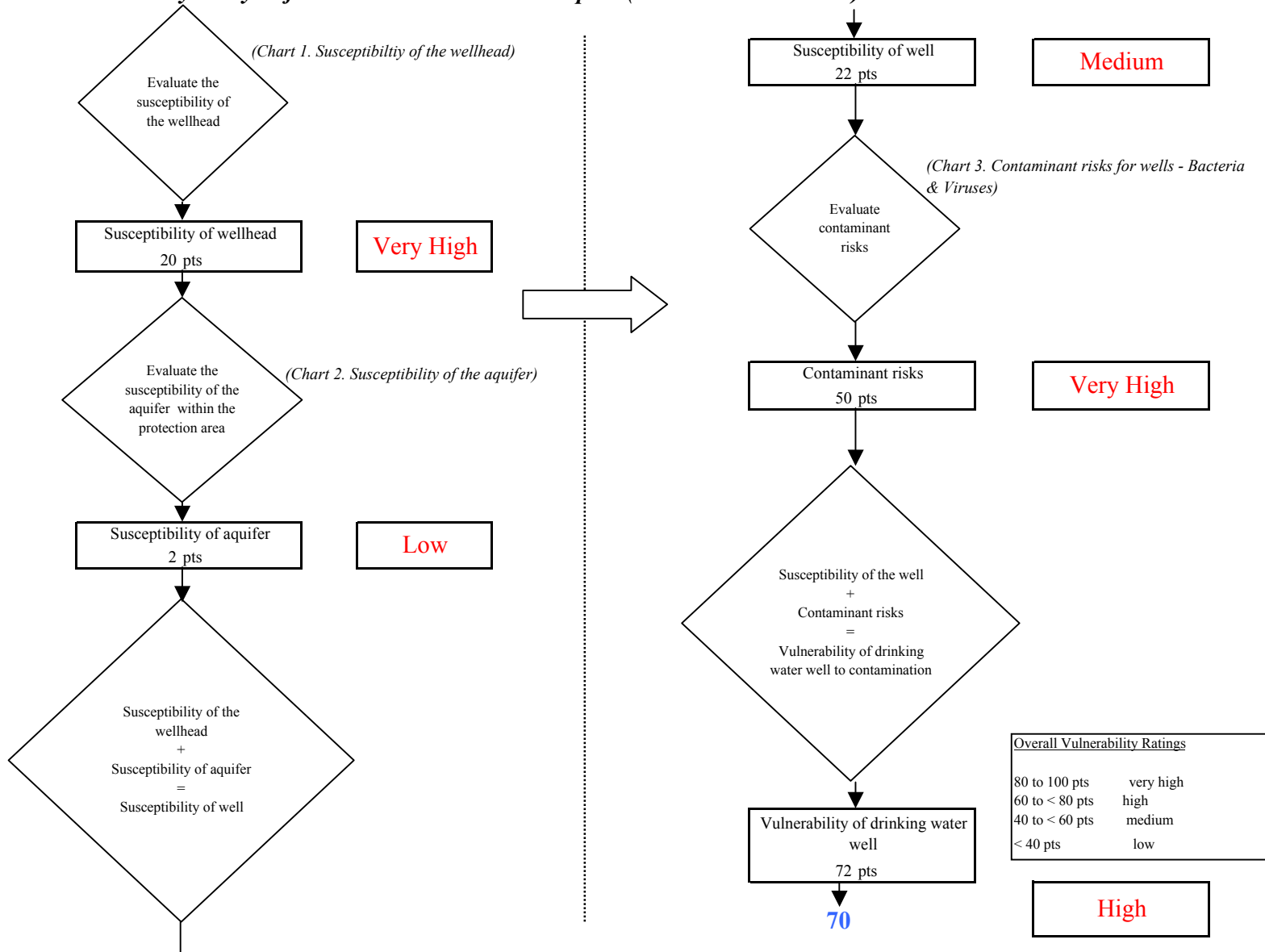


Chart 5. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Nitrates and Nitrites

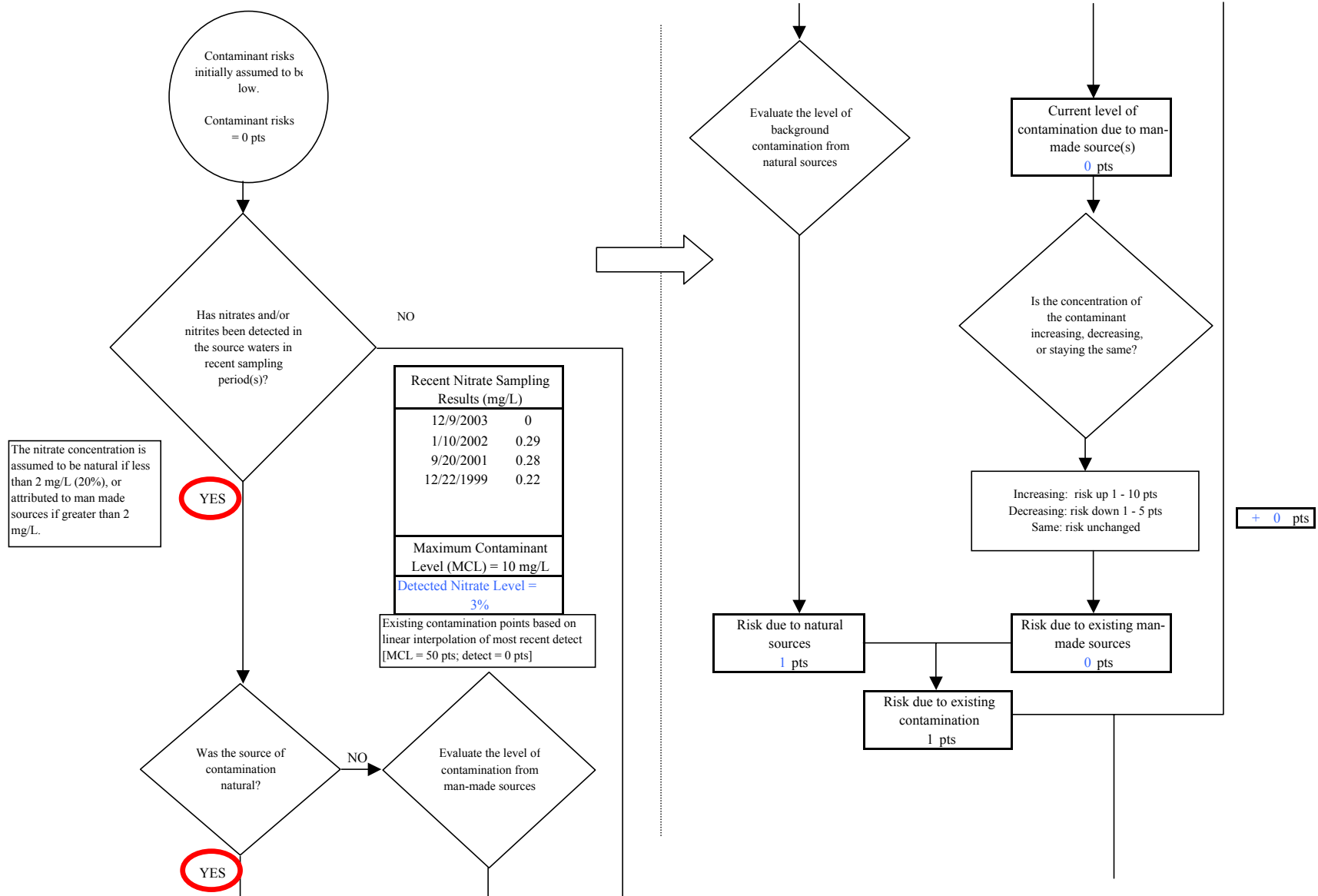


Chart 5. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Nitrates and Nitrites

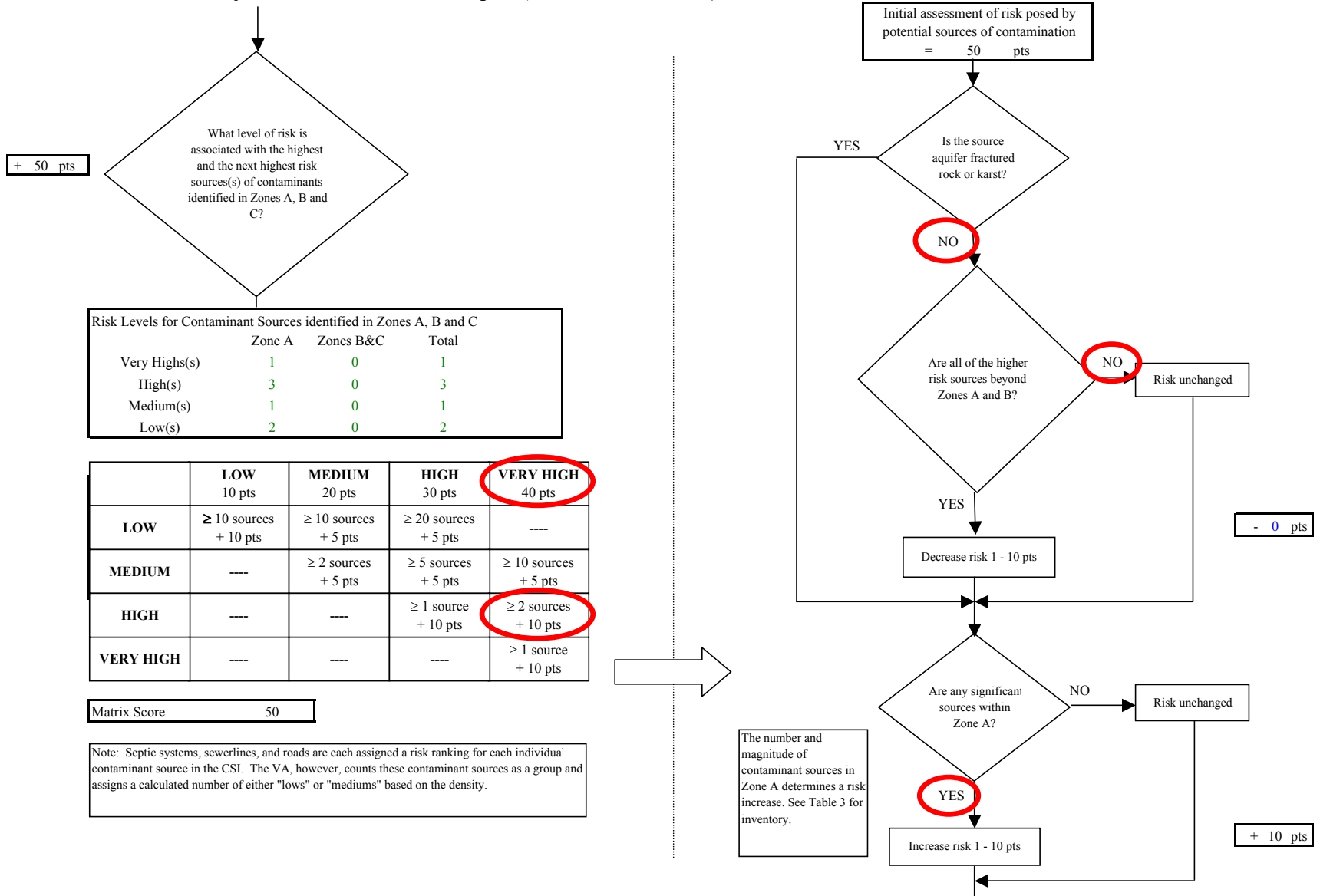


Chart 5. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Nitrates and Nitrites

