Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for KPBSD Nikiski Elementary Drinking Water System, Nikiski area, Alaska PWSID 242610.001

June 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1540
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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Nikiski area, Alaska

Drinking Water Protection Program
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EXECUTIVE SUMMARY

The public water system for KPBSD Nikiski Elementary is a Class A (non-transient/non-community) water system consisting of one well. The KPBSD Nikiski Elementary well is located off of Poolside Road and the Kenai Spur Highway in the city of Nikiski. The wellhead received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **High**. Combining these two ratings produces a **Medium** rating for the natural susceptibility of the well. Identified potential and current sources of contaminants for the KPBSD Nikiski Elementary public drinking water system include: Recognized contaminated sites, heavy equipment storage, large capacity septic systems roads, lawn and garden supply stores, welding shops, logging, sign manufacturing, residential area, septic systems and motor vehicle waste disposal wells. These identified potential and existing sources of contamination are considered as sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals, inorganic chemicals, synthetic organic chemicals and other organic chemicals. Overall, the public water source for the KPBSD Nikiski Elementary received a vulnerability rating of **High** for bacteria and viruses, nitrates and nitrites, inorganic chemicals, volatile organic chemicals and other organic chemicals and **Medium** for synthetic organic chemicals.

KPBSD NIKISKI ELEMENTARY PUBLIC DRINKING WATER SYSTEM

The KPBSD Nikiski Elementary public water system (PWS) is a Class A (non-transient/non-community) water system. The system consists of one well located off Poolside Road and the Kenai Spur Highway in the City of Nikiski (See Map 1 of Appendix A). Nikiski is part of the Kenai Peninsula Borough, which is located directly south of the city of Anchorage (Please see the inset of Map 1 in Appendix A for location). The borough encompasses 25,600 square miles, of which only 15,700 square miles is land.

The Kenai Peninsula is broken into two distinct geographic areas; the Kenai Mountains and the Kenai Lowlands**.** Kenai and its surrounding communities are located in the Kenai Lowlands. Communities located within the Kenai Lowlands include Sterling, Soldotna, Kenai, Nikiski, Clam Gulch, Ninilchik, and Homer. Communities located in the Kenai Mountains include: Cooper Landing, Moose Pass and Seward.

The Kenai Peninsula area topography varies from about 3,000 feet to 5,000 feet above sea level in the Kenai Mountains, the highest point being about 6,400 feet above sea level. The Kenai Peninsula is dotted with many lakes and small streams, including three large lakes (Kenai Lake, Skilak Lake, and Tustemena Lake) and two substantial rivers (Kenai River, and Kasilof River) (USGS 1915).

The KPBSD Nikiski Elementary water system is located within the Kenai Lowlands, which is a sub-province of the Cook Inlet-Susitna Lowland physiographic region. The Kenai Lowland is a glaciated coastal shelf situated west of the northeast-trending Kenai Mountains. Approximately 100 miles long, the coastal shelf is bordered on the west by Cook Inlet, on the east by Kenai Mountains, on the north by Turnagain Arm, and on the south by the Caribou Hills and Kachemak Bay. The following summary of regional geology and hydrogeology is based on studies by Bailey and Hogan (1995); Freethey and Scully (1980); Glass (1996); Hartman, et al. (1972); and Karlstrom (1964).

The Kenai Lowland is underlain by bedrock. Tertiary sedimentary bedrock is more than 500 feet below the city of Kenai airport, but is exposed along beach cliffs and road cuts near the southwest end of the lowland. Unconsolidated surficial deposits of Quaternary age include coastal deposits, glaciolacustrine deposits, glaciofluvial deposits, glacial moraine deposits, and periglacial wind deposits. Unconsolidated Quaternary cover on the lowlands generally thickens from south to North being thin or absent in the Homer area, and over 750 feet thick near Nikiski.

The most significant groundwater resources of the Kenai Lowlands are contained in Quarternary coarse-grained sands and gravels. Flood plain, river terrace and other alluvial deposits are common aquifer materials in the area, and are characterized by high rates of recharge, and large saturated thicknesses. Other favorable materials include proglacial lake and associated river deposits and glacial outwash deposits

consisting of meltwater sorted sand and gravel material. Unsorted glacial moraine and drift deposits generally have poor groundwater yields, as do discontinuous layers of confining clays and silt that are common throughout the unconsolidated materials. The relatively thicker sequence of unconsolidated sediments in the northern portions of the Kenai Lowlands locally hosts thicker, more extensive clay aquitards and multiple aquifers.

The Kenai Peninsula area has a central water system, however, many homes and businesses in the area rely on individual wells for their water supply. Most of these wells are deep with depths between 50 and 200 feet. Static water levels in many of these wells are between 10 and 30 feet below the surface. Although groundwater quality can vary significantly in short distance, groundwater supplies are abundant in the area.

The well log indicates that the well is 210 feet deep and perforated at 97feet below ground surface (bgs). The length of the perforation is not known. The static water level at the time of drilling in 1977 was 70 feet bgs.

According to the 2001 sanitary survey the well is properly sealed. A properly installed sanitary seal may provide protection against contaminant from entering the source water at the casing. The well is not located in a floodplain and the surface is sloped away from the wellhead. The well was constructed prior to grouting regulations and is not properly grouted. Proper grouting provides added protection against contaminants traveling along the well casing and into source water.

This system operates from August through May and serves up to 230 non-residents through 1 service connection.

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KPBSD NIKISKI ELEMENTARY 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 KPBSD Nikiski Elementary. 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 2 years time-of-travel
C	Less than 5 years time-of-travel
D	Less than 10 years time-of-travel

The DWPA for the KPBSD Nikiski Elementary was determined using an analytical calculation and includes Zone A, B, C, and D (See Map 1 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 KPBSD Nikiski Elementary 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; and
- Other organic chemicals.

The sources are displayed on Map 1 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 chemical and other organic chemicals.

VULNERABILITY OF KPBSD NIKISKI ELEMENTARY 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 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. Lastly, 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 well for KPBSD Nikiski Elementary is completed in a semi-confined aquifer setting. The well log indicates a confining layer exists from 72-87feet bgs. This confining layer may provide protective barrier from the movement of contaminants in the subsurface. However, wells penetrating the confining layer may provide a quick path for contaminants to enter the confining aquifer.

Table 2 shows the Susceptibility scores and ratings for the KPBSD Nikiski Elementary.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	22	Very High
Natural Susceptibility	27	Medium

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This score has been derived from an examination of existing and historical contamination that has been detected at the drinking water source through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as for the natural susceptibility:

Contaminant Risk Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

Table 3 summarizes the Contaminant Risks for each category of drinking water contaminants..

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	40	Very High
Nitrates and/or Nitrites	40	Very High
Volatile Organic Chemicals	40	Very High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	50	Very High
Synthetic Organic Chemicals	30	High
Other Organic Chemicals	40	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	65	High
Nitrates and Nitrites	65	High
Volatile Organic Chemicals	65	High
Heavy Metals, Cyanide, and Other Inorganic Chemicals	75	High
Synthetic Organic Chemicals	55	Medium
Other Organic Chemicals	65	High

Bacteria and Viruses

Large capacity septic systems, motor vehicle waste disposal wells, residential septic systems, roads, and residential areas in the protection area represent the greatest risk for bacteria and viruses to the drinking water well.

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). Sampling has not detected bacteria within source waters.

After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high**.**

Nitrates and Nitrites

Large capacity septic systems, lawn and garden services, quarries, residential areas, septic systems and roads 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. Recent sampling has not detected nitrates in the source water.

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 high.

Volatile Organic Chemicals

Motor vehicle waste disposal wells, roads, injection wells and residential septic systems in the protection area represent the greatest identified risk for volatile organic chemical contamination to the well.

Approximately 20% residents in the area typically heat their homes with various types of on-site fuel sources, including propane and heating oil stored in aboveground or underground storage tanks. Although this report does not address heating oil tanks (unless their location is known), they can pose a risk of volatile organic chemical contamination to drinking water sources. 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. Secondary containment around the tank and regular system maintenance can help prevent many of these harmful fuel leaks and help protect the drinking water supply.

Sampling for has not detected any volatile organic chemicals in source water. 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.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

Motor vehicle waste disposal wells, heavy equipment strorage, large capacity septic systems, roads, residential septic systems, welding shops, logging, sign manufacturing and existing manufacturing in the protection area present the greatest risk for inorganic chemicals to the well.

Samplings of inorganic chemicals have detected barium and fluoride at levels below the maximum contaminant level (MCL). Arsenic has been detected at levels exceeding the MCL of 0.010 mg/l.

The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects. Exposure to arsenic at levels above 0.010 mg/l is known to cause skin damage, problems with circulatory systems, and may create an increased risk of developing cancer (EPA, 2002)

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

Synthetic Organic Chemicals

Large capacity septic systems, motor vehicle waste disposal wells, residential septic systems, residential areas and lawn/garden supplies in the protection area represent the greatest identified risk for synthetic organic chemicals to the well.

Sampling for synthetic organic chemicals (SOC's) has not occurred. The system currently has a SOC Waiver and is not required to sample.

After combining the contaminant risk for snythetic organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is medium.

Other Organic Chemicals

Heavy equipment storage, large capacity septic systems, motor vehicle waste disposal wells, roads, residential area, industrial landfill and welding shops in the protection area represent the greatest identified risk for other organic chemicals to the well.

Sampling for other organic chemicals (OOC's) has not occurred. The system currently has a OOC Waiver and is not required to sample.

After combining the contaminant risk for snythetic organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

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ACKNOWLEDGMENT

Source Water Assessments in the Nikiski area were jointly prepared by ADEC-Drinking Water Protection Program and URS Corporation. The Drinking Water Protection Program would like to thank URS Corporation for their efforts in researching the area.

APPENDIX A

KPBSD Nikiski Elementary
Drinking Water Protection Area Location Map
(Map 1)

Map 1- KPBSD Nikiski Elementary-Drinking Water Protection Area

PWSID: 242610.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

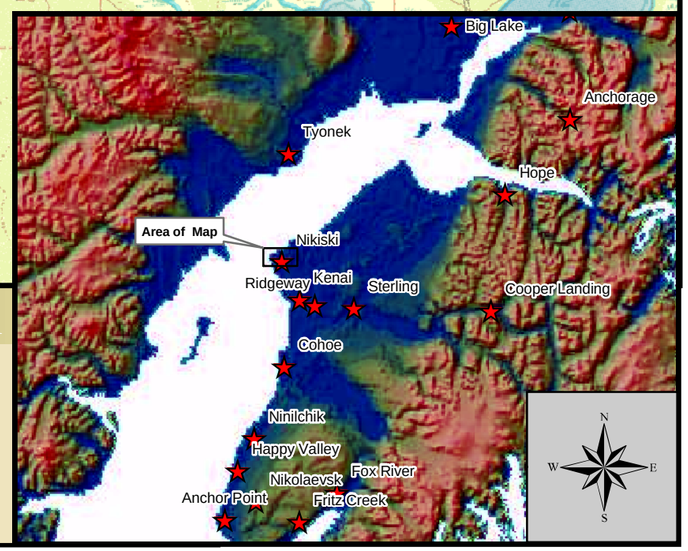
0 937.5 1,875 3,750 Feet

1:32,827

Data Sources:
Kenai Borough: Roads and parcels
Aerial Photo: USGS and Microsoft Terraserver
Potential Sources of Contamination: ADEC

Legend

- Class A Public Water System
- Zone A Protection Area
- Zone B Protection Area
- Zone C Protection Area
- Zone D Protection Area
- Roads
- Rivers and Streams
- Water



APPENDIX B

Contaminant Source Inventory and Risk Ranking for KPBSD Nikiski Elementary (Tables 1-7)

Table 1

Contaminant Source Inventory for ***KPBSD Nikiski Elementary***

PWSID 242610.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-3			McGahan Utilities-Tetrachloroethylene greater than the MCL detected in 1988. The source determined to be the site of an old dry cleaning facility. Status: Active, Priority: High
Heavy equipment rental/storage	C18	C18-1	A	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-9	A	2	Zone A has 9 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1-2	A	2	Zone A has 2 motor vehicle waste disposal wells identified.
Quarries (sand, gravel, rock, other?)	E10	E10-1	A	2	
Residential Areas	R01	R01-1	A	2	Zone A has 100 residential septic systems identified.
Septic systems (serves one single-family home)	R02	R02-1-60	A	2	Zone A has 60 residential septic systems identified.
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-1	A	2	Nikiski Elementary School- CS 2323.38.013. During the removal of underground fuel tanks. Contaminated soils were discovered. No leaks were detected. Status: Closed Priority:Low
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-2	A	2	Schlumberger Well Services- Hydrocarbons and 1,1,1 Trichloroethane detected in GW samples. Monitoring wells in area indicate concentrations are decreasing. Status: Closed, Priority: Low
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-4	A	2	Former Sleepers Trailer Court- 50790 Sleepers Place
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-5	A	2	Brewer Property-53030 Tenakee Loop. Surface gasoline spill 1987, estimated between 25 to 50 gallons, contaminated one residential well. Extent of contamination appears limited to the single water well. Staus: Closed, Priority: Medium
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-6	A	2	East Forelands Delivery Facility-Wik Road. Reeportedly hazardous chemicals and up to 200 55-gallon drums disposed of in oily-water unlined separator pit. Site cleaned up in 1988/89. Possible groundwater contamination. Status: Closed Priority: Low
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-7	A	2	Silvertip Storage Yard-Mile 26 North Kenai Road. 250+ drums of waste oilfield chemicals leak and spill occurred 8/85 Status: Closed Priority: Unranked
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-8	A	2	Hallco Building-Mile 26.1 North Kenai Rd. 9/6/89 diesel contamination discovered during site visit. Site remediated. Status: Closed, Priority: Low
Highways and roads, paved (cement or asphalt)	X20	X20-1-14	A	2	Zone A has 14 roads identified. Assumed to be paved.
Lawn and garden supplies/services	C23	C23-1	B	2	
Welding shops	C43	C43-1	B	2	

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Logging	E02	E02-1	B	2	
Sign manufacturing	I39	I39-01	B	2	
Residential Areas	R01	R01-2	B	2	Zone B has 117 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-61-109	B	2	Zone A has 50 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-15-22	B	2	Zone B has 8 roads identified. Assumed to be paved.
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10-17	C	2	Zone C has 8 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-3-4	C	2	Zone C has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-2	C	2	Zone C has 300 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-110-259	C	2	Zone C has 150 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-23-40	C	2	Zone C has 18 roads identified.
Landfills (industrial)	D52	D52-1	D	3	North Kenai Dumpsite Co.

