Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for KSD Crow Village Chuathbaluk Drinking Water System, Chuathabaluk, Alaska

PWSID # 270883.001

June 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1107
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 KSD Crow Village Chuathbaluk Source of Public Drinking Water, Chuathbaluk, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The KSD Crow Village Chuathbaluk has one Public Water System (PWS) well. The well (PWS No. 270883.001) has been used as a drinking water source since it was drilled in 1985.

The well is a Class A (community and non-transient non-community) water system located approximately 0.25 miles southeast of the school in Chuathbaluk, Alaska. Available records indicate that there is secondary storage of drinking water, with a capacity of 90-gallons, and that the drinking water source is treated by filtration. This system operates year round and serves approximately 33 residents and 124 non-residents through 1 service connection. The wellhead received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **Very High**. Combining these two ratings produce a **High** rating for the natural susceptibility of the well.

Identified potential and current sources of contaminants for the public drinking water source include: motor/motor vehicle repair shop, large-capacity septic systems, nonresidential pit toilets, residential septic systems, residential heating oil tanks, nonresidential heating oil tanks, a water supply wells, a cemetery, petroleum product bulk station/terminals, roads, electric power generation, a firehouse, medical/veterinary facilities, and an airport. 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, nitrates and nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, and other organic chemicals contaminant categories, and a vulnerability rating of **Medium** for synthetic organic chemicals.

PUBLIC DRINKING WATER SYSTEM

The KSD Crow village Chuathbaluk well is a Class A (community/non-transient/non-community) public water system. The system is located approximately 0.25 miles southeast of the school in Chuathbaluk, Alaska (Sec. 10, T017N, R055W, Seward Meridian; see Map A of Appendix A). Chuathbaluk is located on the north bank of the Kuskokwim River, 11 miles upriver from Aniak in the Kilbuk-Kuskokwim Mountains. The community has a population of 102 (ADCED, 2003). Average annual precipitation in Chuathbaluk is 17 inches including approximately 85 inches of snowfall. Temperatures can be as extreme as –55 to 87°F.

The community of Chuathbaluk obtains most of their water supply from a community well; the school has its own watering point. No homes have complete plumbing; honeybuckets and privies are used by most residents for waste disposal with a few homes having septic tanks (ADCED, 2003). Chuathbaluk receives electrical power from the Middle Kuskokwim Electric Co-op. Power generating facilities are fueled by diesel. Refuse is collected weekly by the city and transported to the landfill (ADCED, 2003).

According to information supplied by ADEC for the KSD Crow Village Chuathbaluk PWS, the depth of the primary water well is 40 feet below the ground surface. It is unknown whether the well is screened, and it is assumed that the aquifer is unconfined. The well is not located within a floodplain.

Information acquired from the 2003 sanitary survey 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 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.

The village of Chuathbaluk lies in the Kilbuk-Kuskokwim Mountains. The area surrounding the

village consists of the flat former floodplain of the Kuskokwim River. Soils information for the community of Chuathbaluk is limited, however surficial soils in the neighboring vicinity are composed of stratified sandy silty soils overlying sand and fine gravels. The area is considered a discontinuous permafrost zone and the permafrost masses are small, thin, and generally isolated (U.S. Dept. of Health and Human Services, 1983).

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 KSD Crow Village Chuathbaluk 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 KSD Crow Village Chuathbaluk 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 KSD Crow Village Chuathbaluk 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 KSD Crow Village Chuathbaluk's water well is assumed to be an unconfined aquifer based on proxy well information from PWS 271732.001.

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	5	Low
Susceptibility of the Aquifer	25	Very High
Natural Susceptibility	30	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	50	Very High
Volatile Organic Chemicals	50	Very High
Heavy Metals, Cyanide and Other Inorganic Chemicals	50	Very High
Synthetic Organic Chemicals	28	Medium
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:

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

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Very High**. The risk is primarily attributed to the presence of large capacity septic systems in Zone A. Numerous 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, 2003).

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 **Very 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 large capacity septic systems in Zone A. Numerous 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 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 **Very High**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Very High**. The risk is primarily attributed to the presence of petroleum product bulk station/terminals in Zone A. Numerous other potential contaminant sources are also found within the protection area (see Table 4 – Appendix B).

All recent sampling data for VOC's was below detection levels for the KSD Crow Village Chuathbaluk (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 a motor/motor vehicle repair shop and electric power generation in Zone A. Numerous 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, high levels of copper have been detected in recent sampling history. Copper has exceeded the MCL of 1.3 mg/L (see Chart 8 – 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 **Medium**. The risk is primarily attributed to the presence of a cemetery and an airport 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 the KSD Crow Village Chuathbaluk (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 **Very High**. The risk is primarily attributed to the presence of petroleum product bulk station/terminals 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 KSD Crow Village Chuathbaluk (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 **Very 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 KSD Crow Village Chuathbaluk and the community of Chuathbaluk to protect public health. It is anticipated that Source Water Assessments will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of the drinking water source.

REFERENCES

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

Alaska Department of Environmental Conservation, Contaminated Sites Database, 2003 [WWW database], URL http://www.state.ak.us/dec/dspar/csites/cs_search.htm

Alaska Department of Environmental Conservation, Leaking Underground Storage Tank Database, 2003 [WWW database], URL http://www.dec.state.ak.us/spar/stp/ust/search/fac_search.asp

B&B Environmental, Inc. 1992, New Koliganek Airport Relocation Study.

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

U.S. Department of Health and Human Services, 1983, Sanitation Facilities Construction for Aniak, Alaska, Project No. AN-80-222, Indian Health Service, Alaska Area Health Service, Environmental Health Branch, Anchorage, Alaska, November 1983.

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

APPENDIX A

Drinking Water Protection Area Location Map
(Map A)

Public Water Well System for PWS #270883.001 KSD Crow Village Chuathbaluk

LEGEND

- Public Water System Well

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours

Transportation

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

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

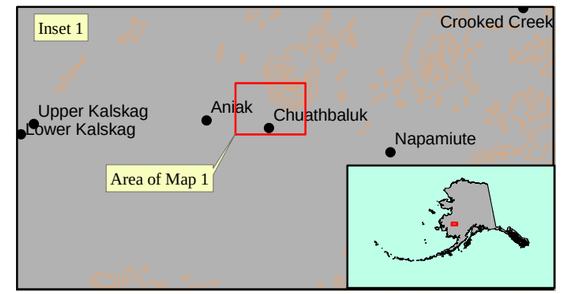
Data Sources:
Contaminant Sources, Public Water System Wells, Contours
Alaska Department of Environmental Conservation (ADEC)

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 0.5 1 2 3 4 Miles

KSD Crow Village Chuathbaluk
PWS 270883.001

Appendix A Map A

APPENDIX B

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

Table 1

Contaminant Source Inventory for ***KSD Crow Village Chuathbaluk***

PWSID 270883.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Motor /motor vehicle repair shops	C31	C31-01	A	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	C	Crow Village School
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	C	Clinic
Pit toilets (open hole), nonresidential (one or more)	D16	D16-01	A	C	Assume 5 or less honeybucket pits in Zone A
Septic systems (serves one single-family home)	R02	R02-01	A	C	Assume 10 or less residential septic systems in Zone A
Tanks, heating oil, residential (above ground)	R08	R08-01	A	C	Assume 15 or less residential heating oil tanks in Zone A
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	C	Power Plant
Tanks, heating oil, nonresidential (aboveground)	T14	T14-02	A	C	School Power Plant
Tanks, heating oil, nonresidential (aboveground)	T14	T14-03	A	C	Clinic
Tanks, heating oil, nonresidential (aboveground)	T14	T14-04	A	C	Store
Tanks, heating oil, nonresidential (aboveground)	T14	T14-05	A	C	Teachers Rental
Tanks, heating oil, nonresidential (aboveground)	T14	T14-06	A	C	Teachers Rental 2
Tanks, heating oil, nonresidential (aboveground)	T14	T14-07	A	C	Russian Orthodox Church
Tanks, heating oil, nonresidential (aboveground)	T14	T14-08	A	C	Fire Station
Tanks, heating oil, nonresidential (aboveground)	T14	T14-09	A	C	City Traditional Office
Tanks, heating oil, nonresidential (aboveground)	T14	T14-10	A	C	Teen Center/Traditional Council Office
Tanks, heating oil, nonresidential (aboveground)	T14	T14-11	A	C	Police Station
Tanks, heating oil, nonresidential (aboveground)	T14	T14-12	A	C	Crow Village School
Water supply wells	W09	W09-01	A	C	1 water supply well in Zone A
Cemeteries	X01	X01-01	A	C	
Petroleum product bulk station/terminals	X11	X11-01	A	C	KSD
Petroleum product bulk station/terminals	X11	X11-02	A	C	City
Petroleum product bulk station/terminals	X11	X11-03	A	C	Middle Kuskokwim Electric

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Highways and roads, dirt/gravel	X24	X24-01	A	C	Assume 1-20 roads in Zone A
Electric power generation (fossil fuels)	X36	X36-01	A	C	Power Plant
Electric power generation (fossil fuels)	X36	X36-02	A	C	School Power Plant
Firehouses	X38	X38-01	A	C	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	C	
Pit toilets (open hole), nonresidential (one or more)	D16	D16-02	B	C	Assume 1 honeybucket pit in Zone B
Septic systems (serves one single-family home)	R02	R02-02	B	C	Assume 3 or less residential septic systems in Zone B
Tanks, heating oil, residential (above ground)	R08	R08-02	B	C	Assume 5 or less residential heating oil tanks in Zone B
Airports	X14	X14-01	B	C	
Highways and roads, dirt/gravel	X24	X24-02	B	C	Assume 1-20 roads in Zone B

Table 2

Contaminant Source Inventory and Risk Ranking for KSD Crow Village Chuathbaluk Sources of Bacteria and Viruses

PWSID 270883.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	High	C	Crow Village School
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	High	C	Clinic
Pit toilets (open hole), nonresidential (one or mor	D16	D16-01	A	Medium	C	Assume 5 or less honeybucket pits in Zone A
Septic systems (serves one single-family home)	R02	R02-01	A	Low	C	Assume 10 or less residential septic systems in Zone A
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Medium	C	
Pit toilets (open hole), nonresidential (one or mor	D16	D16-02	B	Medium	C	Assume 1 honeybucket pit in Zone B
Septic systems (serves one single-family home)	R02	R02-02	B	Low	C	Assume 3 or less residential septic systems in Zone B
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

Table 3

Contaminant Source Inventory and Risk Ranking for KSD Crow Village Chuathbaluk Sources of Nitrates/Nitrites

PWSID 270883.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	High	C	Crow Village School
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	High	C	Clinic
Pit toilets (open hole), nonresidential (one or mor	D16	D16-01	A	Medium	C	Assume 5 or less honeybucket pits in Zone A
Septic systems (serves one single-family home)	R02	R02-01	A	Low	C	Assume 10 or less residential septic systems in Zone A
Cemeteries	X01	X01-01	A	Medium	C	
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Low	C	
Pit toilets (open hole), nonresidential (one or mor	D16	D16-02	B	Medium	C	Assume 1 honeybucket pit in Zone B
Septic systems (serves one single-family home)	R02	R02-02	B	Low	C	Assume 3 or less residential septic systems in Zone B
Airports	X14	X14-01	B	Low	C	
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

Table 4

Contaminant Source Inventory and Risk Ranking for KSD Crow Village Chuathbaluk Sources of Volatile Organic Chemicals

PWSID 270883.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Motor /motor vehicle repair shops	C31	C31-01	A	Medium	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	C	Crow Village School
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	Low	C	Clinic
Pit toilets (open hole), nonresidential (one or mor	D16	D16-01	A	Low	C	Assume 5 or less honeybucket pits in Zone A
Septic systems (serves one single-family home)	R02	R02-01	A	Low	C	Assume 10 or less residential septic systems in Zone A
Tanks, heating oil, residential (above ground)	R08	R08-01	A	Medium	C	Assume 15 or less residential heating oil tanks in Zone A
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	C	Power Plant
Tanks, heating oil, nonresidential (aboveground)	T14	T14-02	A	Low	C	School Power Plant
Tanks, heating oil, nonresidential (aboveground)	T14	T14-03	A	Low	C	Clinic
Tanks, heating oil, nonresidential (aboveground)	T14	T14-04	A	Low	C	Store
Tanks, heating oil, nonresidential (aboveground)	T14	T14-05	A	Low	C	Teachers Rental
Tanks, heating oil, nonresidential (aboveground)	T14	T14-06	A	Low	C	Teachers Rental 2
Tanks, heating oil, nonresidential (aboveground)	T14	T14-07	A	Low	C	Russian Orthodox Church
Tanks, heating oil, nonresidential (aboveground)	T14	T14-08	A	Low	C	Fire Station
Tanks, heating oil, nonresidential (aboveground)	T14	T14-09	A	Low	C	City Traditional Office
Tanks, heating oil, nonresidential (aboveground)	T14	T14-10	A	Low	C	Teen Center/Traditional Council Office
Tanks, heating oil, nonresidential (aboveground)	T14	T14-11	A	Low	C	Police Station
Tanks, heating oil, nonresidential (aboveground)	T14	T14-12	A	Low	C	Crow Village School
Petroleum product bulk station/terminals	X11	X11-01	A	Very High	C	KSD
Petroleum product bulk station/terminals	X11	X11-02	A	Very High	C	City
Petroleum product bulk station/terminals	X11	X11-03	A	Very High	C	Middle Kuskokwim Electric
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Electric power generation (fossil fuels)	X36	X36-01	A	Medium	C	Power Plant