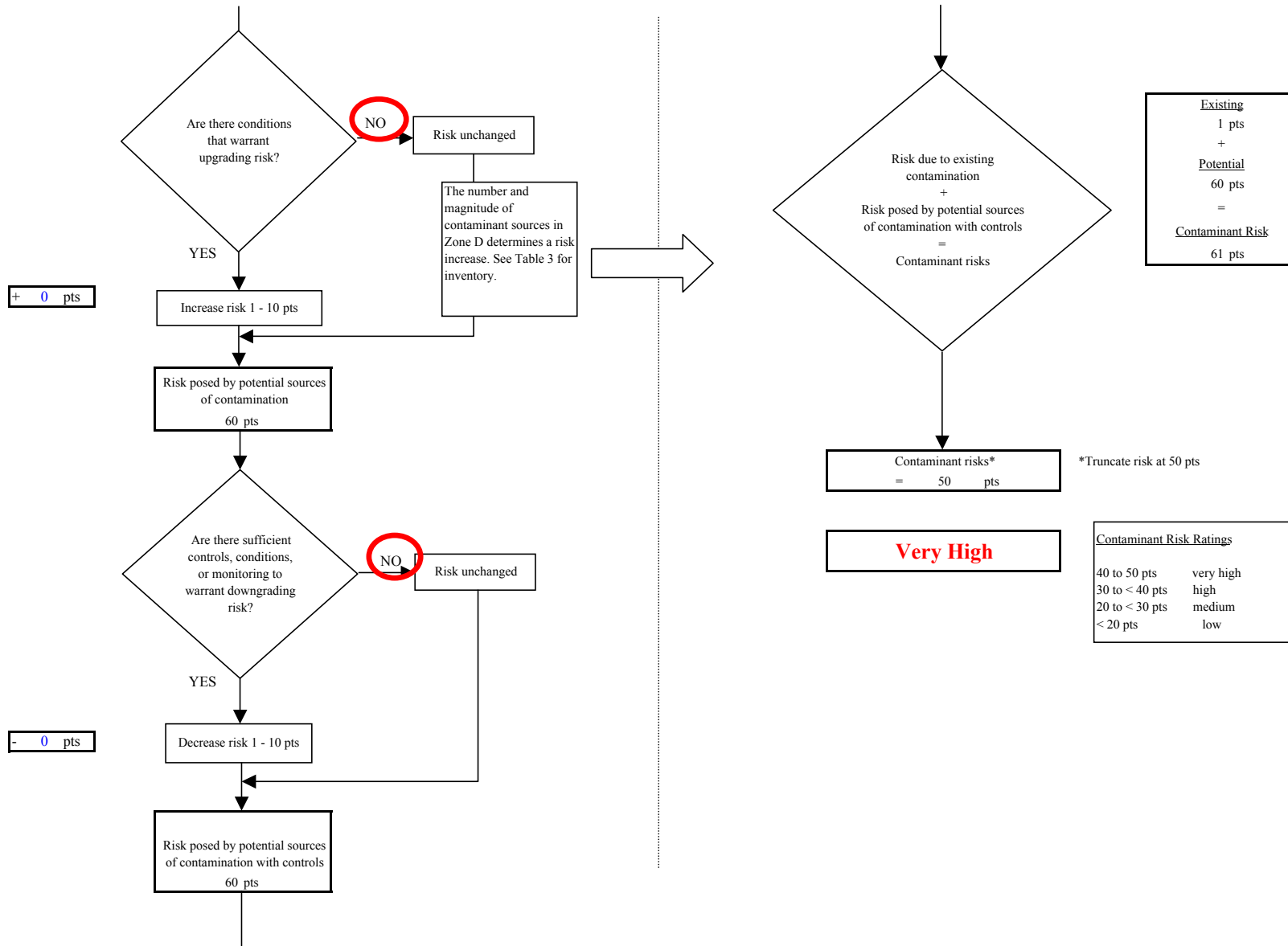


Chart 6. Vulnerability analysis for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Nitrates and Nitrites

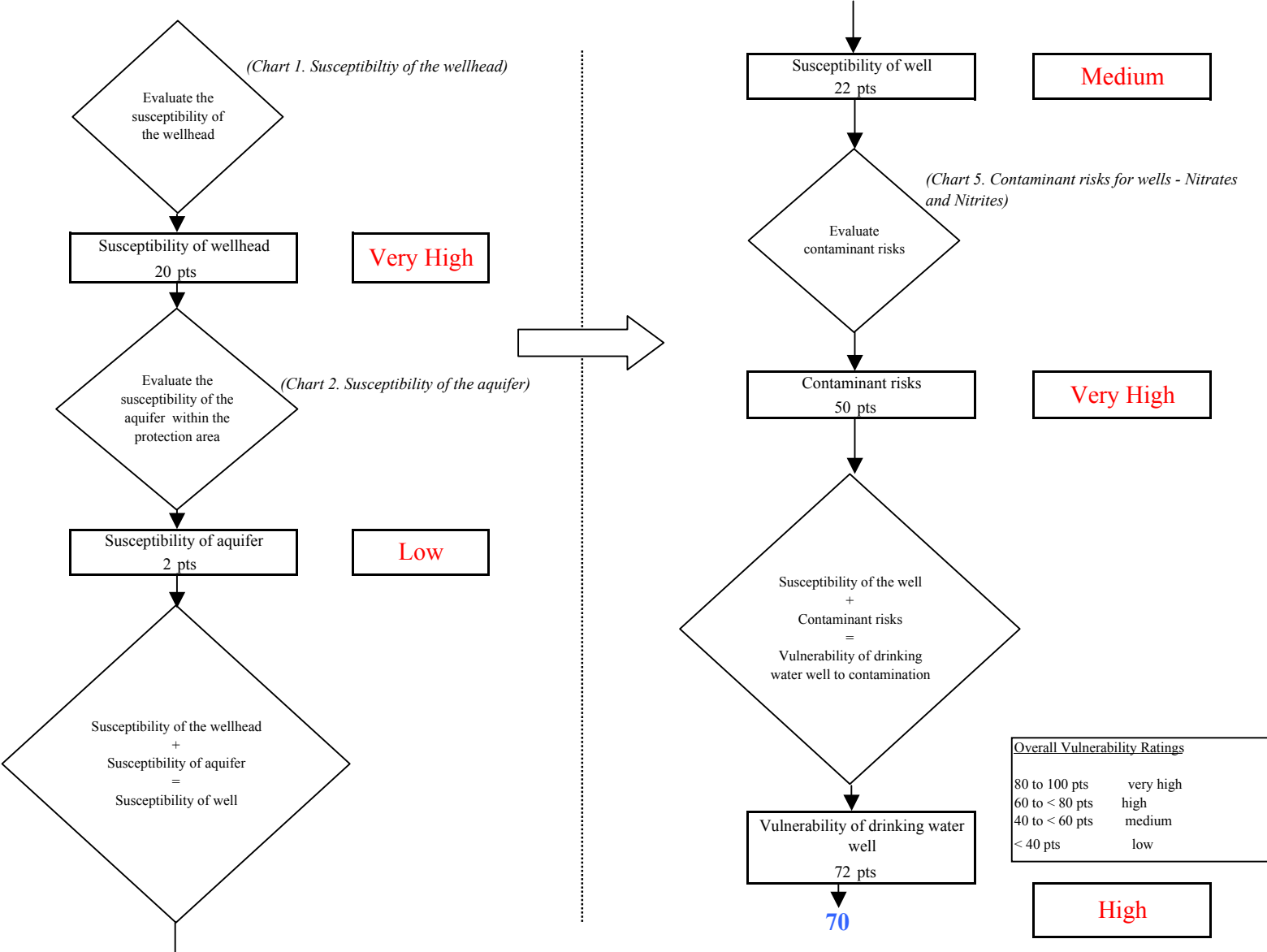


Chart 7. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Volatile Organic Chemicals

