Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for KPBSD Cooper Landing School Drinking Water System, Cooper Landing, Alaska PWSID # 240838

May 2003

DRINKING WATER PROTECTION PROGRAM REPORT Report 858
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 KPBSD Cooper Landing School Source of Public Drinking Water, Cooper Landing, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for KPBSD Cooper Landing School is a Class A water system (nontransient/noncommunity), consisting of one well along Bean Drive off of the Sterling Highway Drive. The wellhead received a susceptibility rating of **Medium** and the aquifer received a susceptibility rating of **Medium**. Combining these two ratings produces a **Medium** rating for the natural susceptibility of the well. Identified potential and current sources of contaminants for KPBSD Cooper Landing School public drinking water source include a large capacity septic system. This identified potential and existing sources of contamination is considered as sources of bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals. Combining the natural susceptibility of the well with the contaminant risk, the public water source for KPBSD Cooper Landing School received a vulnerability rating of **High** for heavy metals, **Medium** for nitrates and/or nitrites, bacteria and viruses and **Low** for volatile organic chemicals, other organic chemicals and synthetic organic chemicals. This assessment can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of KPBSD Cooper Landing School to protect public health

KENAI PENINSULA BOROUGH SCHOOL DISTRICT-COOPER LANDING SCHOOL PUBLIC DRINKING WATER SYSTEM

The Cooper Landing School public water system is a Class A (community) water system. The system consists of one well along Bean Drive off of the Sterling Highway. Cooper Landing is located in the Kenai Peninsula Borough. The Borough encompasses 25,600 square miles, which only 15,700 square miles are land. The Kenai Peninsula is broken into two distinct geographic areas; the Kenai Mountains and the Kenai Lowland. The Kenai Mountains include Cooper Landing, Moose Pass, Crown Point, Trail Lake, and Seward. The Kenai Lowlands are located in the west and compromise about 2900 square miles and include the towns of Sterling, Soldotna, Kenai, Clam Gulch, Ninilchik and Homer.

Although the quality can vary significantly in a short distance, groundwater supplies are abundant in the area. Several areas on the Kenai Peninsula have a central water system, and several subdivisions have private water systems. Many homes and businesses in the area, however, rely on individual wells for their water supply. Most of these wells are shallow with depths of less than 70 feet. Static water levels in many of these wells are around 30 feet below the surface.

According to the most recent Sanitary Survey (11/16/01) the depth of the well is 99 feet below the surface. There is no well log available for this well. However, logs in the area indicate a coning layer exists from 46-72 feet below the surface. The static water level of a nearby well, completed at a similar depth, was 58 feet below surface level at the time of drilling (1997). The Sanitary Survey indicates that the land surface is not sloped away from the well. This can lead to pooling of water near the wellhead. The standing water may travel down the casing into source waters. It is unknown whether this well is grouted, however due to the period of construction it is likely that it is not grouted. A properly grouted well can provide protection from contaminants traveling along the casing. The well was installed with a cap providing a sanitary seal. A properly installed sanitary seal provides protection from contaminant from entering the source waters at the casing.

The system operates year-round and serves 54 non-residents through 1 service connections.

KPBSD COOPER LANDING SCHOOL 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. 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.

The protection areas established for wells by 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.

An outline of the immediate watershed and an analytical calculation was used to determine the size and shape of the protection area for KPBSD Cooper Landing School. The input parameters describing the attributes of the aquifer for the analytical calculation were adopted from Groundwater (Freeze and Cherry 1979). Available geology was also considered to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful protection area (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 of the water for each:

Table 1. Definition of Zones

Zone	Definition
A	¼ the distance for the 2-yr. time-of-travel
B	Less than the 2 year time-of-travel
C	Less Than the 5 year time-of-travel
D	Less than the 10 year time-of-travel

The protection area for KPBSD Cooper Landing School is limited by its immediate watershed and includes only Zone A (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 Cooper Landing School protection area. 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 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 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 7 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/other inorganic chemicals, synthetic organic chemicals and other organic chemicals.

VULNERABILITY OF KPBSD COOPER LANDING SCHOOL DRINKING WATER SYSTEM

Appendix D contains fourteen charts, which together form the 'Vulnerability Analysis' for a source water assessment for a public drinking water source. Chart 1 analyzes the 'Susceptibility of the Wellhead' to contamination by looking at the construction of the well

and its surrounding area. Chart 2 analyzes the 'Susceptibility of the Aquifer' to contamination by looking at the naturally occurring attributes of the water source and influences on the groundwater system that might lead to contamination. Chart 3 analyzes 'Contaminant Risks' for the drinking water source with respect to bacteria and viruses. The 'Contaminant Risks' portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the well. 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/other inorganic chemicals, synthetic organic chemicals, and other organic chemicals, respectively.

Vulnerability of a drinking water source to contamination is a combination of two factors:

- Natural susceptibility; and
- Contaminant risks.

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 Cooper Landing School appears to be completed in a semi-confined aquifer. Well logs indicate that a confining layer is present in the area. This layer may provide a protective barrier from the movement of contaminants to the subsurface. However, logs in the area indicate that the confining layer is discontinuous. In areas where the protective layer is not present, contaminants may enter the aquifer uninhibited though direct infiltration of precipitation.

Table 2 shows the Susceptibility scores and ratings for KPBSD Cooper Landing School .

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	10	Medium
Susceptibility of the Aquifer	10	Medium
Natural Susceptibility	20	Medium

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

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

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

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	35	High
Nitrates and/or Nitrites	36	High
Volatile Organic Chemicals	13	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	50	Very High
Synthetic Organic Chemicals	12	Low
Other Organic Chemicals	12	Low

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

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

Vulnerability of the
Drinking Water Source to Contamination (0 – 100).

Again, rankings are assigned according to a point score:

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

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

Table 4. Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	55	Medium
Nitrates and Nitrites	55	Medium
Volatile Organic Chemicals	35	Low
Heavy Metals, Cyanide, and Other Inorganic Chemicals	70	High
Synthetic Organic Chemicals	30	Low
Other Organic Chemicals	30	Low

Bacteria and Viruses

The contaminant risk for bacteria and viruses is high with a large capacity septic system creating risk to the source water. (See Chart 3 – Contaminant Risks for Bacteria and Viruses in Appendix D).

Only a small amount of bacteria and viruses are required to endanger public health. Bacteria and viruses have not been detected during recent water sampling of the system. 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 medium.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is high with large capacity septic systems creating risk to the source water. (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D). Nitrates are very mobile, moving at approximately the same rate as water.

Sampling history for KPBSD Cooper Landing School well indicates that low concentrations of nitrate have been detected. Existing nitrate concentration is approximately 0.130 mg/L or 1% of the Maximum Contaminant Level (MCL) of 10 milligrams per liter (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. Nitrate concentrations have varying from 0.13 to 0.586 mg/L within the past five years.

It is unknown how much of the existing nitrate concentration can be attributed to natural or human-made sources. Nitrate concentrations in uncontaminated groundwater are typically less than 2 mg/L, or 20% of the MCL, and are derived primarily from the decomposition of organic matter in soils (Wang, Strelakos, Jokela, 2000). The levels detected are considered safe for human consumption.

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 contaminant risk for volatile organic chemicals is low with large capacity septic systems creating risk for volatile organic chemicals (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D). Cooper Landing and the surrounding area heat there homes with various types of on-site fuel sources. For purposes of this report, it is assumed that above ground oil tanks are used for heating. 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.

Volatile organic chemicals have detected low concentrations of dichloromethane during recent a sampling of the well. Dichloromethane is a common laboratory chemical and is often detected is samples due to cross-contamination. The level detected is 10% of the MCL and considered safe for human consumption. 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 low.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is very high with large capacity septic systems, above ground fuel tanks

and existing contamination creating risk. (See Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

Arsenic levels have been detected at levels that exceed the current MCL of 0.01 mg/l. According to the EPA "arsenic occurs naturally in rocks and soil, water, air, and plants and animals. It can be further released into the environment through natural activities such as volcanic action, erosion of rocks, and forest fires, or through human actions. Approximately 90 percent of industrial arsenic in the U.S. is currently used as a wood preservative, but arsenic is also used in paints, dyes, metals, drugs, soaps, and semi-conductors. Agricultural applications, mining, and smelting also contribute to arsenic releases in the environment." (EPA, 2001) Since there are no known sources of arsenic, it is likely that the arsenic detected at KPBSD Cooper Landing is naturally occurring.

Low concentration levels of cadmium and barium have also been detected. The barium and cadmium concentration levels detected are considered safe for human consumption. After combining the contaminant risk for heavy metals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is low with a large capacity septic system creating risk. After combining the contaminant risk with the natural susceptibility of the well, the overall vulnerability to synthetic organic chemicals of the well is low. (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

Other Organic Chemicals

The contaminant risk for other organic chemicals is low with a large capacity septic system creating the risk. After combining the contaminant risk with the natural susceptibility of the well, the overall vulnerability to other organic chemicals of the well is low. (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

Review of the historical sampling data indicates that no synthetic organic chemicals or other organic chemicals have been sampled for within the past 5 years.

Using the Source Water Assessment

This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of KPBSD Cooper Landing School to protect public health. It is anticipated that Source Water Assessments will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of KPBSD Cooper Landing School drinking water source.

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ACKNOWLEDGMENT

Source Water Assessments in the Cooper Landing 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 Cooper Landing School
Drinking Water Protection Area Location Map
(Map 1)

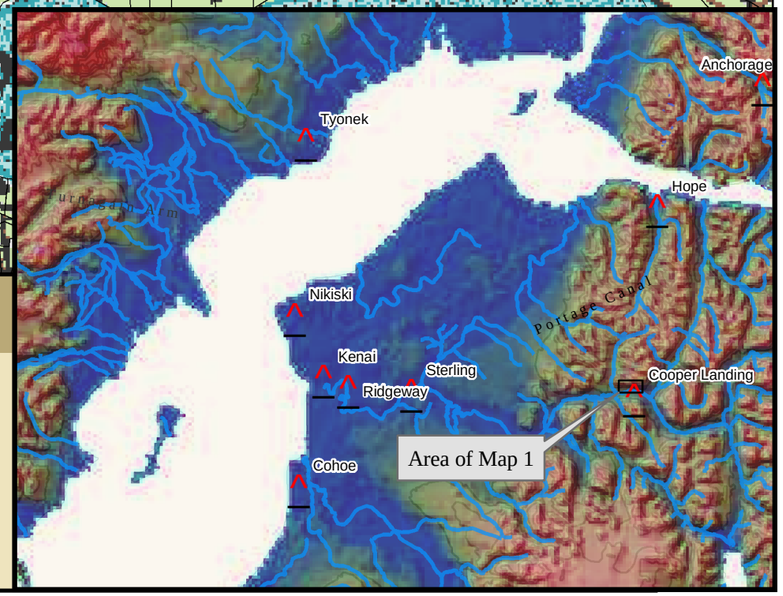
Map 1- KPBSD Cooper Landing School Drinking Water Protection Area

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 1,666 3,332 Feet 1:13,750

Data Sources:
USGS- 1:63,000 Background
DOT:Roads
RDI: Railroad and rivers.



