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# Source Water Assessment

A Hydrogeologic Susceptibility and  
Vulnerability Assessment for  
Northway Washeteria/Clinic  
Drinking Water System,  
Northway, Alaska

PWSID # 381422.001

June 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1399  
Alaska Department of Environmental Conservation

# Source Water Assessment for Northway Washeteria/Clinic Drinking Water System Northway, Alaska

PWSID # 381422.001

DRINKING WATER PROTECTION PROGRAM REPORT 1399

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 Northway Washeteria/Clinic Source of Public Drinking Water, Northway, Alaska

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## Drinking Water Protection Program Alaska Department of Environmental Conservation

### EXECUTIVE SUMMARY

The Northway Washeteria/Clinic has two Public Water System (PWS) wells. The primary well (PWS No 381422.001) has been used as a drinking water source since it was drilled in October of 1992. This source water assessment report is exclusively limited to PWSID #381422.001.

The well is a Class A (community and non-transient non-community) water system located adjacent to the washeteria in Northway, Alaska. Available records indicate that there is secondary storage of drinking water, with a capacity of approximately 47,700-gallons, and that the drinking water source is treated with calcium hypochlorite. This system operates year round and serves approximately 300 residents through 1 service connection. 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 pit toilets, a large capacity septic system and aboveground fuel storage tanks. An inventory of potential or existing contamination sources can be found in Appendix B, Table 1. 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 chemical contaminant categories.

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

### PUBLIC DRINKING WATER SYSTEM

The Northway Washeteria/Clinic well is a Class A (community/non-transient/non-community) public water system. The system located adjacent to the

washeteria in Northway, Alaska (Sec. 26, T014N, R018E, Copper River Meridian; see Map A of Appendix A). Northway is located on the east bank of the Nabesna Slough, 50 miles southeast of Tok. It encompasses three separate settlements: Northway Junction, Northway Village and the City of Northway. Northway has a population of 82 (ADCED, 2003). Average annual precipitation in Northway is 10 inches, including approximately 30 inches of snowfall. Temperatures can be as extreme as -72 to 91°F.

The community of Northway obtains their water supply from community wells. The school uses their own well water systems. Some sewage is collected via a piped system operated by City but the majority of households utilize honey bucket pits or outhouses. More than half the houses lack complete plumbing (ADCED, 2003). Northway receives electrical power from Alaska Power Company. Power generating facilities are fueled by diesel. Refuse is collected by Naabia Niign, Ltd. and transported to the landfill (ADCED, 2003).

According to information supplied by ADEC for the Northway Washeteria/Clinic PWS, the depth of the primary water well is 225 feet below the ground surface. Based on available well construction details, the well is screened. The well is completed in a confined aquifer, and is located within a floodplain.

Information acquired from an April 2000 sanitary survey for the public water system indicated that the land surface is not 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 indicates 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.

Regionally, Northway lies within the broad northwest-trending valley of the Tanana River. Granite rocks and older metamorphic rocks of the Yukon-Tanana terrace form the unnamed hills on the northeast side of the valley. Marine sedimentary rocks form the Nutzotin and Mentasta Mountains on

the west side of the valley, which are separated from the main portion of the valley by the active, northwest-trending Denali fault (Dames & Moore 1995).

The Northway area is located on a flat, swampy floodplain that was once a channel of the Nabesna River. Unconsolidated sediments within the floodplain were deposited by glaciers and streams. The floodplain deposits consist of sand and gravel units with traces of peat and clay, which are overlain by eolian silt. The surface soils are generally composed of silts and silty sands, with minor amounts of sand and clay. Little gravel or clay is present. Soils in the vicinity are generally poorly-drained, and numerous lakes and small ponds dot the landscape (Dames & Moore 1995).

The Northway vicinity is reportedly underlain by discontinuous lenses or isolated masses of permafrost (Dames & Moore 1995).

#### **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 Northway Washeteria/Clinic 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**

<b>Zone</b>	<b>Definition</b>
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 Northway Washeteria/Clinic PWS was determined using an analytical calculation and includes Zones A, B, C, 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 Northway Washeteria/Clinic 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 Northway Washeteria/Clinic’s water well is 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	8	Low
Natural Susceptibility	28	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	35	High
Nitrates and/or Nitrites	44	Very High
Volatile Organic Chemicals	25	Medium
Heavy Metals, Cyanide and		
Other Inorganic Chemicals	50	Very High
Synthetic Organic Chemicals	20	Medium
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:

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

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	65	High
Nitrates and Nitrites	70	High
Volatile Organic Chemicals	55	Medium
Heavy Metals, Cyanide and		
Other Inorganic Chemicals	75	High
Synthetic Organic Chemicals	50	Medium
Other Organic Chemicals	40	Medium

#### Bacteria and Viruses

The contaminant risk for bacteria and viruses is **High**. The risk is primarily attributed to the presence of a large capacity septic system located in Zone B (see Table 2 – Appendix B). Other potential contaminant sources are also found within the protection area (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, 2002). Positive samples increase the overall vulnerability of the drinking water source, indicating that the source is susceptible to bacteria and virus contamination.

No 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 **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 large capacity septic system located in Zone B (see Table 3 – Appendix B). Other potential contaminant sources are also found within the protection area (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 nitrates have been detected in recent sampling events, however they did not exceed

the MCL of 10mg/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 **Medium**. The risk is primarily attributed to the presence of aboveground fuel storage tanks located in Zone A (see Table 4 – Appendix B).

Detectable concentrations of trihalomethanes were reported in recent sampling events for this public water system. However, the detectible concentrations of trihalomethanes reported in 1998, 2000, and 2001 were below the MCL of 0.08 mg/L (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D). Trihalomethanes are considered byproducts of the water treatment process and are not from the source waters. Since the reported concentration of TTHM's in recent sampling events did not exceed the applicable MCL, risk points were not retained.

Possible sources of volatile organic chemicals include facilities with automobiles, residential areas, fuel tanks, and roads. See Table 4 in Appendix B for a complete listing.

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 **Medium**.

### **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 high levels of lead and copper recorded in recent sampling events as well as the presence of pit toilets located in Zone A (see Table 5 – Appendix B).

Based on review of recent sampling records for this public water system, high levels of copper and lead

have been detected in recent sampling history, and have exceeded their respective MCLs of 1.3 mg/L and 0.015 mg/L (see Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

The reported concentrations of lead in recent sampling events are likely representative of source water conditions. Risk points were assigned based on the exceedence of the lead MCL.

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 **High**.

### **Synthetic Organic Chemicals**

The contaminant risk for synthetic organic chemicals is **Medium**. The risk is primarily attributed to the presence of a cemetery located in Zone B (see Table 6 – Appendix B).

No recent sampling data was available in ADEC records for the Northway Washeteria/Clinic (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 roads in Zone A and a large capacity septic system in Zone B (see Table 7 – Appendix B).

No recent sampling data was available in ADEC records for the Northway Washeteria/Clinic (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 Northway 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

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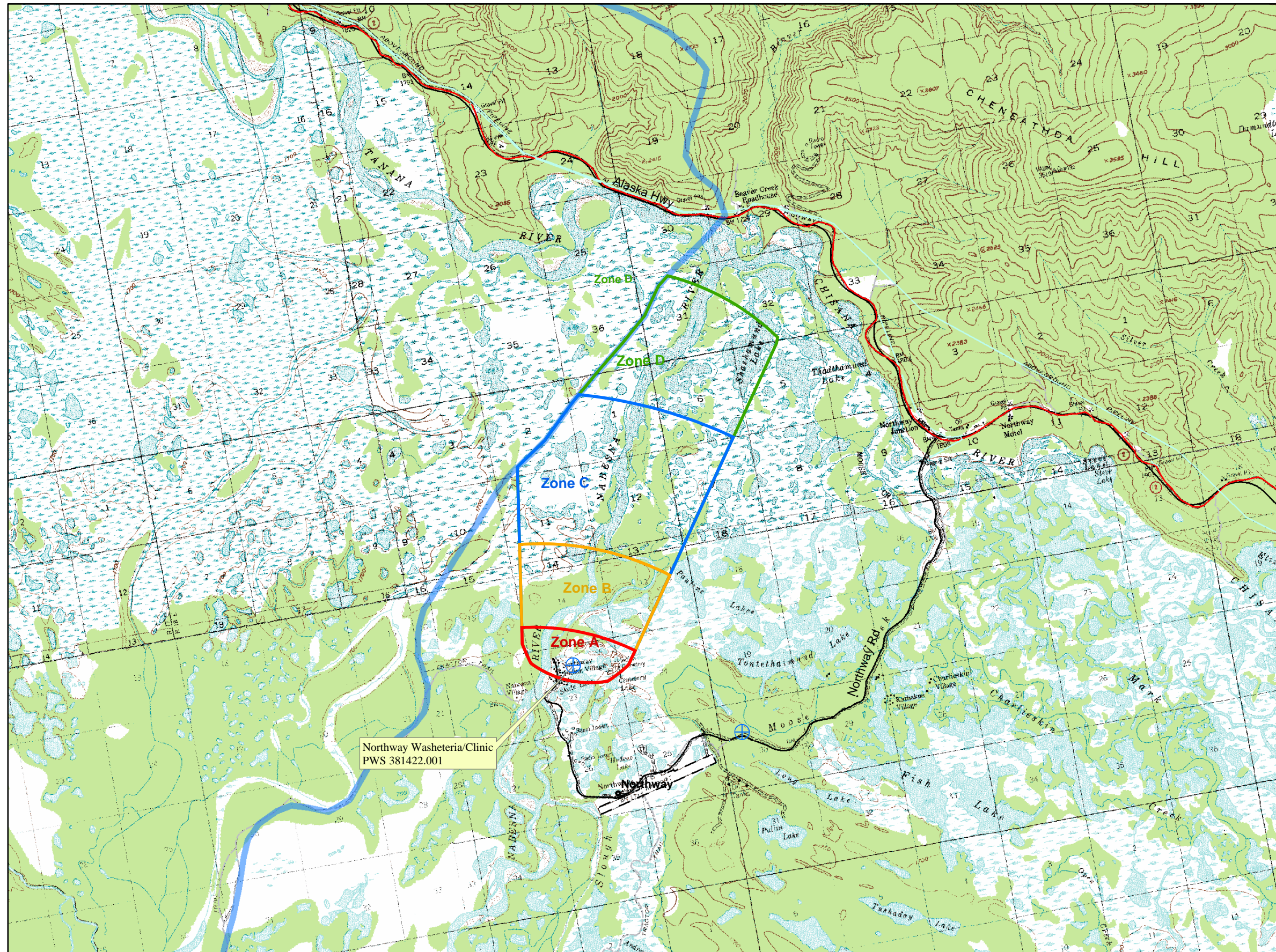
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# **APPENDIX A**

## **Drinking Water Protection Area Location Map (Map A)**

Public Water Well System for PWS #381422.001 Northway Washeteria/Clinic



**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)

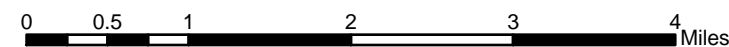
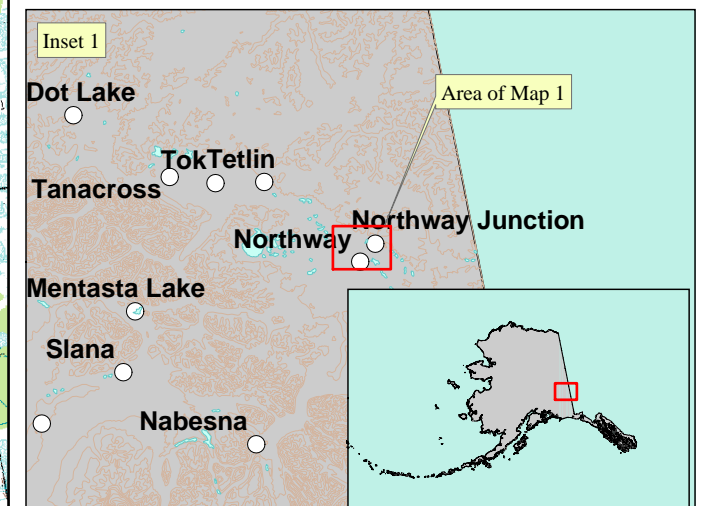
**Groundwater Protection Zones**

- Zone A Protection Area— Several Months Travel Time
- Zone B Protection Area— 2 Years Travel Time
- Zone C Protection Area— 5 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)
- 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.



## **APPENDIX B**

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

**Table 1**

**Contaminant Source Inventory for  
Northway Washeteria/Clinic**

**PWSID 381422.001**

<b>Contaminant Source Type</b>	<b>Contaminant Source ID</b>	<b>CS ID tag</b>	<b>Zone</b>	<b>Map Number</b>	<b>Comments</b>
Pit toilets (open hole), nonresidential (one or more)	D16	D16-01	A	C	Assume 40 or less pit toilets/outhouses in Zone A
Tanks, heating oil, residential (above ground)	R08	R08-01	A	C	Assume 20 or less residential heating oil tanks is Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	C	Assume 20 or less roads in Zone A
Laundromats without dry cleaning	C22	C22-01	B	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	B	C	
Cemeteries	X01	X01-01	B	C	

*Contaminant Source Inventory and Risk Ranking for  
Northway Washeteria/Clinic  
Sources of Bacteria and Viruses*

*PWSID 381422.001*

**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>
Pit toilets (open hole), nonresidential (one or more)	D16	D16-01	A	Medium	C	Assume 40 or less pit toilets/outhouses in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 20 or less roads in Zone A
Laundromats without dry cleaning	C22	C22-01	B	Low	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	B	High	C	

**Table 3**

*Contaminant Source Inventory and Risk Ranking for  
Northway Washeteria/Clinic  
Sources of Nitrates/Nitrites*

**PWSID 381422.001**

<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>
Pit toilets (open hole), nonresidential (one or more)	D16	D16-01	A	Medium	C	Assume 40 or less pit toilets/outhouses in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 20 or less roads in Zone A
Laundromats without dry cleaning	C22	C22-01	B	Low	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	B	High	C	
Cemeteries	X01	X01-01	B	Medium	C	



*Contaminant Source Inventory and Risk Ranking for  
Northway Washeteria/Clinic  
Sources of Volatile Organic Chemicals*

**PWSID 381422.001**

**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>
Pit toilets (open hole), nonresidential (one or more)	D16	D16-01	A	Low	C	Assume 40 or less pit toilets/outhouses in Zone A
Tanks, heating oil, residential (above ground)	R08	R08-01	A	Medium	C	Assume 20 or less residential heating oil tanks in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 20 or less roads in Zone A
Laundromats without dry cleaning	C22	C22-01	B	Low	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	B	Low	C	

*Contaminant Source Inventory and Risk Ranking for  
Northway Washeteria/Clinic*

**PWSID 381422.001**

**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>
Pit toilets (open hole), nonresidential (one or more)	D16	D16-01	A	Low	C	Assume 40 or less pit toilets/outhouses in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 20 or less roads in Zone A
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	B	Low	C	
Cemeteries	X01	X01-01	B	Low	C	

*Contaminant Source Inventory and Risk Ranking for  
Northway Washeteria/Clinic  
Sources of Synthetic Organic Chemicals*

*PWSID 381422.001*

**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>
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	B	Low	C	
Cemeteries	X01	X01-01	B	Medium	C	

