Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Turtle Club Drinking Water System, Fairbanks area, Alaska PWSID # 310780

September 2002

DRINKING WATER PROTECTION PROGRAM REPORT Report 687
Alaska Department of Environmental Conservation

Source Water Assessment for Turtle Club Drinking Water System

Fairbanks area, Alaska

Turtle Club PWSID# 310780

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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 Turtle Club Source of Public Drinking Water, Fairbanks Area, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for Turtle Club is a Class B water system (transient/non-community) consisting of one well on the Steese Highway approximately 10 miles north of Fairbanks, Alaska. The wellhead received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **Very High**. Combining these two ratings produces a **Medium** rating for the natural susceptibility of the well. Identified potential and current sources of contaminants for Turtle Club public drinking water source include: a body shop, a motor vehicle waste disposal well, a junk yard, inactive mines, residential area, septic systems, fuel storage tanks, highways, a motor vehicle facility, a campground, and a DEC-recognized contaminated site. These identified potential and existing sources of contamination are considered as sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Combining the natural susceptibility of the well with the contaminant risk, the public water sources for Turtle Club received a vulnerability rating of **Medium** for bacteria and viruses and nitrates and/or nitrites, and a **Medium** for volatile organic chemicals.

TURTLE CLUB PUBLIC DRINKING WATER SYSTEM

Turtle Club public water system is a Class B (transient/non-community) water system. The system consists of one well between the Steese and the New Steese Highways within the town of Fox, Alaska. Fox is approximately 10 miles north of Fairbanks, Alaska (T2N, R1E, Section 31) (See Map 1 of Appendix A). Fairbanks and its surrounding communities are located in the Fairbanks North Star Borough which is near the center of Alaska (Please see the inset of Map 1 in Appendix A for location). The Borough's current population is 82,840 making it the second-largest population center in the state (ADCED, 2002). Communities located within the Borough include : College, Eielson Air Force Base, Ester, Fairbanks, Fox, Harding Lake, Moose Creek, North Pole, Pleasant Valley, Salcha, and Two Rivers.

The majority of residents the Fairbanks area have individual wells and septic systems, and the remainder haul water (ADCED, 2002). Heating oil (stored in both above and below ground 275 to 500-gallon tanks) is used for heating homes and buildings. Refuse is transported to the Fairbanks North Star Borough landfill.

The Fairbanks area includes two distinct topographic areas: the floodplain of the Tanana River and the Chena River, and the uplands north of this floodplain. This water system is located in the uplands at an elevation of approximately 700 feet above sea level.

According to the most recent Sanitary Survey (9/27/99) for this water system, the depth of the well is 175 feet below the ground surface, and is screened in bedrock (schist). Bedrock in this area is predominantly a metamorphosed marine mud deposit, called a pelitic schist. The schist is locally intruded by granitic rocks – granite and quartz diorite. Groundwater in the bedrock is principally contained in fractures. The water wells in this area with the greatest well recharge appear to be in quartz veins, quartzite, and siliceous schist (Nelson, 1978).

Groundwater in the uplands is recharged by local precipitation. Outflow of ground water in the uplands primarily occurs two ways. In areas under artesian pressure (pressure caused by overlying permafrost), water can flow to the surface through thawed conduits within the permafrost. Otherwise groundwater will flow under the permafrost (if present) and out to the groundwater beneath the adjacent flood plain or creek valley (Nelson, 1978).

The Sanitary Survey (6/24//98) for the water system indicates the well site is not properly drained. Proper drainage on the surface helps prevent potential contaminants from travelling down the well casing. The well is grouted according to ADEC regulations. Proper grouting also provides added protection against contaminants travelling along the well casing and into source waters. A sanitary seal has been installed on the well.

This system operates year-round and serves approximately 4 residents and 200 non-residents through two service connections.

TURTLE CLUB 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.

An outline of the immediate watershed was used to determine the size and shape of the protection area for Turtle Club. 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 B Public Water Systems for additional information).

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. An analytical calculation was used to determine the size and shape of the protection area. The input parameters describing the attributes of the aquifer in this calculation were adopted from the U.S. Geological Survey (*Patrick, Brabets, and Glass, 1989*), and State of Alaska Department of Water Resources (*Jokela et. al., 1991*).

The time of travel for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. The following is a summary of the four protection area zones for wells and the calculated time-of-travel for each:

Table 1. Definition of Zones

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

The DWPA for Turtle Club 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 Turtle Club 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 B public water system assessments, three categories of drinking water contaminants were inventoried. They include:

- Bacteria and viruses;
- Nitrates and/or nitrites;
- Volatile organic chemicals

The sources are displayed on Map 2 of Appendix C and summarized in Table 1 of Appendix B.

RANKING OF CONTAMINANT RISKS

Once the potential and existing sources of contamination have been identified, they are 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, and volatile organic chemicals.

VULNERABILITY OF TURTLE CLUB 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 8 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

A score for the Natural Susceptibility is reached by considering the properties of the well and the aquifer.

Susceptibility of the Wellhead (0 – 25 Points)
(Chart 1 of Appendix D)

+

Susceptibility of the Aquifer (0 – 25 Points)
(Chart 2 of Appendix D)

=

Natural Susceptibility (Susceptibility of the Well)
(0 – 50 Points)

A ranking is assigned for the Natural Susceptibility according to the point score:

Natural Susceptibility Ratings	
40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

The well for the Turtle Club is completed in an unconfined aquifer. Because unconfined aquifers are recharged by surface water and precipitation that migrates downward from the surface, contaminants at the surface have the potential to adversely impact this aquifer. Table 2 shows the Susceptibility scores and ratings for Turtle Club.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	0	Low
Susceptibility of the Aquifer	24	Very High
Natural Susceptibility	24	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	25	Medium
Nitrates and/or Nitrites	25	Medium
Volatile Organic Chemicals	45	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	50	Medium
Nitrates and Nitrites	50	Medium
Volatile Organic Chemicals	70	High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is medium with the density of the residential septic systems representing the most significant risk to the drinking water well (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 sampling of this water 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 also medium with the density of residential septic systems representing the greatest risk to this source of public drinking 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 the Turtle Club well indicates that very low concentrations of nitrate have been detected in the drinking water. Concentrations have ranged from not detected to 0.250 mg/L. The Maximum Contaminant Level (MCL) for nitrates is 10 mg/L. The MCL is the maximum level of contaminant that is allowed to exist in drinking 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 medium.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is very high with the motor vehicle waste disposal well (Class V injection well) and the residential fuel storage tanks creating the greatest risk for volatile organic chemicals (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

The Alaska Department of Environmental Conservation (ADEC) identified the potential motor vehicle waste disposal well, a type of Class V injection well, based on the land use type and lack of sewerline coverage in the area. The U.S. Environmental Protection Agency (EPA) has banned this type of well since April 2000 because of their extreme threat to groundwater quality. This ban requires all existing injection wells of this type be phased out and closed.

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

Volatile Organic Chemicals have not been sampled for in recent history. 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.

The DEC-recognized contaminated site at the former Mohawk Canada Limited Fox Mill Processing Facility is located approximately 1700 feet upgradient of the well for the Turtle Club and poses a risk of heavy metals to the drinking water system. During a preliminary site investigation, high levels of aresenic, lead, and silver were found in the tailings at the site. Further characterization work is planned as of August 1, 2002. Although heavy metals are not looked at in this assessment, more information on this site can be found by calling the ADEC Contaminated Sties Remediation Program at (907) 269-7658.

