Source Water Assessment

A Hydrogeologic Susceptibility and Vulnerability Assessment for Rivers Edge RV Park Drinking Water System,
Fairbanks, Alaska
PWSID 313071

October 2003

DRINKING WATER PROTECTION PROGRAM REPORT Report 1236
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 Rivers Edge RV Park Source of Public Drinking Water, Fairbanks Area, Alaska

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

This source water assessment provides an evaluation of the vulnerability of the public water system serving the Rivers Edge RV Park to potential contamination. This Class B (non-community) water system consists of one well on Boat Street near the intersection of Airport Way and the Parks Highway west of downtown Fairbanks, Alaska. The well received a natural susceptibility rating of **Medium**. This rating is a combination of a susceptibility rating of **Low** for the actual wellhead and a **Very High** rating for the aquifer in which the well is drawing water from. Identified potential and current sources of contamination for the Rivers Edge RV Park public water system include: a leather processing business, sewer lines, construction trade areas, furniture stores, a furniture store, a jeweler, a motor vehicle repair shop, a pet groomer, a pharmacy, residential areas, fuel storage tanks, a funeral services business, a hardware store, a laboratory, Class V Motor Vehicle Waste Disposal wells, Leaking Underground Storage Tank (LUST) sites, and DEC-recognized contaminated sites. These are considered as sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Combining the natural susceptibility of the well with the contaminant risk, the public water system for Rivers Edge RV Park received an overall vulnerability rating of **High** for volatile organic chemicals; and a **Medium** for bacteria and viruses, and nitrates and/or nitrites.

RIVERS EDGE RV PARK PUBLIC DRINKING WATER SYSTEM

Rivers Edge RV Park public water system is a Class B (non-community) water system. The system consists of one well on Boat Street near the intersection of Airport Way and the Parks Highway west of downtown Fairbanks, Alaska (T1S, R1W, Section 7) (See Map 1 of Appendix A). Fairbanks is located in the Fairbanks North Star Borough which is near the center of Alaska (Please see the inset of Map 1 in Appendix A for location). The Borough's current population is 82,840 making it the second-largest population center in the state (ADCED, 2002). Communities located within the Borough include : College, Eielson Air Force Base, Ester, Fairbanks, Fox, Harding Lake, Moose Creek, North Pole, Pleasant Valley, Salcha, and Two Rivers.

Golden Heart Utilities provides a piped water and sewer system for the city of Fairbanks. The majority of residents use heating oil (typically stored in both above and below ground 275 to 500-gallon tanks) for heating homes and buildings (ADCED, 2002). Electricity is provided by Golden Valley Electric Association. The city provides garbage collection services, and refuse is hauled to the Class 1 Borough landfill on South Cushman (ADCED, 2002).

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

According to the well log for this water system, the depth of the well is 90 feet below the ground surface and is screened in water bearing gravel.

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

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

RIVERS EDGE RV PARK DRINKING WATER PROTECTION AREA

The pathways most likely for surface contamination to reach the groundwater are identified as the first step in determining a drinking water system's risk. These areas are determined by looking at the characteristics of the soil, groundwater, aquifer, and well.

The most probable area for contamination to reach the drinking water well is the area that contributes water to

the well, the groundwater capture zone. The groundwater capture zone is located in the area circling the well (the area influenced by pumping) and also the area of the water table upgradient of the well, usually forming a parabola shape.

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

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

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

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

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

The following is a summary of the four zones for wells and the calculated time-of-travel for each:

Table 1. Definition of Zones

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

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

The drinking water protection area outlined for the Rivers Edge RV Park on Map 1 of Appendix A will serve as the focus for voluntary protection efforts.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program (DWPP) has completed an inventory of potential and existing sources of contamination within the Rivers Edge RV Park protection area. This inventory was completed through a search of agency records and other publicly available information. Potential drinking water contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development.

For the basis of all Class B public water system assessments, three categories of drinking water contaminants were inventoried. They include:

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

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

RANKING OF CONTAMINANT RISKS

Once the potential and existing sources of contamination have been identified, they are each assigned a ranking according to what type and level of risk they represent. Ranking of contaminant risks for a "potential" or "existing" source of contamination is a combination of toxicity and volume associated with that source. Rankings include:

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

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

Tables 2 through 4 in Appendix B contain the ranking of inventoried potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals.

VULNERABILITY OF RIVERS EDGE RV PARK DRINKING WATER SYSTEM

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

- Natural susceptibility; and
- Contaminant risks.