*Contaminant Source Inventory and Risk Ranking for  
Northway Washeteria/Clinic  
Sources of Other Organic Chemicals*

*PWSID 381422.001*

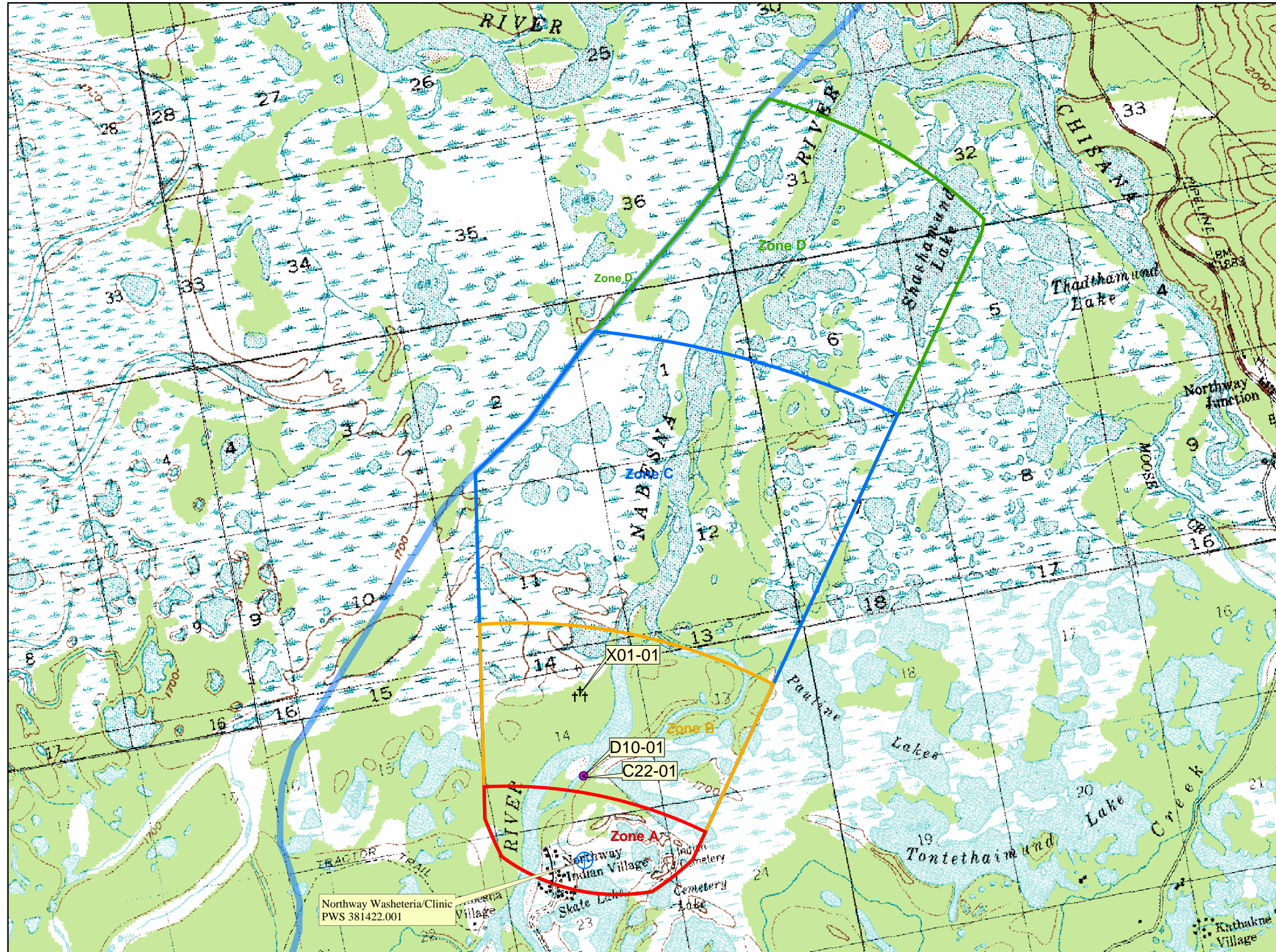
**Table 7**

<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>
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 20 or less roads in Zone A
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	B	Low	C	

## **APPENDIX C**

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

**Public Water Well System for PWS #381422.001 Northway Washeteria/Clinic  
Showing Sources of Existing and Potential 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 C Protection Area - 5 Years Travel Time
- Zone D Protection Area - 10 Years Travel Time or Watershed Boundary

**Existing or Potential Contaminant Sources**

- Laundromats without dry cleaning (C22)
- Injection Wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method) (D10)
- Cemetery (X01)

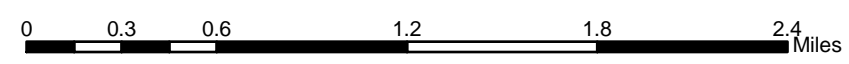
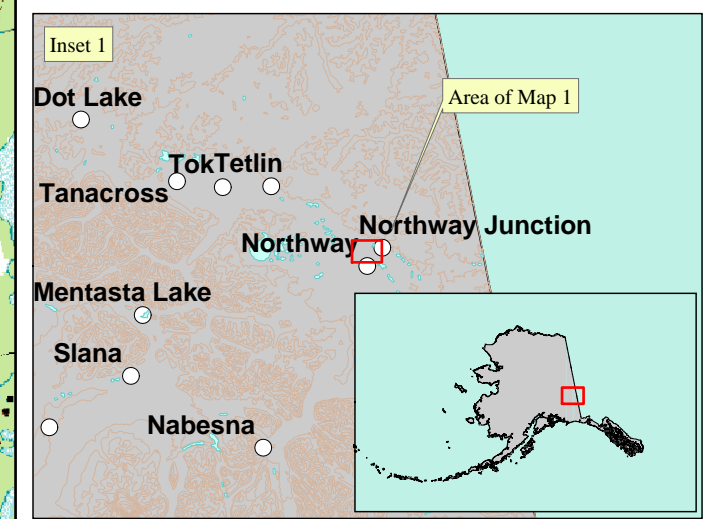
**Data Sources:**

- 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

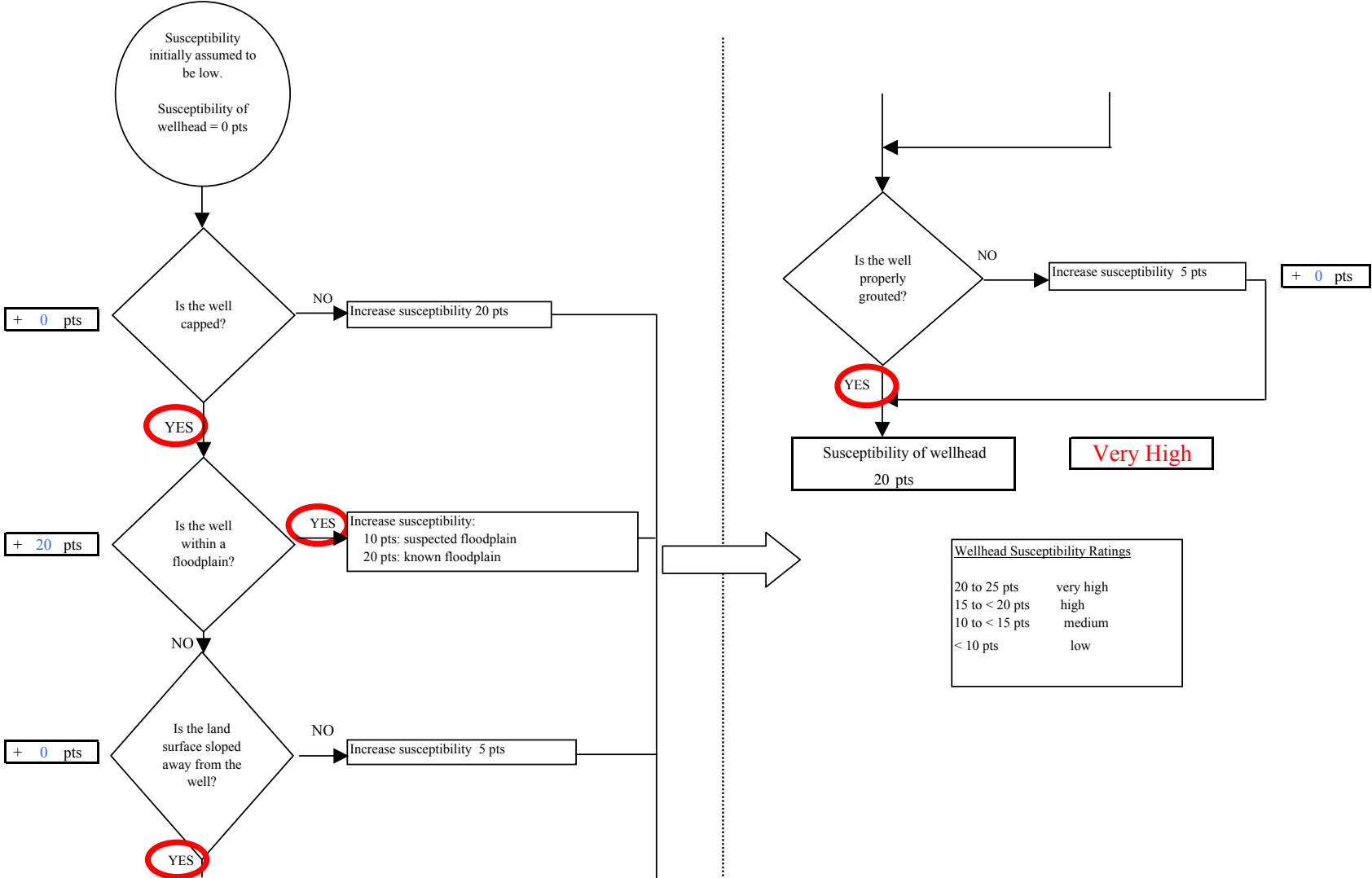
URS Corporation does not guarantee the accuracy or validity of the data provided.