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Electric power generation (fossil fuels)	X36	X36-02	A	Medium	C	School Power Plant
Firehouses	X38	X38-01	A	Low	C	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Low	C	
Pit toilets (open hole), nonresidential (one or mor	D16	D16-02	B	Low	C	Assume 1 honeybucket pit in Zone B
Septic systems (serves one single-family home)	R02	R02-02	B	Low	C	Assume 3 or less residential septic systems in Zone B
Tanks, heating oil, residential (above ground)	R08	R08-02	B	Medium	C	Assume 5 or less residential heating oil tanks in Zone B
Airports	X14	X14-01	B	High	C	
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

Table 5

Contaminant Source Inventory and Risk Ranking for KSD Crow Village Chuathbaluk

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 270883.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Motor /motor vehicle repair shops	C31	C31-01	A	Medium	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	C	Crow Village School
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	Low	C	Clinic
Pit toilets (open hole), nonresidential (one or mor	D16	D16-01	A	Low	C	Assume 5 or less honeybucket pits in Zone A
Septic systems (serves one single-family home)	R02	R02-01	A	Low	C	Assume 10 or less residential septic systems in Zone A
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	C	Power Plant
Tanks, heating oil, nonresidential (aboveground)	T14	T14-02	A	Low	C	School Power Plant
Tanks, heating oil, nonresidential (aboveground)	T14	T14-03	A	Low	C	Clinic
Tanks, heating oil, nonresidential (aboveground)	T14	T14-04	A	Low	C	Store
Tanks, heating oil, nonresidential (aboveground)	T14	T14-05	A	Low	C	Teachers Rental
Tanks, heating oil, nonresidential (aboveground)	T14	T14-06	A	Low	C	Teachers Rental 2
Tanks, heating oil, nonresidential (aboveground)	T14	T14-07	A	Low	C	Russian Orthodox Church
Tanks, heating oil, nonresidential (aboveground)	T14	T14-08	A	Low	C	Fire Station
Tanks, heating oil, nonresidential (aboveground)	T14	T14-09	A	Low	C	City Traditional Office
Tanks, heating oil, nonresidential (aboveground)	T14	T14-10	A	Low	C	Teen Center/Traditional Council Office
Tanks, heating oil, nonresidential (aboveground)	T14	T14-11	A	Low	C	Police Station
Tanks, heating oil, nonresidential (aboveground)	T14	T14-12	A	Low	C	Crow Village School
Cemeteries	X01	X01-01	A	Low	C	
Petroleum product bulk station/terminals	X11	X11-01	A	Low	C	KSD
Petroleum product bulk station/terminals	X11	X11-02	A	Low	C	City
Petroleum product bulk station/terminals	X11	X11-03	A	Low	C	Middle Kuskokwim Electric
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Electric power generation (fossil fuels)	X36	X36-01	A	Medium	C	Power Plant

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Electric power generation (fossil fuels)	X36	X36-02	A	Medium	C	School Power Plant
Firehouses	X38	X38-01	A	Low	C	
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Low	C	
Pit toilets (open hole), nonresidential (one or mor	D16	D16-02	B	Low	C	Assume 1 honeybucket pit in Zone B
Septic systems (serves one single-family home)	R02	R02-02	B	Low	C	Assume 3 or less residential septic systems in Zone B
Airports	X14	X14-01	B	Low	C	
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

Table 6

Contaminant Source Inventory and Risk Ranking for KSD Crow Village Chuathbaluk Sources of Synthetic Organic Chemicals

PWSID 270883.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	C	Crow Village School
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	Low	C	Clinic
Septic systems (serves one single-family home)	R02	R02-01	A	Low	C	Assume 10 or less residential septic systems in Zone A
Cemeteries	X01	X01-01	A	Medium	C	
Petroleum product bulk station/terminals	X11	X11-01	A	Low	C	KSD
Petroleum product bulk station/terminals	X11	X11-02	A	Low	C	City
Petroleum product bulk station/terminals	X11	X11-03	A	Low	C	Middle Kuskokwim Electric
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-01	A	Low	C	
Septic systems (serves one single-family home)	R02	R02-02	B	Low	C	Assume 3 or less residential septic systems in Zone B
Airports	X14	X14-01	B	Medium	C	

Table 7

Contaminant Source Inventory and Risk Ranking for KSD Crow Village Chuathbaluk Sources of Other Organic Chemicals

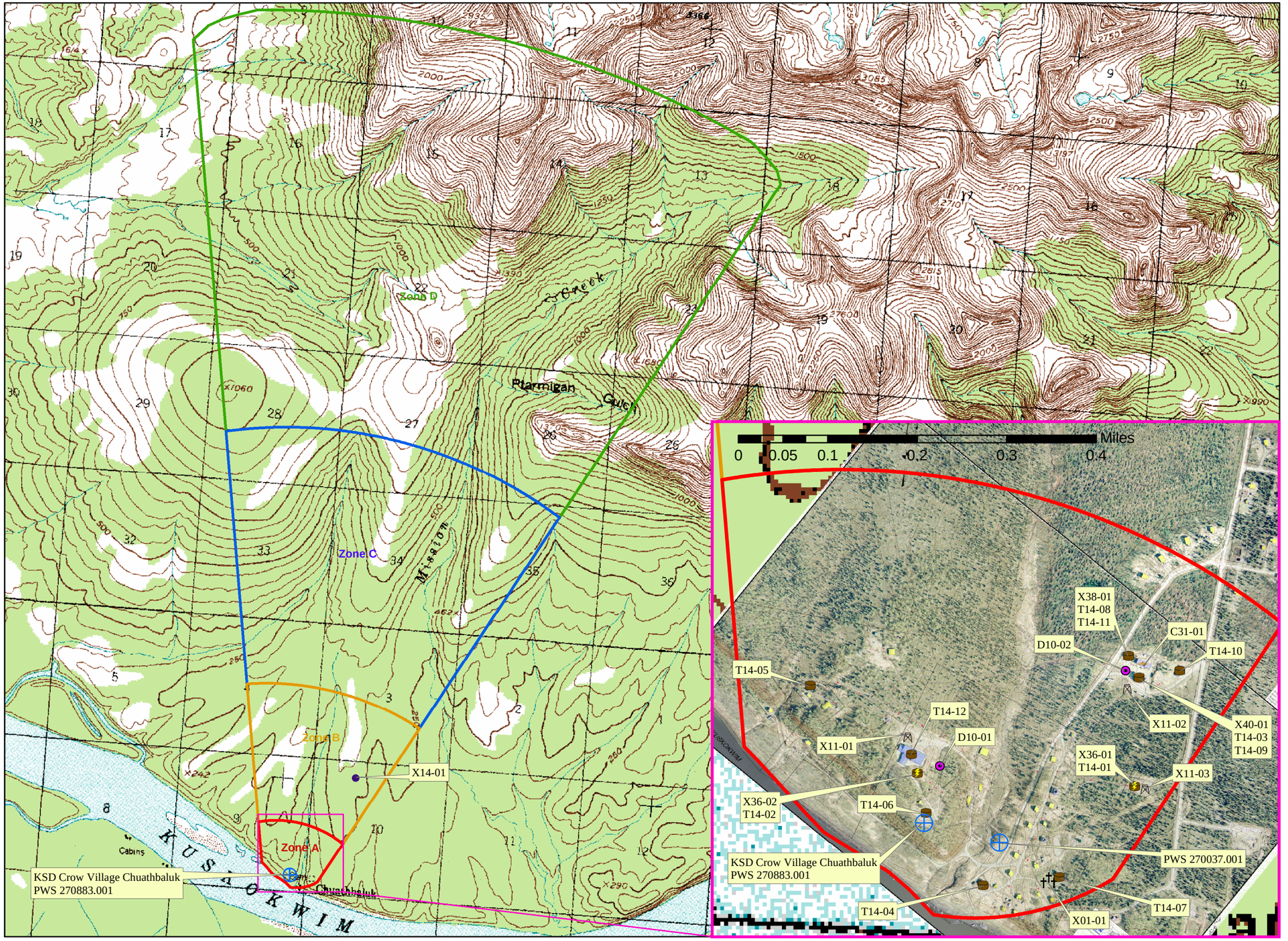
PWSID 270883.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Motor /motor vehicle repair shops	C31	C31-01	A	Medium	C	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	C	Crow Village School
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	A	Low	C	Clinic
Septic systems (serves one single-family home)	R02	R02-01	A	Low	C	Assume 10 or less residential septic systems in Zone A
Petroleum product bulk station/terminals	X11	X11-01	A	High	C	KSD
Petroleum product bulk station/terminals	X11	X11-02	A	High	C	City
Petroleum product bulk station/terminals	X11	X11-03	A	High	C	Middle Kuskokwim Electric
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Electric power generation (fossil fuels)	X36	X36-01	A	High	C	Power Plant
Electric power generation (fossil fuels)	X36	X36-02	A	High	C	School Power Plant
Septic systems (serves one single-family home)	R02	R02-02	B	Low	C	Assume 3 or less residential septic systems in Zone B
Airports	X14	X14-01	B	Medium	C	
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

APPENDIX C

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

Public Water Well System for PWS #270883.001 KSD Crow Village Chuathbaluk
Showing Potential and Existng Sources of Contamination



LEGEND

- Public Water System Well

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours

Transportation

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

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

Existing or Potential Contaminant Sources

- Motor vehicle repair shop (C31)
- Injection wells (Class V) Large capacity septic system (drain field disposal method) (D10)
- Nonresidential aboveground heating oil tank (T14)
- Petroleum product bulk station/terminal (X11)
- Airport/landing strip (X14)
- Electric power generation (fossil fuels) (X36)
- Firehouse (X38)
- Medical/veterinary facilities (X40)

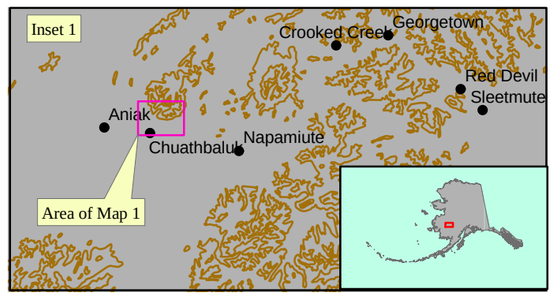
Data Sources:

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.



