Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Pilot Station Water System Drinking Water System, Pilot Station, Alaska

PWSID # 260163.002

August 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1040
Alaska Department of Environmental Conservation

Source Water Assessment for
Pilot Station Water System
Drinking Water System
Pilot Station, Alaska

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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 Pilot Station Water System Source of Public Drinking Water, Pilot Station, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Pilot Station Water System has three Public Water System (PWS) wells. The well (PWS No. 260163.002) has been used as a drinking water source since it was drilled in 1997. Well "C" is connected to this distribution system to augment the existing water supply. This source water assessment report is limited to PWSID #260163.002 and the third well in the community, designated as Well "C:" by the operator.

The wells constitute a Class A (community and non-transient non-community) water system located northwest of the community of Pilot Station, Alaska. Available records indicate that there is secondary storage of drinking water, with a capacity of 212,000-gallons, and that the drinking water source is treated with calcium hypochlorite. The system operates year round and serves approximately 536 residents through 105 service connections. The wellhead received a susceptibility rating of **Very High** and the aquifer received a susceptibility rating of **Very High**. Combining these two ratings produce a **Very High** rating for the natural susceptibility of the well.

Identified potential and current sources of contaminants for the public drinking water source include: domestic wastewater collection systems, residential heating oil tanks, 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 **Very High** for the bacteria and viruses, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals; a vulnerability rating of **High** for nitrates and nitrites; and a vulnerability rating of **Medium** for synthetic organic chemicals, and other organic chemicals

PUBLIC DRINKING WATER SYSTEM

The Pilot Station Water System wells constitute a Class A (community/non-transient/non-community) public water system. The system is located northwest of the community of Pilot Station, Alaska (Sec. 5, T21N, R74W, Seward Meridian; see Map A of Appendix A). Pilot Station is located on the northwest bank of the Yukon River. The community is 11 miles east of St. Mary's and 26 miles west of Marshall on the Yukon-Kuskokwim Delta. Pilot Station has a population of 564 (ADCED, 2003). Average annual precipitation in Pilot Station is 16 inches, including approximately 60 inches of snowfall. Temperatures range from -44 to 83°F.

The community of Pilot Station obtains most of their water supply from community wells. Most households are served by the piped sewage collection system and the remaining households haul honey buckets (ADCED, 2003). Pilot Station receives electrical power from AVEC, a REA Cooperative. Power generating facilities are fueled by diesel. Refuse is collected by the City of Pilot Station and transported to the landfill (ADCED, 2003).

According to information supplied by ADEC for the Pilot Station PWS, the depth of the primary water well is 93 feet below the ground surface. Well construction details indicate that the well is screened in an unconfined aquifer. The well is not located within a floodplain.

Information acquired from a January 2003 sanitary survey for the public water system indicated that the land surface is sloped away from the well. Generally, land surfaces that slope away from the wellhead promote surface water drainage, which reduces the potential of contaminant migration down the well casing annulus. The sanitary survey also indicated that 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.

Pilot Station is located within the Yukon Delta National Wildlife Refuge in southwestern Alaska.

The bedrock in the area consists primarily of sandstone, which form well defined northeast trending hills. The hills are composed of a thick sequence of interbedded marine and nonmarine deposits. Soils generally consist of poorly drained mineral soils, organic rich soils, and well-drained mineral soils. Pilot Station is located in an area known to be underlain by a layer of discontinuous permafrost (Nakanishi & Dorava, 1994).

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 well.

The most probable area for contamination to reach the drinking water well is the area that contributes water to the well, 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 well, 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 the Pilot Station Water System 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 wells 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 Pilot Station Water System PWS was determined using an analytical calculation and includes Zones A 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 Pilot Station Water System 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 7 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 Pilot Station Water System's water well is completed in an unconfined aquifer. Unconfined aquifers are more 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	25	Very High
Natural Susceptibility	45	Very High

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This 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	26	Medium
Volatile Organic Chemicals	35	High
Heavy Metals, Cyanide and Other Inorganic Chemicals	45	Very High
Synthetic Organic Chemicals	12	Low
Other Organic Chemicals	12	Low

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

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	95	Very High
Nitrates and Nitrites	70	High
Volatile Organic Chemicals	80	Very High
Heavy Metals, Cyanide and Other Inorganic Chemicals	90	Very High
Synthetic Organic Chemicals	55	Medium
Other Organic Chemicals	55	Medium

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Very High**. The risk is primarily attributed to the presence of bacteria and viruses in recent sampling results and the presence of an abandoned well and roads 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 bacteria counts have been 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 well, the overall vulnerability of the well to contamination is **Very High**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Medium**. The risk to this source of public drinking water is primarily attributed to the presence of an abandoned well 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 well indicates that low levels of nitrates have been detected in recent sampling events. However, the reported concentrations of nitrates do not exceed the maximum contaminant level (MCL) of 10 mg/L. 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).

Nitrate levels are often derived from the decomposition of organic matter in soils. Although the nitrate source is unknown, such occurrences may be attributed to septic systems or other sources. After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the well, the

overall vulnerability of the well to nitrate and nitrite contamination is **High**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **High**. The risk is primarily attributed to the presence of an abandoned well, a petroleum product bulk station/terminal and an airport located in Zone A. Several other potential contaminant sources are also found within the protection area (see Table 4 – Appendix B).

A detectable concentration of toluene was reported in a recent sampling event for this public water system. However, the detectible concentration of toluene reported in 2001 was well below the MCL of 1.0 mg/L (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 well, the overall vulnerability of the well to contamination is **Very 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 an abandoned well in Zone A (see Table 5 – Appendix B).

Based on review of recent sampling records for this public water system, moderate levels of antimony have been detected, but have not exceeded the MCL of 0.006 mg/L (see Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

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

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is **Low**. The risk is primarily attributed to the presence of an abandoned well in Zone A (see Table 6 – Appendix B).

No recent sampling data was available in ADEC records for the Pilot Station Water System (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 well, the overall vulnerability of the well to contamination is **Medium**.

Other Organic Chemicals

The contaminant risk for other organic chemicals is **Low**. The risk is primarily attributed to the presence of an abandoned well, a petroleum product bulk station/terminal, and electric power generation 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 the Pilot Station Water System (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 **Medium**.

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 Pilot Station 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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Nakanishi, A.S., and Dorava, J.M. 1994, Overview of Environmental and Hydrogeologic Conditions at St. Mary's, Alaska, U.S. Geological Survey Open File Report 94-481, prepared in cooperation with the FAA.

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APPENDIX A

Drinking Water Protection Area Location Map
(Map A)

APPENDIX B

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

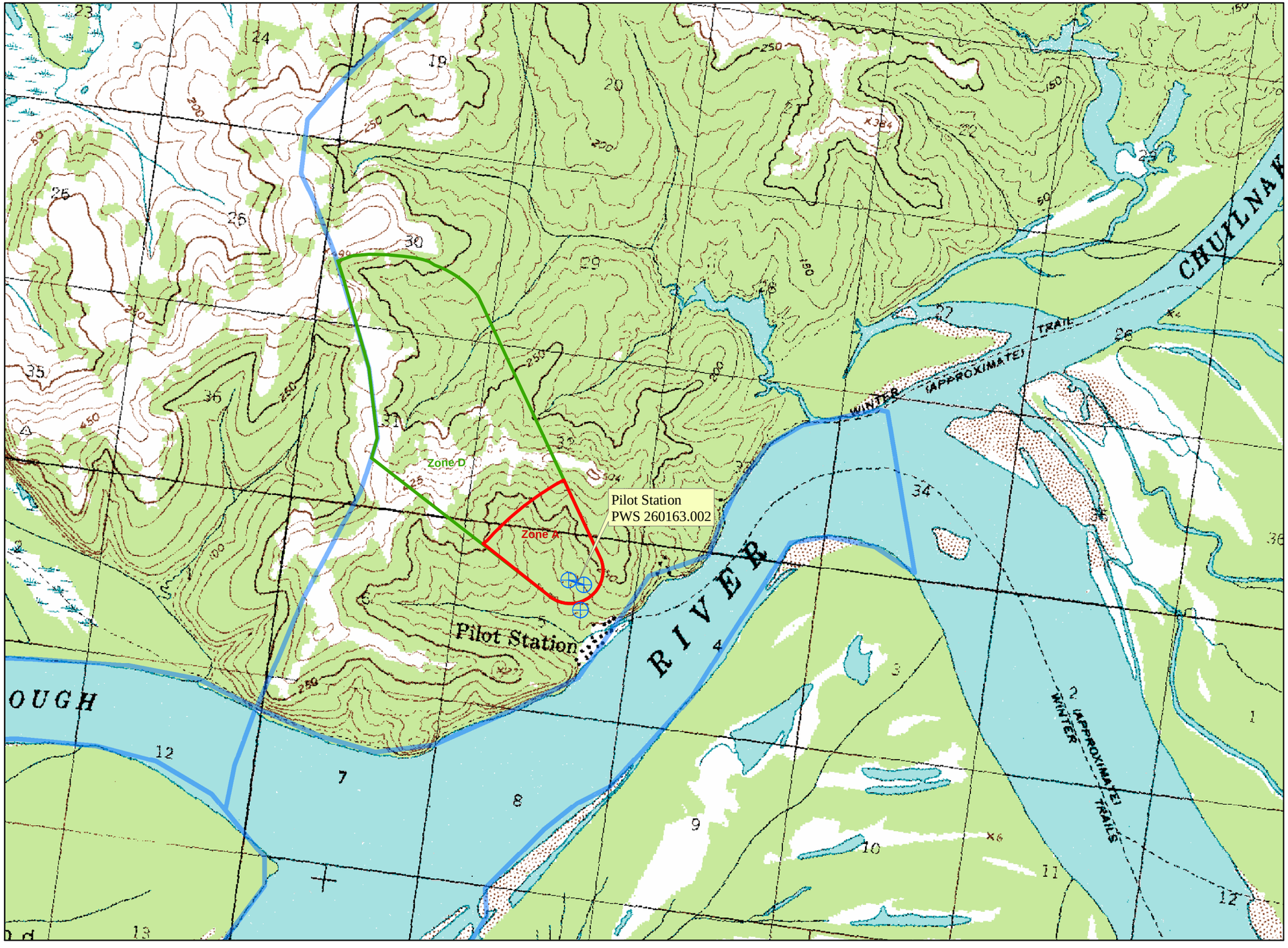
APPENDIX C

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

APPENDIX D

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

Public Water Well System for PWS #260163.002 Pilot Station



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 D Protection Area– 10 Years Travel Time or Watershed Boundary

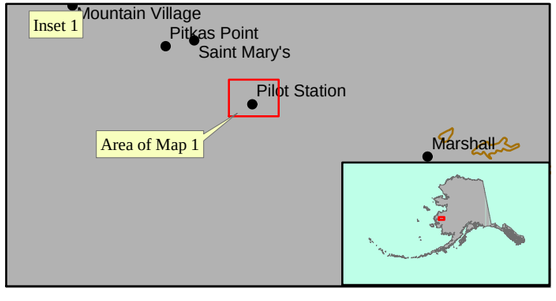
Data Sources:

Contaminant Sources, Public Water System Wells, Contours
Alaska Department of Environmental Conservation (ADEC)
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 A Public Water Systems" published by ADEC

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



0 0.4 0.8 1.6 2.4 3.2 Miles

Pilot Station
PWS 260163.002
Appendix A Map A

Table 1

Contaminant Source Inventory for

Pilot Station

PWSID 260163.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01	A	C	Assume 20 or fewer sewer lines in Zone A
Tanks, heating oil, residential (above ground)	R08	R08-01	A	C	Assume 10 or less residential heating oil tanks
Highways and roads, dirt/gravel	X24	X24-01	A	C	Assume 1-20 roads in Zone A

Table 2

Contaminant Source Inventory and Risk Ranking for Pilot Station
Sources of Bacteria and Viruses

PWSID 260163.002

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01	A	Medium	C	Assume 20 or fewer sewer lines in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A

Table 3

Contaminant Source Inventory and Risk Ranking for Pilot Station
Sources of Nitrates/Nitrites

PWSID 260163.002

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01	A	Medium	C	Assume 20 or fewer sewer lines in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A

Table 4

Contaminant Source Inventory and Risk Ranking for Pilot Station
Sources of Volatile Organic Chemicals

PWSID 260163.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01	A	Low	C	Assume 20 or fewer sewer lines in Zone A
Tanks, heating oil, residential (above ground)	R08	R08-01	A	Medium	C	Assume 10 or less residential heating oil tanks
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A

Table 5

Contaminant Source Inventory and Risk Ranking for Pilot Station

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 260163.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01	A	Low	C	Assume 20 or fewer sewer lines in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A

Table 6

Contaminant Source Inventory and Risk Ranking for Pilot Station
Sources of Synthetic Organic Chemicals

PWSID 260163.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01	A	Low	C	Assume 20 or fewer sewer lines in Zone A

