Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Susitna Valley High School Talkeetna area, Alaska PWSID 221012

April 2004

DRINKING WATER PROTECTION PROGRAM REPORT Report 1498
Alaska Department of Environmental Conservation

Source Water Assessment for Susitna Valley High School Talkeetna area, Alaska PWSID 225032

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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 Susitna Valley High School
Talkeetna area, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

This source water assessment provides an evaluation of the vulnerability to potential contamination of the public water system serving Susitna Valley High School. This Class A (non-transient non-community) water system consists of one well located along the Parks Highway near its intersection with Helena Avenue 15 miles south of Talkeetna, Alaska. The well received a natural susceptibility rating of **Low.** This rating is a combination of a susceptibility rating of **Low** for the actual wellhead and a **Medium** rating for the aquifer in which the well is drawing water from. Identified potential and current sources of contamination for the Susitna Valley High School public water system include: pit toilets, fuel storage tanks, roads, a gasoline station, and a campground. These 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. Combining the natural susceptibility of the well with the contaminant risk, the public water system for Susitna Valley High School received an overall vulnerability rating of **Medium** for volatile organic chemicals and heavy metals, cyanide, and other inorganic chemicals, and a **Low** for bacteria and viruses, nitrates and/or nitrites, synthetic organic chemicals, and other organic chemicals.

SUSITNA VALLEY HIGH SCHOOL PUBLIC DRINKING WATER SYSTEM

The Susitna Valley High public water system is a Class A (non-transient non-community) water system. The well is located along the Parks Highway near its intersection with Helena Avenue 15 miles south of Talkeetna, Alaska (T24N, R4W, Section 32) (See Map 1 of Appendix A).). Talkeetna is located at the end of Talkeetna Road off of the George Parks Highway north of Anchorage, Alaska. Talkeetna is located within the Matanuska-Susitna Borough which is located in south-central Alaska (Please see the inset of Map 1 in Appendix A for location). The Borough's current population is almost 70,000 (ADCED, 2002). Communities located within the Borough include : Big Lake, Buffalo Soapstone, Butte, Chase, Chickaloon, Farm Loop, Fishhook, Gateway, Glacier View, Houston, Knik River, Knik-Fairview, Lake Louise, Lakes, Lazy Mountain, Meadow Lakes, Palmer, Petersville, Point MacKenzie, Skwentna, Susitna, Sutton-Alpine, Talkeetna, Tanaina, Trapper Creek, Wasilla, Willow and Y.

Residents of in the area of Talkeetna primarily use the Susitna Valley High School or individual water wells and septic systems or outhouses. A piped sewer system is also operated by the Borough (ADCED, 2002). Electricity is provided by Matanuska Electric Association. Residents use heating oil (typically stored in both above and below ground 275 to 500-gallon tanks) or wood to heat homes and buildings (ADCED, 2002). A Borough-operated refuse transfer station is located at mile 11.5 Talkeetna Spur Road.

The Susitna Valley High School lies in the broad alluvial plain of the Chulitna and Susitna Rivers at an elevation of approximately 350 feet above sea level.

According to the well log, the depth of the well is 120 feet below the ground surface and is screened in clean sandy gravel. Most of these wells in this area are shallow with depths of less than 100 feet. Static water levels vary between 15 and 60 feet below the surface. The coarse, alluvial, sandy gravel of the floodplain provides a large aquifer throughout the year. Both the Susitna River and surface infiltration contribute water to this alluvial aquifer. Discontinuous permafrost (perennially frozen areas) may also be present in the alluvial plain. Areas with discontinuous permafrost may locally affect the ground water flow directions.

The Susitna Valley High School public drinking water system serves approximately 210 non-residents through one service connection.

SUSITNA VALLEY HIGH SCHOOL DRINKING WATER PROTECTION AREA

The pathways most likely for surface contamination to reach the groundwater are identified as the first step in determining a drinking water system's risk. 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 wells is the area that contributes water to the well, the groundwater capture zone. The groundwater capture zone is located in the area circling the well (the area influenced by pumping) and also the

area of the water table upgradient of the well, usually forming a parabola shape.

There are many different ways of calculating the size of capture zones. This assessment uses a combination of two simple groundwater flow equations, the Thiem and uniform flow equations for all groundwater wells screened in unconsolidated material. The orientation of the capture zone is then drawn using a water table elevation map (if available) or a land surface elevation map of the area. The capture zone calculated in this assessment is only a best guess using the information and resources available to us, and may differ slightly from the actual capture zone.

The parameters used to calculate the shape of this capture zone are general for the whole alluvial plain and were obtained from area well logs in the area and the Groundwater textbook by Freeze and Cherry (Freeze and Cherry, 1979).

Only limited information is available for the aquifer Susitna Valley High School's public water system well draws its water from. The orientation of the capture zone was drawn based on the assumption that groundwater flow direction is generally the same direction as the topography.

Because of uncertainties and changing site conditions, a factor of safety is added to the groundwater capture zone to form the drinking water protection area for the well.

The protection areas established for wells are usually separated into four zones, limited by the watershed. These zones correspond to times-of-travel (TOT) of the water moving through the aquifer to the well (plus the factor of safety).

The following is a summary of the four 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 2 years time-of-travel
C	Less than 5 years time-of-travel
D	Less than 10 years time-of-travel

The time of travel for *contaminants* within the water varies with their unique physical and chemical characteristics.

The drinking water protection area outlined for the Susitna Valley High School on Map 1 of Appendix A will serve as the focus for voluntary protection efforts.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program (DWPP) has completed an inventory of potential and existing sources of contamination within the Susitna Valley High School protection area. This inventory was completed through a search of agency records and other publicly available information. 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; and
- Other inorganic chemicals.

The sources are displayed on Map 2 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 each 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 combination of toxicity and volume associated with that source. Rankings include:

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

Bacteria and Viruses are only inventoried in Zones A and B because of their short life span. Only "Very High" and "High" rankings are inventoried within the outer Zone D due to the probability of contaminant dilution by the time the contaminants get to the well.

Tables 2 through 7 in Appendix B contain the ranking of inventoried potential and existing sources of contamination with respect to the six contaminant categories.

VULNERABILITY OF SUSITNA VALLEY HIGH SCHOOL 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 properties of the aquifer and the presence of other wells or boreholes in the area. 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 the water system's contaminant sample results. Lastly, Chart 4 combines the results of the first three charts to produce 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 wellhead for the Susitna Valley High School received a Low Susceptibility rating. The 1/31/01 Sanitary Survey indicates the well is capped with a sanitary seal, and the land surface is sloped away from the wells; however, the well is not grouted. A sanitary seal prevents potential contaminants from entering the well from the inside while sloping the land surface away from the well and grouting help to prevent potential contaminants from traveling down the outside of the well casing.

The aquifer the Susitna Valley High School well is completed in received a Medium Susceptibility rating. Although the highly transmissive aquifer material (sand and gravel) in the area allows contaminants to travel quickly through it, there are some clay and silts above the aquifer that help to slow the migration of contaminants downward from the surface with the precipitation and surface water runoff. The depth of the water table allows some natural filtering of contaminants before they come into contact with the water table where they can disperse quickly. If there are any other wells in the area, they can also provide a quick pathway for contaminants to travel down into the aquifer if they are not grouted correctly. Table 2 summarizes the Susceptibility scores and ratings for Susitna Valley High School.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	13	Medium
Natural Susceptibility	18	Low

The Contaminant Risk has been derived from an evaluation of the routine sampling results of the water system and the presence of potential sources of contamination. Contaminant risks to a drinking water source depend on the type and distribution of contaminant sources. 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	10	Low
Nitrates and/or Nitrites	12	Low
Volatile Organic Chemicals	40	Very High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	29	Medium
Synthetic Organic Chemicals	0	Low
Other Organic Chemicals	10	Low

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

Natural Susceptibility (0 – 50 points)
+
Contaminant Risks (0 – 50 points)
=
Vulnerability of the
Drinking Water Source to Contamination (0 – 100).

Again, rankings are assigned according to a point score:

Overall Vulnerability Ratings	
80 to 100 pts	Very High
60 to < 80 pts	High
40 to < 60 pts	Medium
< 40 pts	Low

Table 4 contains the overall vulnerability scores (0 – 100) and ratings for each of the six categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	30	Low
Nitrates and/or Nitrites	30	Low
Volatile Organic Chemicals	55	Medium
Heavy Metals, Cyanide, and Other Inorganic Chemicals	45	Medium
Synthetic Organic Chemicals	20	Low
Other Organic Chemicals	30	Low

Bacteria and Viruses

The pit toilets represent the greatest risk of Bacteria and Viruses to this water system.

Only a small amount of bacteria and viruses are required to endanger public health. Coliforms (a bacteria) are found naturally in the environment and although they aren't necessarily a health threat, it is 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 (EPA, 2002). Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2002). Routine sampling has not recently detected coliforms in the water.

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 low.

Nitrates and Nitrites

The pit toilets are also the greatest risk of nitrates and nitrites for this source of public drinking water.

Nitrates are very mobile, moving at approximately the same rate as water. Nitrates have not been detected in significant concentrations in recent sampling history for the Susitna Valley High School well.

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

Volatile Organic Chemicals

The fuel storage tanks represent the greatest risk for volatile organic chemical contamination to the well.

Both underground and above ground heating oil storage tanks are the standard way of heating homes and businesses in this area. The most common causes of fuel leaks of these heating oil systems are overfilling the tank, ruptured fuel lines, leaking storage tanks, damaged or faulty valves and vandalism. Regular system maintenance can help prevent many of these harmful fuel leaks.

Volatile Organic Chemicals have not been detected during routine sampling of this water system. 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 gasoline storage tanks represent the greatest risk to heavy metals for this source of public drinking water.

Arsenic and Barium have been detected in small concentrations with respect to their Maximum Contaminant Levels (MCL). A MCL is the

concentration of a contaminant allowed in the drinking water by the Environmental Protection Area (EPA). No other heavy metals were not detected during recent sampling.

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 medium.

Synthetic Organic Chemicals

No potential sources of risk of synthetic organic chemicals were identified for this source of public drinking water.

Synthetic Organic Chemicals have not recently been sampled for in this water system.

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 low.

Other Organic Chemicals

The Parks Highway represents the greatest risk of other organic chemicals for this source of public drinking water.

Other Organic Chemicals have not recently been sampled for in this water system.

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 low.

REFERENCES

Alaska Department of Community and Economic Development (ADCED), 2002 [WWW document]. URL http://www.dced.state.ak.us/mra/CF_BLOCK.cfm.

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

United States Environmental Protection Agency (EPA), 2002 [WWW document]. URL http://www.epa.gov/safewater/mcl.html.

APPENDIX A

Susitna Valley High School
Drinking Water Protection Area Location Map
(Map 1)

MSBSD Susitna Valley High Drinking Water Protection Area

Map 1: MSBSD Susitna Valley High Drinking Water Protection Area

PWSID: 221012

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 2,000 4,000 8,000 12,000 Feet

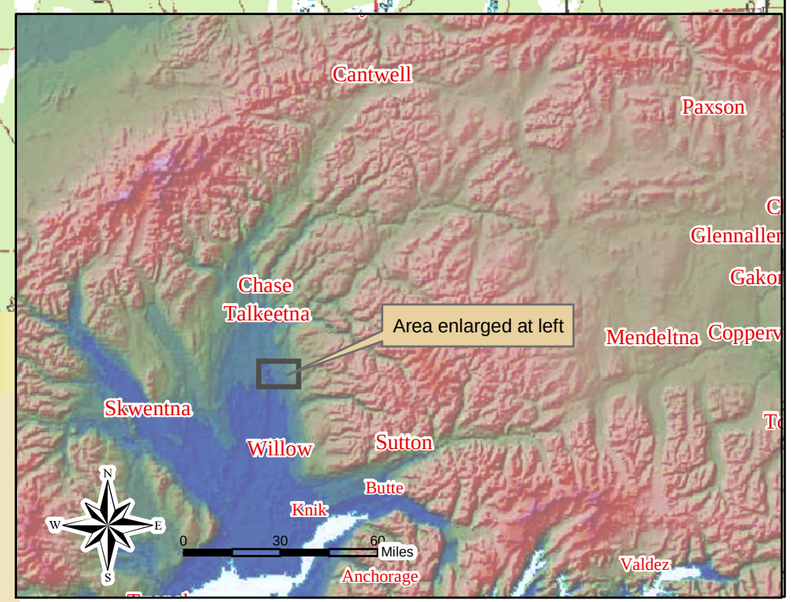
1:48,000

Data Sources:

Background image
- USGS 1:63,000 mapping

Legend

- MSBSD Susitna Valley High well
- Zone A
- Zone B
- Zone C
- Zone D



APPENDIX B

Contaminant Source Inventory and Risk Ranking for Susitna Valley High School (Tables 1-7)