Table 2

Contaminant Source Inventory and Risk Ranking for KPBSD Nikiski Elementary Sources of Bacteria and Viruses

PWSID 242610.001

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	D10-1-9	A	High	2	Zone A has 9 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1-2	A	Low	2	Zone A has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-1	A	Low	2	Zone A has 100 residential septic systems identified.
Septic systems (serves one single-family home)	R02	R02-1-60	A	Low	2	Zone A has 60 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-14	A	Low	2	Zone A has 14 roads identified. Assumed to be paved.
Residential Areas	R01	R01-2	B	Low	2	Zone B has 117 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-61-109	B	Low	2	Zone A has 50 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-15-22	B	Low	2	Zone B has 8 roads identified. Assumed to be paved.
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10-17	C	High	2	Zone C has 8 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-3-4	C	Low	2	Zone C has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-2	C	Low	2	Zone C has 300 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-110-259	C	Low	2	Zone C has 150 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-23-40	C	Low	2	Zone C has 18 roads identified.

Table 3

Contaminant Source Inventory and Risk Ranking for KPBSD Nikiski Elementary Sources of Nitrates/Nitrites

PWSID 242610.001

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	D10-1-9	A	High	2	Zone A has 9 large capacity septic systems identified.
Quarries (sand, gravel, rock, other?)	E10	E10-1	A	Low	2	
Residential Areas	R01	R01-1	A	Low	2	Zone A has 100 residential septic systems identified.
Septic systems (serves one single-family home)	R02	R02-1-60	A	Low	2	Zone A has 60 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-14	A	Low	2	Zone A has 14 roads identified. Assumed to be paved.
Lawn and garden supplies/services	C23	C23-1	B	Medium	2	
Logging	E02	E02-1	B	Low	2	
Residential Areas	R01	R01-2	B	Low	2	Zone B has 117 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-61-109	B	Low	2	Zone A has 50 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-15-22	B	Low	2	Zone B has 8 roads identified. Assumed to be paved.
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10-17	C	High	2	Zone C has 8 large capacity septic systems identified.
Residential Areas	R01	R01-2	C	Low	2	Zone C has 300 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-110-259	C	Low	2	Zone C has 150 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-23-40	C	Low	2	Zone C has 18 roads identified.

Table 4

Contaminant Source Inventory and Risk Ranking for KPBSD Nikiski Elementary
Sources of Volatile Organic Chemicals

PWSID 242610.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Heavy equipment rental/storage	C18	C18-1	A	Medium	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-9	A	Low	2	Zone A has 9 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1-2	A	High	2	Zone A has 2 motor vehicle waste disposal wells identified.
Quarries (sand, gravel, rock, other?)	E10	E10-1	A	Low	2	
Residential Areas	R01	R01-1	A	Low	2	Zone A has 100 residential septic systems identified.
Septic systems (serves one single-family home)	R02	R02-1-60	A	Low	2	Zone A has 60 residential septic systems identified.
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-4	A	Low	2	Former Sleepers Trailer Court- 50790 Sleepers Place
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-5	A	Medium	2	Brewer Property-53030 Tenakee Loop. Surface gasoline spill 1987, estimated between 25 to 50 gallons, contaminated one residential well. Extent of contamination appears limited to the single water well. Staus: Closed, Priority: Medium
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-6	A	Low	2	East Forelands Delivery Facility-Wik Road. Reeportedly hazardous chemicals and up to 200 55-gallon drums disposed of in oily-water unlined separator pit. Site cleaned up in 1988/89. Possible groundwater contamination. Status: Closed Priority: Low
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-8	A	Low	2	Hallco Building-Mile 26.1 North Kenai Rd. 9/6/89 diesel contamination discovered during site visit. Site remediated. Status: Closed, Priority: Low
Highways and roads, paved (cement or asphalt)	X20	X20-1-14	A	Low	2	Zone A has 14 roads identified. Assumed to be paved.
Welding shops	C43	C43-1	B	Medium	2	
Logging	E02	E02-1	B	Low	2	
Sign manufacturing	I39	I39-01	B	Medium	2	
Residential Areas	R01	R01-2	B	Low	2	Zone B has 117 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-61-109	B	Low	2	Zone A has 50 residential septic systems identified.

Table 4 (continued)

Contaminant Source Inventory and Risk Ranking for KPBSD Nikiski Elementary

Sources of Volatile Organic Chemicals

PWSID 242610.001

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	X20-15-22	B	Low	2	Zone B has 8 roads identified. Assumed to be paved.
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10-17	C	Low	2	Zone C has 8 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-3-4	C	High	2	Zone C has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-2	C	Low	2	Zone C has 300 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-110-259	C	Low	2	Zone C has 150 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-23-40	C	Low	2	Zone C has 18 roads identified.

Table 5

Contaminant Source Inventory and Risk Ranking for KPBSD Nikiski Elementary

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 242610.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Heavy equipment rental/storage	C18	C18-1	A	Low	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-9	A	Low	2	Zone A has 9 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1-2	A	High	2	Zone A has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-1	A	Low	2	Zone A has 100 residential septic systems identified.
Septic systems (serves one single-family home)	R02	R02-1-60	A	Low	2	Zone A has 60 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-14	A	Low	2	Zone A has 14 roads identified. Assumed to be paved.
Lawn and garden supplies/services	C23	C23-1	B	Low	2	
Welding shops	C43	C43-1	B	Low	2	
Logging	E02	E02-1	B	Low	2	
Sign manufacturing	I39	I39-01	B	Medium	2	
Residential Areas	R01	R01-2	B	Low	2	Zone B has 117 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-61-109	B	Low	2	Zone A has 50 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-15-22	B	Low	2	Zone B has 8 roads identified. Assumed to be paved.
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10-17	C	Low	2	Zone C has 8 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-3-4	C	High	2	Zone C has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-2	C	Low	2	Zone C has 300 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-110-259	C	Low	2	Zone C has 150 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-23-40	C	Low	2	Zone C has 18 roads identified.

Table 6

Contaminant Source Inventory and Risk Ranking for KPBSD Nikiski Elementary Sources of Synthetic Organic Chemicals

PWSID 242610.001

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	D10-1-9	A	Low	2	Zone A has 9 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1-2	A	Low	2	Zone A has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-1	A	Low	2	Zone A has 100 residential septic systems identified.
Septic systems (serves one single-family home)	R02	R02-1-60	A	Low	2	Zone A has 60 residential septic systems identified.
Lawn and garden supplies/services	C23	C23-1	B	Medium	2	
Residential Areas	R01	R01-2	B	Low	2	Zone B has 117 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-61-109	B	Low	2	Zone A has 50 residential septic systems identified.
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10-17	C	Low	2	Zone C has 8 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-3-4	C	Low	2	Zone C has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-2	C	Low	2	Zone C has 300 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-110-259	C	Low	2	Zone C has 150 residential septic systems identified.

Table 7

Contaminant Source Inventory and Risk Ranking for KPBSD Nikiski Elementary Sources of Other Organic Chemicals

PWSID 242610.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Heavy equipment rental/storage	C18	C18-1	A	Medium	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1-9	A	Low	2	Zone A has 9 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1-2	A	Medium	2	Zone A has 2 motor vehicle waste disposal wells identified.
Quarries (sand, gravel, rock, other?)	E10	E10-1	A	Low	2	
Residential Areas	R01	R01-1	A	Low	2	Zone A has 100 residential septic systems identified.
Septic systems (serves one single-family home)	R02	R02-1-60	A	Low	2	Zone A has 60 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-1-14	A	Low	2	Zone A has 14 roads identified. Assumed to be paved.
Welding shops	C43	C43-1	B	Low	2	
Residential Areas	R01	R01-2	B	Low	2	Zone B has 117 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-61-109	B	Low	2	Zone A has 50 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-15-22	B	Low	2	Zone B has 8 roads identified. Assumed to be paved.
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10-17	C	Low	2	Zone C has 8 large capacity septic systems identified.
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-3-4	C	Medium	2	Zone C has 2 motor vehicle waste disposal wells identified.
Residential Areas	R01	R01-2	C	Low	2	Zone C has 300 residential acres identified.
Septic systems (serves one single-family home)	R02	R02-110-259	C	Low	2	Zone C has 150 residential septic systems identified.
Highways and roads, paved (cement or asphalt)	X20	X20-23-40	C	Low	2	Zone C has 18 roads identified.

APPENDIX C

KPBSD Nikiski Elementary
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2 and 3)

Zone B has:
117 residential acres (R01)
50 residential septic systems (R02)
8 roads (X20)

Zone A has:
60 residential septic systems (R02)
9 large capacity septic systems (D10)
2 motor vehicle waste disposal wells (D42)
100 residential acres (R01)
14 roads (X20)

Zone C has:
230 residential acres (R01) identified.
150 residential septic systems (R02) identified.
8 large capacity septic systems (D10) identified.
2 motor vehicle waste disposal wells (D42).
18 roads (X20) identified (X20).

U04-1
U04-2
U04-3
U04-4
U04-5
C18-1
C23-1
E10-1
E02-1
I39-01

POLAR WY
ARUNDEL RD
WILMA DR
FROST AV
NOATAK WAY
FORELAND ST
LOTI DR
GALLAGHER AVE
DIOMEDE DR
NIKISKI AVE
ADMIRALTY DR
ANGELA CT
ISLAND LAKE RD
KINGERY RD
VILLAGE AVE
STOHL RD
ROZELLA DR
LEONARD DR
KODIAK ST
MIDDLETON DR
UNIMAK DR
RAMONA ST
UNGA ST
FOREST WAY
IZIGAN AVE
SOPHY AVE
ATTU AVE
BLAISE CT
AMICHTKA ST
SHEMYA WAY
KUSKOKWIM AVE
MENTASTA AV
MCKINLEY AV
BELUGA CI
SUSITNA AV
LIGHTHOUSE ST
KENAI SPUR RD
ASPEN LN
BIRCH GROVE ST
POOLSIDE DR
CHERILYN AV
TACHATNA AVE
KOTSINA ST
CORINGA AVE
AMBRYM AV
AMBRYN AV
BEAVER ST
SUVA ST
TIKOPIA ST
GALEN AVE
MALAITA AVE
BERNICE LAKE POW
ROSS PO
CORCORAN CIR
AINSWORTH AVENUE
JAY KAY CT
DEE CT
ENGLISH AVE
ALASKAN WAY
MARION CIR
MARK BLVD
TENAKEE LP
TEAL AVE
LAKE VIEW
KIM LN
ARCTIC CIR
SUZANNE AVE
TY CIR
RAMBLING RD
MATTHEW CIR
PIPELINE RD
PANATELLA CT
JOLENE LP
CORNWELL CT
FREDA DR
WINDY RD
ALEXANDER RD
CLARK AVE
BASTIEN RD

Map 2-KPBSD Nikiski Elementary: Potential Sources of Contamination

PWSID: 242610.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

Data Sources:
Roads and parcels: Kenai Borough
Aerial Photo: USGS and Microsoft Terraserver
Potential Sources of Contamination: ADEC

0 1,160 2,320 Feet

1:15,518

®

Class A Public Water System
Zone A Protection Area Lana
Zone B Protection Area Lana
Zone C Protection Area Lana
Zone D Protection Area Lana
Roads
Logging
Water
Rivers and Streams
Parcels
Residential Area (R02)
D52
E02
Quarries (E10)
Heavy equipment rental/storage (C18)
Lawn and garden supplies/services (C23)
Welding shops (C43)
Large Capacity Septic System (D10)
Motor Vehicle Waste Disposal Well (D42)
Sign manufacturing (I39)
Residential Septic System (R02)
Contaminated sites, DEC recognized (U04)
Boat yards and marinas (X15)

Zone D has:
9 large capacity septic systems (D10)
10 motor vehicle waste disposal wells (D42)