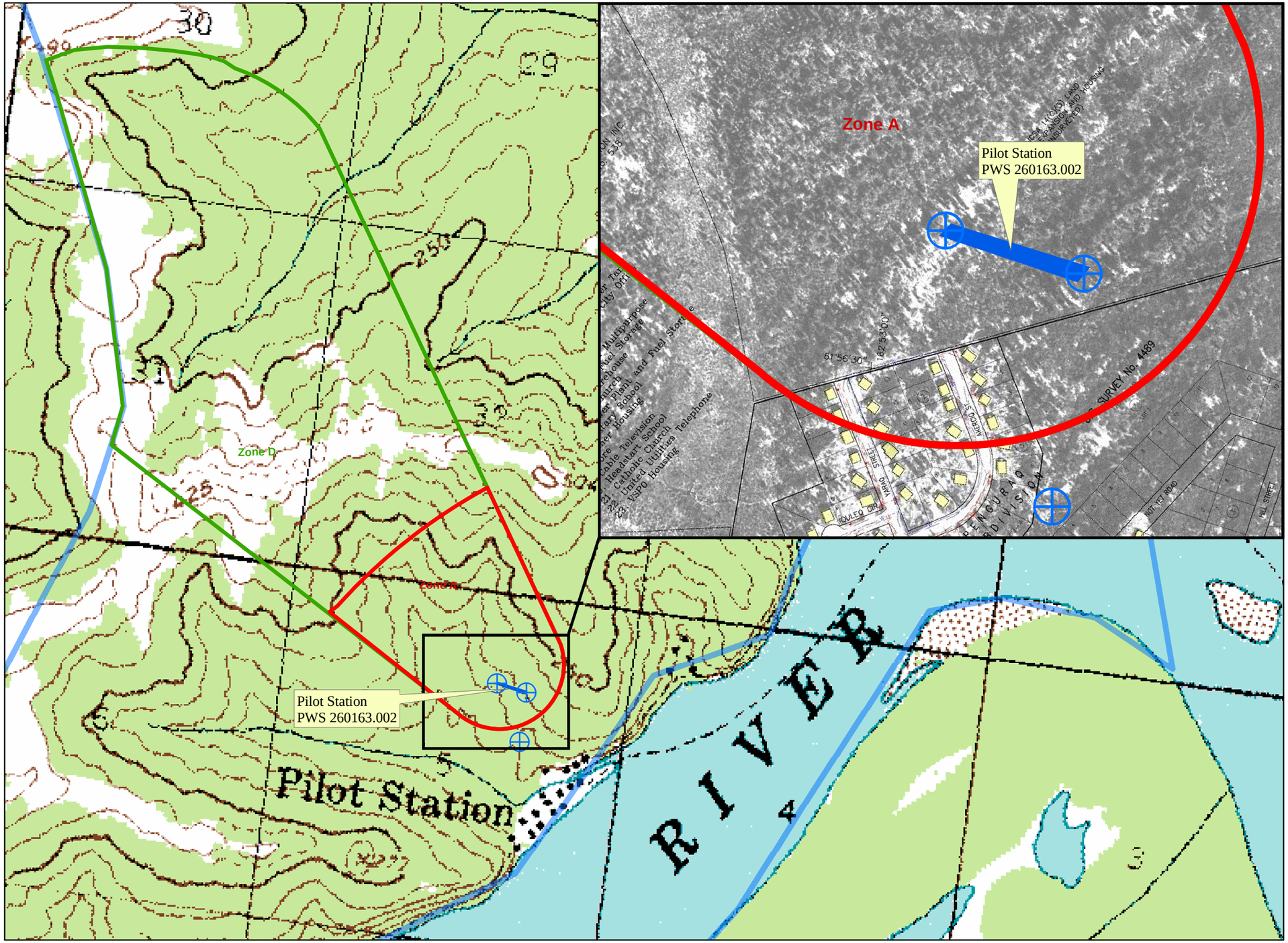
Table 7

Contaminant Source Inventory and Risk Ranking for Pilot Station
Sources of Other Organic Chemicals

PWSID 260163.002

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01	D01-01	A	Low	C	Assume 20 or fewer sewer lines in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A

Public Water Well System for PWS #260163.002 Pilot Station
Showing Potential and Existng Sources of 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 D Protection Area– 10 Years Travel Time or Watershed Boundary

Existing or Potential Contaminant Sources

There are no potential or existing contaminant sources within the protection area.

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 A Public Water Systems" published by ADEC

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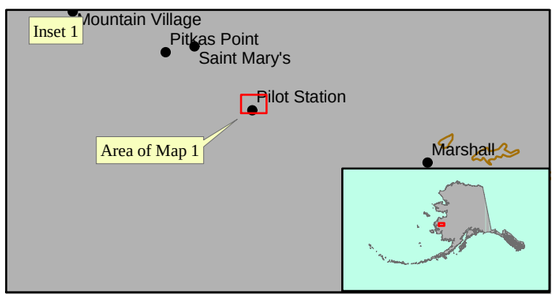


0 0.2 0.4 0.8 1.2 1.6 Miles

Pilot Station
PWS 260163.002

Appendix C Map C

Chart 1. Susceptibility of the wellhead - Pilot Station Water System (PWS No.260163.002)

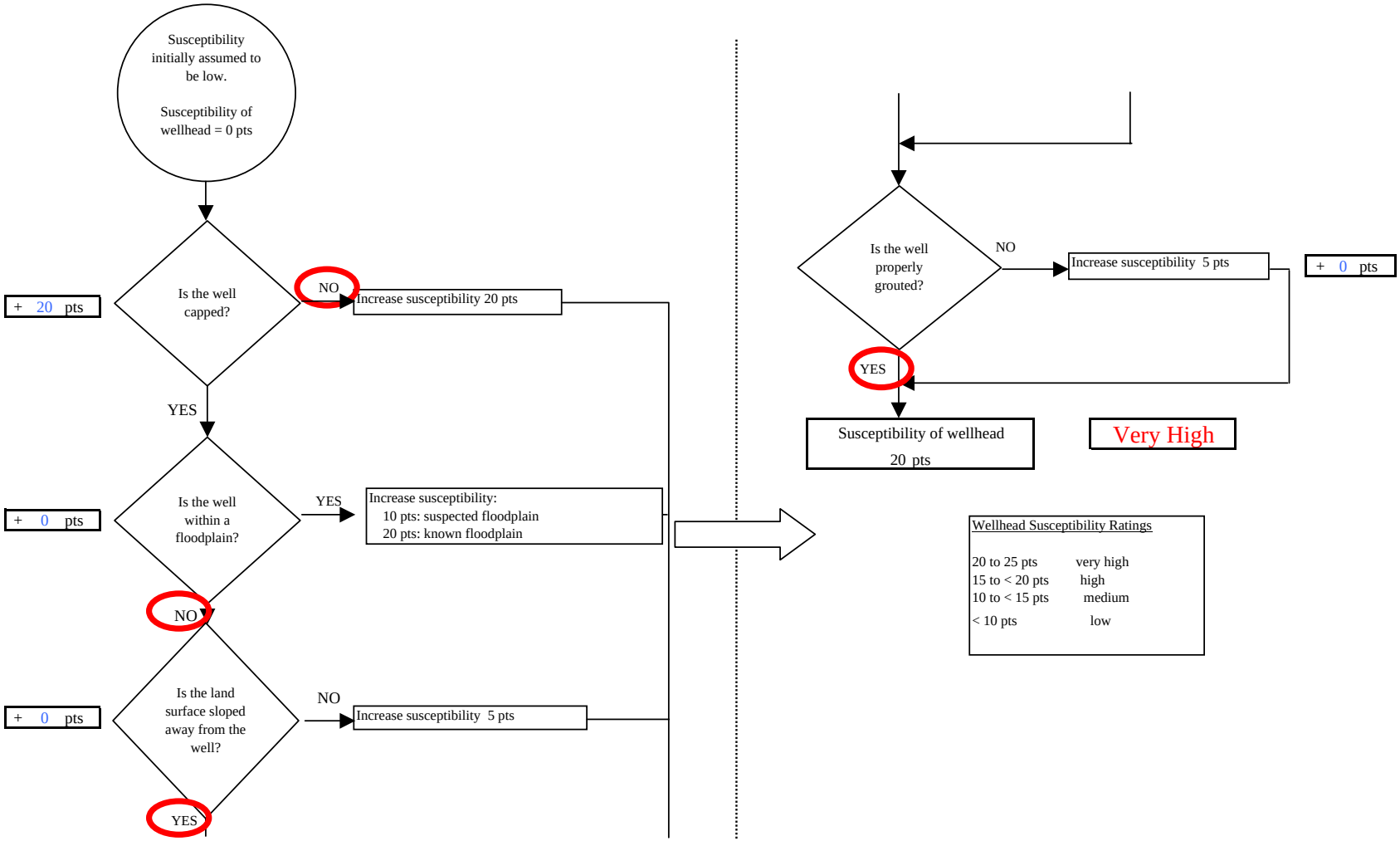


Chart 2. Susceptibility of the aquifer Pilot Station Water System (PWS No.260163.002)

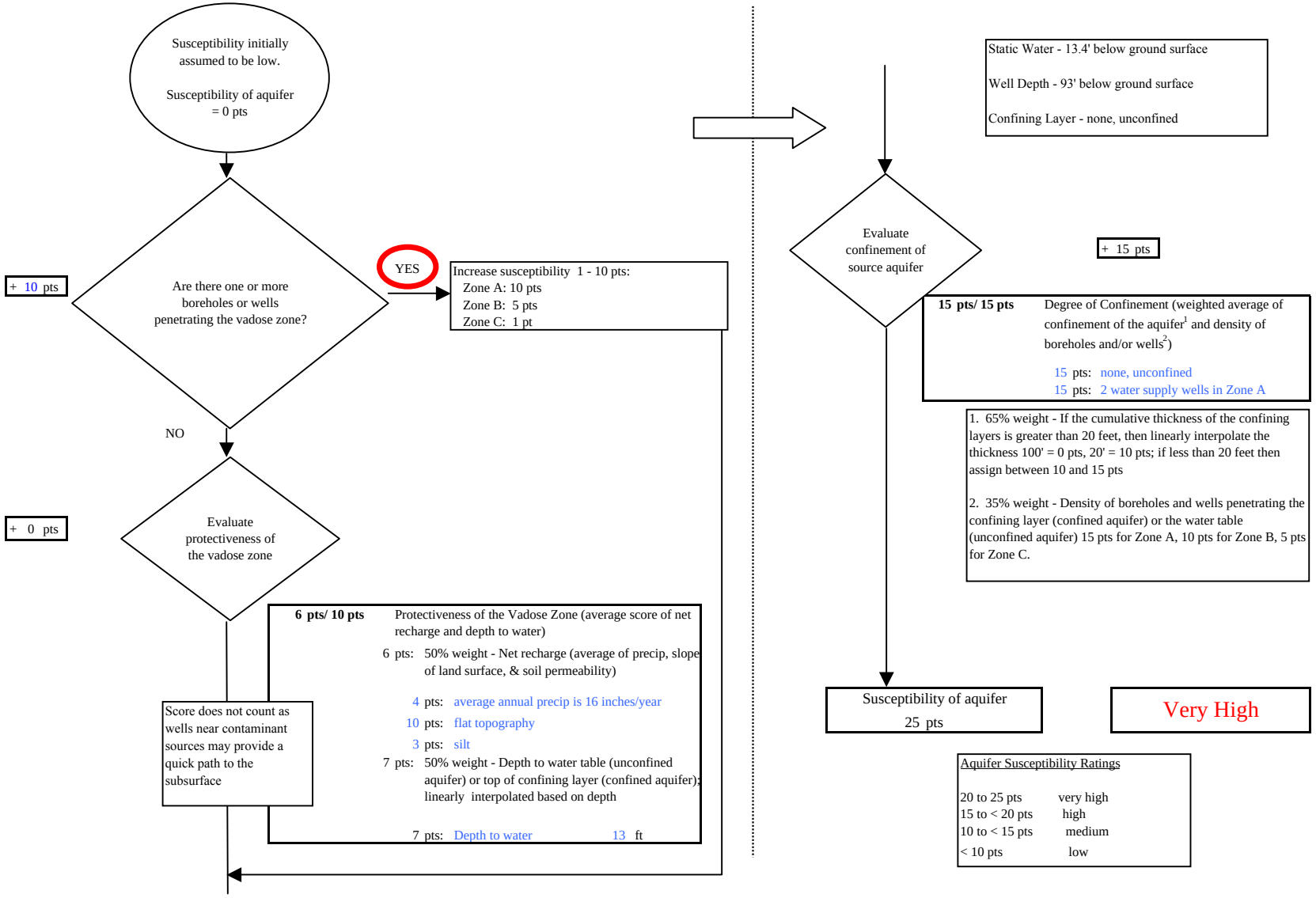
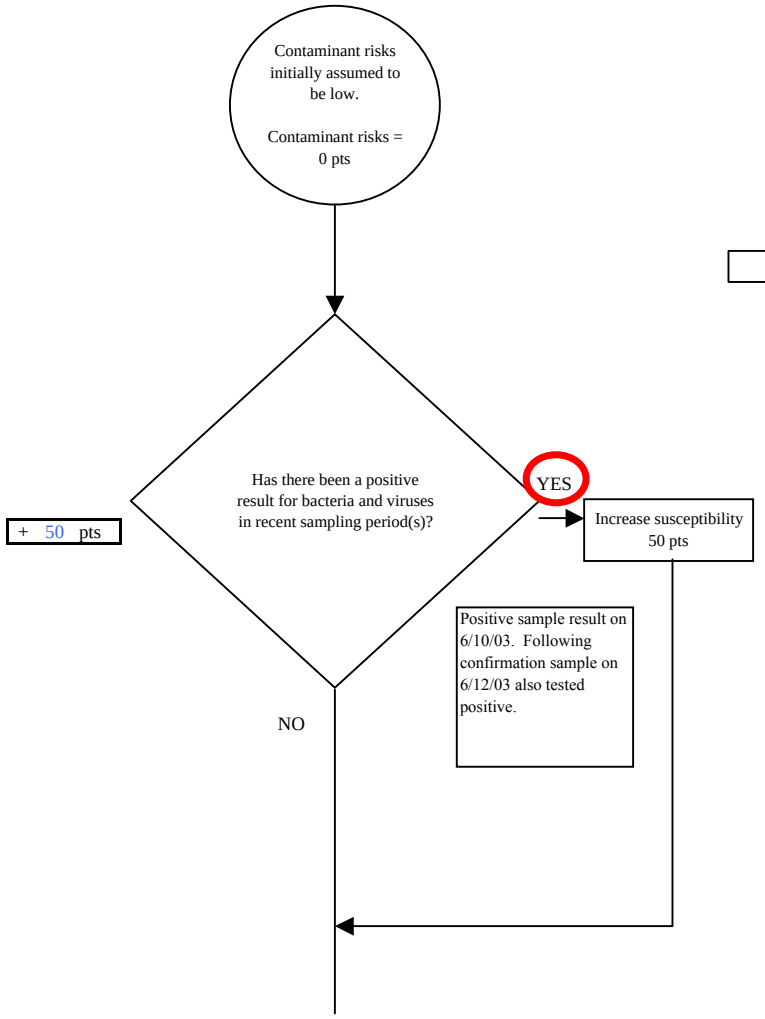
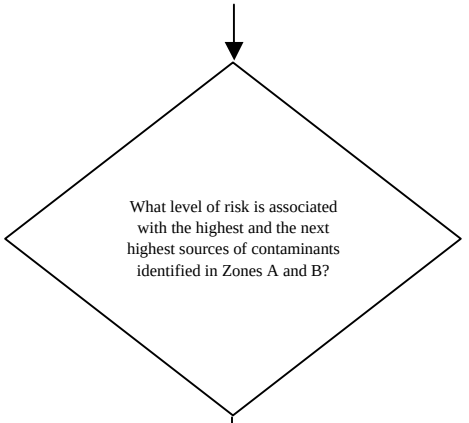