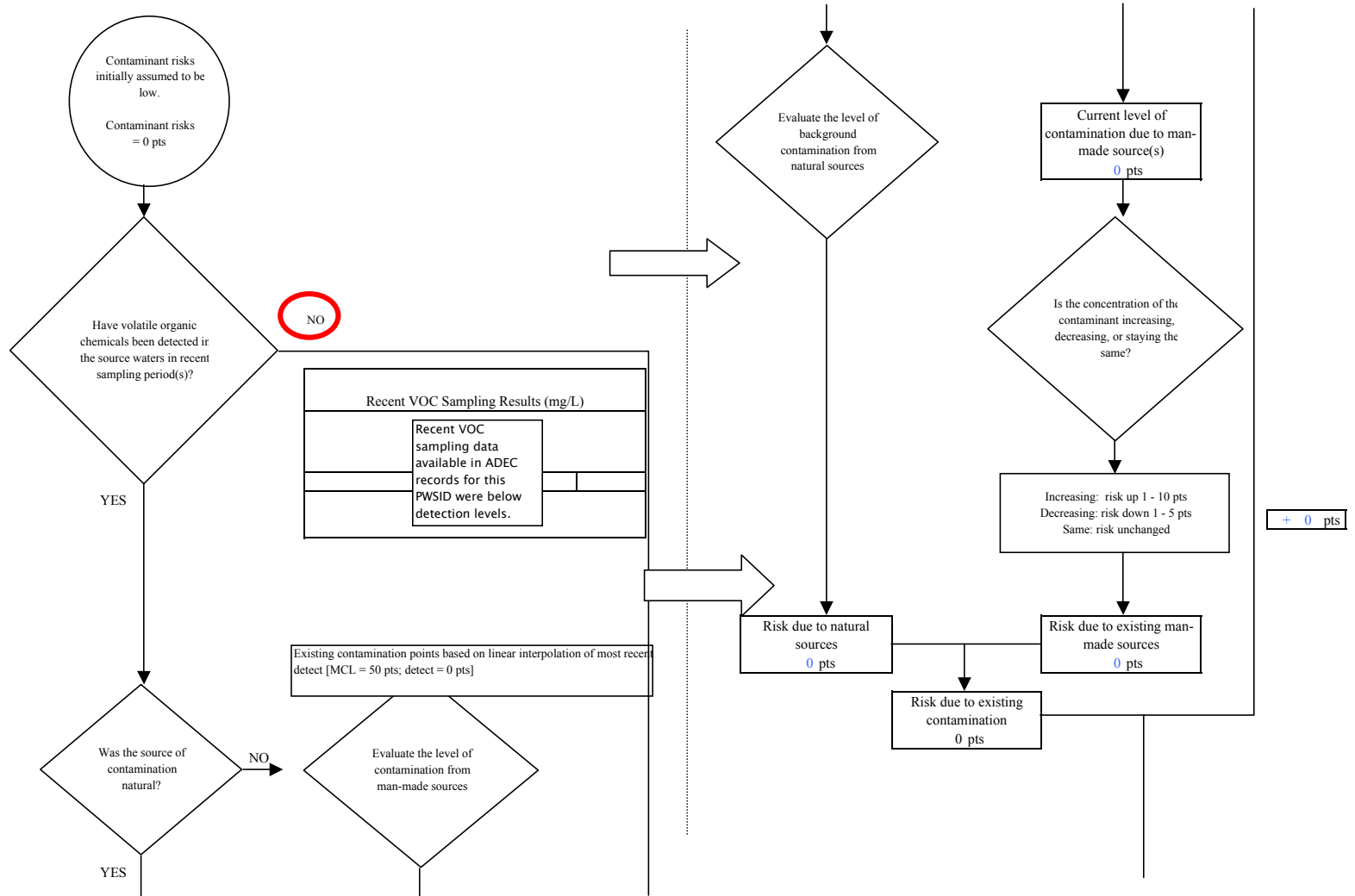


Chart 7. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Volatile Organic Chemicals

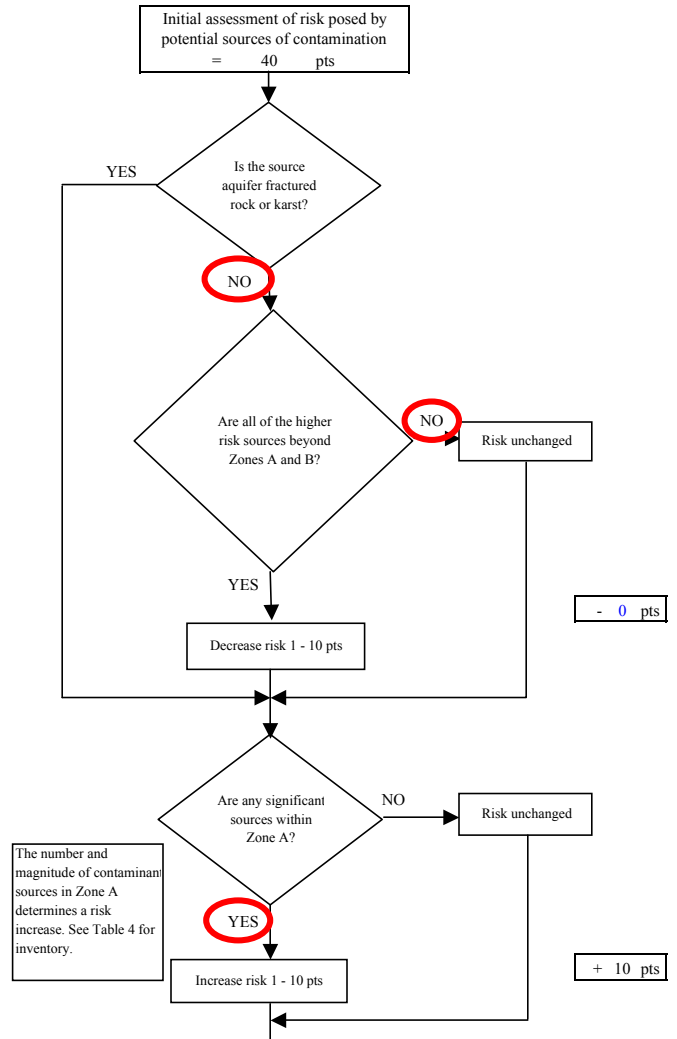
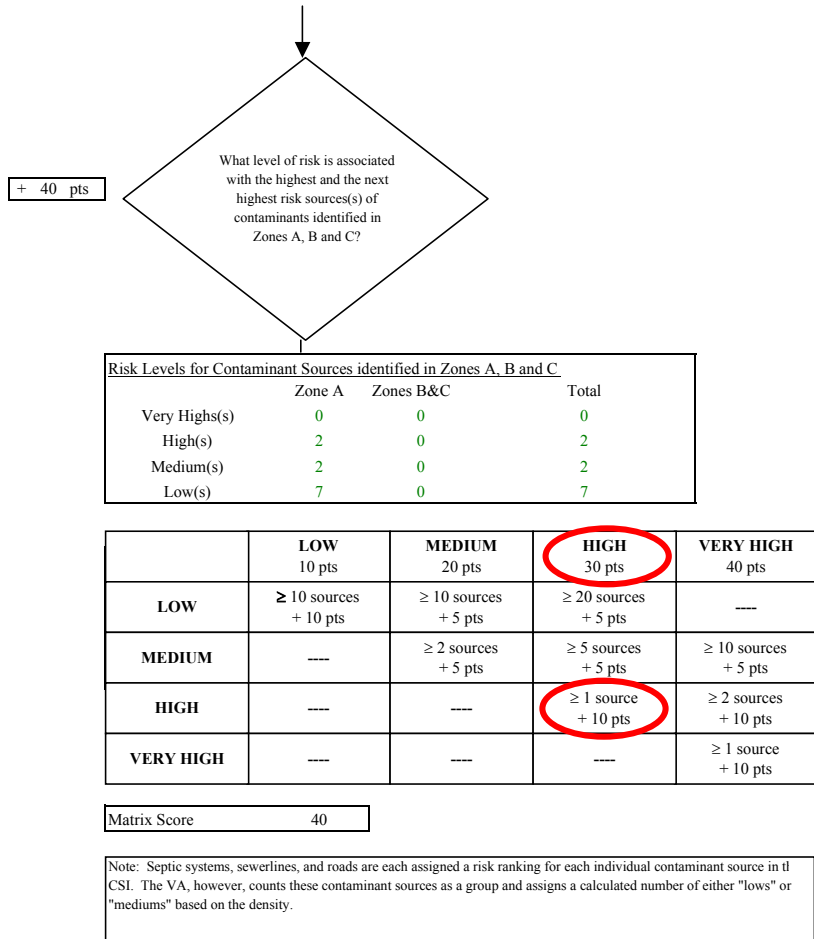


Chart 7. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Volatile Organic Chemicals