D52-1
U04-7
U04-8
U04-6
U04-3
U04-4
I39-01
C23-1
E02-1
U04-1
E10-1
C18-1
C43-1
U04-5

MERKLE AVE
DANA ST
MARHENKE ST
MCCAHAN DR
MARLENE AVE
SUNSET ST
SUNSTONE AV
CRESTVIEW AVE
RIDGEWOOD ST
TRAIL ST
MARTILLE ST
CHICKADEE ST
AURORA DR
NURPHY DR
RECTOR ST
AVIARY ST
BLUEJAY ST
BLUEJAY TRL
EAGLE AVE
DOVE CT
HUMMINGBIRD CT
MOLANDER CT
GARY CT
UNNAMED
CURRY LN
FISH AVE
WILMA DR
WIK RD
HAYES CT
POLAR WY
FORELAND ST
LOIS DR
DIOMEDE DR
PORTER AV
NIKISKI AVE
UNNAMED
MONTAGUE LN
ADMIRALTY DR
KINGERY RD
VILLAGE AVE
MIDDLETON DR
STOHL RD
UMIAT CIR
CHIRKOF DR
NOATAK WAY
FROST AV
AMCHITKA ST
ROZELLA DR
LEONARD DR
LIGHTHOUSE ST
KODIAK ST
UNIMAK DR
FOREST WAY
UNGA ST
RAMONA ST
SOPHY AVE
BLAISE CT
SHEMYA WAY
MENTASTA AV
MCKINLEY AV
BELUGA CI
KENAI SPUR RD
FOREST GLEN ST
BIRCH GROVE ST
CORCORAN CIR
AINSWORTH AVENUE
JAY KAY CT
DEE CT
ENGLISH AVE
ALASKAN WAY
MARION CIR
MARK BLVD
ESTES AVE
MOOSE RUN RD
WAPITI RUN RD
RUT AVE
HUNTER AVE
PIPELINE RD
TEAL AVE
TENAKEE LP
LAKE VIEW
KIM LN
ARCTIC CIR
SUZANNE AVE
RAMBLING RD
TY CIR
POOLSIDE DR
CHERILYN AV
TACHATNA AVE
KOTSINA ST
CORINGA AVE
AMBRYM AV
AMBRYN AV
TIKOPIA ST
SUVA ST

Map 3-KPBSD Nikiski Elementary: Potential Sources of Contamination

PWSID: 242610.001

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

Data Sources:
Roads and parcels: Kenai Borough
Aerial Photo: USGS and Microsoft Terraserver
Potential Sources of Contamination: ADEC

0 1,160 2,320 Feet

1:19,898

- Class A Public Water System
- Zone A Protection Area Lana
- Zone B Protection Area Lana
- Zone C Protection Area Lana
- Zone D Protection Area Lana
- Roads
- Water
- Rivers and Streams
- Parcels
- Residential Area (R02)
- Heavy equipment rental/storage (C18)
- Lawn and garden supplies/services (C23)
- Welding shops (C43)
- Large Capacity Septic System (D10)
- Motor Vehicle Waste Disposal Well (D42)
- Sign manufacturing (I39)
- Residential Septic System (R02)
- Contaminated sites, DEC recognized (U04)
- Boat yards and marinas (X15)
- Landfills (Industrial) (D52)
- Logging (E10)

APPENDIX D

Vulnerability Analysis for KPBSD Nikiski Elementary Public Drinking Water Source

(Charts 1-14)

Chart 1. Susceptibility of the wellhead - KPBSD Nikiski Elementary-PWSID 242610.001

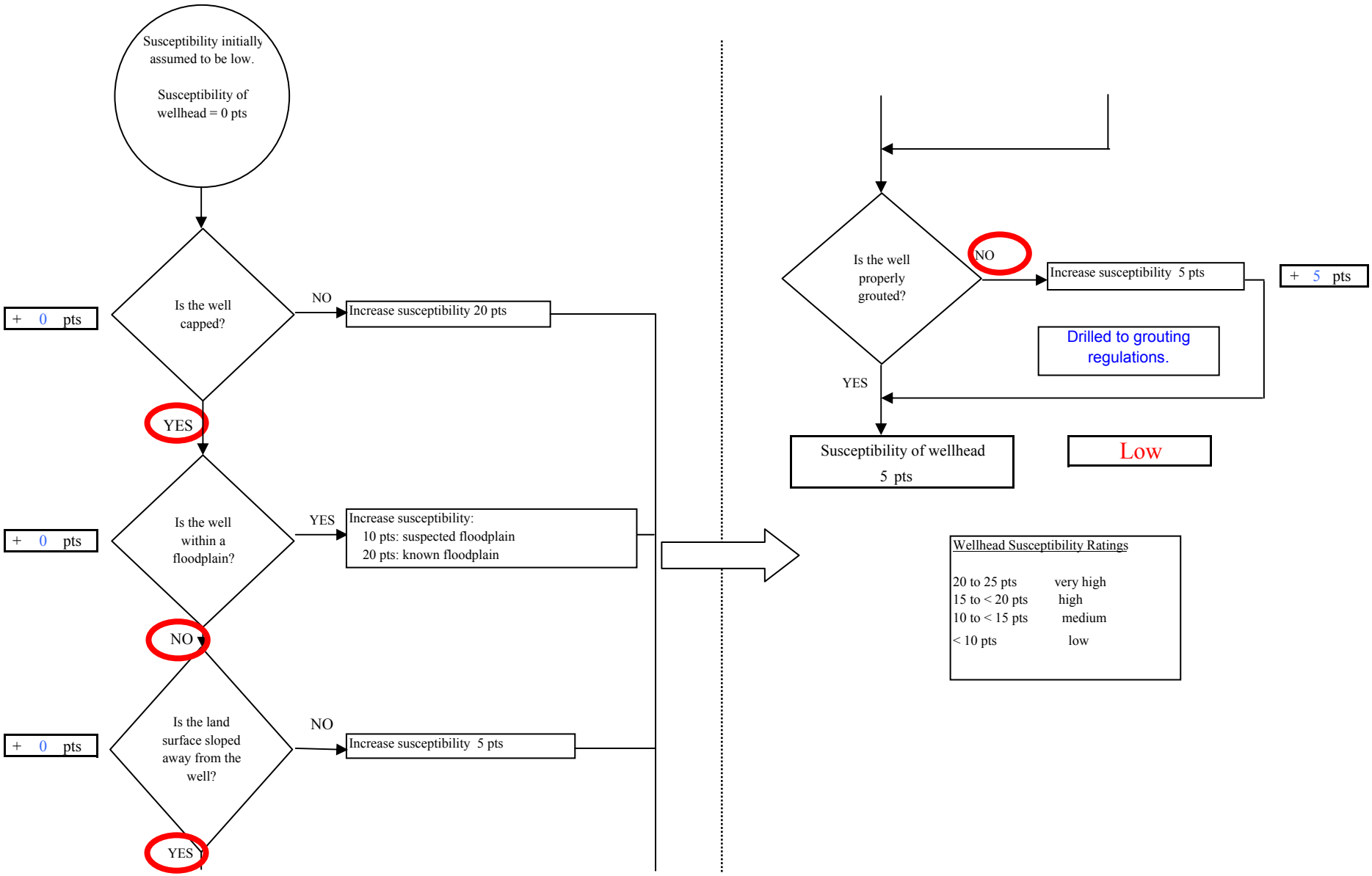


Chart 2. Susceptibility of the aquifer - KPBSD Nikiski Elementary-PWSID 242610.001

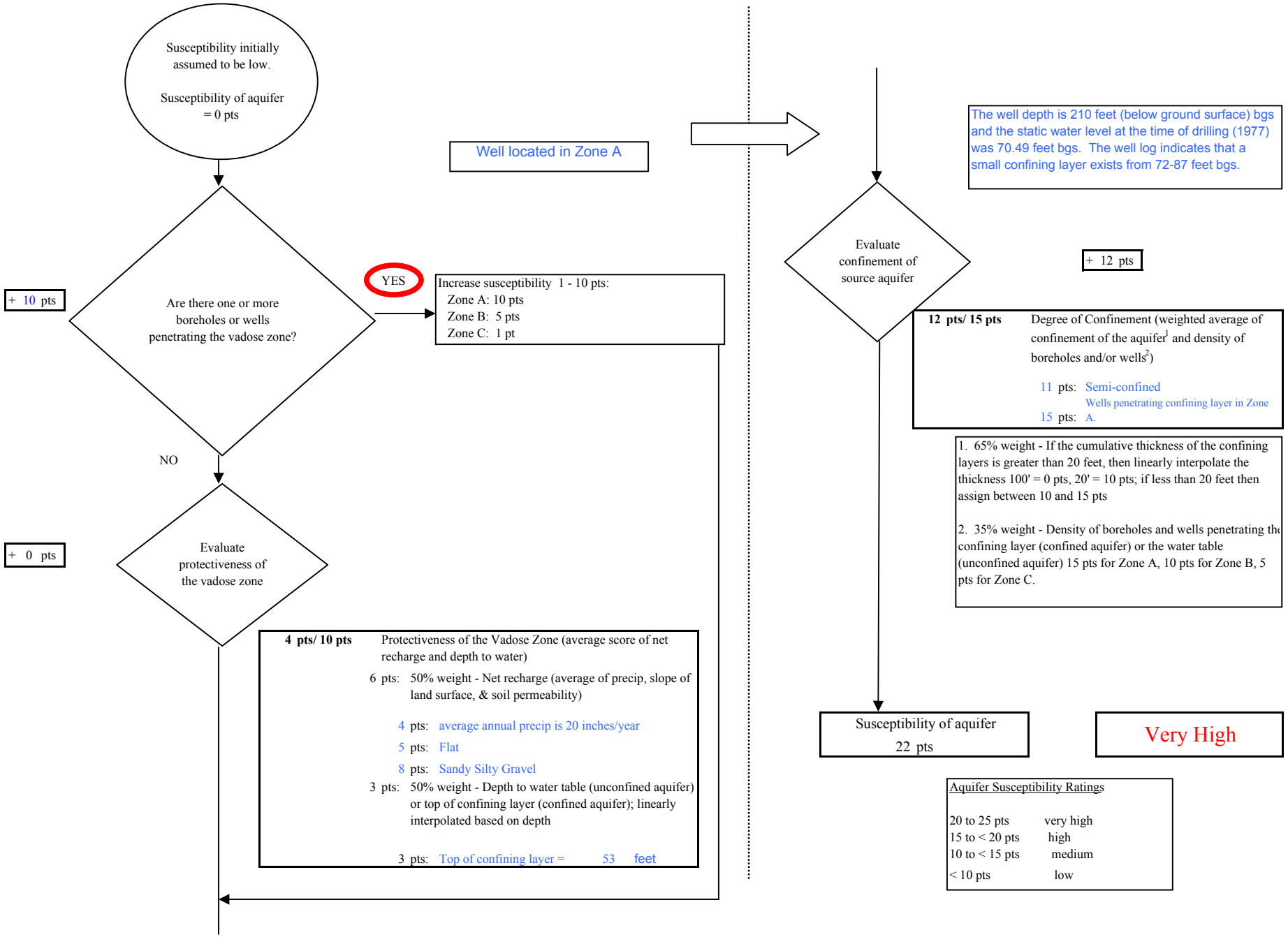
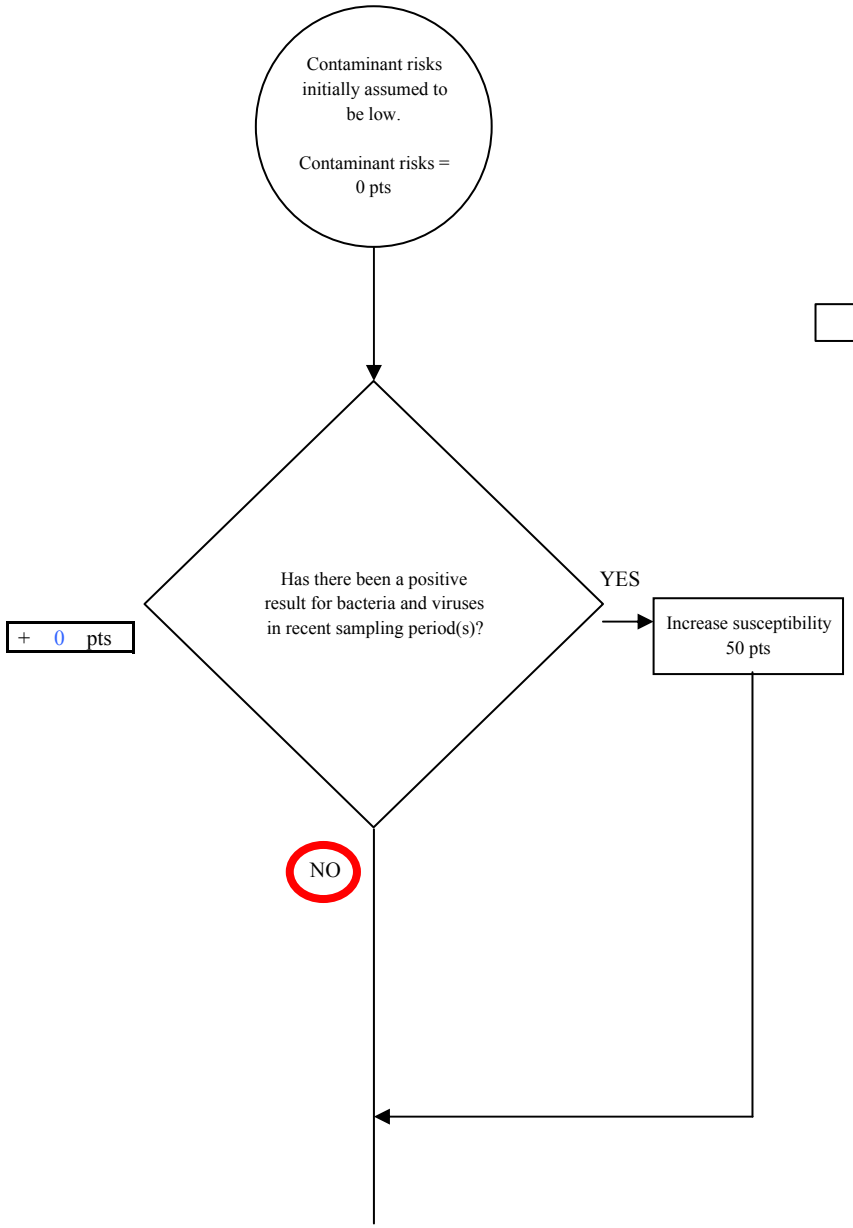
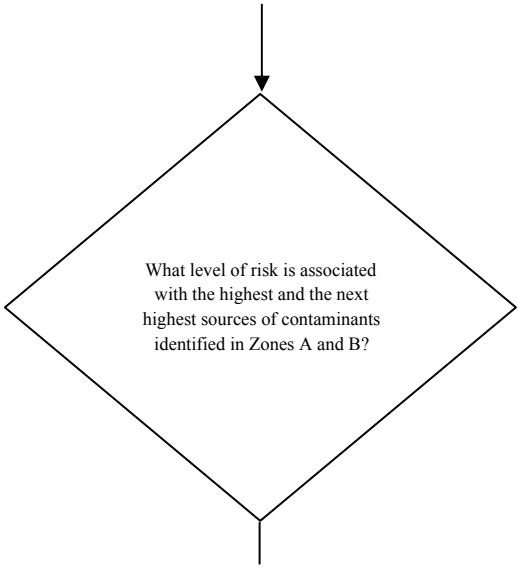