KSD Crow Village Chuathbaluk
PWS 270883.001

Appendix C Map C

APPENDIX D

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

Chart 1. Susceptibility of the wellhead - KSD Crow Village Chuathbaluk (PWS No. 270883.001)

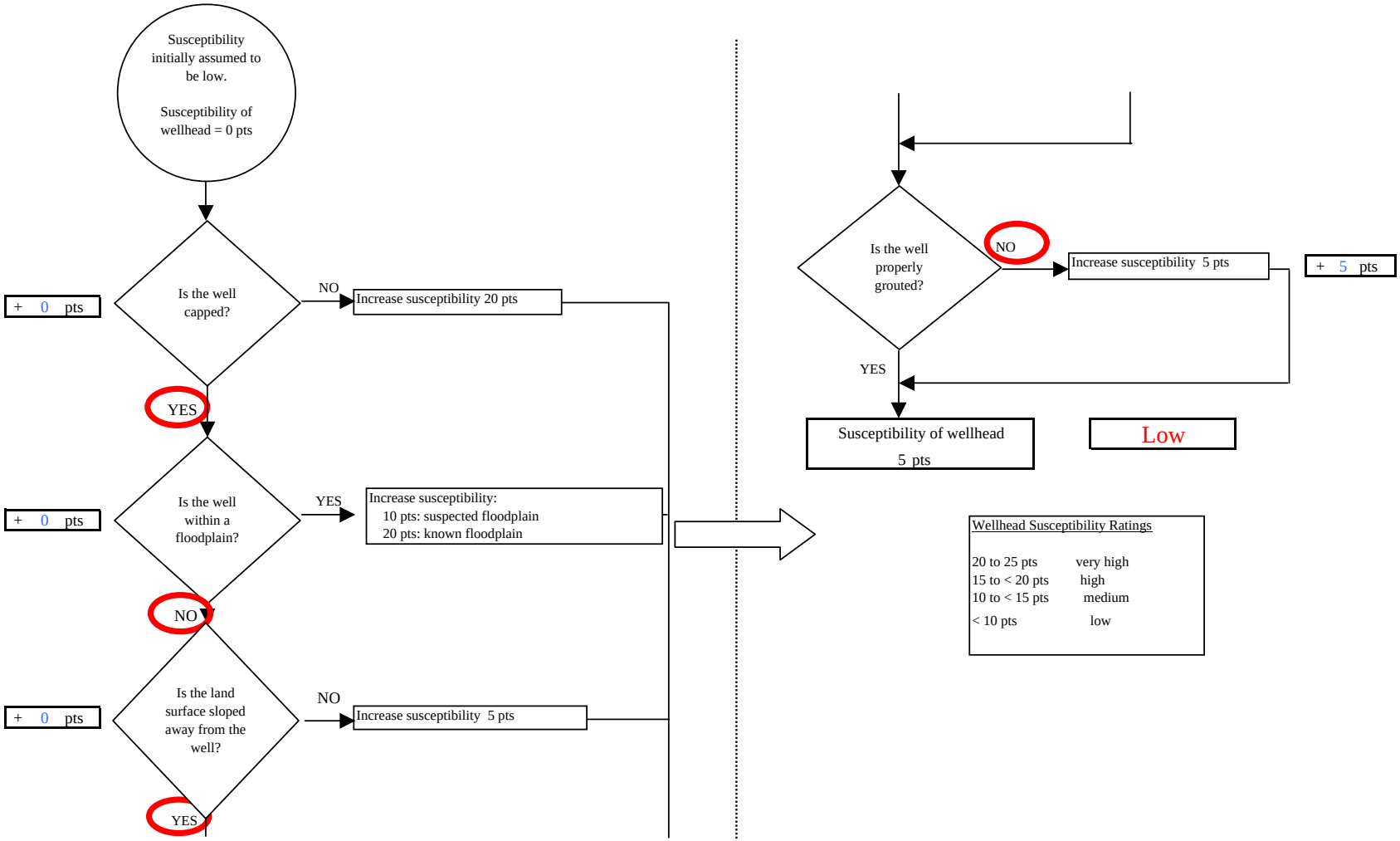


Chart 2. Susceptibility of the aquifer KSD Crow Village Chuathbaluk (PWS No. 270883.001)

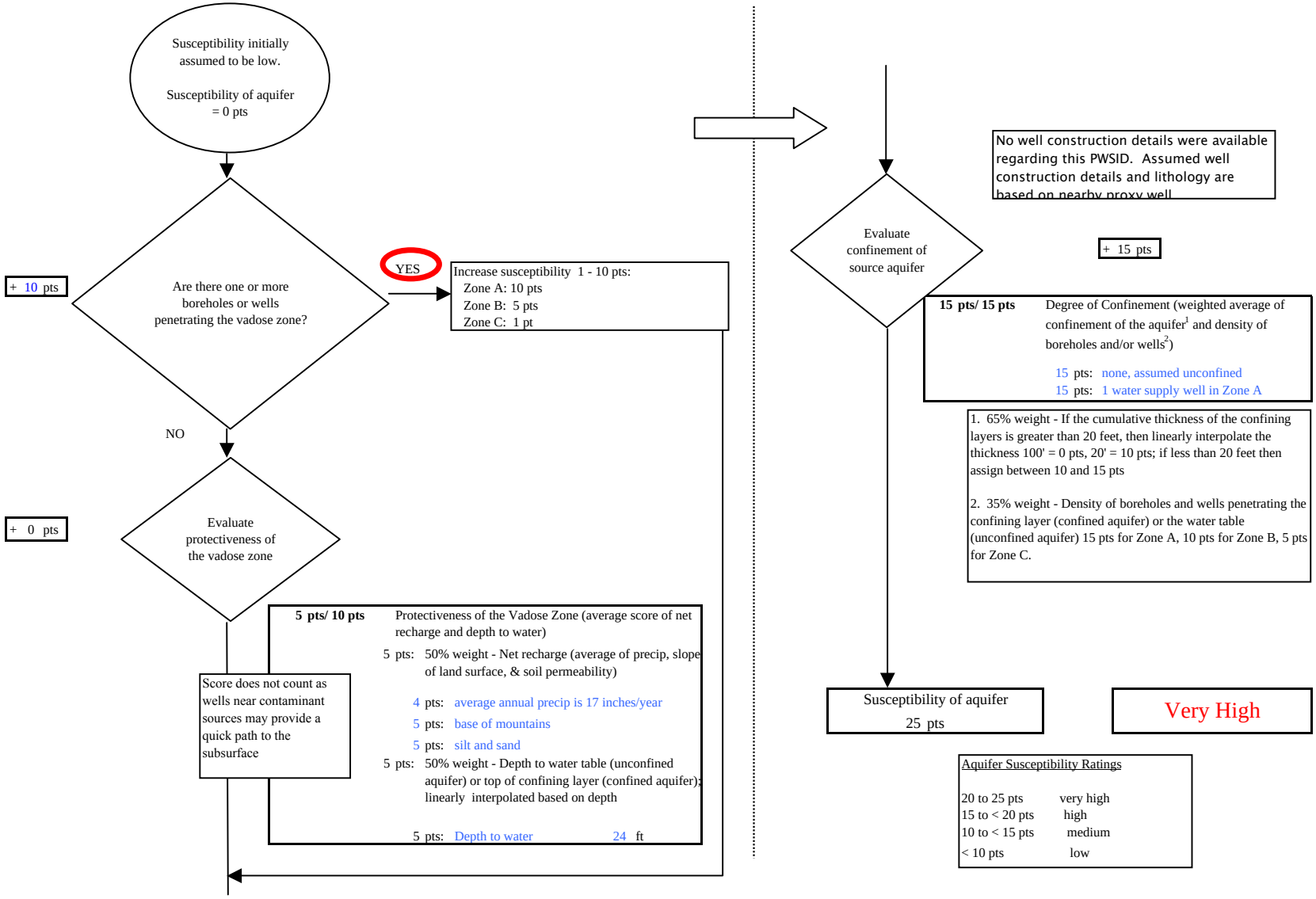
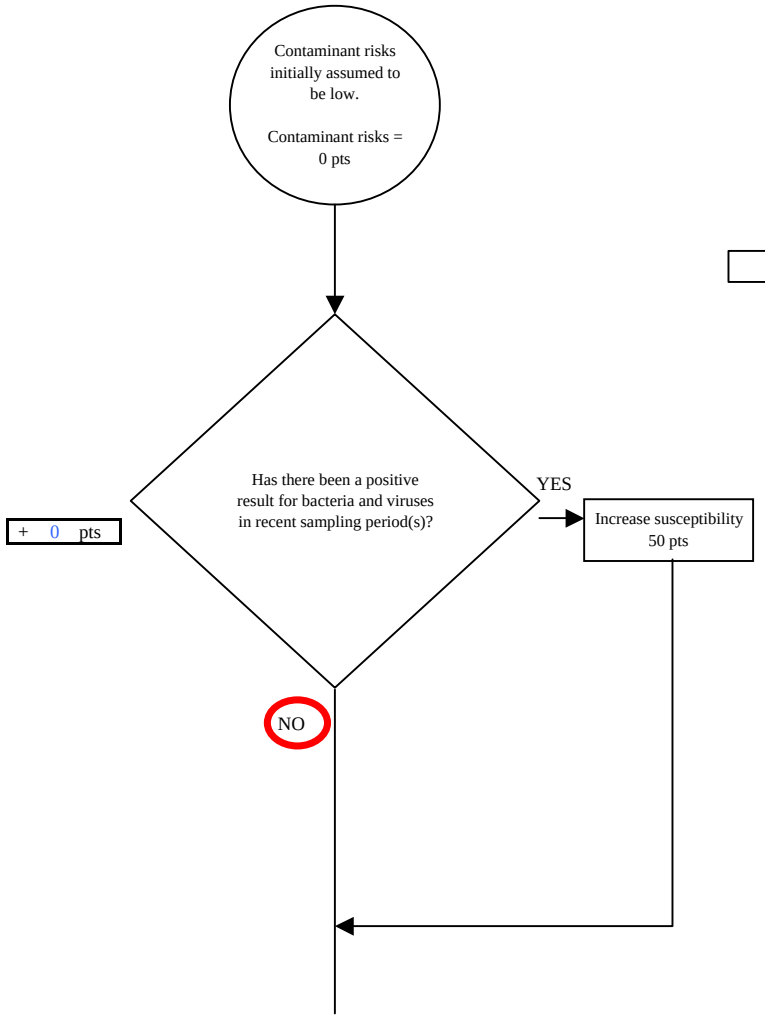
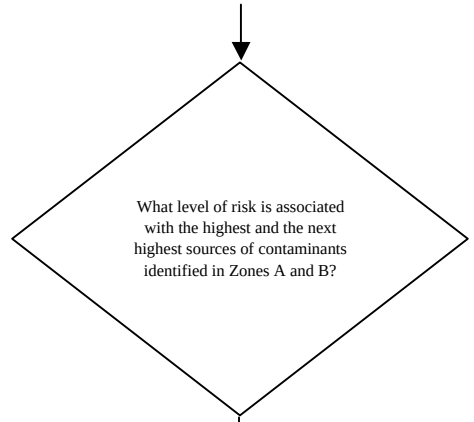


Chart 3. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Bacteria & Viruses





+ 40 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)	2	0	2
Medium(s)	7	2	9
Low(s)	12	2	14

	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.

Chart 3. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Bacteria & Viruses

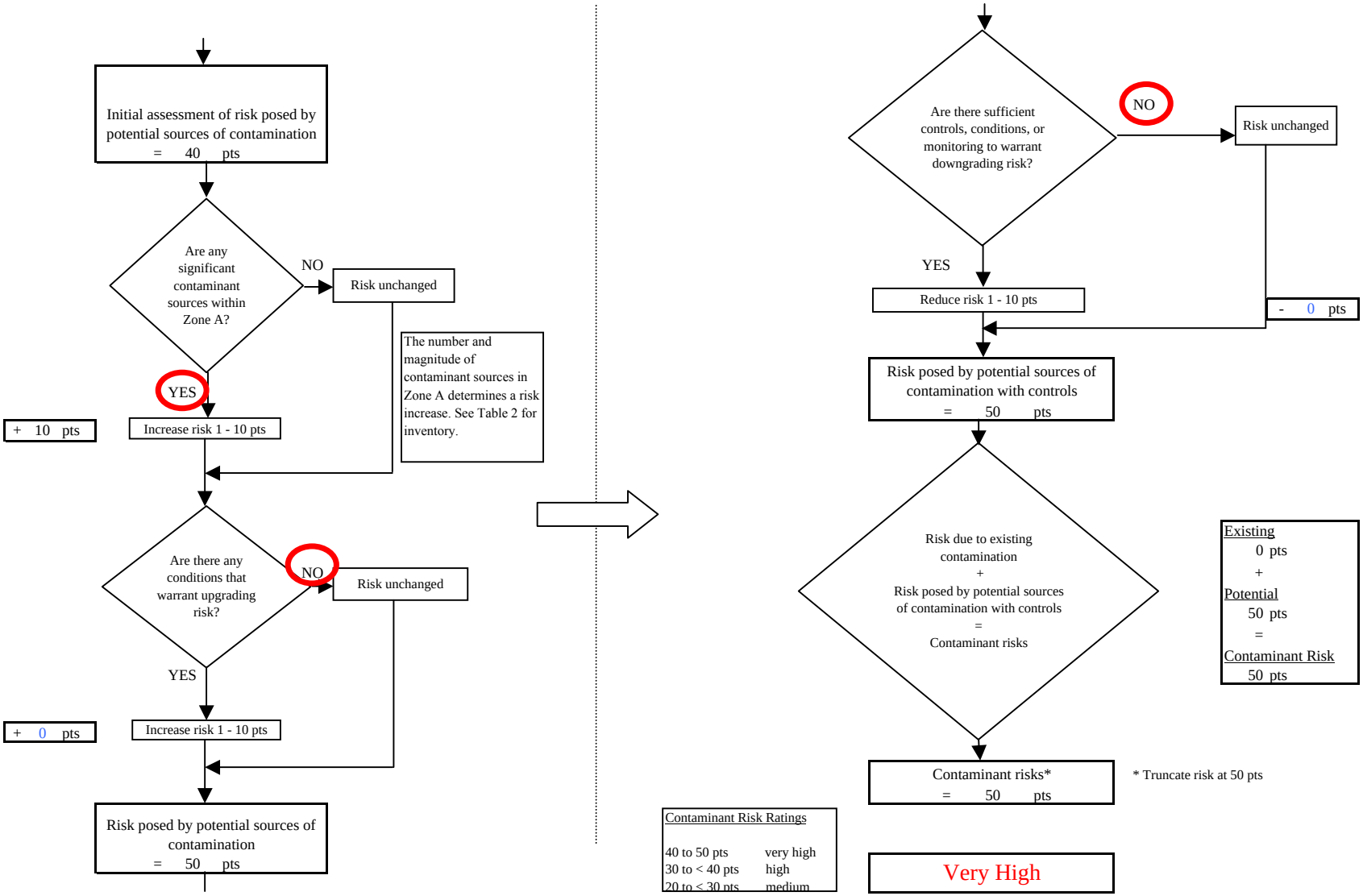


Chart 4. Vulnerability analysis for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Bacteria & Viruses