- Well
- Zone A Protection Area
- Roads
- Parcels

APPENDIX B

Contaminant Source Inventory and Risk Ranking for KPBSD Cooper Landing School (Tables 1-7)

Table 2

Contaminant Source Inventory and Risk Ranking for KPBSD Cooper Landing School Sources of Bacteria and Viruses

PWSID 240838.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	High	2	

Table 3

Contaminant Source Inventory and Risk Ranking for KPBSD Cooper Landing School Sources of Nitrates/Nitrites

PWSID 240838.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	High	2	

Table 4

Contaminant Source Inventory and Risk Ranking for KPBSD Cooper Landing School Sources of Volatile Organic Chemicals

PWSID 240838.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	2	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	2	

Table 5

Contaminant Source Inventory and Risk Ranking for KPBSD Cooper Landing School

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 240838.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	2	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	Low	2	

Table 6

Contaminant Source Inventory and Risk Ranking for KPBSD Cooper Landing School Sources of Synthetic Organic Chemicals

PWSID 240838.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	2	

Table 7

Contaminant Source Inventory and Risk Ranking for KPBSD Cooper Landing School Sources of Other Organic Chemicals

PWSID 240838.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	2	

Table 1

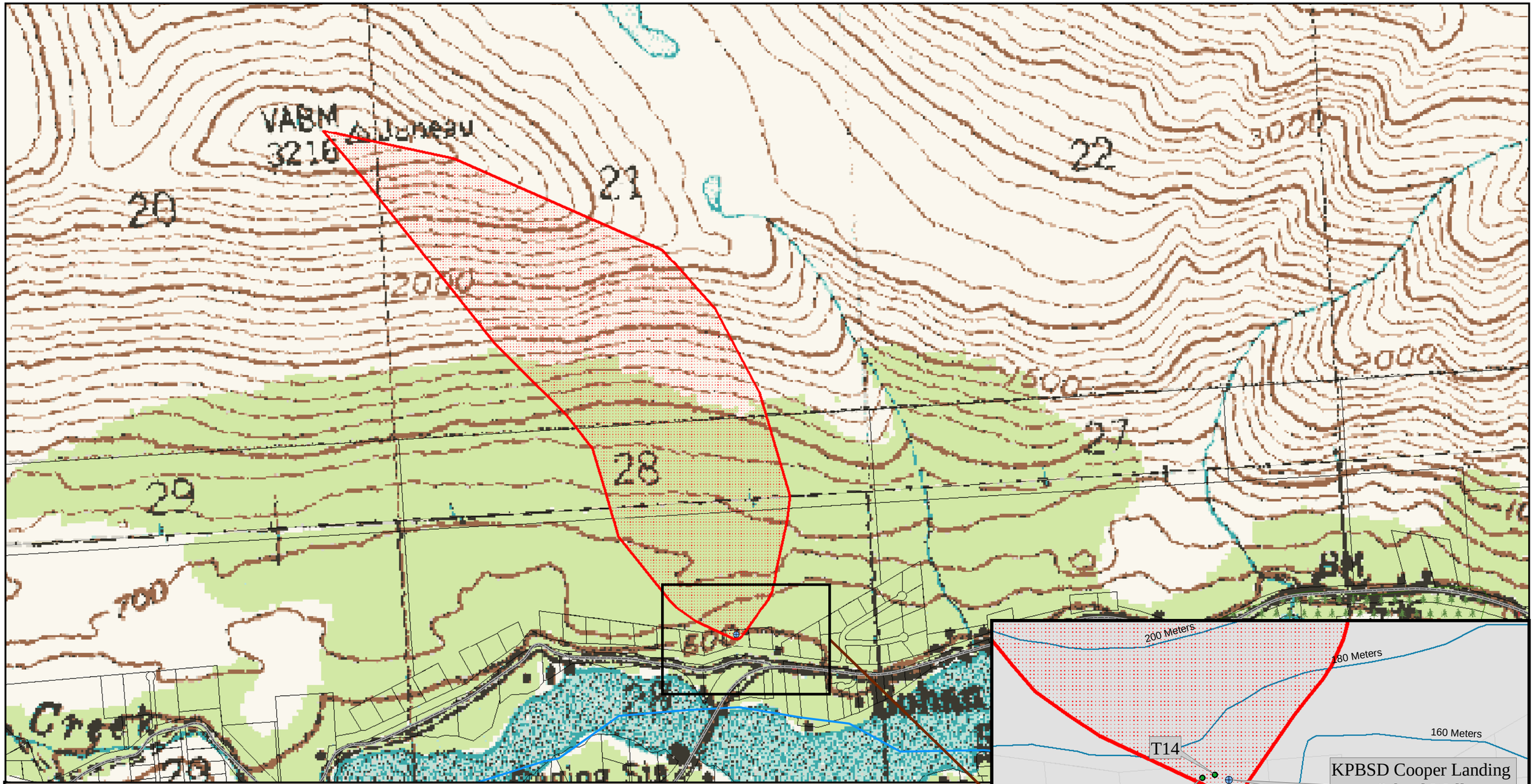
Contaminant Source Inventory for
KPBSD Cooper Landing School

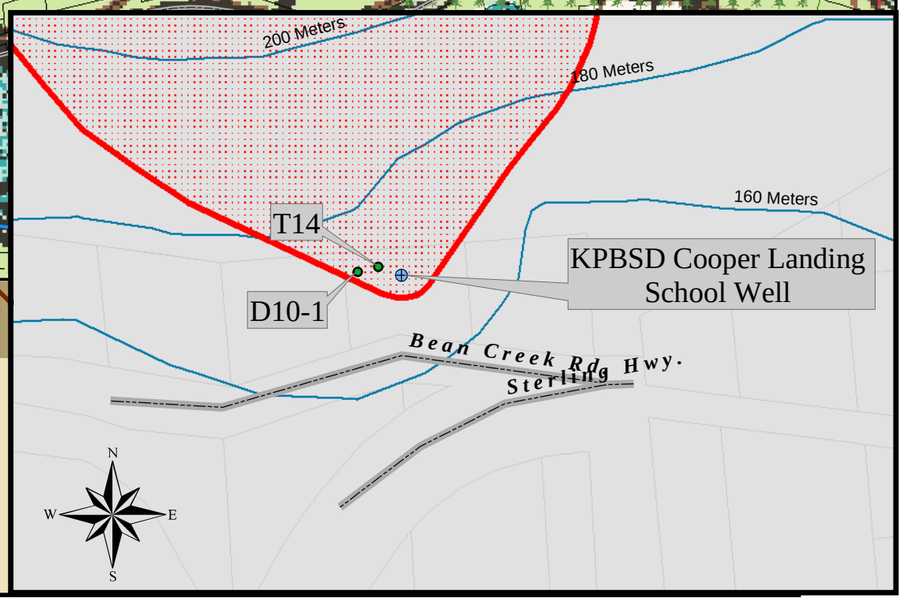
PWSID 240838.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	2	
Tanks, heating oil, nonresidential (aboveground)	T14	T14-01	A	2	

APPENDIX C

KPBSD Cooper Landing School
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)





Map 2- KPBSD Cooper Landing School Potential and Existing Source of Contamination

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

Feet
0 333 666 1,332

1:12,312

Data Sources:
USGS- 1:63,000 Background
Kenai Borough: Parcels
URS Corp.: Septics
DOT:Roads
GDT: Railroad and rivers.

Legend

- Cooper Landing Elementary Well
- Zone A Protection Area
- Large Capacity Septic System (D10)
- Tanks, heating oil, nonresidential (aboveground) (T14)
- Parcels
- Lakes
- Rivers
- Railroads
- Roads

APPENDIX D

Vulnerability Analysis for KPBSD Cooper Landing School Public Drinking Water Source

(Charts 1-14)