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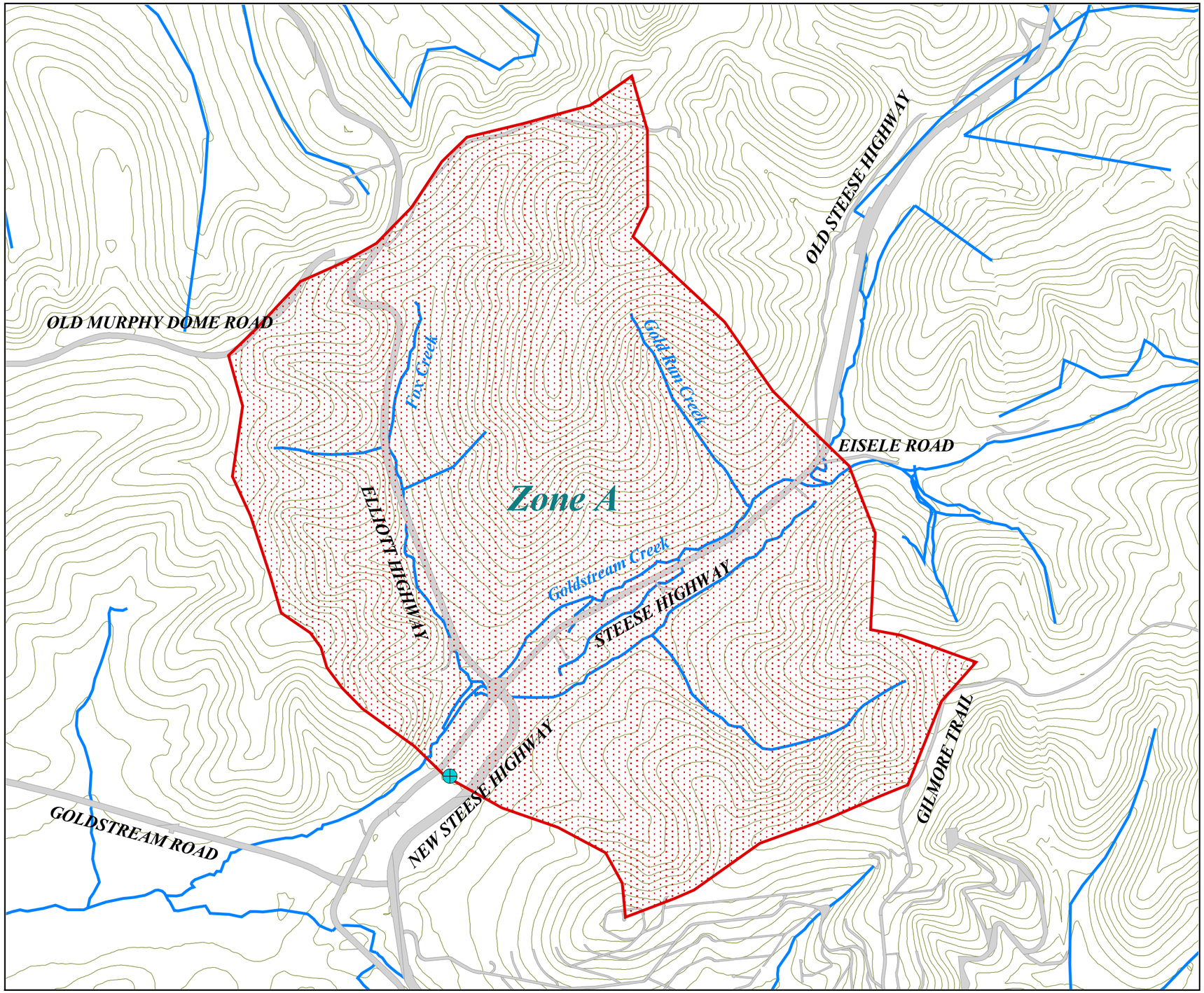
APPENDIX A

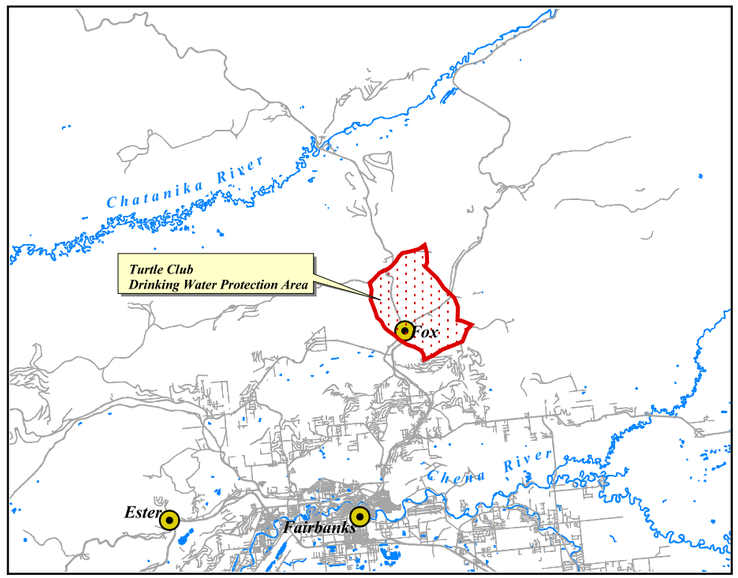
Turtle Club
Drinking Water Protection Area Location Map
(Map 1)

Turtle Club Drinking Water Protection Area



Legend

- Turtle Club Well
- Zone A Protection Area
- Several Months Travel Time
- Roads
- Rivers and Streams
- Elevation Contours (20 meters)



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Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Turtle Club (Tables 1-4)

Table 1

Contaminant Source Inventory for ***Turtle Club***

PWSID 310780.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Body shops (automotive)	C05	C05-1	A	2	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	A	2	
Scrap, salvage, or junk yards	D59	D59-1	A	2	
Metals mining, placer (inactive)	E04	E04-1	A	2	Fox Creek Placer Mine
Metals mining, underground (inactive)	E05	E05-1	A	2	Janiksela Prospect
Metals mining, underground (inactive)	E05	E05-2	A	2	Fox Gulch Prospect
Metals mining, underground (inactive)	E05	E05-3	A	2	Anderson Propect
Metals mining, underground (inactive)	E05	E05-4	A	2	Arctic 1-30 Association
Residential Areas	R01	R01-1	A	2	Approximately 450 acres of residential area located within Zone A
Septic systems (serves one single-family home)	R02	R02-1 - 87	A	2	Number approximated based on number of parcels designated as residential
Tanks, heating oil, residential (above ground)	R08	R08-1 - 87	A	2	Number approximated based on number of parcels designated as residential
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-1	A	2	Former Mohawk Canada Limited Fox Mill Processing Facility; active site; high levels of arsenic, lead and silver found in the tailings piles.
Highways and roads, paved (cement or asphalt)	X20	X20-1 - 3	A	2	Elliott, Steese, and New Steese Highways
Motor vehicle/general storage yards/facilities	X27	X27-1	A	2	
Campgrounds and RV Parks	X35	X35-1	A	2	

Table 2

Contaminant Source Inventory and Risk Ranking for Turtle Club

Sources of Bacteria and Viruses

PWSID 310780.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	A	Low	2	
Residential Areas	R01	R01-1	A	Low	2	Approximately 450 acres of residential area located within Zone A
Septic systems (serves one single-family home)	R02	R02-1 - 87	A	Low	2	Number approximated based on number of parcels designated as residential
Highways and roads, paved (cement or asphalt)	X20	X20-1 - 3	A	Low	2	Elliott, Steese, and New Steese Highways
Campgrounds and RV Parks	X35	X35-1	A	Low	2	

Table 3

Contaminant Source Inventory and Risk Ranking for Turtle Club

Sources of Nitrates/Nitrites

PWSID 310780.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Residential Areas	R01	R01-1	A	Low	2	Approximately 450 acres of residential area located within Zone A
Septic systems (serves one single-family home)	R02	R02-1 - 87	A	Low	2	Number approximated based on number of parcels designated as residential
Highways and roads, paved (cement or asphalt)	X20	X20-1 - 3	A	Low	2	Elliott, Steese, and New Steese Highways
Campgrounds and RV Parks	X35	X35-1	A	Low	2	

Table 4

Contaminant Source Inventory and Risk Ranking for Turtle Club
Sources of Volatile Organic Chemicals

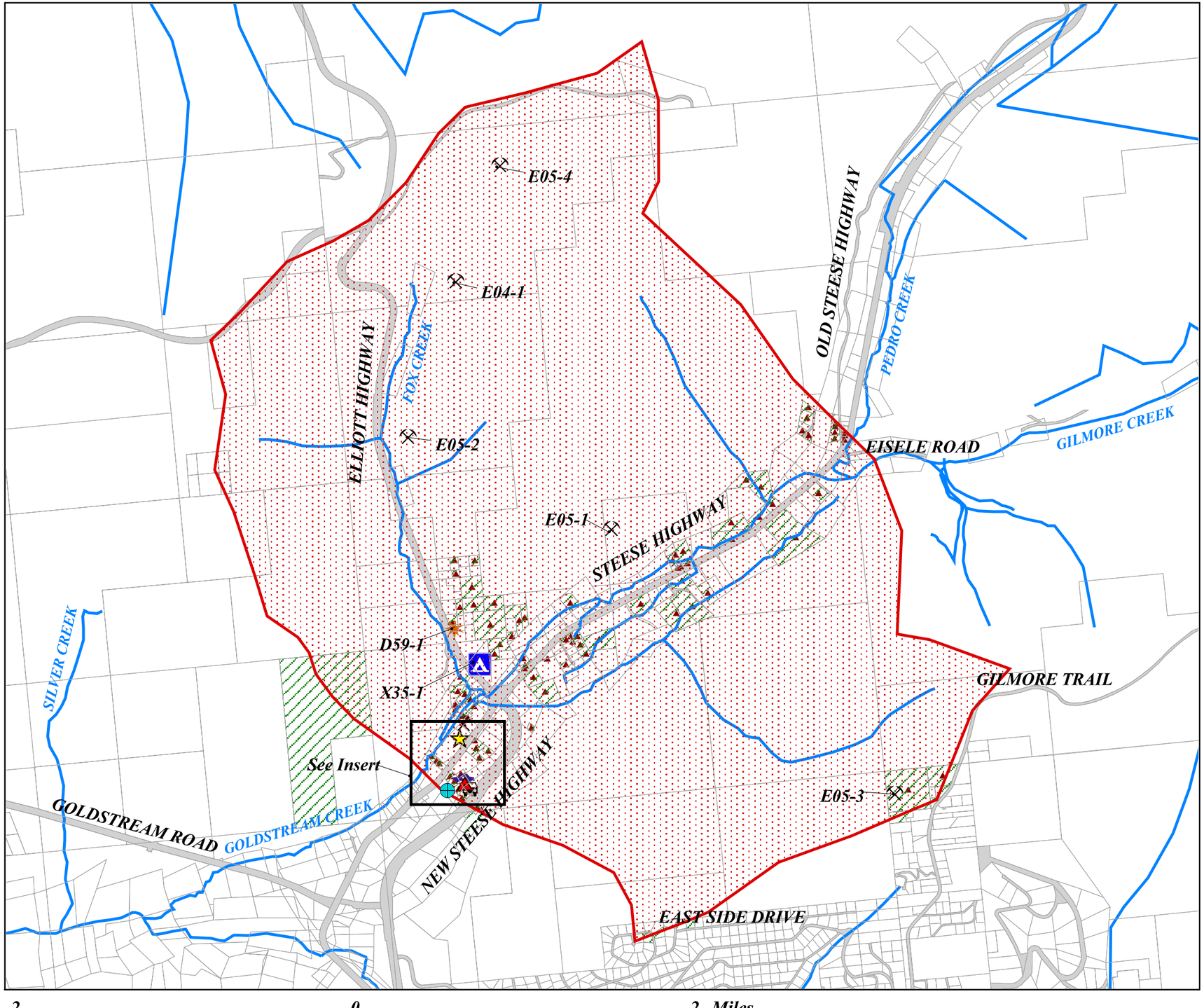
PWSID 310780.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Body shops (automotive)	C05	C05-1	A	Medium	2	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	A	High	2	
Scrap, salvage, or junk yards	D59	D59-1	A	Low	2	
Metals mining, underground (inactive)	E05	E05-1	A	Medium	2	Janiksela Prospect
Metals mining, underground (inactive)	E05	E05-2	A	Medium	2	Fox Gulch Prospect
Metals mining, underground (inactive)	E05	E05-3	A	Medium	2	Anderson Propect
Metals mining, underground (inactive)	E05	E05-4	A	Medium	2	Arctic 1-30 Association
Residential Areas	R01	R01-1	A	Low	2	Approximately 450 acres of residential area located within Zone A
Septic systems (serves one single-family home)	R02	R02-1 - 87	A	Low	2	Number approximated based on number of parcels designated as residential
Tanks, heating oil, residential (above ground)	R08	R08-1 - 87	A	Medium	2	Number approximated based on number of parcels designated as residential
Highways and roads, paved (cement or asphalt)	X20	X20-1 - 3	A	Low	2	Elliott, Steese, and New Steese Highways
Motor vehicle/general storage yards/facilities	X27	X27-1	A	Low	2	
Campgrounds and RV Parks	X35	X35-1	A	Low	2	