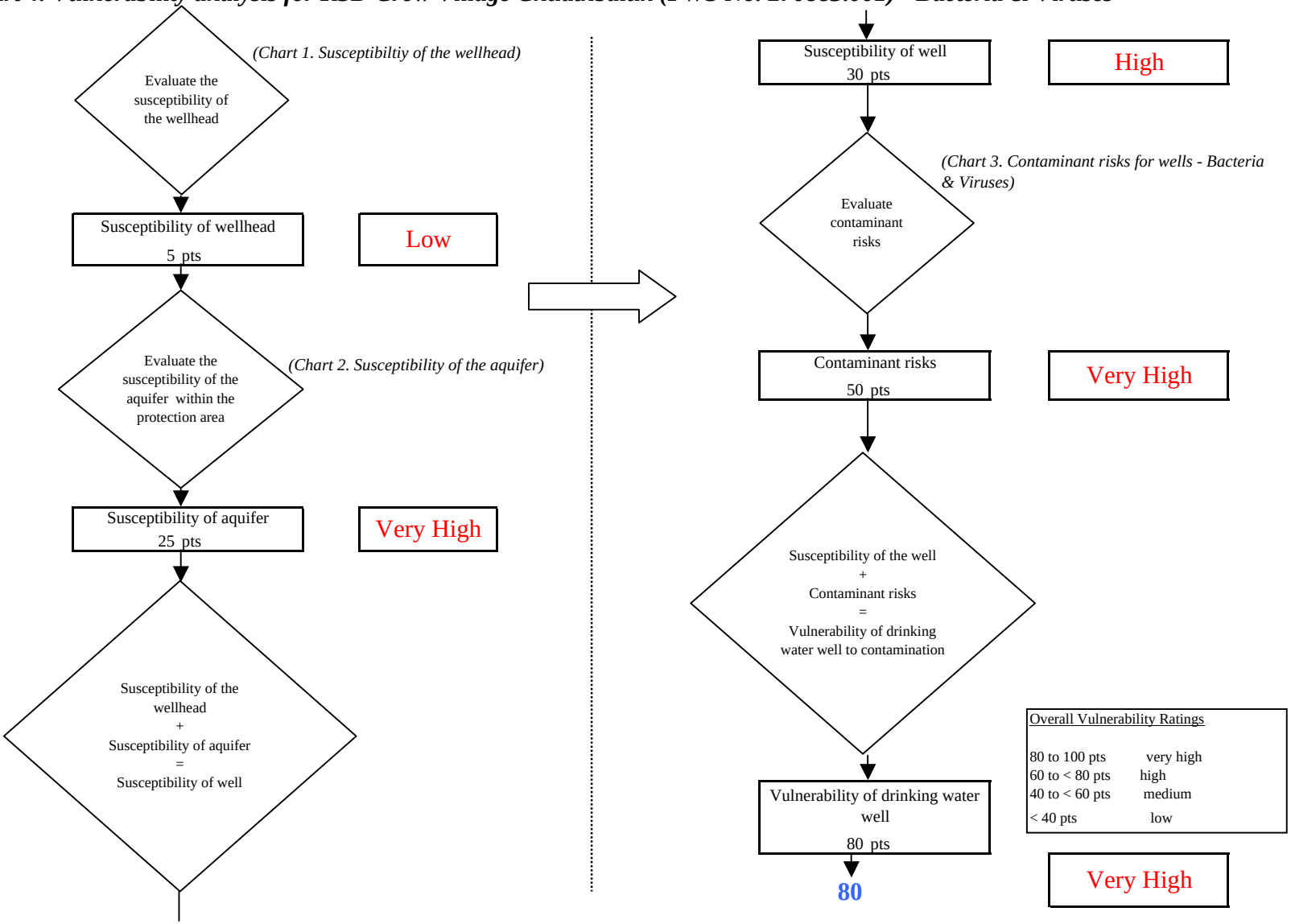


Chart 5. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Nitrates and Nitrites

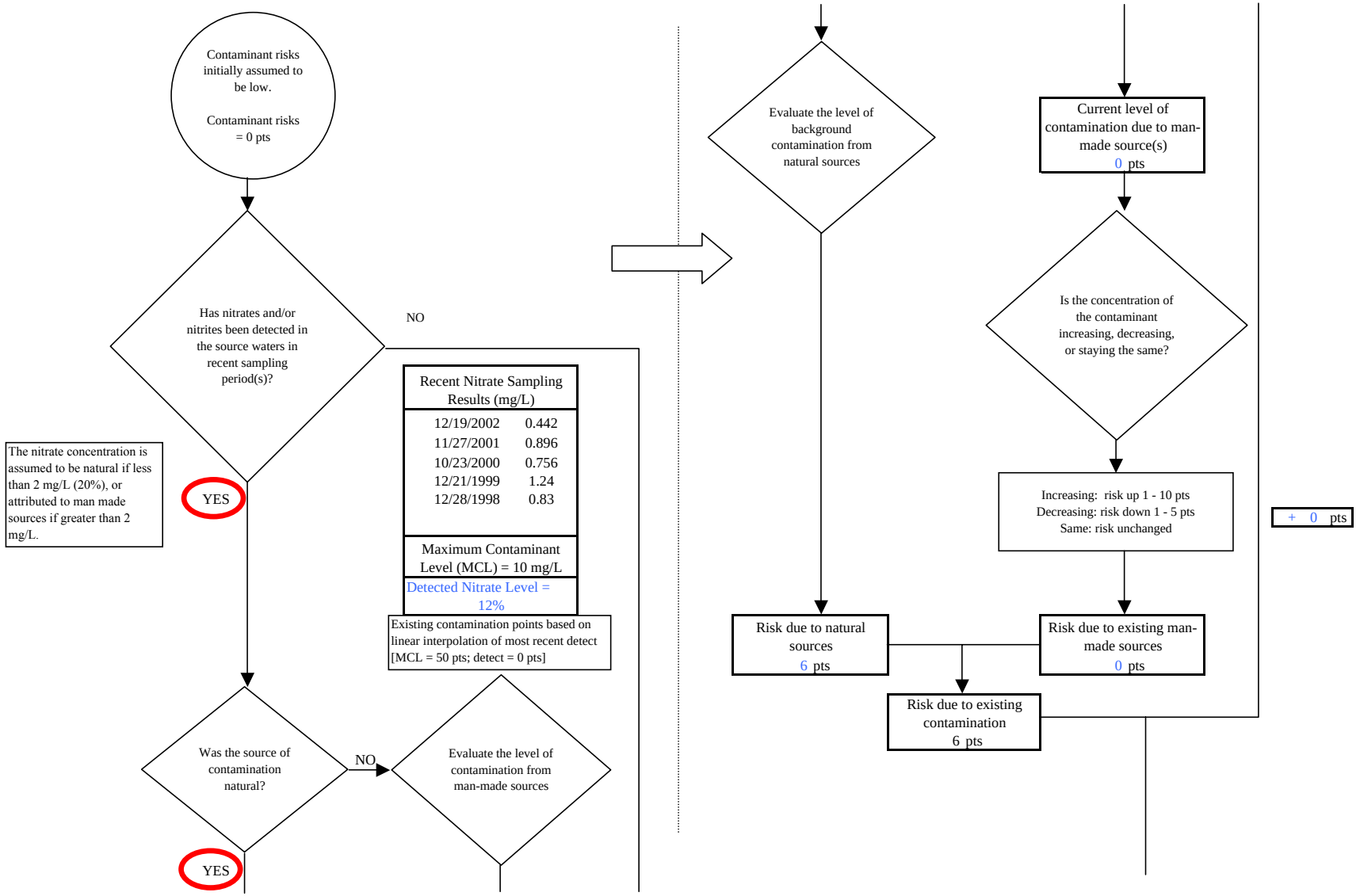


Chart 5. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Nitrates and Nitrites

Initial assessment of risk posed by

+ 40 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)	2	0	2
Medium(s)	7	2	9
Low(s)	13	6	19

	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.

potential sources of contamination = 40 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

YES

Increase risk 1 - 10 pts

+ 10 pts

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

Chart 5. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Nitrates and Nitrites

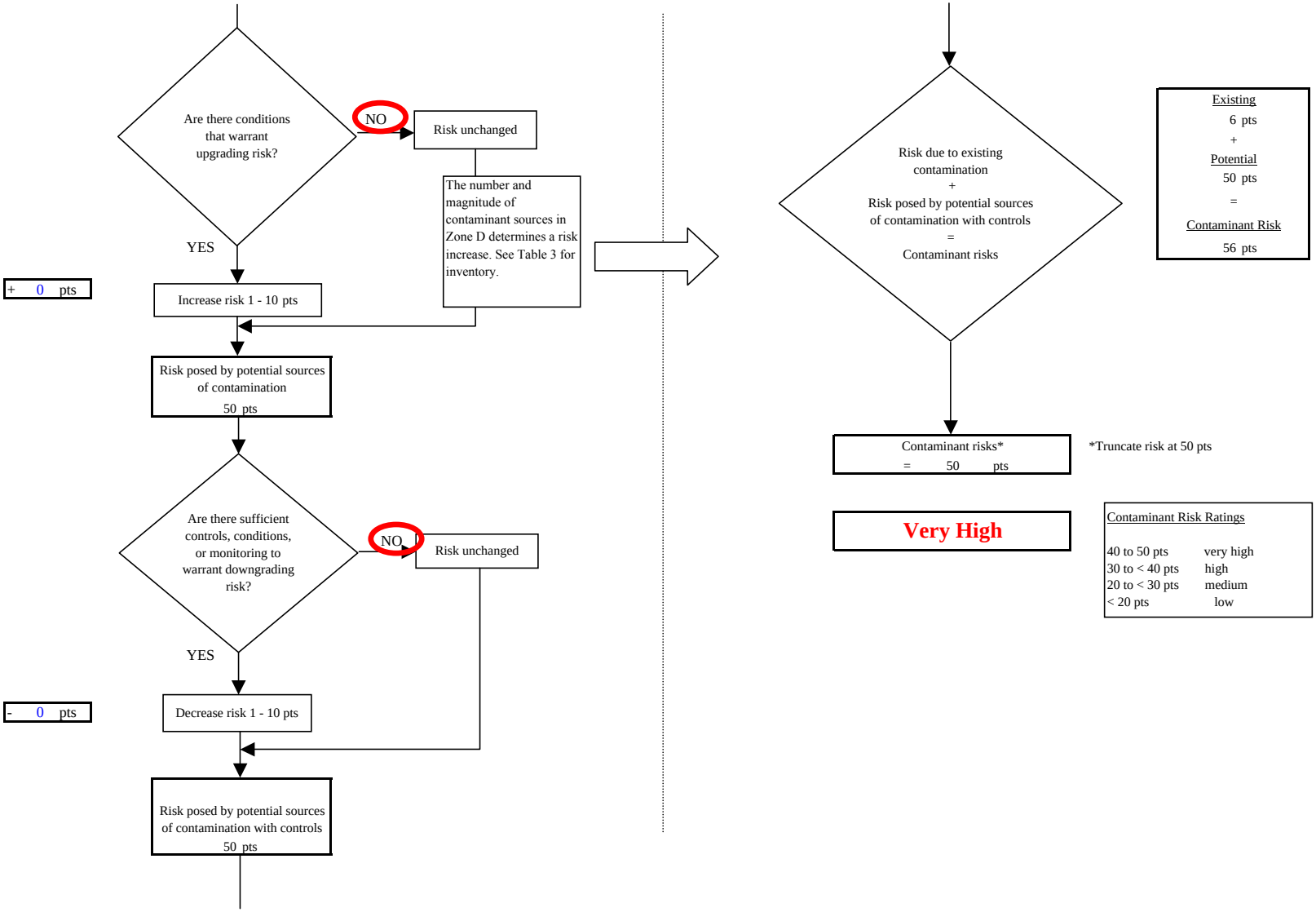


Chart 6. Vulnerability analysis for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Nitrates and Nitrites