Chart 3. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Bacteria & Viruses





+ 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)	10	0	10
Medium(s)	0	0	0
Low(s)	66	8	74

	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 KPBSD Nikiski Elementary-PWSID 242610.001 - Bacteria & Viruses

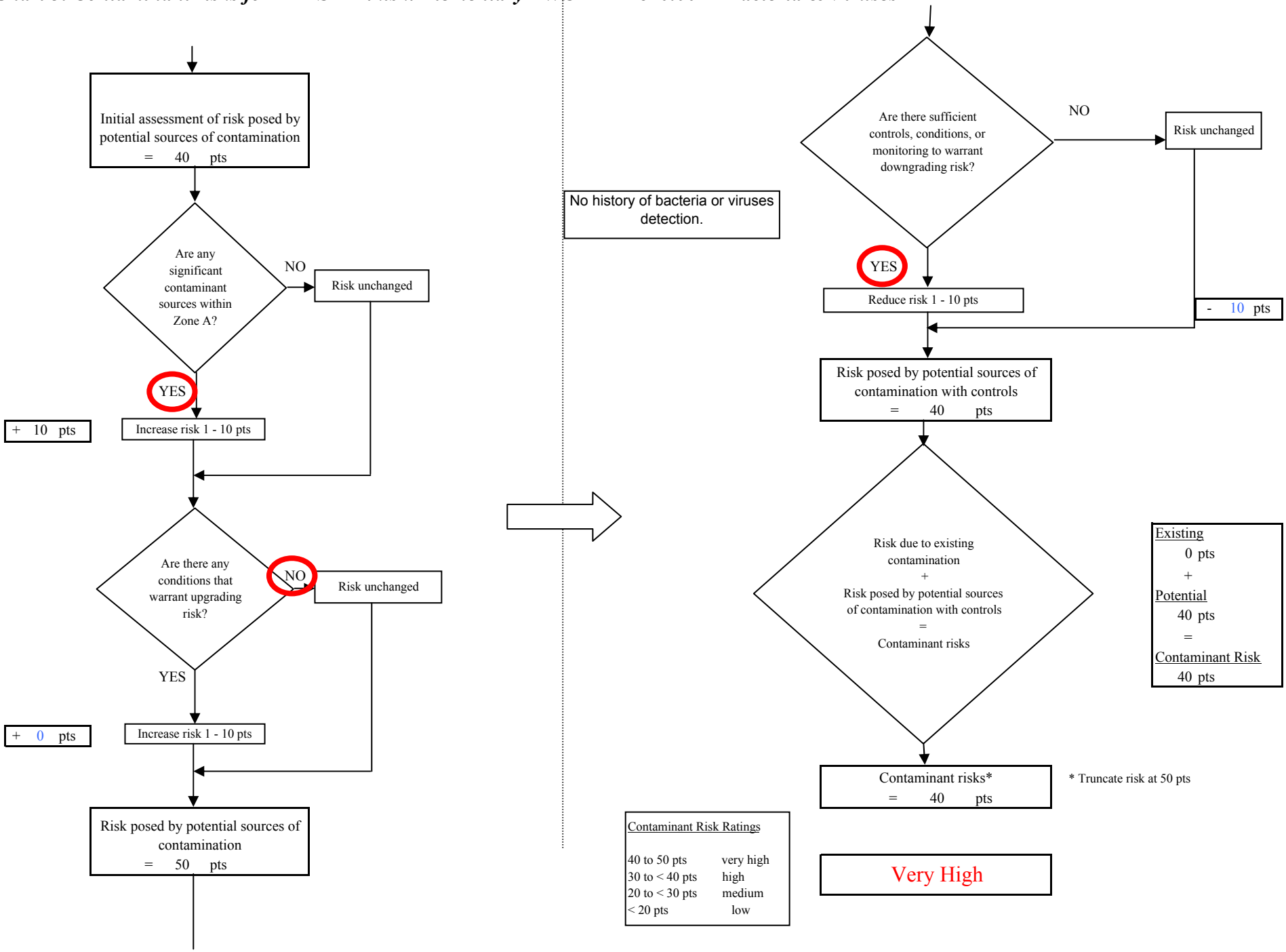


Chart 4. Vulnerability analysis for KPBSD Nikiski Elementary-PWSID 242610.001 - Bacteria & Viruses

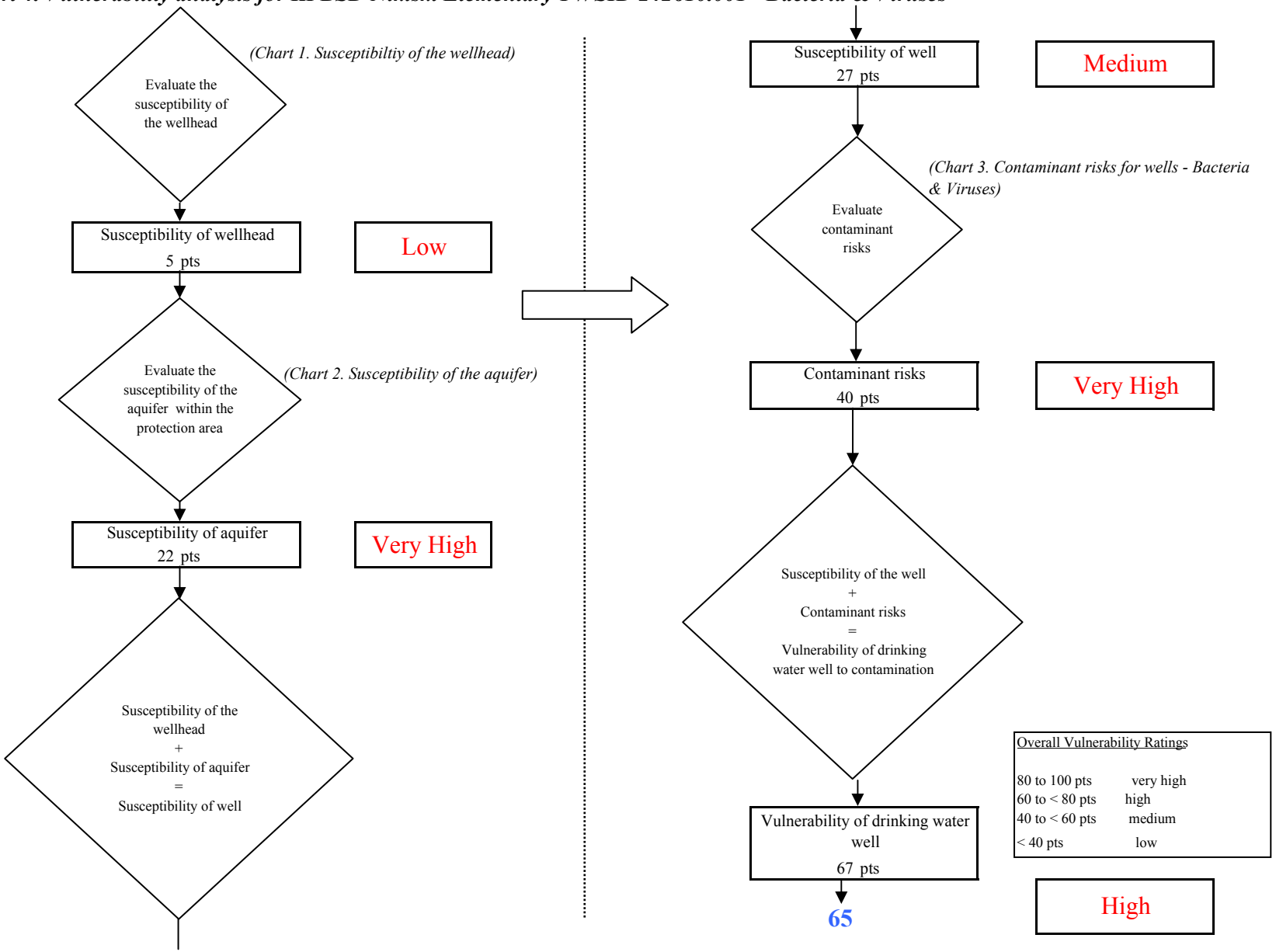


Chart 5. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Nitrates and Nitrites

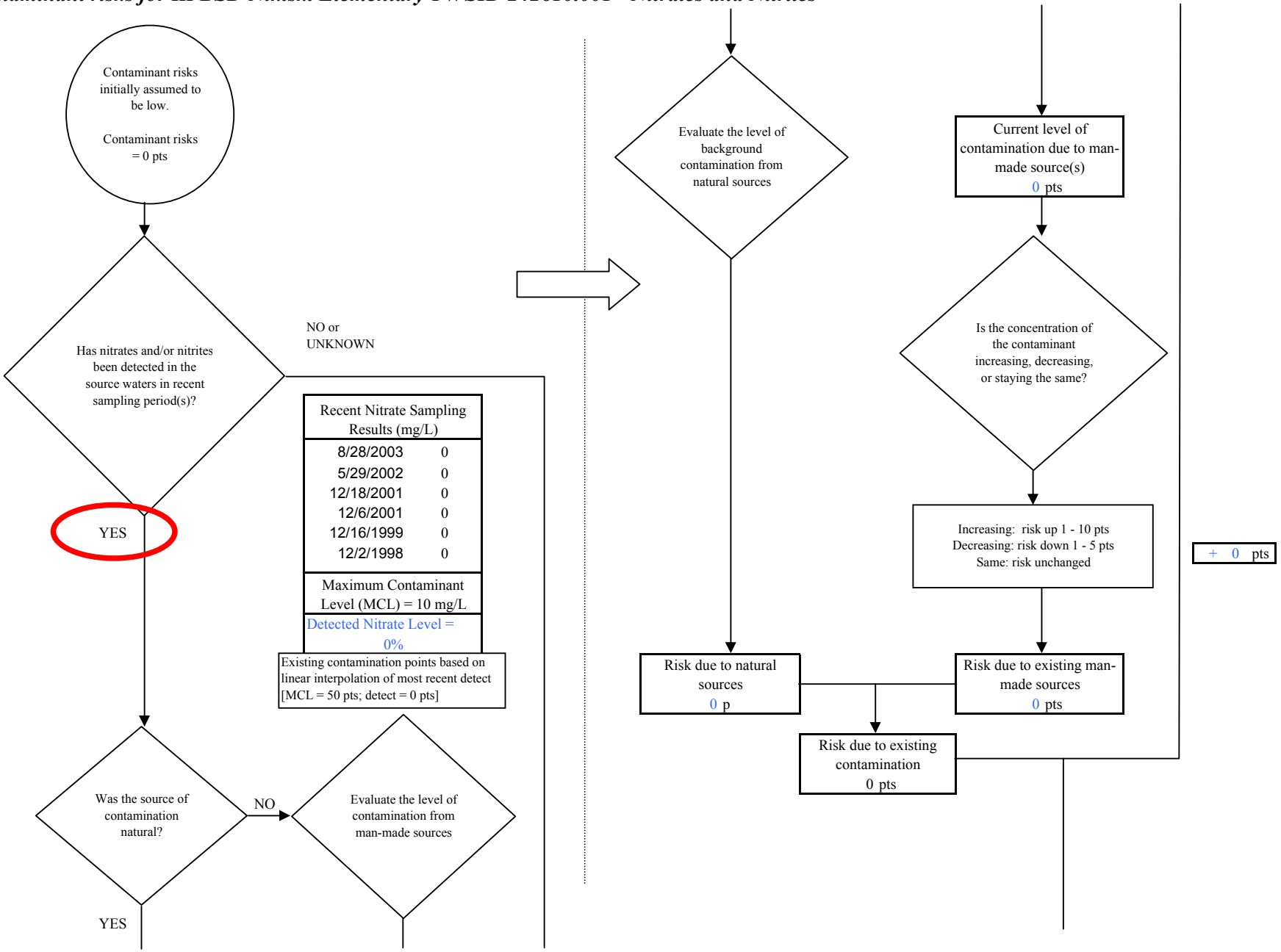


Chart 5. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Nitrates and Nitrites