Chart 1. Susceptibility of the wellhead - KPBSD-Cooper Landing School

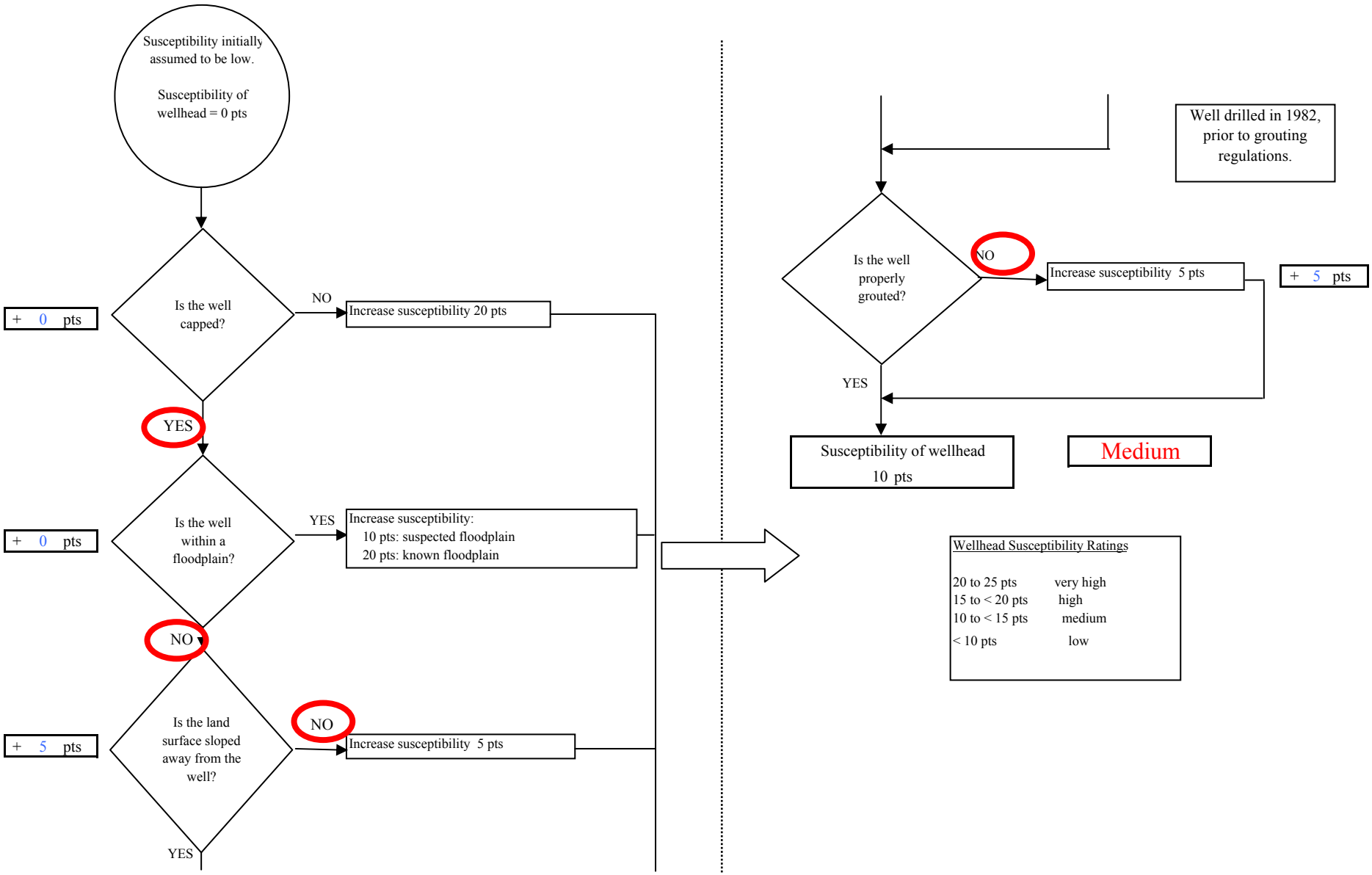


Chart 2. Susceptibility of the aquifer - KPBSD-Cooper Landing School

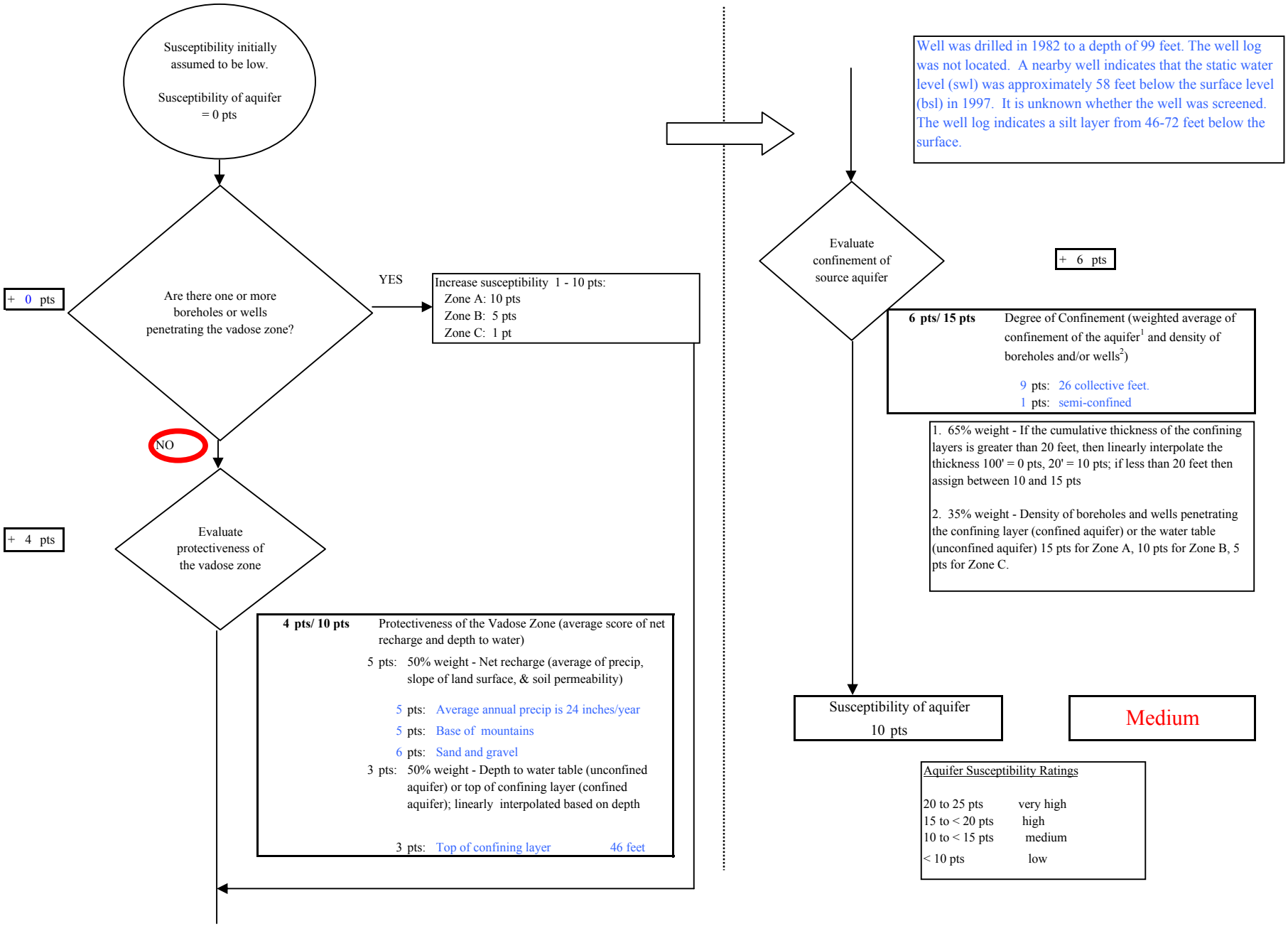
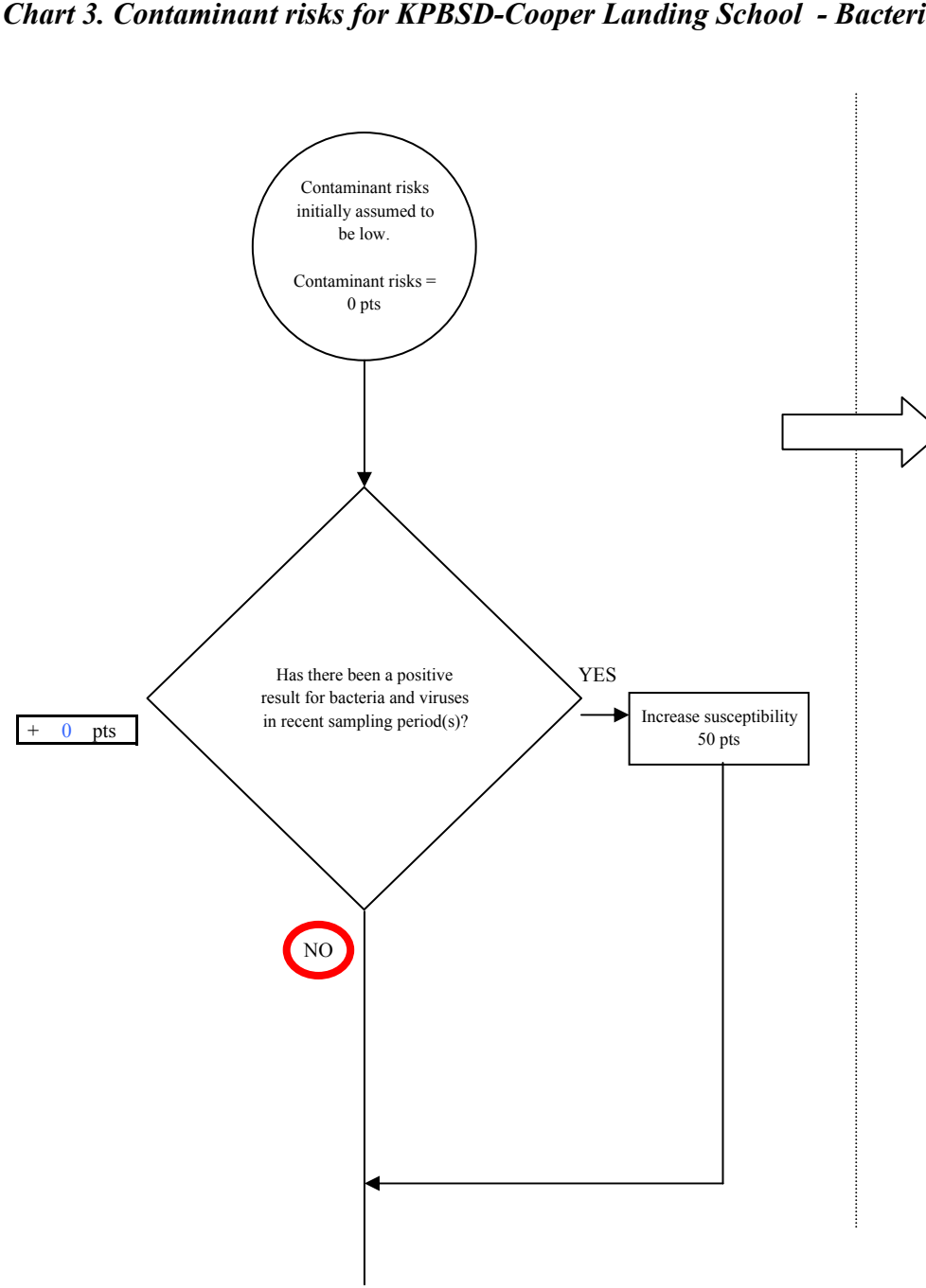
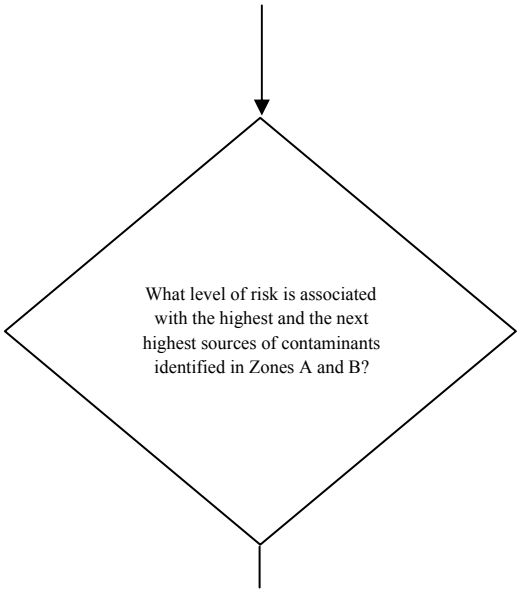


Chart 3. Contaminant risks for KPBSD-Cooper Landing School - Bacteria & Viruses





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

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

Matrix Score 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.

Chart 3. Contaminant risks for KPBSD-Cooper Landing School - Bacteria & Viruses

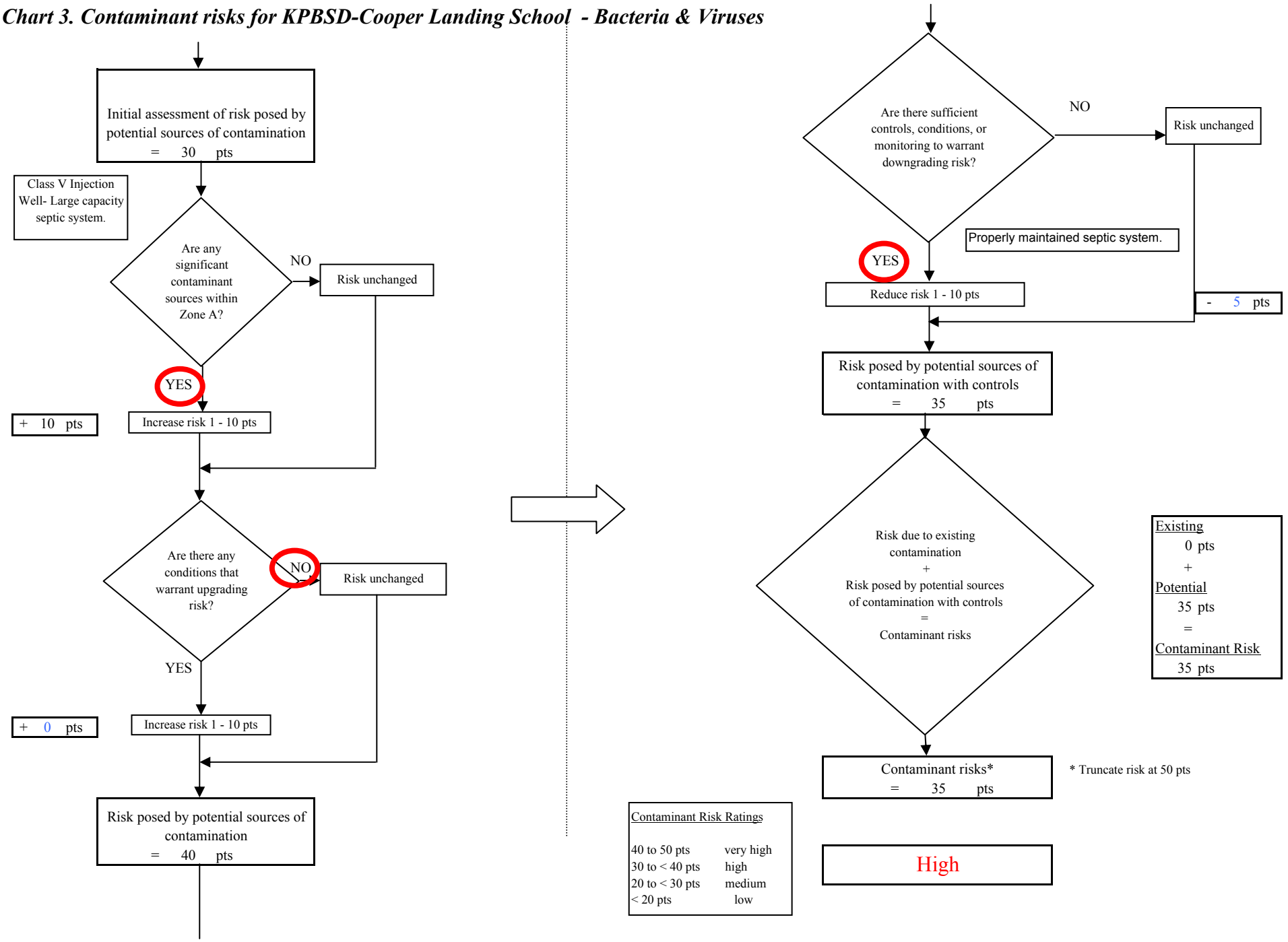


Chart 4. Vulnerability analysis for KPBSD-Cooper Landing School - Bacteria & Viruses

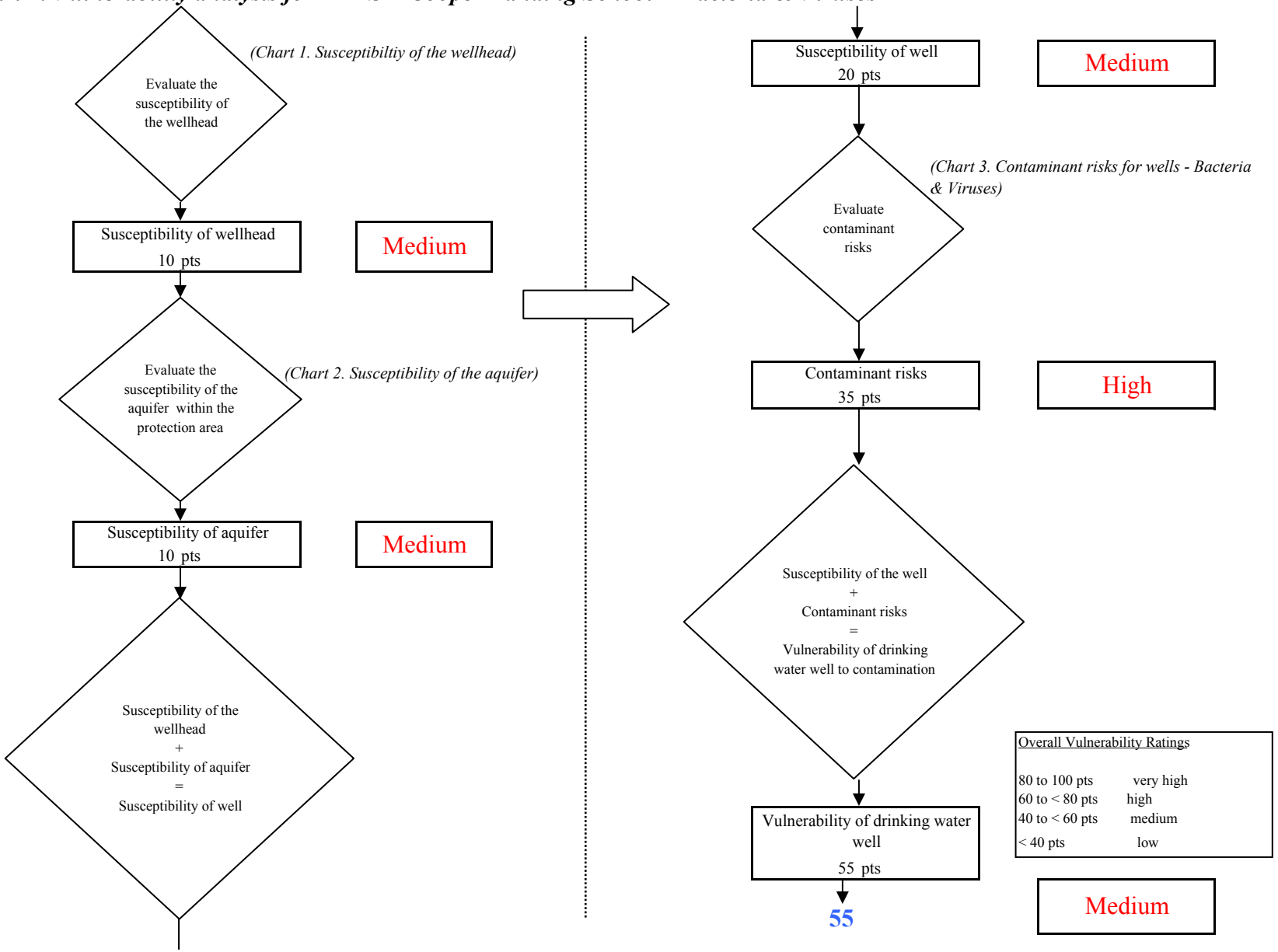


Chart 5. Contaminant risks for KPBSD-Cooper Landing School - Nitrates and Nitrites