Appendix D contains eight charts, which together form the 'Vulnerability Analysis' for a source water assessment for a public drinking water source. Chart 1 analyzes the 'Susceptibility of the Wellhead' to contamination by looking at the construction of the well and its surrounding area. Chart 2 analyzes the 'Susceptibility of the Aquifer' to contamination by looking at the properties of the aquifer and the presence of other wells or boreholes in the area. Chart 3 analyzes 'Contaminant Risks' for the drinking water source with respect to Bacteria and Viruses. The 'Contaminant Risks' portion of the analysis considers potential sources of contaminants as well as a review of the water system's contaminant sample results. Lastly, Chart 4 combines the results of the first three charts to produce the 'Vulnerability Analysis for Bacteria and Viruses'. Charts 5 through 8 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

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

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

+

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

=

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

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

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

The wellhead for the Rivers Edge RV Park received a Low Susceptibility rating. The 11/3/00 Sanitary Survey indicates the well is securely capped although it is not covered with a sanitary seal. The land surface is sloped away from the well and the well casing has been grouted. A sanitary seal prevents potential contaminants from entering the well while sloping of the land surface and grouting help to prevent potential contaminants from traveling down the outside of the well casing.

The aquifer the Rivers Edge RV Park well is completed in received a Very High Susceptibility rating. The highly transmissive aquifer material in the area allows contaminants to quickly travel downward from the surface with the precipitation and surface water runoff, while the shallow water table leaves little room for soils to filter contaminants before they are dispersed into the groundwater. Wells within the protection area can also provide a quick pathway to the aquifer if they are not grouted correctly. Table 2 summarizes the Susceptibility scores and ratings for Rivers Edge RV Park.

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	0	Low
Susceptibility of the Aquifer	21	Very High
Natural Susceptibility	21	Medium

The Contaminant Risk has been derived from an evaluation of the routine sampling results of the water system and the presence of potential sources of contamination. Contaminant risks to a drinking water source depend on the type and distribution of contaminant sources. Flow charts are used to assign a point score, and ratings are assigned in the same way as for the natural susceptibility:

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

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

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	20	Medium
Nitrates and/or Nitrites	20	Medium
Volatile 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	40	Medium
Nitrates and Nitrites	40	Medium
Volatile Organic Chemicals	60	High

Bacteria and Viruses

The sewer lines in the protection area represent the greatest risk 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). Routine sampling has not detected coli forms in the water.

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

Nitrates and Nitrites

The sewer lines in the protection area also represent the greatest risk to to nitrates and nitrites for this source of public drinking water.

Nitrates are very mobile, moving at approximately the same rate as water. Nitrates have not been detected in recent sampling history for the Rivers Edge RV Park well.

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

Volatile Organic Chemicals

The underground fuel storage tanks and the Class V Motor Vehicle Waste Disposal wells represent the greatest risk for volatile organic chemical contamination to the well.

Class V Motor Vehicle Waste Disposal wells are most commonly septic systems or dry wells servicing a type of motor vehicle repair shop. They have been banned as of April 5, 2000 although existing disposal wells have until January 1, 2007 in most cases to either close or obtain a permit to operate.

A DEC-recognized contaminated site and a closed Leaking Underground Storage Tank (LUST) site are located at 4561 Old Airport Road and Zone B of the protection area (RecKey 1992310922201). Contamination was detected when two 12,000 gallon heating oil tanks were removed in 1992. Contaminated soil was removed and only very low concentrations were detected in the groundwater.

A second DEC-recognized contaminated site is located at 1721 University Ave and Zone C of the protection area (RecKey 1991310925301). A site assessment in 1991 revealed that a garage floor drain contributed petroleum, solvents, and metals contamination to both soils and groundwater. Contaminated soils were excavated and the site is now closed.

The Leaking Underground Storage Tank (LUST) site in Zone C is also located at 1721 University Ave. Contamination was discovered during the removal of 1,000-gallon gasoline tank in 1991. Contaminated soils

were excavated and the groundwater monitoring is ongoing.

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

Volatile Organic Chemicals have not been sampled for in this water system. After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

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APPENDIX A

Rivers Edge RV Park
Drinking Water Protection Area Location Map
(Map 1)

GEIST ROAD
PARKS HIGHWAY
FAIRBANKS STREET
BIRCH LANE
ARIAN DRIVE
RIVERVIEW DRIVE
PARK DRIVE
COPPET STREET
PHILLIPS FIELD ROAD
CHENA LANDINGS LOOP ROAD
2ND AVENUE
HILTON AVENUE
EAGAN AVENUE
ROAD
HOSELTON ROAD
Zone A
BOAT STREET
AIRPORT WAY
Zone B
MITCHELL AVENUE
ADAMS DRIVE
SWENSON AVENUE
UNIVERSITY AVENUE
Zone C
HILL ROAD
ADA STREET
KIANA STREET
LILIAN STREET
19TH AVENUE
WILBUR STREET
DAVIS ROAD
KING ROAD
AIRPORT WAY
OLD AIRPORT WAY
ACCESS ROAD
SOUTH FAIRBANKS EXPRESSWAY
Zone D
ROBERT J. MITCHELL EXPRESSWAY
PEGER ROAD
FIFTH
TRUCK ST
TRAILER ST
KOBA
SHELL