Chart 3. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Bacteria & Viruses





+ 20 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)	2	0	2
Low(s)	1	0	1

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

Matrix Score 20

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

Chart 3. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Bacteria & Viruses

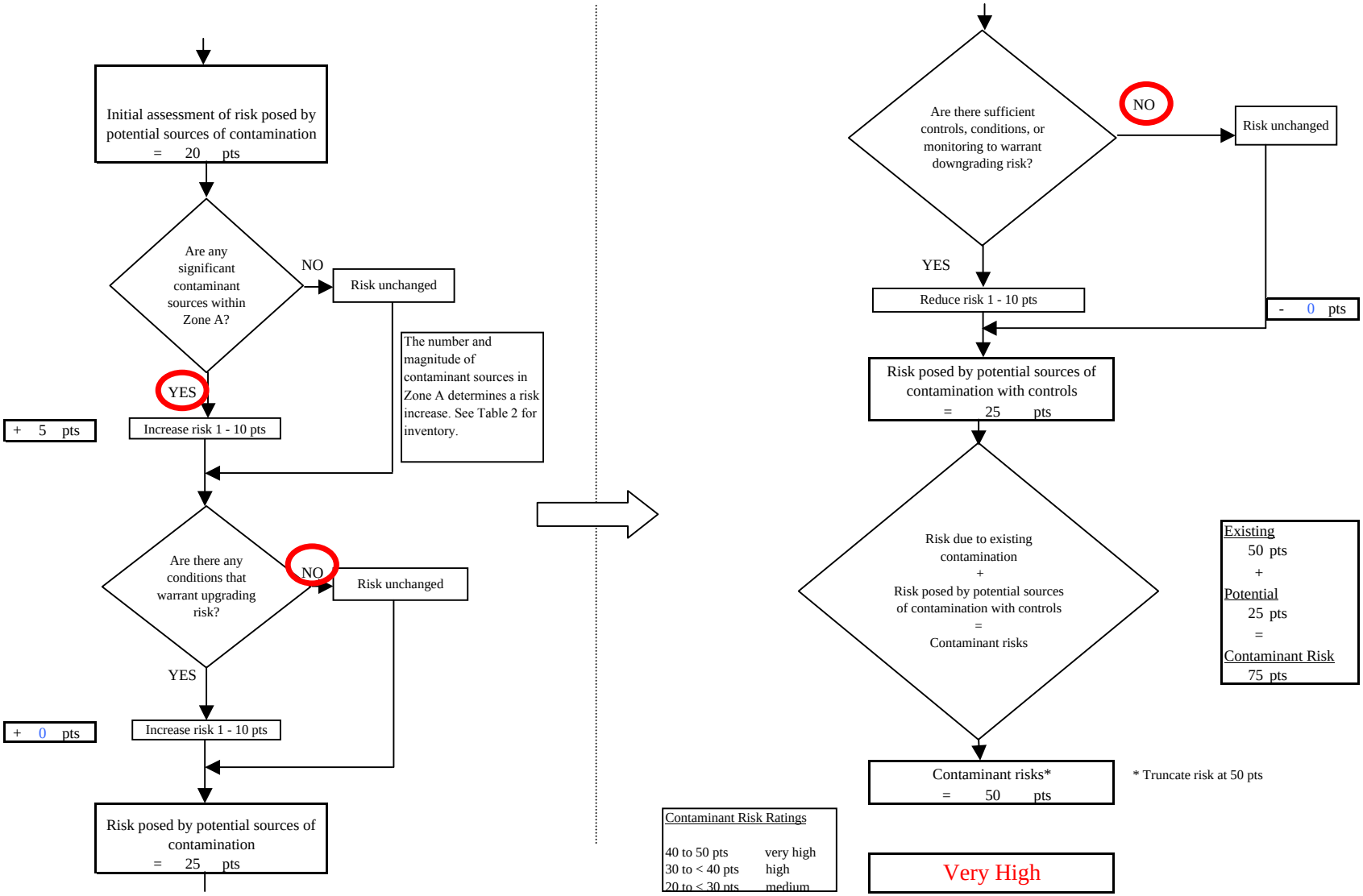


Chart 4. Vulnerability analysis for Pilot Station Water System (PWS No.260163.002) - Bacteria & Viruses

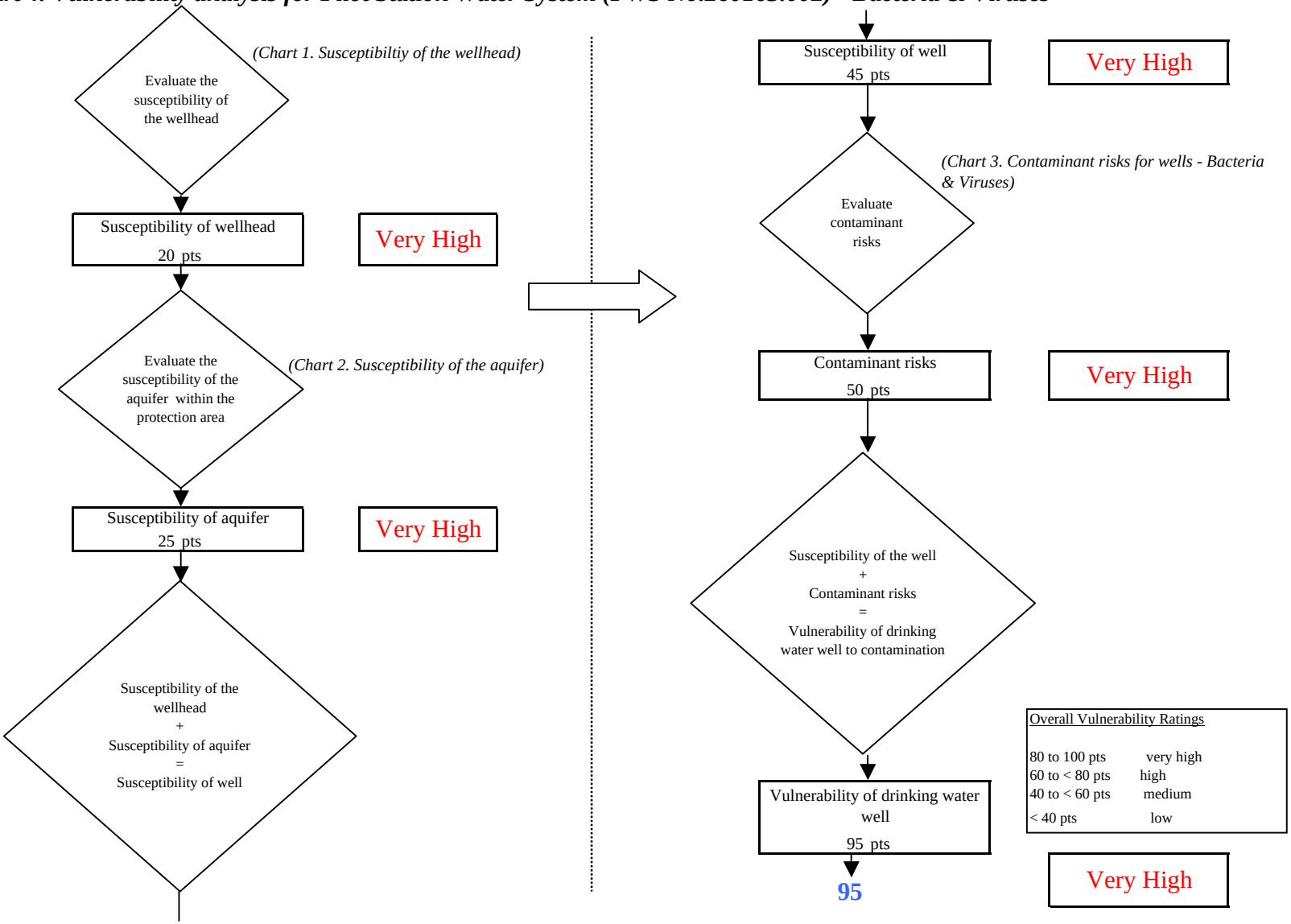


Chart 5. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Nitrates and Nitrites

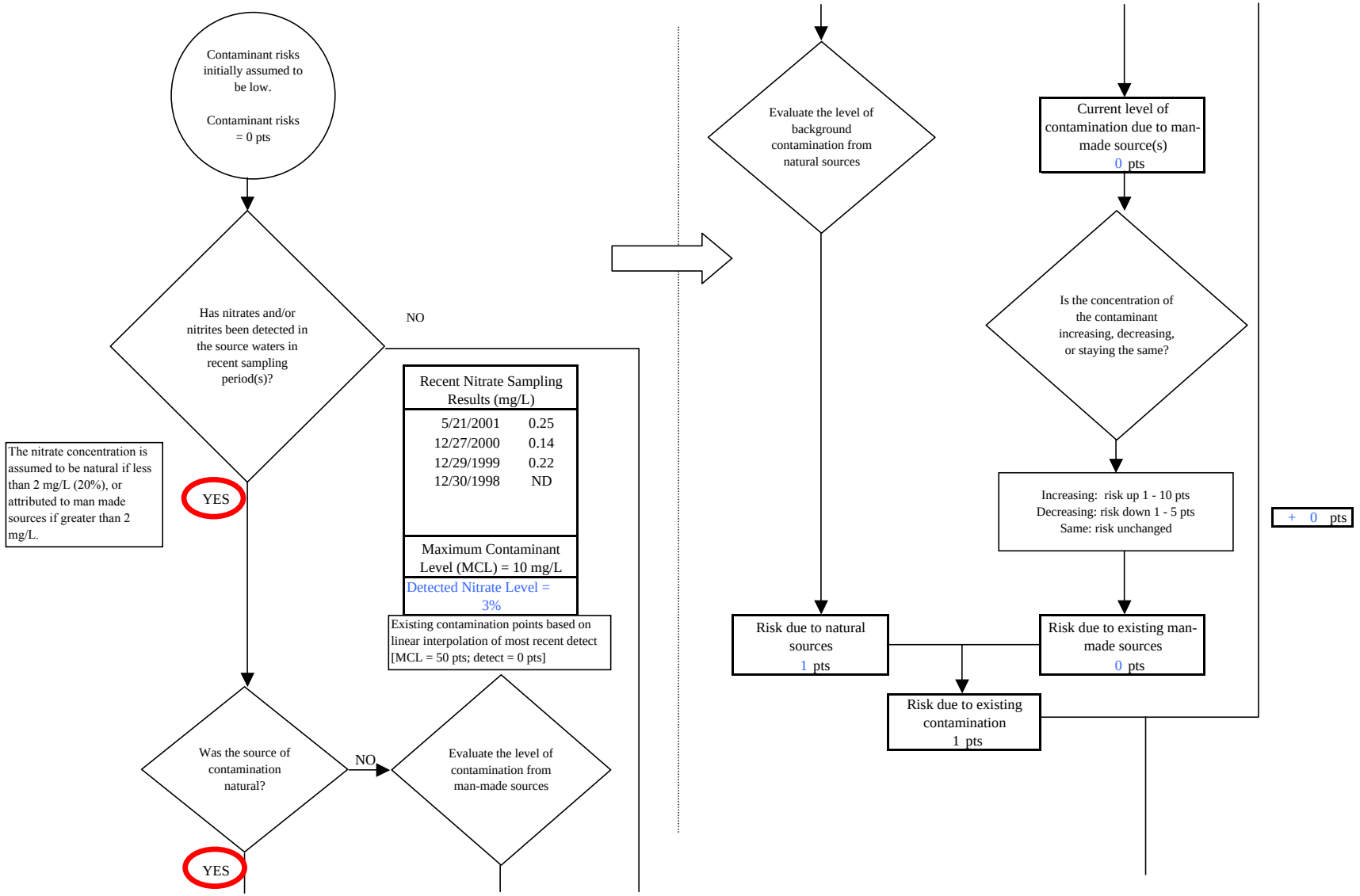


Chart 5. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Nitrates and Nitrites

+ 20 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A, B and C?