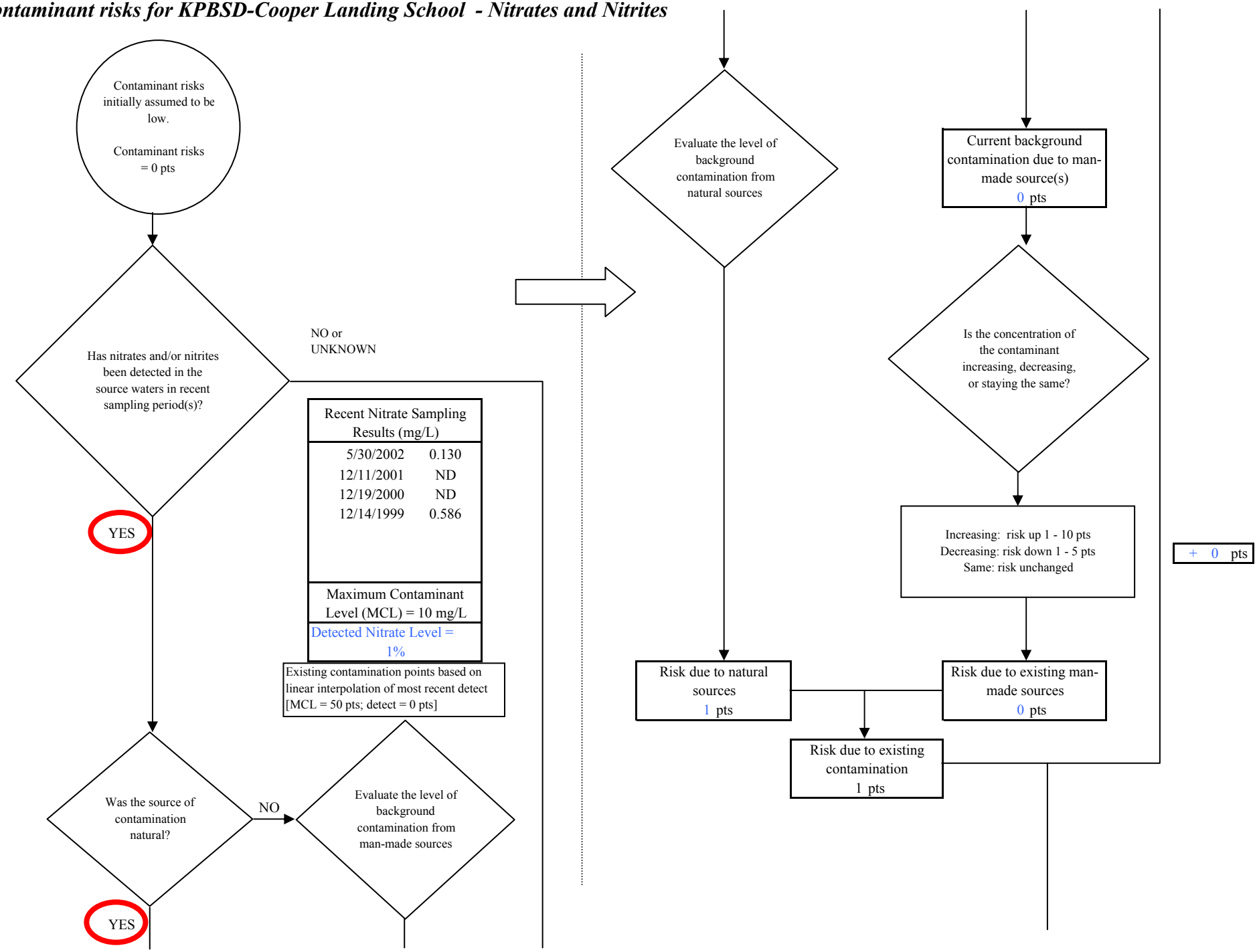


Chart 5. Contaminant risks for KPBSD-Cooper Landing School - Nitrates and Nitrites

+ 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)	1	0	1
Medium(s)	0	0	0
Low(s)	0	0	0

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

Matrix Score 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.

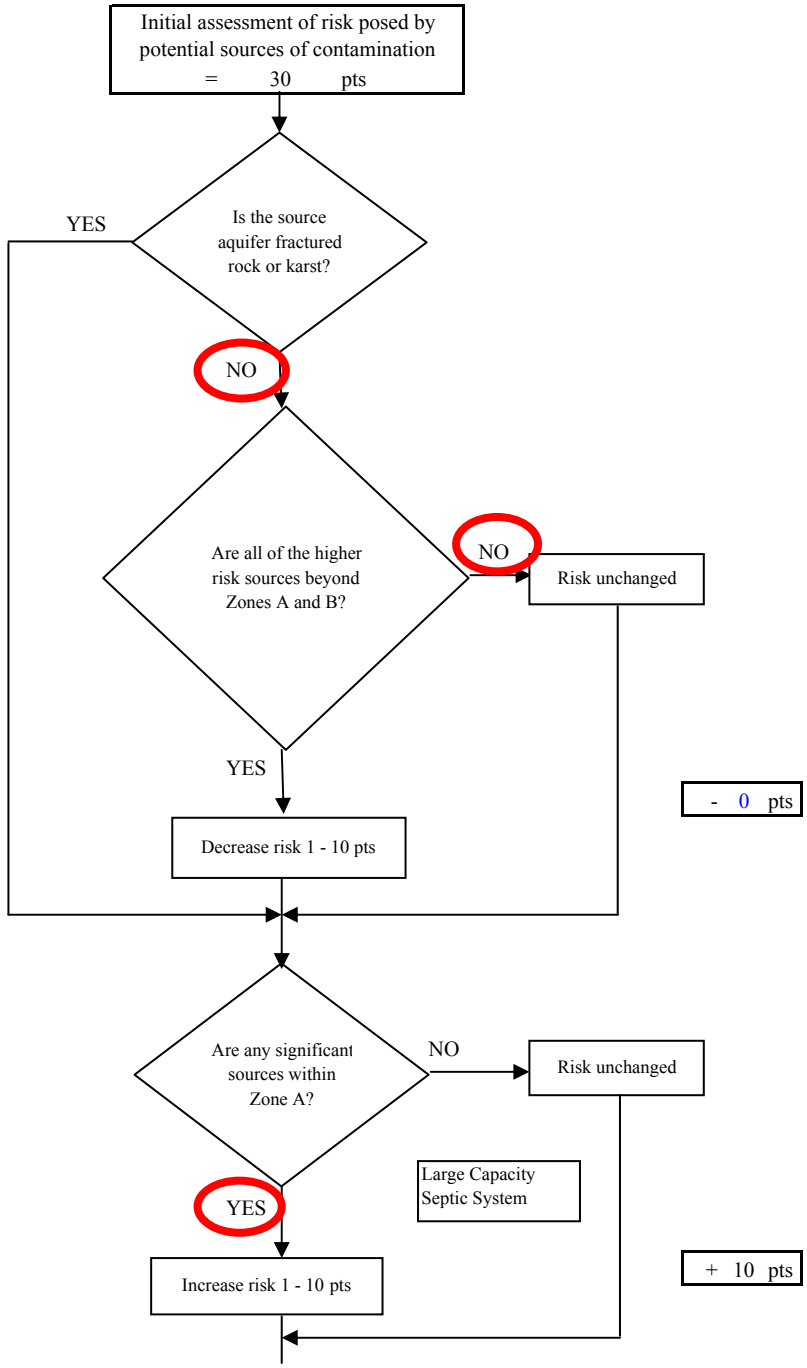


Chart 5. Contaminant risks for KPBSD-Cooper Landing School - Nitrates and Nitrites

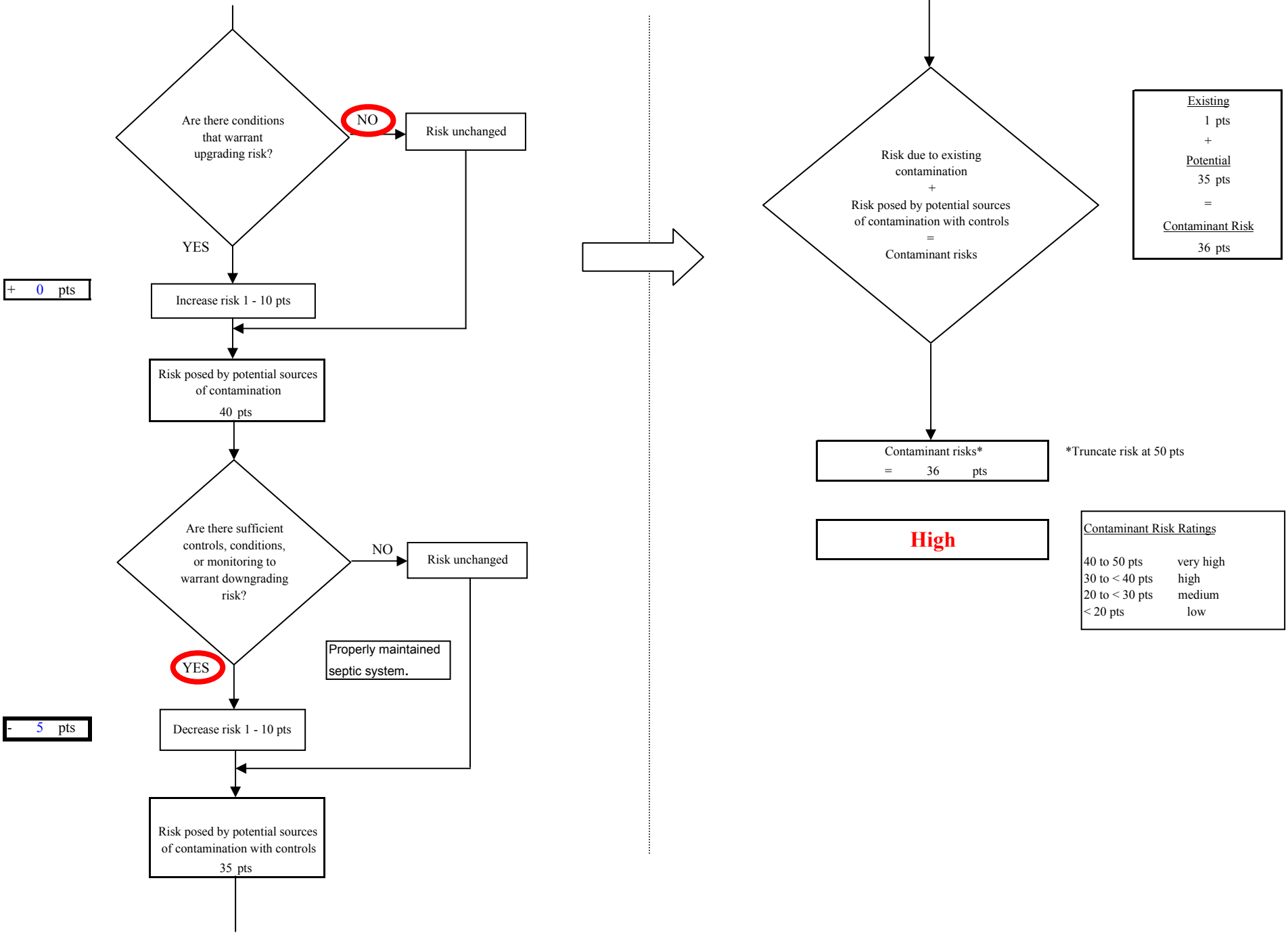


Chart 6. Vulnerability analysis for KPBSD-Cooper Landing School - Nitrates and Nitrites