Table 1

Contaminant Source Inventory for ***MSBSD Susitna Valley High***

PWSID 221012.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Pit toilets (vaulted) nonresidential (one or more)	D17	D17-1	A	2	
Tanks, diesel (above ground)	T06	T06-1	A	2	MSBSD Susitna Valley High
Tanks, heating oil, nonresidential (underground)	T16	T16-1	A	2	MSBSD Susitna Valley High
Highways and roads, paved (cement or asphalt)	X20		A	2	Parks Hwy
Gasoline stations (without repair shop)	C15	C15-1	B	2	Mile 99 Parks Hwy
Tanks, diesel (above ground)	T06	T06-2	B	2	
Tanks, diesel (underground)	T08	T08-1	B	2	
Tanks, gasoline (above ground)	T10	T10-1	B	2	
Tanks, gasoline (above ground)	T10	T10-2	B	2	
Tanks, gasoline (underground)	T12	T12-1	B	2	
Tanks, gasoline (underground)	T12	T12-2	B	2	
Campgrounds and RV Parks	X35	X35-1	B	2	Parks and Helena Ave

Table 2

Contaminant Source Inventory and Risk Ranking for MSBSD Susitna Valley High Sources of Bacteria and Viruses

PWSID 221012.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	Parks Hwy
Pit toilets (vaulted) nonresidential (one or more)	D17	D17-1	A	Low	2	
Campgrounds and RV Parks	X35	X35-1	B	Low	2	Parks and Helena Ave

Table 3

Contaminant Source Inventory and Risk Ranking for MSBSD Susitna Valley High Sources of Nitrates/Nitrites

PWSID 221012.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	Parks Hwy
Pit toilets (vaulted) nonresidential (one or more)	D17	D17-1	A	Low	2	
Campgrounds and RV Parks	X35	X35-1	B	Low	2	Parks and Helena Ave

Table 4

Contaminant Source Inventory and Risk Ranking for MSBSD Susitna Valley High Sources of Volatile Organic Chemicals

PWSID 221012.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	Parks Hwy
Tanks, diesel (above ground)	T06	T06-1	A	Medium	2	MSBSD Susitna Valley High
Tanks, heating oil, nonresidential (underground)	T16	T16-1	A	Low	2	MSBSD Susitna Valley High
Gasoline stations (without repair shop)	C15	C15-1	B	High	2	Mile 99 Parks Hwy
Tanks, diesel (above ground)	T06	T06-2	B	Medium	2	
Tanks, diesel (underground)	T08	T08-1	B	High	2	
Tanks, gasoline (above ground)	T10	T10-1	B	Medium	2	
Tanks, gasoline (above ground)	T10	T10-2	B	Medium	2	
Tanks, gasoline (underground)	T12	T12-1	B	High	2	
Tanks, gasoline (underground)	T12	T12-2	B	High	2	
Campgrounds and RV Parks	X35	X35-1	B	Low	2	Parks and Helena Ave

Table 5

Contaminant Source Inventory and Risk Ranking for MSBSD Susitna Valley High

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 221012.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	Parks Hwy
Tanks, heating oil, nonresidential (underground)	T16	T16-1	A	Low	2	MSBSD Susitna Valley High
Gasoline stations (without repair shop)	C15	C15-1	B	Low	2	Mile 99 Parks Hwy
Tanks, gasoline (above ground)	T10	T10-1	B	Medium	2	
Tanks, gasoline (above ground)	T10	T10-2	B	Medium	2	
Tanks, gasoline (underground)	T12	T12-1	B	Medium	2	
Tanks, gasoline (underground)	T12	T12-2	B	Medium	2	

Table 6

Contaminant Source Inventory and Risk Ranking for MSBSD Susitna Valley High Sources of Other Organic Chemicals

PWSID 221012.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Highways and roads, paved (cement or asphalt)	X20		A	Low	2	Parks Hwy
Gasoline stations (without repair shop)	C15	C15-1	B	Low	2	Mile 99 Parks Hwy

APPENDIX C

Susitna Valley High School
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

DORIS
SUNSHINE
T12-1
T12-2
T08-1
T10-1
T10-2
T06-2
ODIN
C15-1
X35-1
TALKEETNA
BILLINGS
KALISPELL
PARKS
ANACONDA
MSBSD Susitna Valley High School well
D17-1
BOZEMAN
MISSOULA
T06-1
T16-1
Area enlarged at left

Map 2: MSBSD Susitna Valley High School Potential Contaminant Sources

PWSID: 221012

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 200 400 800 Feet

1:4,800

Data Sources:

Background image
Parcels, roads - MatSu Borough

Legend

- C15, Gasoline station
- D17, Vaulted pit toilet
- T06, Aboveground diesel tank
- T08, Underground diesel tank
- T10, Aboveground gasoline tank
- T12, Underground gasoline tank
- T16, Underground heating oil tank
- X35, Campground/RV Park
- Parcels
- Roads

N W E S

0 1 2 Miles

December 22, 2003

APPENDIX D

Vulnerability Analysis for Susitna Valley High School Public Drinking Water Source

(Charts 1-14)