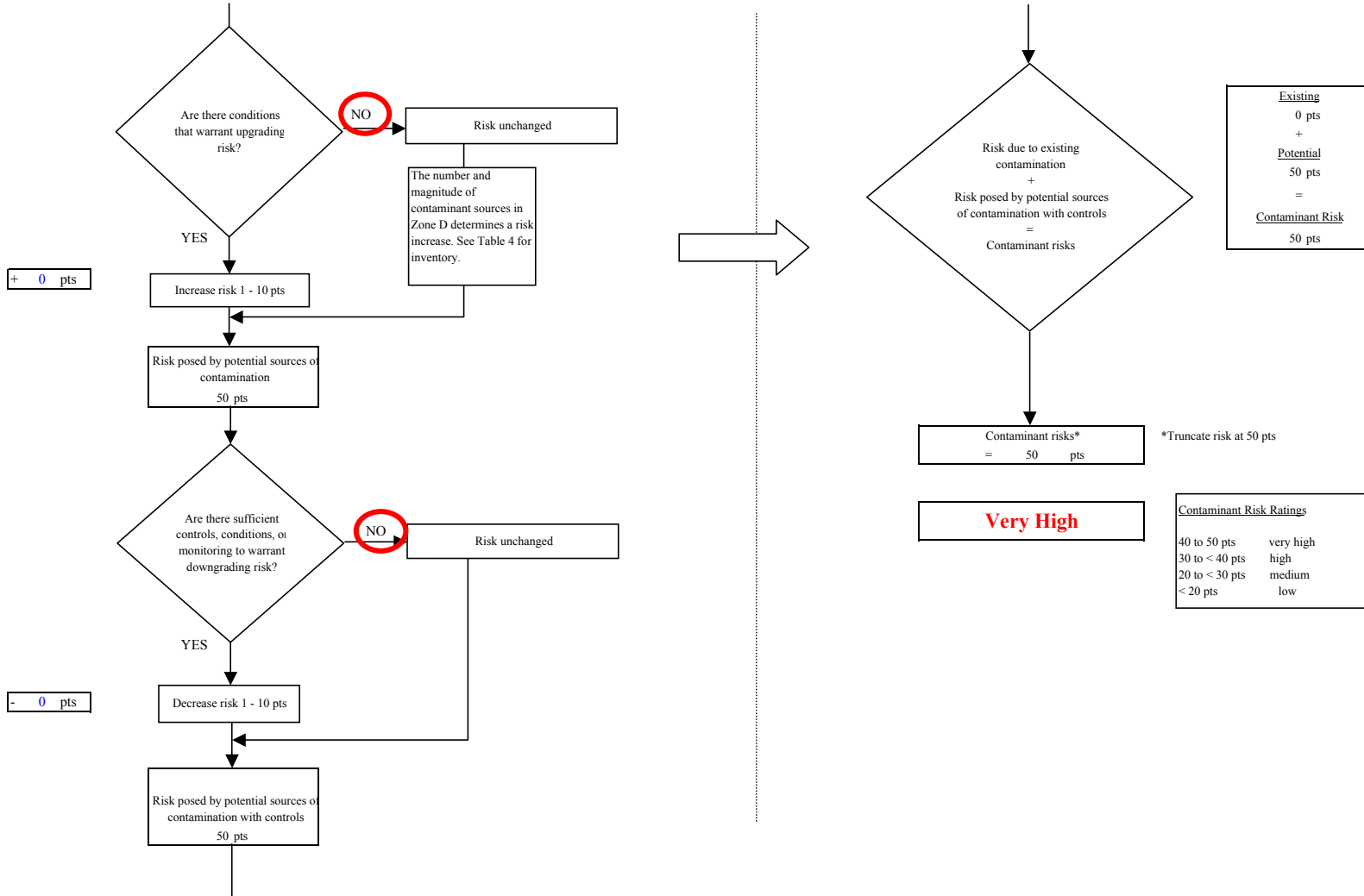


Chart 8. Vulnerability analysis for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Volatile Organic Chemicals