## **APPENDIX D**

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

**Chart 1. Susceptibility of the wellhead - Northway Washeteria/Clinic (PWS No 381422.001)**





**Chart 2. Susceptibility of the aquifer Northway Washeteria/Clinic (PWS No 381422.001)**

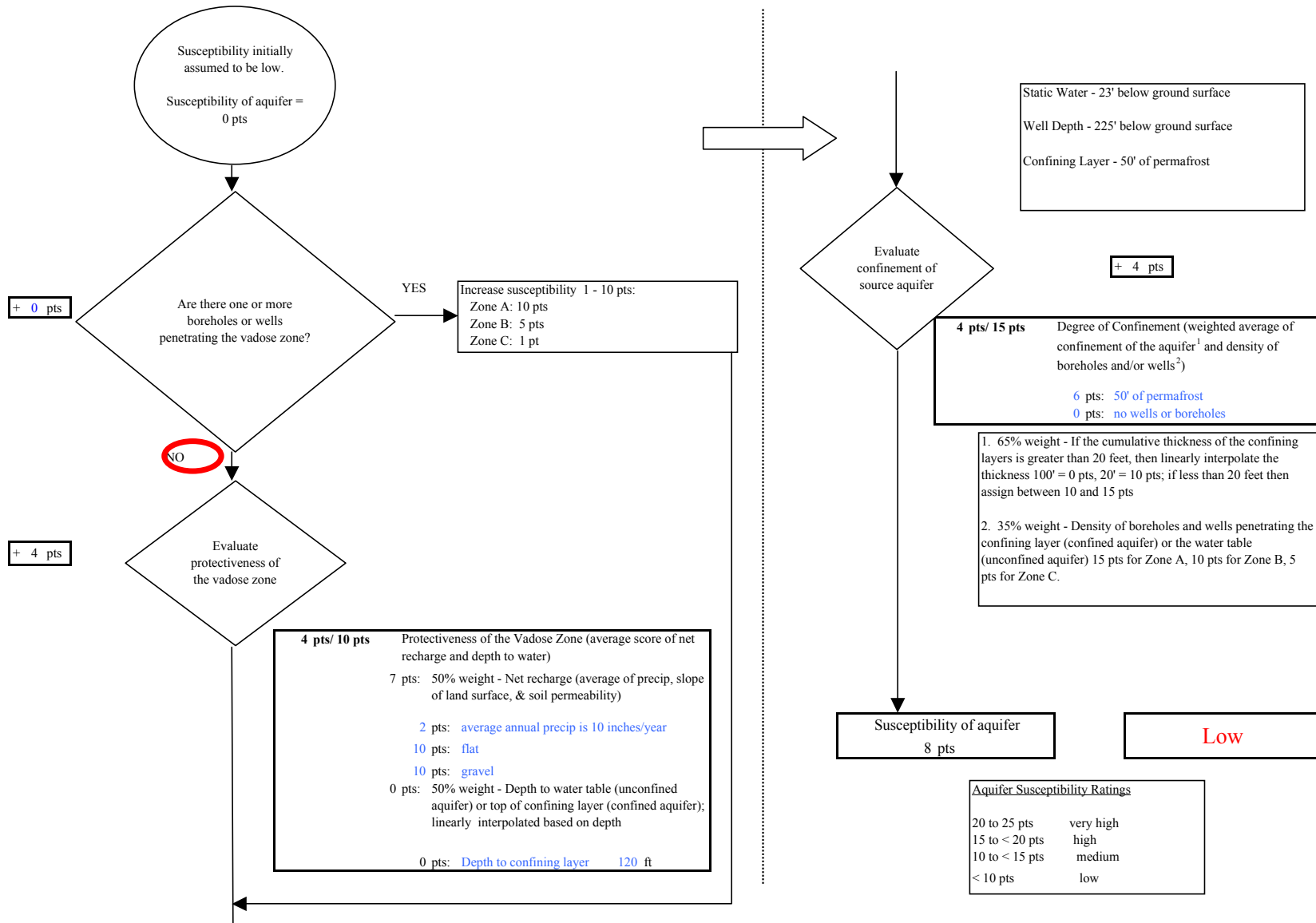


Chart 3. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Bacteria & Viruses

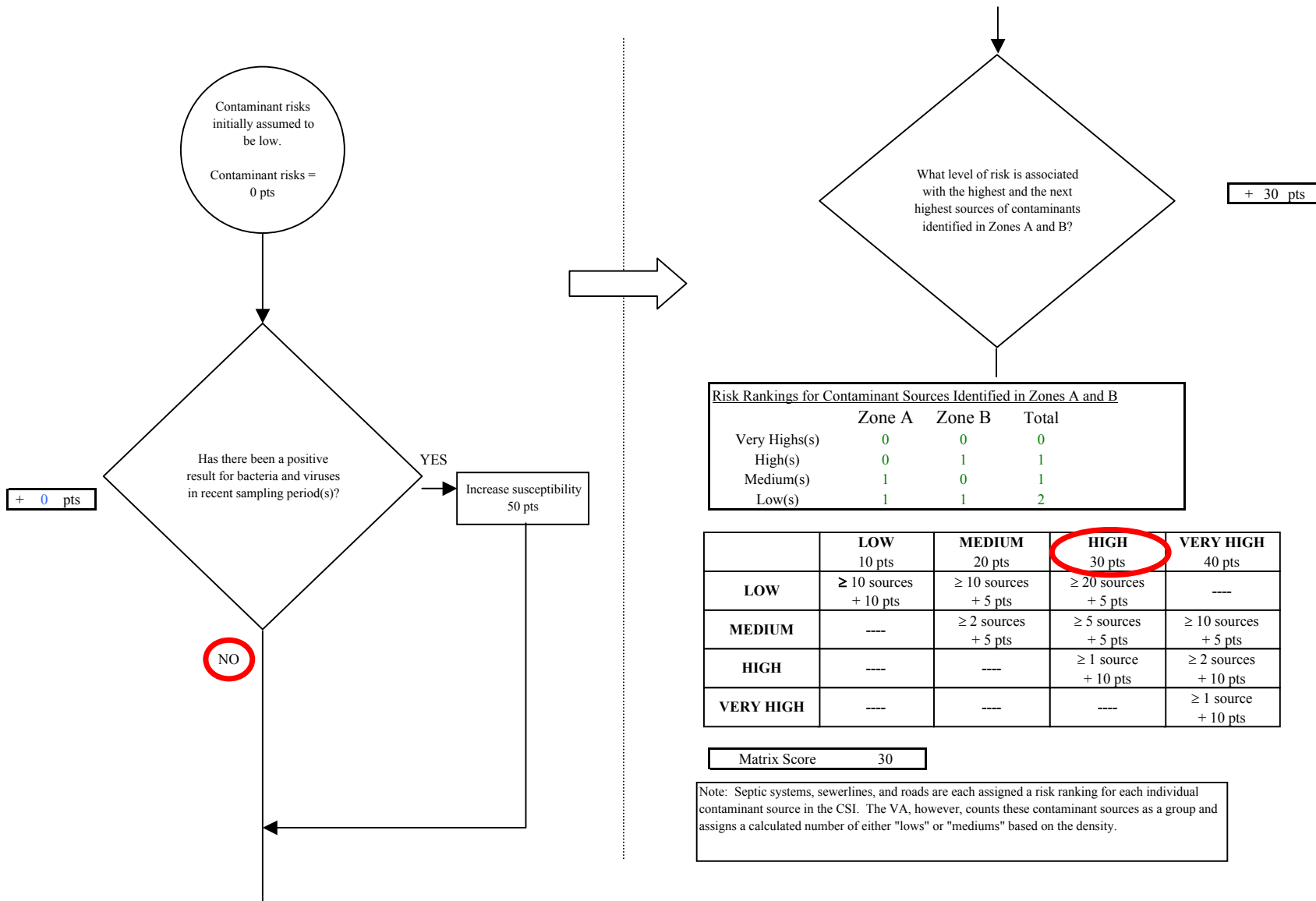
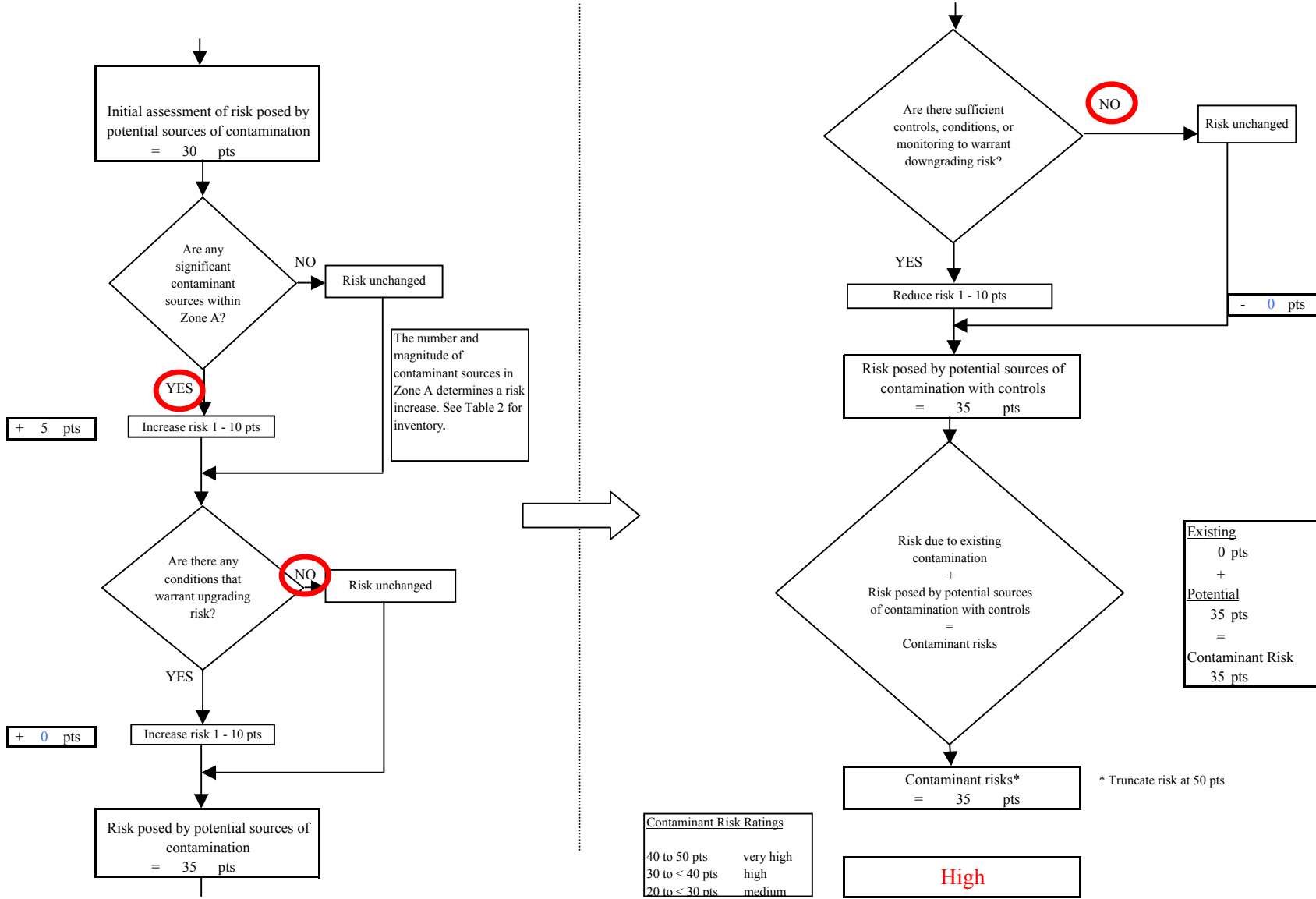


Chart 3. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Bacteria & Viruses



**Chart 4. Vulnerability analysis for Northway Washeteria/Clinic (PWS No 381422.001) - Bacteria & Viruses**

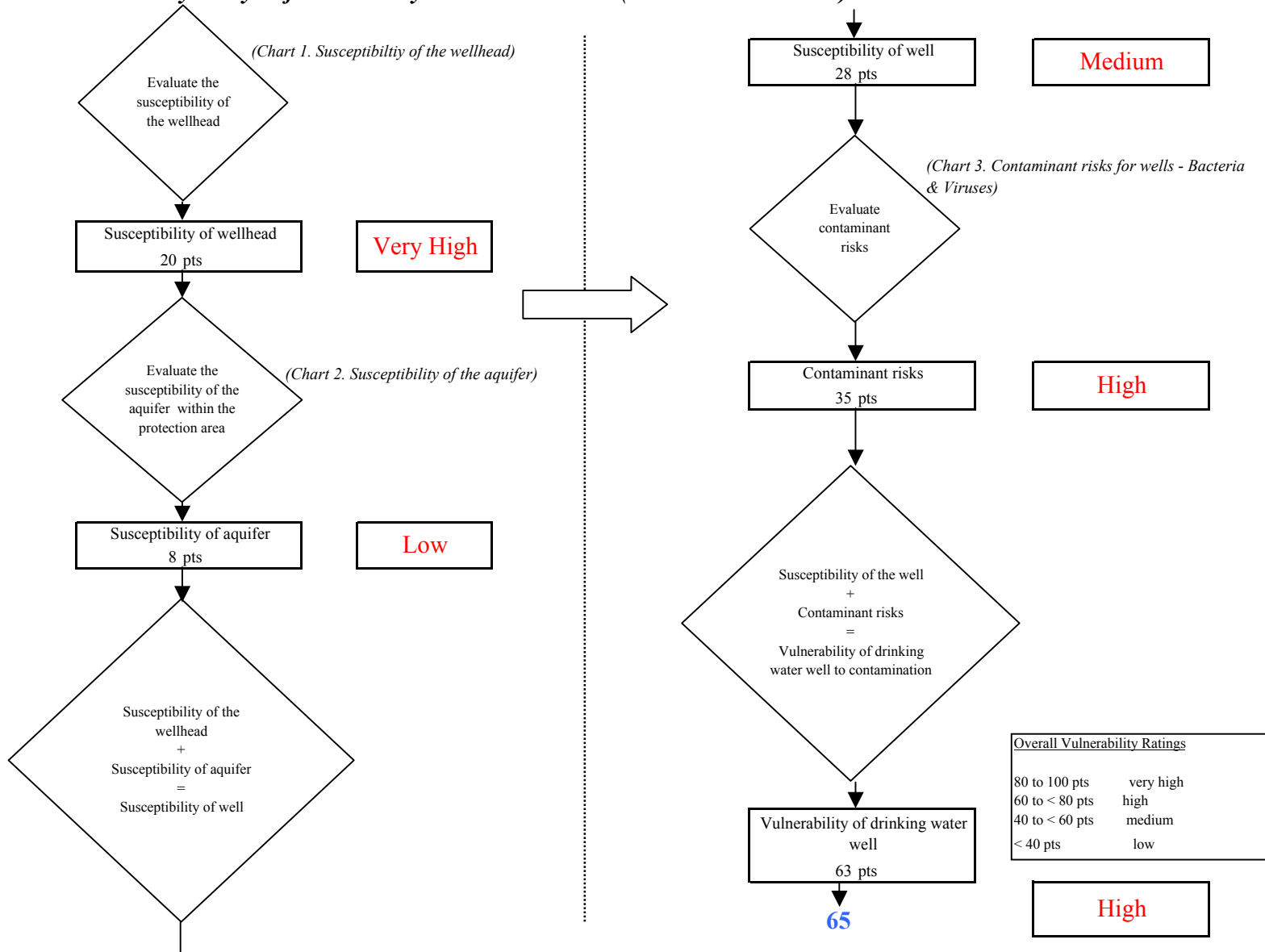


Chart 5. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Nitrates and Nitrites