Map 1: Drinking Water Protection Area

PWSID: 313071

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 700 1,400 2,800 Feet

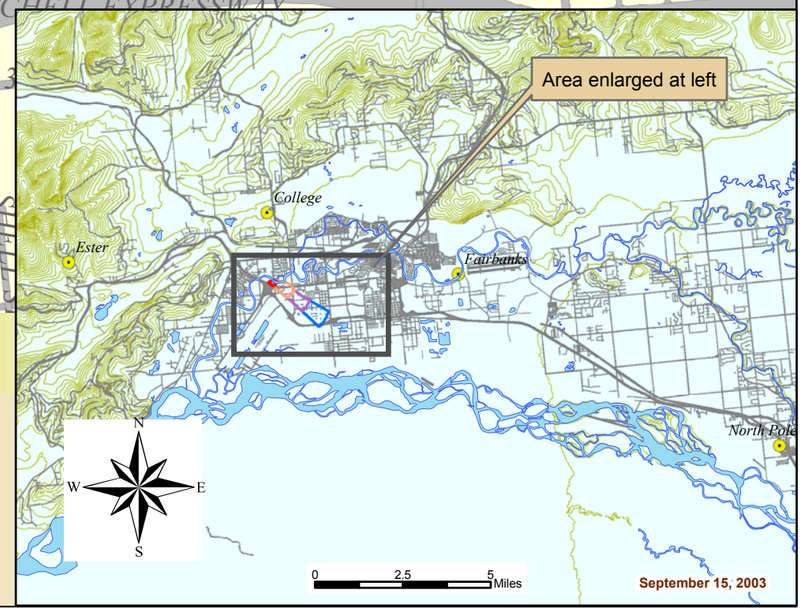
1:16,800

Data Sources:

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

Legend

- Zone A *Several months travel time*
- Zone B *Less than 2 years travel time*
- Zone C *Less than 5 years travel time*
- Zone D *Less than 10 years travel time*
- Rivers Edge RV Park well
- Parcels
- Roads



APPENDIX B

Contaminant Source Inventory and Risk Ranking for Rivers Edge RV Park (Tables 1-4)

Table 1

Contaminant Source Inventory for ***Rivers Edge R.V. Park***

PWSID 313071.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Leather processing	C24	C24-1	A	2	4106 Boat Street
Domestic wastewater collection systems (sewer lines or lift stations)	D01		A	2	Estimated 2 sewer lines in Zone A
Construction trade areas and materials	C09	C09-1	B	2	4561 Old Airport Road
Furniture manufacturing, repair, and finishing shops	C14	C14-1	B	2	4630 Old Airport Way
Jewelers	C19	C19-1	B	2	3755 Airport Way
Motor /motor vehicle repair shops	C31	C31-1	B	2	1432 University Ave S
Pet groomers	C34	C34-1	B	2	1424 University Ave S
Pharmacies (with on-site wastewater disposal)	C35	C35-1	B	2	3755 Airport Way
Domestic wastewater collection systems (sewer lines or lift stations)	D01		B	2	Estimated 7 sewer lines in Zone B
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	B	2	1432 University Ave S
Residential Areas	R01		B	2	Approximately 15 acres of residential area
Tanks, diesel (underground)	T08	T08-1	B	2	3755 Airport Way
Tanks, diesel (underground)	T08	T08-2	B	2	3755 Airport Way
Tanks, gasoline (underground)	T12	T12-1	B	2	3755 Airport Way
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-1	B	2	4561 Old Airport Road; Brown and Root; RecKey 1992310922201
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U08-2	B	2	3755 Airport Way
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U09-1	B	2	Brown and Root
Construction trade areas and materials	C09	C09-2	C	2	1630 Washington Drive
Funeral services and crematories	C13	C13-1	C	2	3704 Erickson Ave
Hardware stores	C17	C17-1	C	2	1725 University Ave S
Laboratories (chemical, soils, and research)	C20	C20-1	C	2	1818 University Ave S #9
Domestic wastewater collection systems (sewer lines or lift stations)	D01		C	2	Estimated six sewer lines in Zone C
Residential Areas	R01		C	2	Approximately 50 acres of residential area in Zone C