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	2	0	2
Low(s)	1	0	1

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

Matrix Score 20

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

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

Is the source aquifer fractured rock or karst?

YES

NO

Are all of the higher risk sources beyond Zones A and B?

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

Risk unchanged

The number and magnitude of contaminant sources in Zone A determines a risk increase. See Table 3 for inventory.

YES

Increase risk 1 - 10 pts

+ 5 pts

Chart 5. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Nitrates and Nitrites

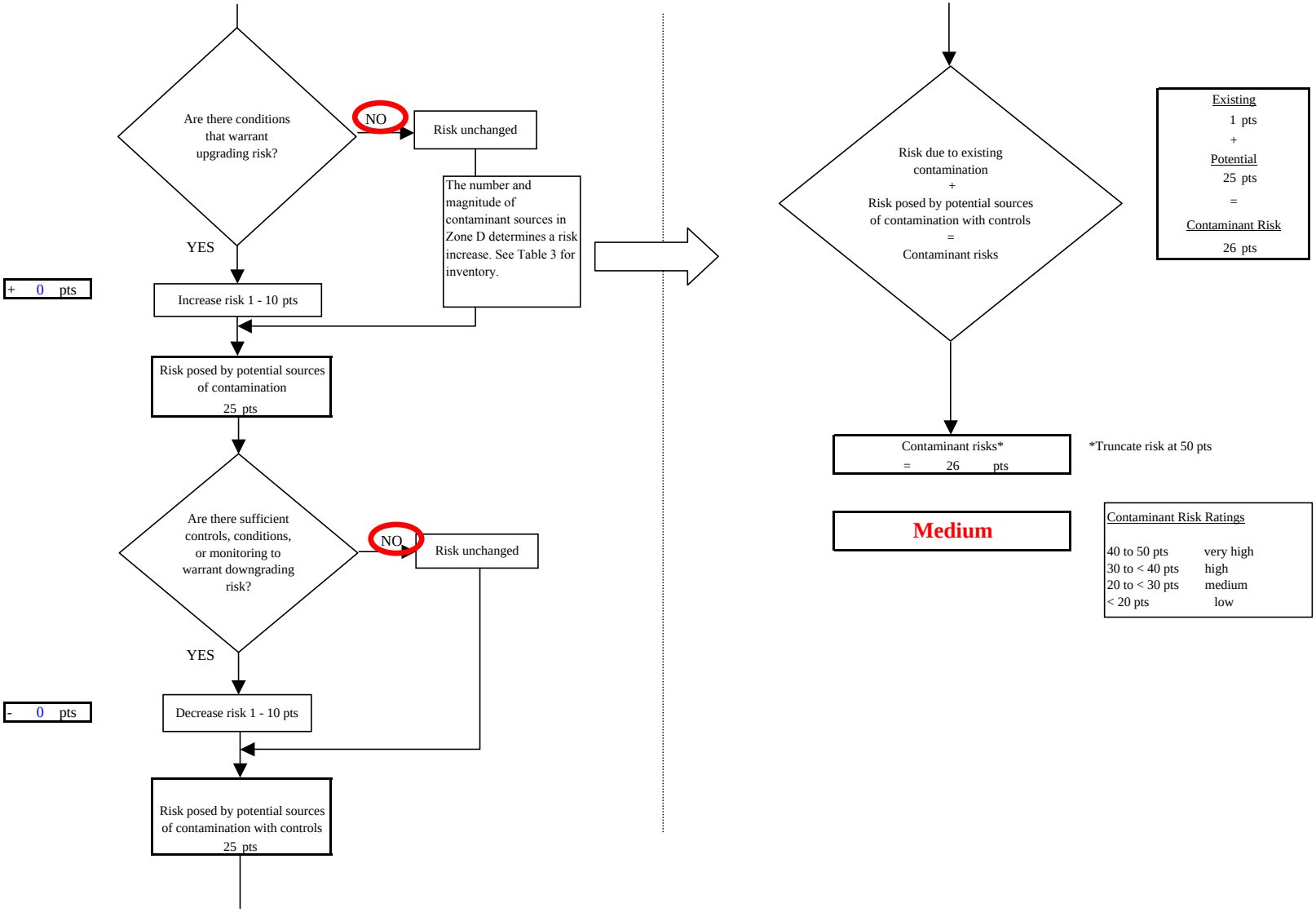


Chart 6. Vulnerability analysis for Pilot Station Water System (PWS No.260163.002) - Nitrates and Nitrites

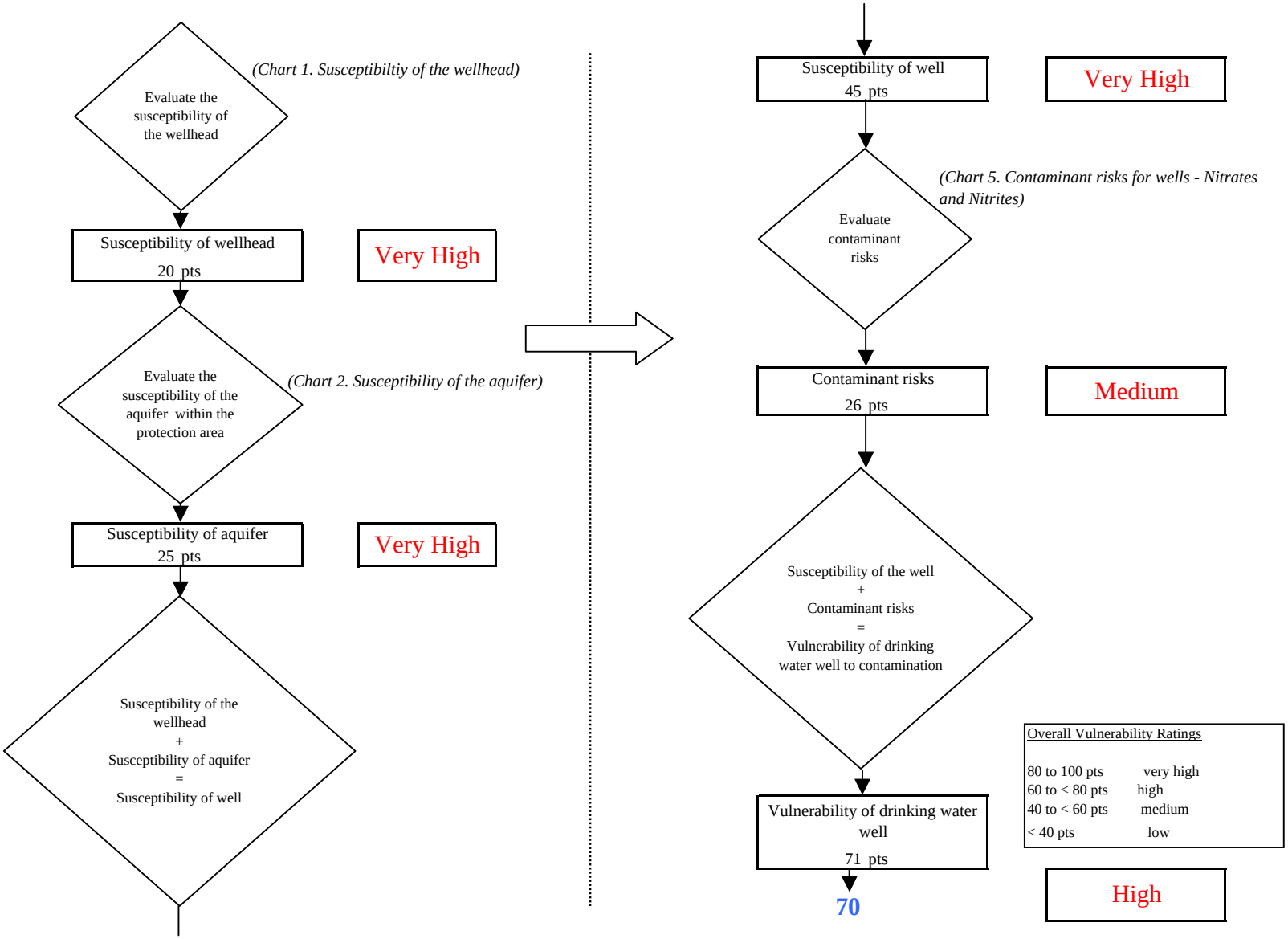


Chart 7. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Volatile Organic Chemicals

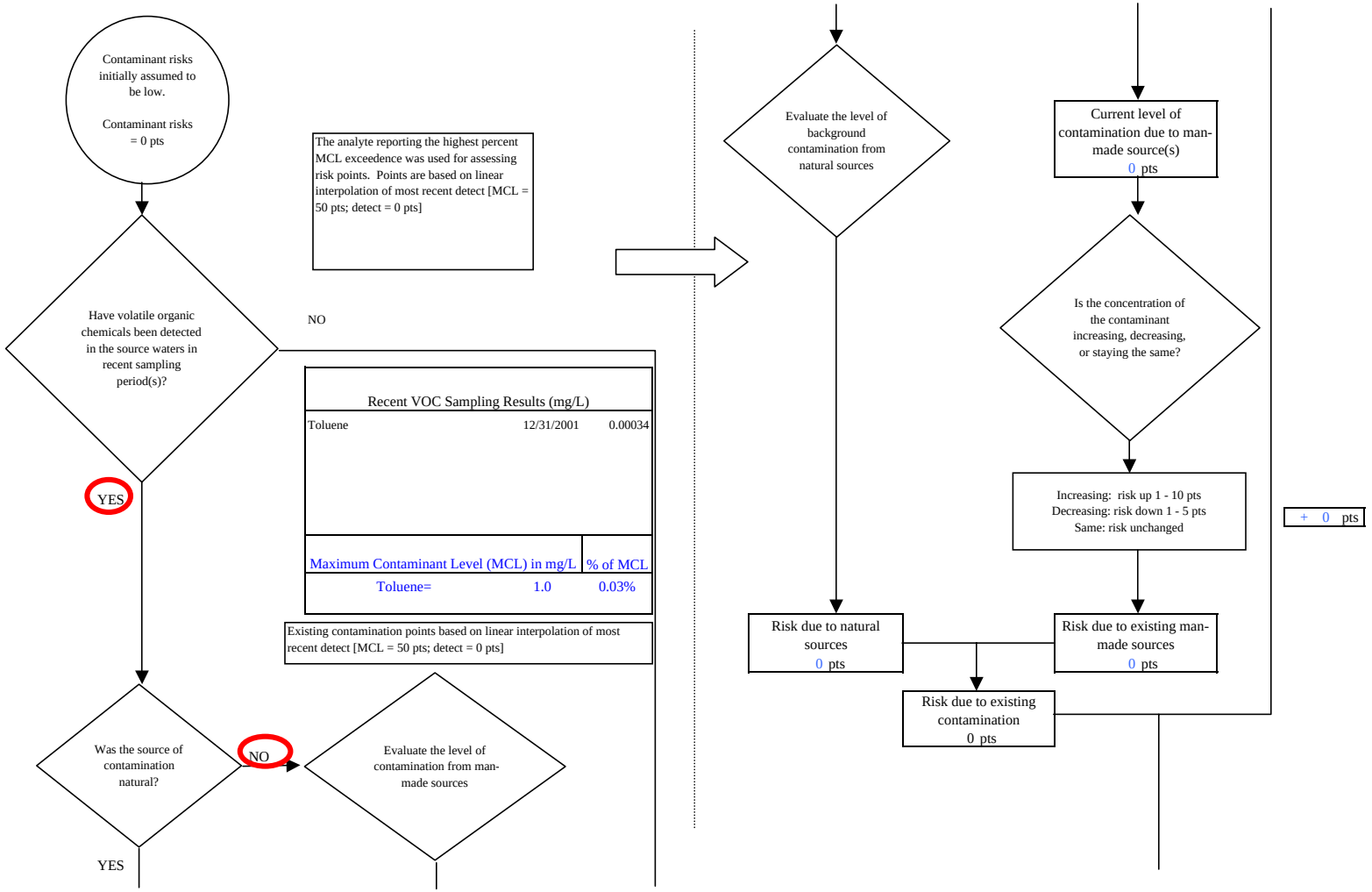
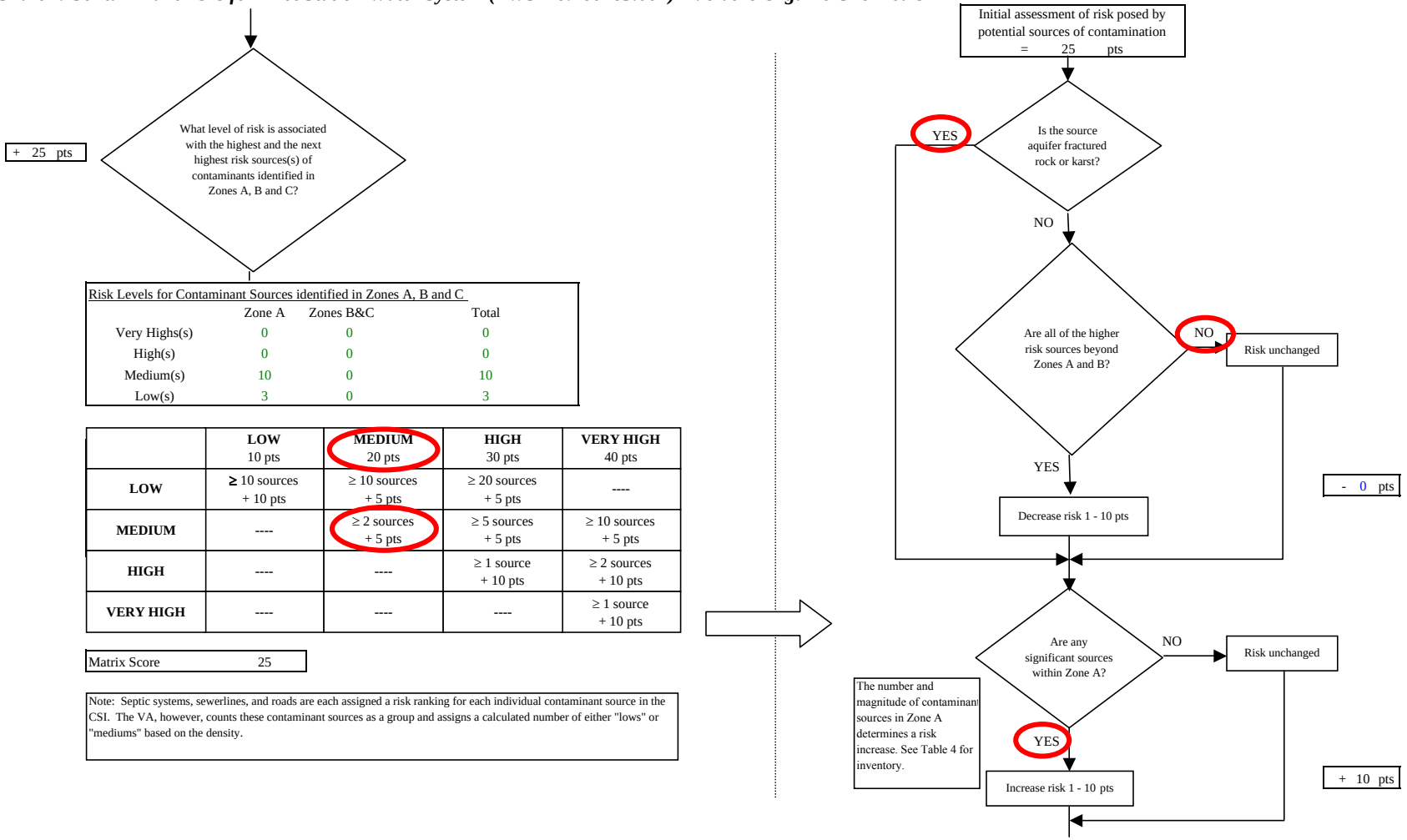


