Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Spenard Builders Supply Drinking Water System,
Fairbanks, Alaska
PWSID 311744

September 2003

DRINKING WATER PROTECTION PROGRAM REPORT Report 1234
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 Spenard Builders Supply Source of Public Drinking Water, Fairbanks Area, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

This source water assessment provides an evaluation of the vulnerability of the public water system serving the Spenard Builders Supply to potential contamination. This Class B (non-community) water system consists of one well on Phillips Field Road near its intersection with Peger Road close to downtown Fairbanks, Alaska. The well received a natural susceptibility rating of **Medium** This rating is a combination of a susceptibility rating of **Low** for the actual wellhead and a **Very High** rating for the aquifer in which the well is drawing water from. Identified potential and current sources of contamination for the Spenard Builders Supply public water system include: construction trade areas, gasoline stations, hardware stores, plastics manufacturing, fuel storage tanks, DEC-recognized contaminated sites, Leaking Underground Storage Tank sites, rail corridors, motor supply stores, vehicle maintenance facilities, and medical/veterinary facilities. These are considered as sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Combining the natural susceptibility of the well with the contaminant risk, the public water system for Spenard Builders Supply received an overall vulnerability rating of **Low** for bacteria and viruses, **Medium** for nitrates and/or nitrites; and **High** for volatile organic chemicals.

SPENARD BUILDERS SUPPLY PUBLIC DRINKING WATER SYSTEM

Spenard Builders Supply public water system is a Class B (non-community) water system. The system consists of one well on Phillips Field Road near its intersection with Peger Road close to downtown Fairbanks, Alaska (T1S, R1W, Section 9) (See Map 1 of Appendix A). Fairbanks is located in the Fairbanks North Star Borough which is near the center of Alaska (Please see the inset of Map 1 in Appendix A for location). The Borough's current population is 82,840 making it the second-largest population center in the state (ADCED, 2002). Communities located within the Borough include : College, Eielson Air Force Base, Ester, Fairbanks, Fox, Harding Lake, Moose Creek, North Pole, Pleasant Valley, Salcha, and Two Rivers.

City water, sewer and electricity for the city of Fairbanks are provided by Golden Valley Utilities. Some residents use residential septic systems. The majority of residents (approximately 70%) use heating oil (typically stored in both above and below ground 275 to 500-gallon tanks) to heat homes and buildings. Garbage collection services are proved by the city, and refuse is transported to the Fairbanks North Star Borough Class I Landfill on South Cushman Street.

The Fairbanks area includes two distinct topographic areas: the alluvial plain between the Tanana River and the Chena River, and the uplands north of this alluvial plain. The Spenard Builders Supply water system is located in the alluvial plain at an elevation of approximately 425 feet above sea level.

According to well log for this water system, the depth of the well is 78 feet below the ground surface and is screened in a combination of sand and gravel. The alluvial plain consists of alternating layers of silt, sand and gravel up to over 500 feet thick, in some locations overlain by 1 to 10 feet of silt or sandy silt or a few feet of peat (Glass and others, 1996). Discontinuous permafrost (perennially frozen areas) is also common in the alluvial plain. The depth to permafrost in these areas ranges between 2 and 45 feet below the ground surface with the thickness of the permafrost ranging between 5 and 265 feet (Pewe, T.L. 1958. Geology of the Fairbanks (D-2) Quadrangle, Alaska. USGS). Areas with discontinuous permafrost may locally affect the ground water flow directions.

Primarily the Tanana River, but also the Chena River contribute water to this alluvial aquifer. The Chena River typically only contributes water when its stage is high and the Tanana is low (Nelson, 1978). The Tanana River gets approximately 85% of its water from snowmelt of the Alaska Range and 15% from the Yukon-Tanana uplands (Anderson, 1970).

This system serves approximately 200 non-residents through two service connections.

SPENARD BUILDERS SUPPLY 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 well 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. The Drinking Water Protection Program (DWPP) 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 by the DWPP 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 various United State Geological Survey (USGS) reports, well logs in the area, and the Groundwater textbook by Freeze and Cherry (Freeze and Cherry, 1979).

The water table in the area of the Spenard Builders Supply, the area between the Tanana and the Chena Rivers, is primarily influenced by the level of water flow in each river. The capture zones were drawn based on three separate configurations of the water table during various stages of the rivers: a period of high stage in the Chena River (October 14-17, 1986), high stage in the Tanana River (July 16-17, 1987), and low stages in both rivers (March 30-April 3, 1988) (Glass and others, 1996). High water levels in the Chena usually occur in the spring due to runoff from the uplands and in late summer due to rainstorms (Nelson, 1978). The Tanana usually experiences high flow during the hot, dry periods of mid-summer when maximum snowmelt from the Alaska Range occurs (Nelson, 1978). Groundwater in this area generally flows toward the northwest, from the Tanana River to the Chena River, however flow is reversed very near the Chena River during its high stage periods (Glass and others, 1996). These flow reversals are of short duration (i.e. days versus months) and of limited extent, generally within 1000 feet of the river (Nakanishi, et all, 1998).

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 Spenard Builders Supply 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 Spenard Builders Supply 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 B public water system assessments, three categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites;
- Volatile organic 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 4 in Appendix B contain the ranking of inventoried potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals.

VULNERABILITY OF SPENARD BUILDERS SUPPLY 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 eight 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 8 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile 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 Spenard Builders Supply received a Low Susceptibility rating. The 10/12/99 Sanitary Survey indicated the well is capped with a sanitary seal, the land surface is sloped away from the well providing adequate drainage, and the well is grouted. A sanitary seal prevents potential contaminant 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 in the area the Spenard Builders Supply well is completed in received a High Susceptibility rating. The highly transmissive aquifer material and the high water table in the area allow contaminants to quickly travel downward from the surface with the precipitation and surface water runoff. Private wells in the protection area can also provide a quick path to the aquifer if they are not grouted properly. Table 2 summarizes the Susceptibility scores and ratings for Spenard Builders Supply.

Table 2. Susceptibility

	Score	**Rating**
Susceptibility of the Wellhead	0	Low
Susceptibility of the Aquifer	20	Very High
Natural Susceptibility	20	Medium

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	30	High
Volatile 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 three 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 Nitrites	50	Medium
Volatile Organic Chemicals	70	High

Bacteria and Viruses

There are no identified sources of bacteria and viruses within the protection area.

Only a small amount of bacteria and viruses are required to endanger public health. Coli forms 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 coli forms 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 detected coli forms 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 large capacity septic system in the protection area represents the greatest risk to to 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 recent (within the past 5 years) sampling history for the Spenard Builders Supply 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 medium.

Volatile Organic Chemicals

The plastics and synthetic fibers manufacturing along with the underground 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 the area surrounding Fairbanks. 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 sampled for in 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 High.