APPENDIX C

Turtle Club
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)

Turtle Club Drinking Water Protection Area with Potential & Existing Contaminant Sources

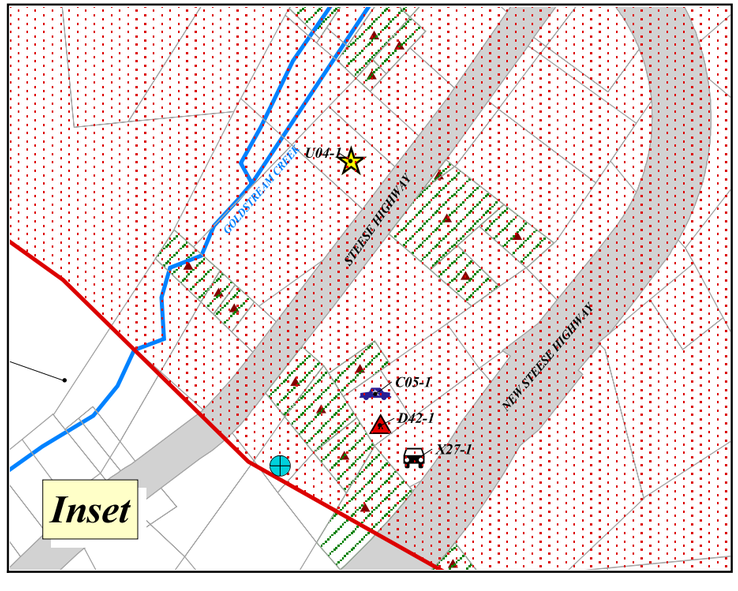


Legend

- Turtle Club Well

Zone A Protection Area
- Several Months Travel Time
- Parcels
- Rivers and Streams

Contaminant Sources
- Body Shop (C5)
- Motor Vehicle Waste Disposal Well (Class V Injection well) (D42)
- Scrap, Salvage, or Junk Yard (D59)
- ADEC recognized Contaminanted Site (U04)
- Motor vehicle storage yard (X27)
- Campground or RV Park (X35)
- Underground Mines (E05)
- Residential Area (R01)
- Septic sytems (R02) and Aboveground Residential Heating Oil Tanks (R08)
- Roads (X20)



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Map 2

APPENDIX D

Vulnerability Analysis for Turtle Club Public Drinking Water Source

(Charts 1-8)