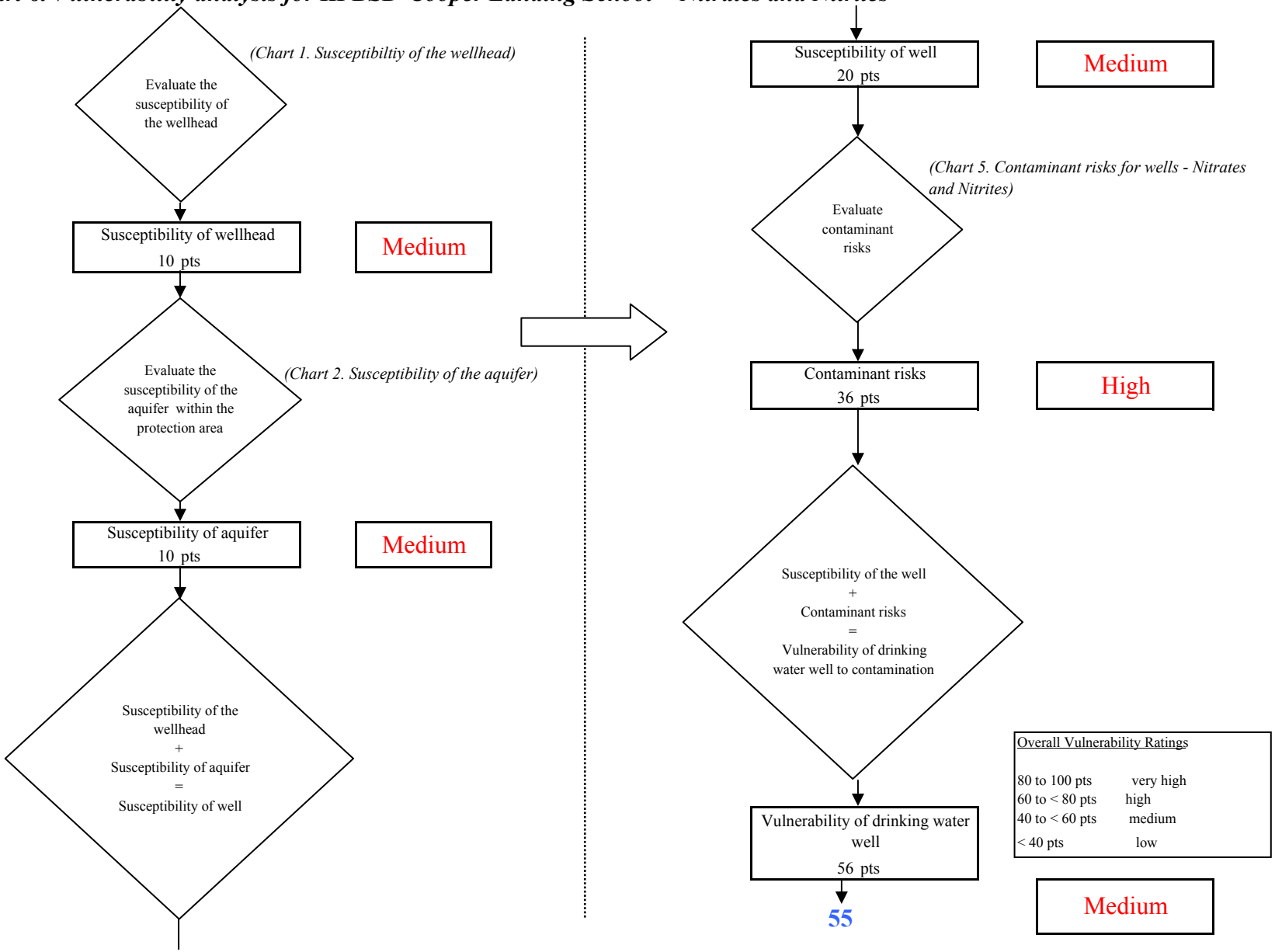


Chart 7. Contaminant risks for KPBSD-Cooper Landing School - Volatile Organic Chemicals

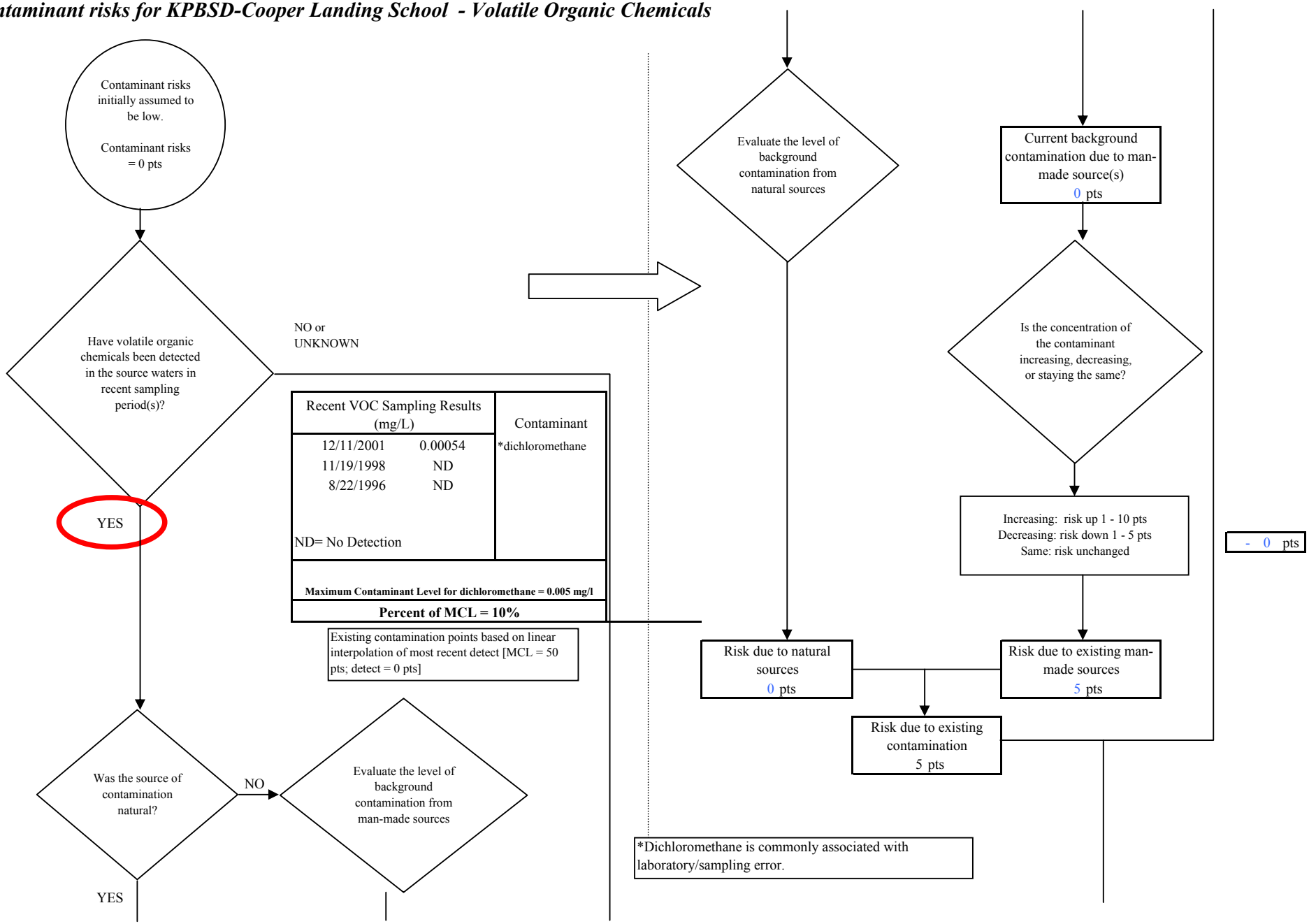


Chart 7. Contaminant risks for KPBSD-Cooper Landing School - Volatile Organic Chemicals

+ 10 pts

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

Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	0	2

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

Matrix Score 10

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

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

Is the source aquifer fractured rock or karst?

YES

NO

Are all of the higher risk sources beyond Zones A and B?

NO → Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO → Risk unchanged

YES

large capacity septic

Increase risk 1 - 10 pts

+ 2 pts

Chart 7. Contaminant risks for KPBSD-Cooper Landing School - Volatile Organic Chemicals

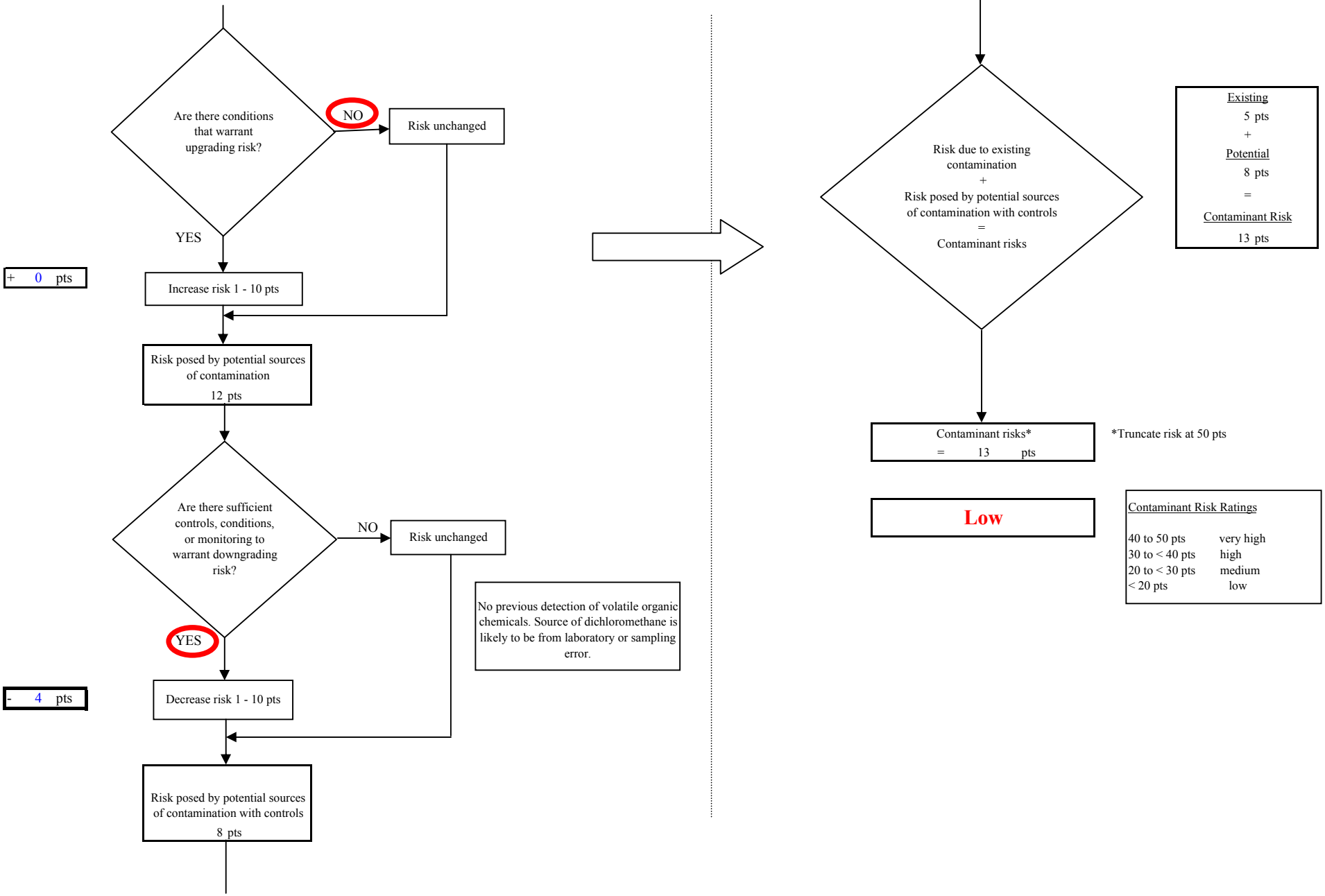


Chart 8. Vulnerability analysis for KPBSD-Cooper Landing School - Volatile Organic Chemicals