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APPENDIX A

Spenard Builders Supply
Drinking Water Protection Area Location Map
(Map 1)

Map 1: Drinking Water Protection Area

PWSID: 311744

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 550 1,100 2,200 3,300 Feet

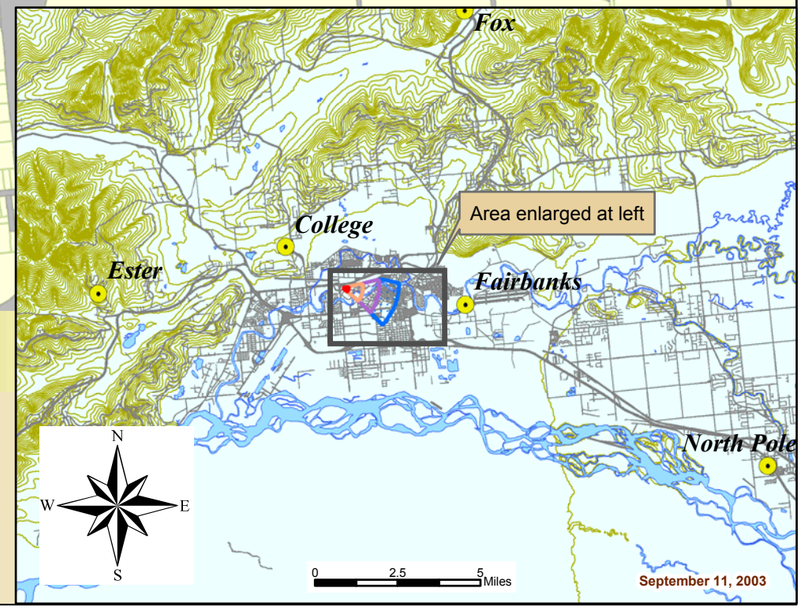
1:13,200

Data Sources:

Parcel, roads - Fairbanks North Star Borough
Water bodies, railroad - Geographic Data Technology
Elevation contours - USGS digital elevation models (DEMs)

Legend

- Spenard Builders Supply well
- Zone A *Several months travel time*
- Zone B *Less than 2 years travel time*
- Zone C *Less than 5 years travel time*
- Zone D *Less than 10 years travel time*
- Surface water
- Roads
- Parcels



APPENDIX B

Contaminant Source Inventory and Risk Ranking for Spenard Builders Supply (Tables 1-4)

Table 1

Contaminant Source Inventory for ***Spenard Building Supply***

PWSID 311744.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Construction trade areas and materials	C09	C09-1	B	2	1988 Phillips Field Drive
Gasoline stations (without repair shop)	C15	C15-1	B	2	2160 Phillips Field Road
Hardware stores	C17	C17-1	B	2	1990 Phillips Field Drive
Hardware stores	C17	C17-2	B	2	1991 Fox Ave
Plastics and synthetic fibers manufacturing	I36	I36-1	B	2	1881 Livengood Ave
Tanks, diesel (underground)	T08	T08-1	B	2	2160 Phillips Field Road
Tanks, diesel (underground)	T08	T08-2	B	2	2160 Phillips Field Road
Tanks, gasoline (underground)	T12	T12-1	B	2	2160 Phillips Field Road
Tanks, heating oil, nonresidential (underground)	T16	T16-1	B	2	1951 Fox Ave
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-1	B	2	Lower 2nd Ave; File Number 102.23.016
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-2	B	2	1881 Livengood Ave; File Number 102.38.096
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-1	B	2	Alaska Railroad Corporation - Fairbanks Machine & Steel; File Number 102.26.011
Rail corridors	X30	X30-1	B	2	
Motor/motor vehicle supplies stores	C28	C28-1	C	2	1337 6th Ave
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	C	2	1219 9th Street
Plastics and synthetic fibers manufacturing	I36	I36-2	C	2	1883 Fox Ave
Tanks, heating oil, residential (underground)	R09	R09-1	C	2	505 Stewart Street
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-3	C	2	505 Stewart Street; RecKey 1992310908602
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-2	C	2	Alaska Railroad Corporation; File Number 102.26.105
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-3	C	2	1042 Lathrop Street; File Number 102.26.074
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-4	C	2	1500 Hilton; File Number 102.26.082
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-5	C	2	1688 Airport Way; File Number 102.26.119
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-6	C	2	1412 Airport Way; File Number 102.26.022

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-7	C	2	1705 Wells Street; File Number 102.26.155
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U08-1	C	2	
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U08-2	C	2	202 Wein Street
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U08-3	C	2	202 Wien Avenue; File Number 102.26.038
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U08-4	C	2	1400 First Ave
Government vehicle maintenance facilities	X19	X19-1	C	2	202 Wien Avenue
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-1	C	2	1500 Airport Way

Table 2

Contaminant Source Inventory and Risk Ranking for Spenard Building Supply Sources of Nitrates/Nitrites

PWSID 311744.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Hardware stores	C17	C17-1	B	Low	2	1990 Phillips Field Drive
Hardware stores	C17	C17-2	B	Low	2	1991 Fox Ave
Plastics and synthetic fibers manufacturing	I36	I36-1	B	Low	2	1881 Livengood Ave
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	C	High	2	1219 9th Street
Plastics and synthetic fibers manufacturing	I36	I36-2	C	Low	2	1883 Fox Ave
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-1	C	Low	2	1500 Airport Way

Table 3

Contaminant Source Inventory and Risk Ranking for Spenard Building Supply
Sources of Volatile Organic Chemicals

PWSID 311744.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Construction trade areas and materials	C09	C09-1	B	Low	2	1988 Phillips Field Drive
Gasoline stations (without repair shop)	C15	C15-1	B	High	2	2160 Phillips Field Road
Hardware stores	C17	C17-1	B	Low	2	1990 Phillips Field Drive
Hardware stores	C17	C17-2	B	Low	2	1991 Fox Ave
Plastics and synthetic fibers manufacturing	I36	I36-1	B	Very High	2	1881 Livengood Ave
Tanks, diesel (underground)	T08	T08-1	B	High	2	2160 Phillips Field Road
Tanks, diesel (underground)	T08	T08-2	B	High	2	2160 Phillips Field Road
Tanks, gasoline (underground)	T12	T12-1	B	High	2	2160 Phillips Field Road
Tanks, heating oil, nonresidential (underground)	T16	T16-1	B	Low	2	1951 Fox Ave
Rail corridors	X30	X30-1	B	Medium	2	
Motor/motor vehicle supplies stores	C28	C28-1	C	Low	2	1337 6th Ave
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	C	Low	2	1219 9th Street
Plastics and synthetic fibers manufacturing	I36	I36-2	C	Very High	2	1883 Fox Ave
Tanks, heating oil, residential (underground)	R09	R09-1	C	Medium	2	505 Stewart Street
Government vehicle maintenance facilities	X19	X19-1	C	Medium	2	202 Wien Avenue
Medical/veterinary facilities (doctor or dentist offices, hospitals, nursing homes)	X40	X40-1	C	Low	2	1500 Airport Way

APPENDIX C

Spenard Builders Supply
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

Map 2: Potential Contaminant Sources

PWSID: 311744

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 312.5 625 1,250 1,875 Feet

1:7,500

Data Sources:

Parcel, roads - Fairbanks North Star Borough
Water bodies, railroad - Geographic Data Technology
Elevation contours - USGS digital elevation models (DEMs)