Chart 1. Susceptibility of the wellhead - Turtle Club

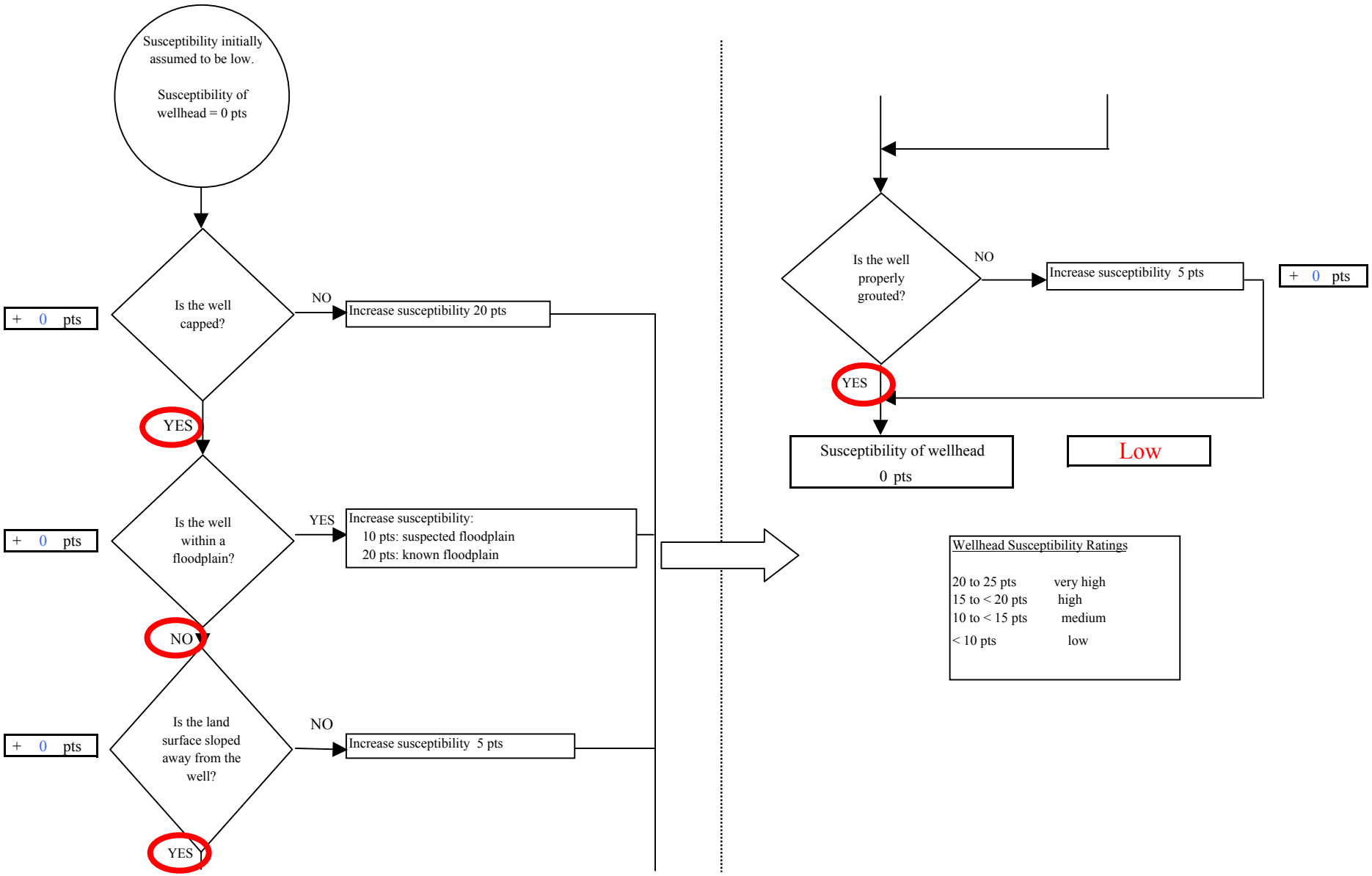


Chart 2. Susceptibility of the aquifer - Turtle Club

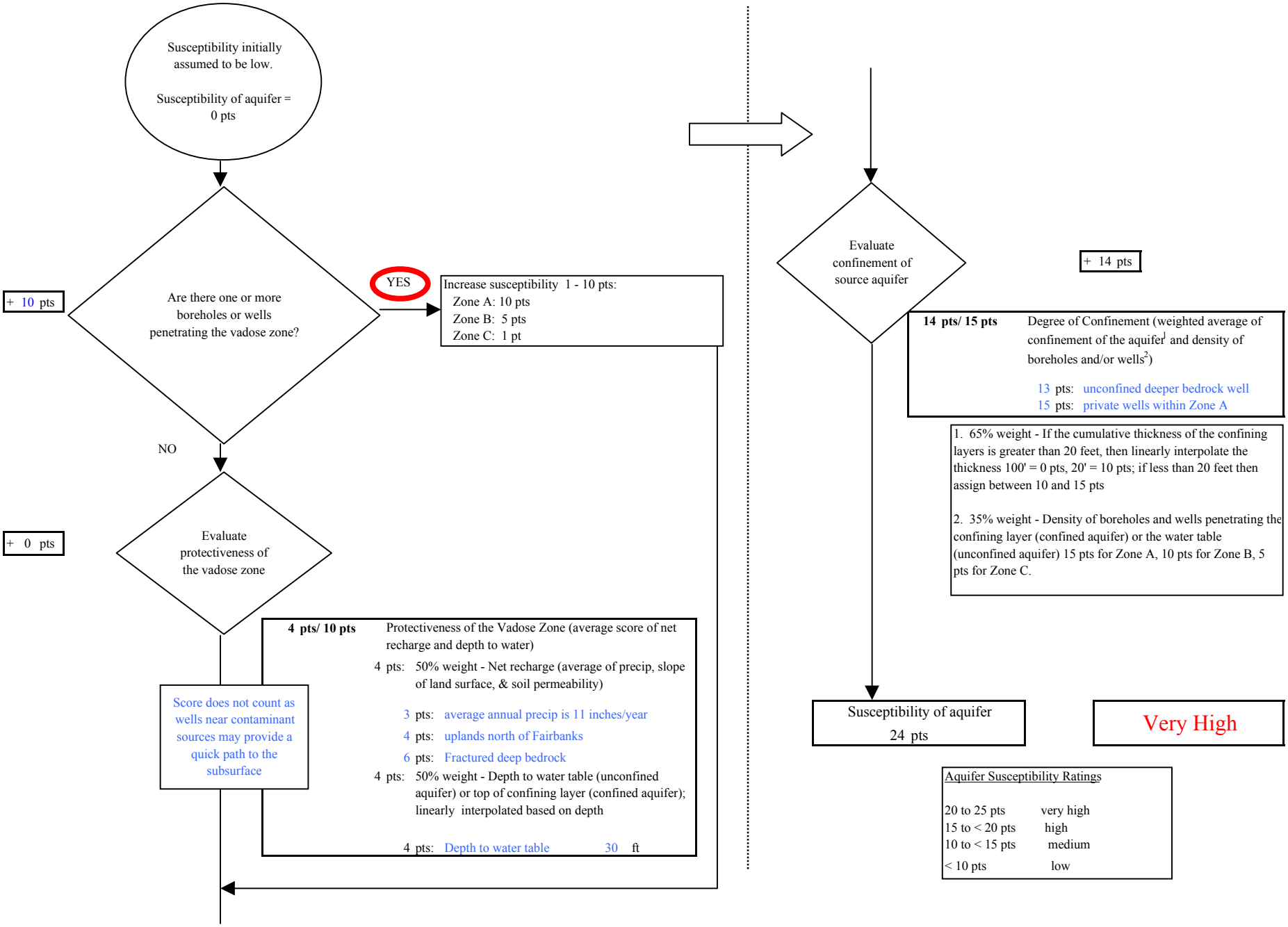
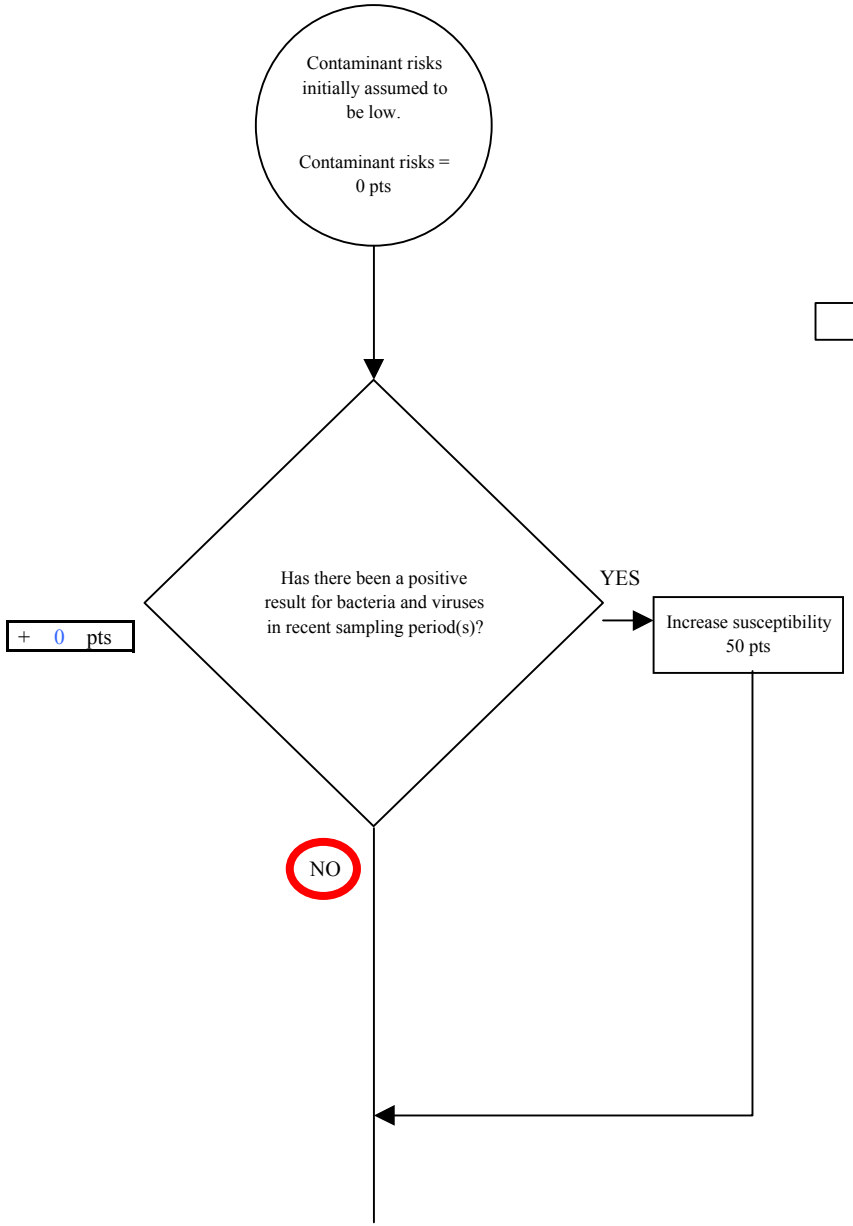
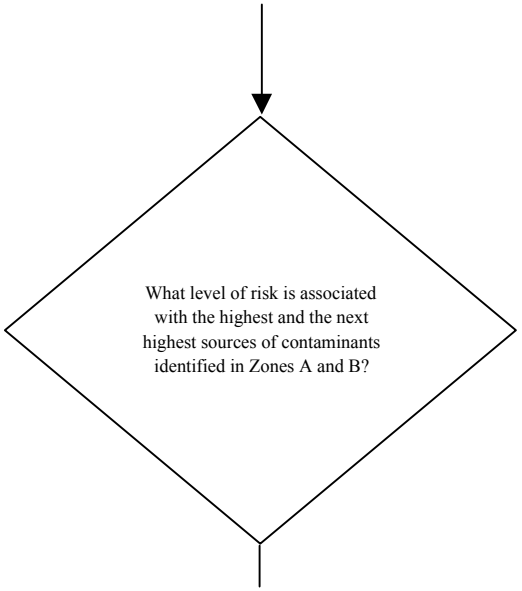


Chart 3. Contaminant risks for Turtle Club - Bacteria & Viruses





+ 20 pts

Risk Rankings for Contaminant Sources Identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	99	0	99