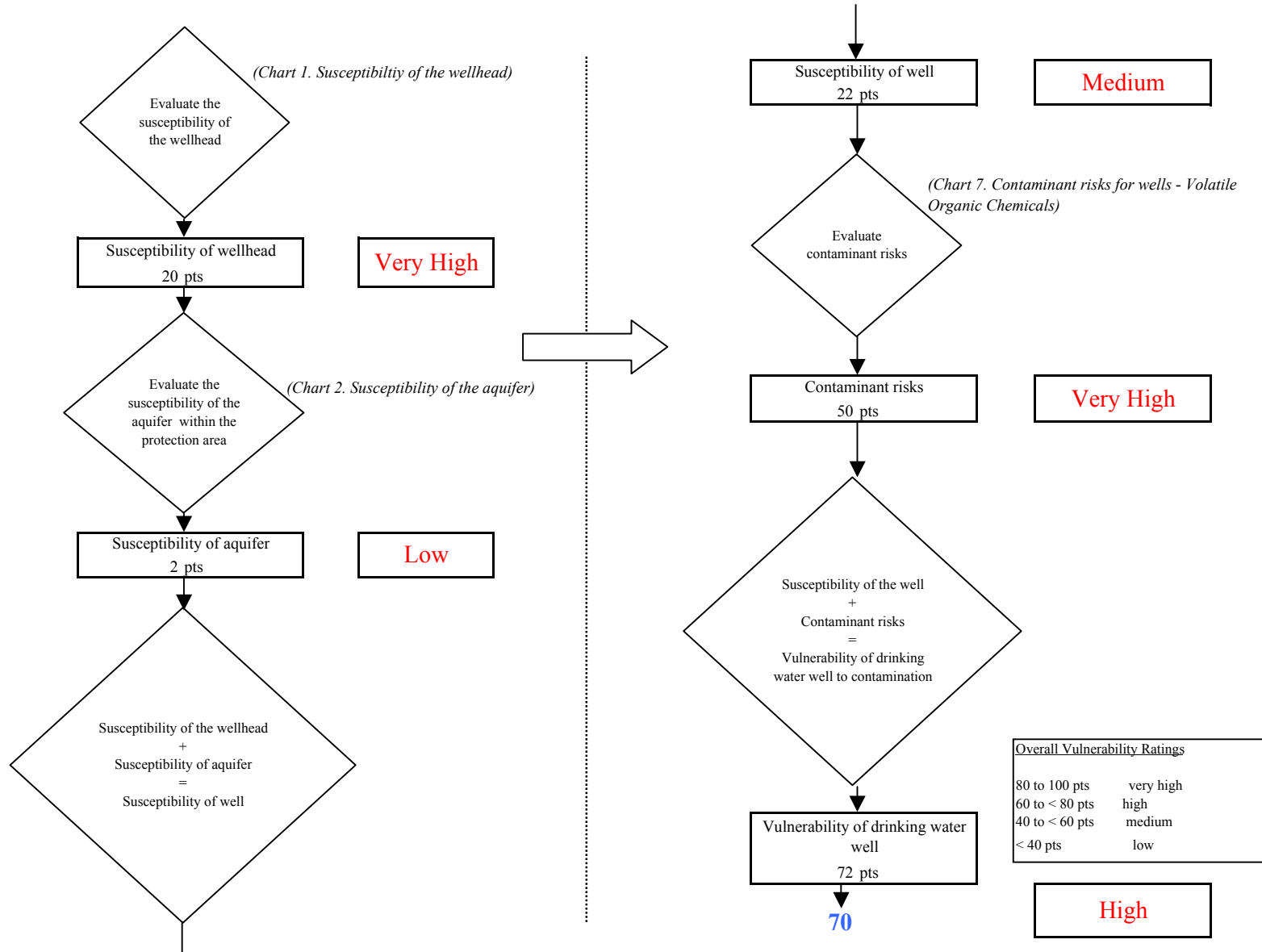


Chart 9. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

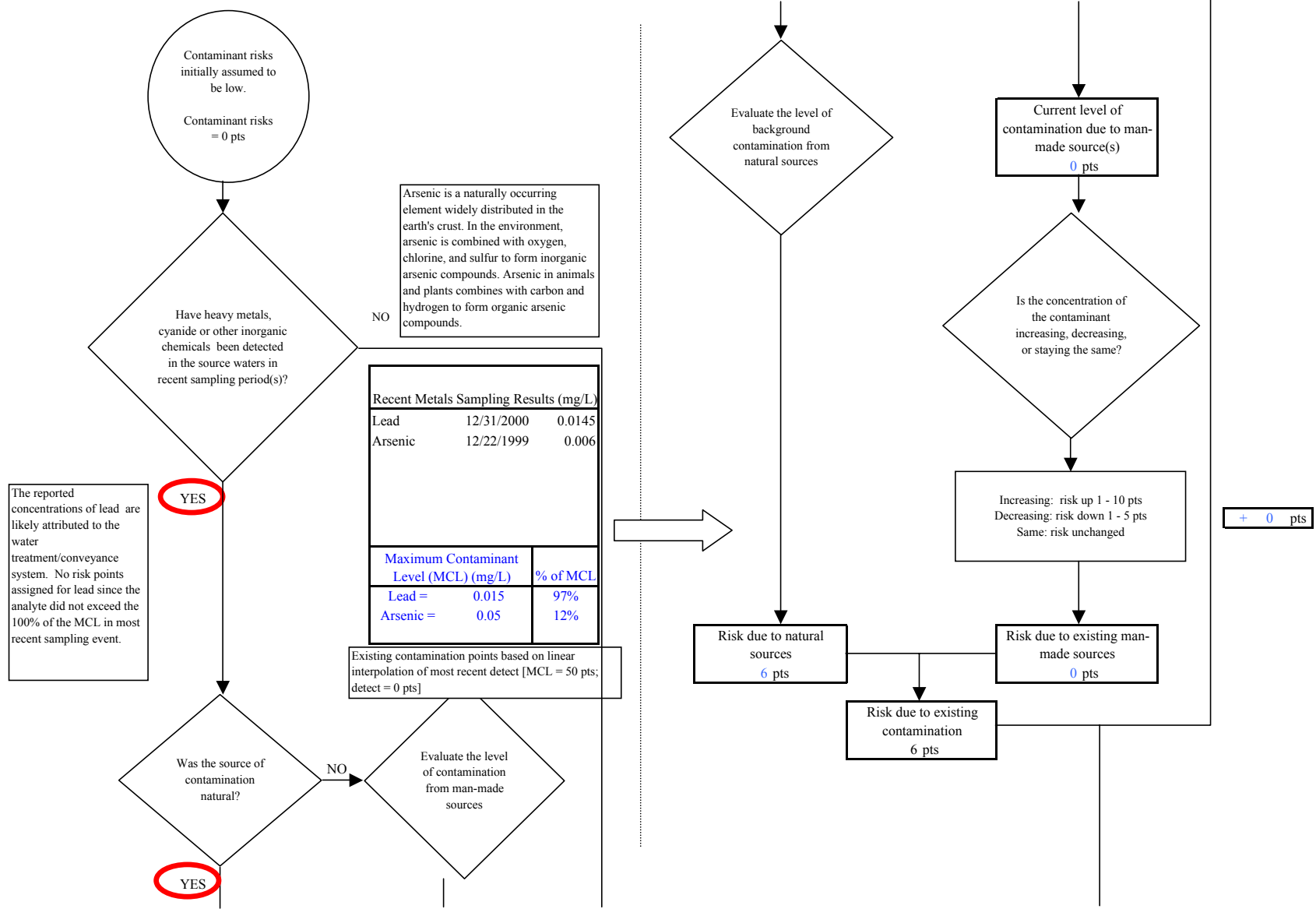


Chart 9. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

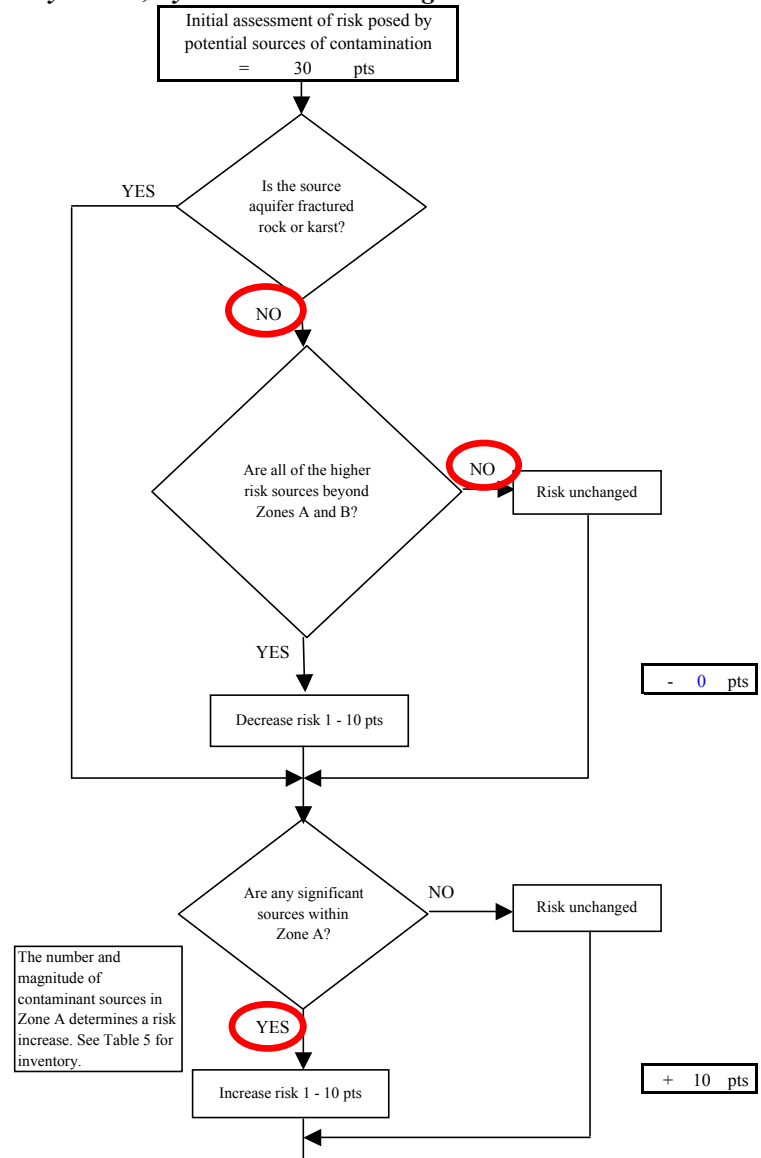
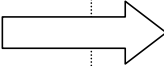
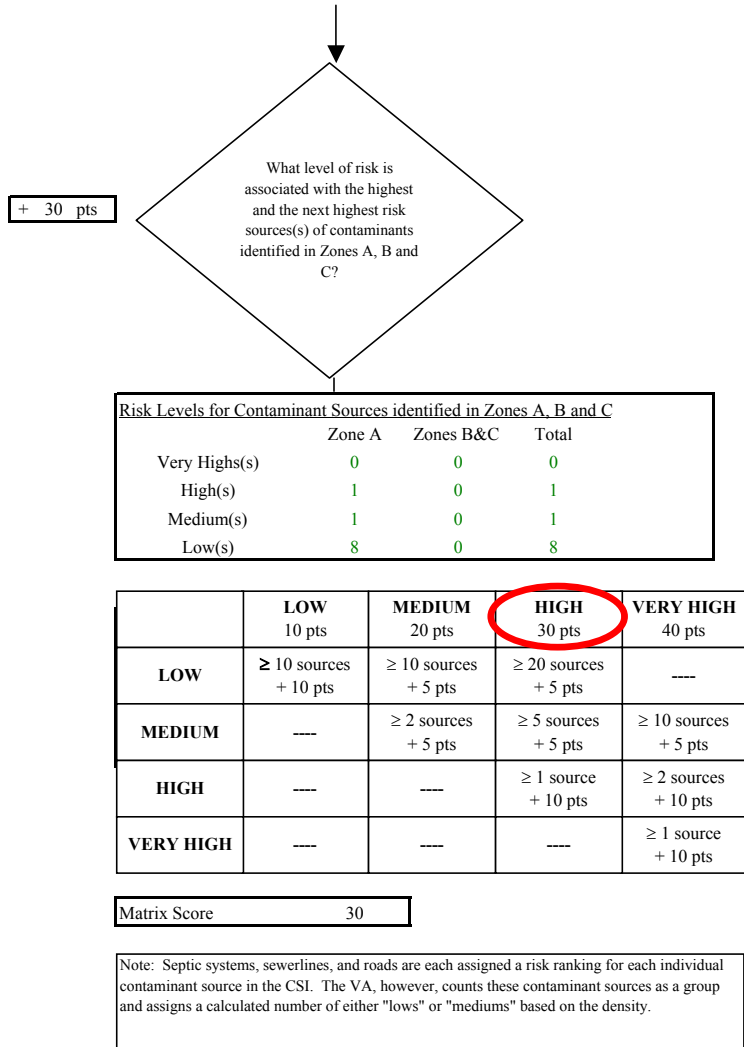


Chart 9. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

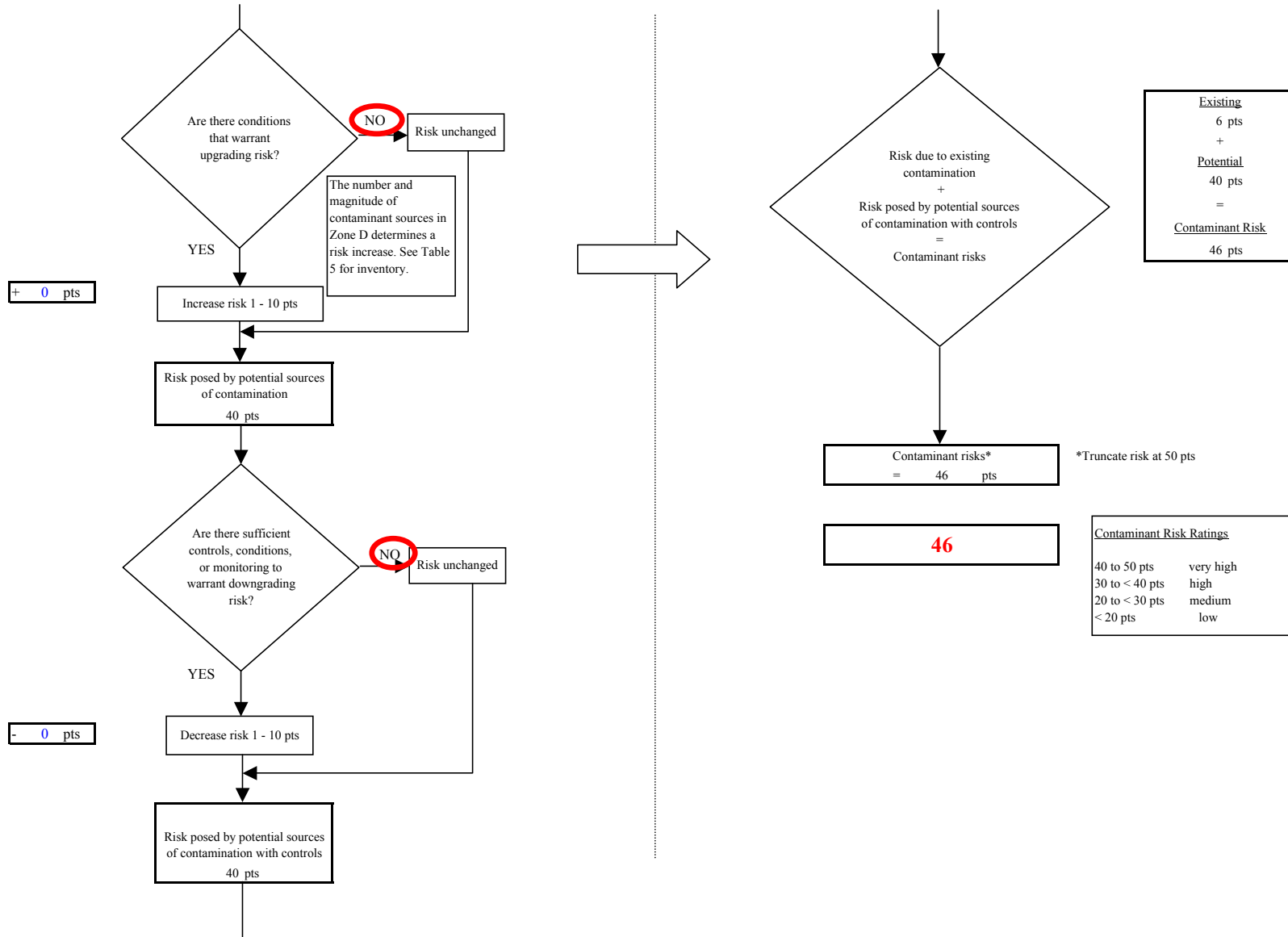


Chart 10. Vulnerability analysis for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