Legend

- R01, Residential area
- X30, Rail corridor
- GHU sewer customers
- Spenard Builders Supply well
- C08, Car wash
- C09, Construction trade areas
- C10, Dry cleaner
- C15, Gasoline stations
- C16, Gasoline station (with repair shop)
- C17, Hardware stores
- C28, Motor supplies stores
- C37, Printers
- D04, Wastewater sludge application area
- D10, Large capacity septic systems
- D40, Industrial Class V injection well
- D42, Motor Vehicle waste Class V injection well
- I08, Cement manufacturing
- I36, Synthetic fibers manufacturing
- I45, Textile manufacturing
- R09, Residential heating oil UST
- Diesel UST
- Gasoline UST
- Heating oil UST
- U04, Contaminated sites, DEC recognized
- U07, Open LUST Sites
- U08, Closed LUST Sites
- X19, Government vehicle maintenance facilities
- X36, Electric power generation
- X40, Medical/veterinary facilities

APPENDIX D

Vulnerability Analysis for Spenard Builders Supply Public Drinking Water Source

(Charts 1-8)

Chart 1. Susceptibility of the wellhead - Spenard Builders Supply

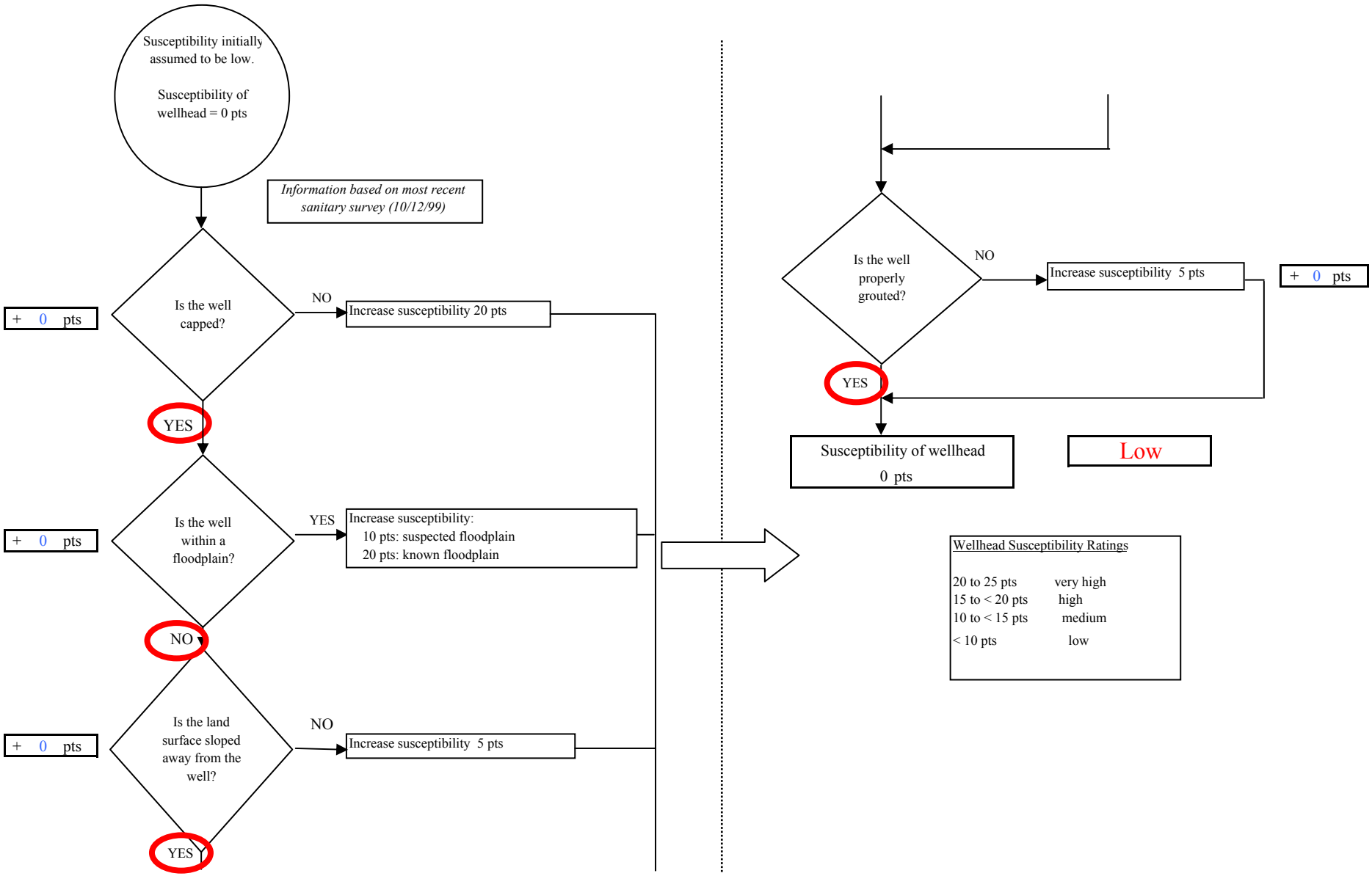


Chart 2. Susceptibility of the aquifer - Spenard Builders Supply

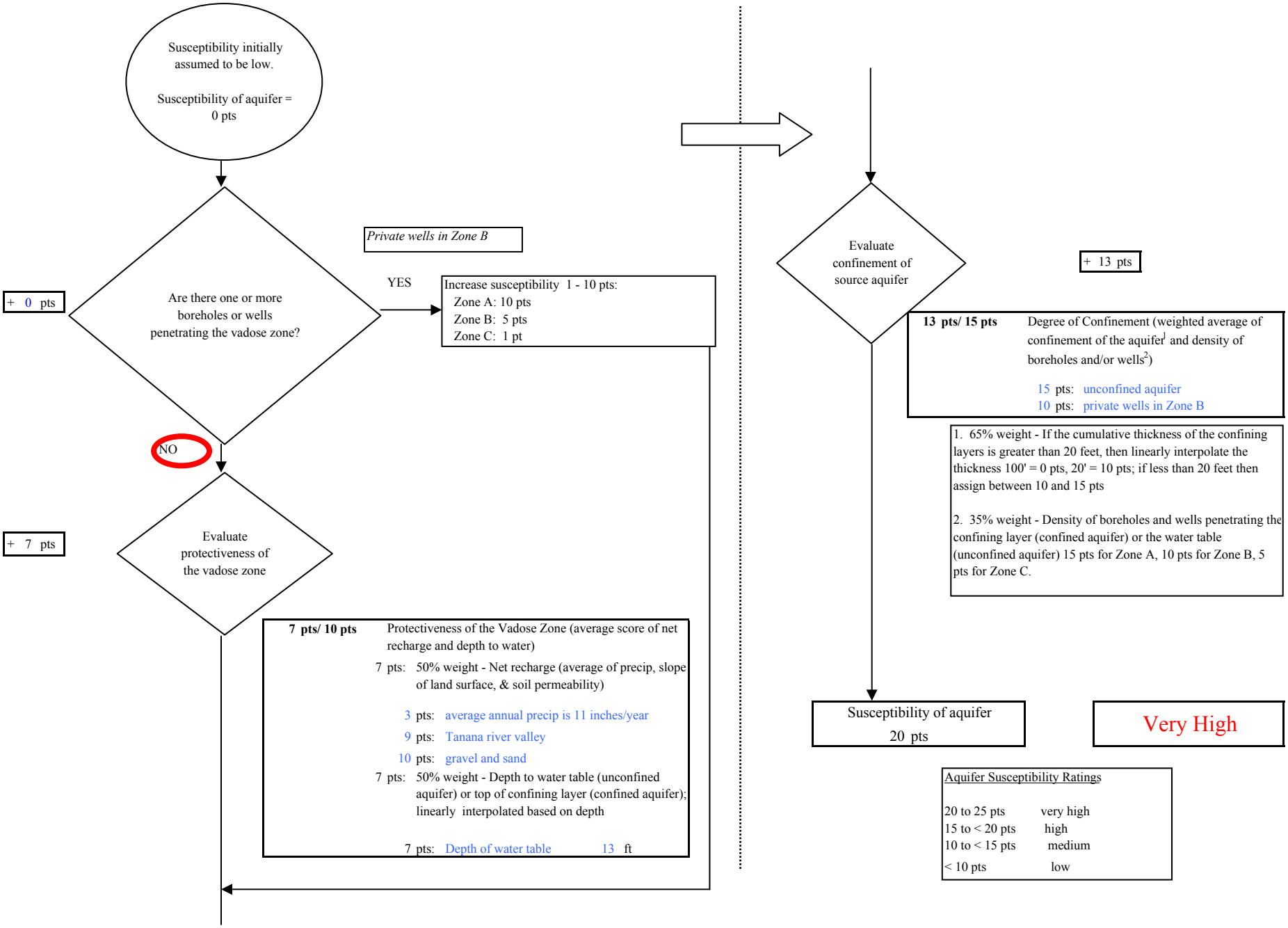
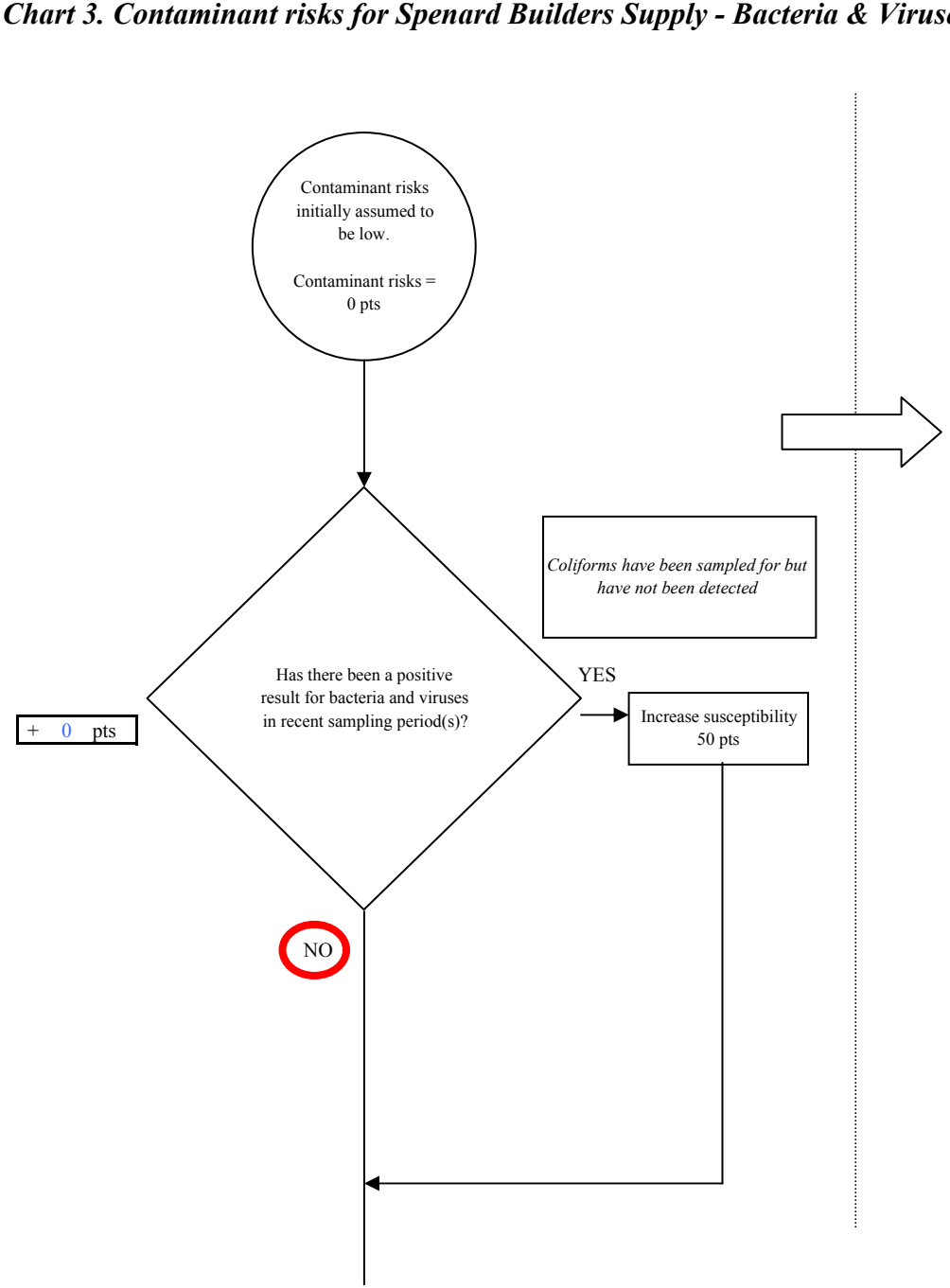
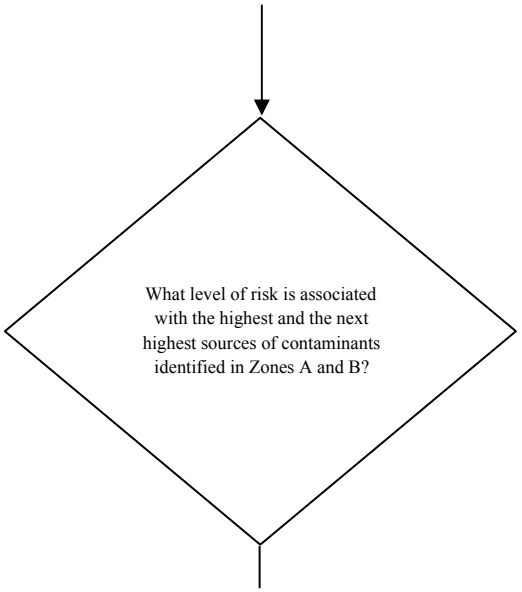


Chart 3. Contaminant risks for Spenard Builders Supply - Bacteria & Viruses





+ 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)	1	2	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 Spenard Builders Supply - Bacteria & Viruses