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

Matrix Score 20

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

Chart 3. Contaminant risks for Turtle Club - Bacteria & Viruses

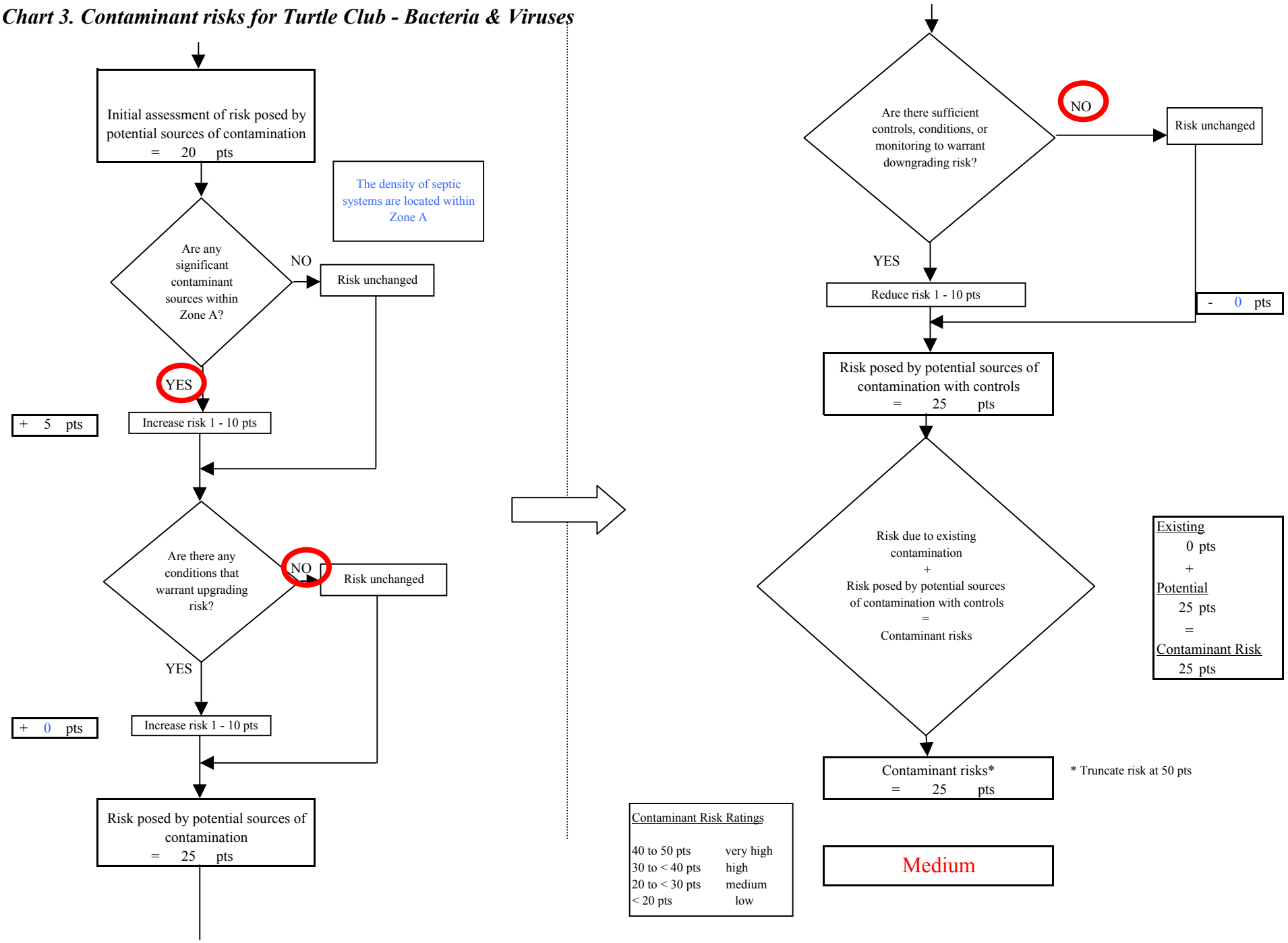


Chart 4. Vulnerability analysis for Turtle Club - Bacteria & Viruses

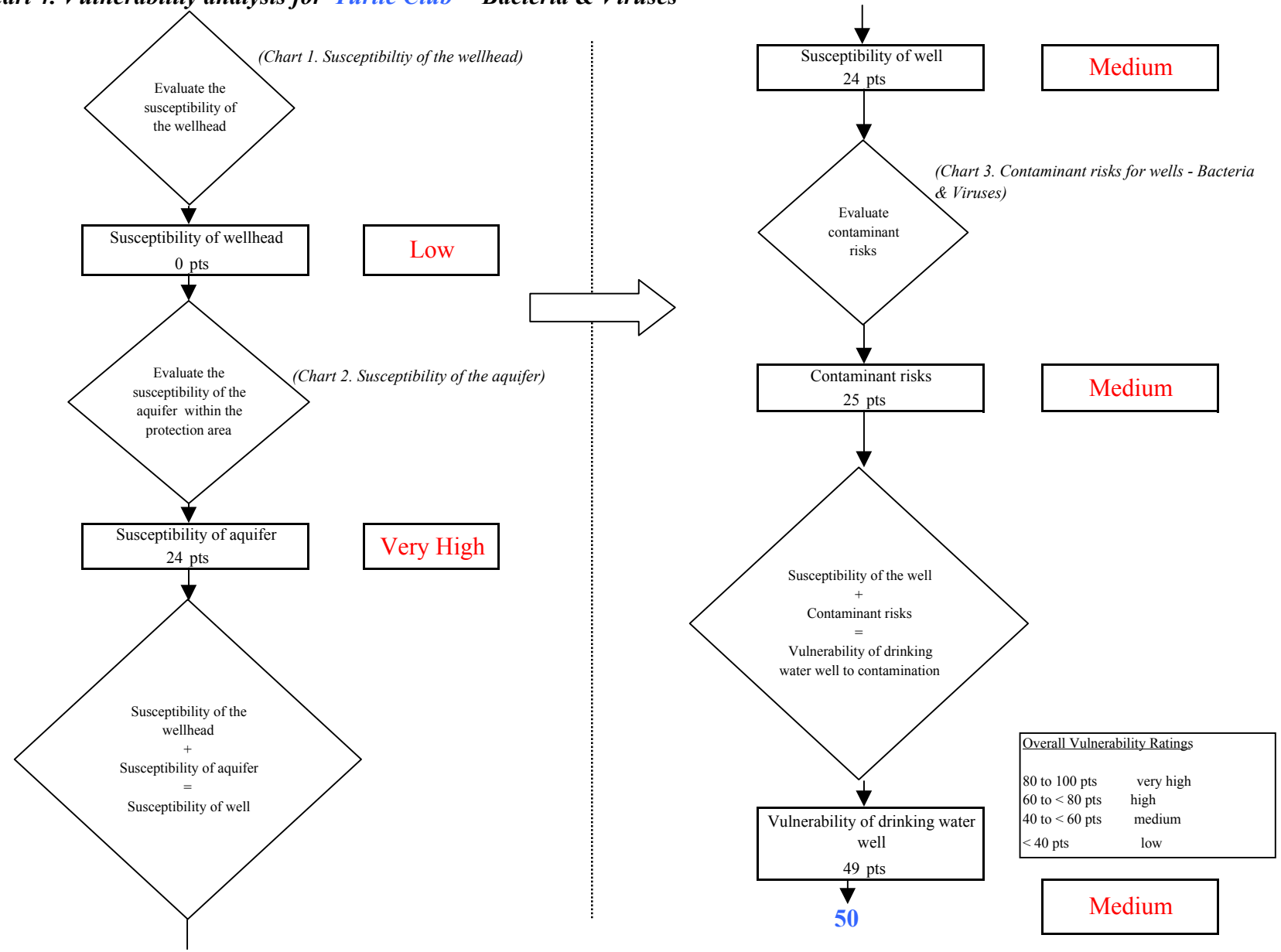


Chart 5. Contaminant risks for Turtle Club - Nitrates and Nitrites

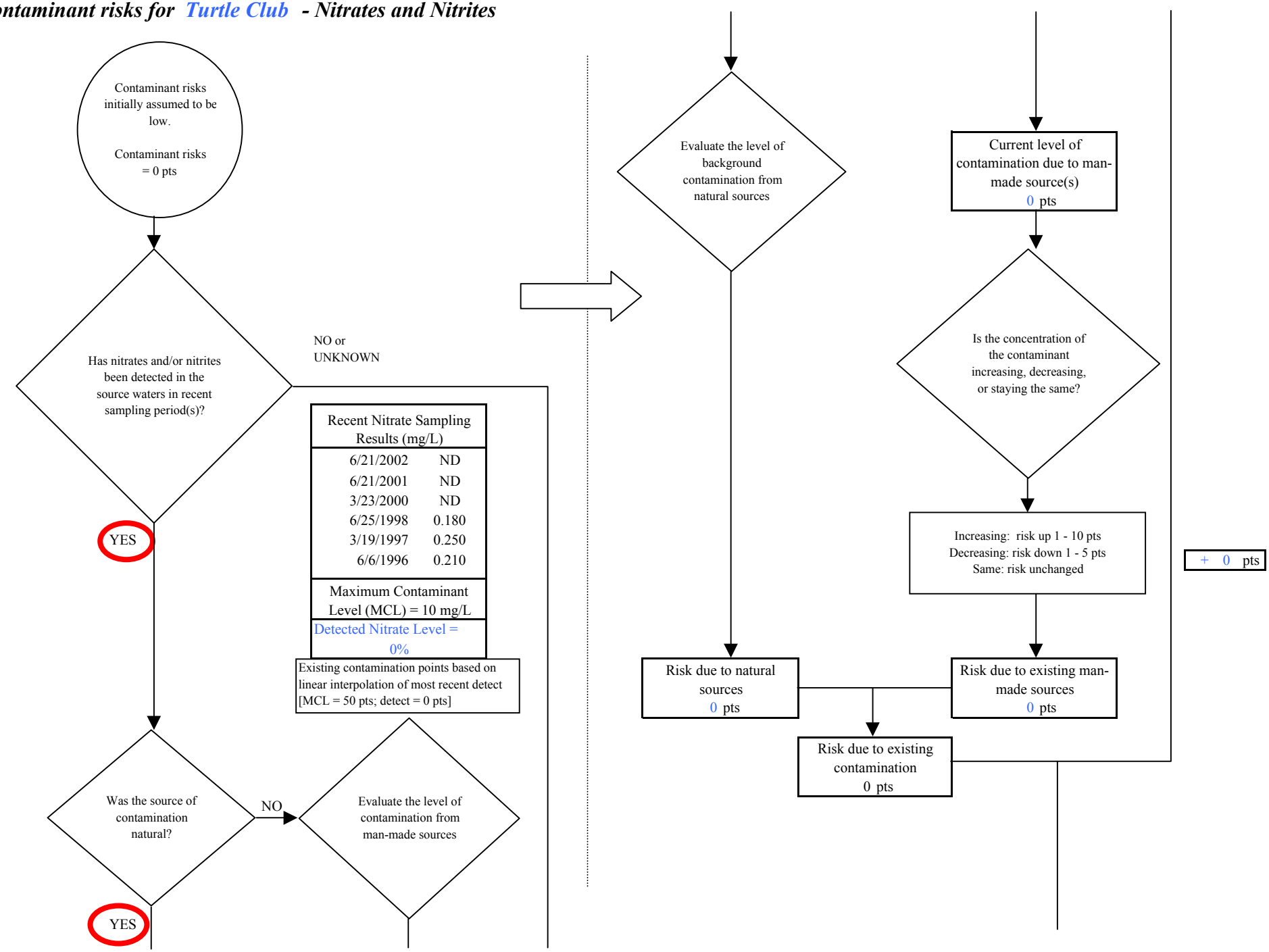
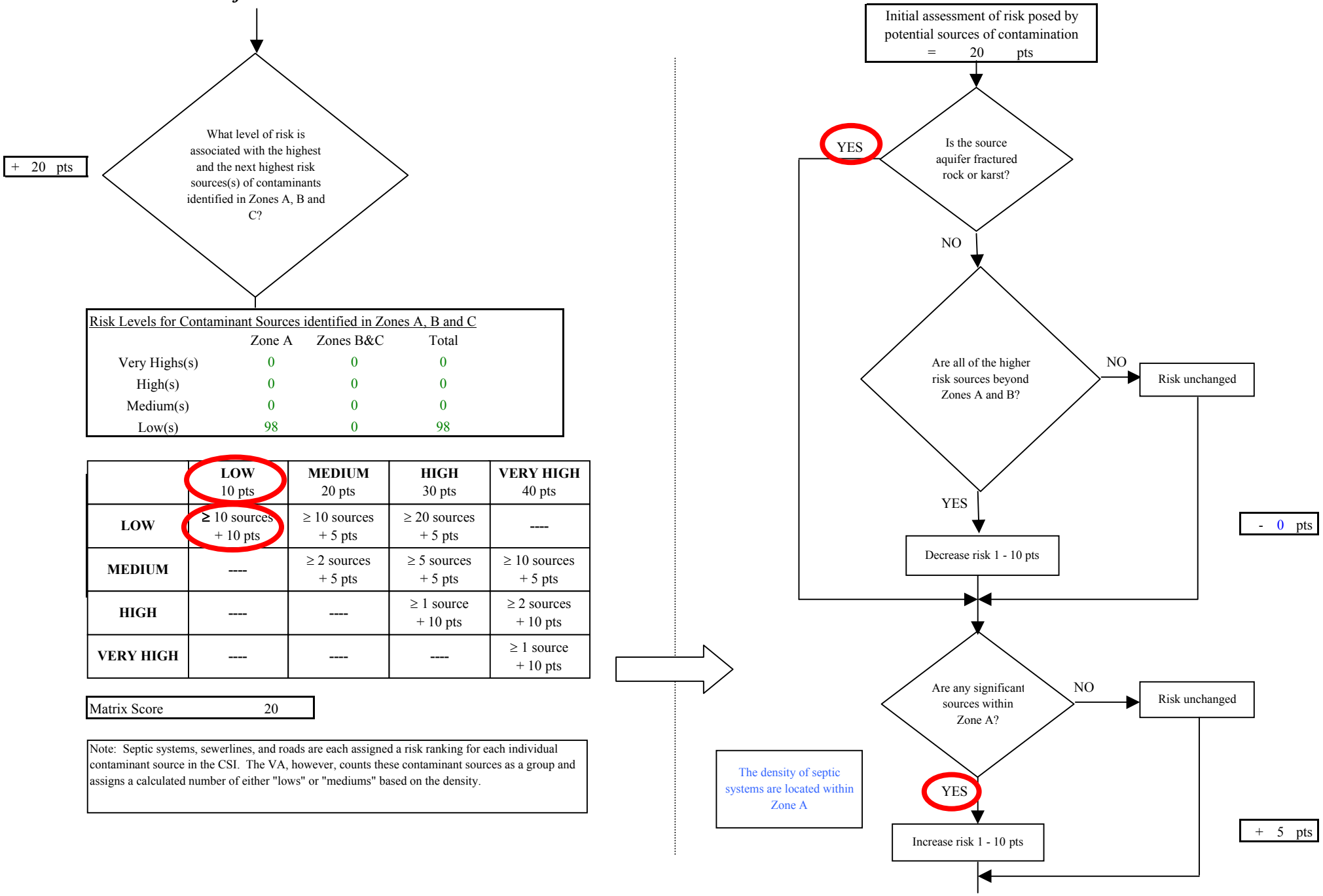


Chart 5. Contaminant risks for Turtle Club - Nitrates and Nitrites