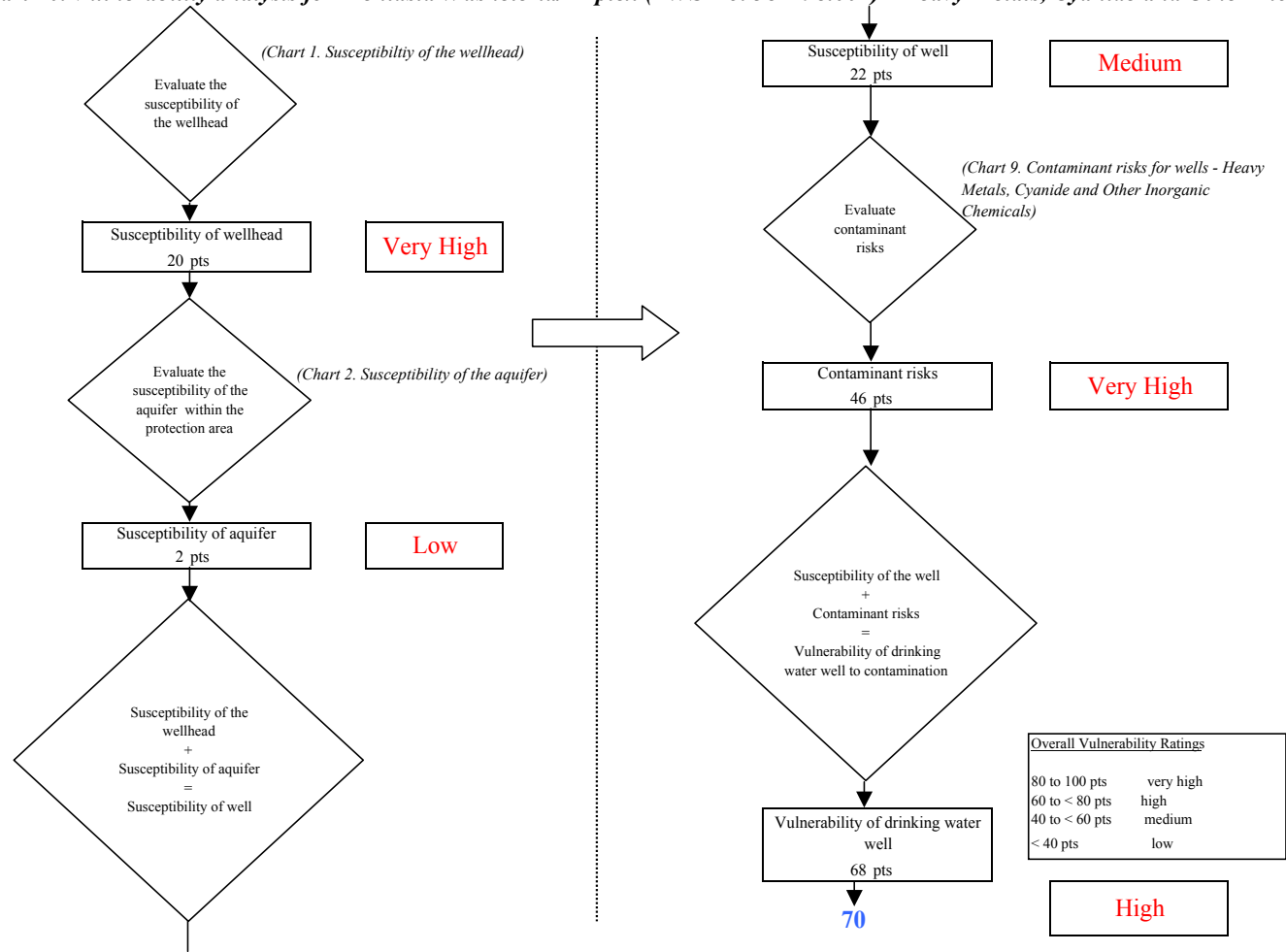


Chart 11. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Synthetic Organic Chemicals

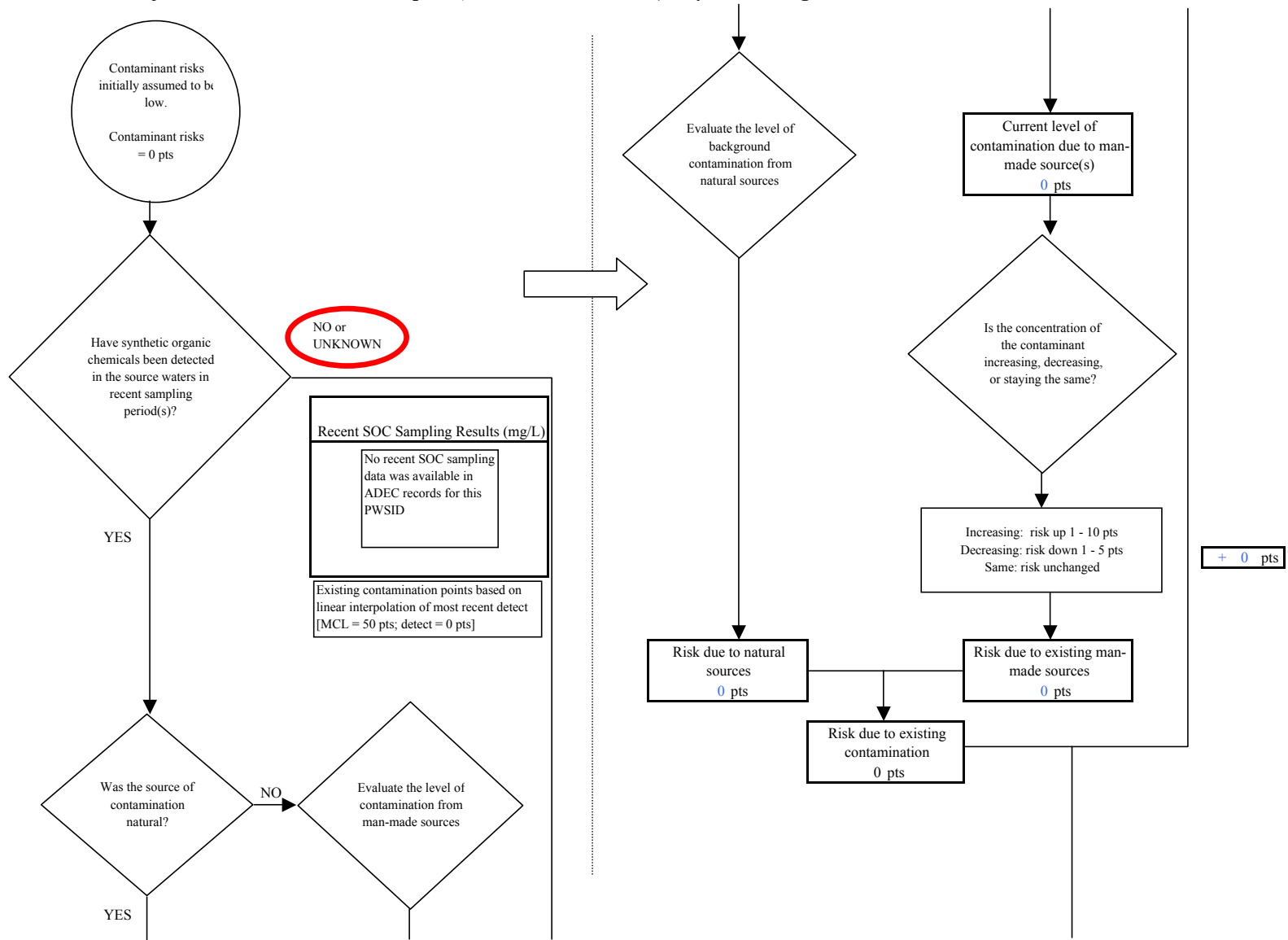
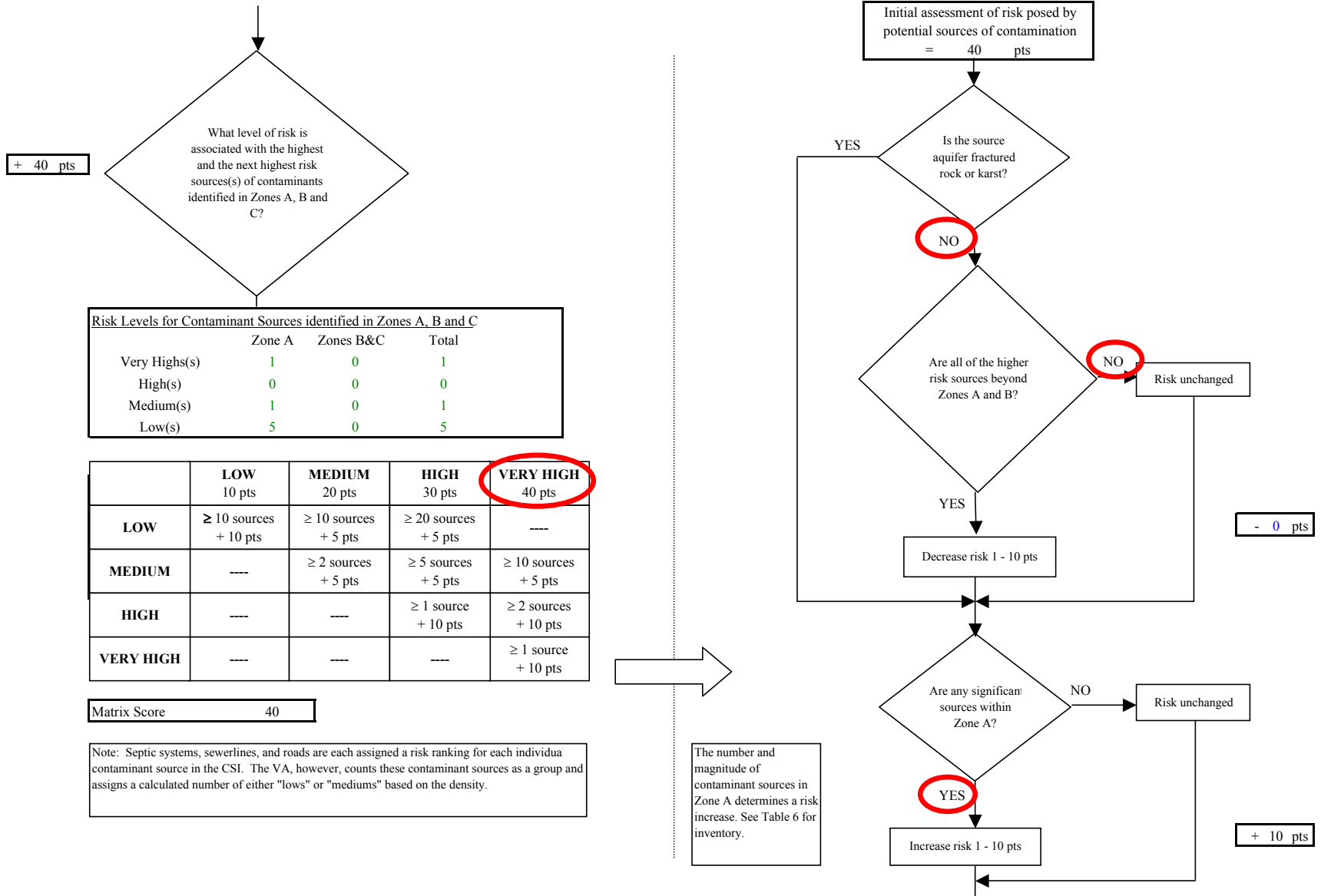


Chart 11. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Synthetic Organic Chemicals



Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very High(s)	1	0	1
High(s)	0	0	0
Medium(s)	1	0	1
Low(s)	5	0	5

	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 40

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.