Chart 7. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Volatile Organic Chemicals



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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	10	0	10
Low(s)	3	0	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 25

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 7. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Volatile Organic Chemicals

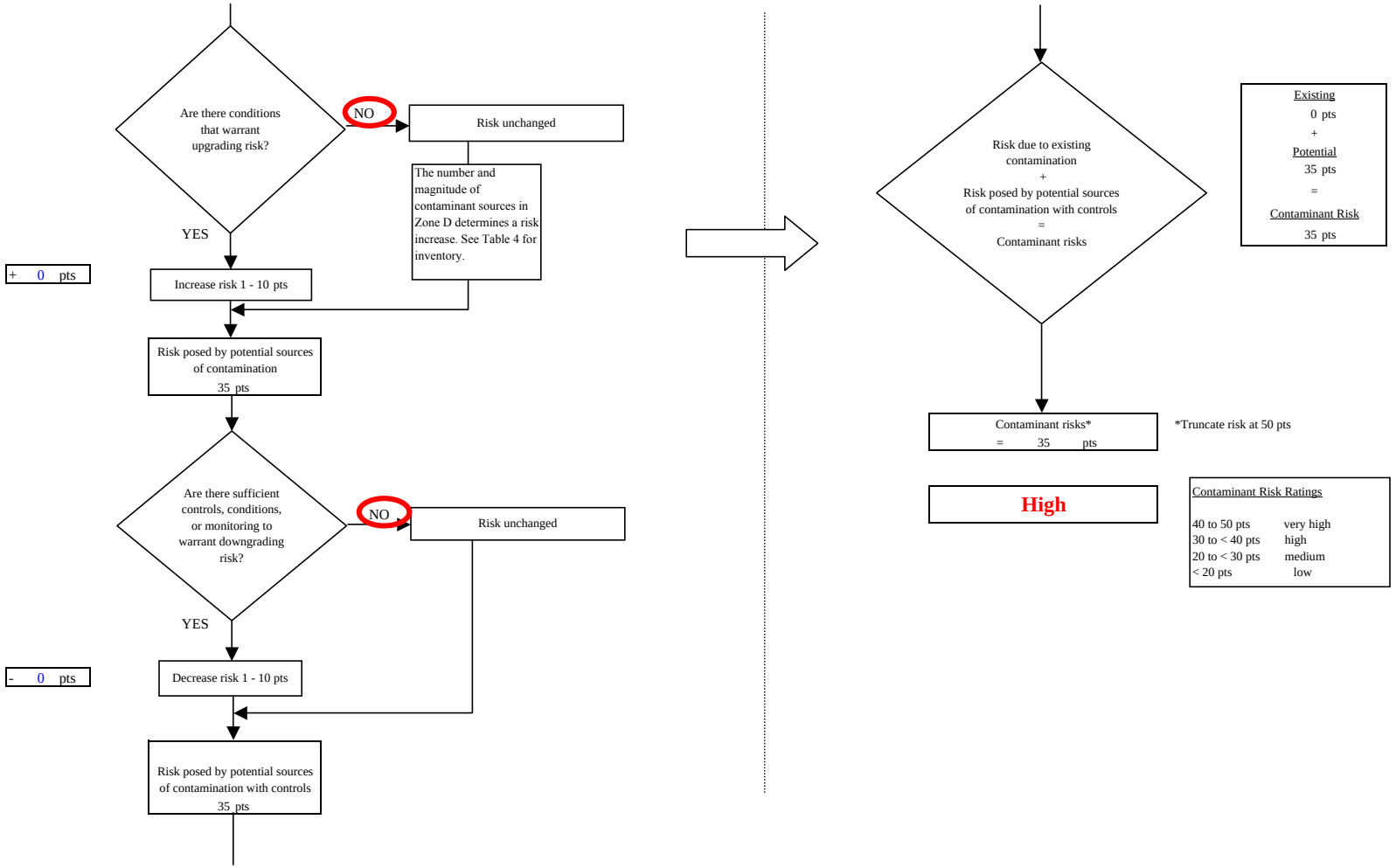


Chart 8. Vulnerability analysis for Pilot Station Water System (PWS No.260163.002) - Volatile Organic Chemicals

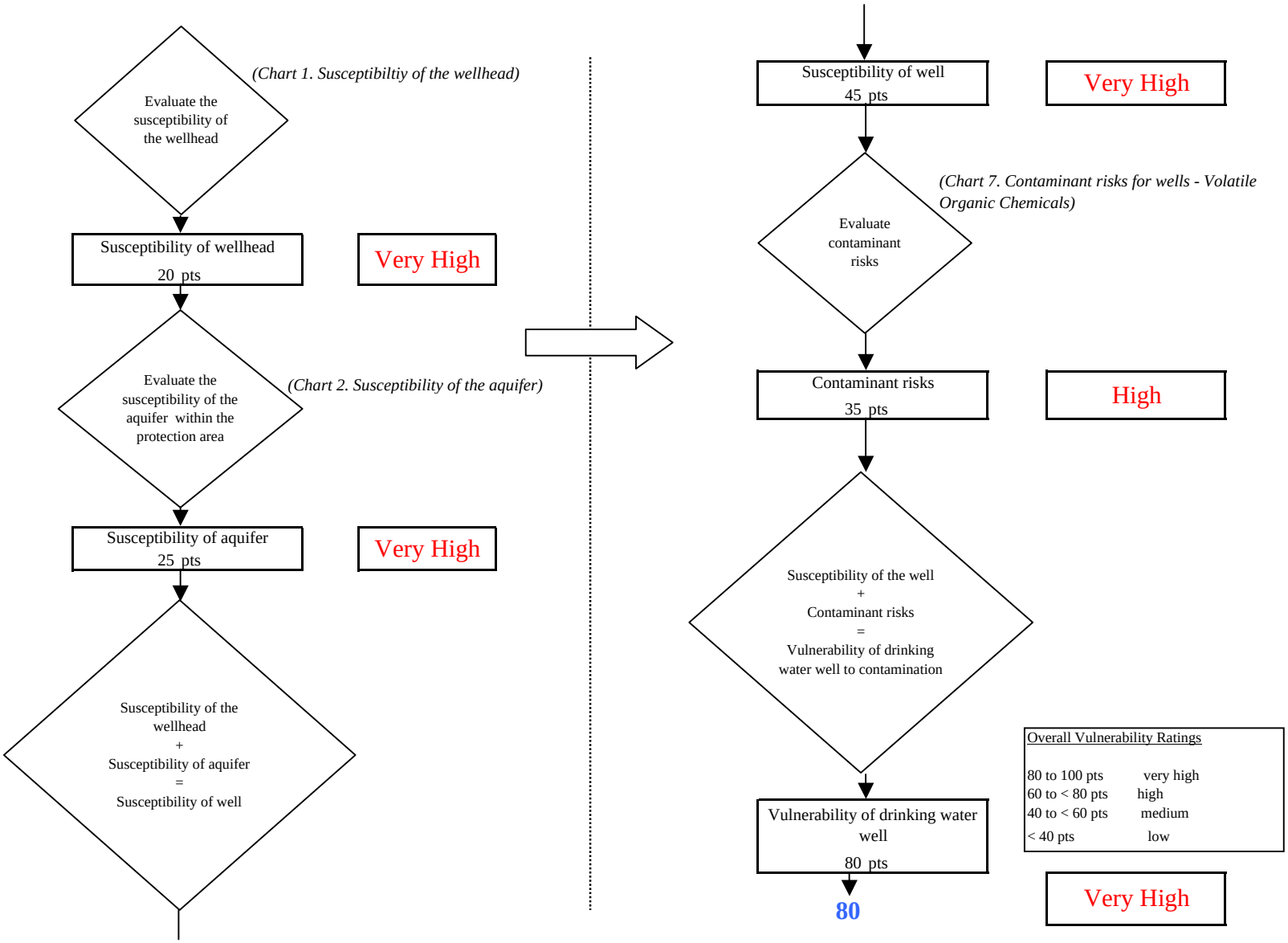


Chart 9. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Heavy Metals, Cyanide and Other Inorganic Chemicals

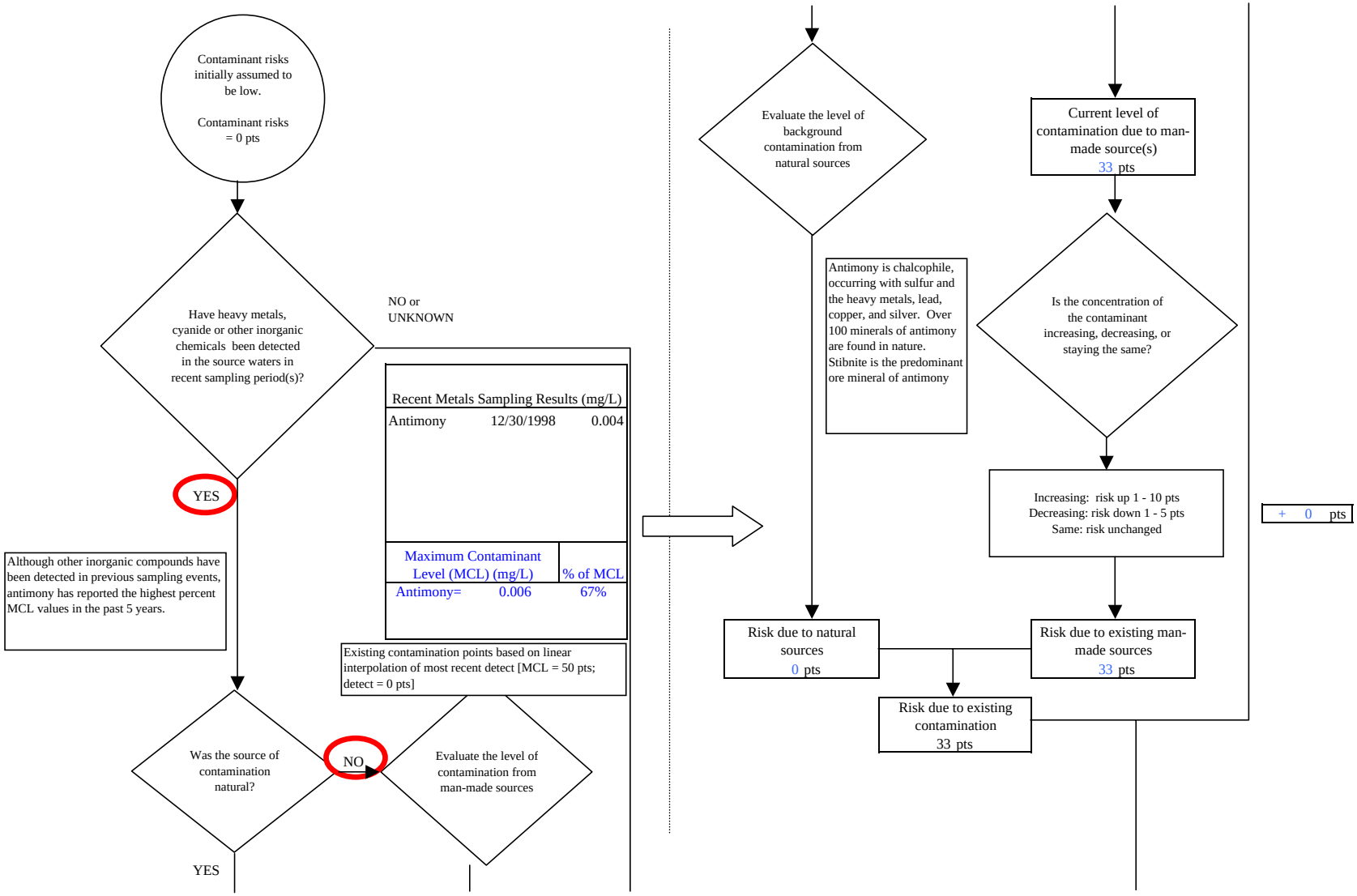
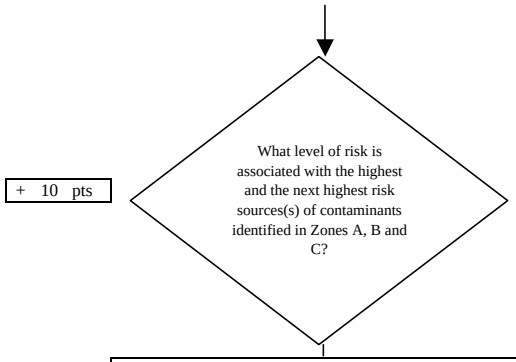