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

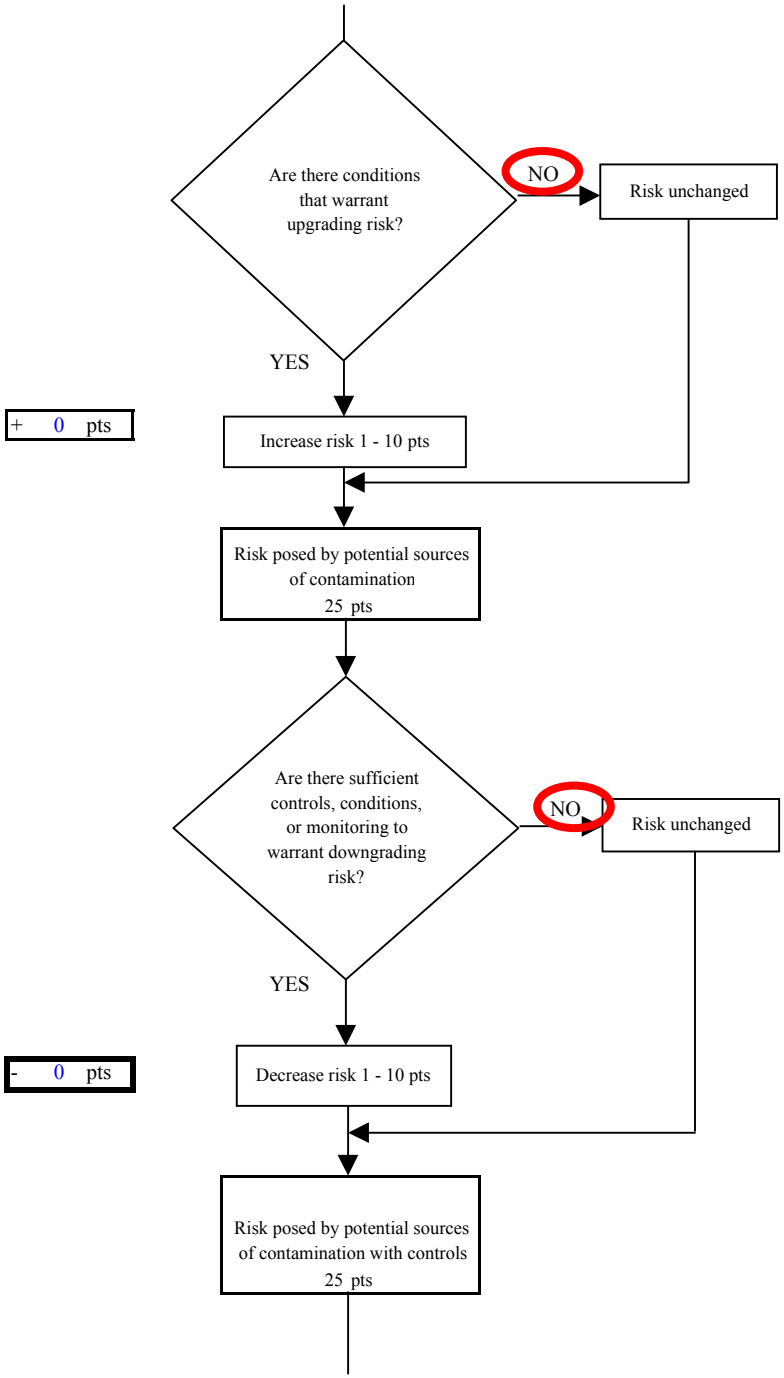
	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	98	0	98

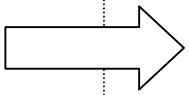
	LOW 10 pts	**MEDIUM** 20 pts	**HIGH** 30 pts	**VERY HIGH** 40 pts
LOW	≥ 10 sources + 10 pts	≥ 10 sources + 5 pts	≥ 20 sources + 5 pts	----
MEDIUM	----	≥ 2 sources + 5 pts	≥ 5 sources + 5 pts	≥ 10 sources + 5 pts
HIGH	----	----	≥ 1 source + 10 pts	≥ 2 sources + 10 pts
VERY HIGH	----	----	----	≥ 1 source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