The number and magnitude of contaminant sources in Zone A determines a risk increase. See Table 6 for inventory.

Chart 11. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Synthetic Organic Chemicals

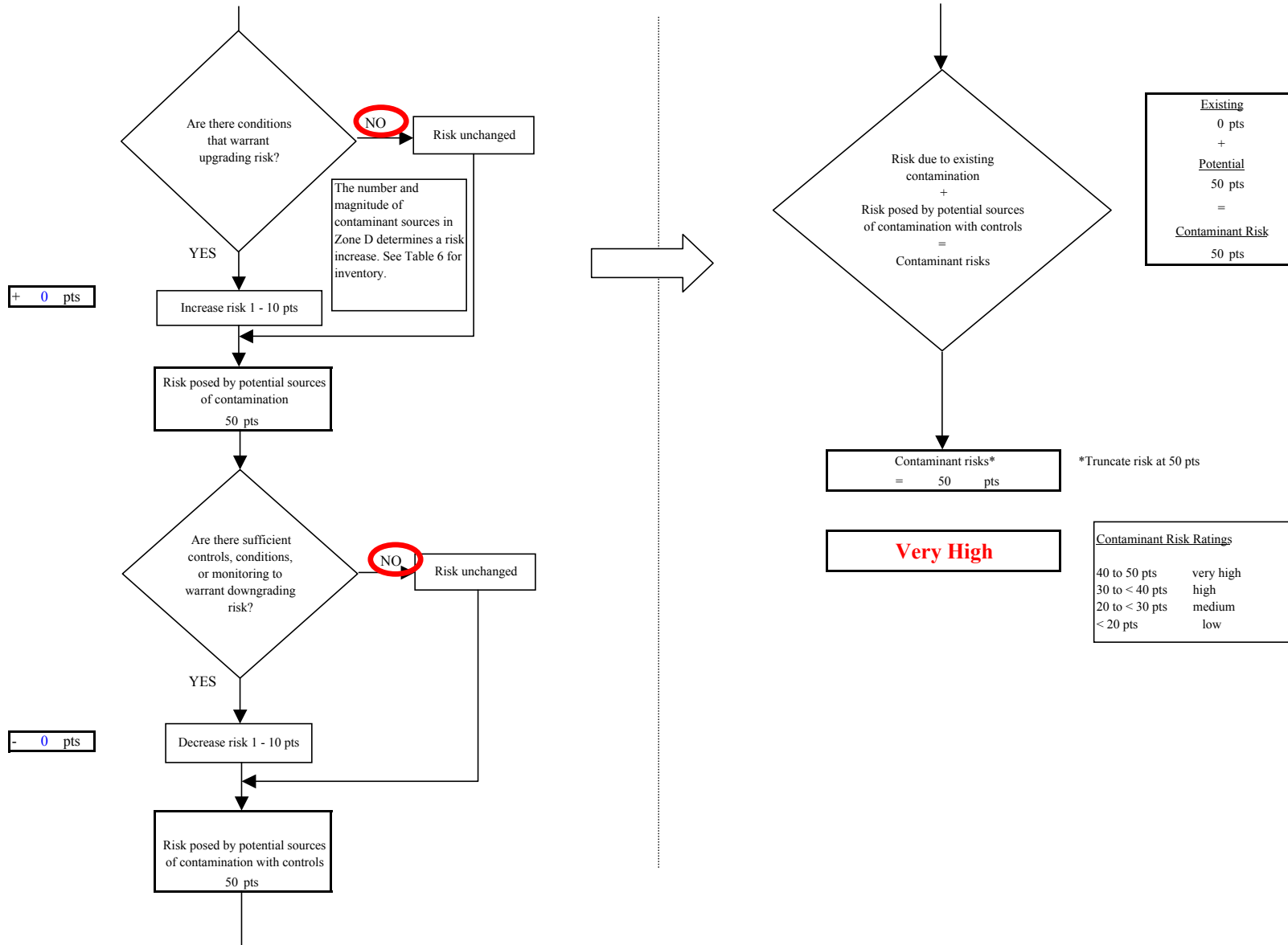


Chart 12. Vulnerability analysis for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Synthetic Organic Chemicals

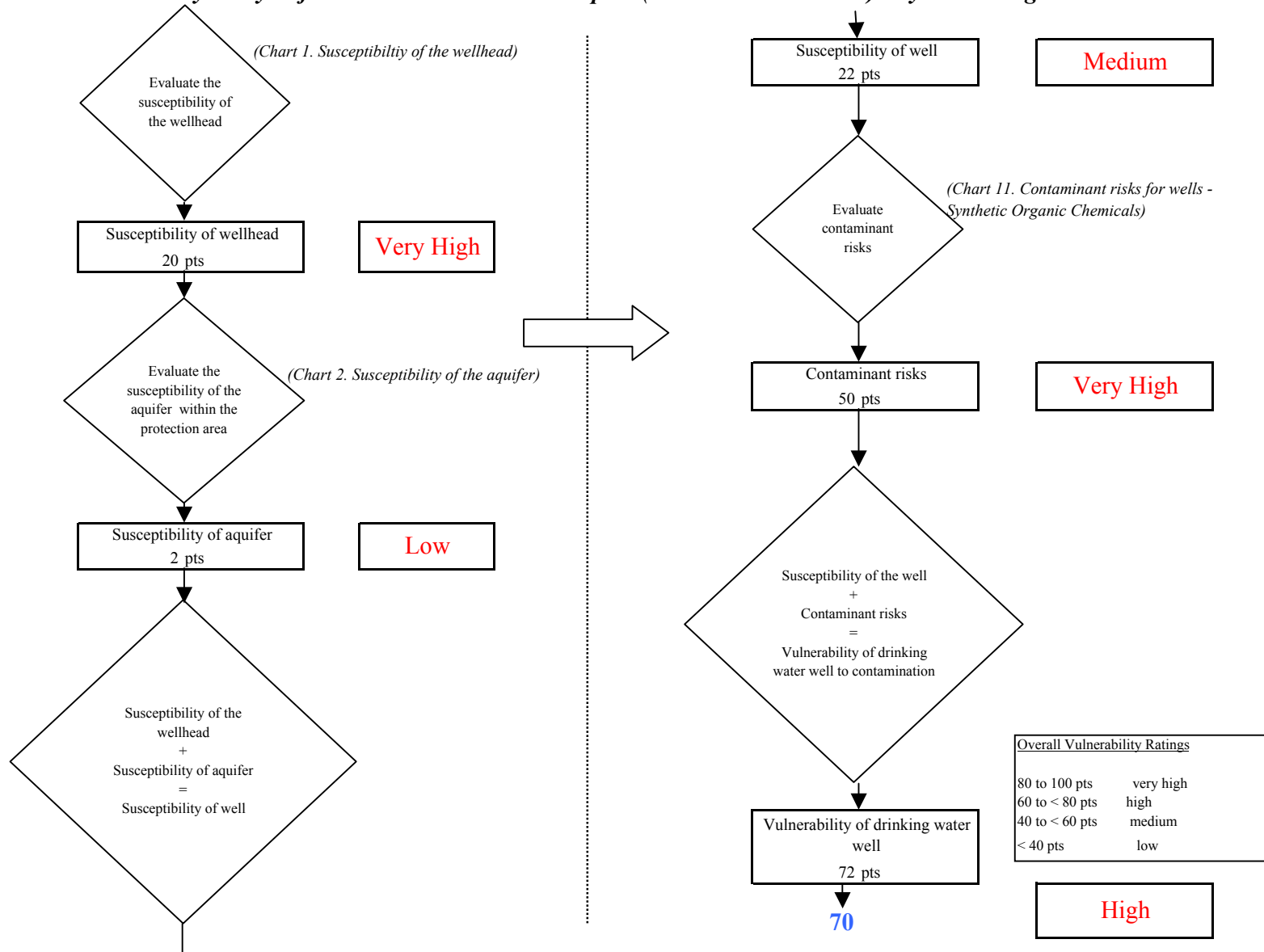


Chart 13. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Other Organic Chemicals