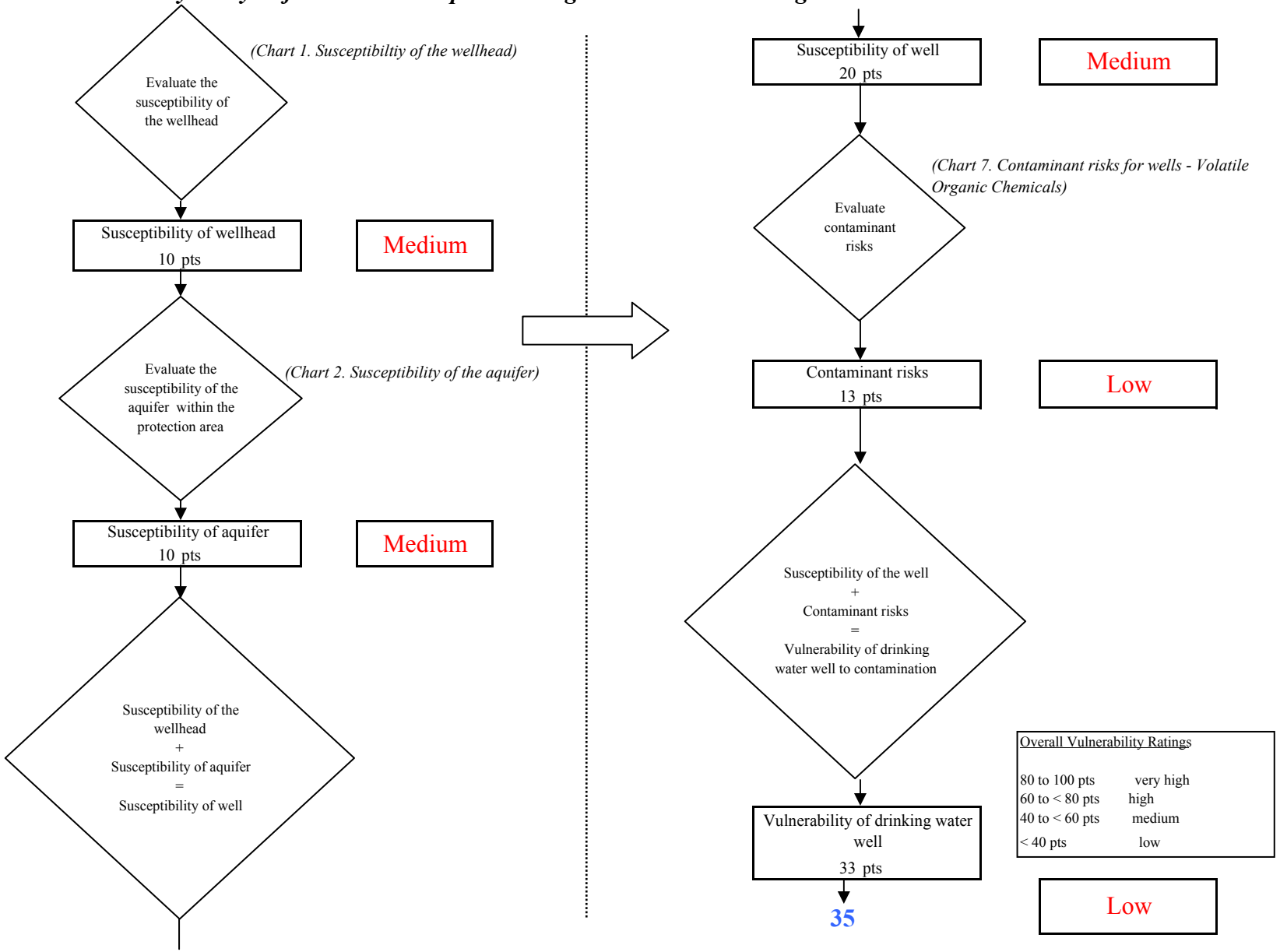


Chart 9. Contaminant risks for KPBSD-Cooper Landing School - Heavy Metals, Cyanide and Other Inorganic Chemicals

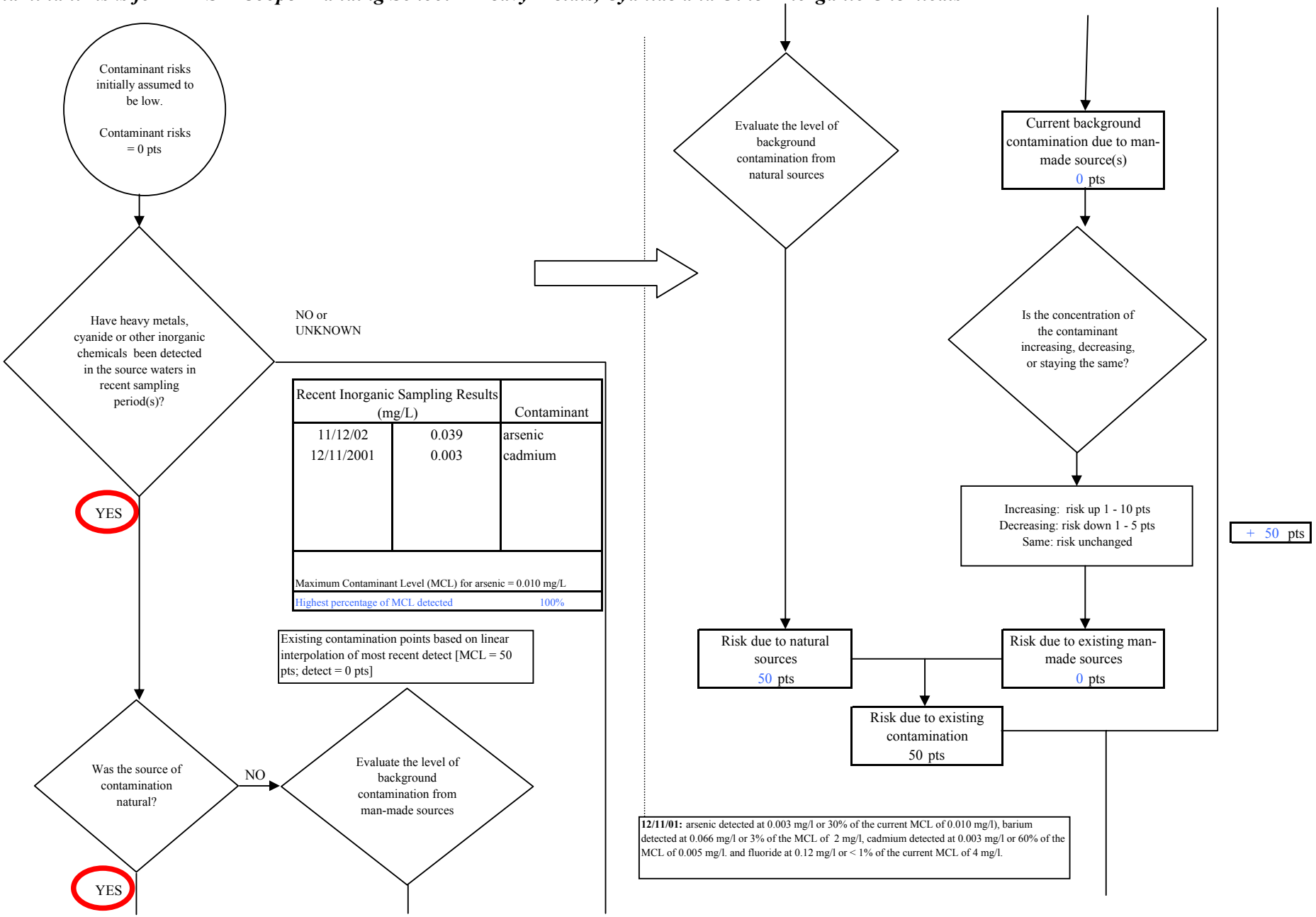


Chart 9. Contaminant risks for KPBSD-Cooper Landing School - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 10 pts

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

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

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

Matrix Score	10

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

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

Is the source aquifer fractured rock or karst?

YES

NO

Are all of the higher risk sources beyond Zones A and B?

NO → Risk unchanged

YES → Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO → Risk unchanged

YES → Large capacity septic system → Increase risk 1 - 10 pts

+ 2 pts

Chart 9. Contaminant risks for KPBSD-Cooper Landing School - Heavy Metals, Cyanide and Other Inorganic Chemicals

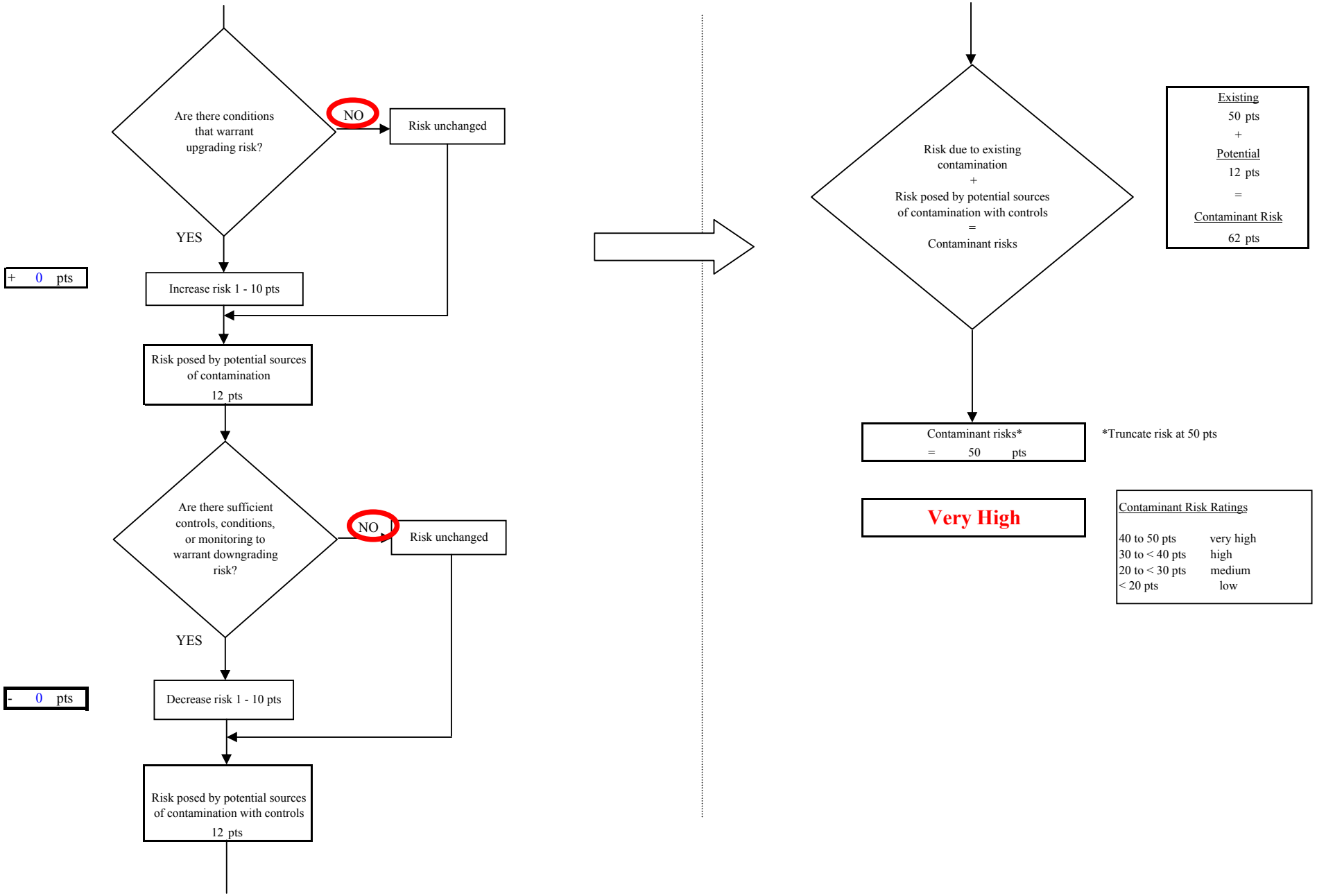


Chart 10. Vulnerability analysis for KPBSD-Cooper Landing School - Heavy Metals, Cyanide and Other Inorganic Chemicals

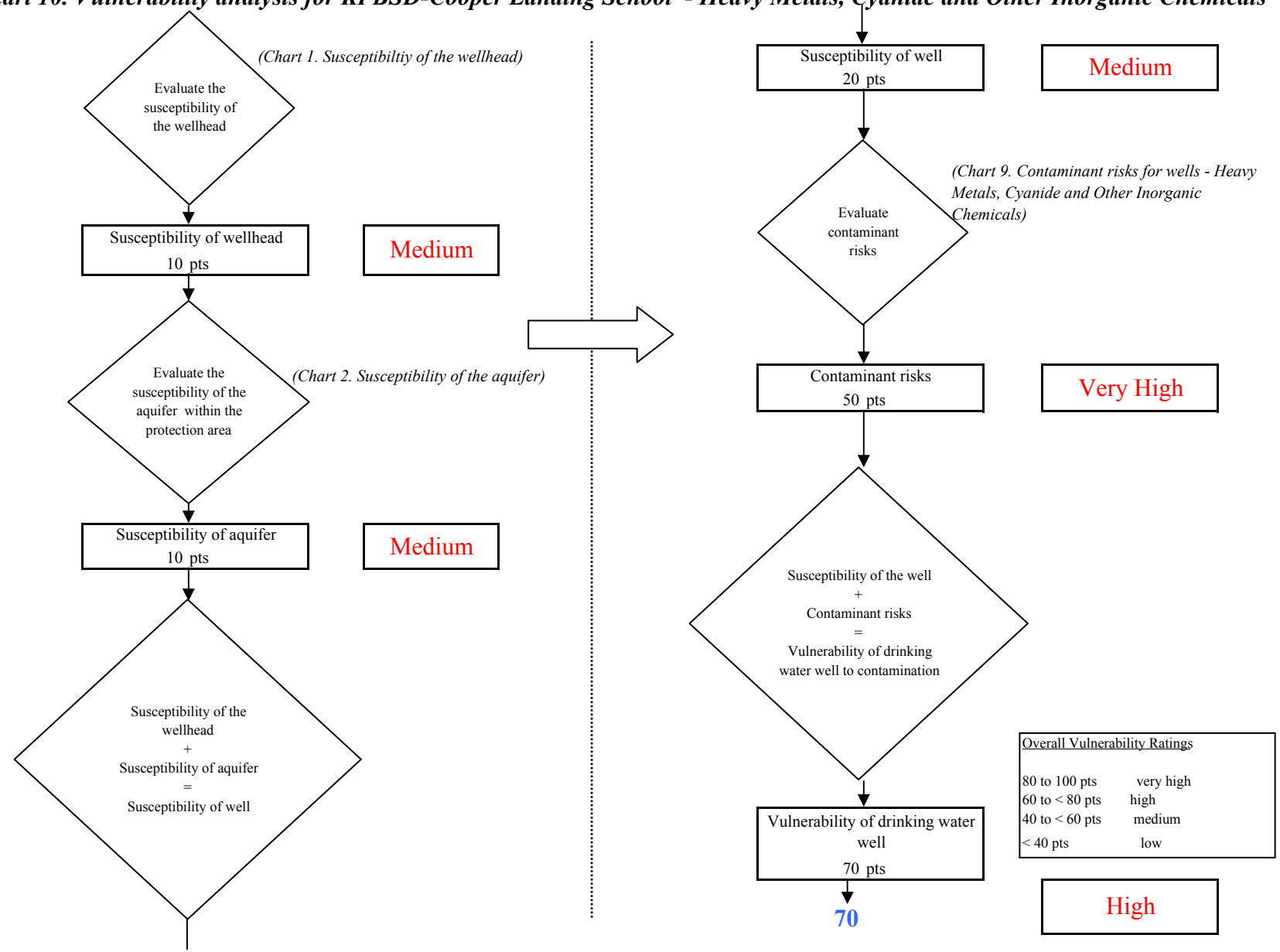


Chart 11. Contaminant risks for KPBSD-Cooper Landing School - Synthetic Organic Chemicals