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-2	C	2	1721 University Ave; RecKey 1991310925301
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-1	C	2	1701 E 6th Ave; File Number 102.26.030
Motor vehicle/general storage yards/facilities	X27	X27-1	C	2	3420 Davis Road
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-3	D	2	3133 Davis Road; RecKey 1998310100801
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-4	D	2	3045 Davis Road; RecKey 1996310916501
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-5	D	2	3021 Davis Road; RecKey 1990310915601
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-6	D	2	2449 Hill Road; RecKey 1992310908601
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-2	D	2	3133 Davis Road; File Number 100.26.073
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-3	D	2	2055 Hill Road; File Number 100.26.053
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-4	D	2	3000 Davis Road
Open Leaking Underground Fuel Storage Tank (LUST) Sites	U07	U07-5	D	2	One Mile Peger Rd
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U08-3	D	2	3045 Davis Road

Table 2

Contaminant Source Inventory and Risk Ranking for Rivers Edge R.V. Park Sources of Bacteria and Viruses

PWSID 313071.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Domestic wastewater collection systems (sewer lines or lift stations)	D01		A	Medium	2	Estimated 2 sewer lines in Zone A
Residential Areas	R01		B	Low	2	Approximately 15 acres of residential area
Domestic wastewater collection systems (sewer lines or lift stations)	D01		B	Medium	2	Estimated 7 sewer lines in Zone B
Pharmacies (with on-site wastewater disposal)	C35	C35-1	B	Low	2	3755 Airport Way
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	B	Low	2	1432 University Ave S
Domestic wastewater collection systems (sewer lines or lift stations)	D01		C	Medium	2	Estimated six sewer lines in Zone C
Residential Areas	R01		C	Low	2	Approximately 50 acres of residential area in Zone C

Table 3

Contaminant Source Inventory and Risk Ranking for Rivers Edge R.V. Park Sources of Nitrates/Nitrites

PWSID 313071.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01		A	Medium	2	Estimated 2 sewer lines in Zone A
Leather processing	C24	C24-1	A	Low	2	4106 Boat Street
Residential Areas	R01		B	Low	2	Approximately 15 acres of residential area
Domestic wastewater collection systems (sewer lines or lift stations)	D01		B	Medium	2	Estimated 7 sewer lines in Zone B
Pharmacies (with on-site wastewater disposal)	C35	C35-1	B	Low	2	3755 Airport Way
Residential Areas	R01		C	Low	2	Approximately 50 acres of residential area in Zone C
Domestic wastewater collection systems (sewer lines or lift stations)	D01		C	Medium	2	Estimated six sewer lines in Zone C
Hardware stores	C17	C17-1	C	Low	2	1725 University Ave S