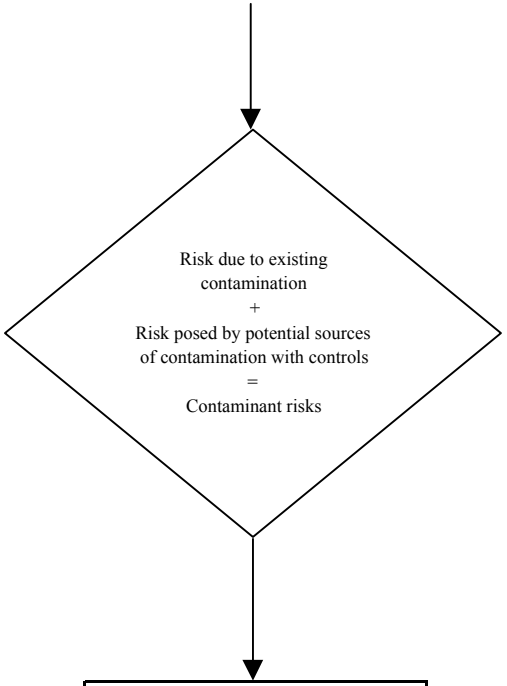
Matrix Score 20

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

Chart 5. Contaminant risks for Turtle Club - Nitrates and Nitrites







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

Contaminant risks*
= 25 pts

*Truncate risk at 50 pts

Medium

Contaminant Risk Ratings

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

Chart 6. Vulnerability analysis for Turtle Club - Nitrates and Nitrites

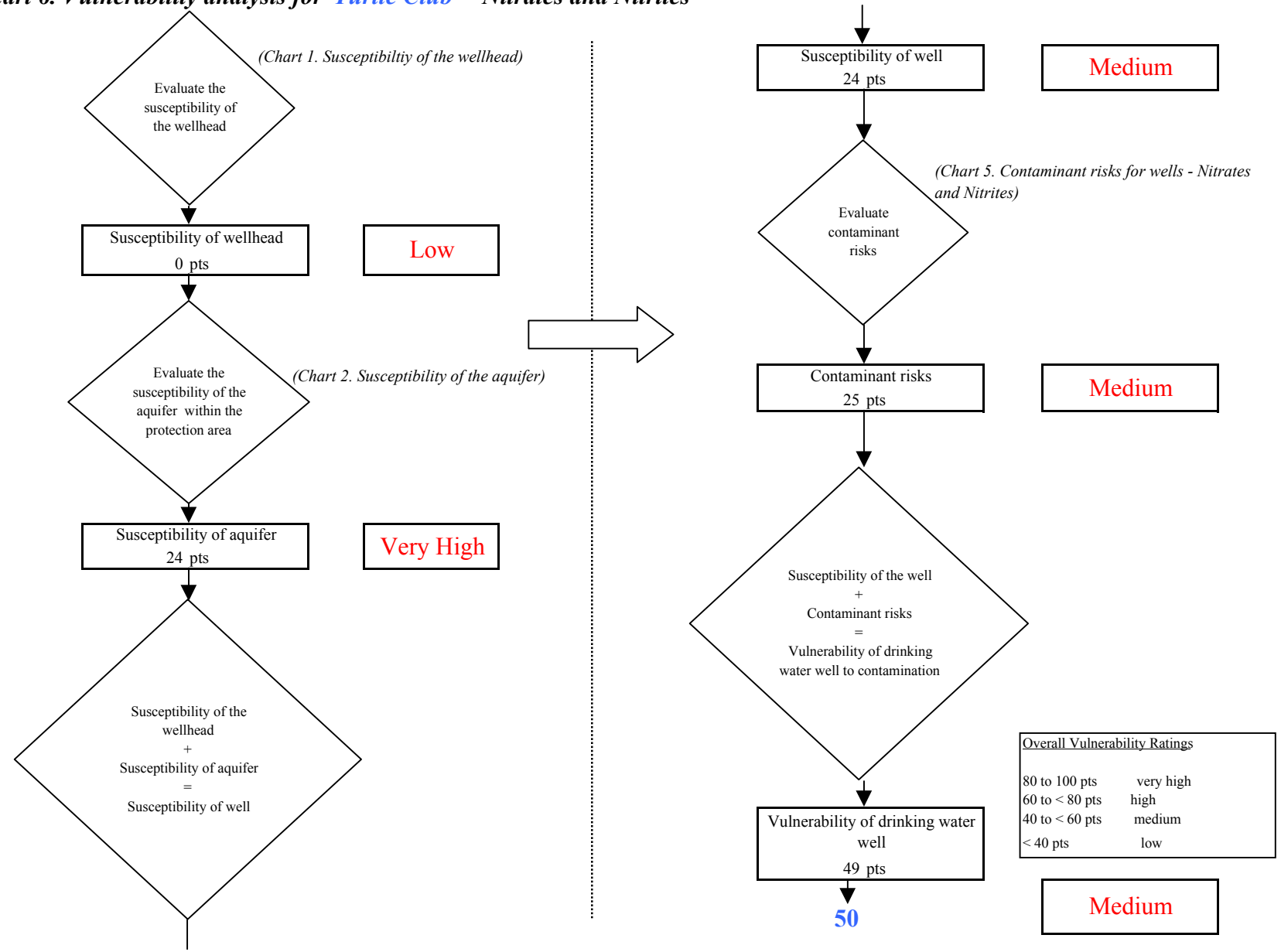


Chart 7. Contaminant risks for Turtle Club - Volatile Organic Chemicals

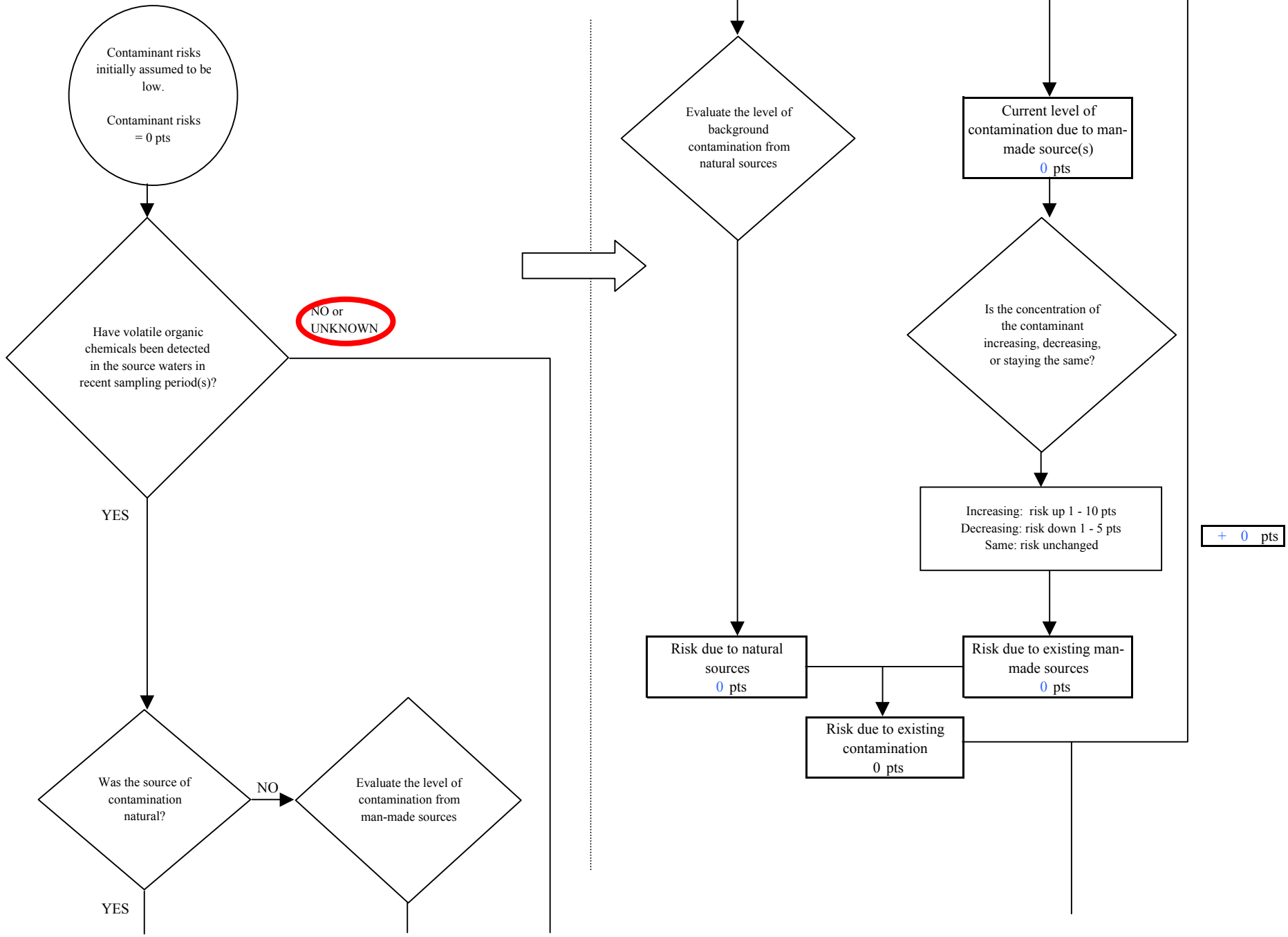
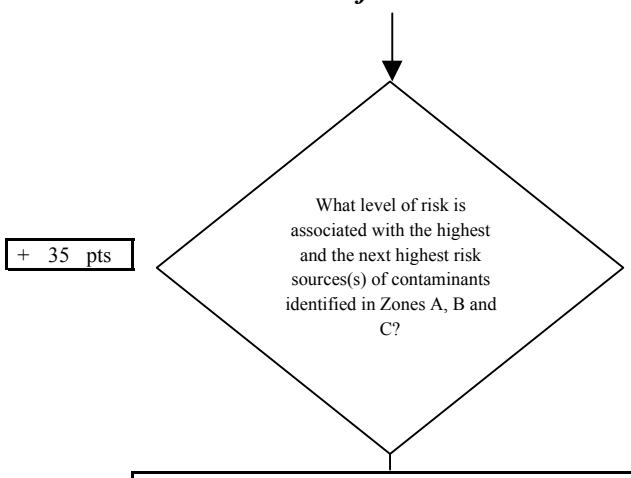