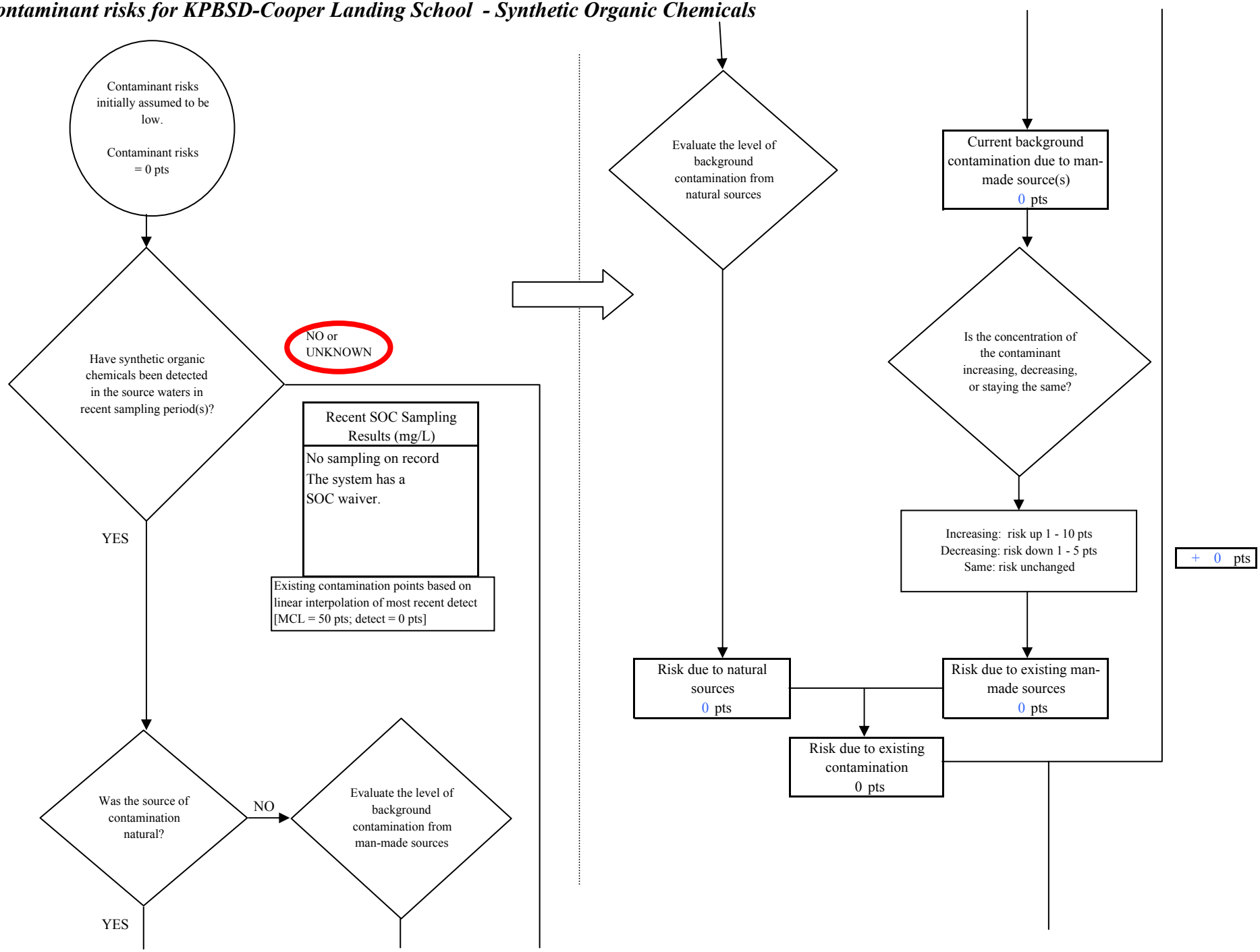
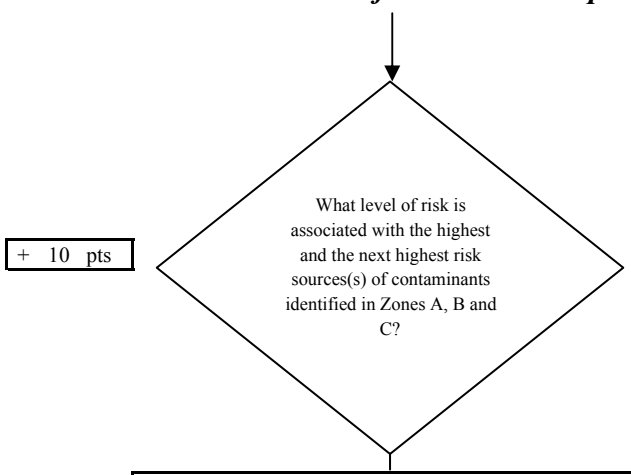


Chart 11. Contaminant risks for KPBSD-Cooper Landing School - Synthetic Organic Chemicals



+ 10 pts

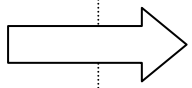
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	1	0	1

	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.



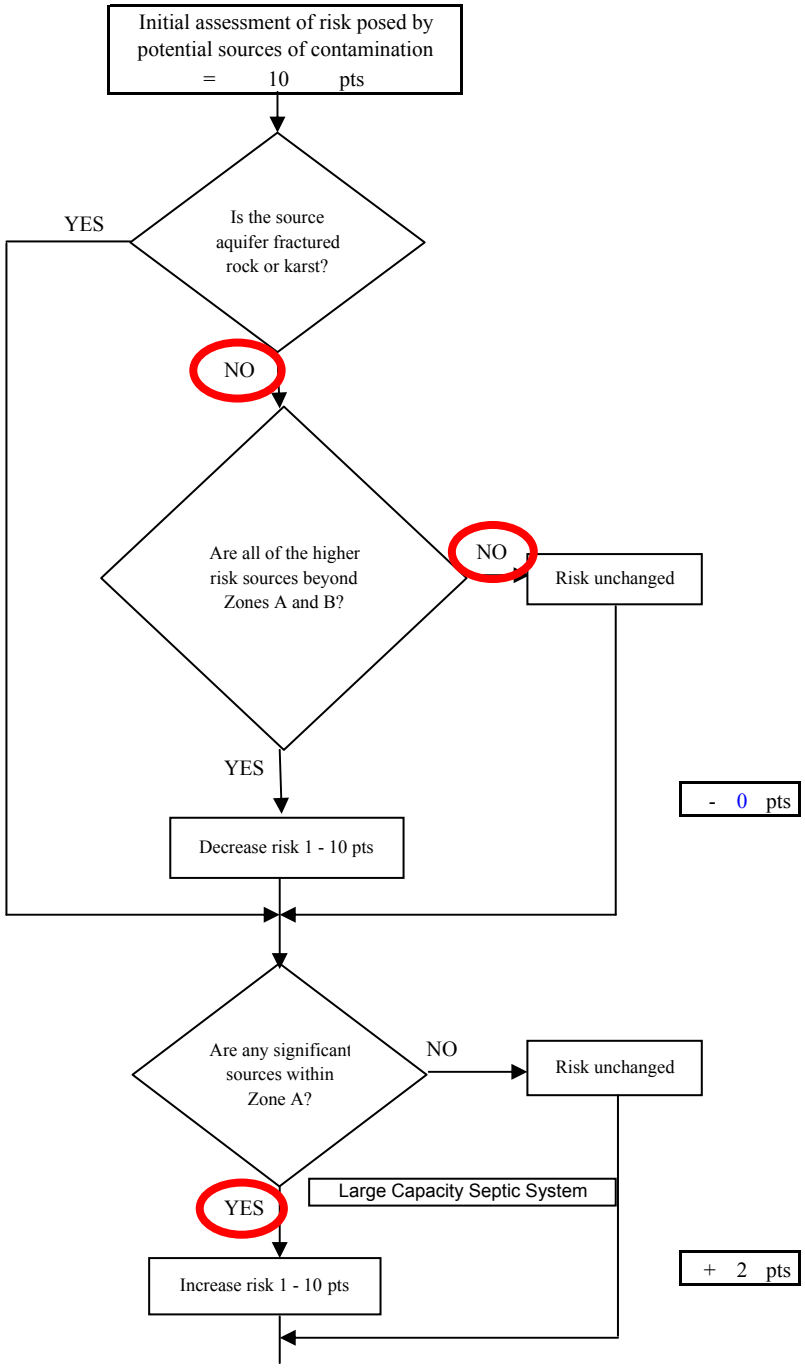


Chart 11. Contaminant risks for KPBSD-Cooper Landing School - Synthetic Organic Chemicals

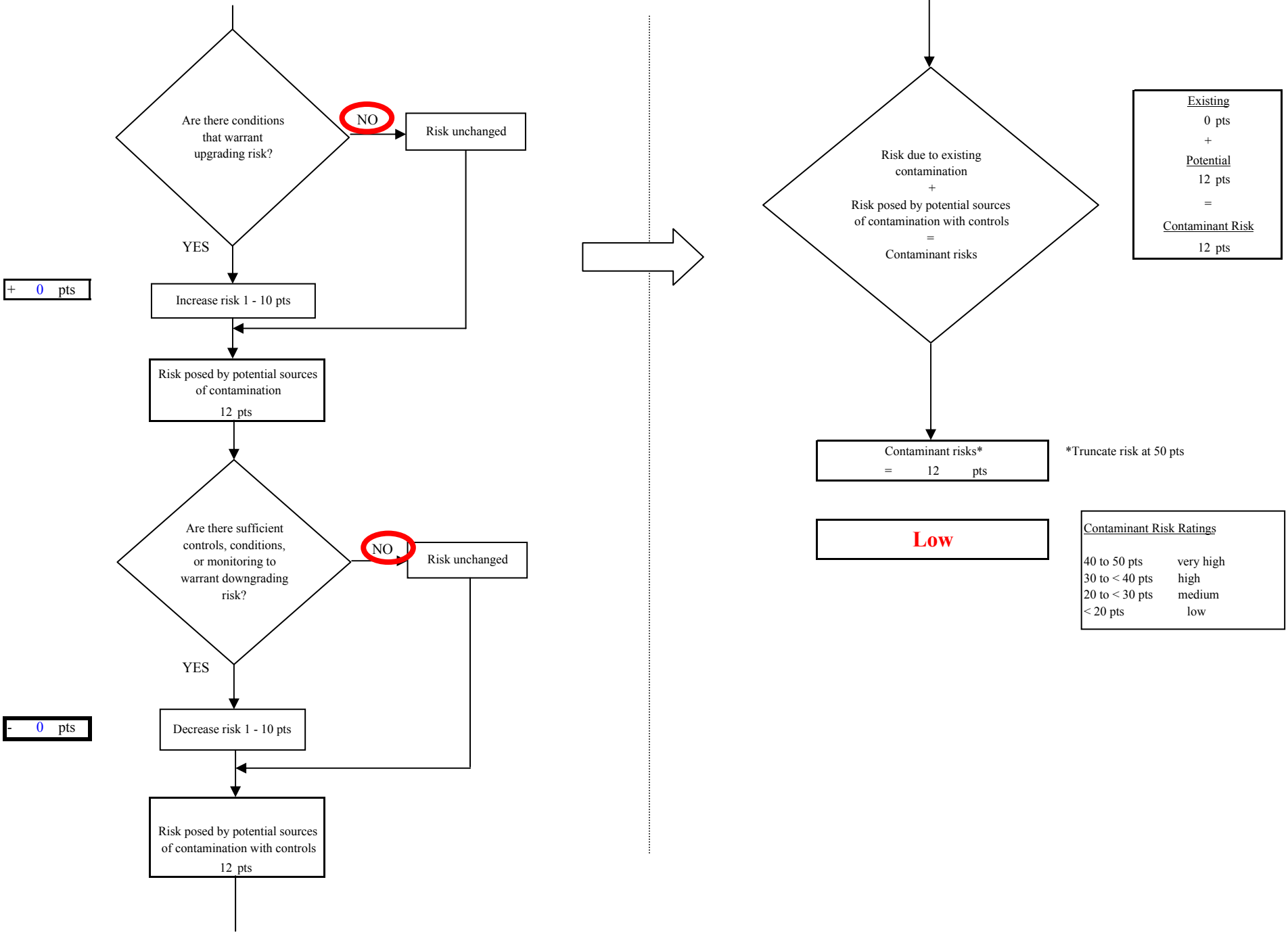


Chart 12. Vulnerability analysis for KPBSD-Cooper Landing School - Synthetic Organic Chemicals