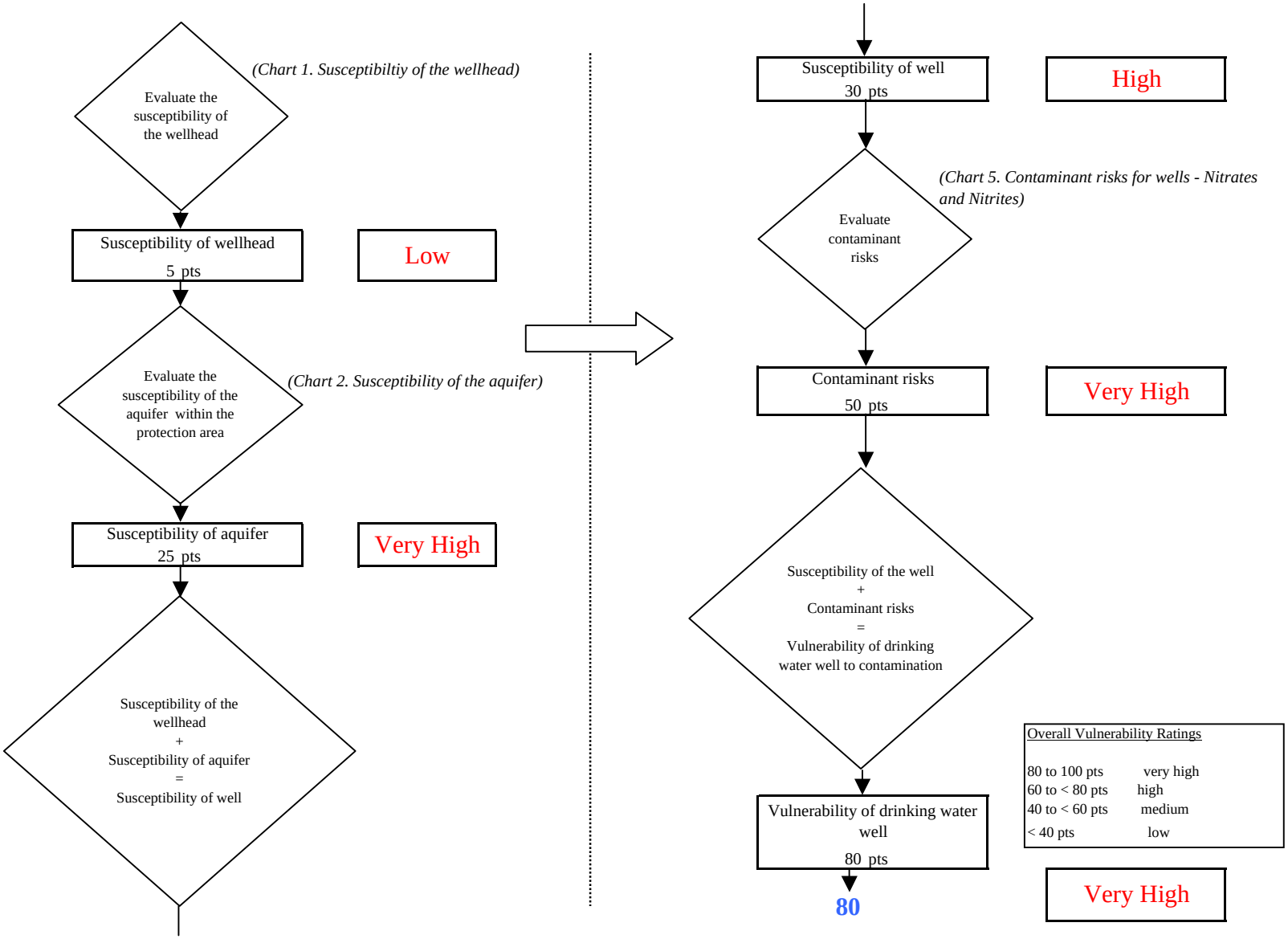


Chart 7. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Volatile Organic Chemicals

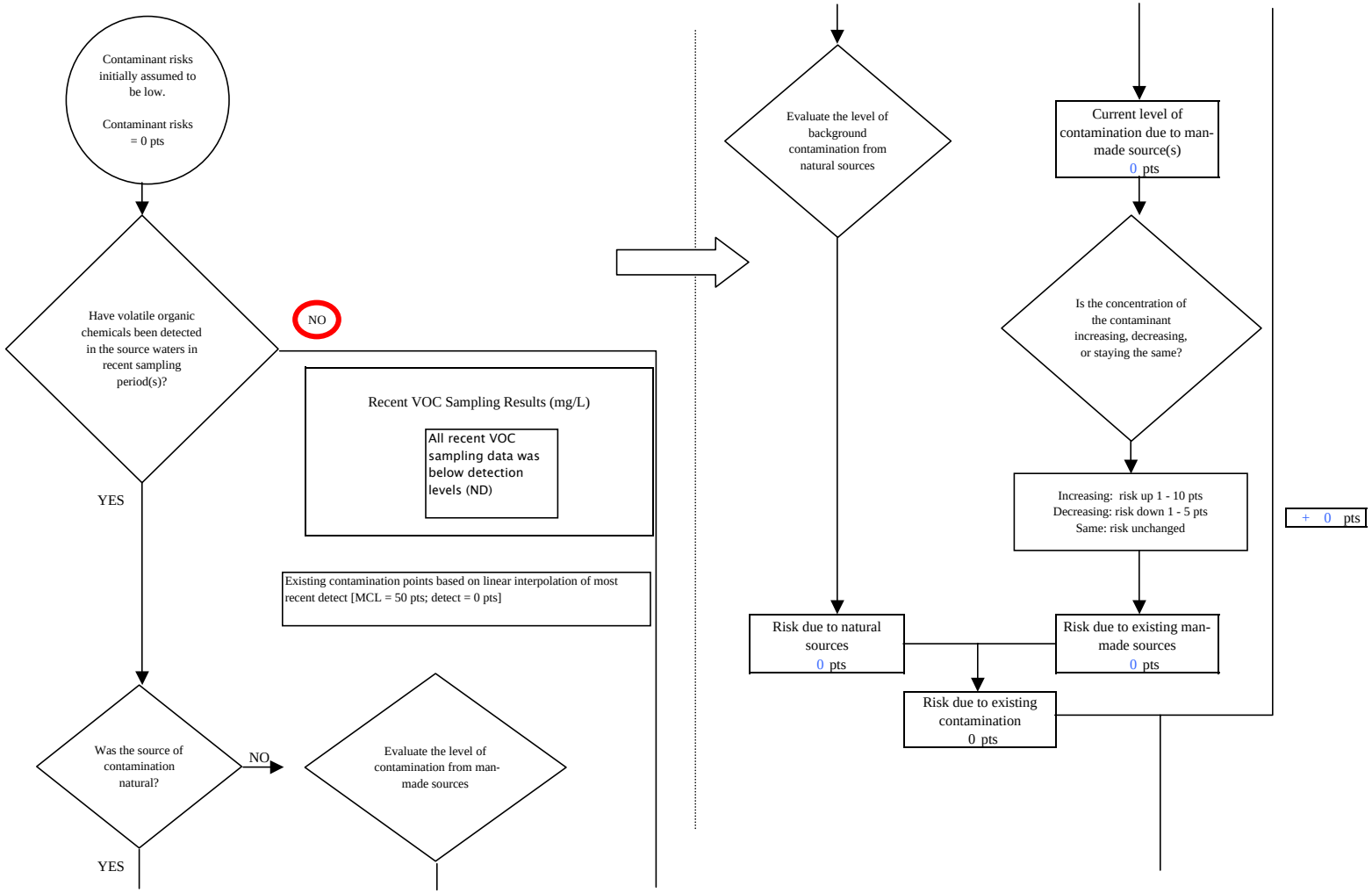


Chart 7. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Volatile Organic Chemicals

+ 50 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)	3	0	3
High(s)	0	1	1
Medium(s)	19	6	25
Low(s)	34	7	41

	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 50

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 = 50 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 4 for inventory.

YES

Increase risk 1 - 10 pts

+ 10 pts

Chart 7. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Volatile Organic Chemicals

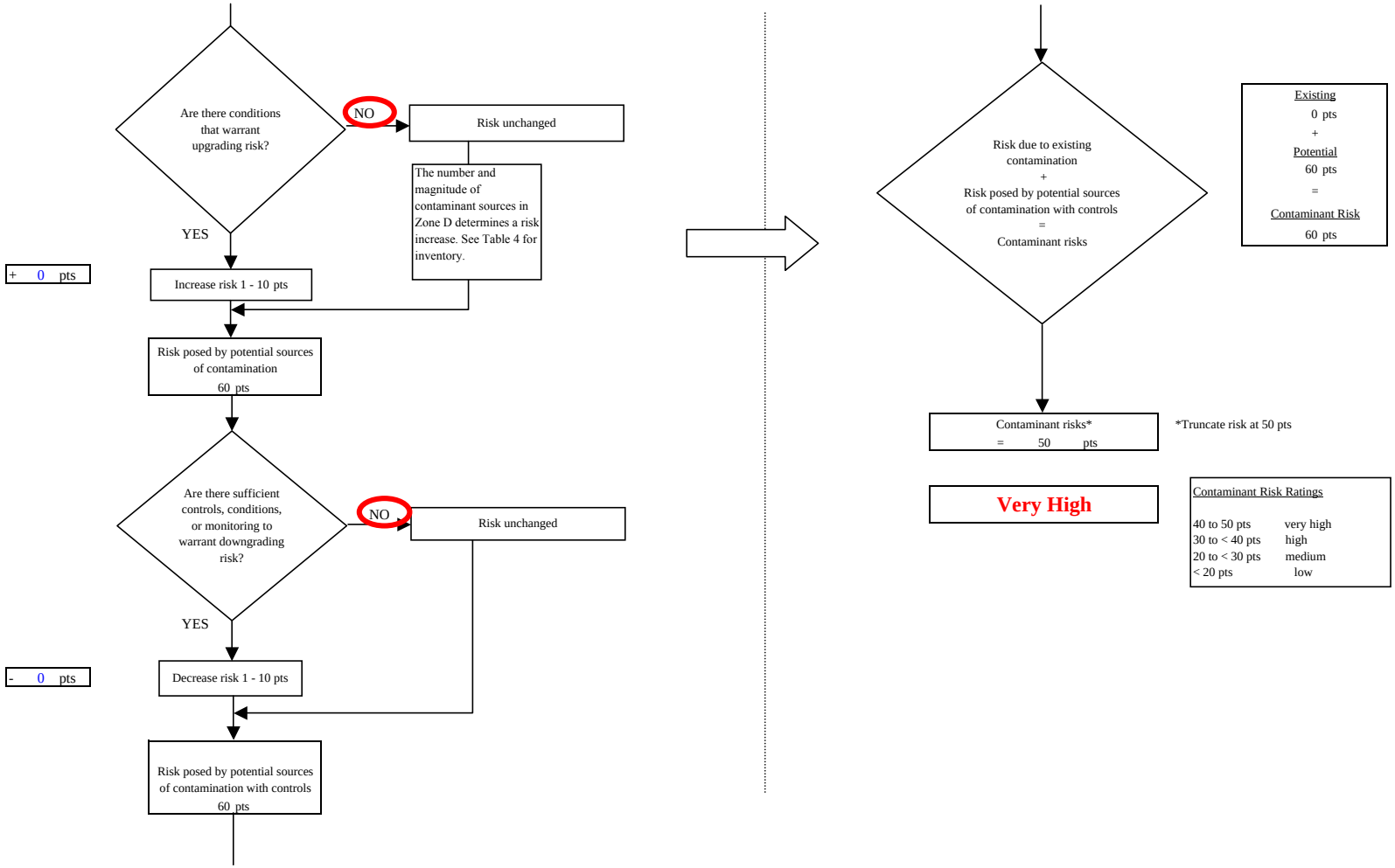


Chart 8. Vulnerability analysis for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Volatile Organic Chemicals