Chart 9. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Heavy Metals, Cyanide and Other Inorganic Chemicals



+ 10 pts

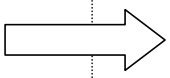
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	0	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.



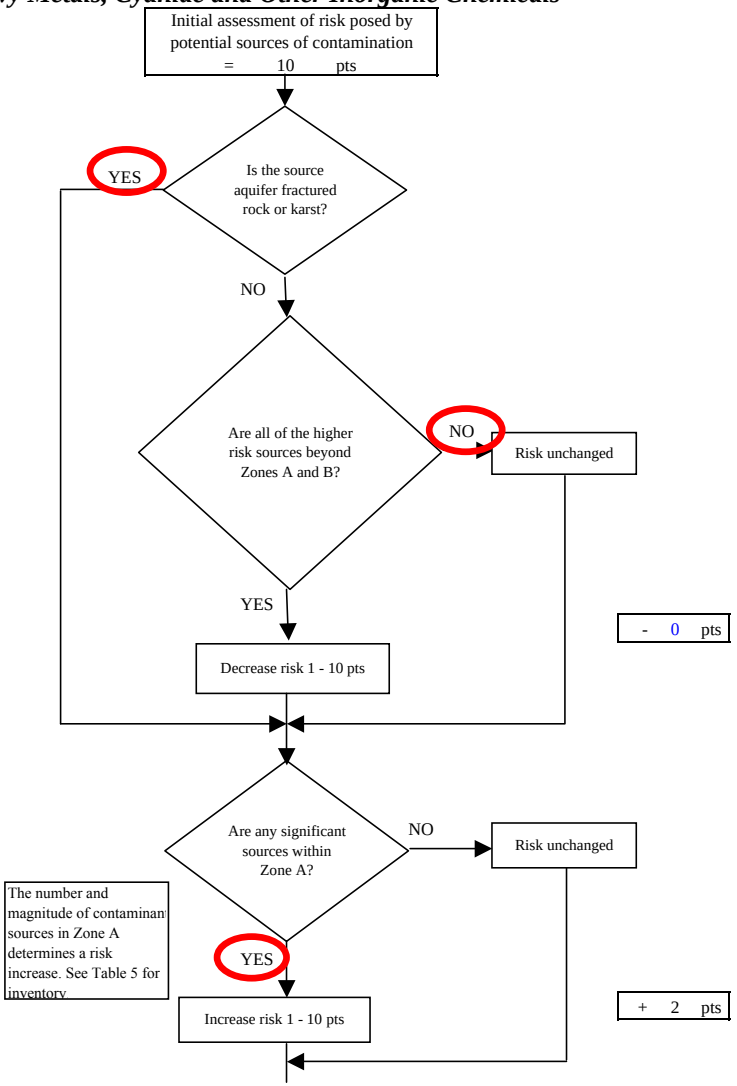


Chart 9. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Heavy Metals, Cyanide and Other Inorganic Chemicals

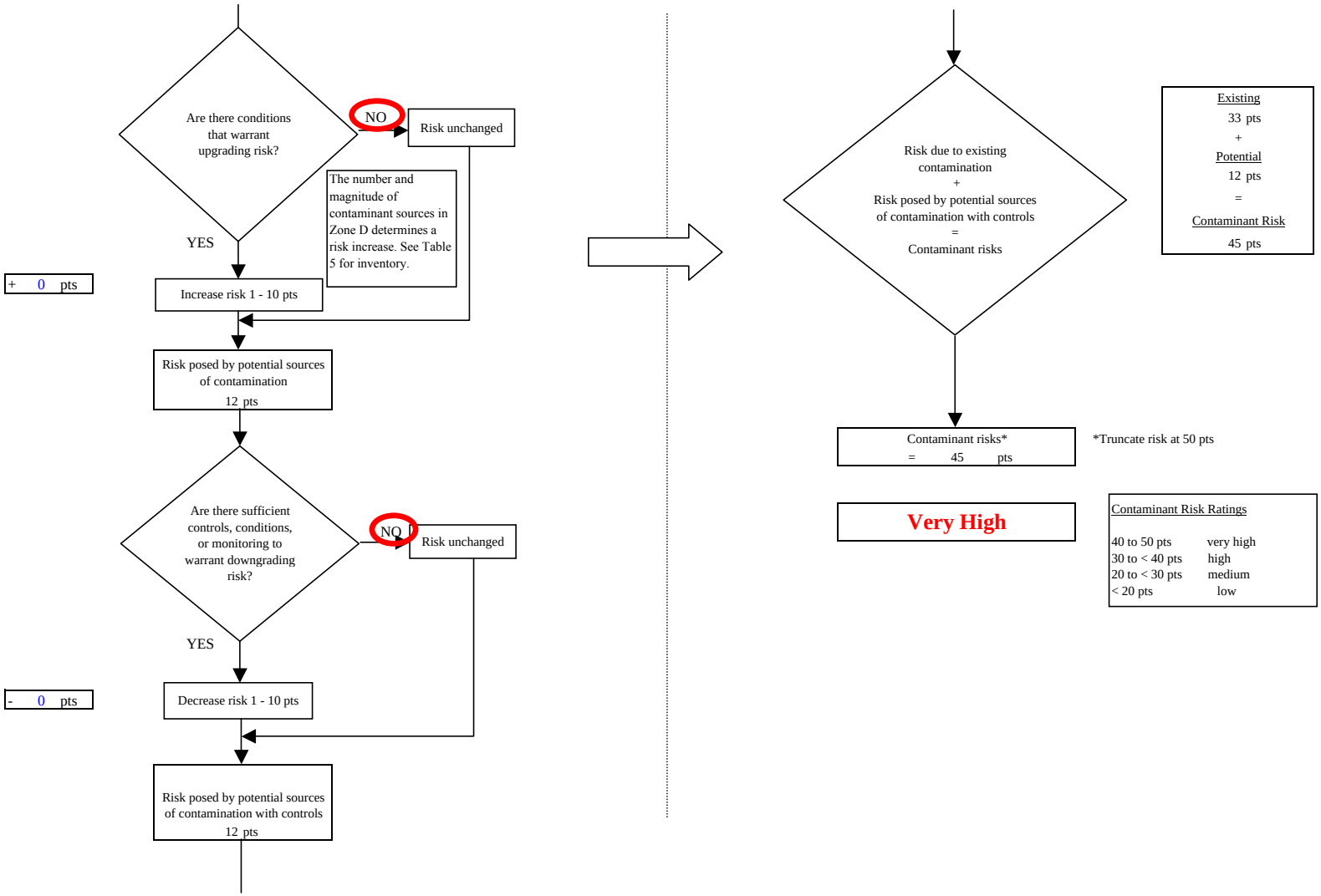


Chart 10. Vulnerability analysis for Pilot Station Water System (PWS No.260163.002) - Heavy Metals, Cyanide and Other Inorganic Chemicals

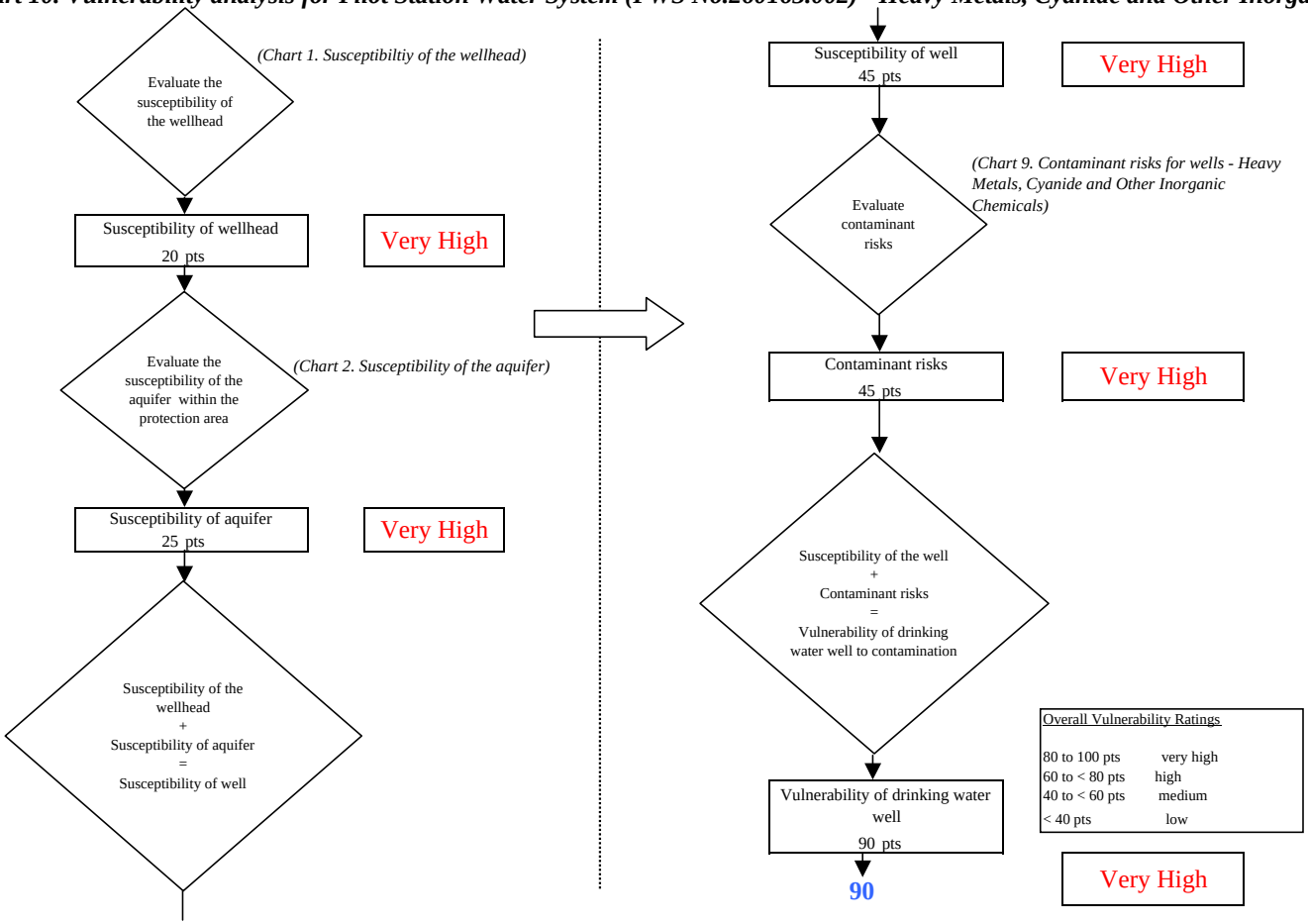


Chart 11. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Synthetic Organic Chemicals