Table 4

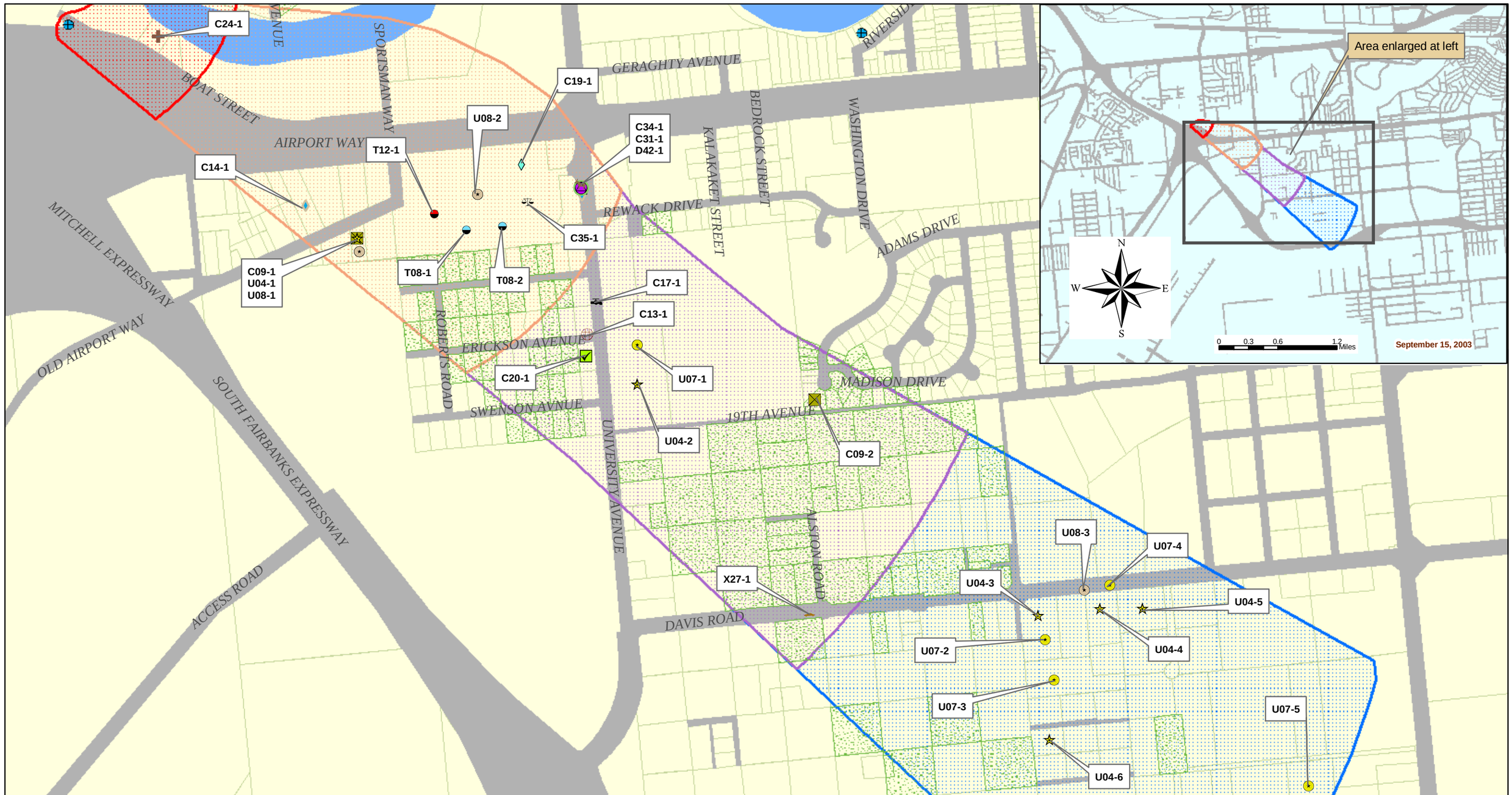
Contaminant Source Inventory and Risk Ranking for Rivers Edge R.V. Park
Sources of Volatile Organic Chemicals

PWSID 313071.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Domestic wastewater collection systems (sewer lines or lift stations)	D01		A	Low	2	Estimated 2 sewer lines in Zone A
Leather processing	C24	C24-1	A	Medium	2	4106 Boat Street
Domestic wastewater collection systems (sewer lines or lift stations)	D01		B	Low	2	Estimated 7 sewer lines in Zone B
Residential Areas	R01		B	Low	2	Approximately 15 acres of residential area
Construction trade areas and materials	C09	C09-1	B	Low	2	4561 Old Airport Road
Furniture manufacturing, repair, and finishing shops	C14	C14-1	B	Medium	2	4630 Old Airport Way
Jewelers	C19	C19-1	B	Low	2	3755 Airport Way
Motor /motor vehicle repair shops	C31	C31-1	B	Medium	2	1432 University Ave S
Pet groomers	C34	C34-1	B	Low	2	1424 University Ave S
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	B	High	2	1432 University Ave S
Tanks, diesel (underground)	T08	T08-1	B	High	2	3755 Airport Way
Tanks, diesel (underground)	T08	T08-2	B	High	2	3755 Airport Way
Tanks, gasoline (underground)	T12	T12-1	B	High	2	3755 Airport Way
Domestic wastewater collection systems (sewer lines or lift stations)	D01		C	Low	2	Estimated six sewer lines in Zone C
Residential Areas	R01		C	Low	2	Approximately 50 acres of residential area in Zone C
Construction trade areas and materials	C09	C09-2	C	Low	2	1630 Washington Drive
Hardware stores	C17	C17-1	C	Low	2	1725 University Ave S
Laboratories (chemical, soils, and research)	C20	C20-1	C	Low	2	1818 University Ave S #9
Motor vehicle/general storage yards/facilities	X27	X27-1	C	Low	2	3420 Davis Road

APPENDIX C

Rivers Edge RV Park
Drinking Water Protection Area
and Potential and Existing Contaminant Sources
(Map 2)



Map 2: Potential Contaminant Sources

PWSID: 313071

Alaska Department of Environmental Conservation

Alaska Drinking Water Protection Program

0 312.5 625 1,250 Feet

1:7,500

Data Sources:

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

- Public Drinking Water well
- R01, Residential area
- Roads
- Parcels
- C09, Construction trade areas
- C13, Funeral services
- C14, Furniture manufacturing
- C17, Hardware stores
- C19, Jewelers
- C20, Laboratories
- C24, Leather processing
- C31, Motor repair shops
- C34, Pet groomers
- C35, Pharmacies
- D10, Large capacity septic systems
- D42, Motor Vehicle Waste Disposal wells
- T08, Tanks, diesel (underground)
- T12, Tanks, gasoline (underground)
- U04, Contaminated sites, DEC recognized
- U07, Open LUST Sites
- U08, Closed LUST Sites
- X27, Motor vehicle/general storage yards

APPENDIX D

Vulnerability Analysis for Rivers Edge RV Park
Public Drinking Water Source
(Charts 1-8)

Chart 1. Susceptibility of the wellhead - Rivers Edge RV Park

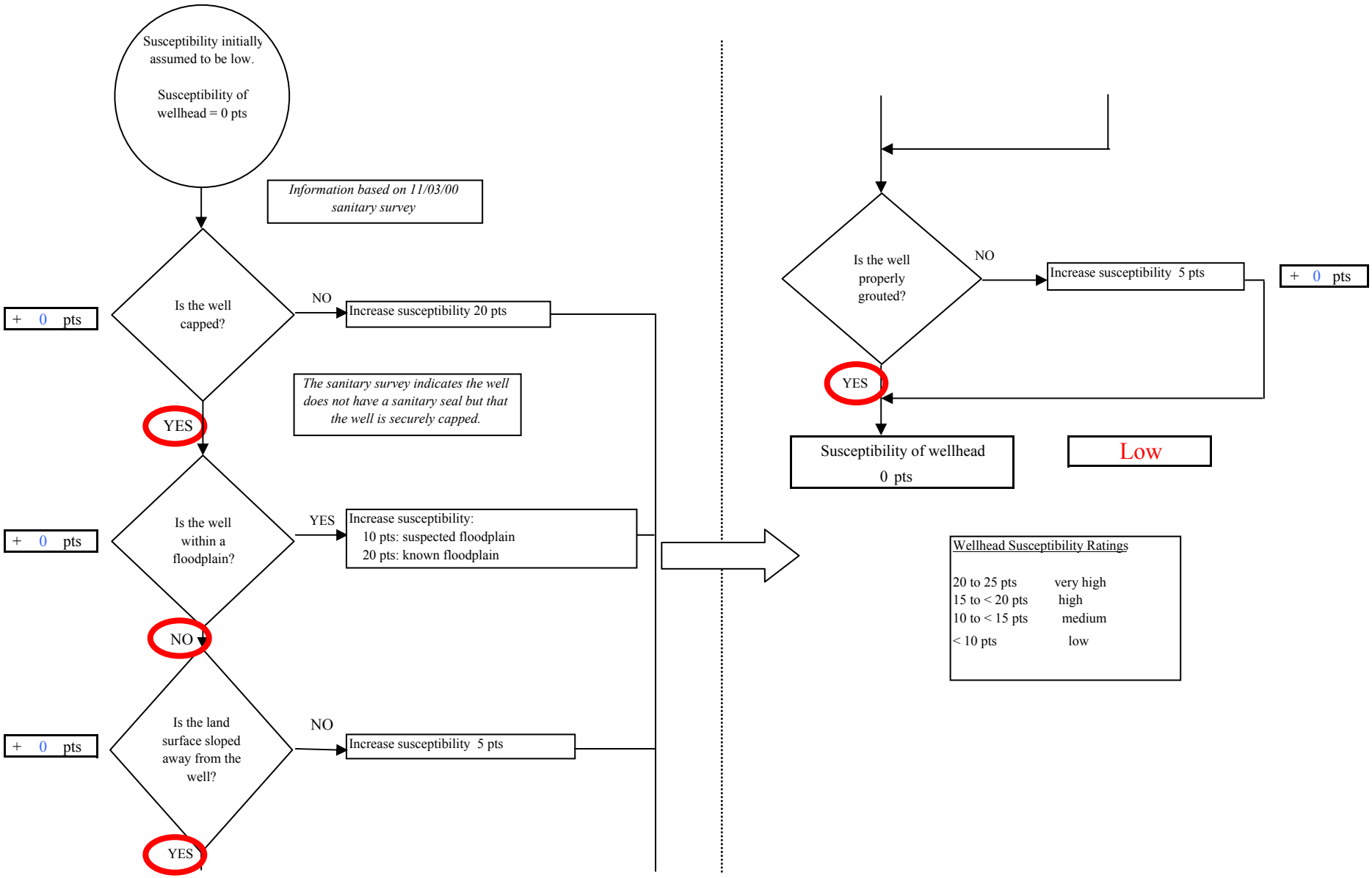