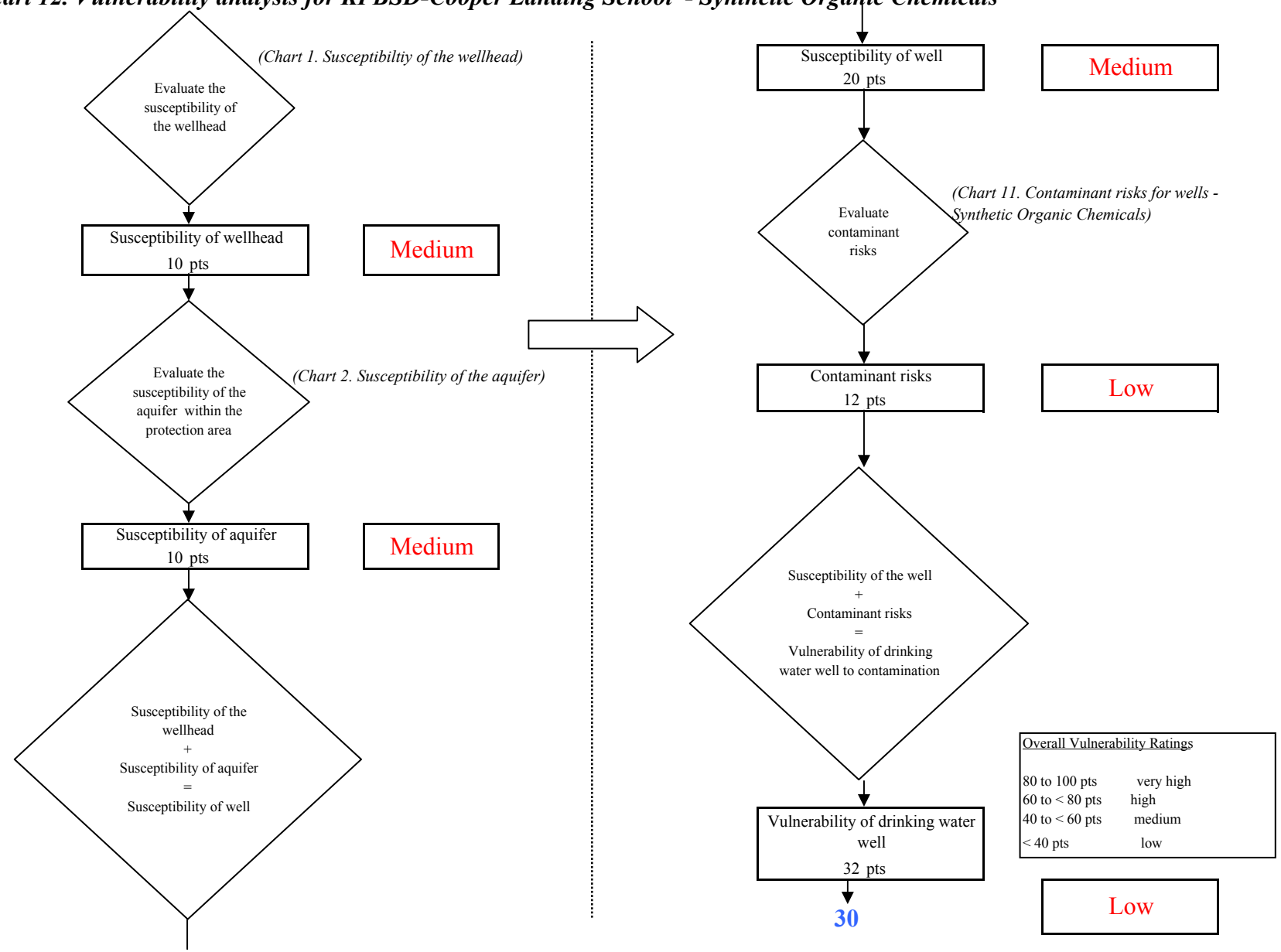


Chart 13. Contaminant risks for KPBSD-Cooper Landing School - Other Organic Chemicals

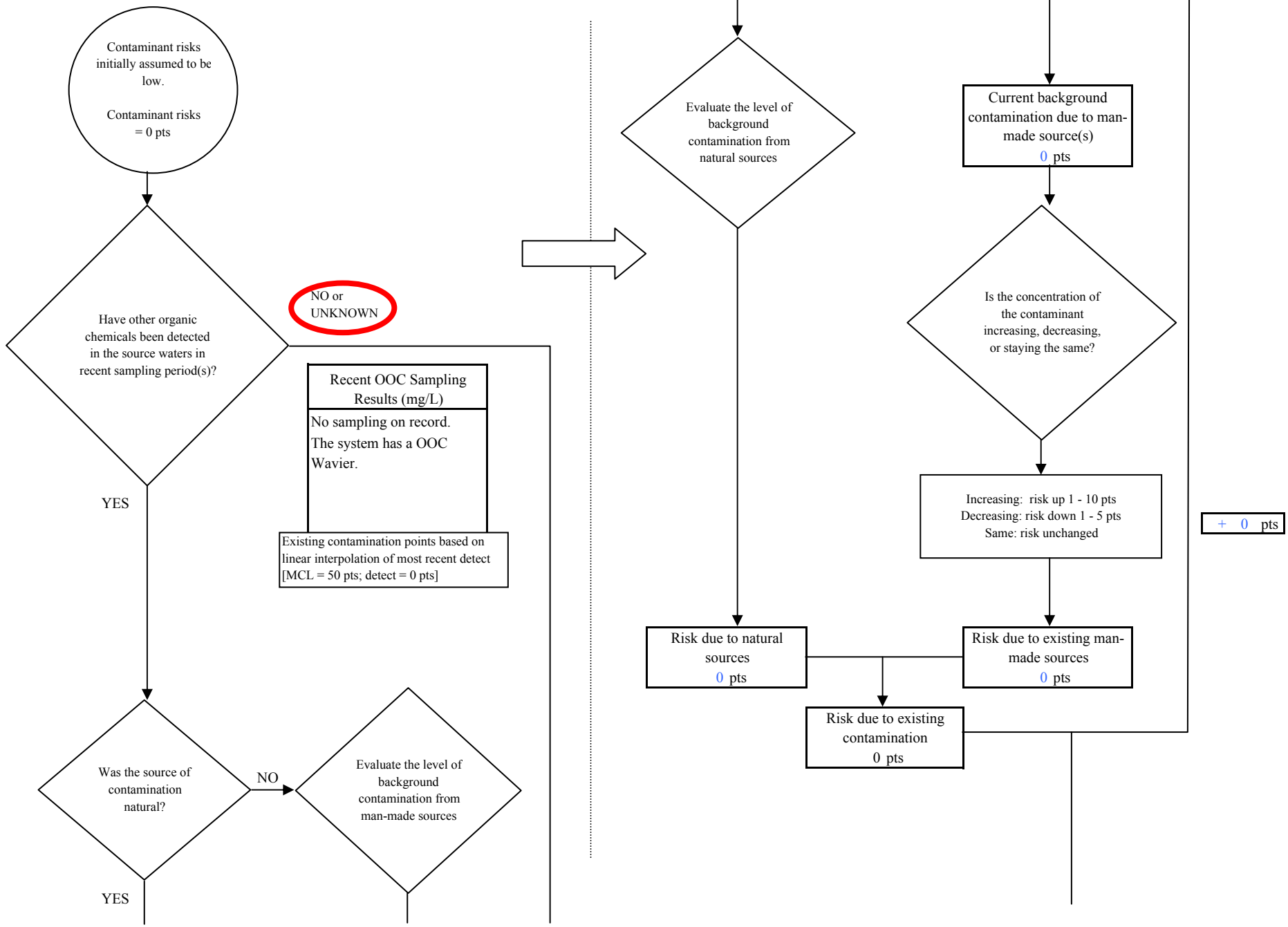


Chart 13. Contaminant risks for KPBSD-Cooper Landing School - Other Organic Chemicals

+ 10 pts

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

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

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

Matrix Score 10

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

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

Is the source aquifer fractured rock or karst?

YES

NO

Are all of the higher risk sources beyond Zones A and B?

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

Risk unchanged

YES

Large Capacity Septic System

Increase risk 1 - 10 pts

+ 2 pts

Chart 13. Contaminant risks for KPBSD-Cooper Landing School - Other Organic Chemicals

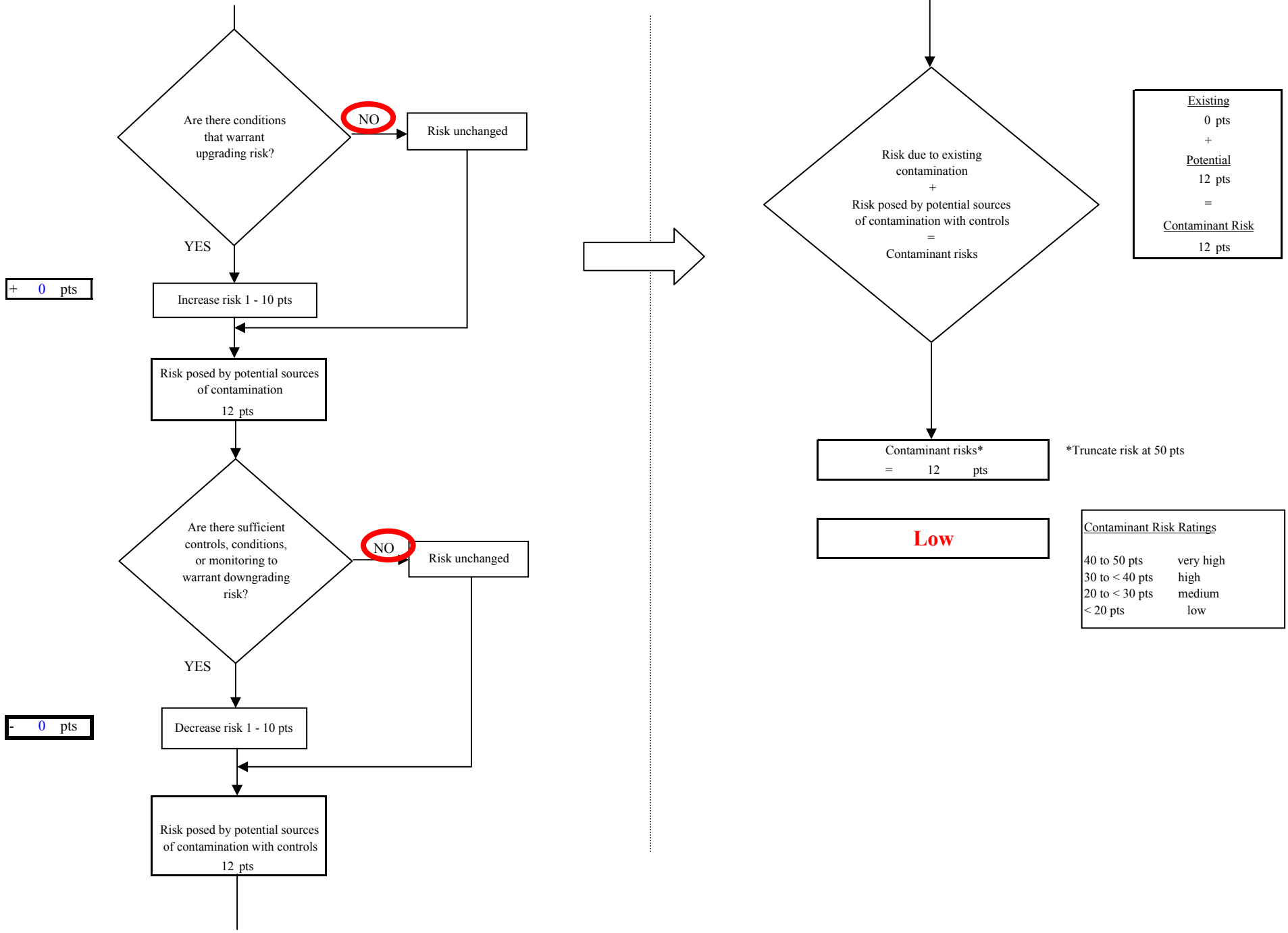


Chart 14. Vulnerability analysis for KPBSD-Cooper Landing School - Other Organic Chemicals