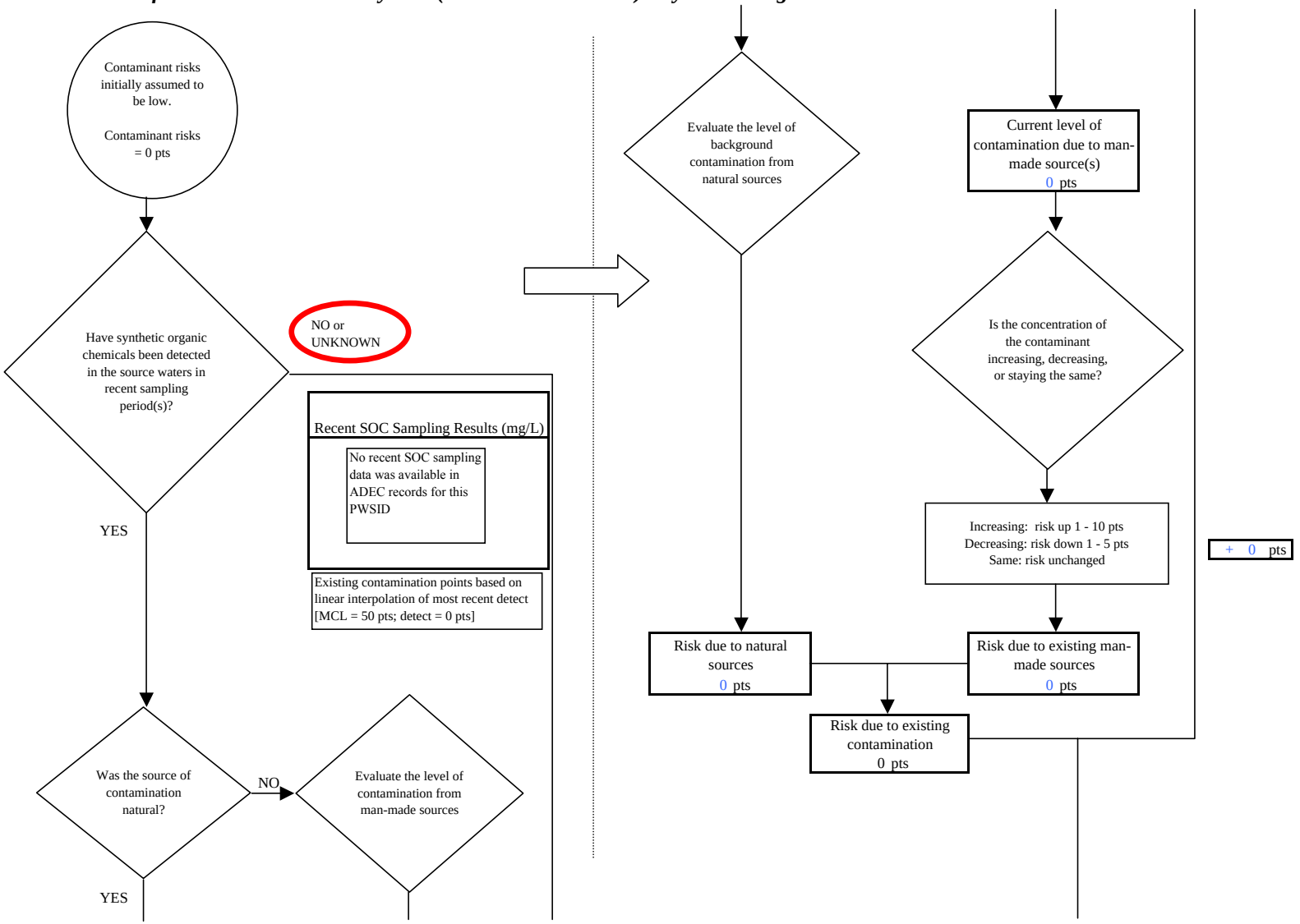
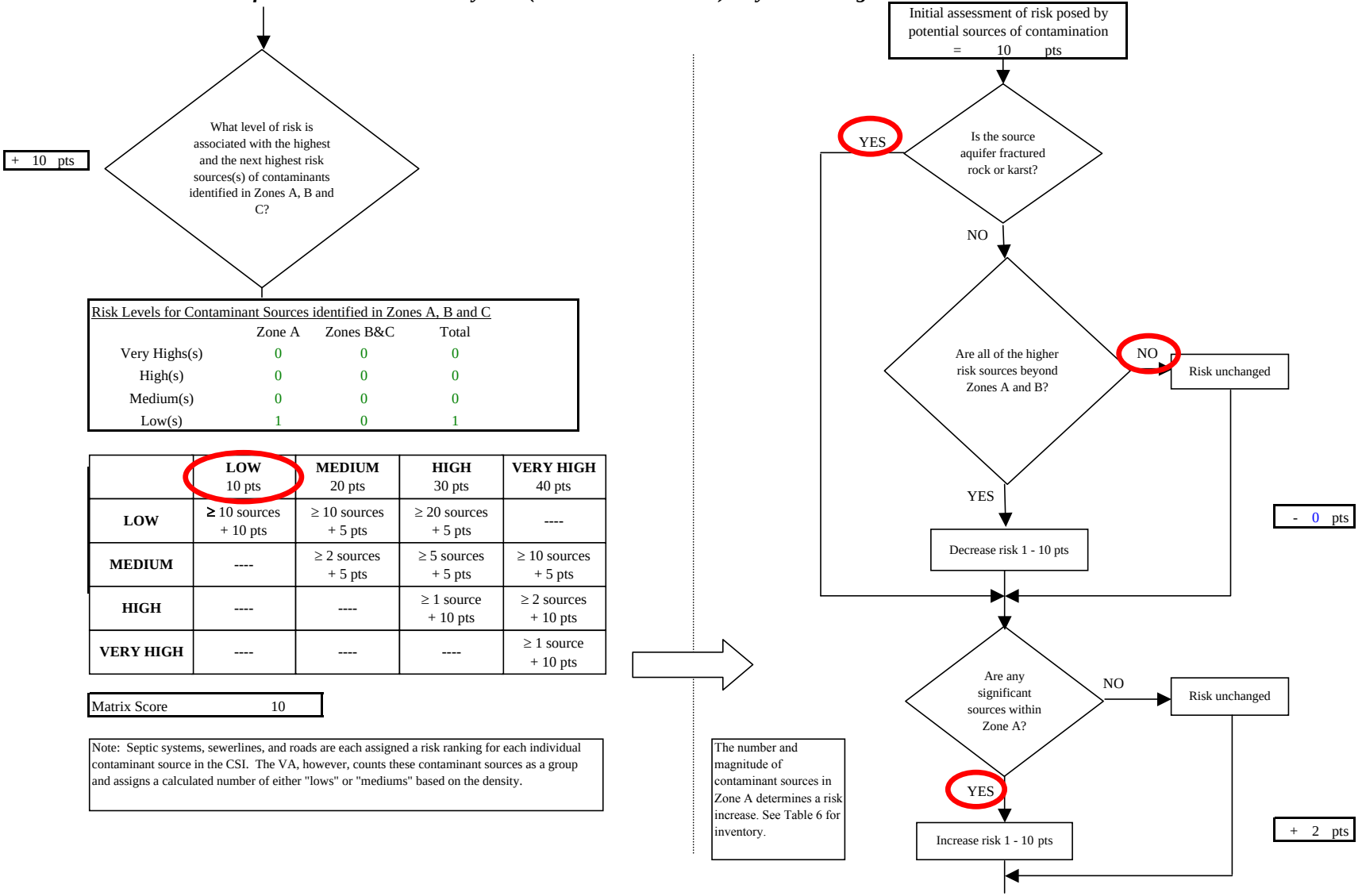


Chart 11. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Synthetic Organic Chemicals



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

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

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

Matrix Score 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.

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

Chart 11. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Synthetic Organic Chemicals

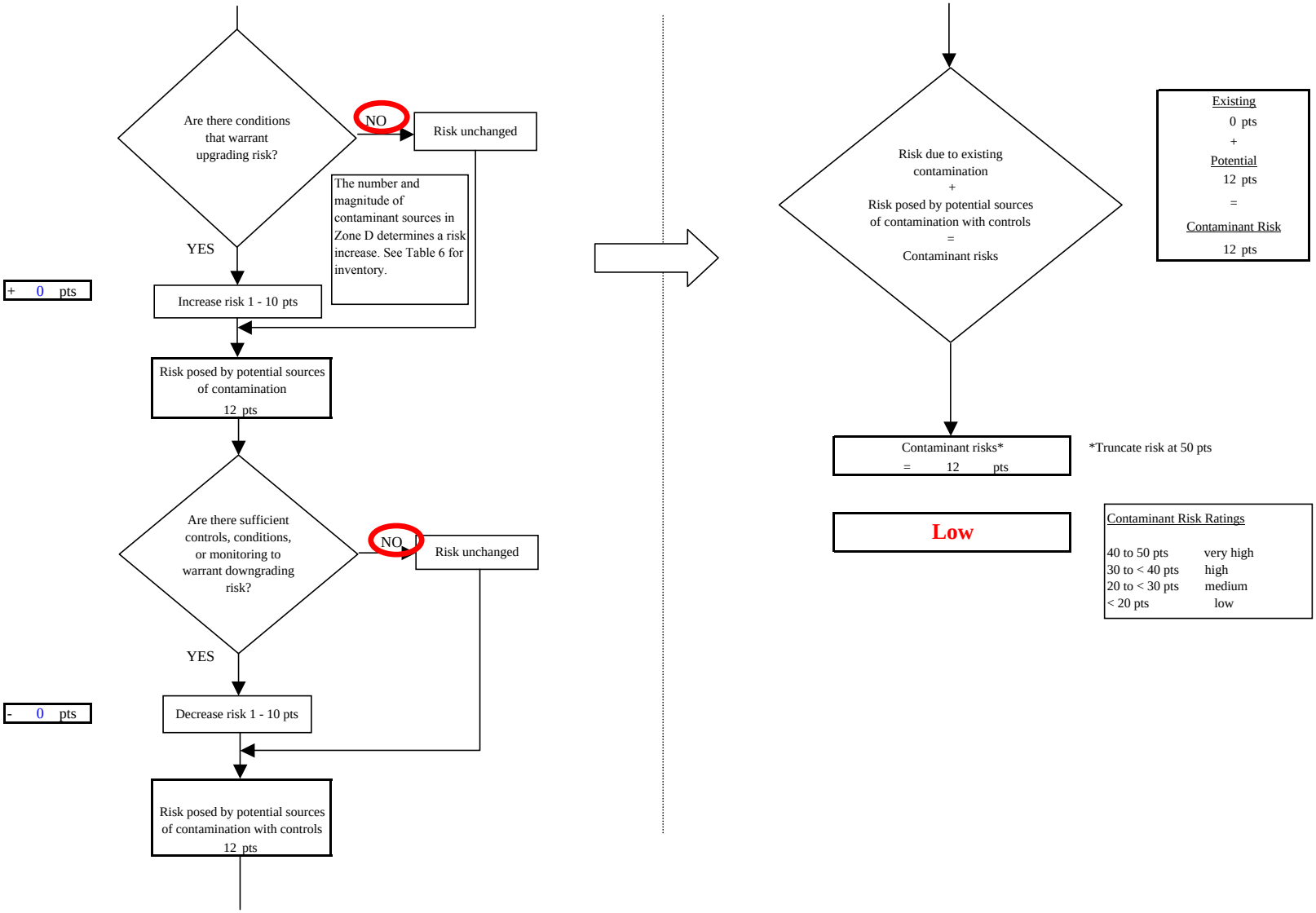


Chart 12. Vulnerability analysis for Pilot Station Water System (PWS No.260163.002) - Synthetic Organic Chemicals

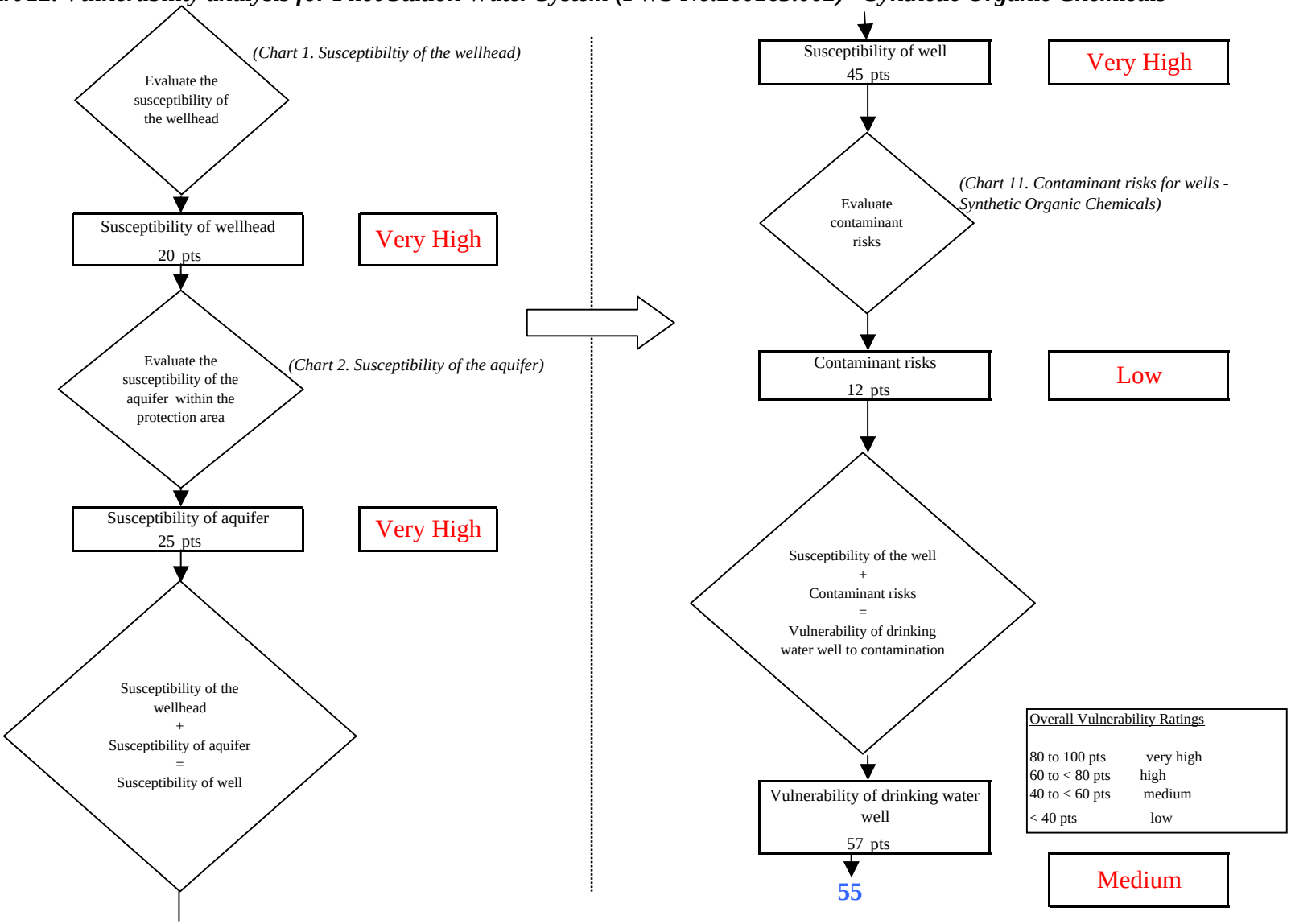


Chart 13. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Other Organic Chemicals