Chart 7. Contaminant risks for Turtle Club - Volatile Organic Chemicals



+ 35 pts

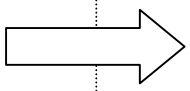
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	1	0	1
Medium(s)	93	0	93
Low(s)	18	0	18

	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 35

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.



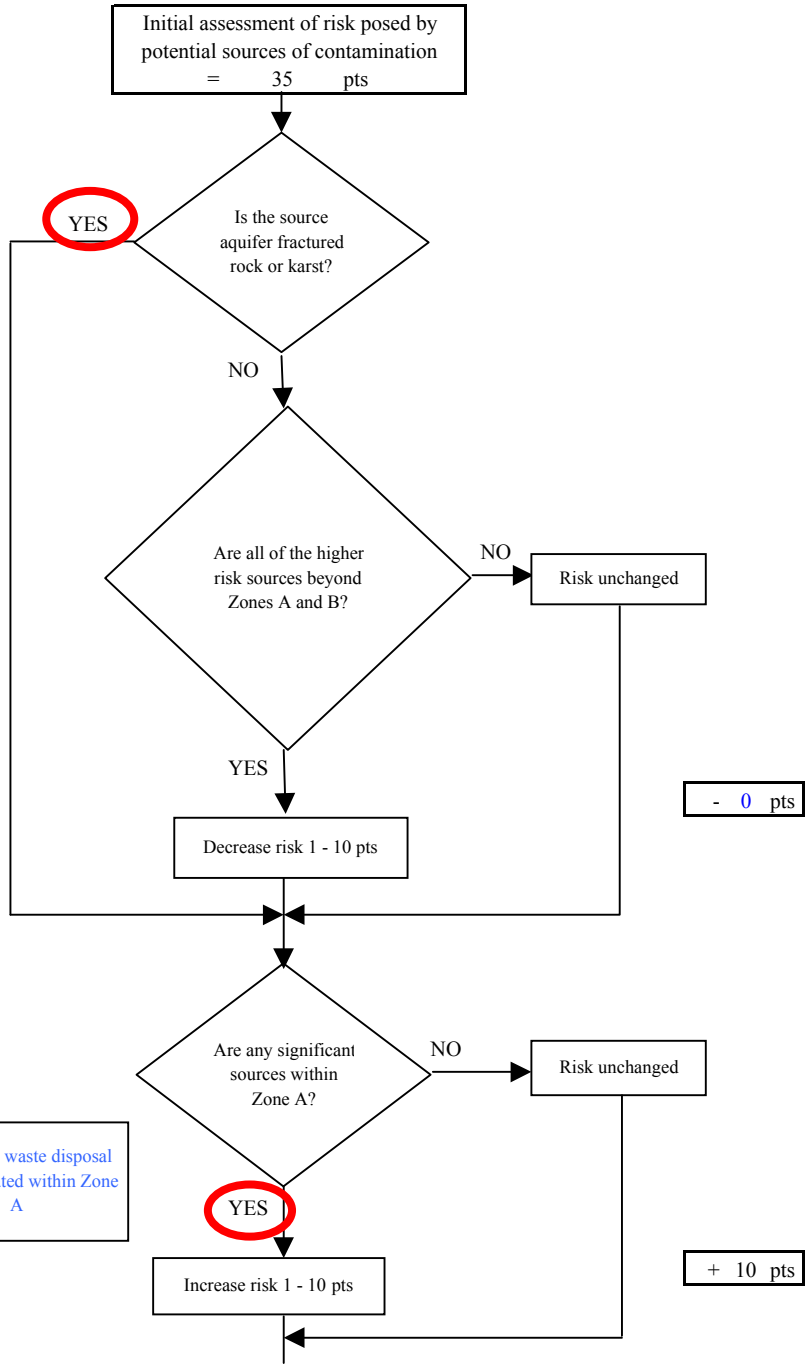


Chart 7. Contaminant risks for Turtle Club - Volatile Organic Chemicals

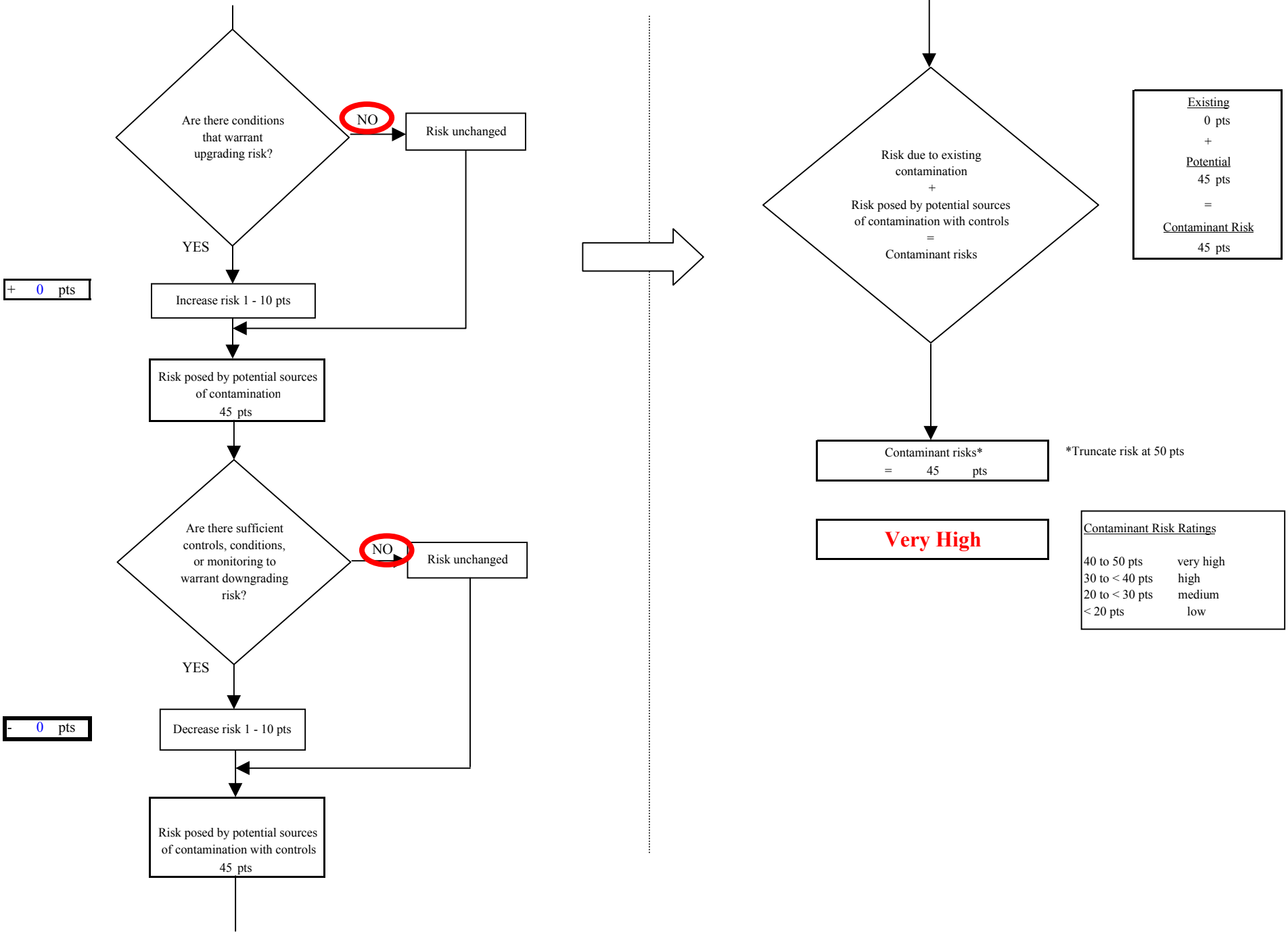


Chart 8. Vulnerability analysis for Turtle Club - Volatile Organic Chemicals