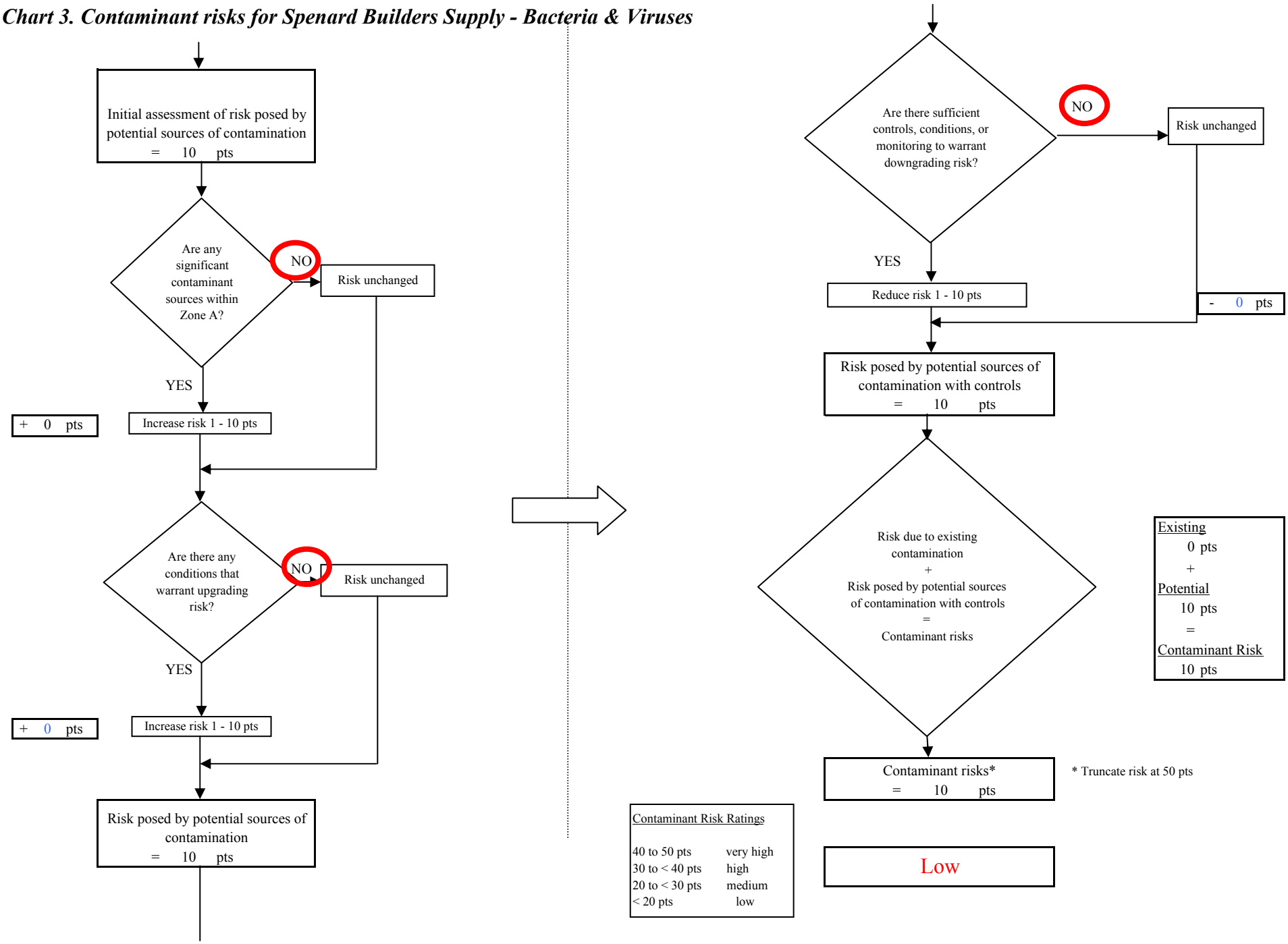


Chart 4. Vulnerability analysis for Spenard Builders Supply - Bacteria & Viruses

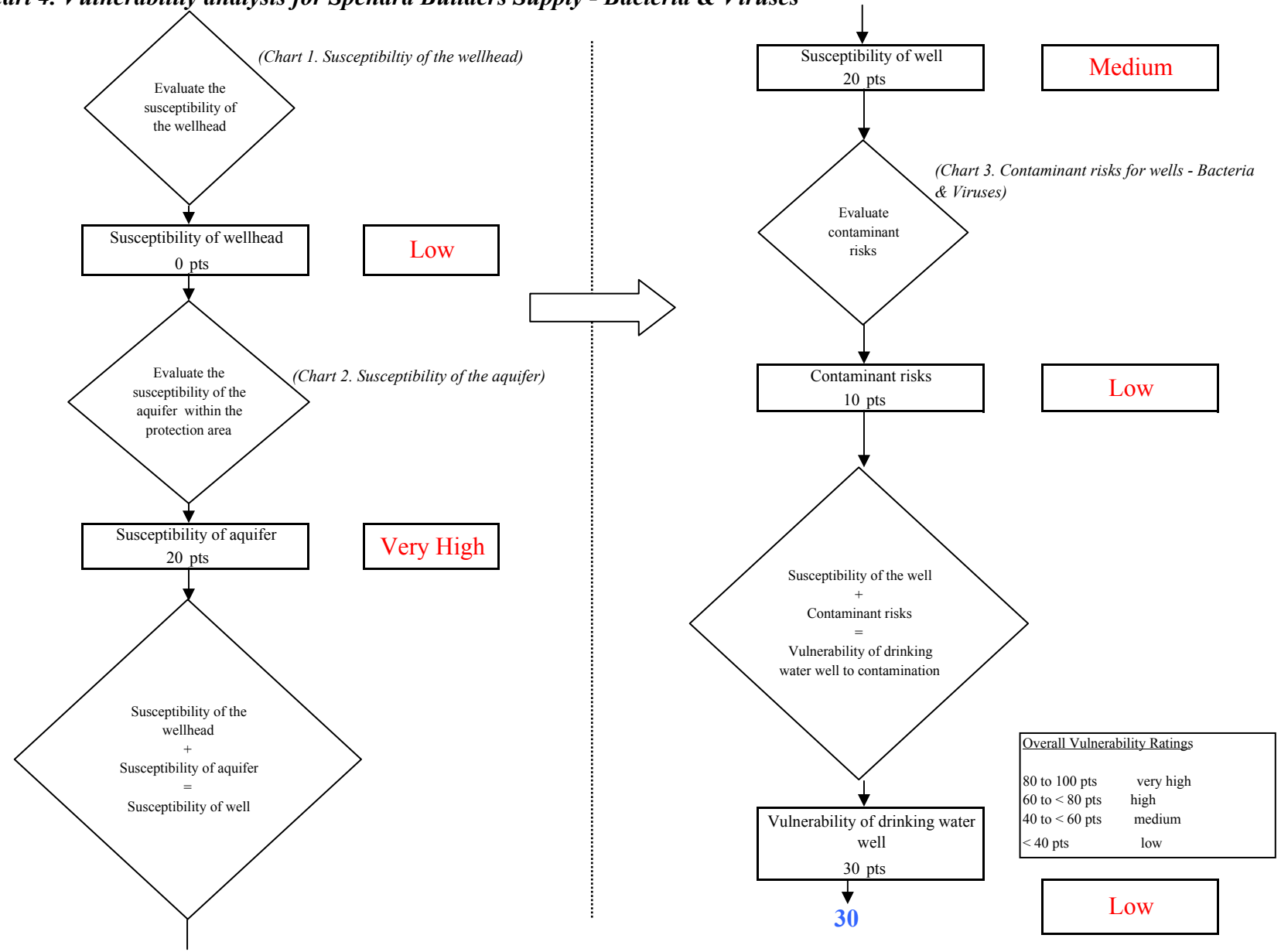


Chart 5. Contaminant risks for Spenard Builders Supply - Nitrates and Nitrites

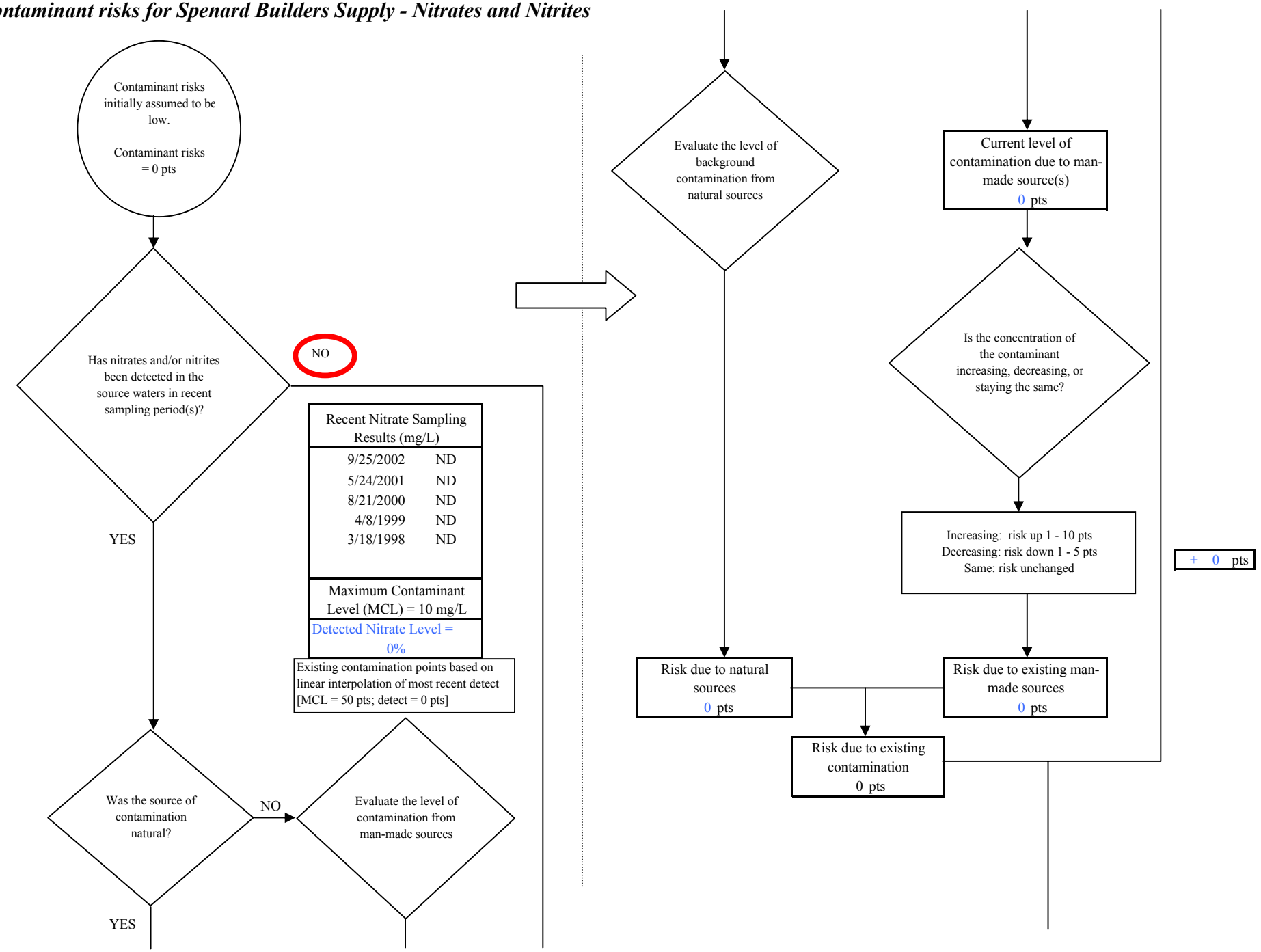


Chart 5. Contaminant risks for Spenard Builders Supply - Nitrates and Nitrites

+ 30 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	1	1
Medium(s)	0	0	0
Low(s)	1	11	12

	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 30

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 = 30 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