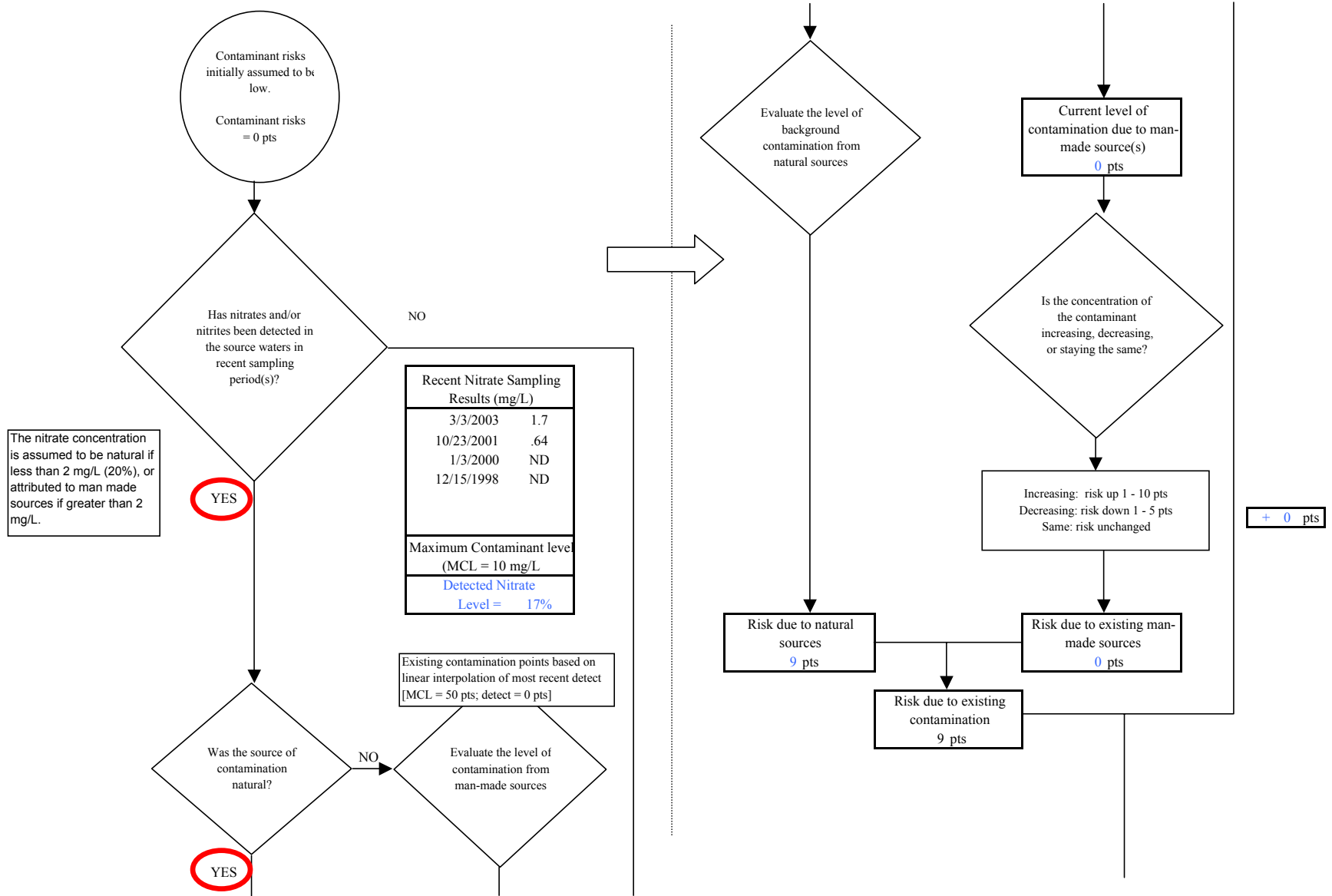
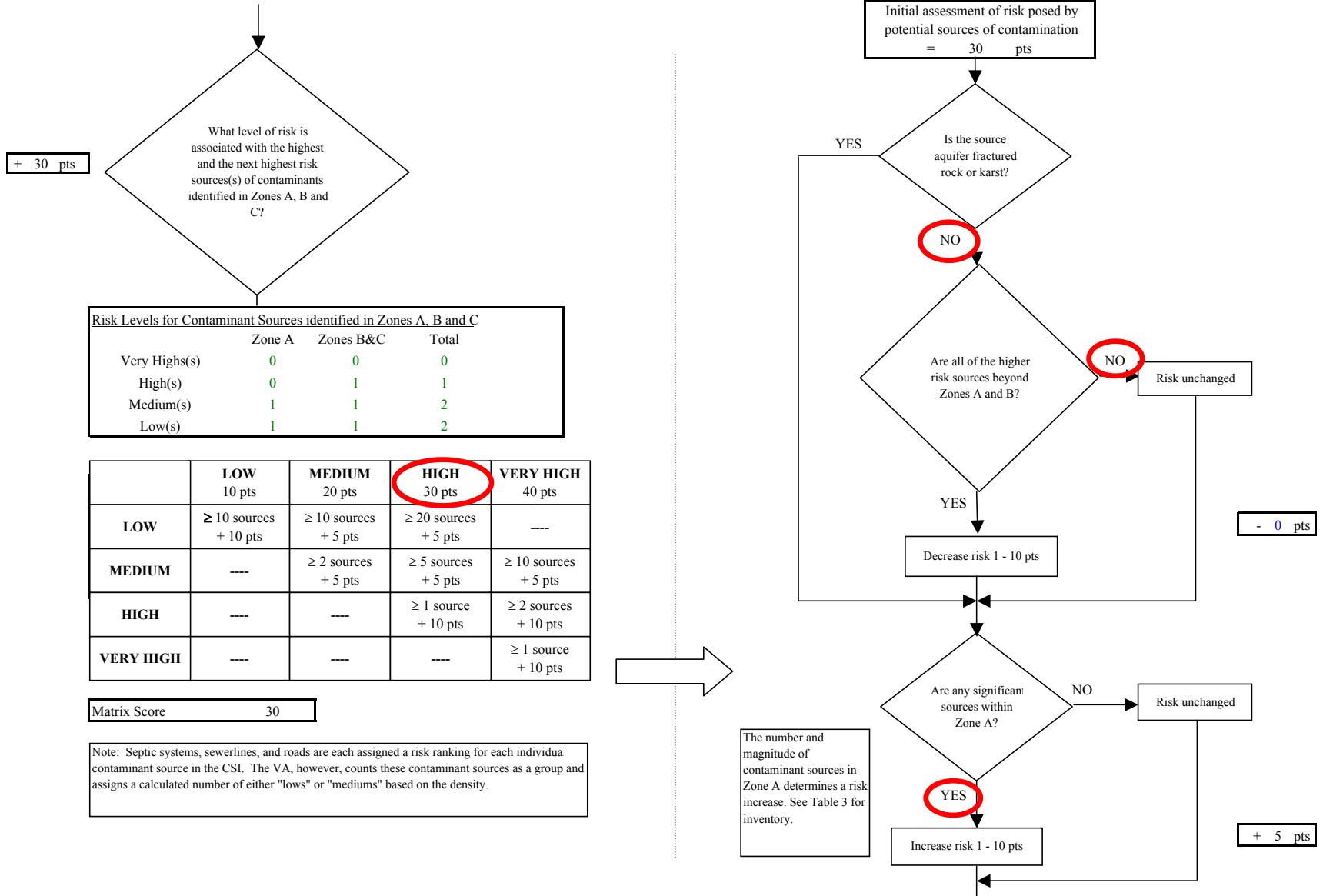
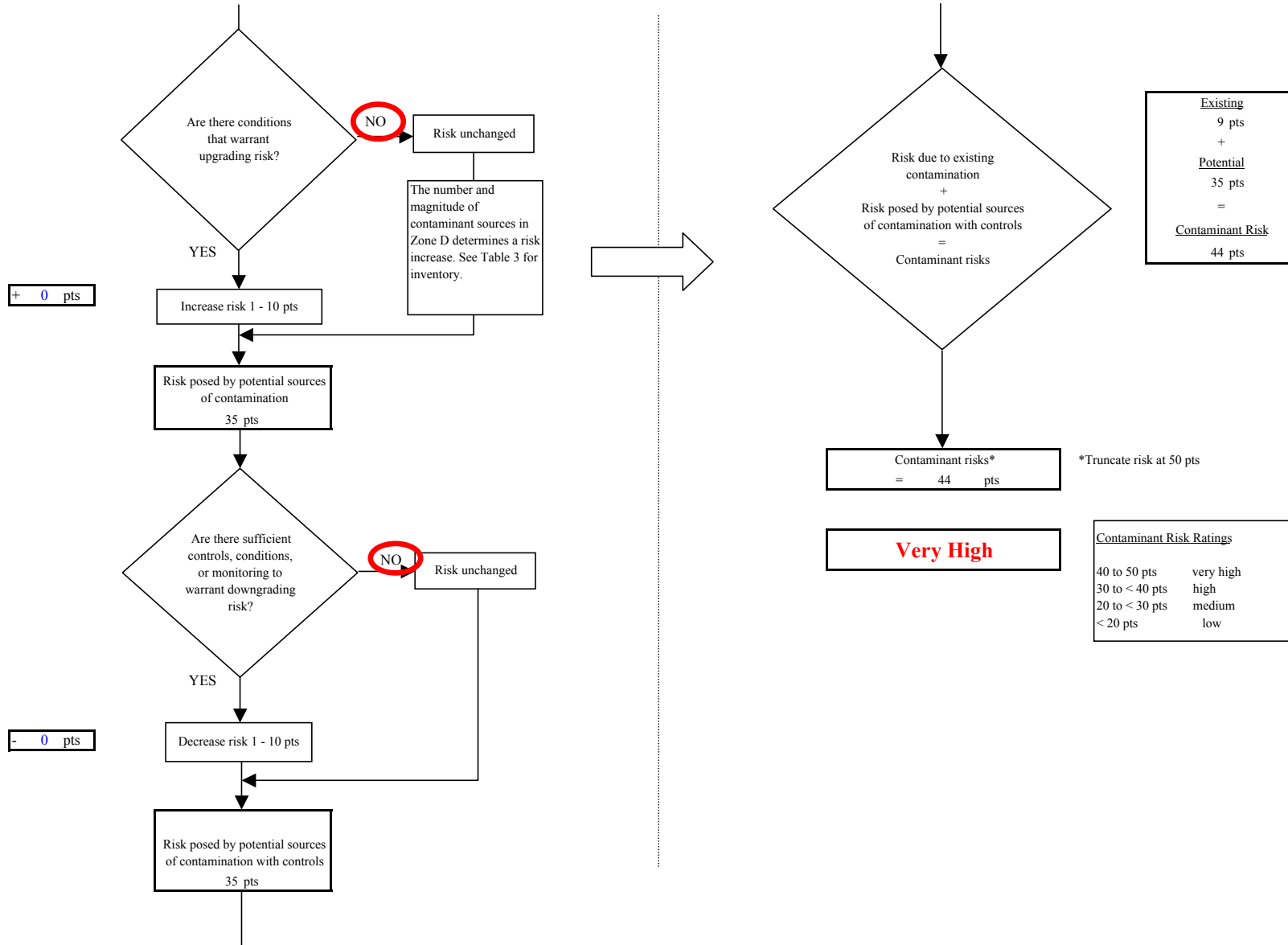


Chart 5. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Nitrates and Nitrites



**Chart 5. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Nitrates and Nitrites**



**Chart 6. Vulnerability analysis for Northway Washeteria/Clinic (PWS No 381422.001) - Nitrates and Nitrites**

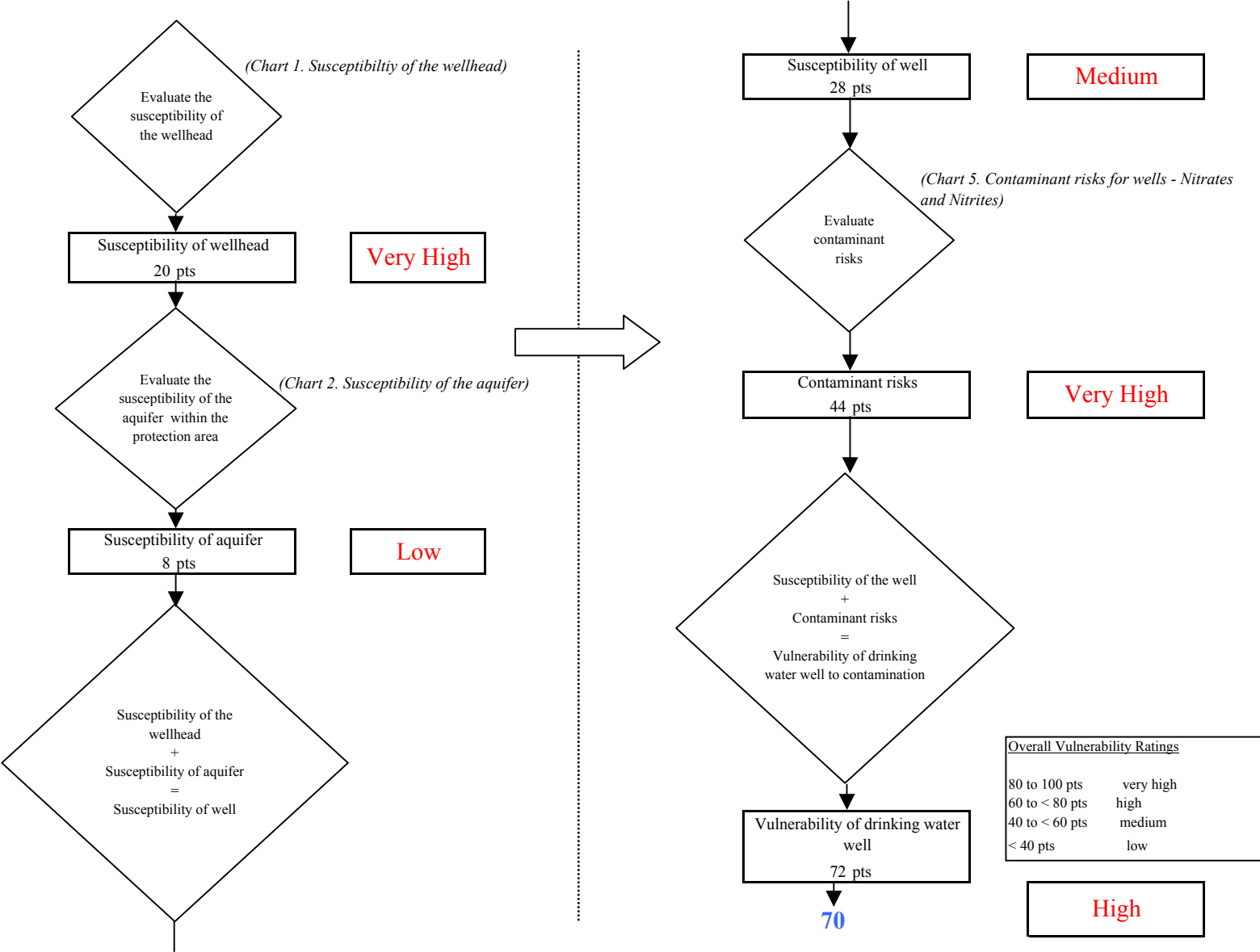




Chart 7. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Volatile Organic Chemicals

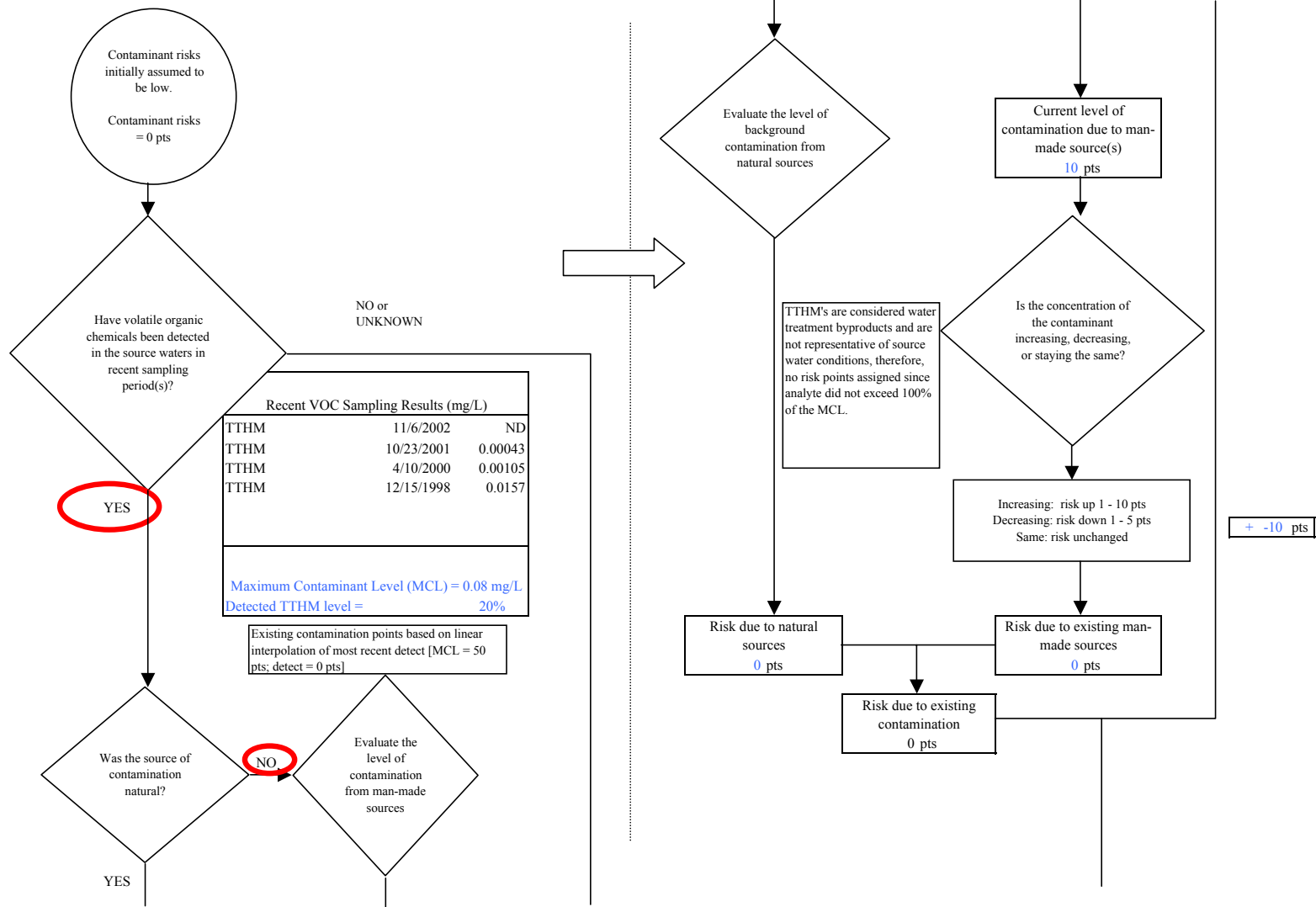
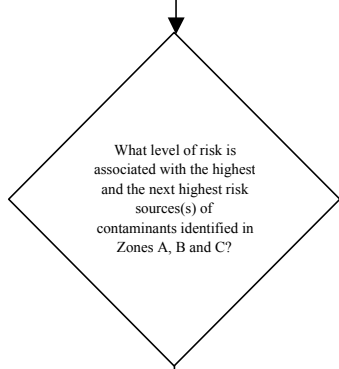


Chart 7. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Volatile Organic Chemicals