Chart 1. Susceptibility of the wellhead - MSBSD Susitna Valley High

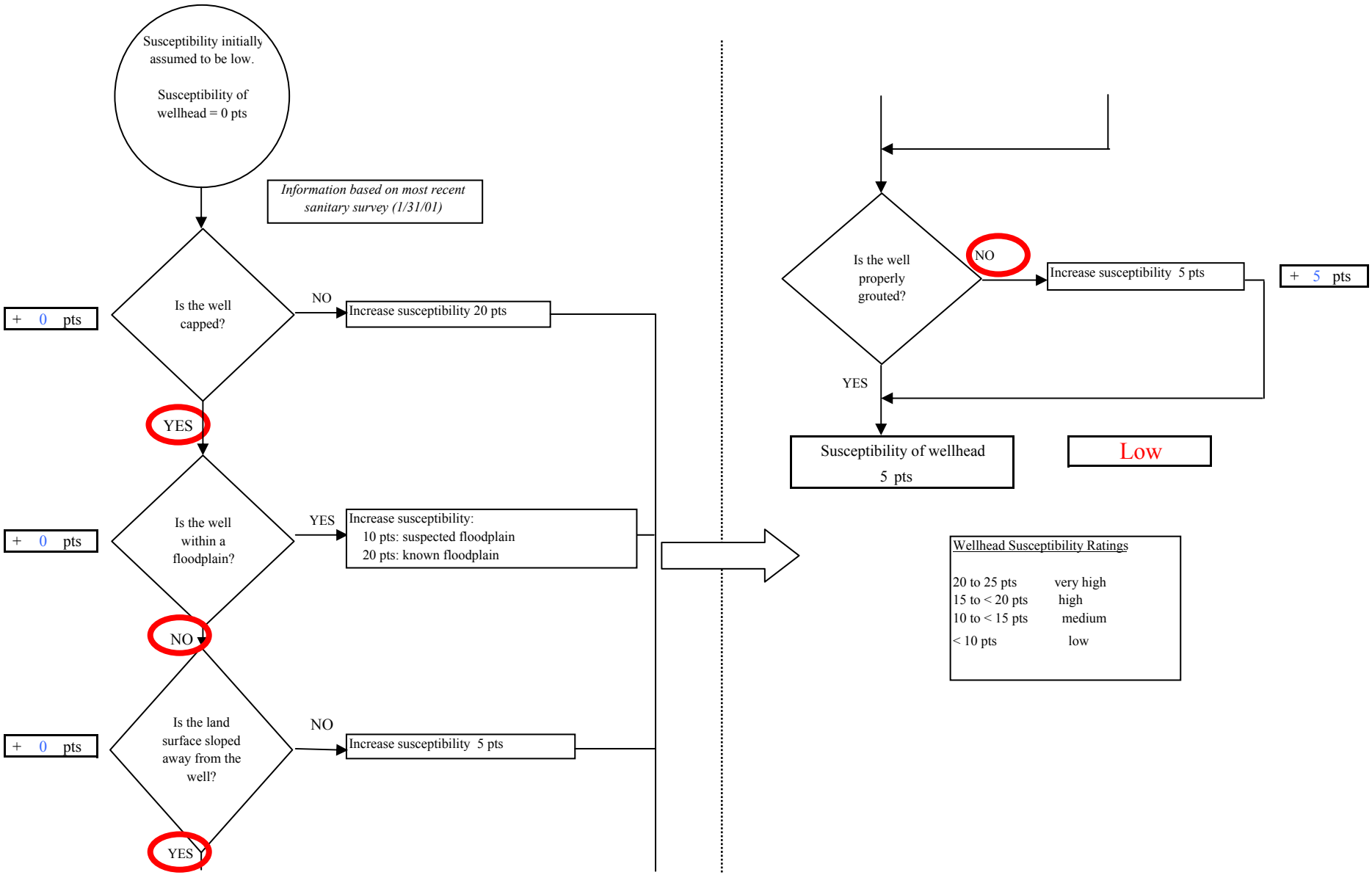


Chart 2. Susceptibility of the aquifer - MSBSD Susitna Valley High

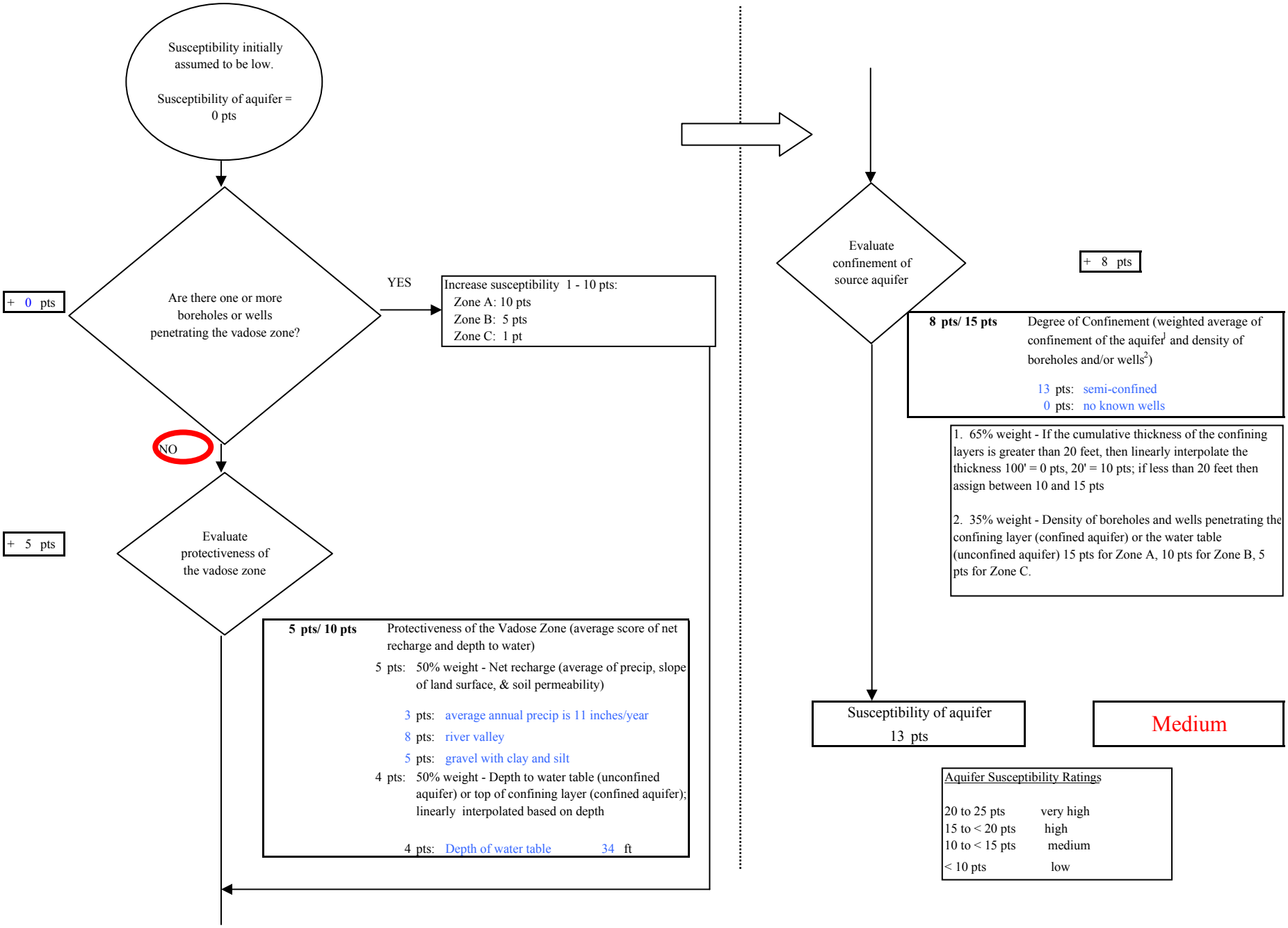
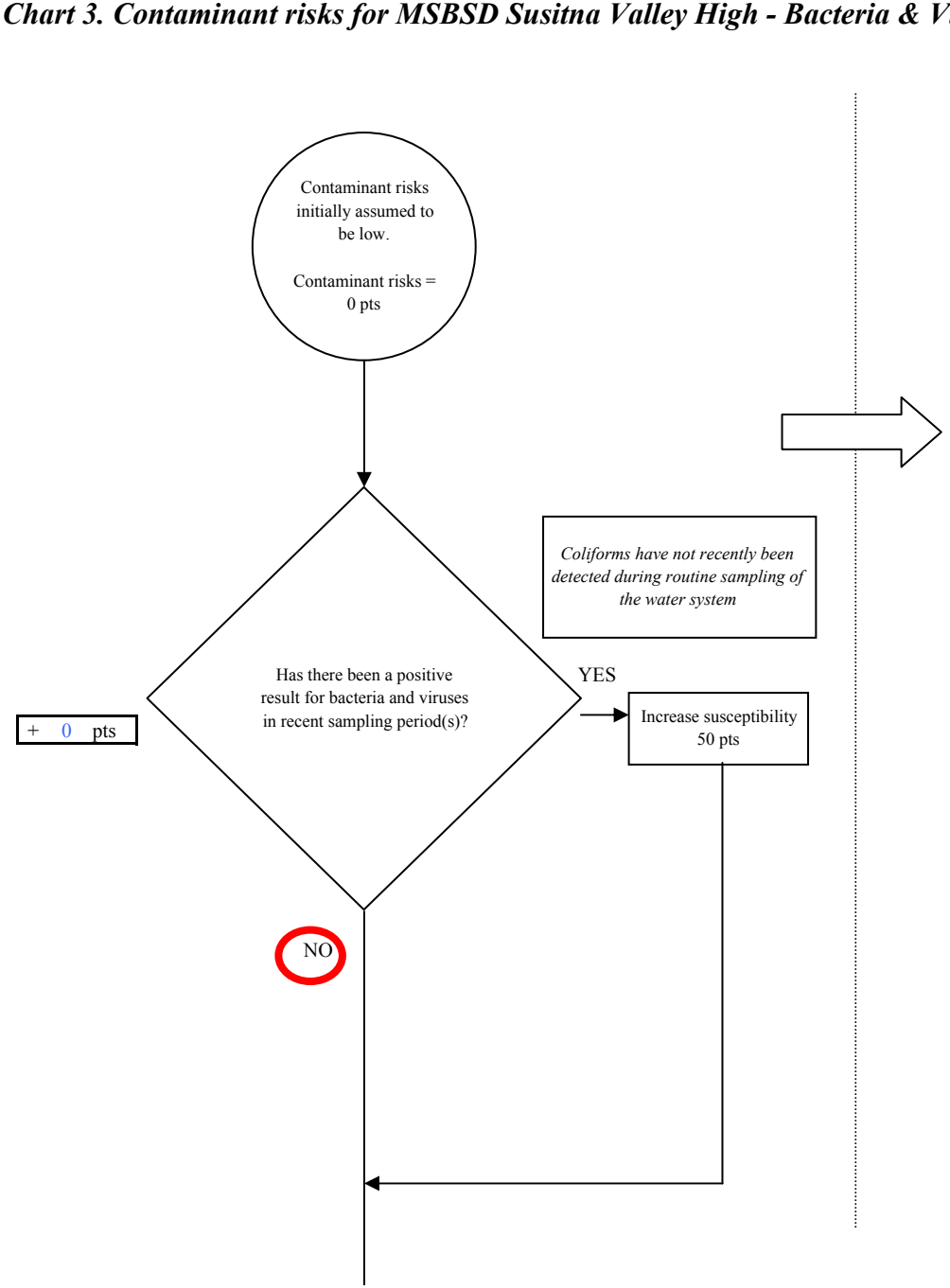
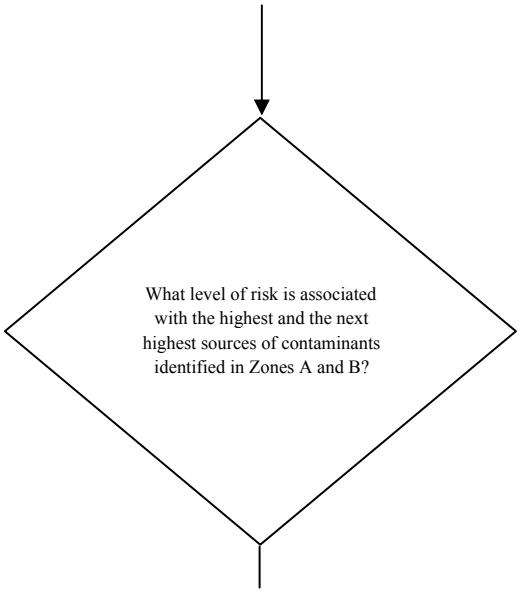


Chart 3. Contaminant risks for MSBSD Susitna Valley High - Bacteria & Viruses





+ 10 pts

Risk Rankings for Contaminant Sources Identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	1	3

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

Matrix Score 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 3. Contaminant risks for MSBSD Susitna Valley High - Bacteria & Viruses

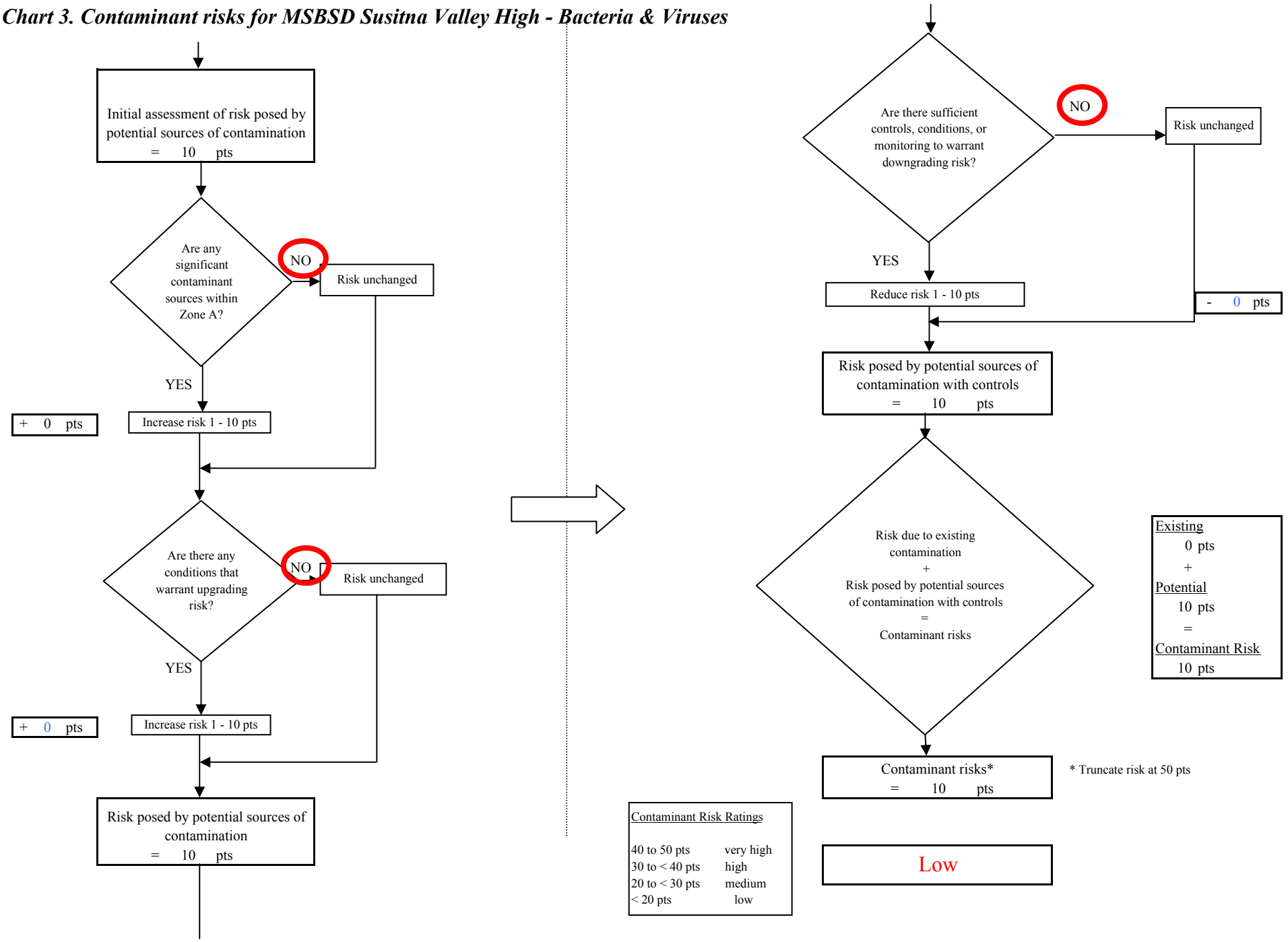


Chart 4. Vulnerability analysis for MSBSD Susitna Valley High - Bacteria & Viruses