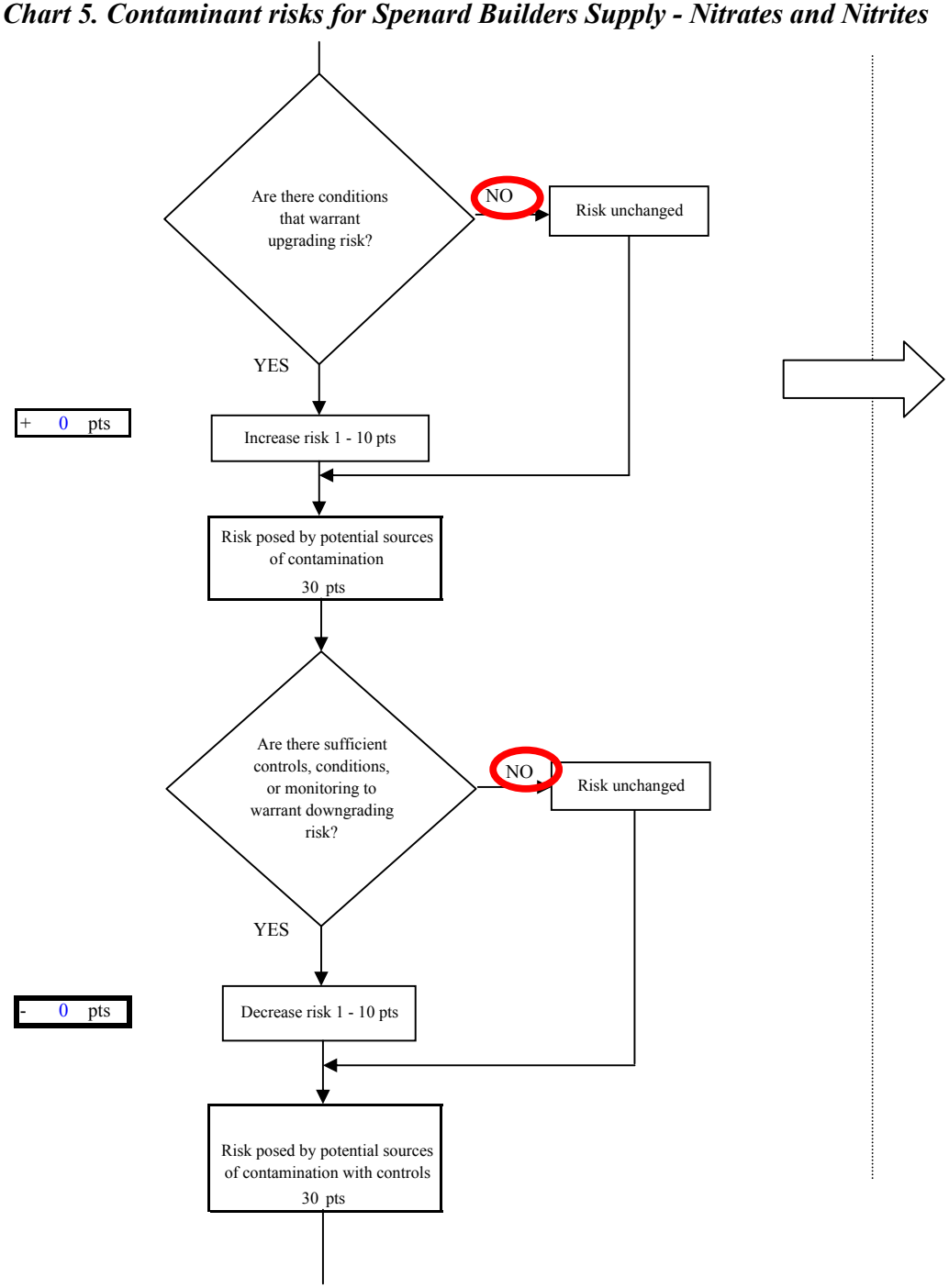
Risk unchanged

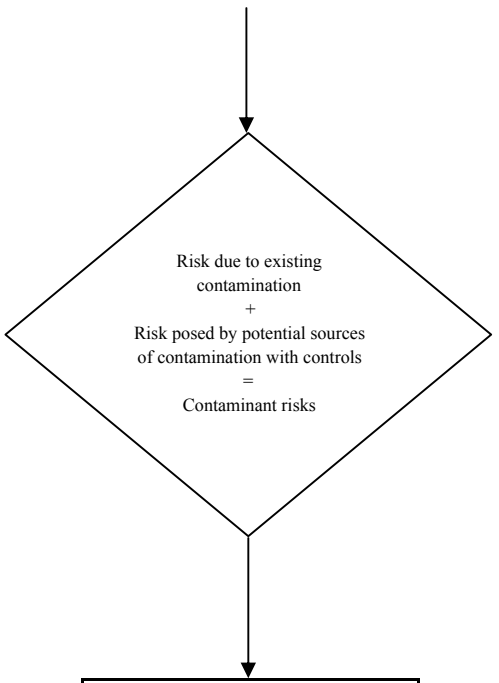
YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 5. Contaminant risks for Spenard Builders Supply - Nitrates and Nitrites





Existing
0 pts
+
Potential
30 pts
=
Contaminant Risk
30 pts

Contaminant risks*
= 30 pts

*Truncate risk at 50 pts

High

Contaminant Risk Ratings

40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20 pts	low

Chart 6. Vulnerability analysis for Spenard Builders Supply - Nitrates and Nitrites

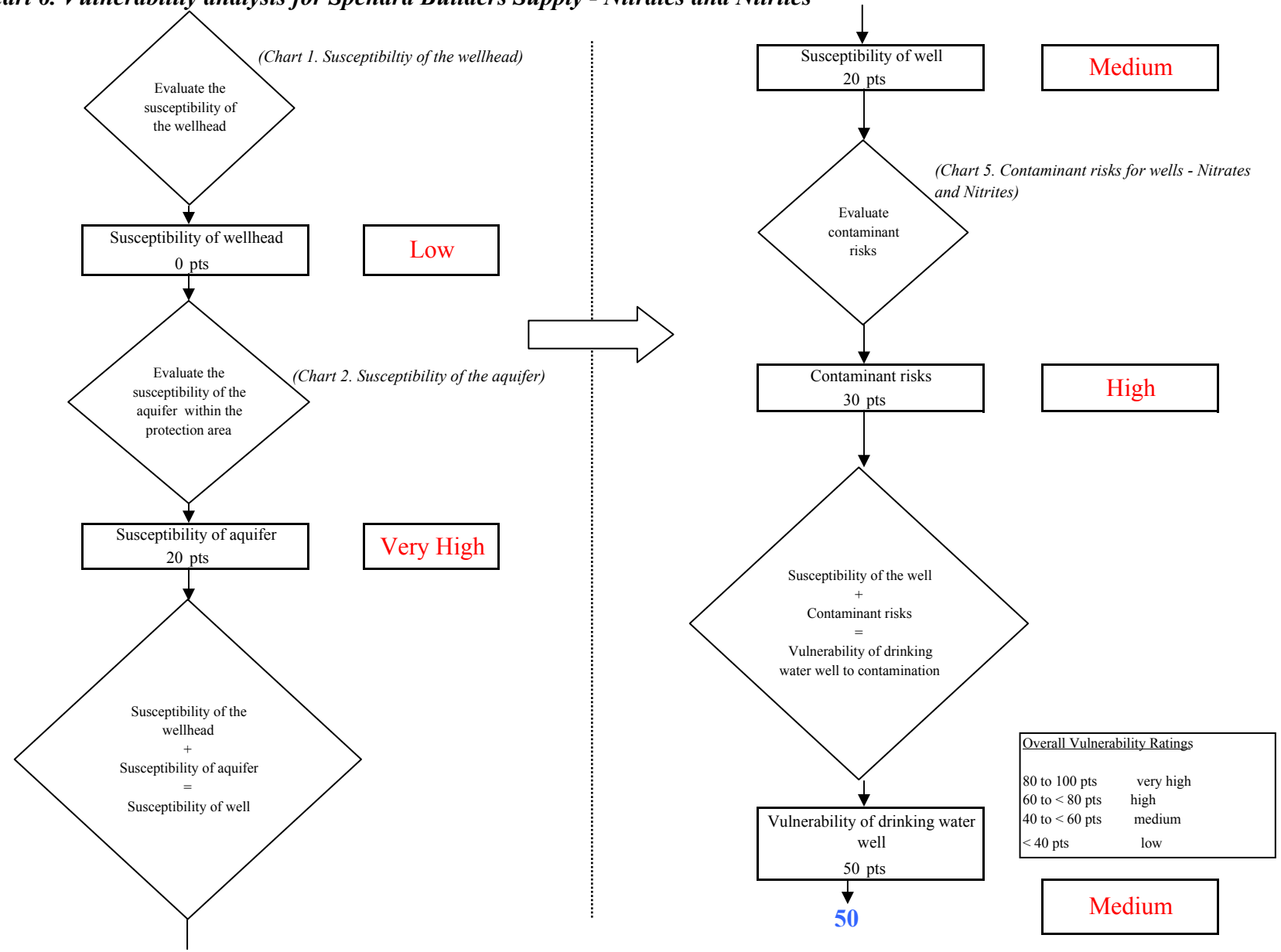


Chart 7. Contaminant risks for Spenard Builders Supply - Volatile Organic Chemicals