+ 20 pts

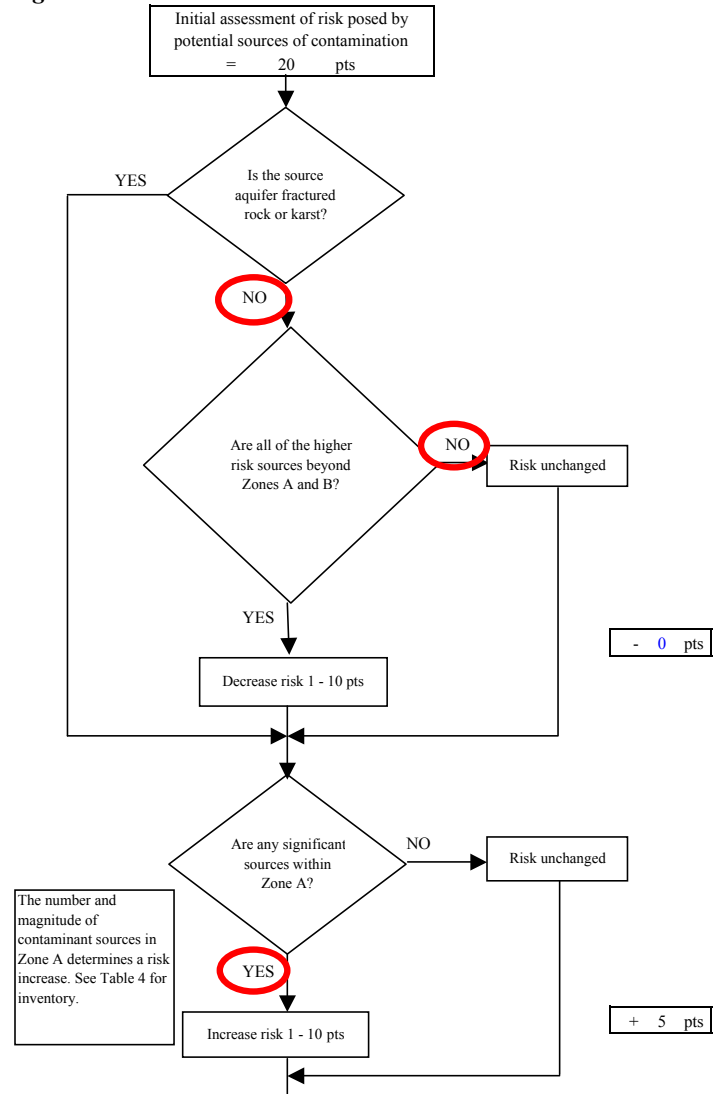
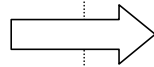


Risk Levels for Contaminant Sources identified in Zones A, B and C			
	Zone A	Zones B&C	Total
Very High(s)	0	0	0
High(s)	0	0	0
Medium(s)	1	0	1
Low(s)	2	2	4

	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.

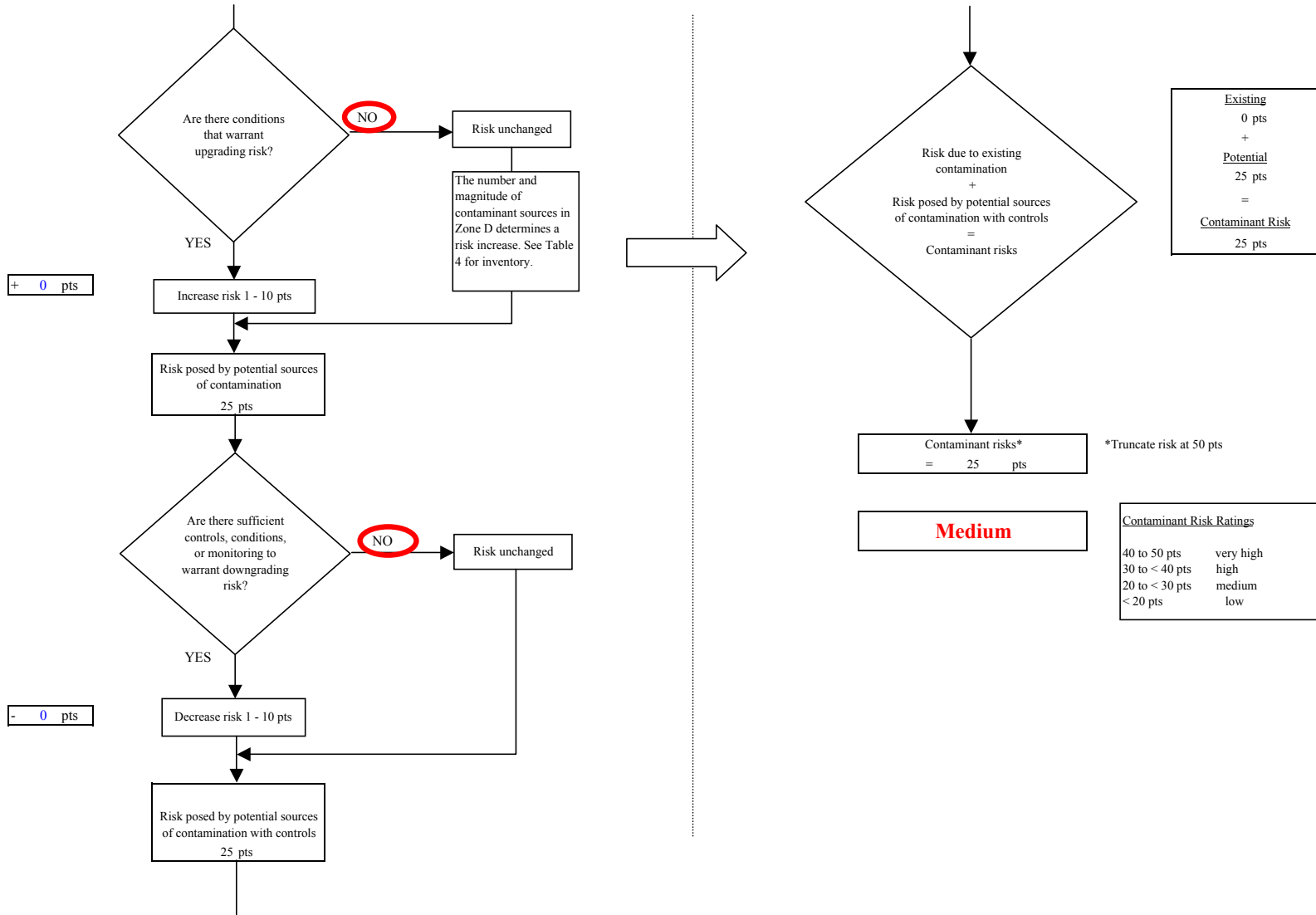


- 0 pts

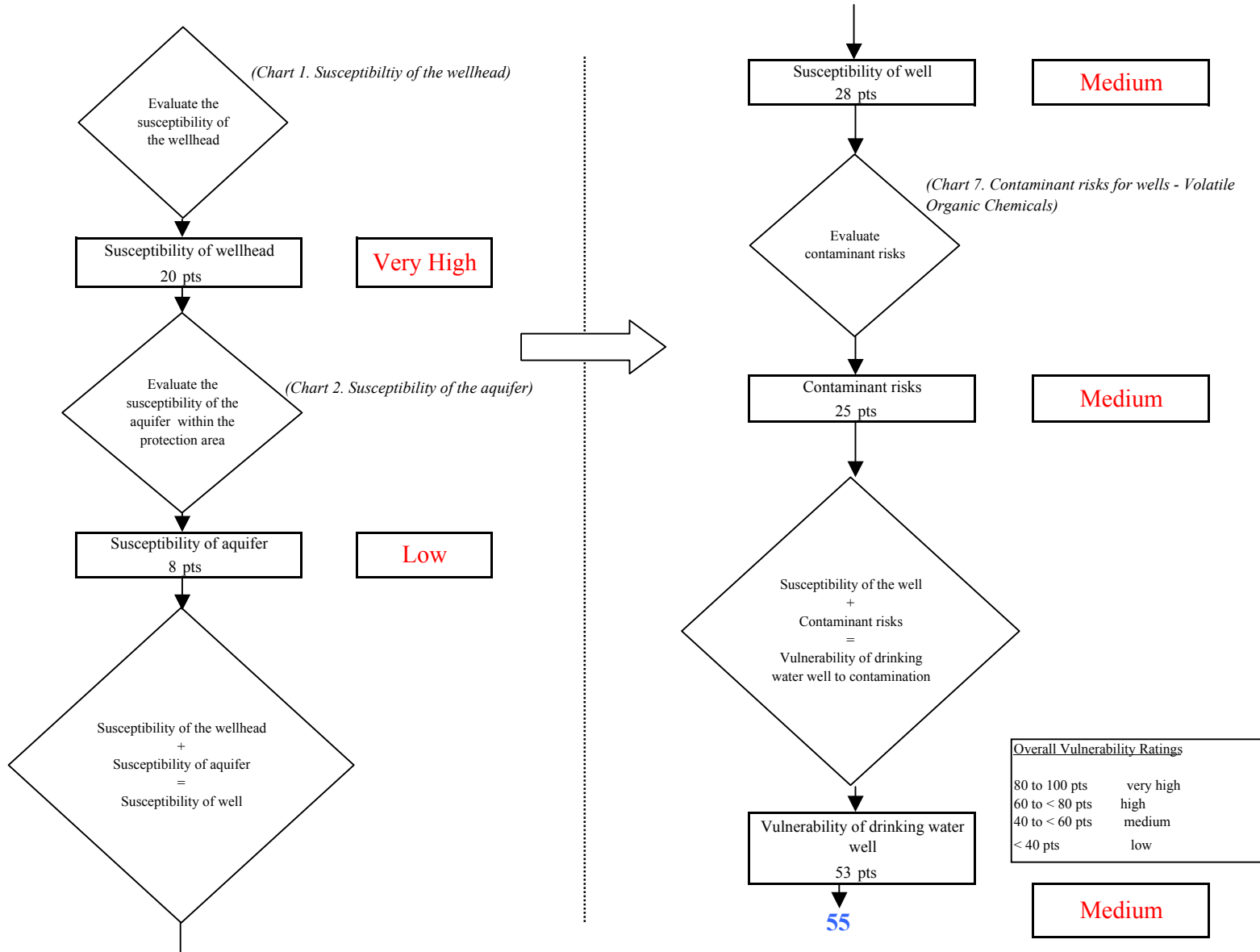
+ 5 pts

The number and magnitude of contaminant sources in Zone A determines a risk increase. See Table 4 for inventory.

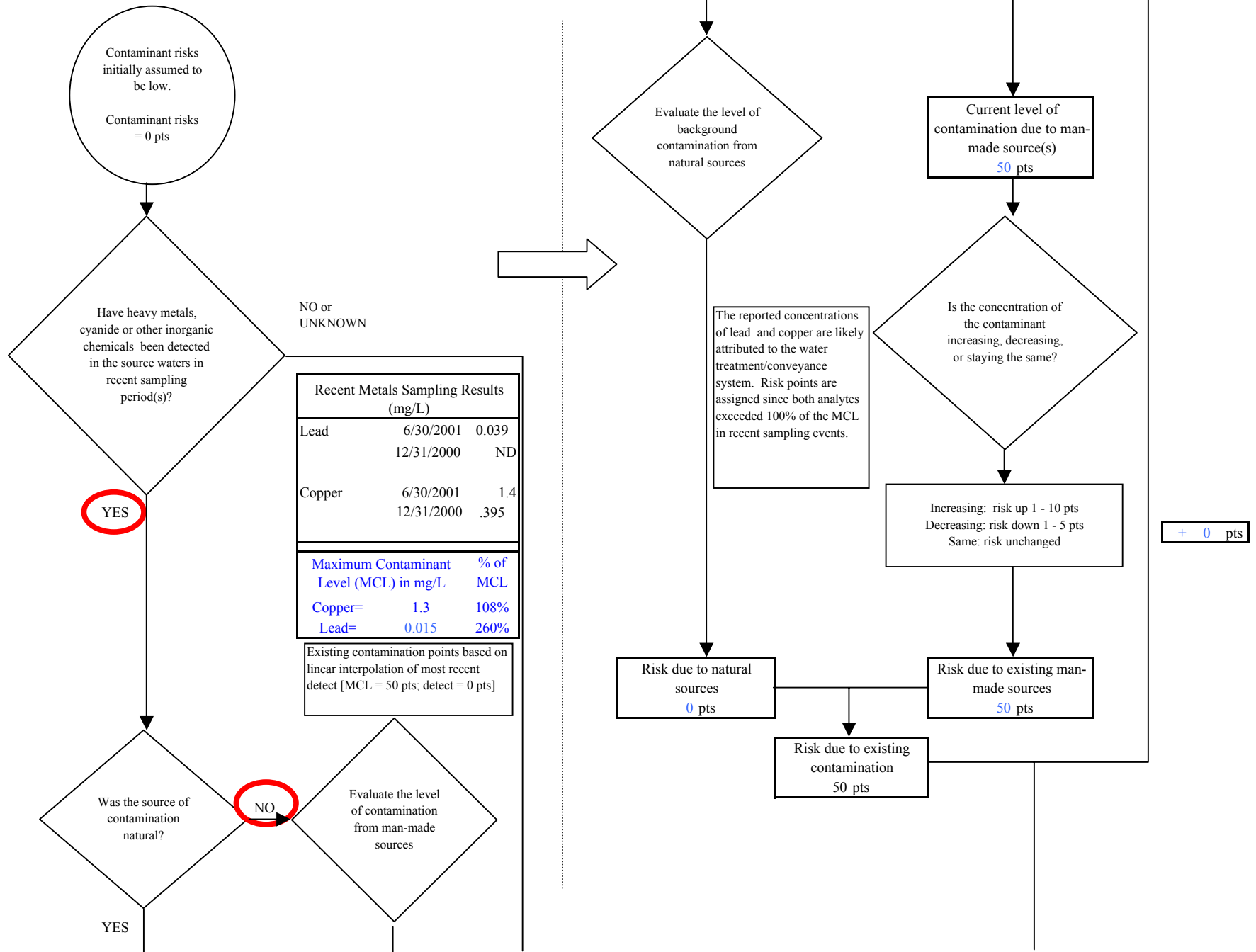
Chart 7. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Volatile Organic Chemicals