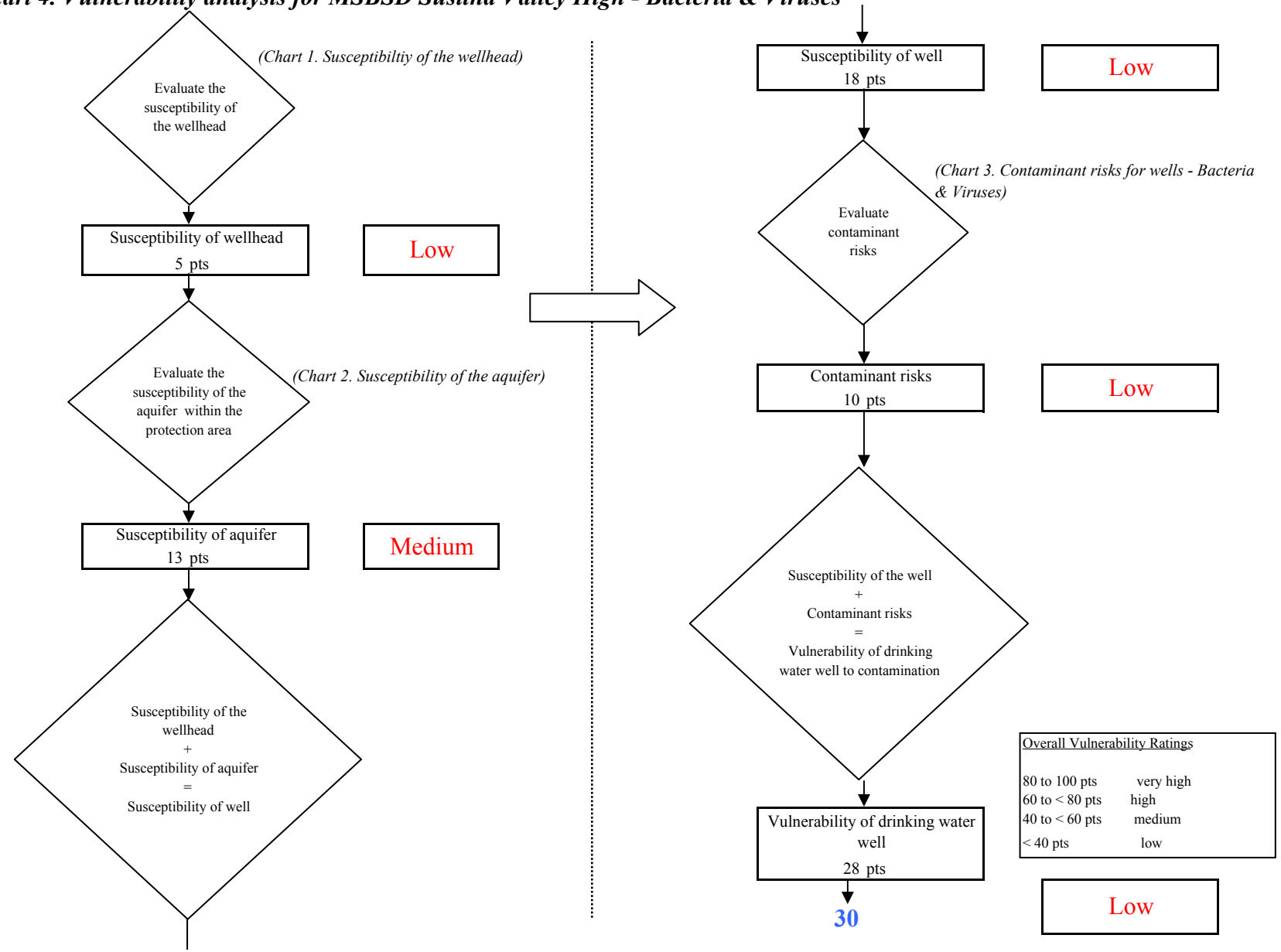


Chart 5. Contaminant risks for MSBSD Susitna Valley High - Nitrates and Nitrites

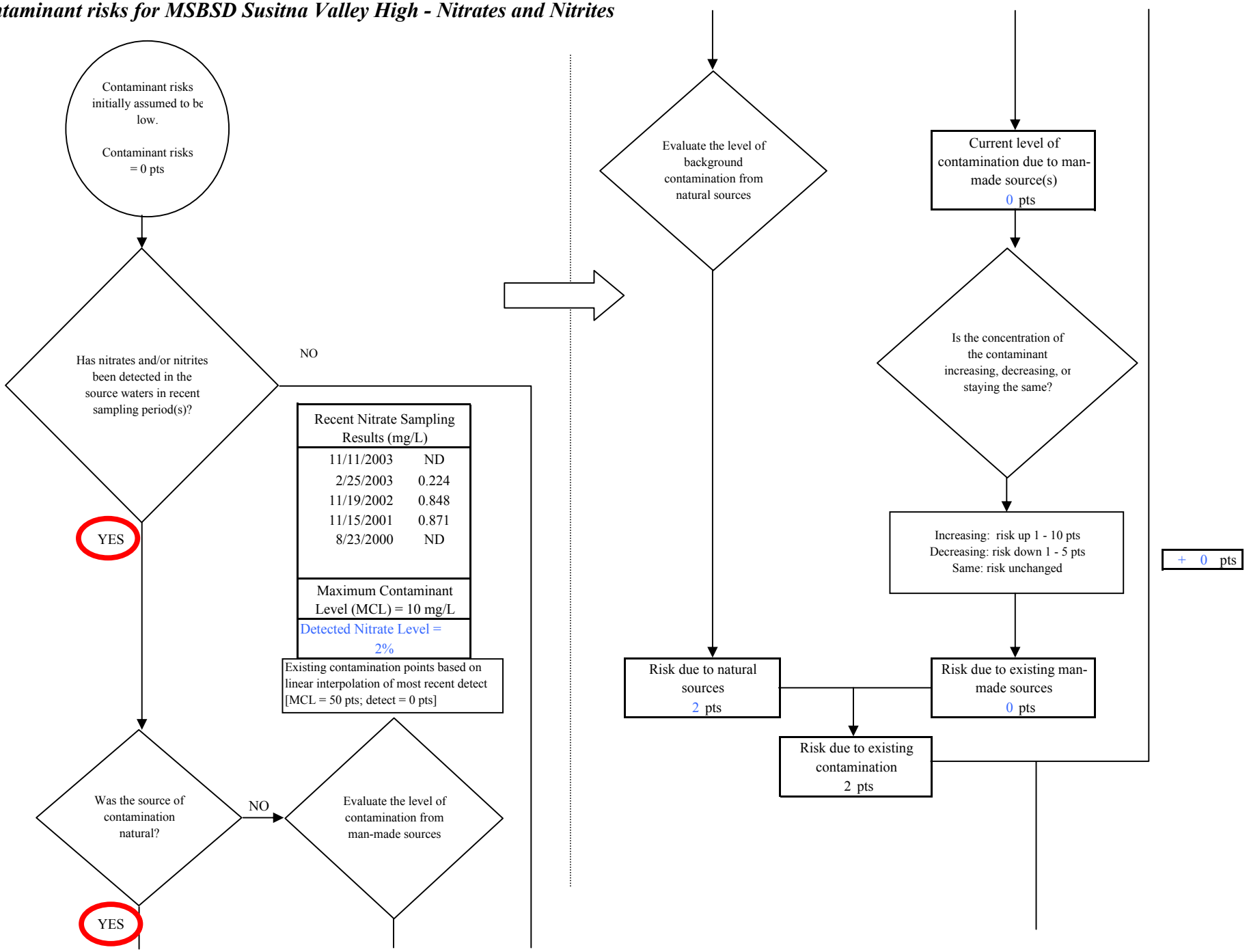


Chart 5. Contaminant risks for MSBSD Susitna Valley High - Nitrates and Nitrites

+ 10 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)	0	0	0
Low(s)	2	1	3

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

Matrix Score 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.

Initial assessment of risk posed by potential sources of contamination = 10 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

+ 0 pts

Chart 5. Contaminant risks for MSBSD Susitna Valley High - Nitrates and Nitrites

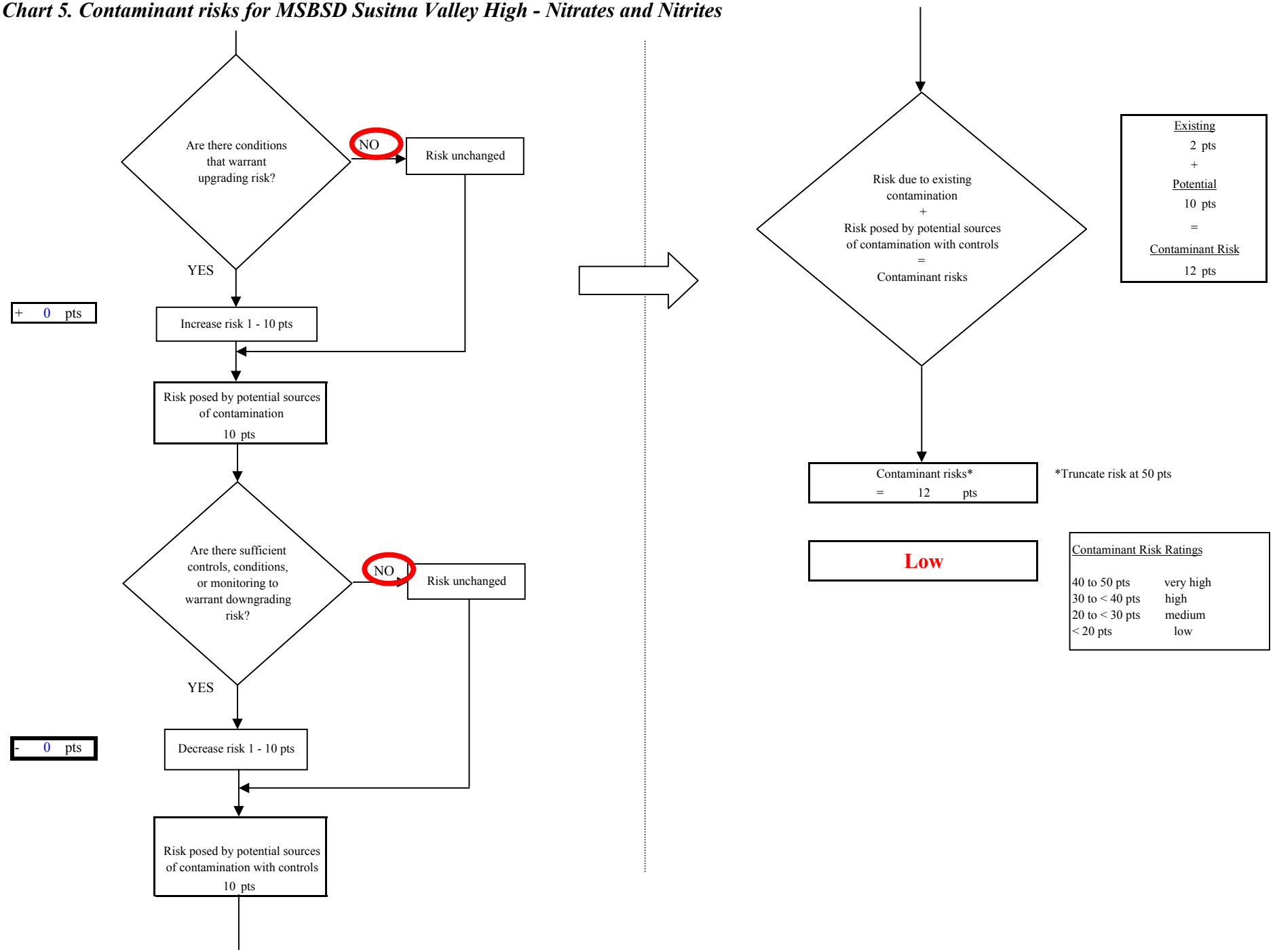


Chart 6. Vulnerability analysis for MSBSD Susitna Valley High - Nitrates and Nitrites

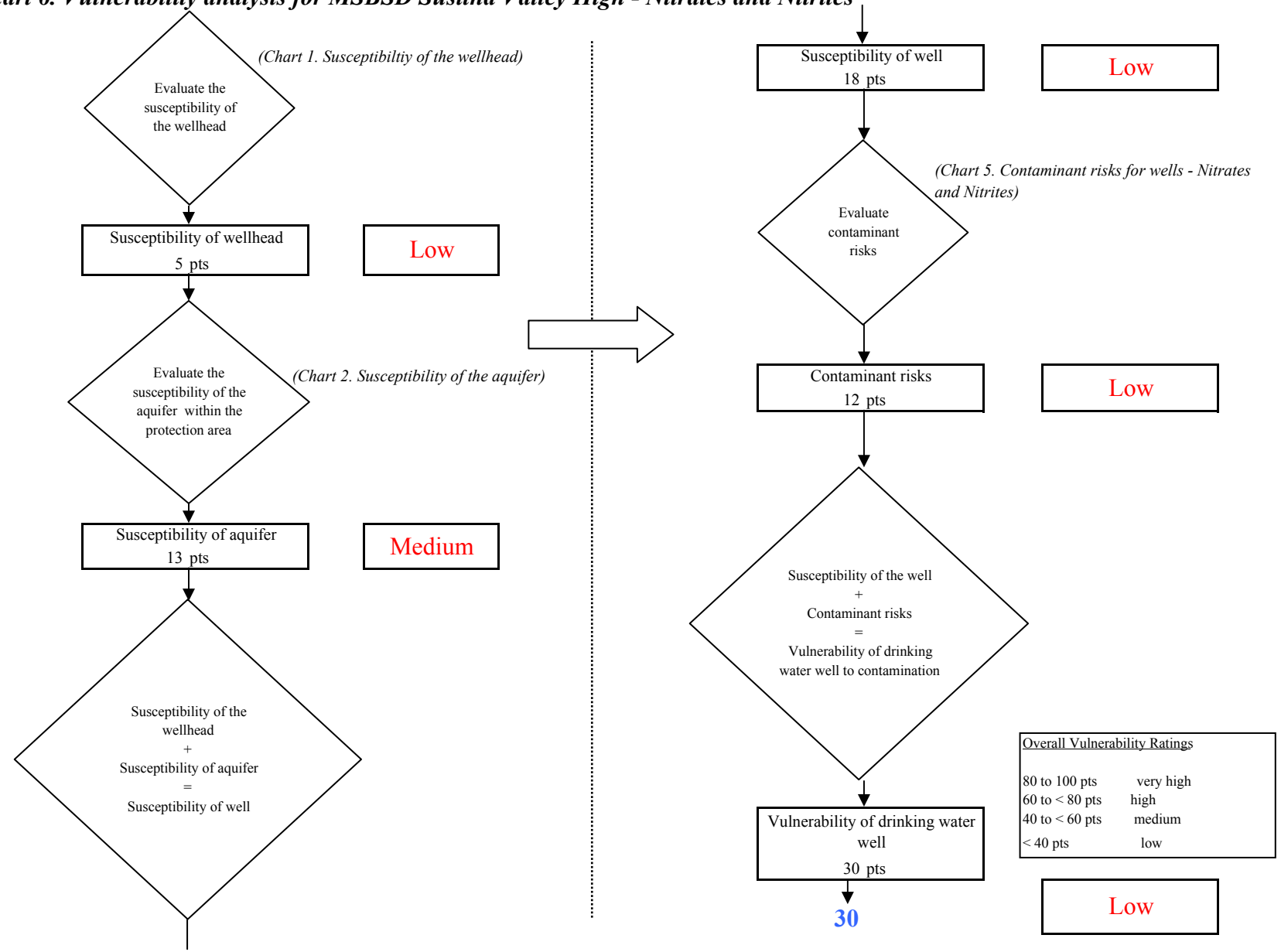


Chart 7. Contaminant risks for MSBSD Susitna Valley High - Volatile Organic Chemicals