+ 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)	10	11	21
Medium(s)	0	1	1
Low(s)	66	29	95

	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

+ 10 pts

Chart 5. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Nitrates and Nitrites

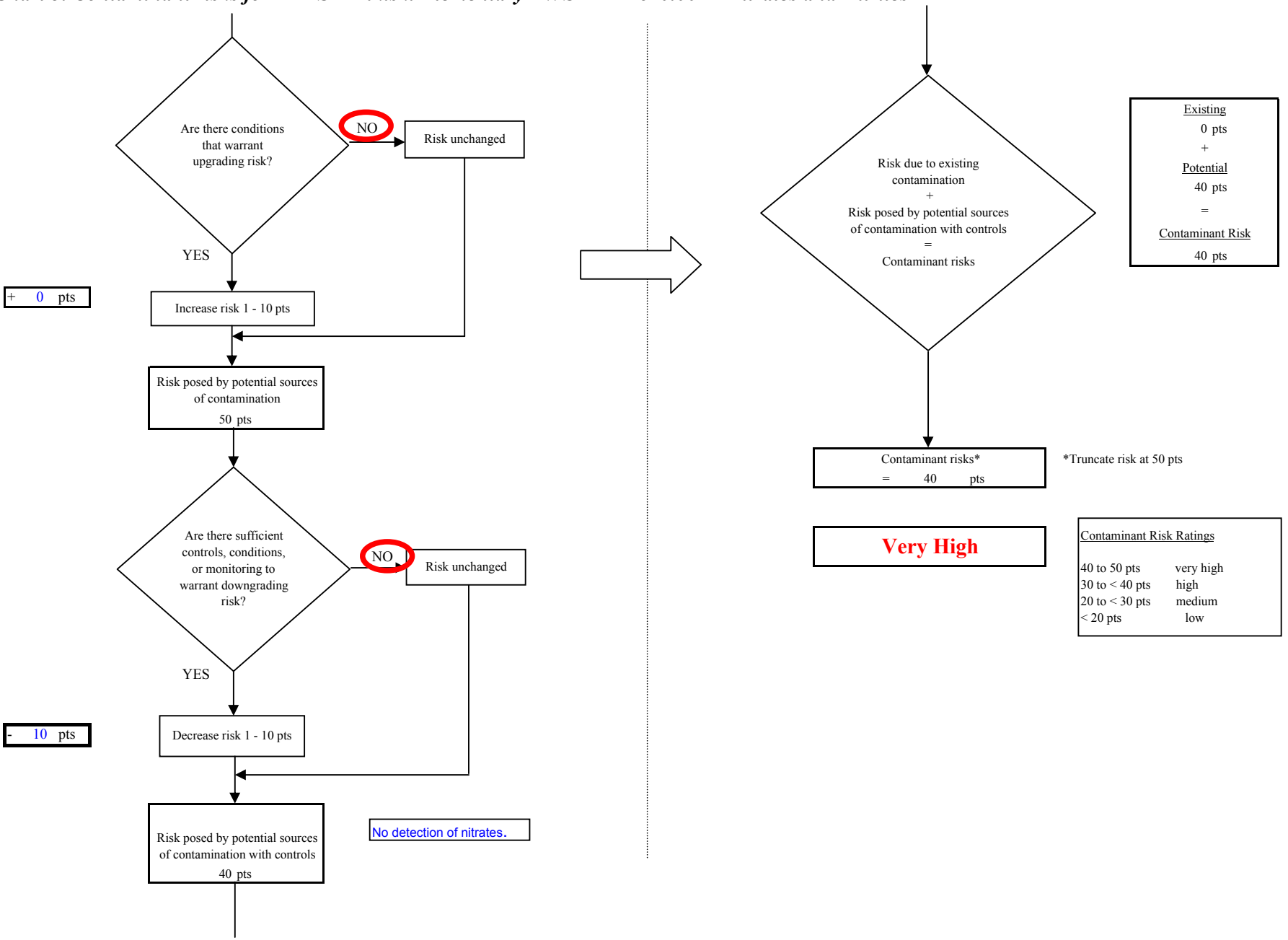


Chart 6. Vulnerability analysis for KPBSD Nikiski Elementary-PWSID 242610.001 - Nitrates and Nitrites

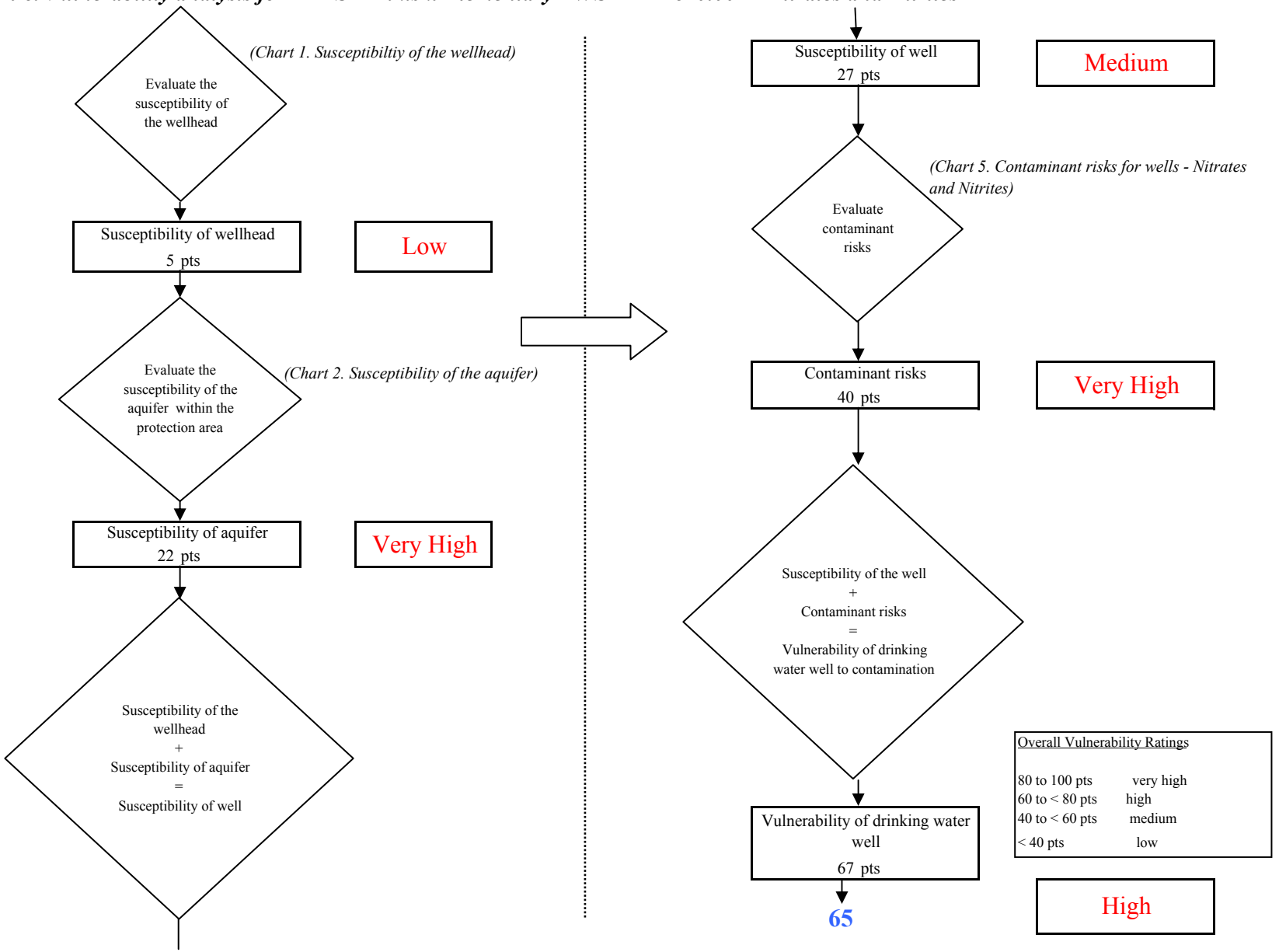


Chart 7. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Volatile Organic Chemicals

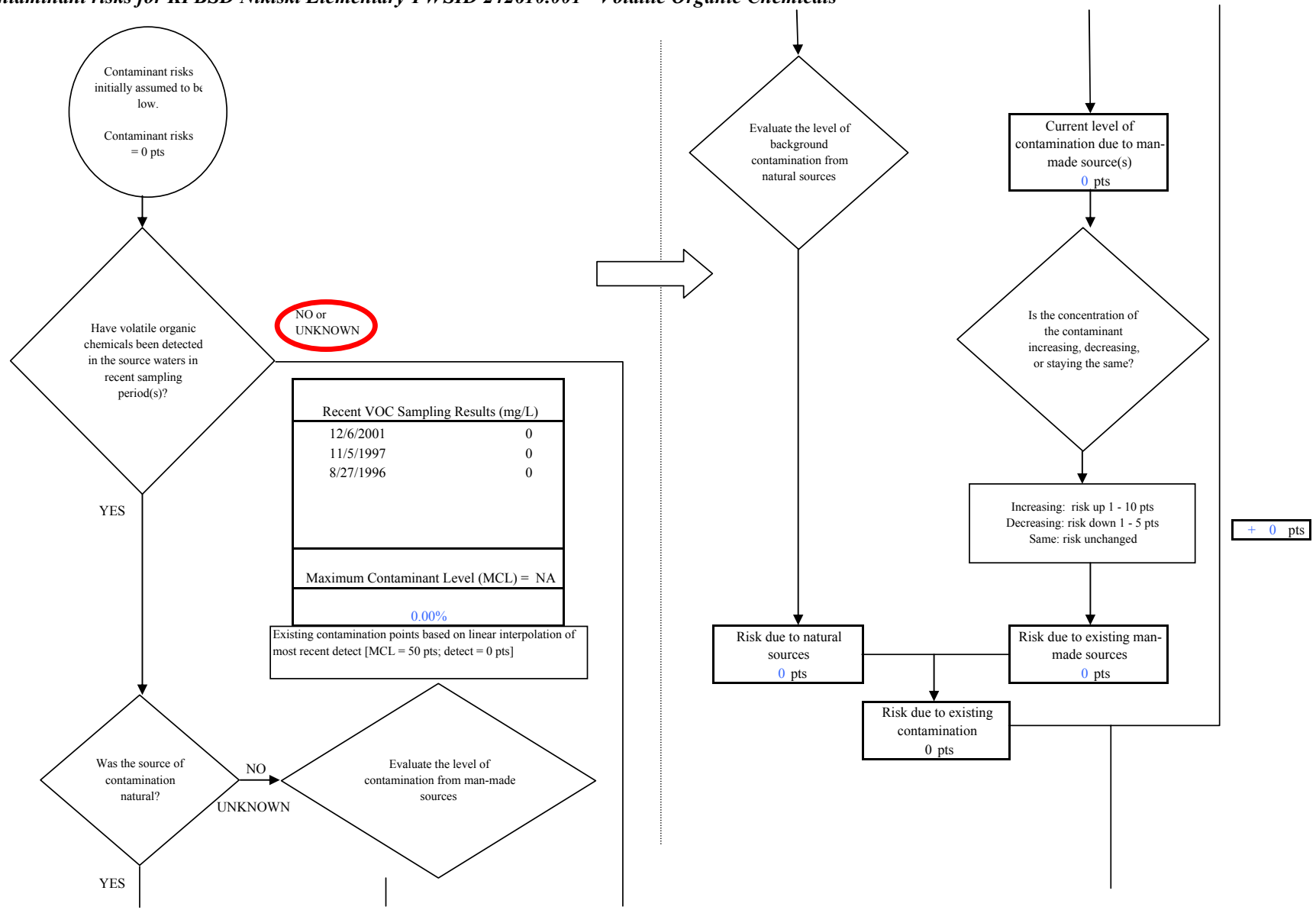


Chart 7. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Volatile Organic Chemicals

+ 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)	3	3	6
Medium(s)	2	2	4
Low(s)	20	20	40

	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 th 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 significan sources within Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 10 pts

Chart 7. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Volatile Organic Chemicals