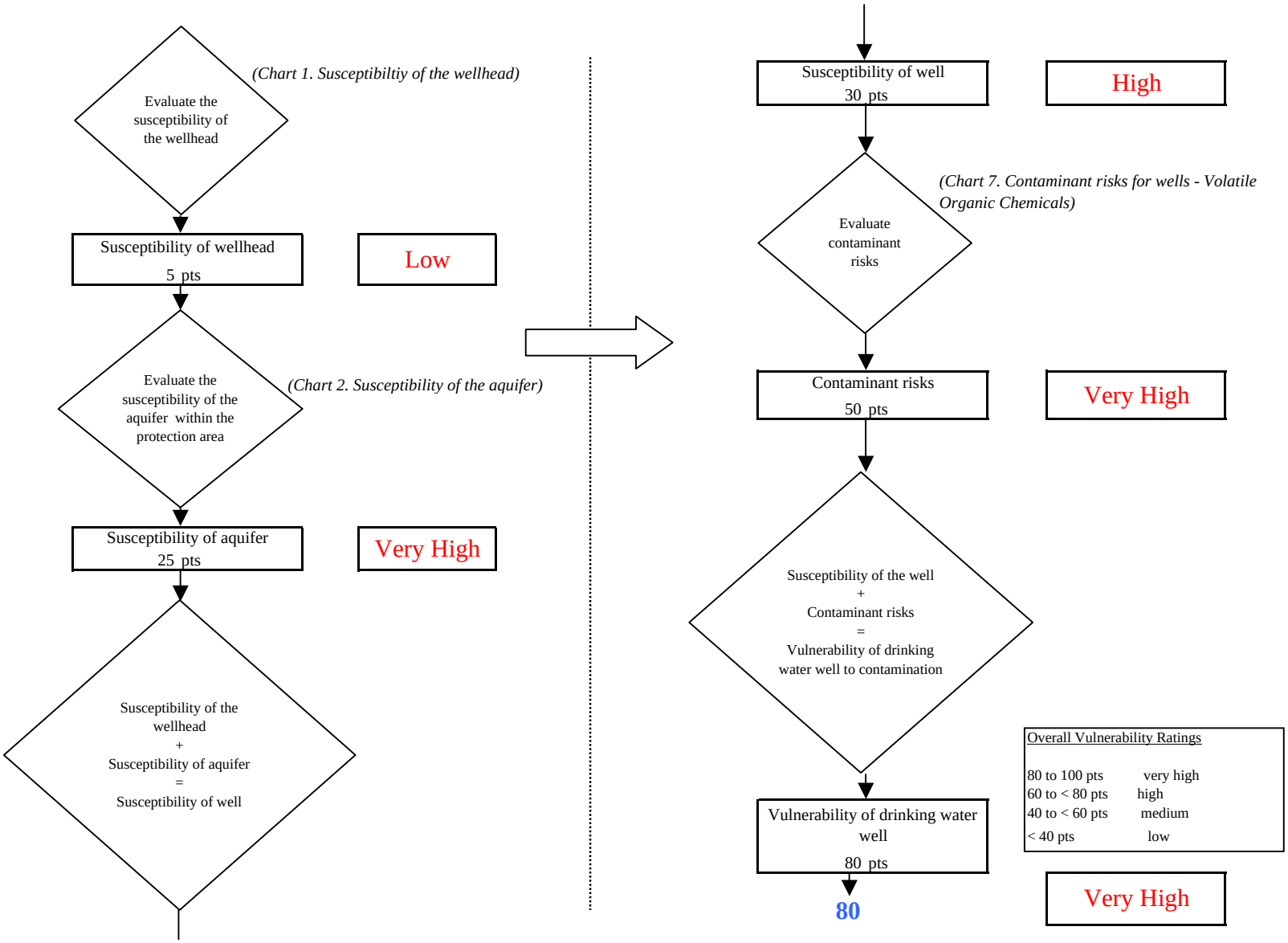


Chart 9. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

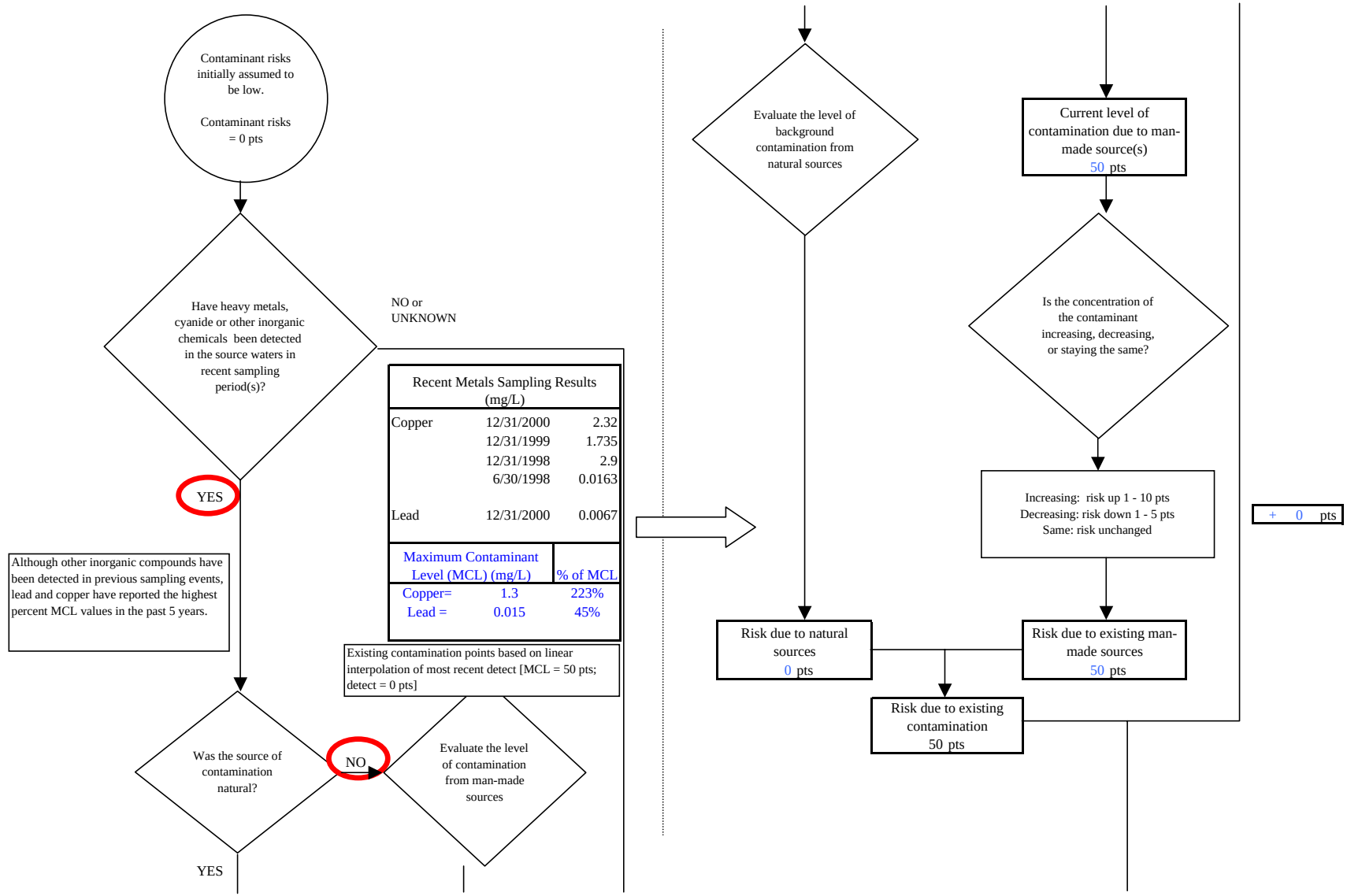


Chart 9. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 25 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)	3	0	3
Low(s)	38	8	46

	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.

potential sources of contamination = 25 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

YES → Increase risk 1 - 10 pts

+ 10 pts

The number and magnitude of contaminant sources in Zone A determines a risk increase. See Table 5 for inventory.

Chart 9. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

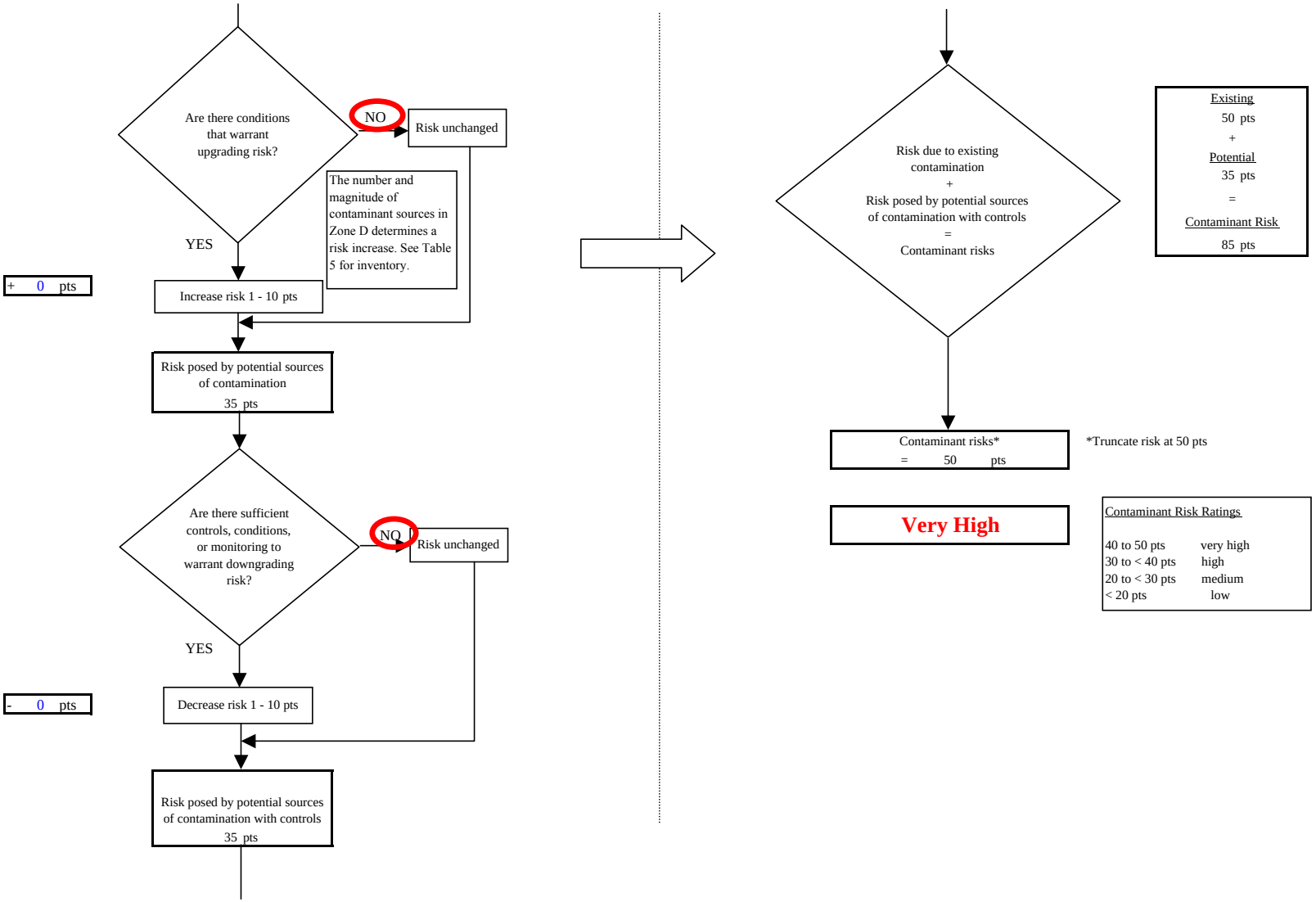


Chart 10. Vulnerability analysis for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

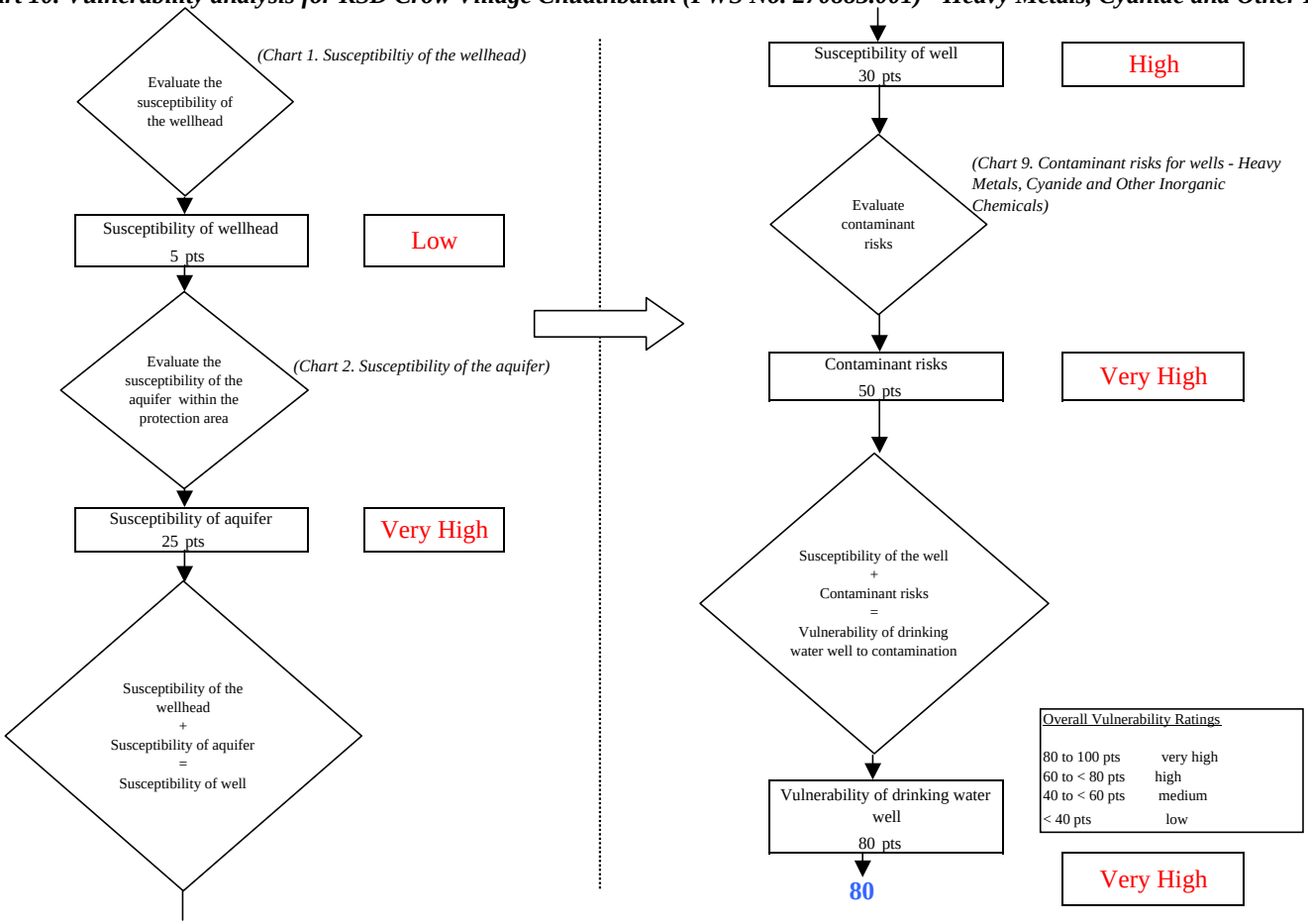


Chart 11. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Synthetic Organic Chemicals