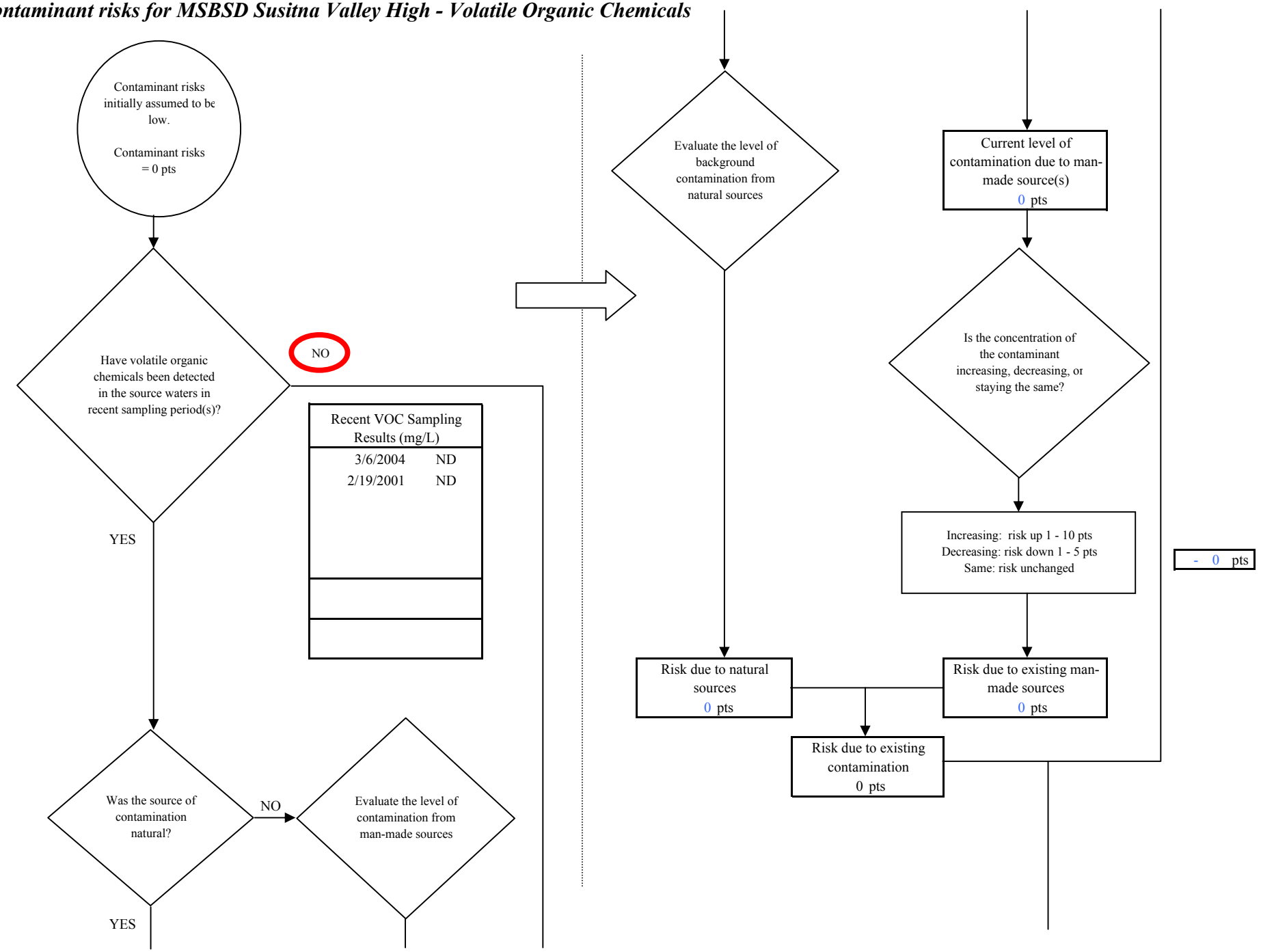


Chart 7. Contaminant risks for MSBSD Susitna Valley High - Volatile Organic Chemicals

+ 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)	0	4	4
Medium(s)	1	3	4
Low(s)	2	1	3

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

Matrix Score 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.

Initial assessment of risk posed by 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

+ 0 pts

Chart 7. Contaminant risks for MSBSD Susitna Valley High - Volatile Organic Chemicals

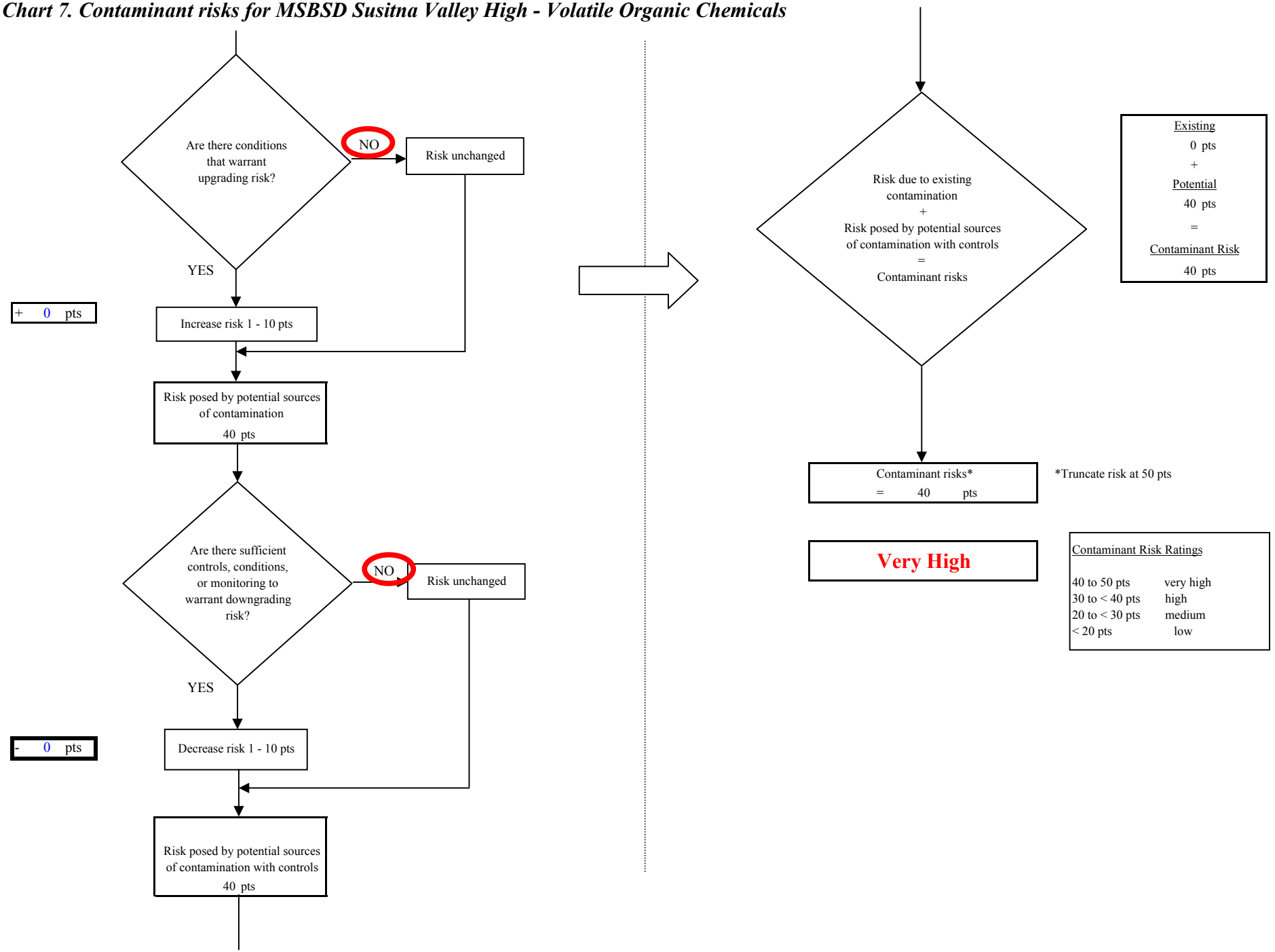


Chart 8. Vulnerability analysis for MSBSD Susitna Valley High - Volatile Organic Chemicals

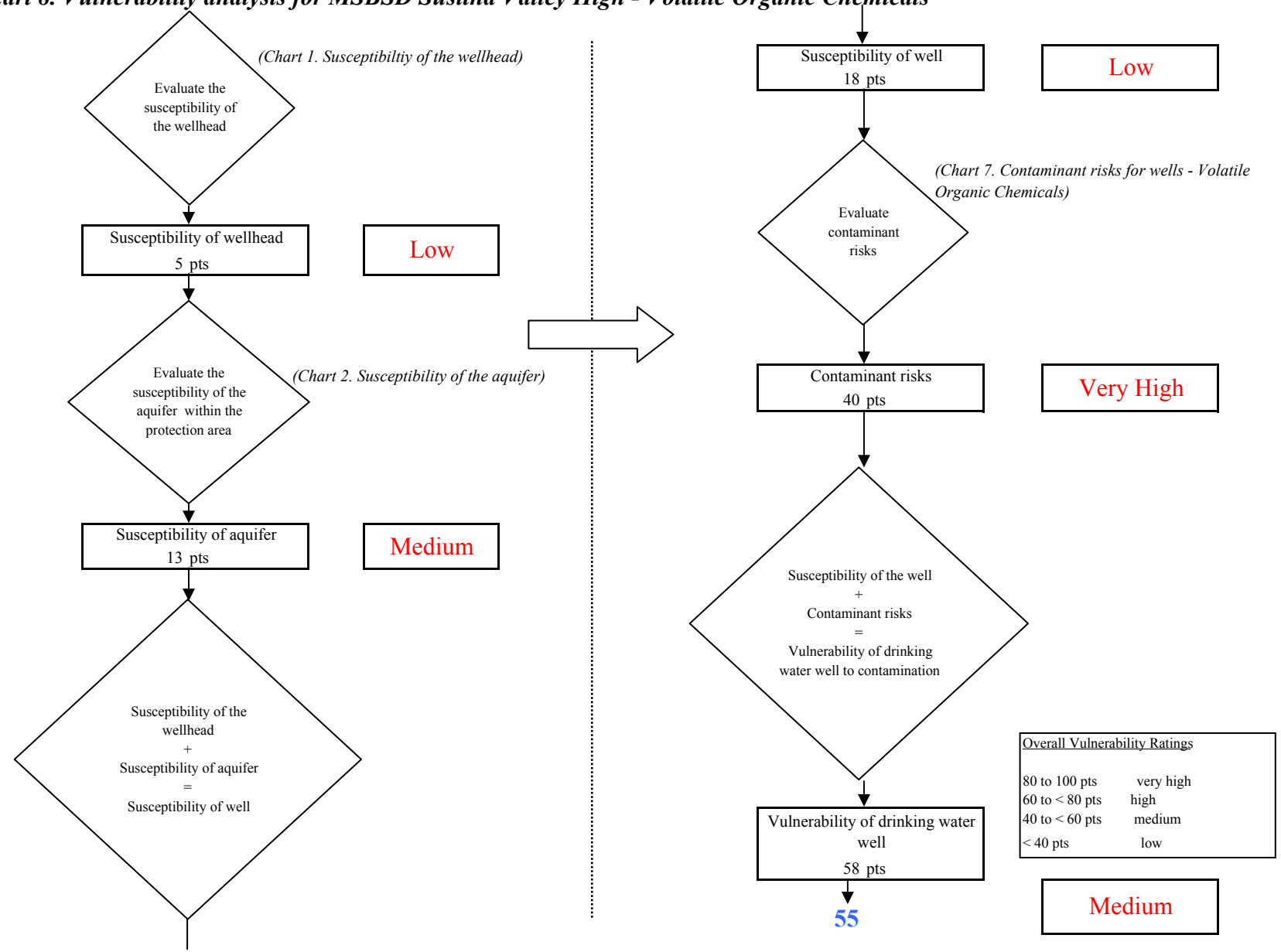


Chart 9. Contaminant risks for MSBSD Susitna Valley High - Heavy Metals, Cyanide and Other Inorganic Chemicals