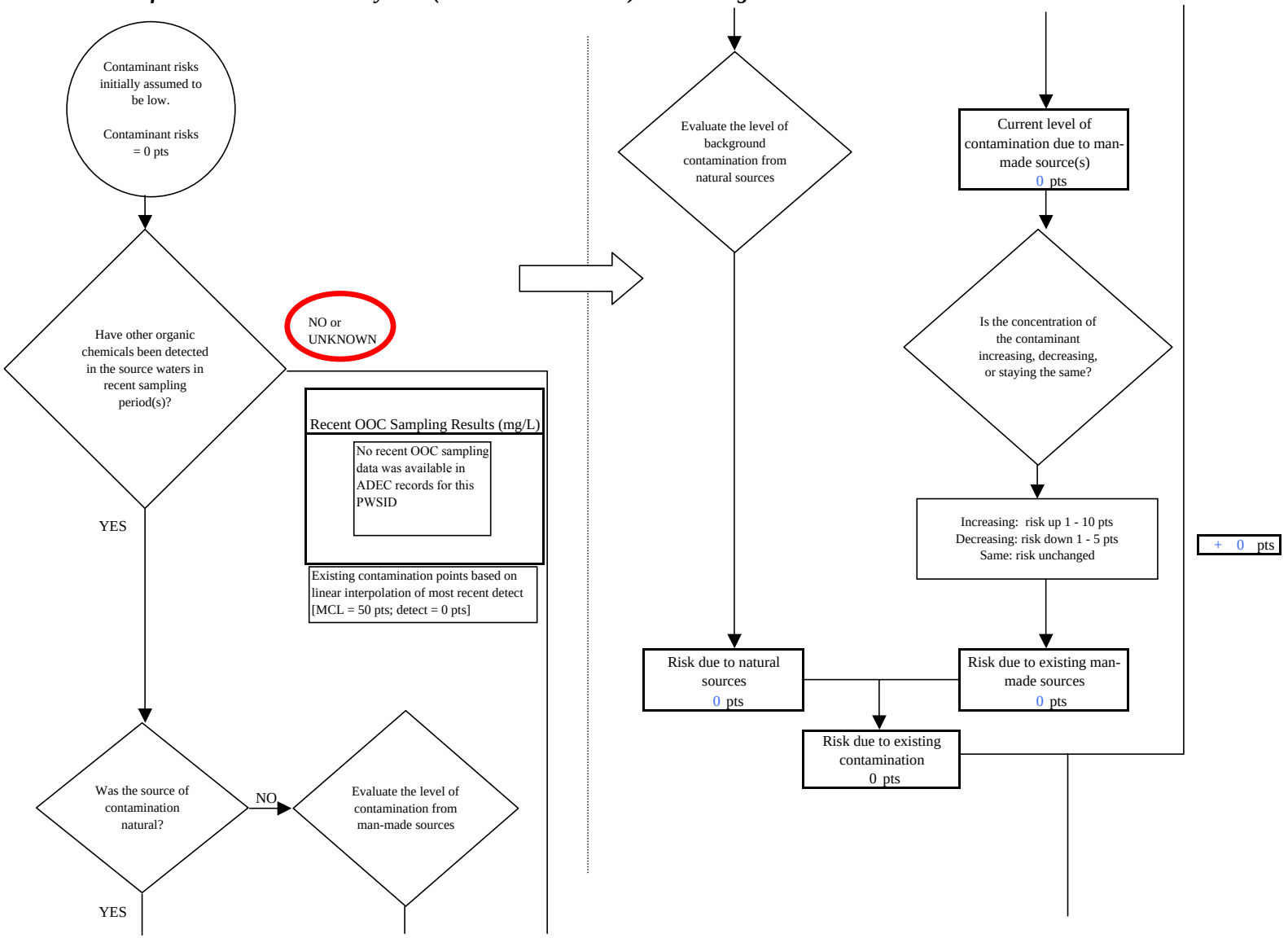
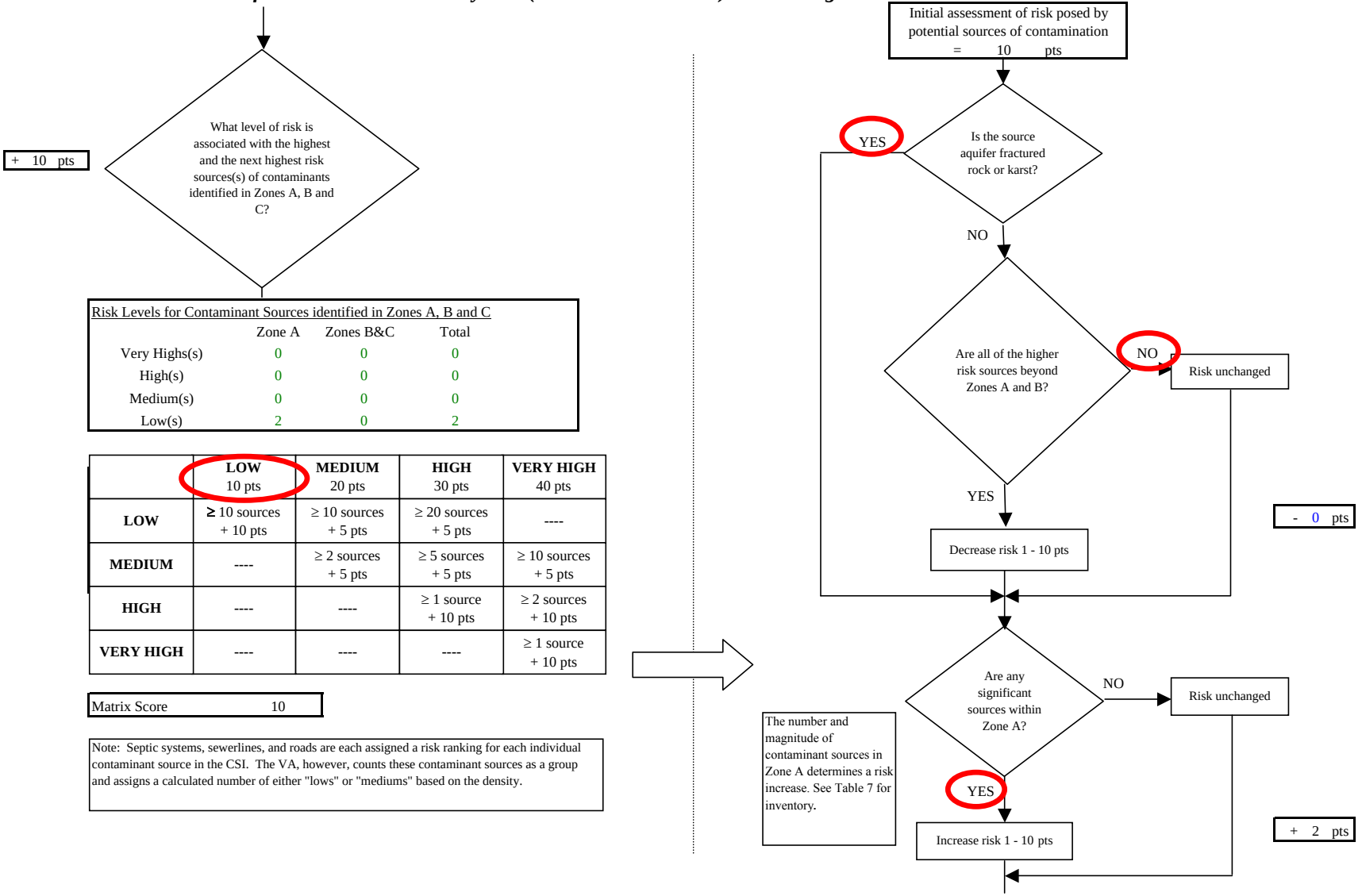


Chart 13. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Other Organic Chemicals



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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	0	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 13. Contaminant risks for Pilot Station Water System (PWS No.260163.002) - Other Organic Chemicals

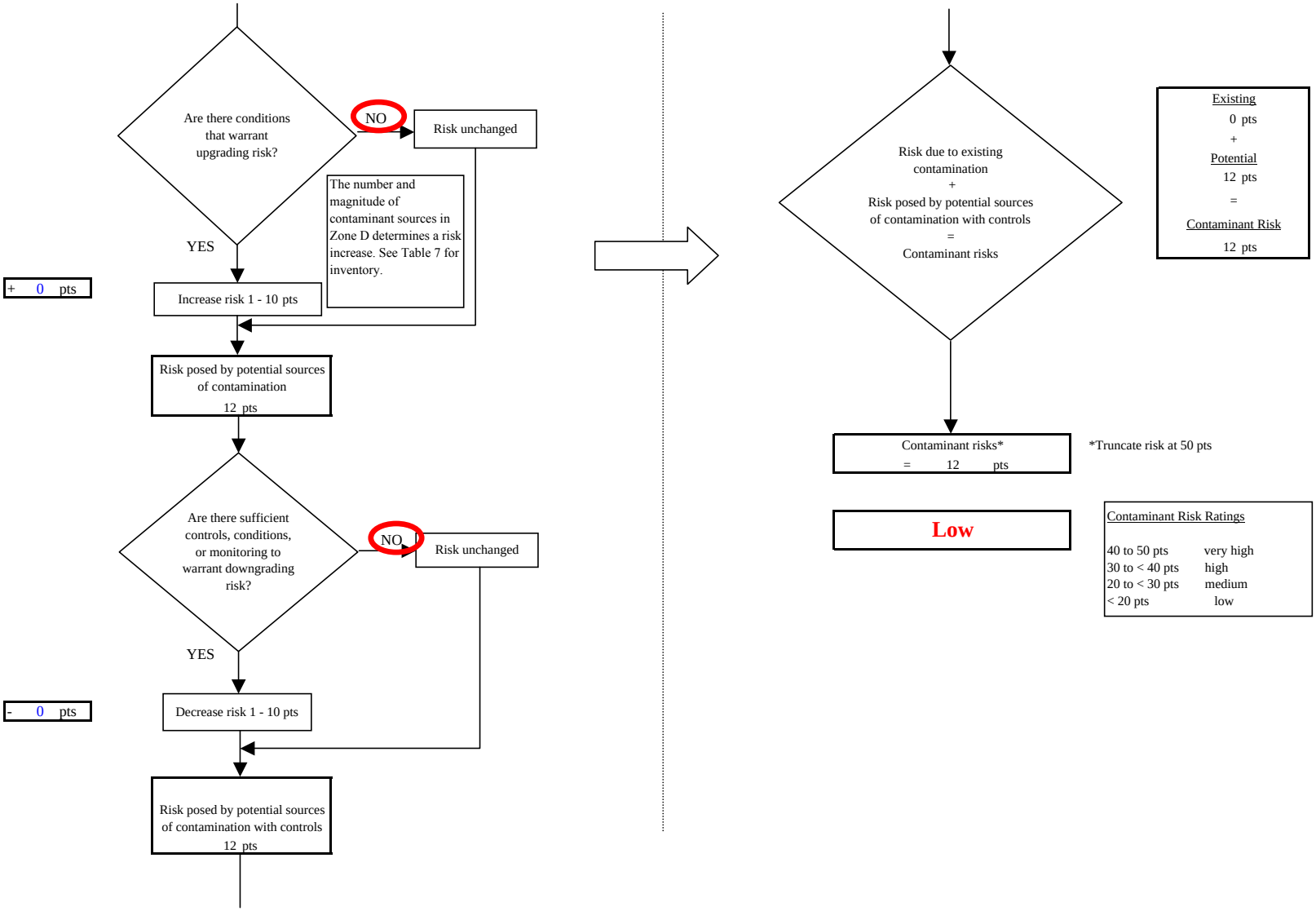


Chart 14. Vulnerability analysis for Pilot Station Water System (PWS No.260163.002) - Other Organic Chemicals