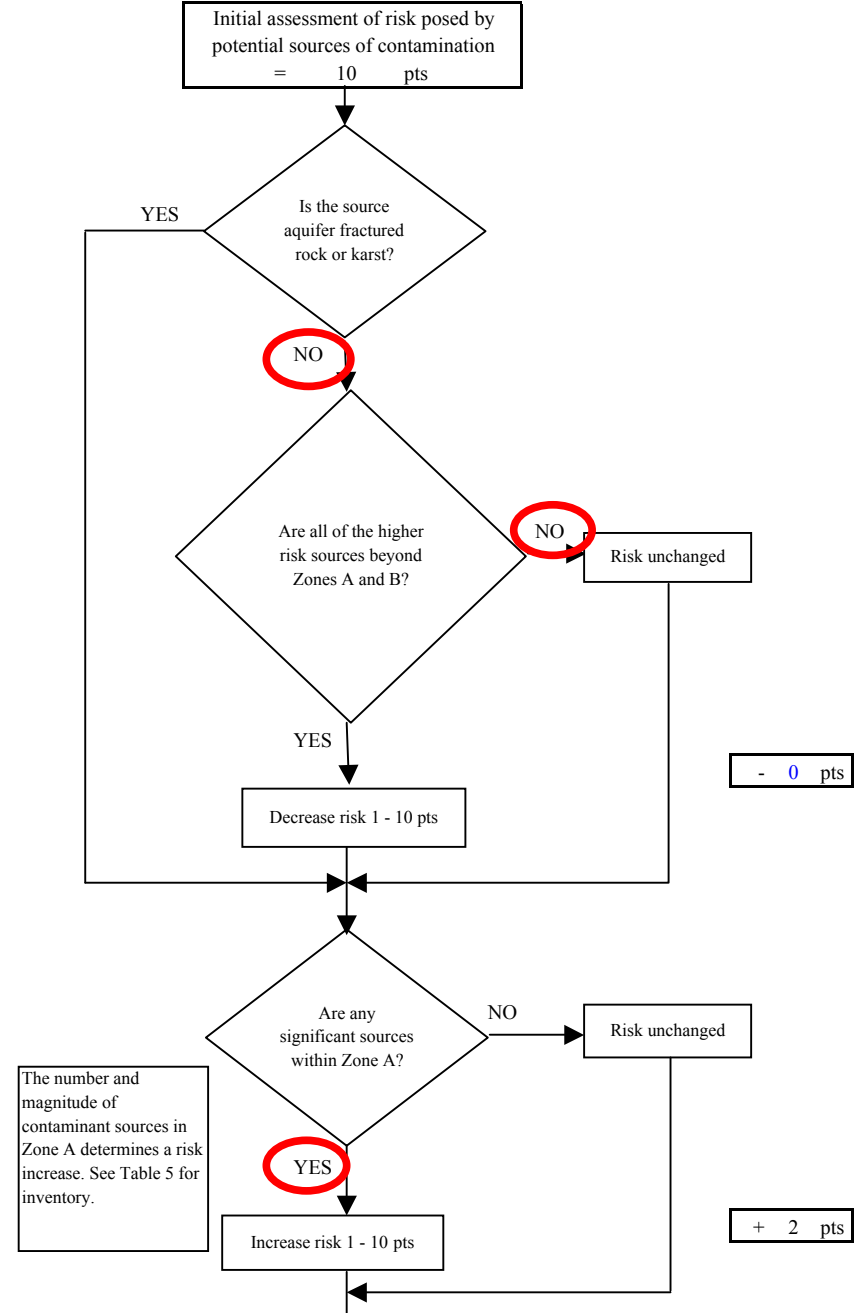
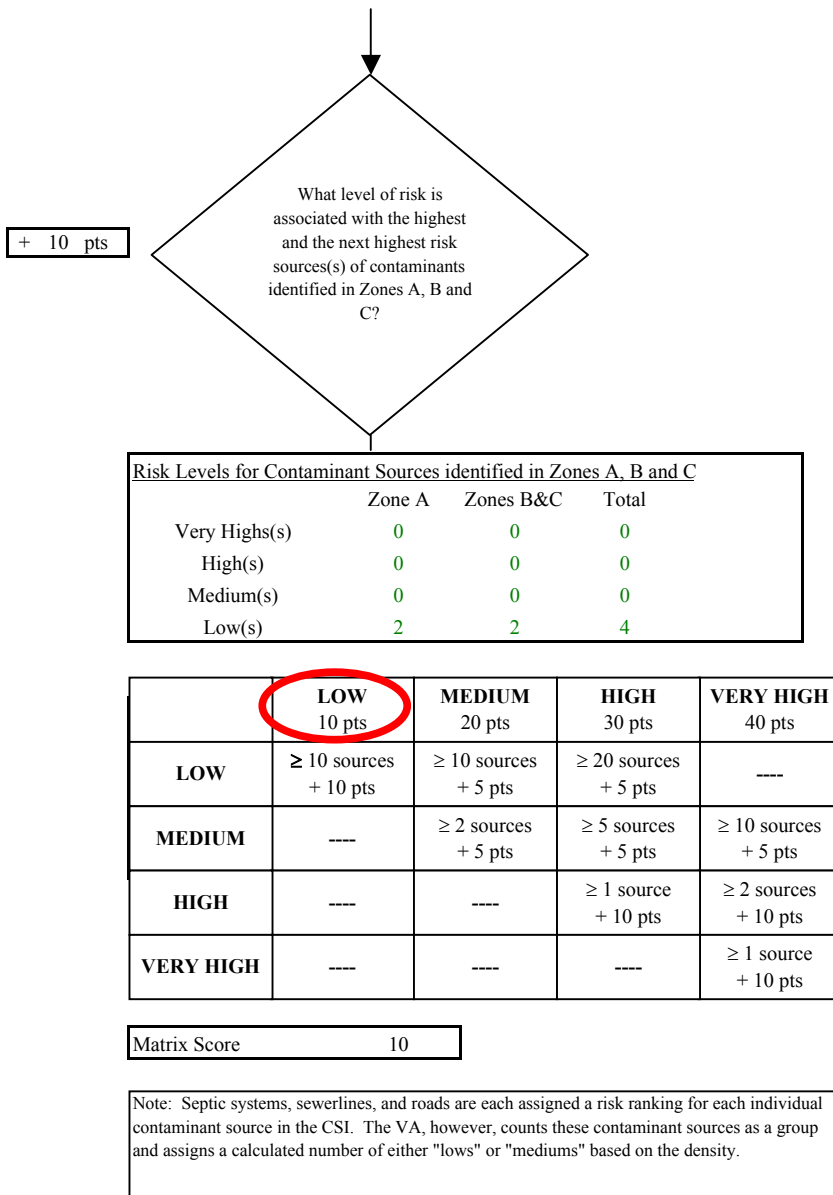
**Chart 8. Vulnerability analysis for Northway Washeteria/Clinic (PWS No 381422.001) - Volatile Organic Chemicals**



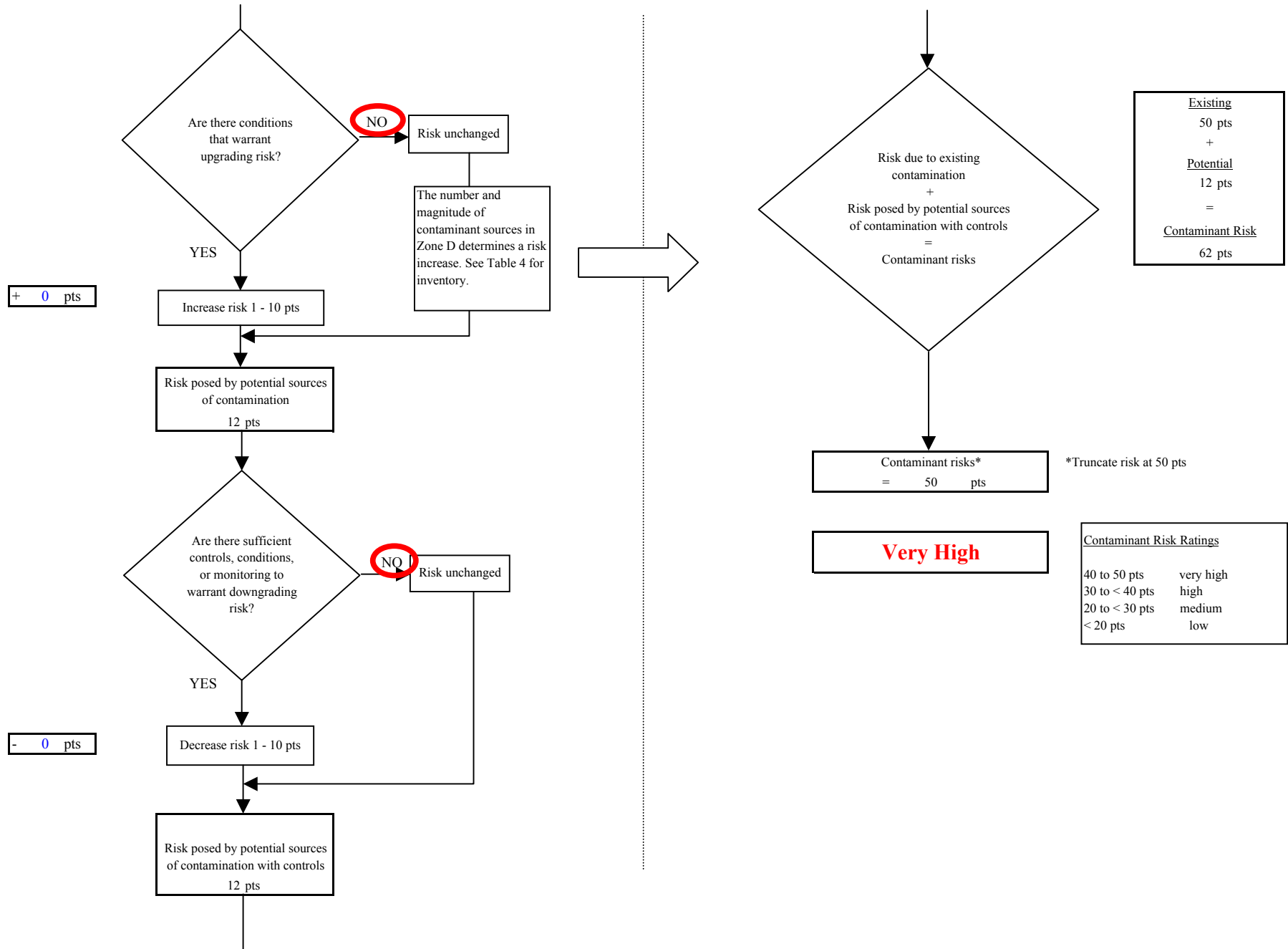
**Chart 9. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals**



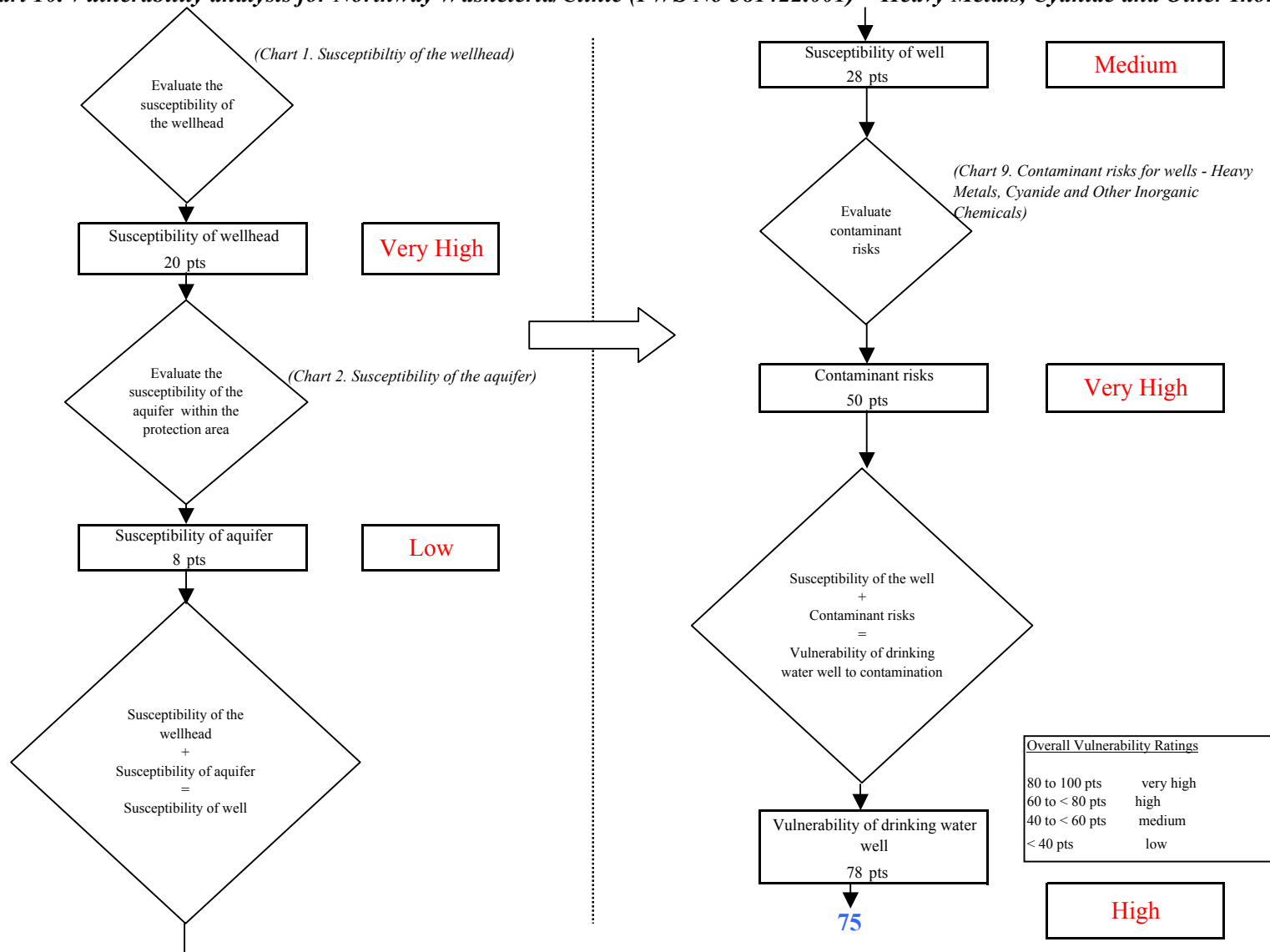
**Chart 9. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals**



**Chart 9. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals**

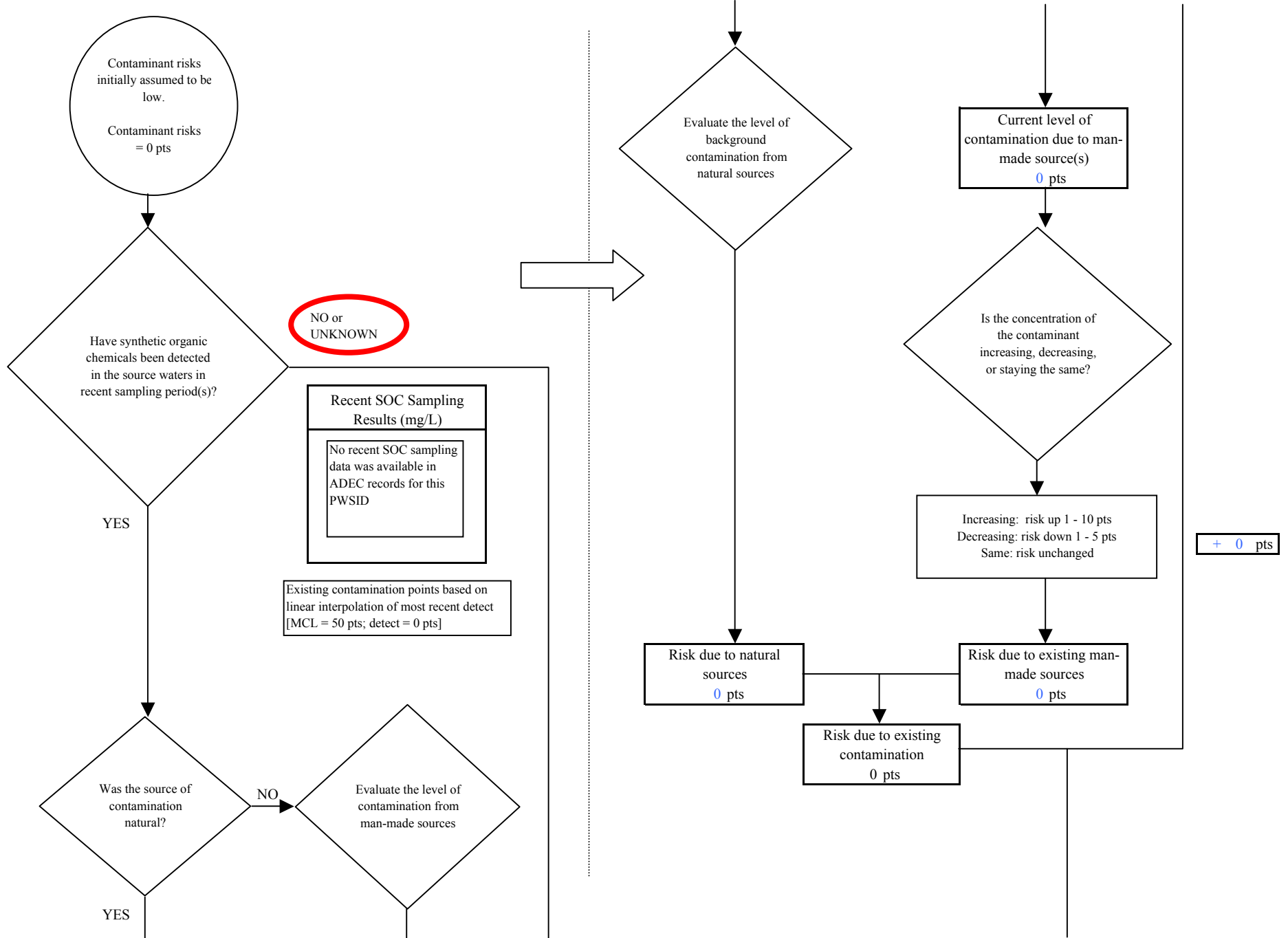


**Chart 10. Vulnerability analysis for Northway Washeteria/Clinic (PWS No 381422.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals**