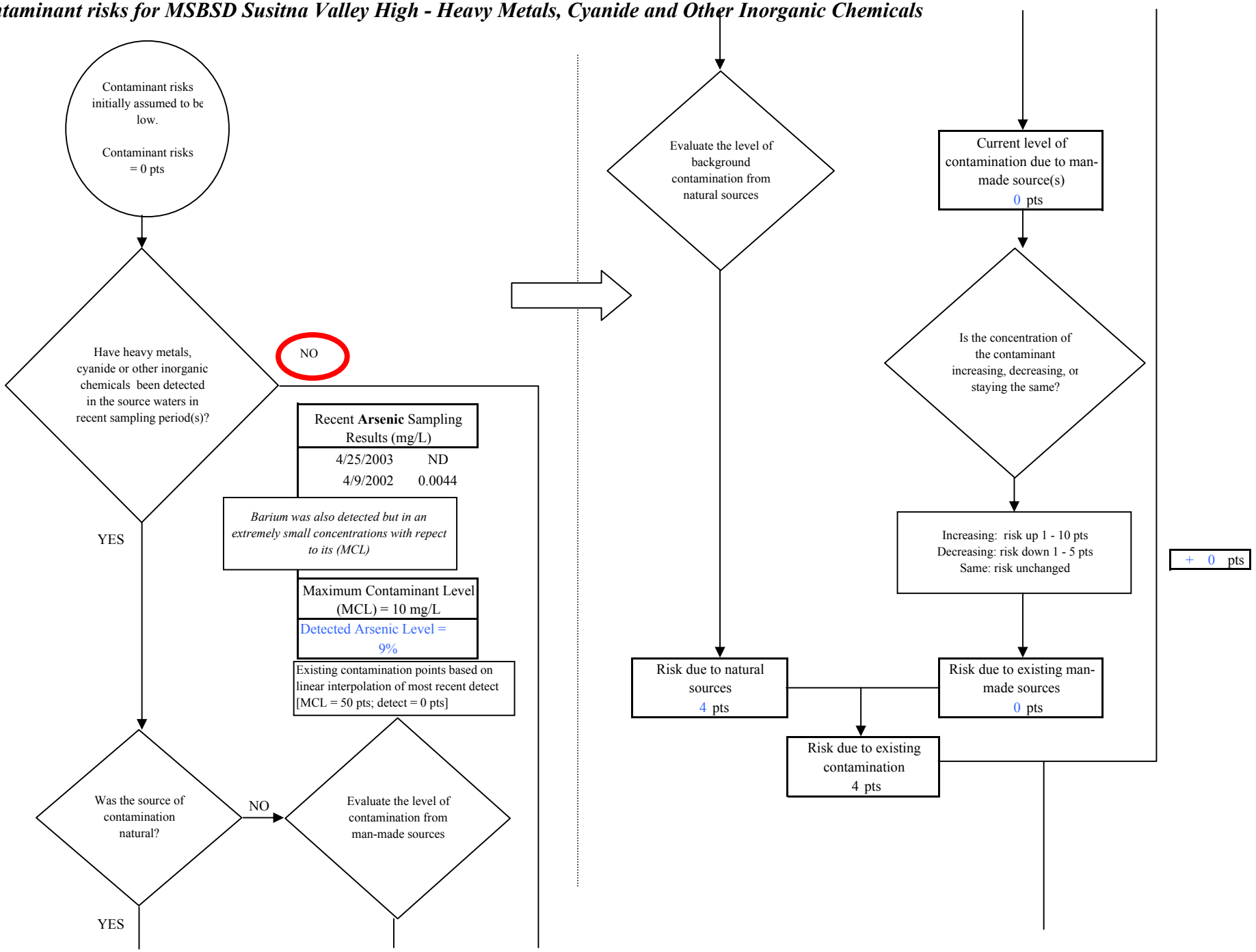


Chart 9. Contaminant risks for MSBSD Susitna Valley High - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 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)	0	4	4
Low(s)	2	1	3

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

Matrix Score 25

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

Initial assessment of risk posed by 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

+ 0 pts

Chart 9. Contaminant risks for MSBSD Susitna Valley High - Heavy Metals, Cyanide and Other Inorganic Chemicals

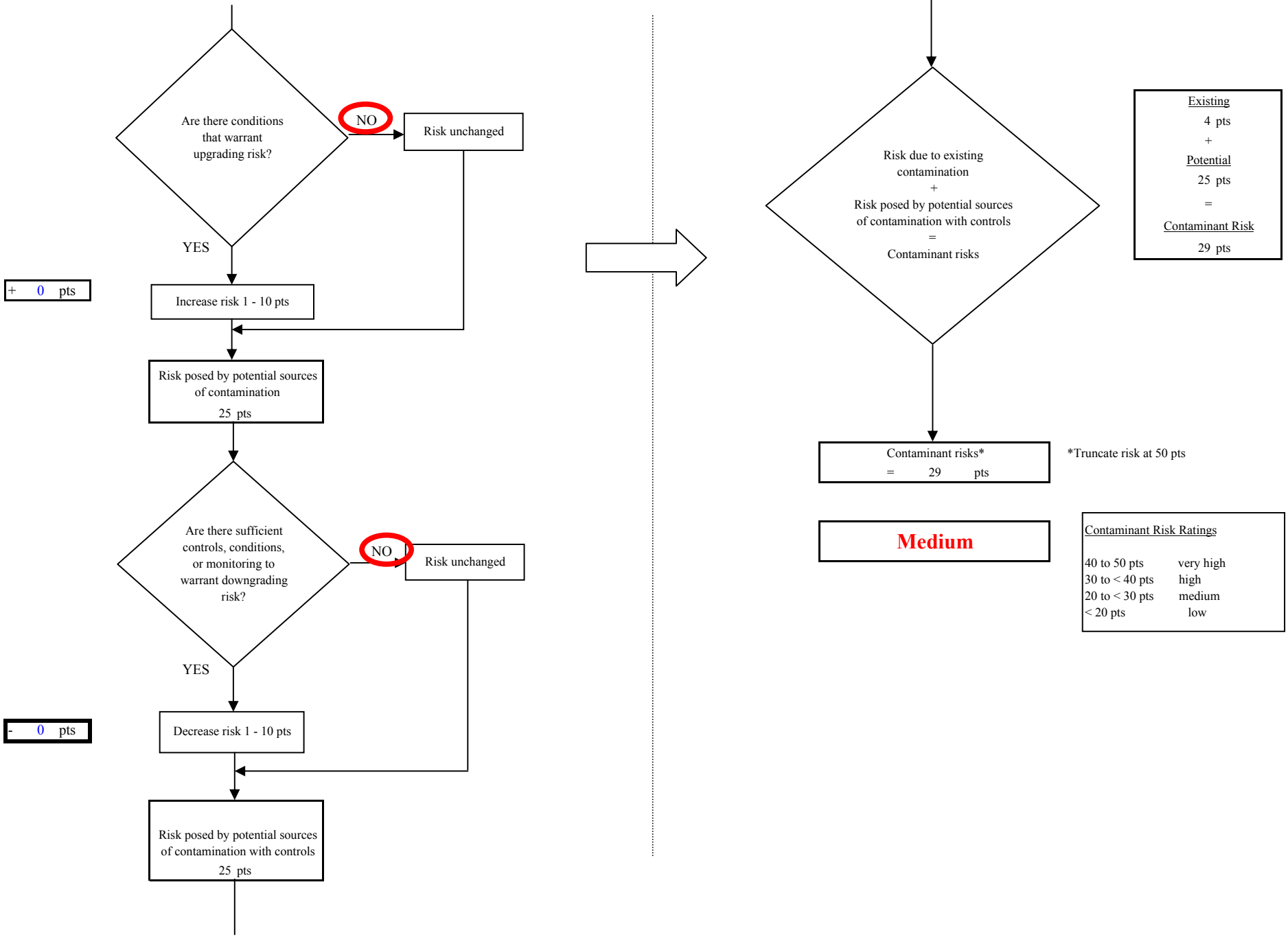


Chart 10. Vulnerability analysis for MSBSD Susitna Valley High - Heavy Metals, Cyanide and Other Inorganic Chemicals

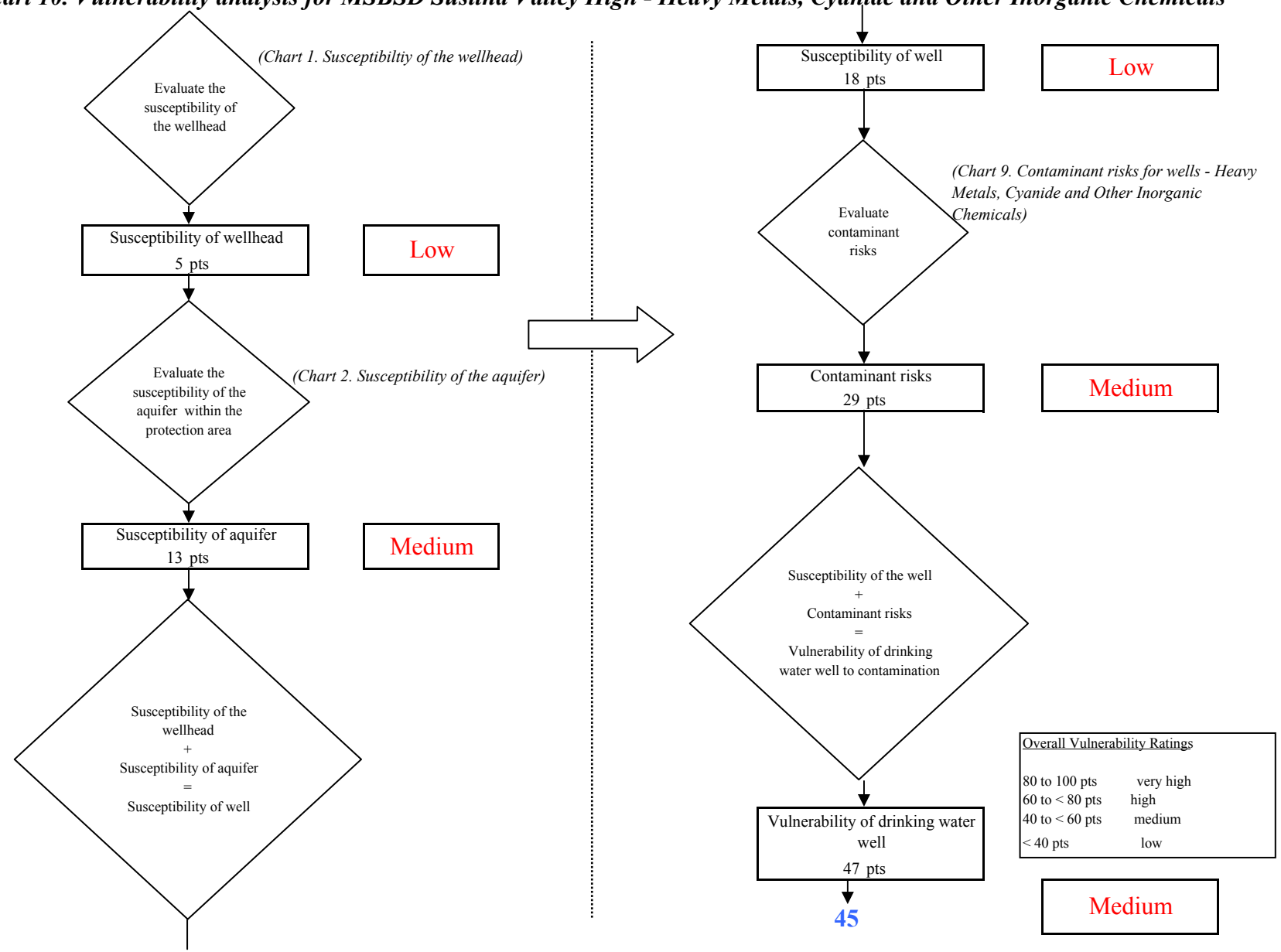


Chart 11. Contaminant risks for MSBSD Susitna Valley High - Synthetic Organic Chemicals

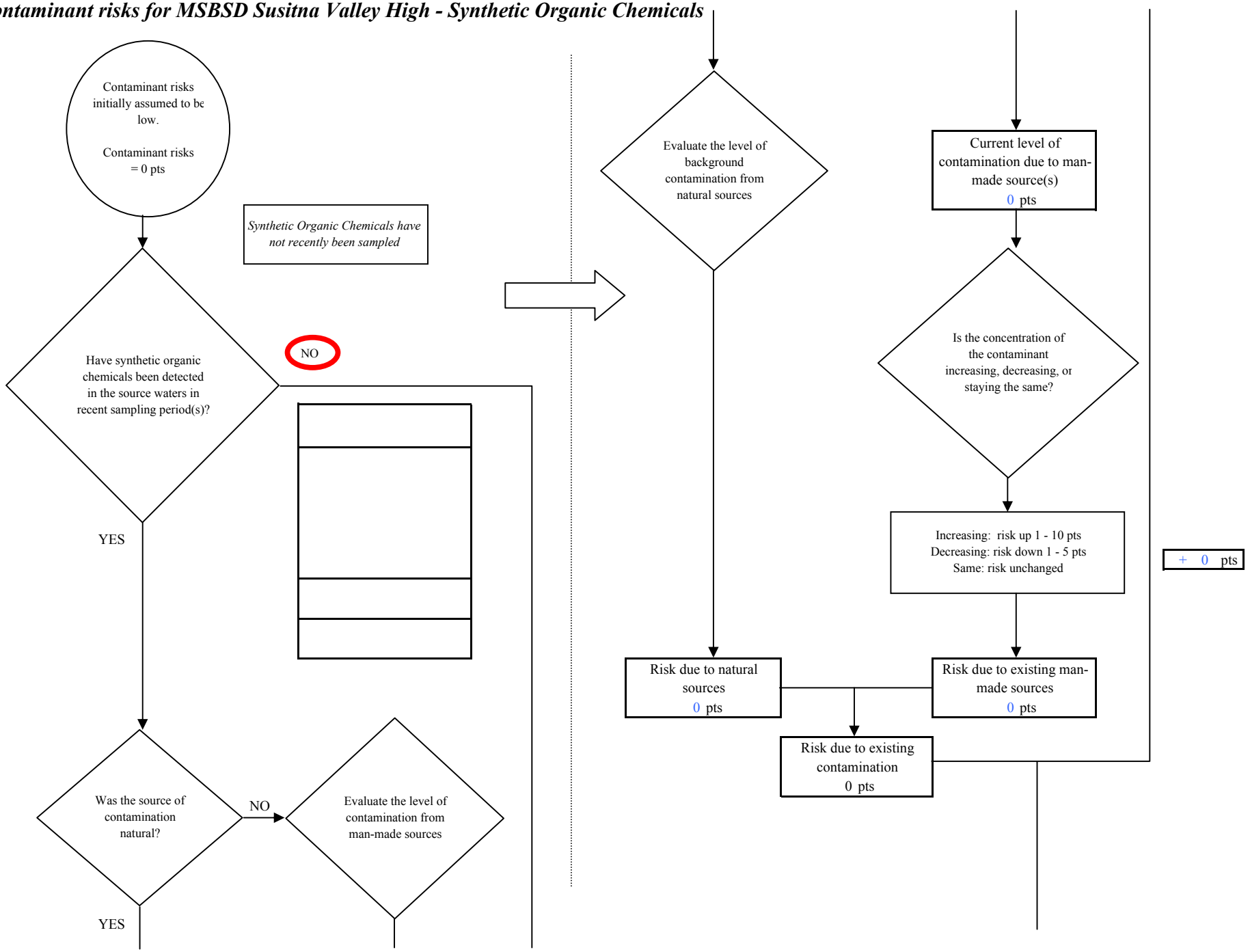


Chart 11. Contaminant risks for MSBSD Susitna Valley High - Synthetic Organic Chemicals