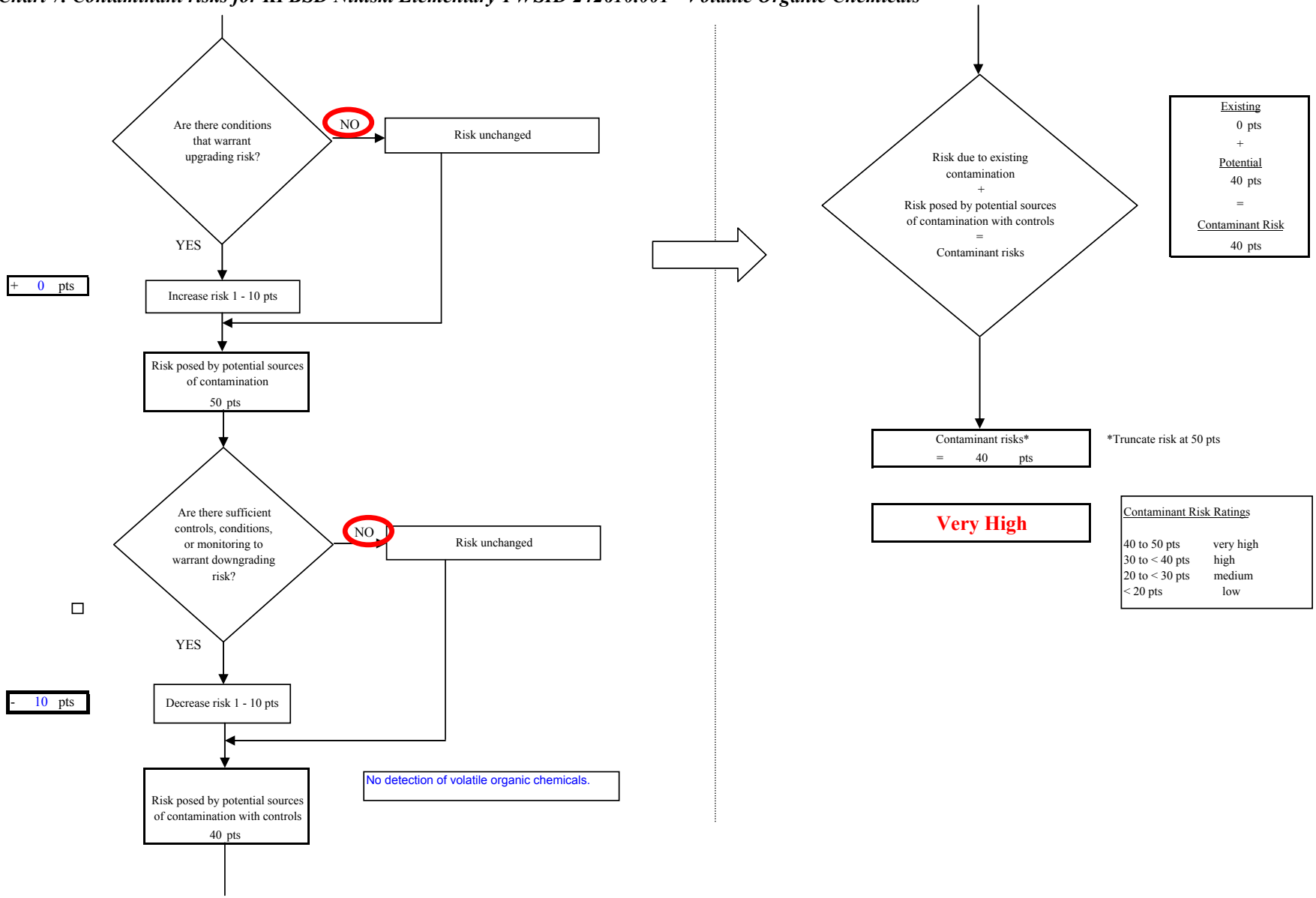


Chart 8. Vulnerability analysis for KPBSD Nikiski Elementary-PWSID 242610.001 - Volatile Organic Chemicals

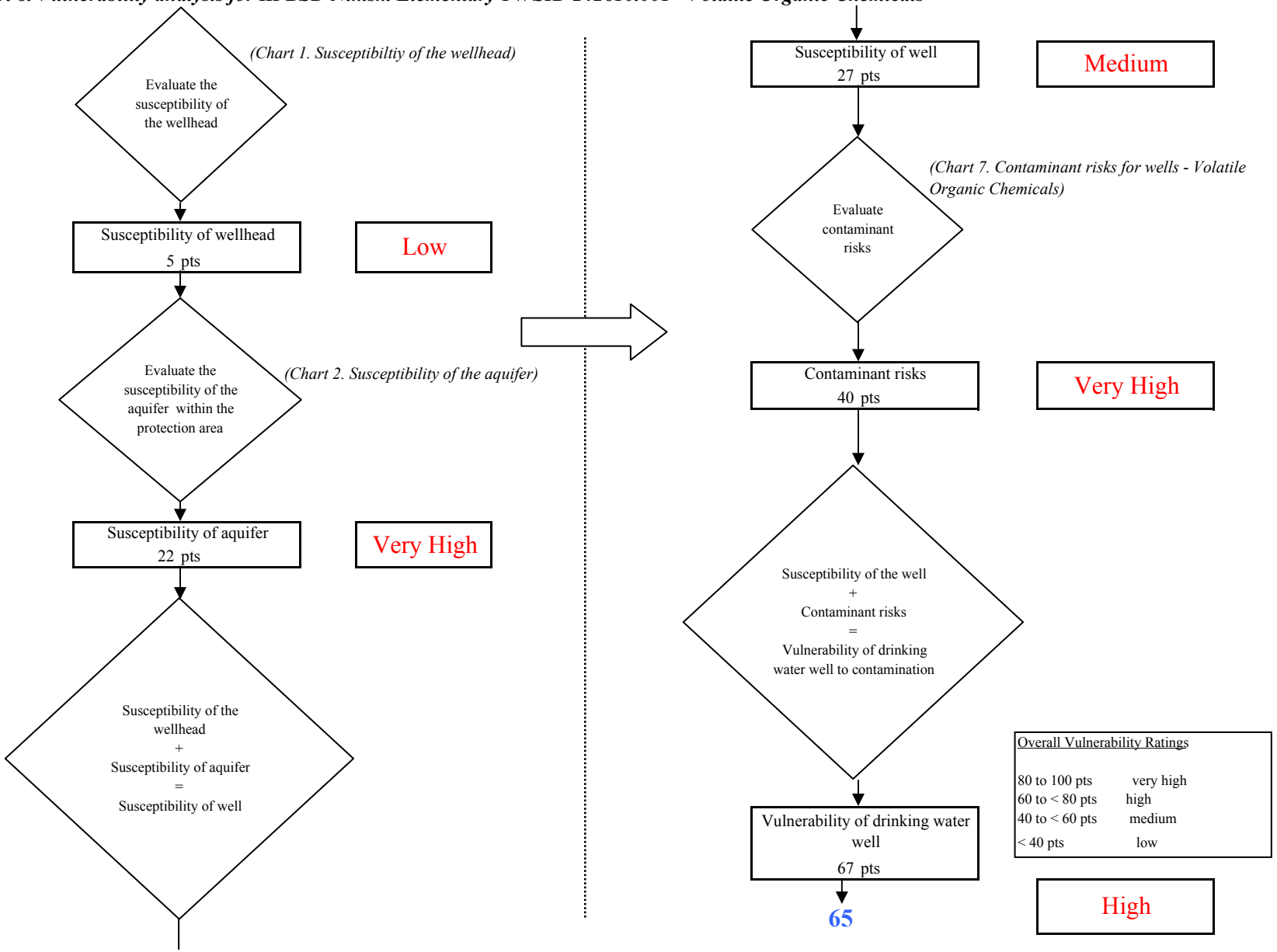


Chart 9. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Heavy Metals, Cyanide and Other Inorganic Chemicals

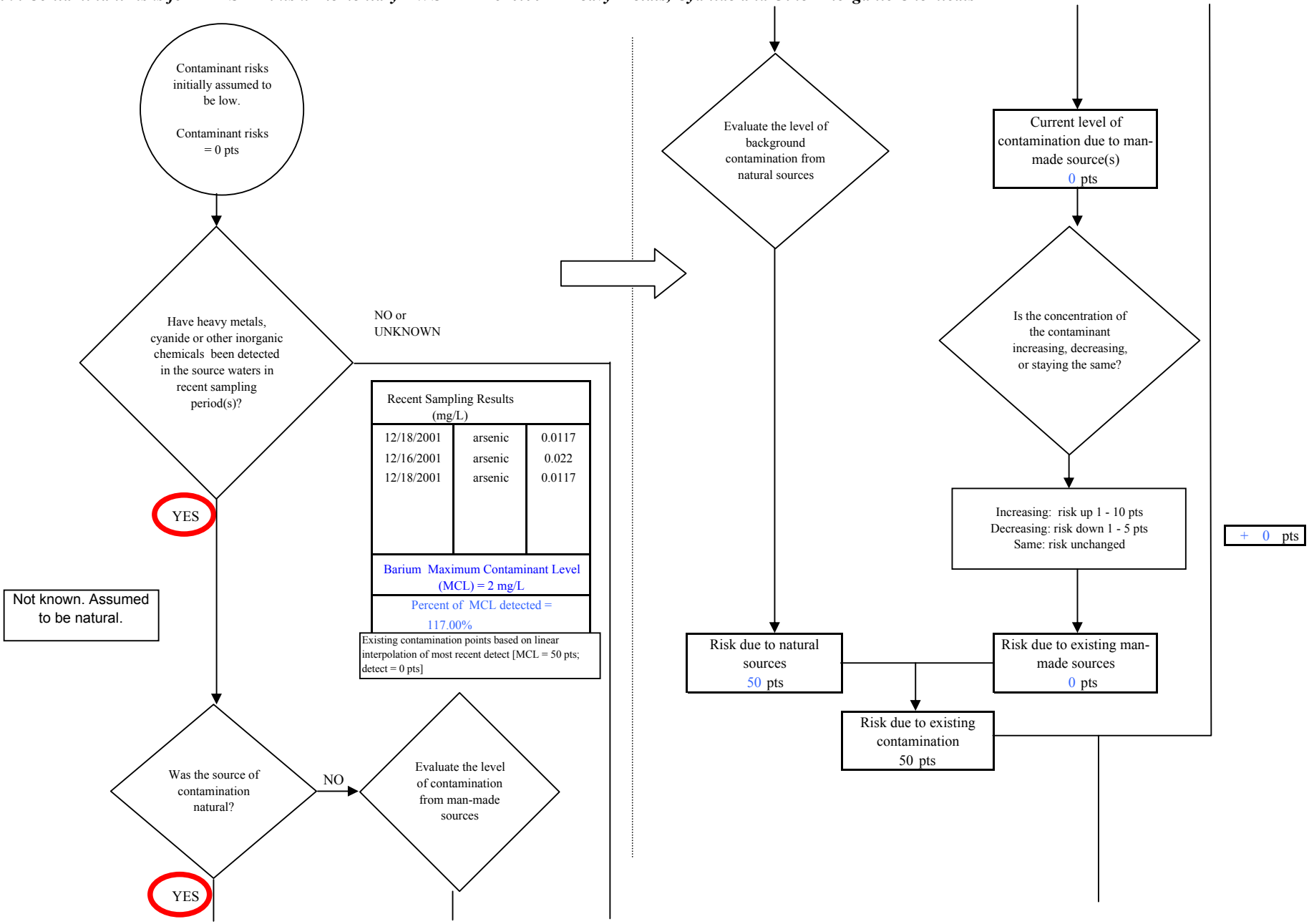


Chart 9. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 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)	3	3	6
Medium(s)	0	1	1
Low(s)	15	17	32

	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

+ 10 pts

Chart 9. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Heavy Metals, Cyanide and Other Inorganic Chemicals