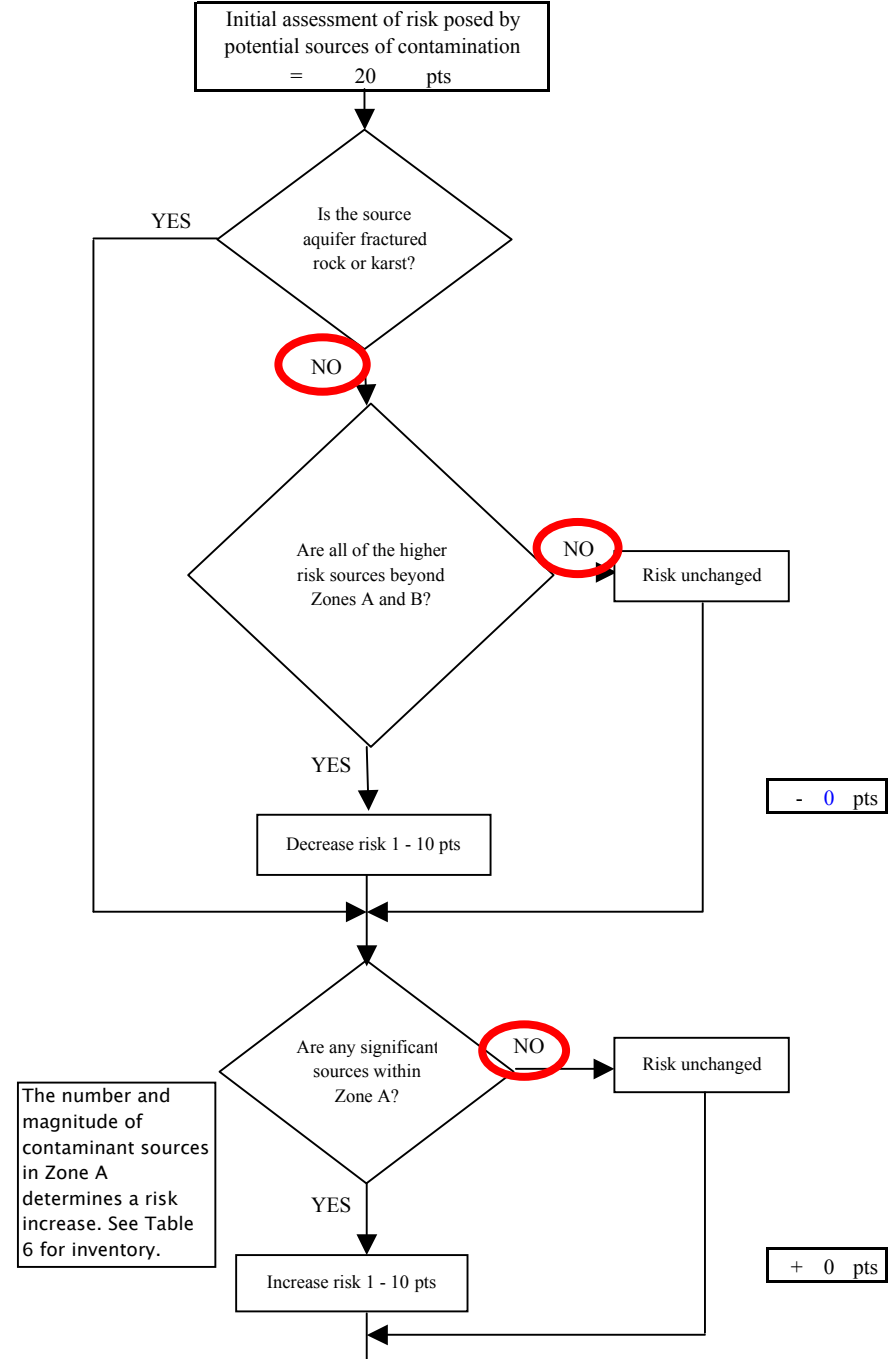
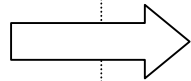
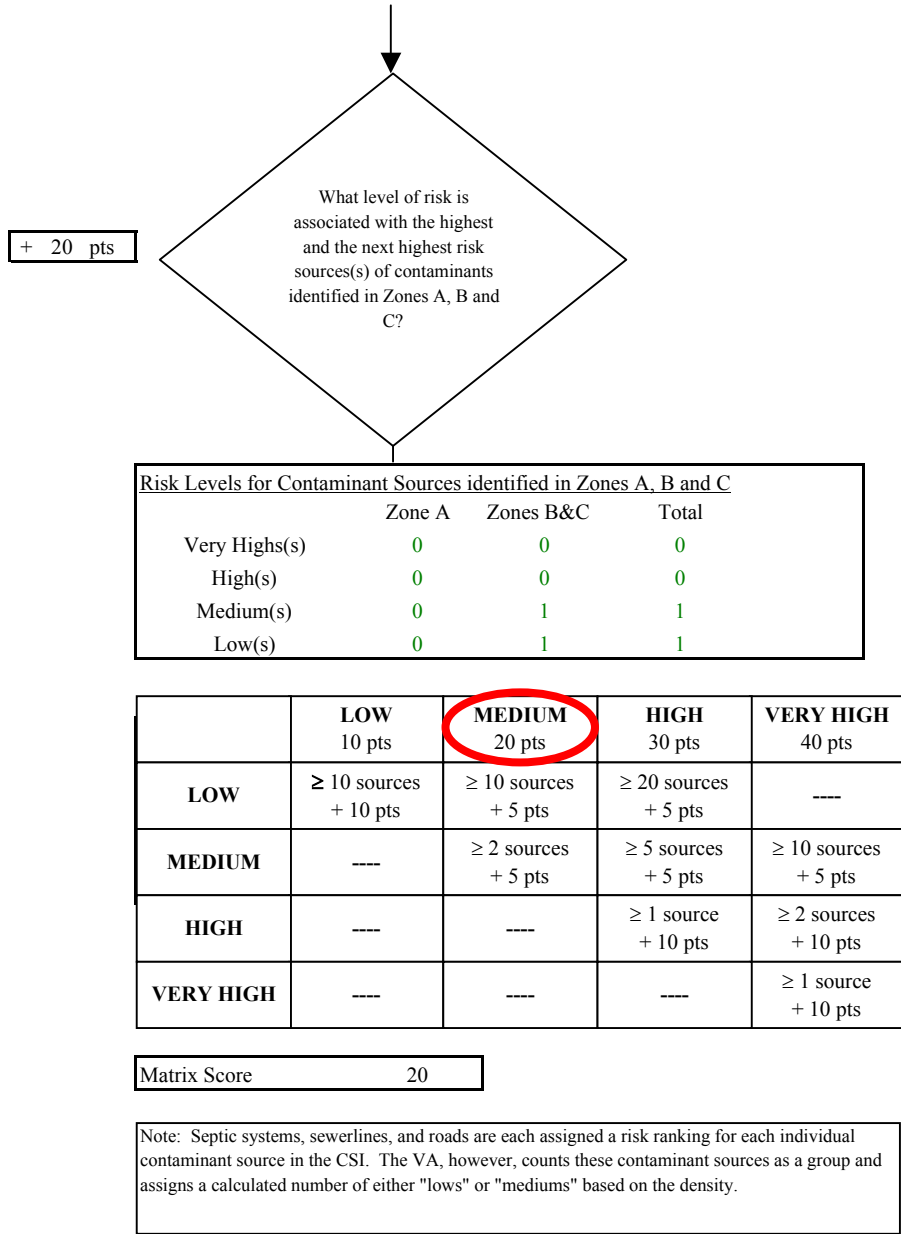




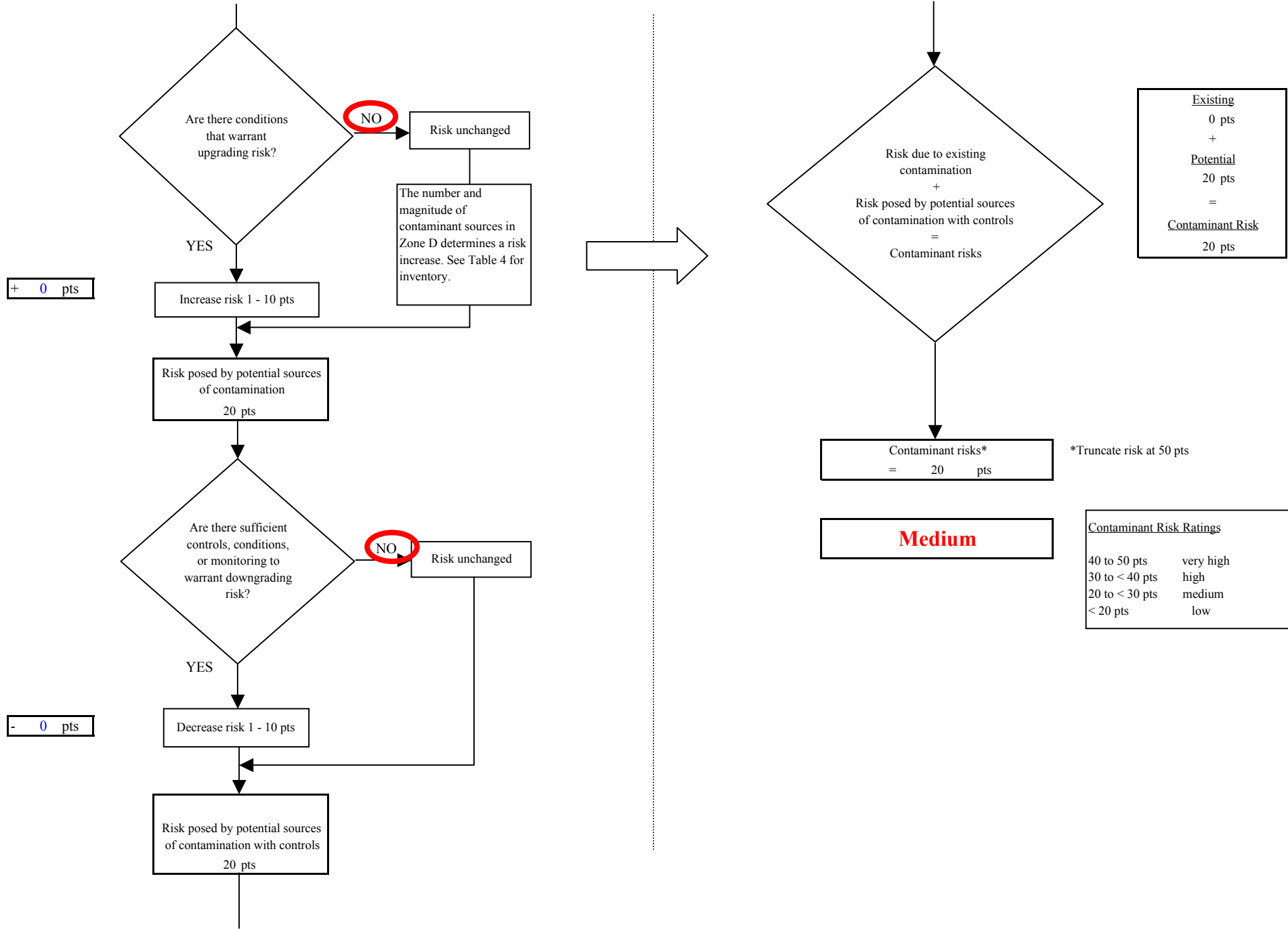
**Chart 11. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Synthetic Organic Chemicals**



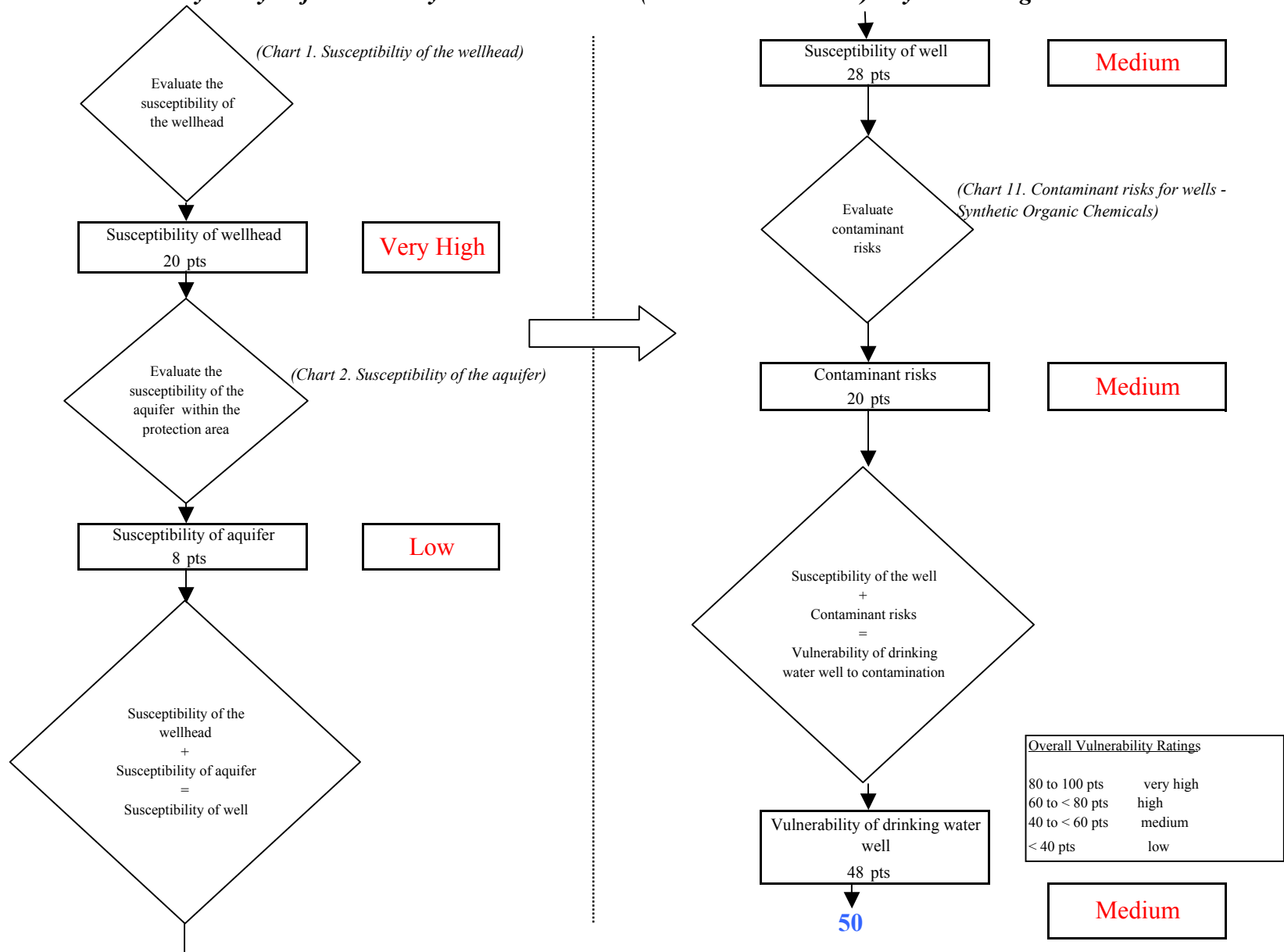
**Chart 11. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Synthetic Organic Chemicals**