+ 0 pts

What level of risk is associated with the highest and the next highest risk sources(s) of contaminants identified in Zones A, 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)	0	0	0
Low(s)	0	0	0

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

Matrix Score 0

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

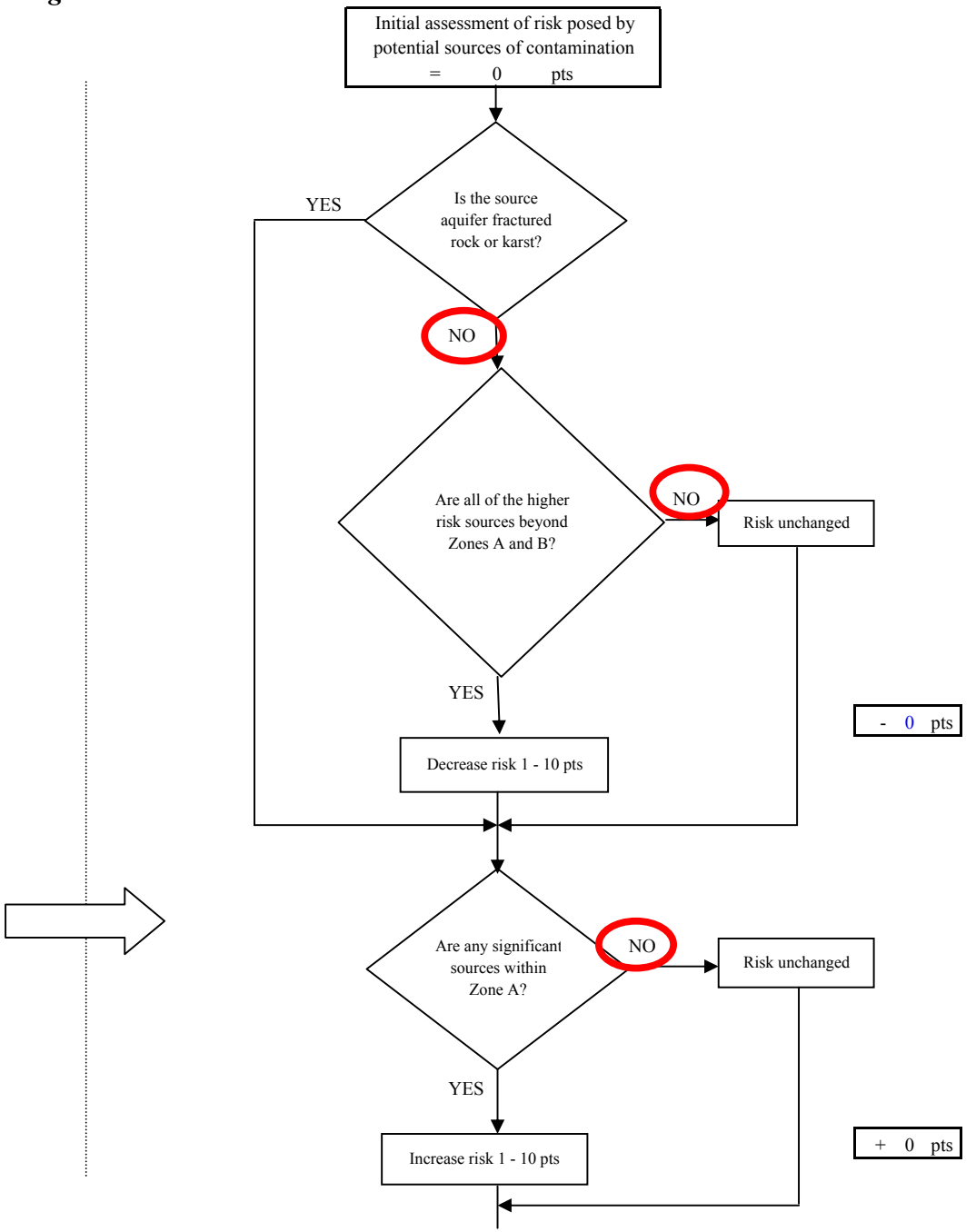


Chart 11. Contaminant risks for MSBSD Susitna Valley High - Synthetic Organic Chemicals

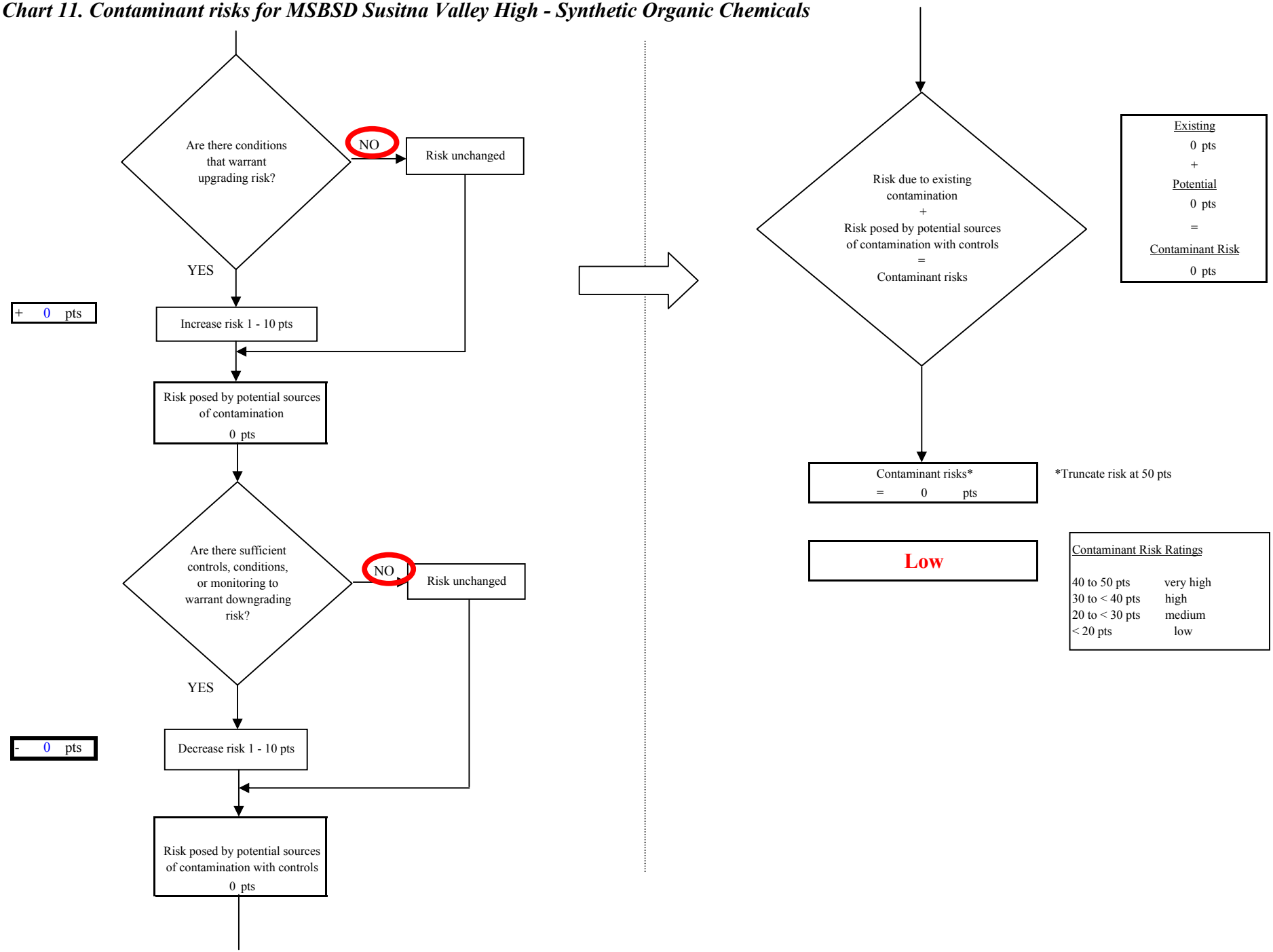


Chart 12. Vulnerability analysis for MSBSD Susitna Valley High - Synthetic Organic Chemicals

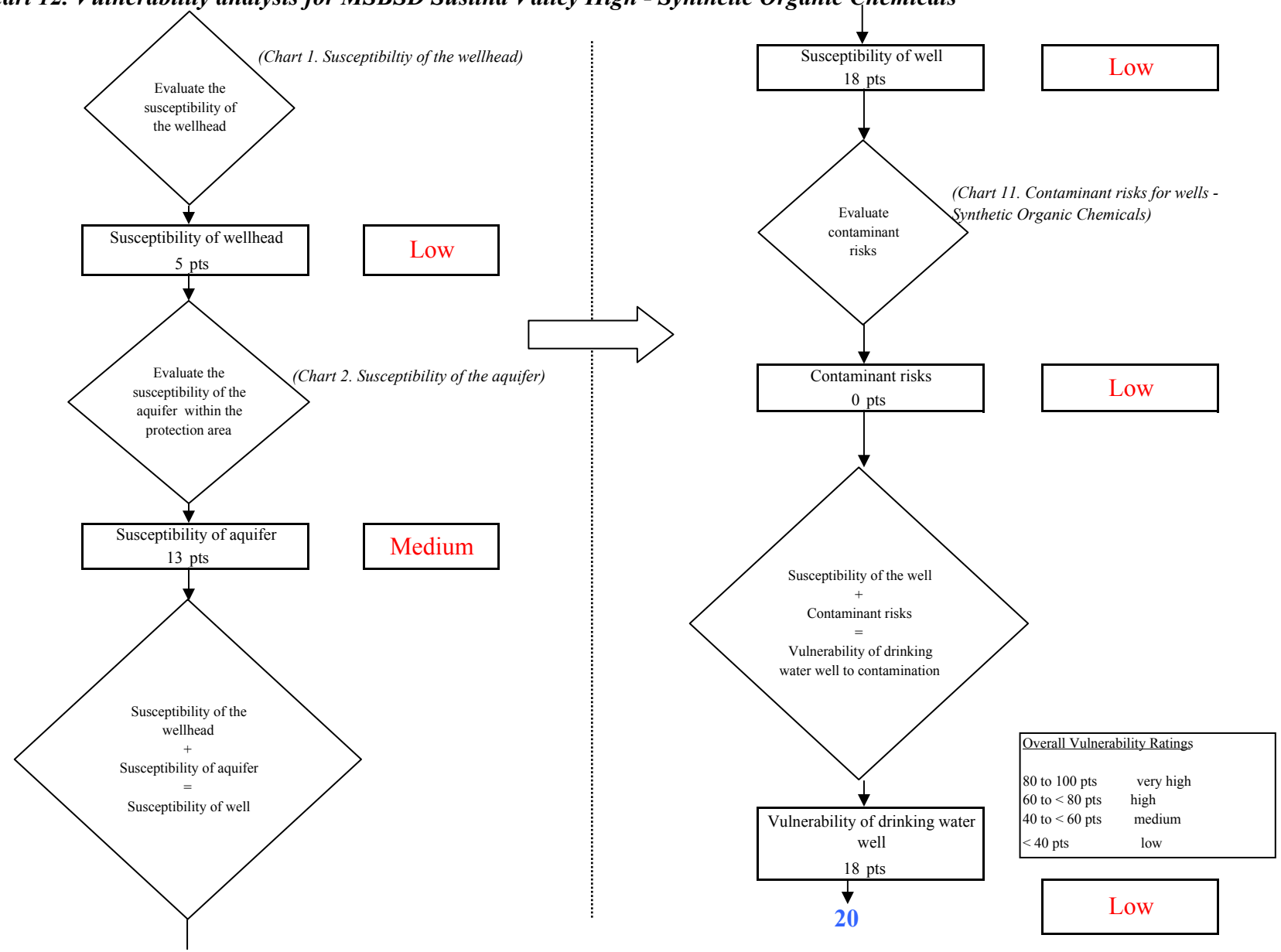


Chart 13. Contaminant risks for MSBSD Susitna Valley High - Other Organic Chemicals