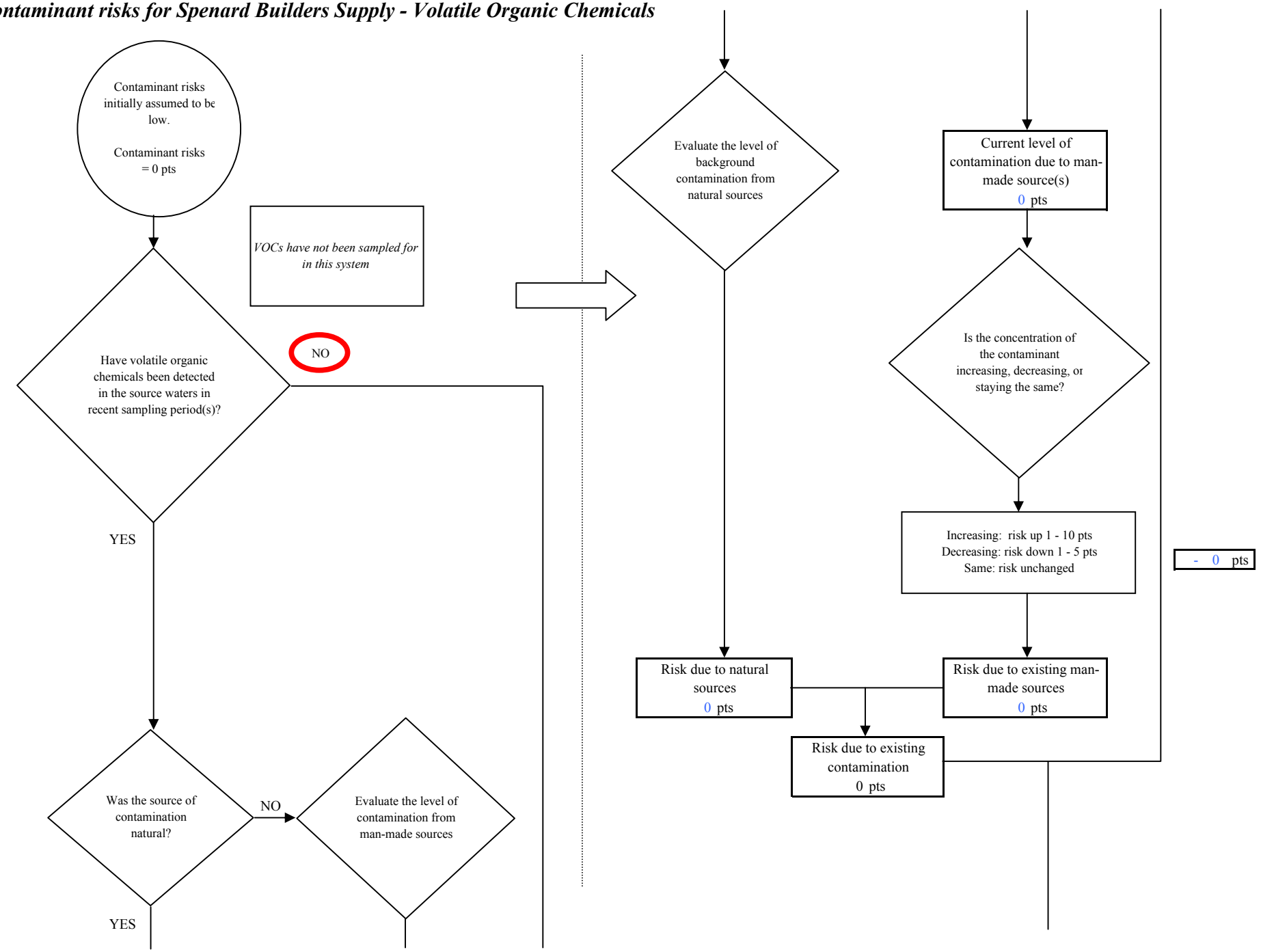


Chart 7. Contaminant risks for Spenard Builders Supply - Volatile Organic Chemicals

+ 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)	0	2	2
High(s)	0	4	4
Medium(s)	0	3	3
Low(s)	1	9	10

	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

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 7. Contaminant risks for Spenard Builders Supply - Volatile Organic Chemicals

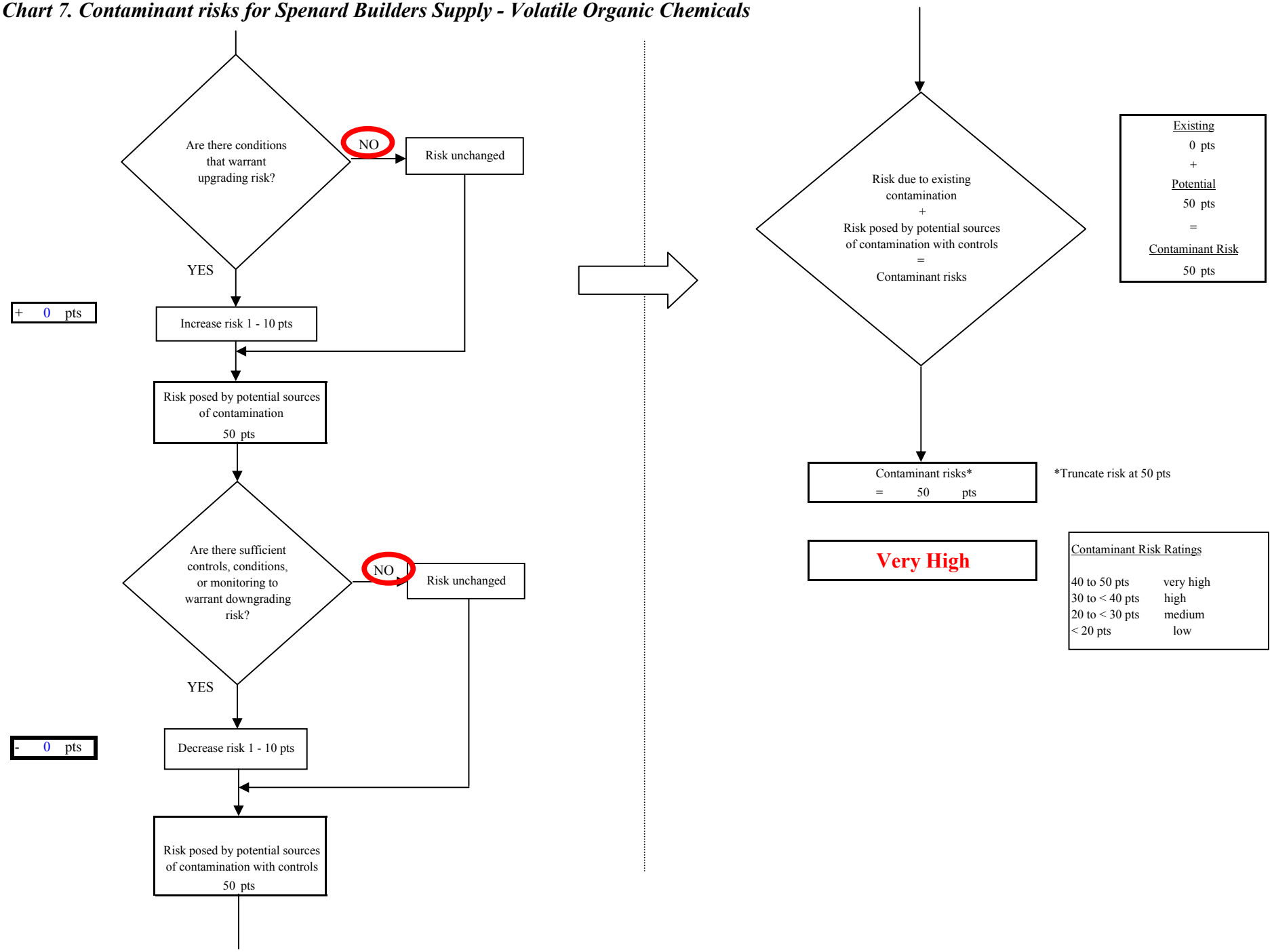


Chart 8. Vulnerability analysis for Spenard Builders Supply - Volatile Organic Chemicals