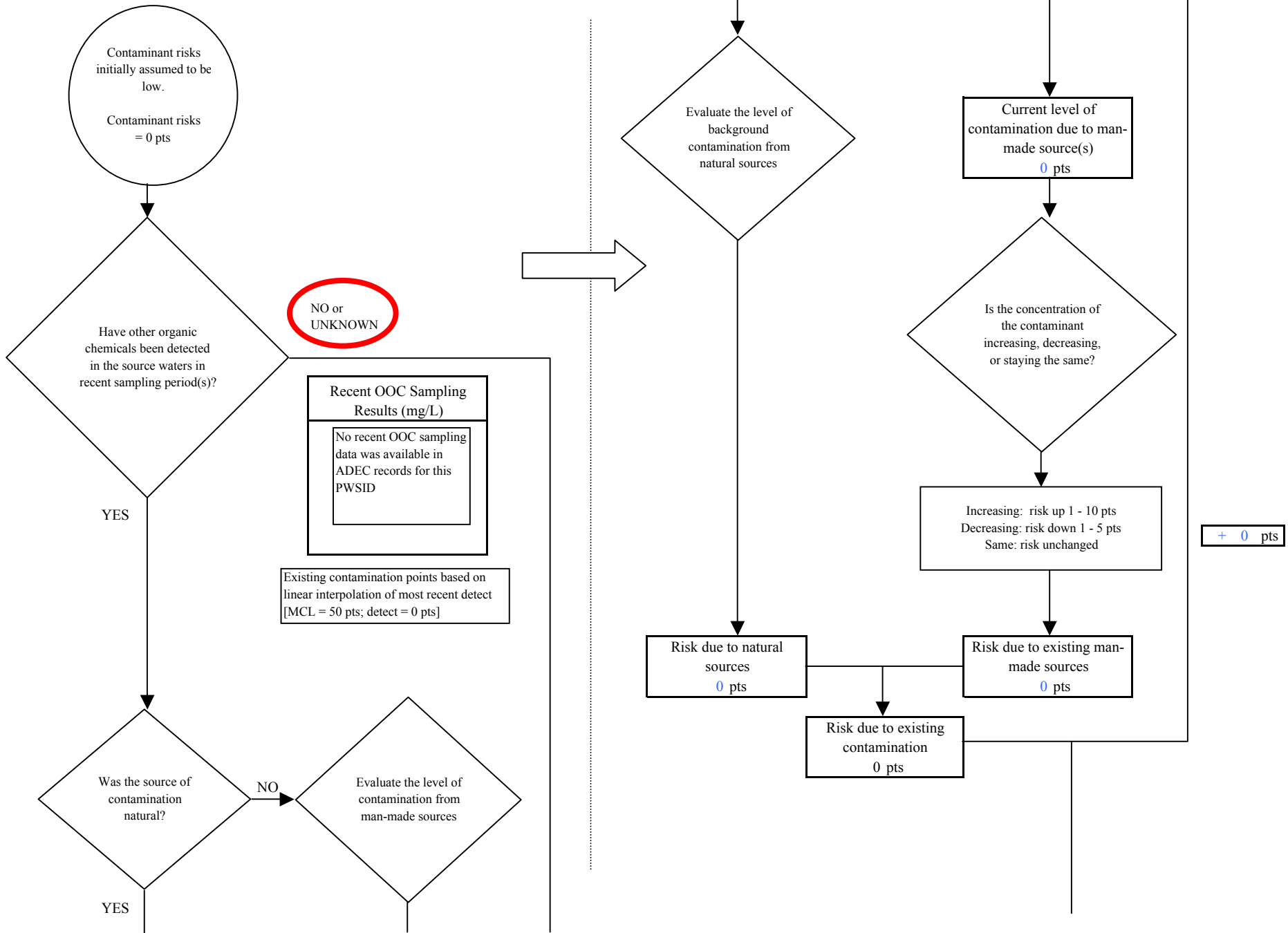
**Chart 11. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Synthetic Organic Chemicals**



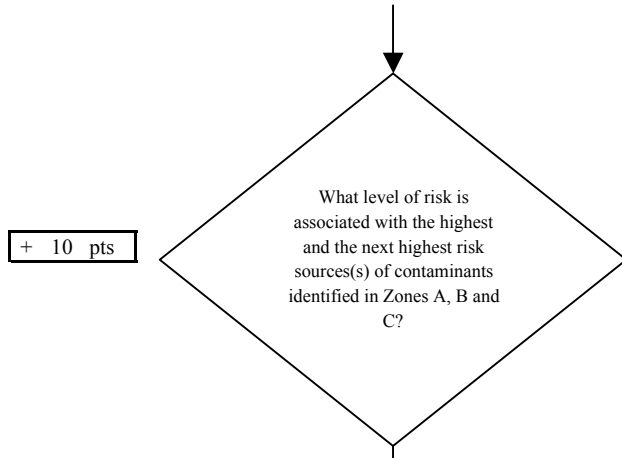
**Chart 12. Vulnerability analysis for Northway Washeteria/Clinic (PWS No 381422.001) - Synthetic Organic Chemicals**



**Chart 13. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Other Organic Chemicals**



**Chart 13. Contaminant risks for Northway Washeteria/Clinic (PWS No 381422.001) - Other Organic Chemicals**

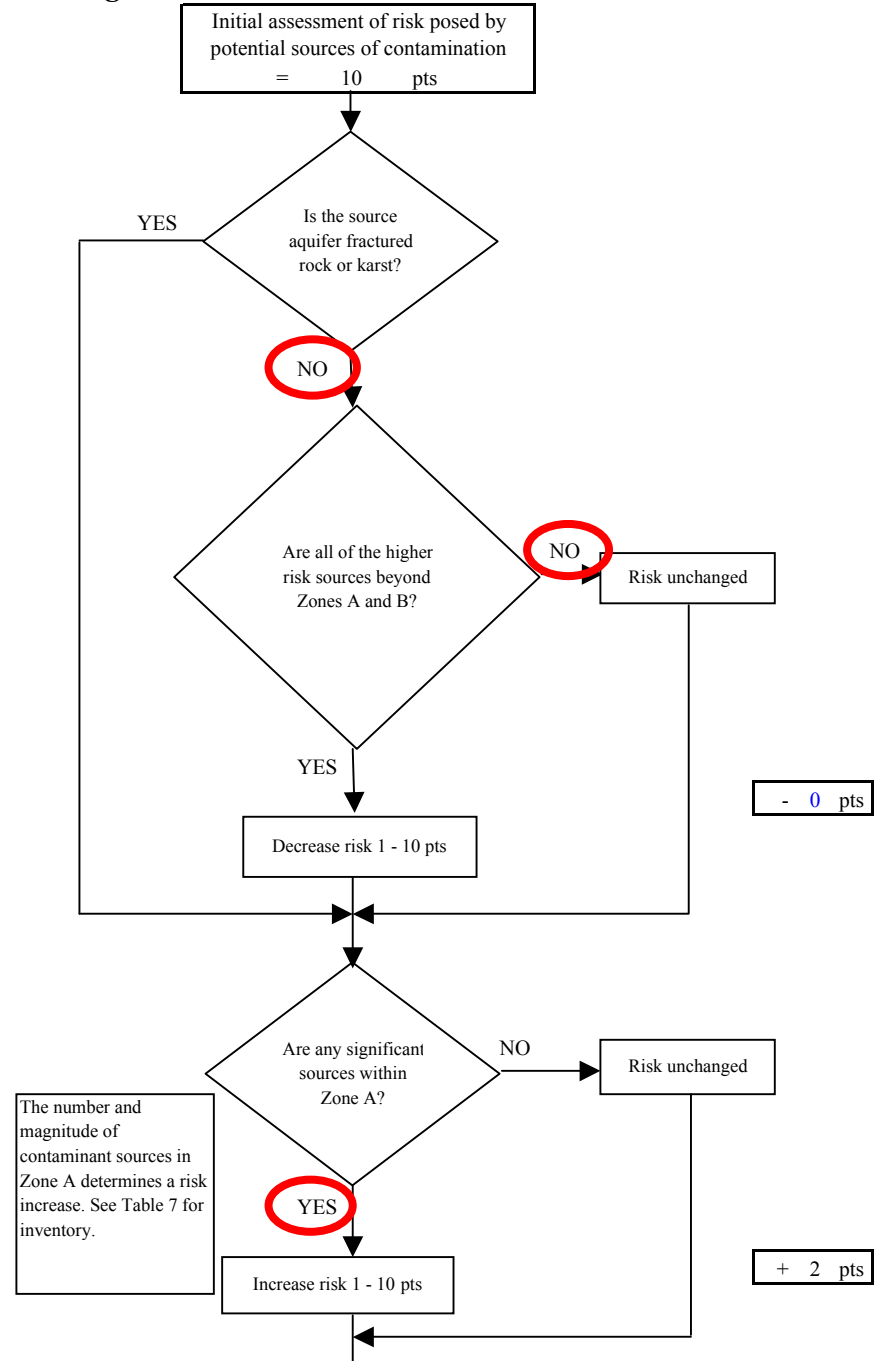


Risk Levels for Contaminant Sources identified in Zones A, B and C			
	Zone A	Zones B&C	Total
Very High(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	1	1	2

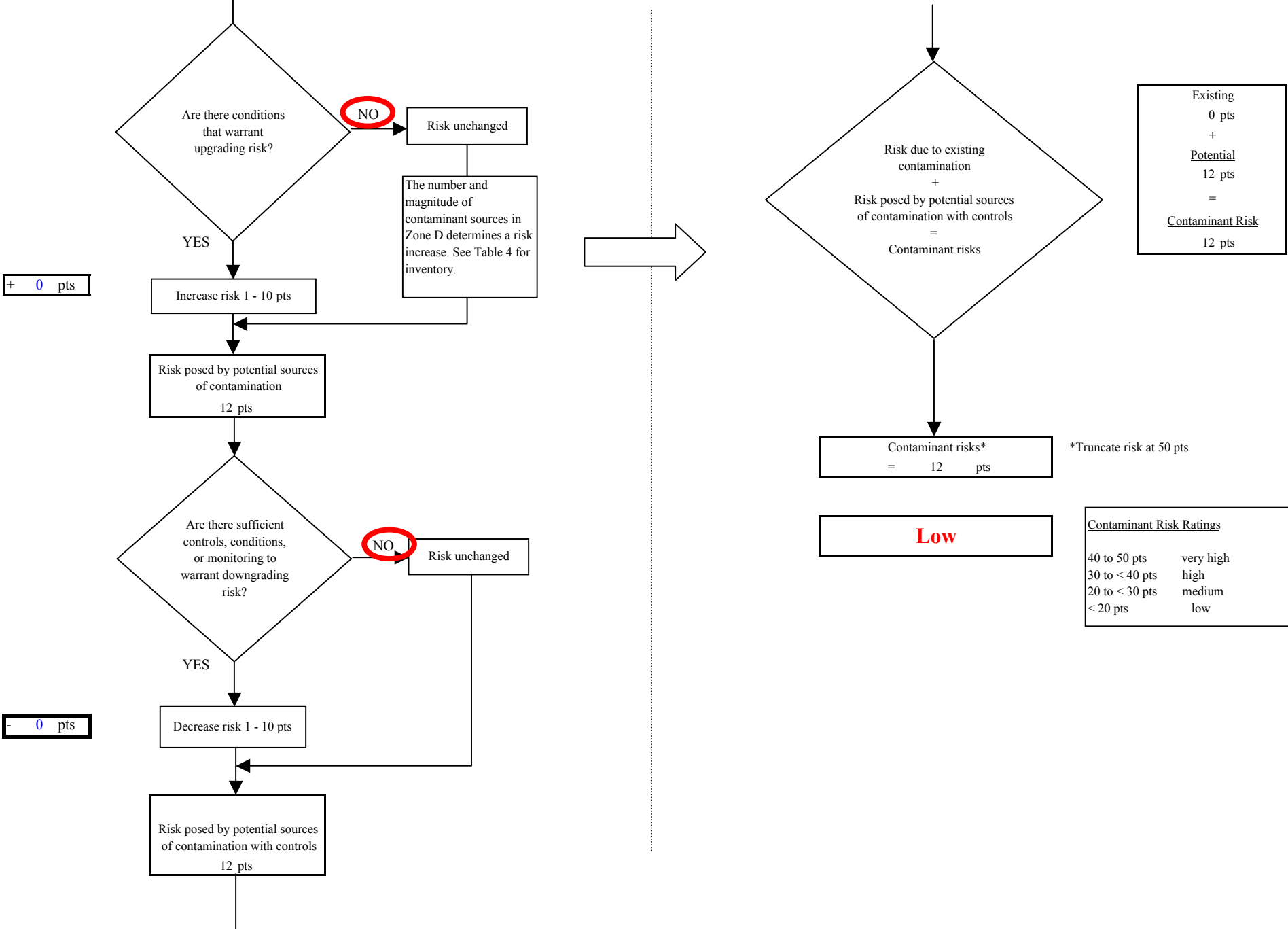
	<b>LOW</b> 10 pts	<b>MEDIUM</b> 20 pts	<b>HIGH</b> 30 pts	<b>VERY HIGH</b> 40 pts
<b>LOW</b>	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
<b>MEDIUM</b>	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
<b>HIGH</b>	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
<b>VERY HIGH</b>	----	----	----	≥ 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 Northway Washeteria/Clinic (PWS No 381422.001) - Other Organic Chemicals**



**Chart 14. Vulnerability analysis for Northway Washeteria/Clinic (PWS No 381422.001) - Other Organic Chemicals**