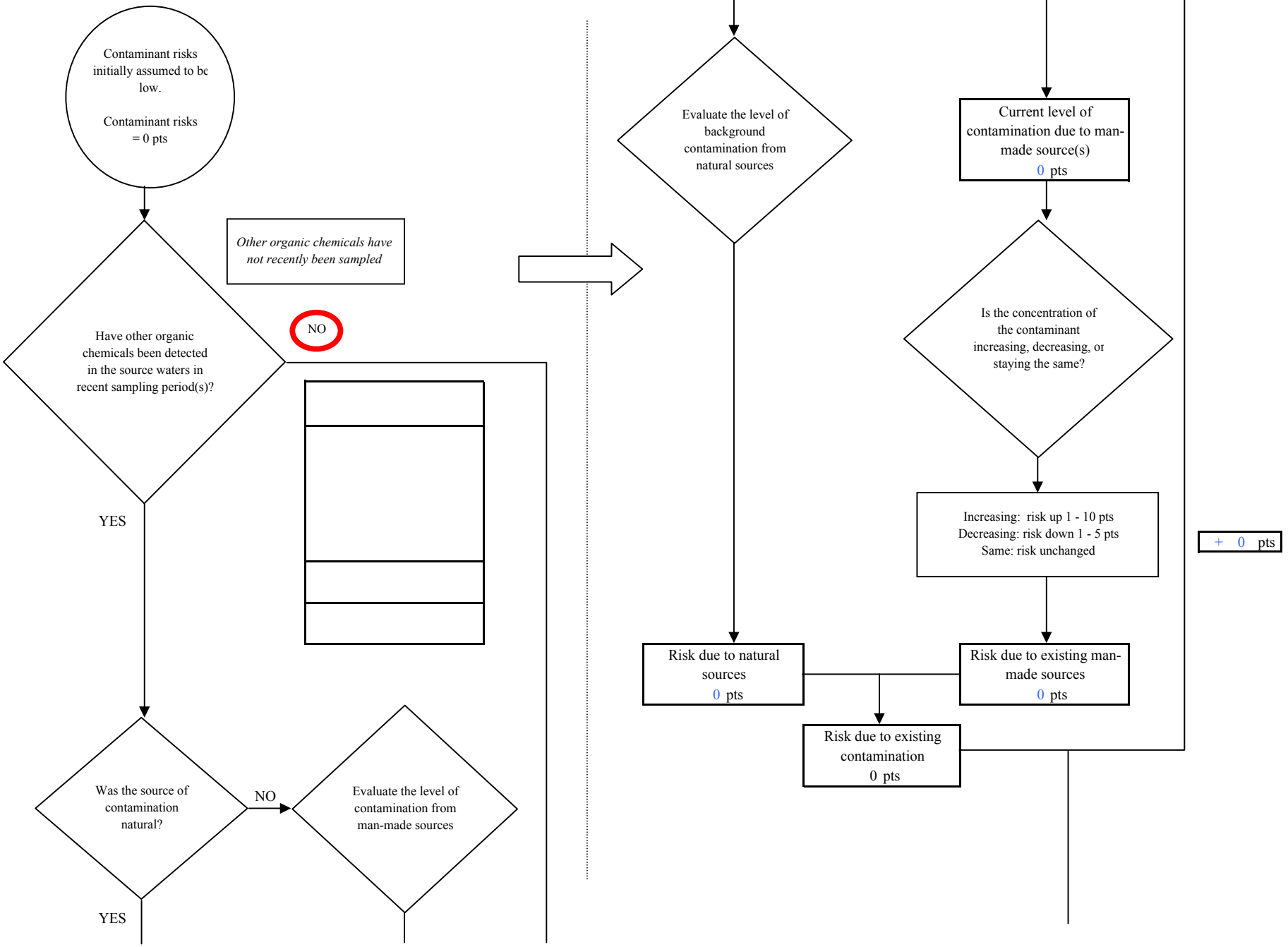


Chart 13. Contaminant risks for MSBSD Susitna Valley High - Other Organic Chemicals

+ 10 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)	0	0	0
Low(s)	1	1	2

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

Matrix Score 10

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

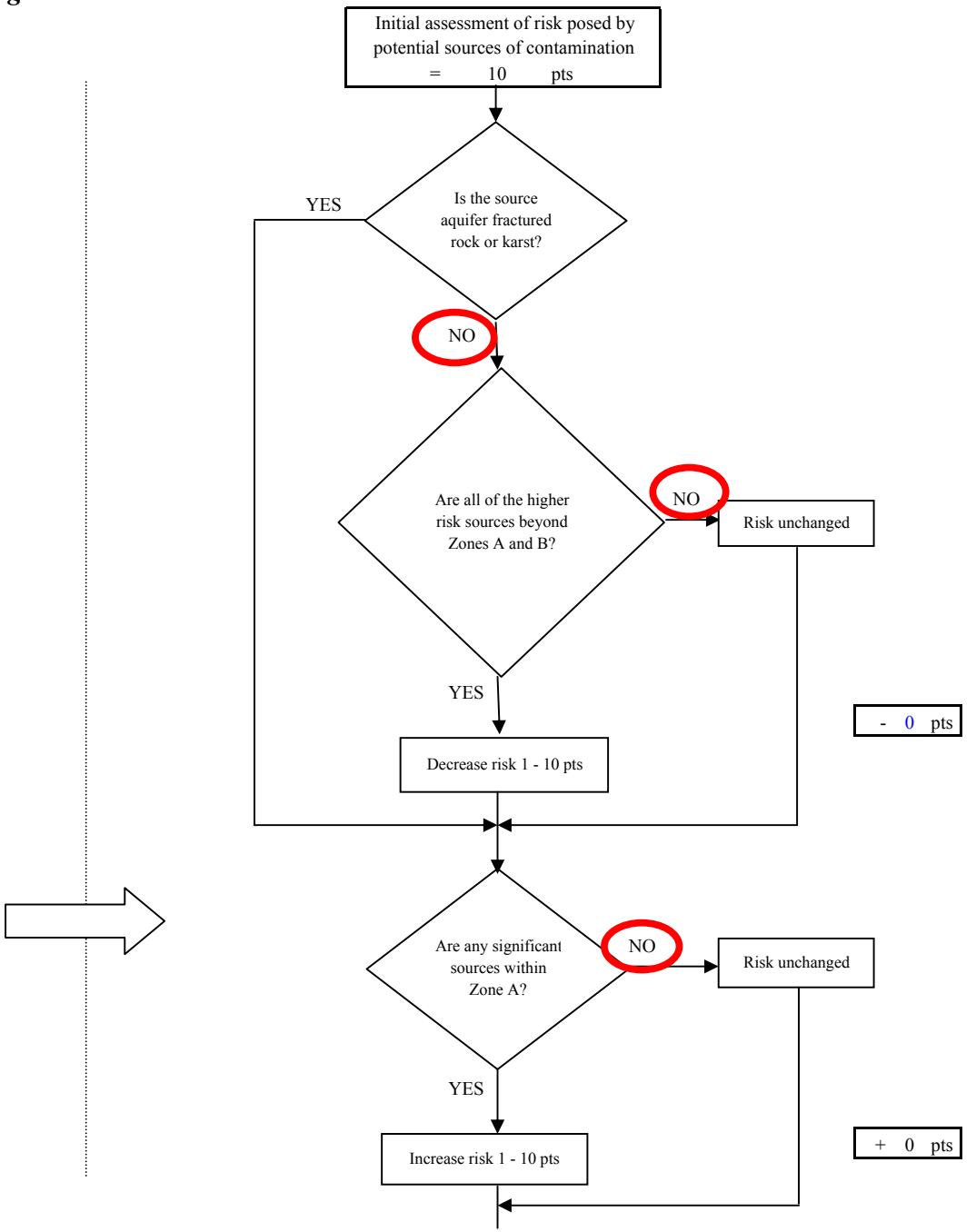


Chart 13. Contaminant risks for MSBSD Susitna Valley High - Other Organic Chemicals

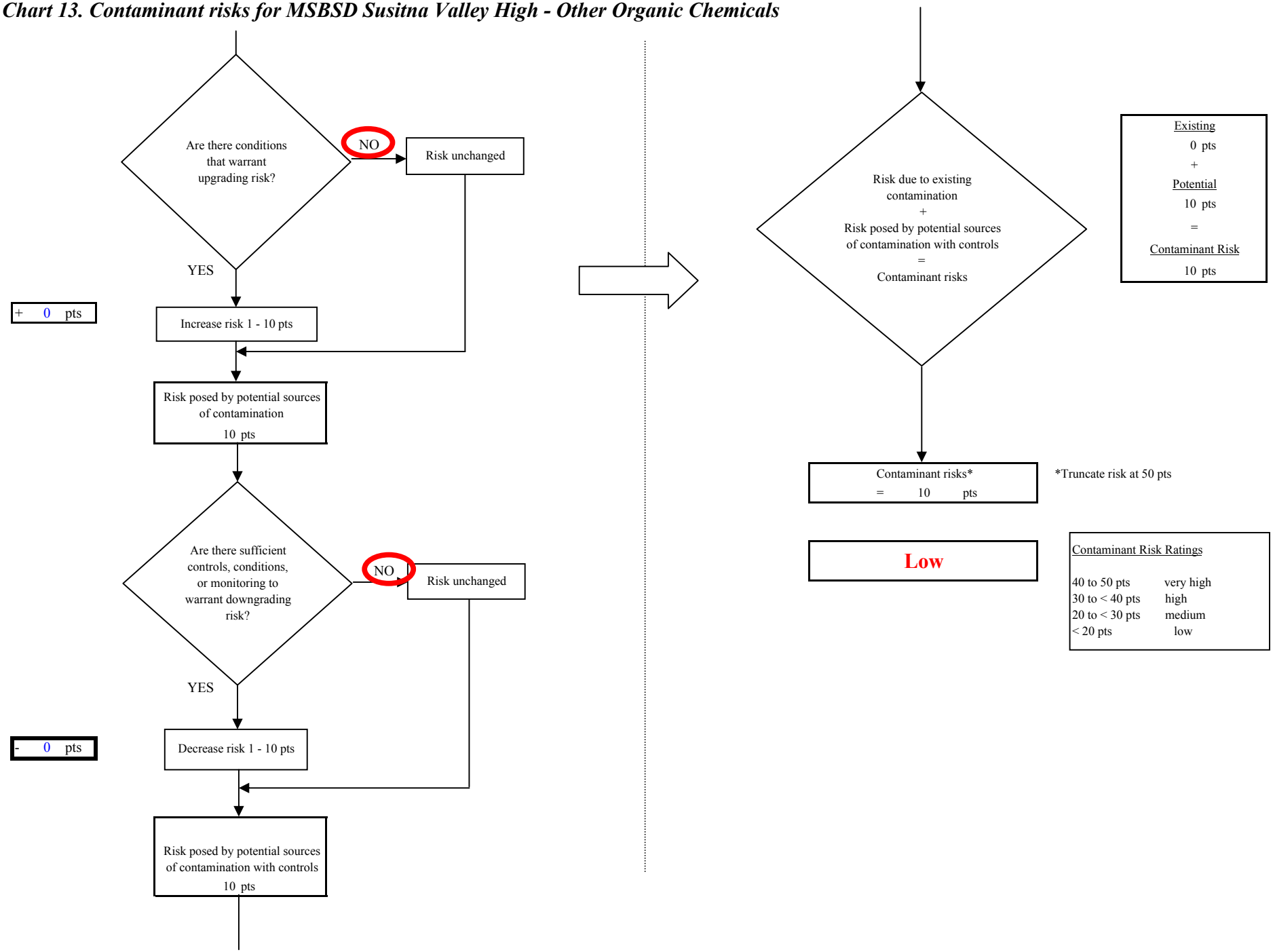


Chart 14. Vulnerability analysis for MSBSD Susitna Valley High - Other Organic Chemicals