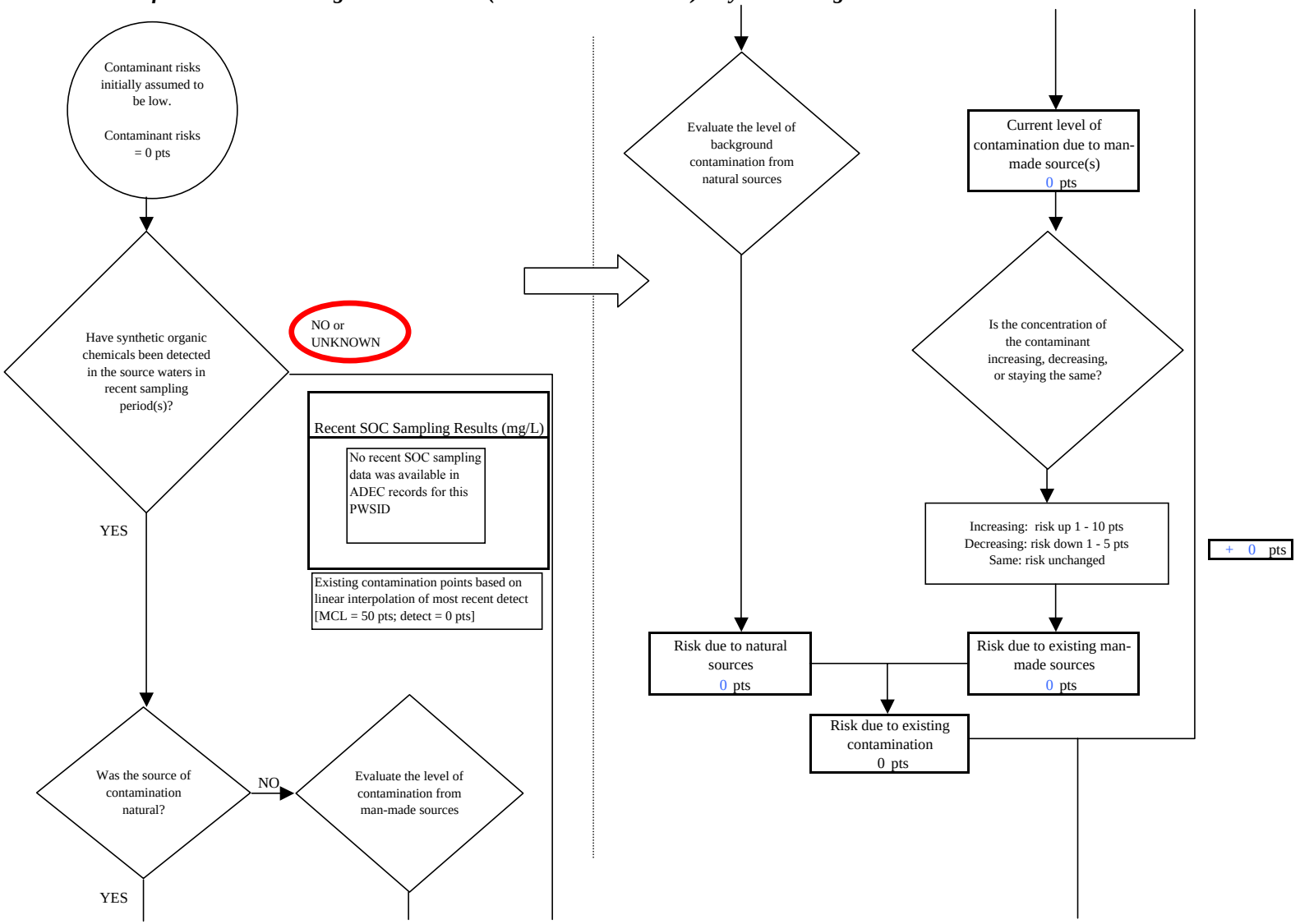
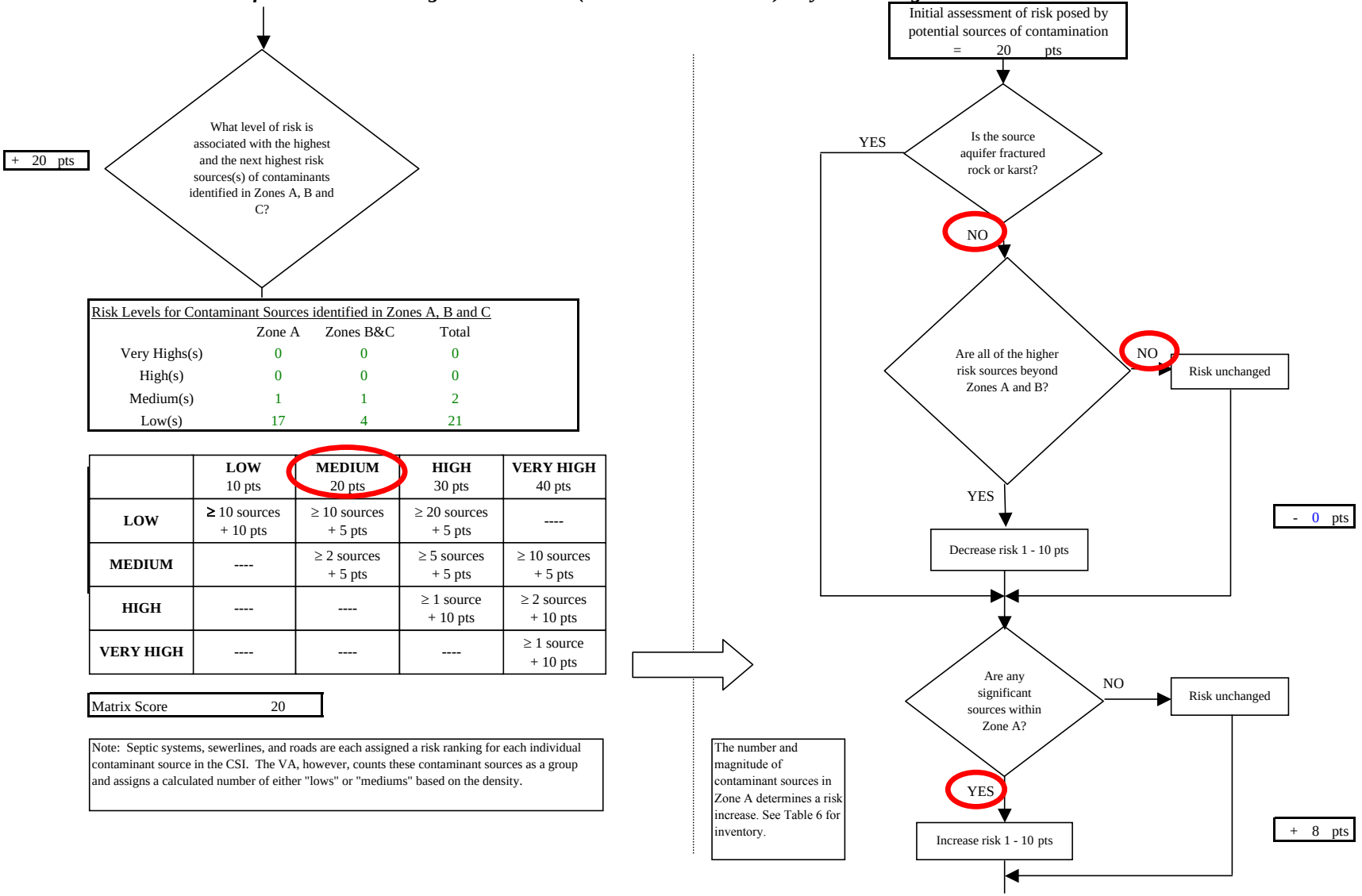


Chart 11. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Synthetic Organic Chemicals



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)	1	1	2
Low(s)	17	4	21

	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.

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

Chart 11. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Synthetic Organic Chemicals

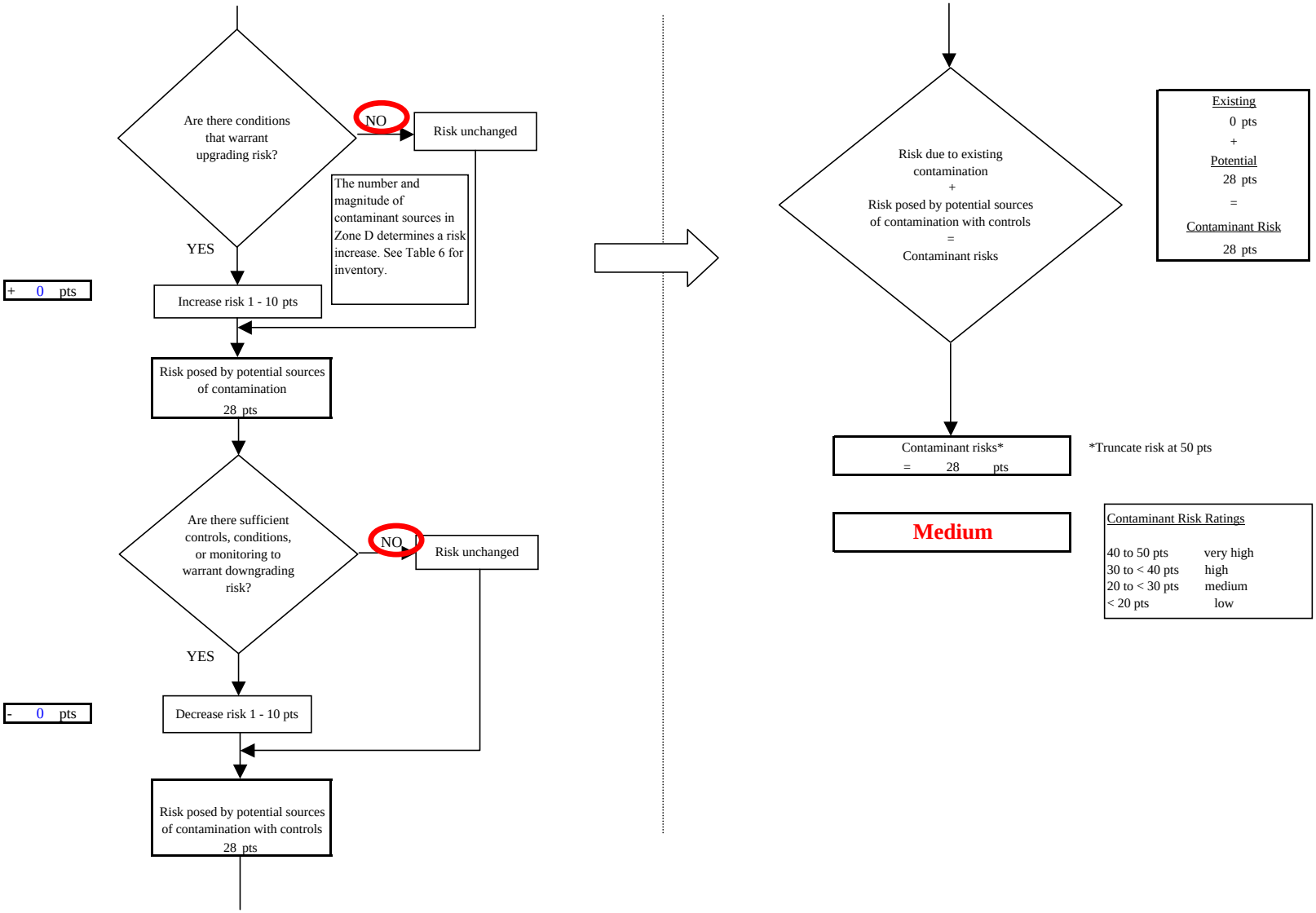


Chart 12. Vulnerability analysis for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Synthetic Organic Chemicals