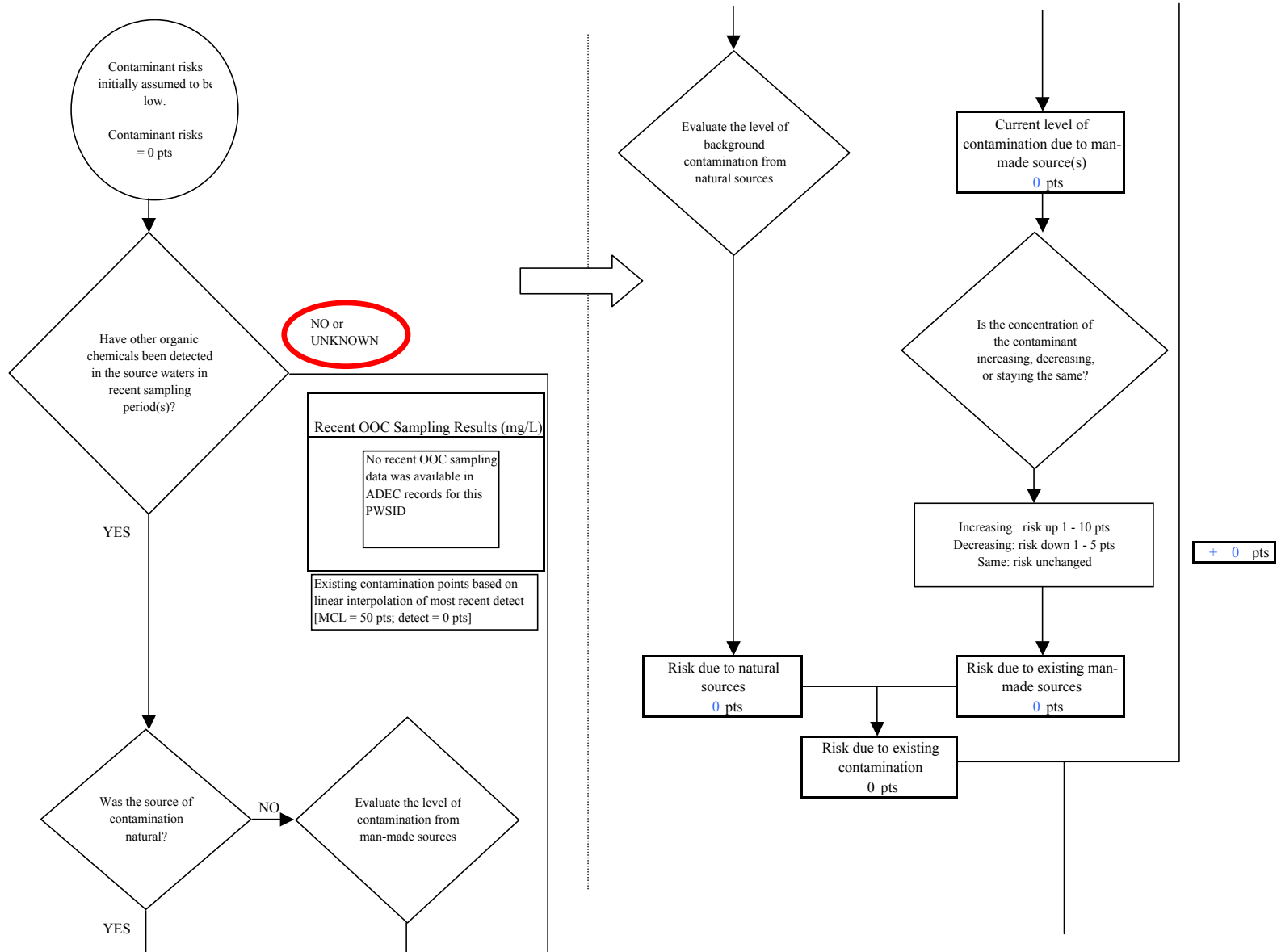


Chart 13. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Other Organic Chemicals

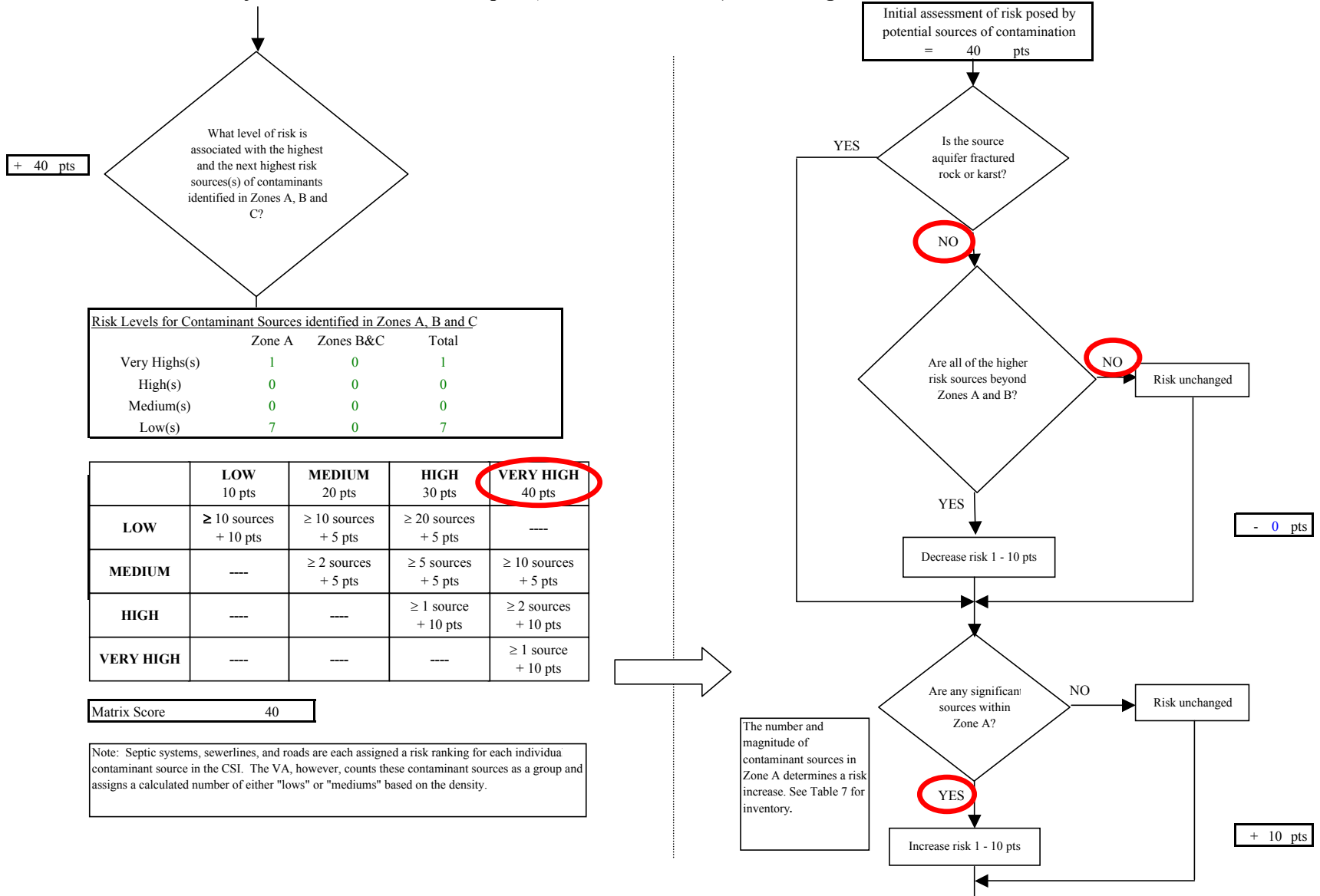


Chart 13. Contaminant risks for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Other Organic Chemicals

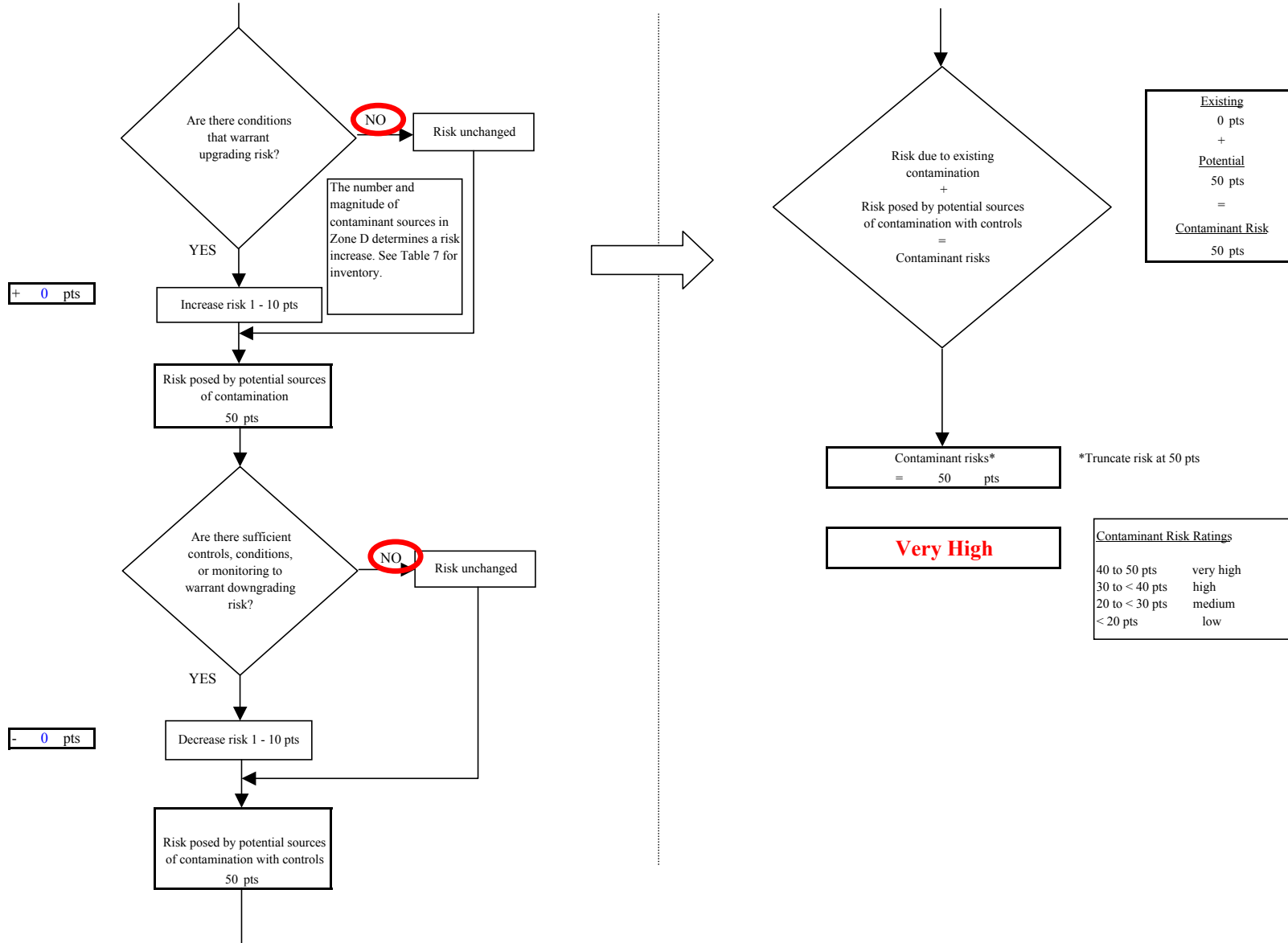


Chart 14. Vulnerability analysis for Mentasta Washeteria/14 plex (PWS No. 381498.001) - Other Organic Chemicals