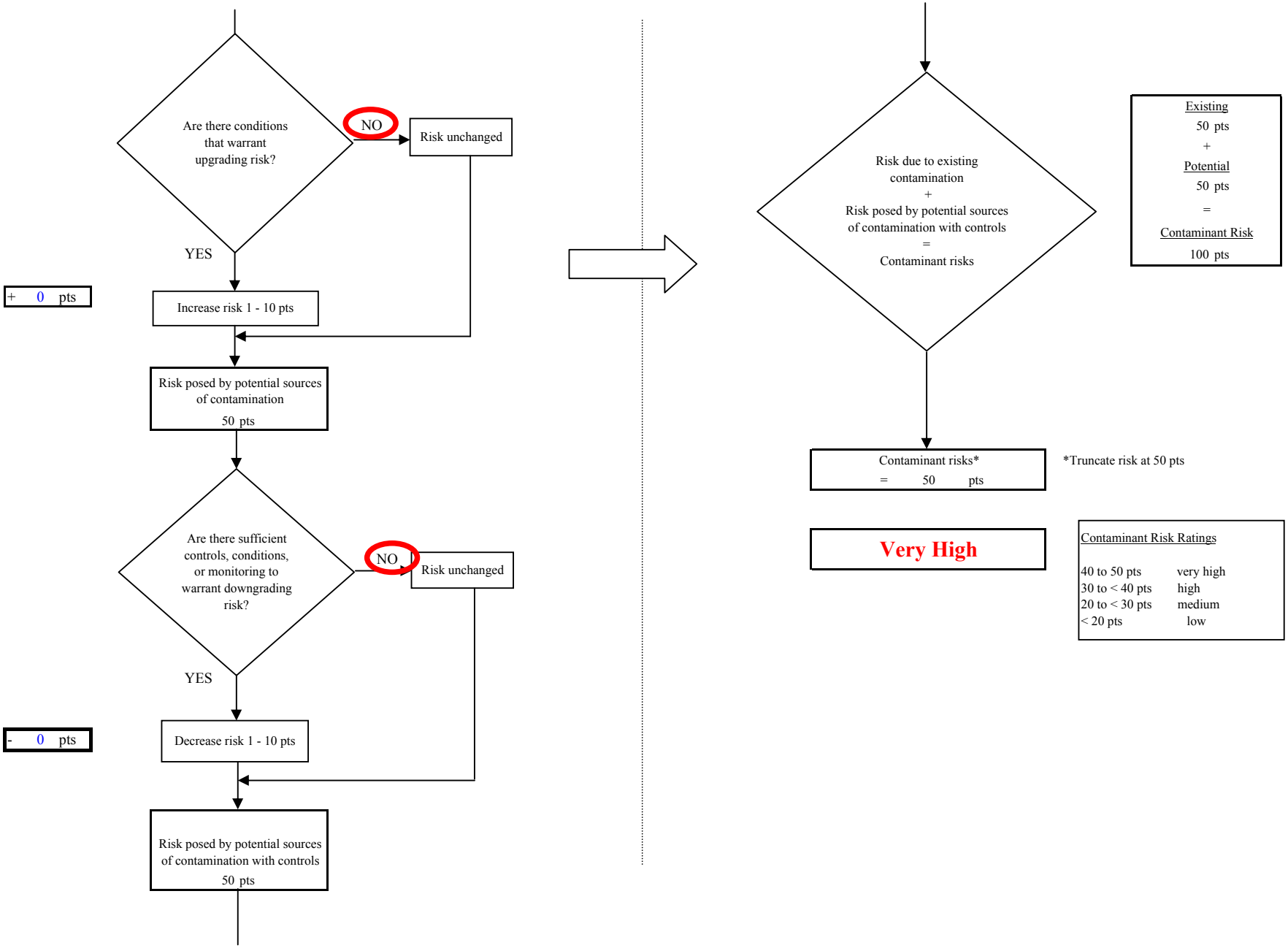


Chart 10. Vulnerability analysis for KPBSD Nikiski Elementary-PWSID 242610.001 - Heavy Metals, Cyanide and Other Inorganic Chemicals

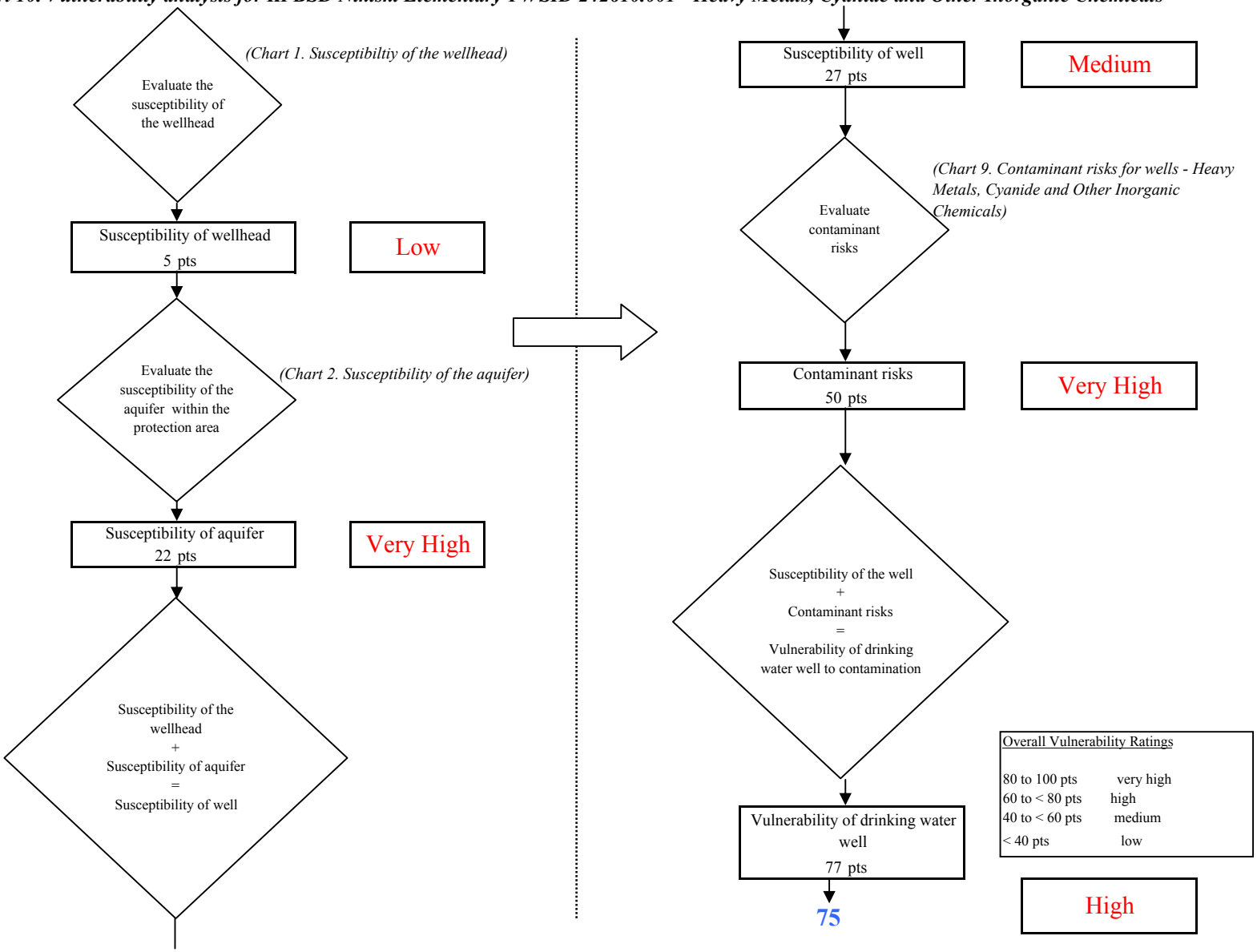


Chart 11. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Synthetic Organic Chemicals

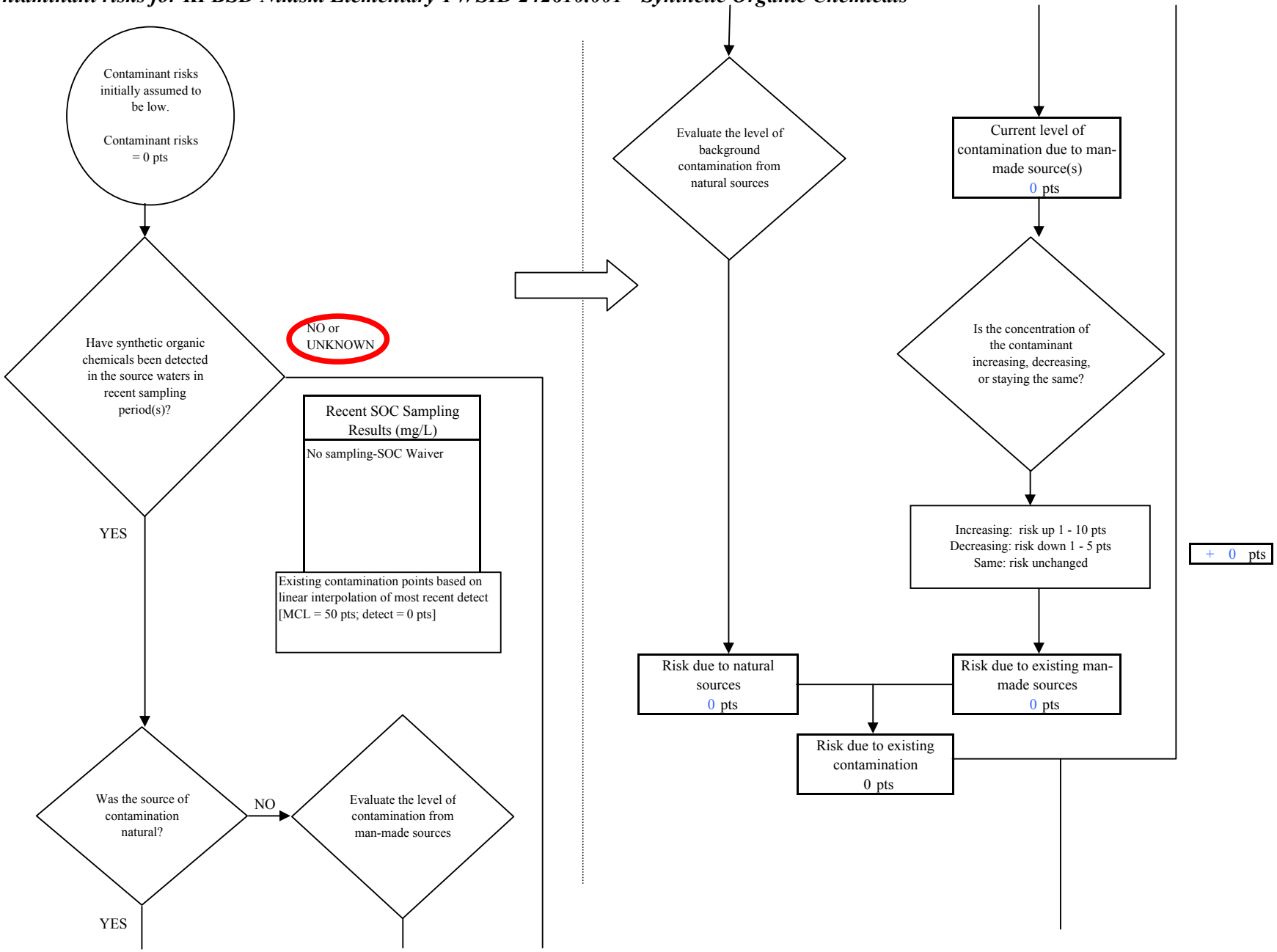


Chart 11. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Synthetic Organic Chemicals

+ 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	1	1
Low(s)	15	16	31

	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

+ 5 pts

Chart 11. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Synthetic Organic Chemicals

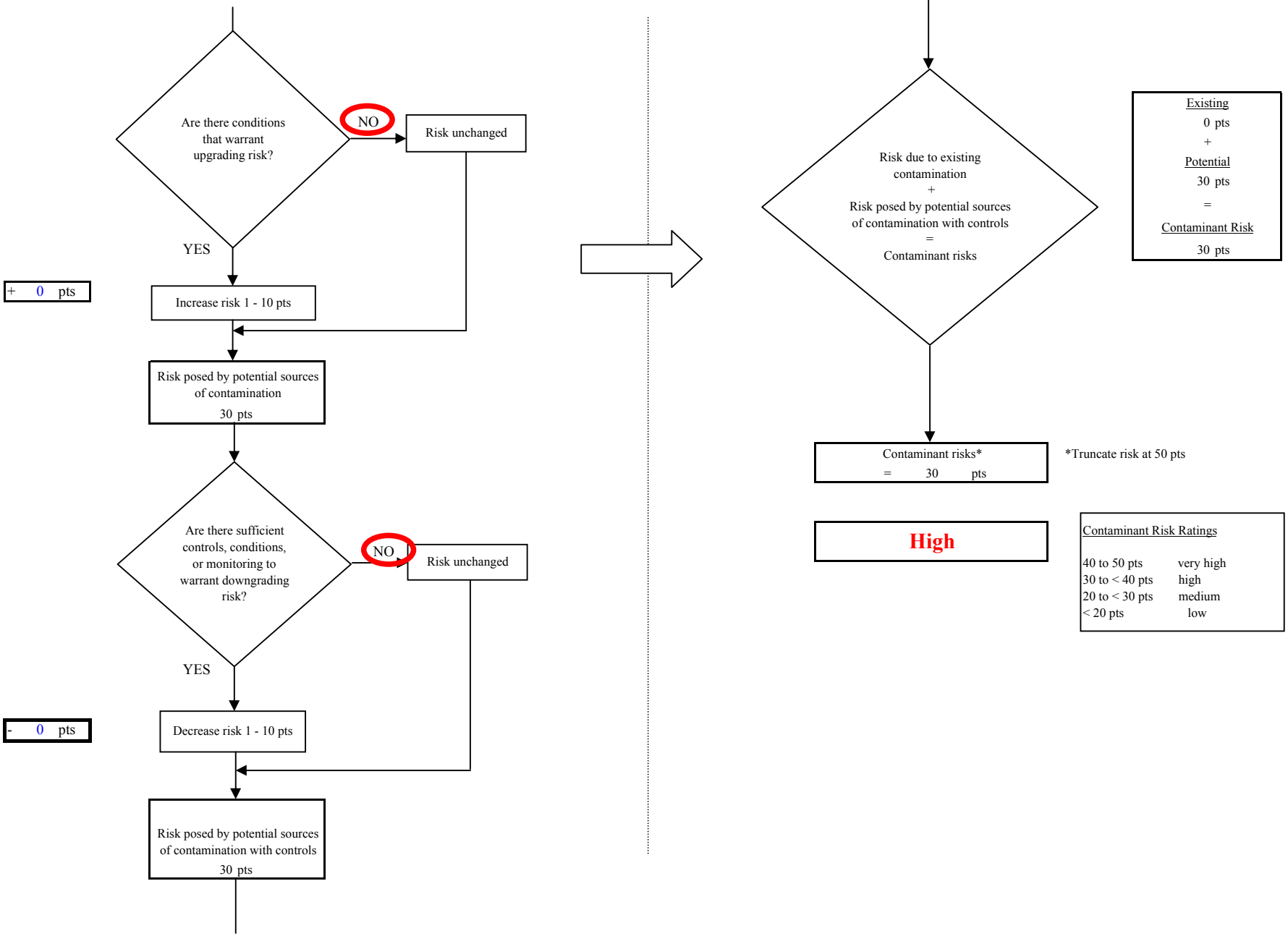


Chart 12. Vulnerability analysis for KPBSD Nikiski Elementary-PWSID 242610.001 - Synthetic Organic Chemicals