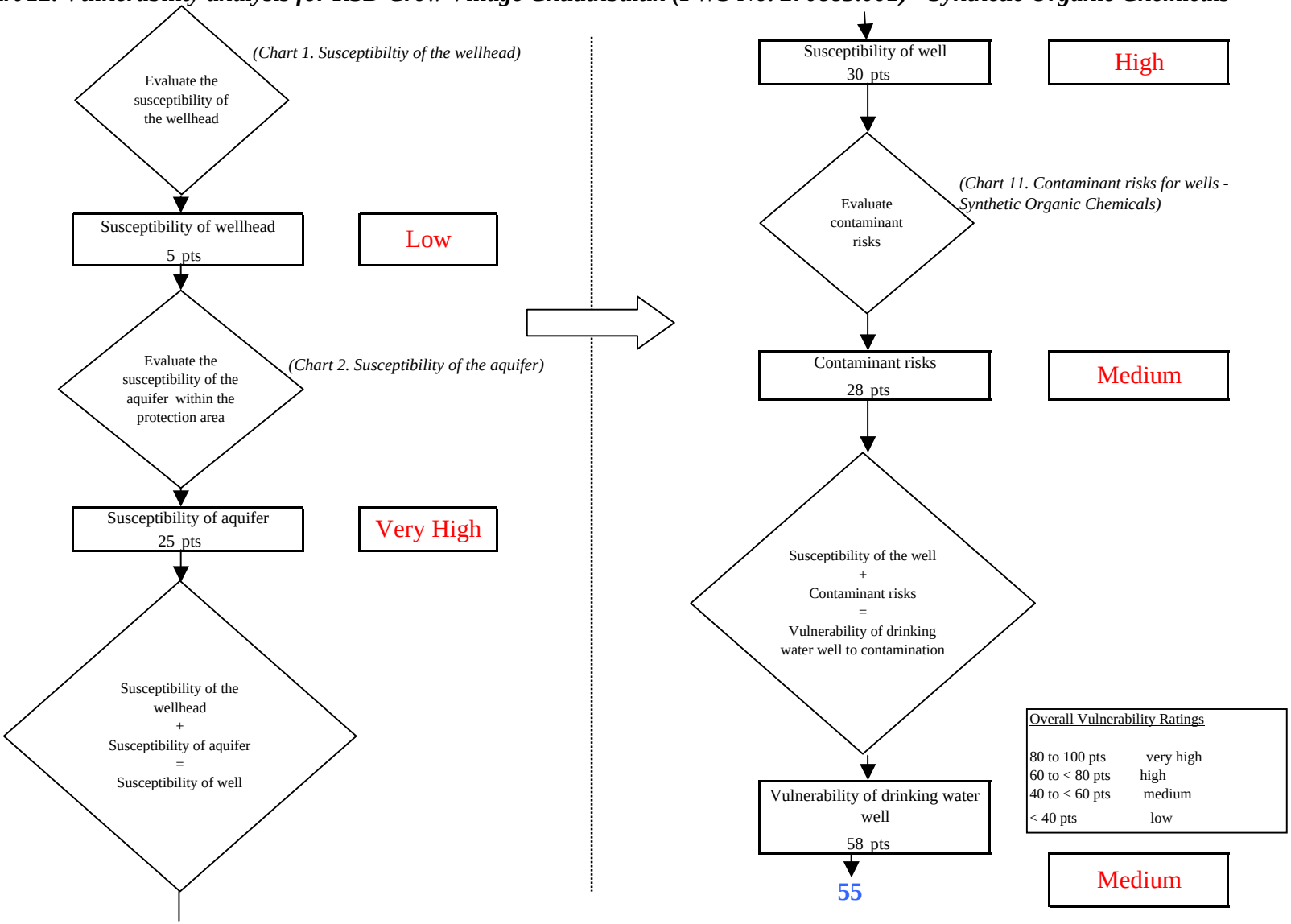


Chart 13. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Other Organic Chemicals

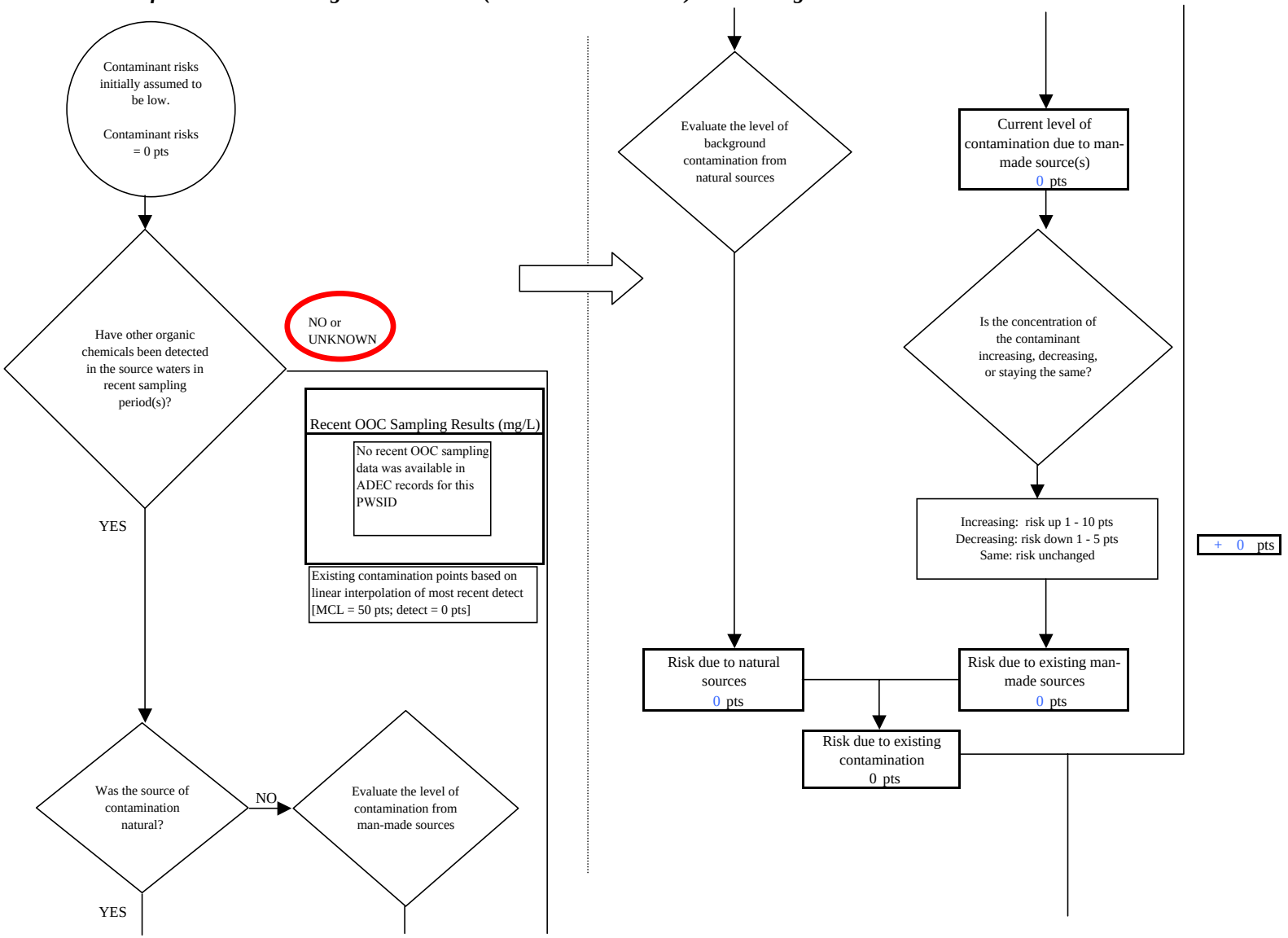


Chart 13. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Other Organic Chemicals

Initial assessment of risk posed by

+ 40 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)	5	0	5
Medium(s)	1	1	2
Low(s)	14	5	19

	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.

potential sources of contamination = 40 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 7 for inventory.

YES

Increase risk 1 - 10 pts

+ 10 pts

Chart 13. Contaminant risks for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Other Organic Chemicals

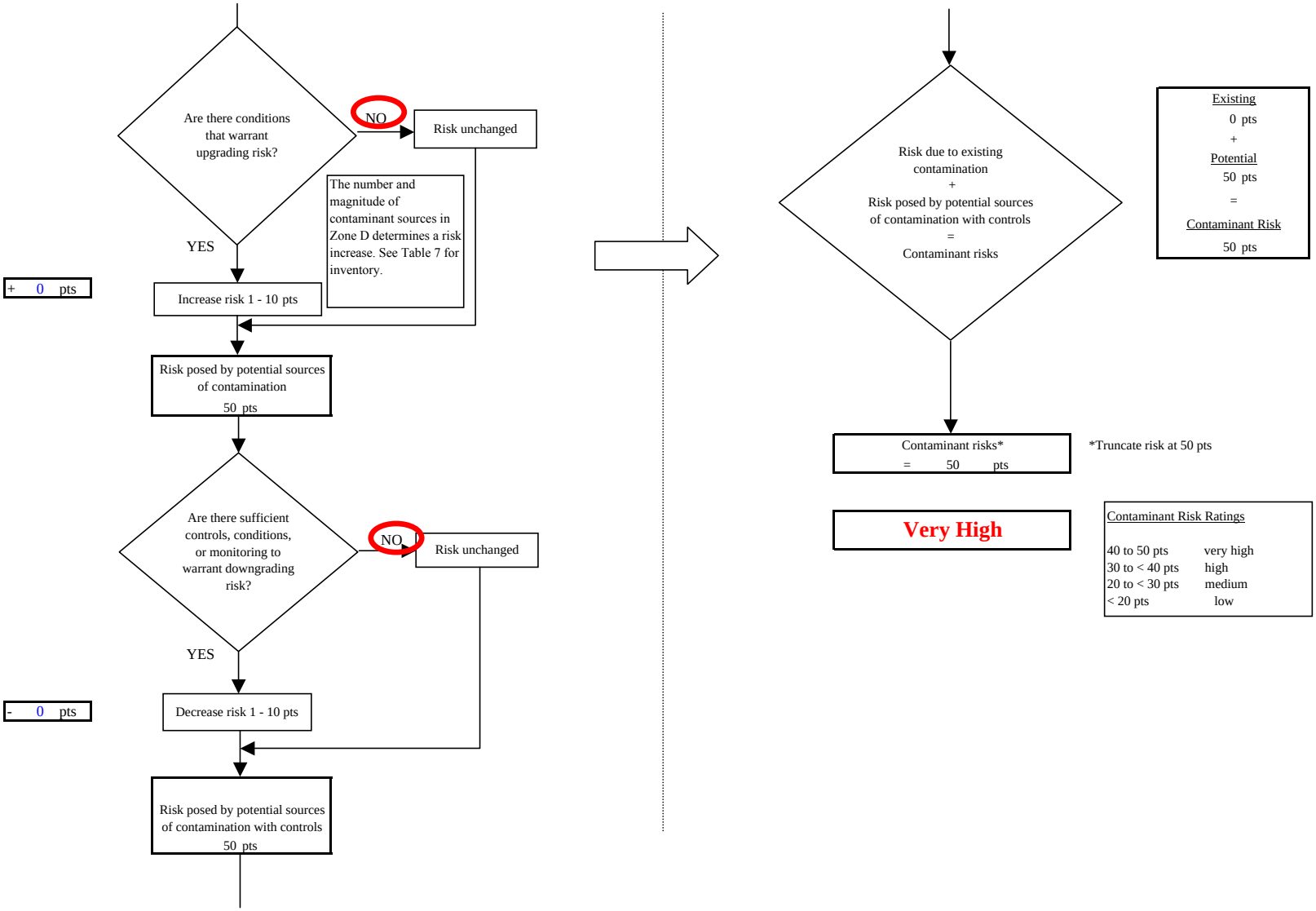


Chart 14. Vulnerability analysis for KSD Crow Village Chuathbaluk (PWS No. 270883.001) - Other Organic Chemicals