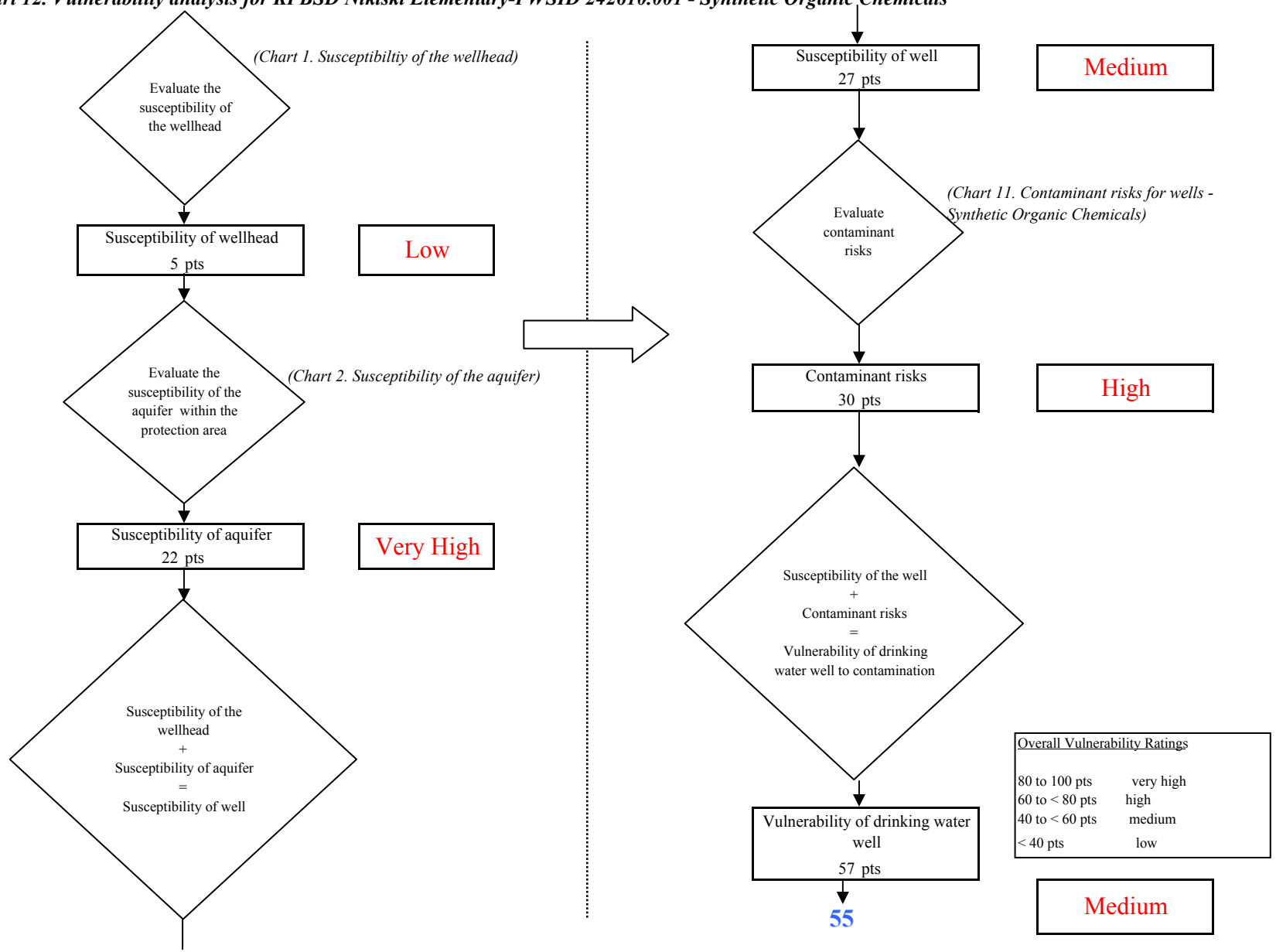


Chart 13. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Other Organic Chemicals

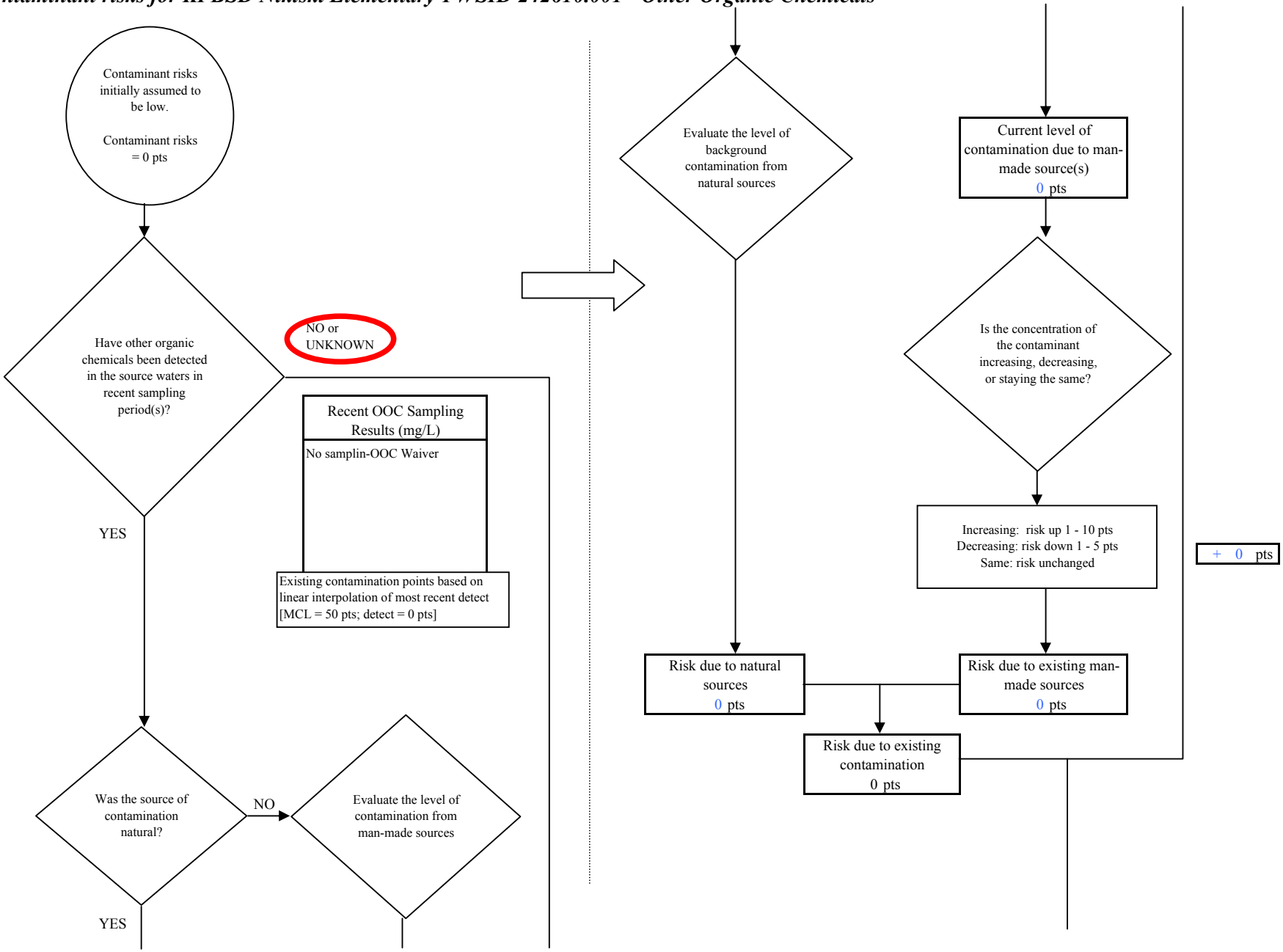


Chart 13. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Other Organic Chemicals

+ 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)	4	1	5
Low(s)	14	15	29

	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

+ 10 pts

Chart 13. Contaminant risks for KPBSD Nikiski Elementary-PWSID 242610.001 - Other Organic Chemicals

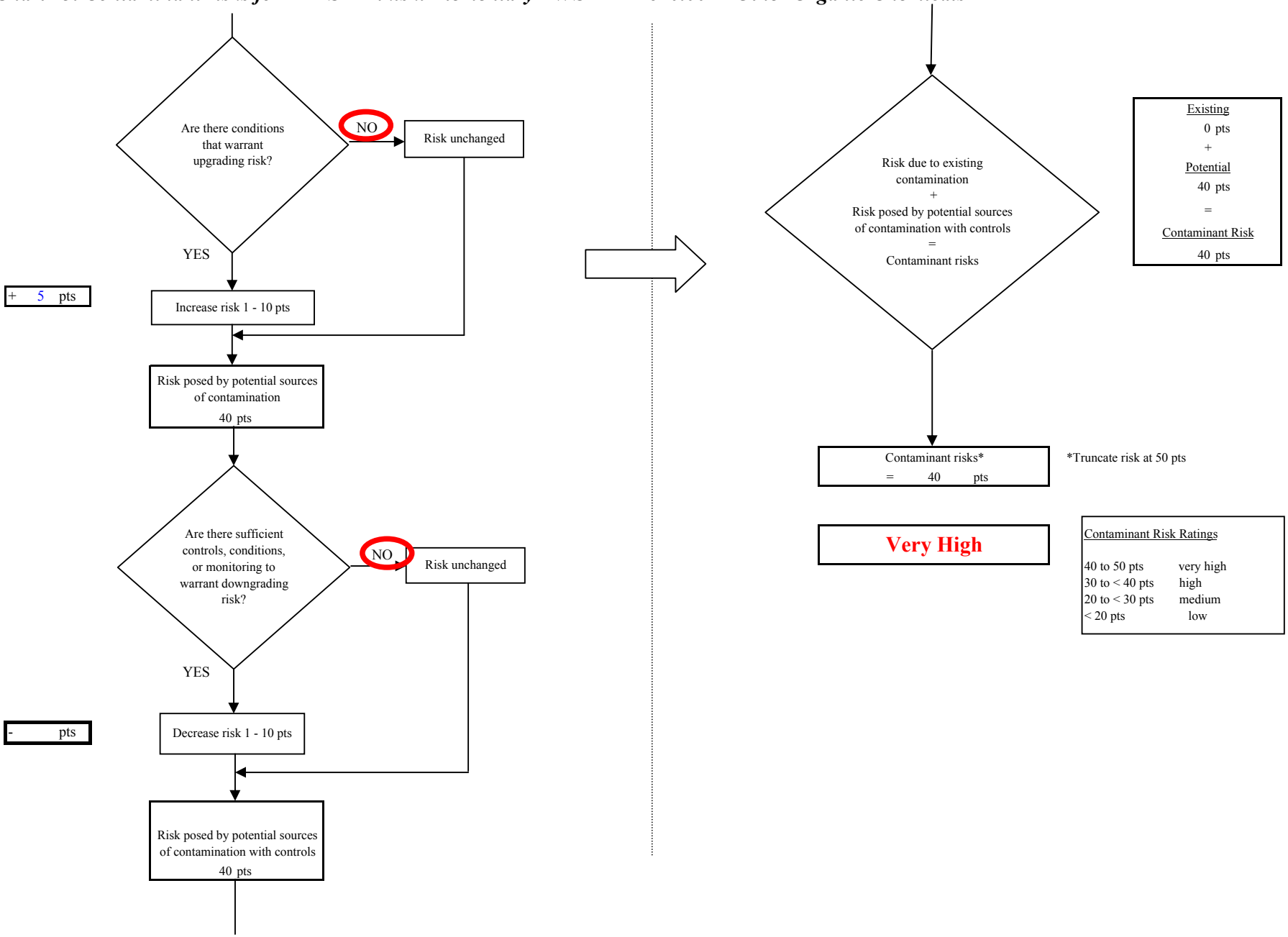


Chart 14. Vulnerability analysis for KPBSD Nikiski Elementary-PWSID 242610.001 - Other Organic Chemicals