Chart 2. Susceptibility of the aquifer - Rivers Edge RV Park

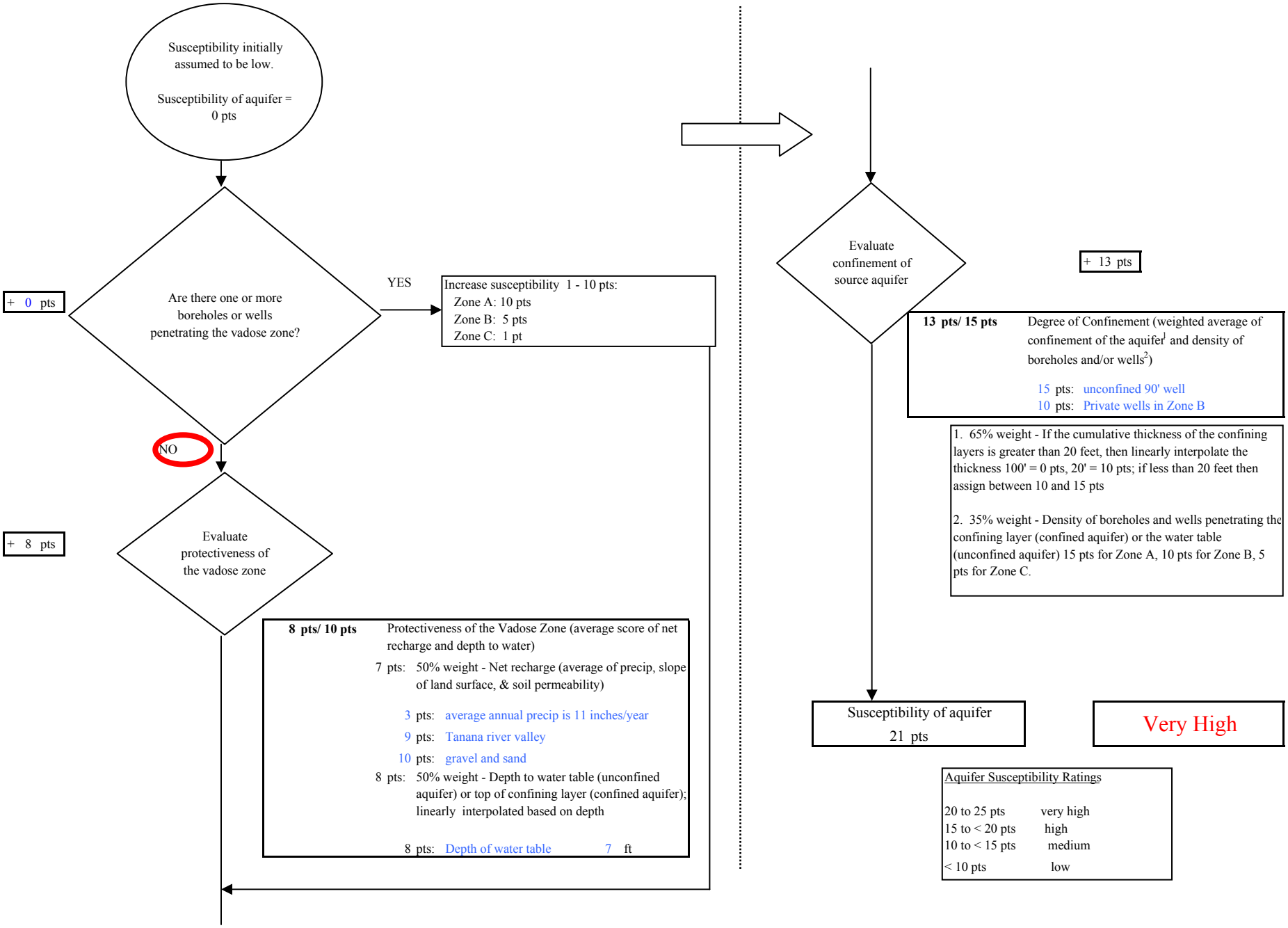
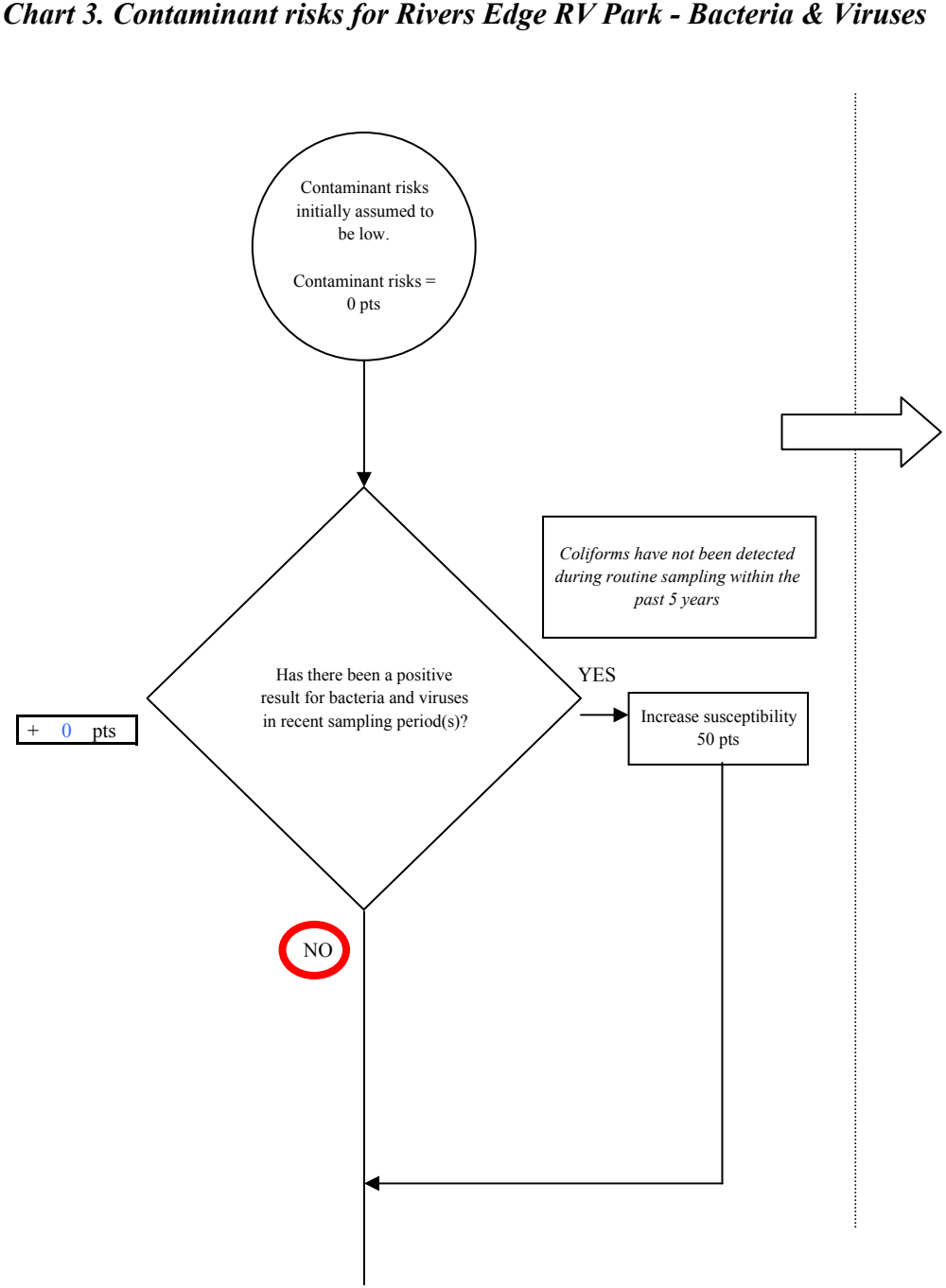
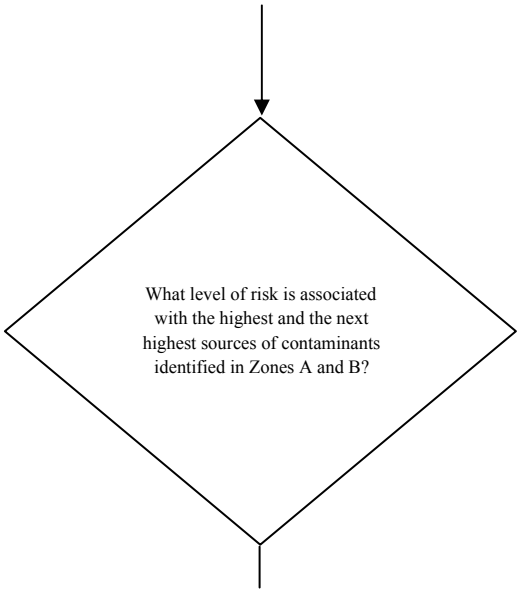


Chart 3. Contaminant risks for Rivers Edge RV Park - Bacteria & Viruses





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

	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 Rivers Edge RV Park - Bacteria & Viruses

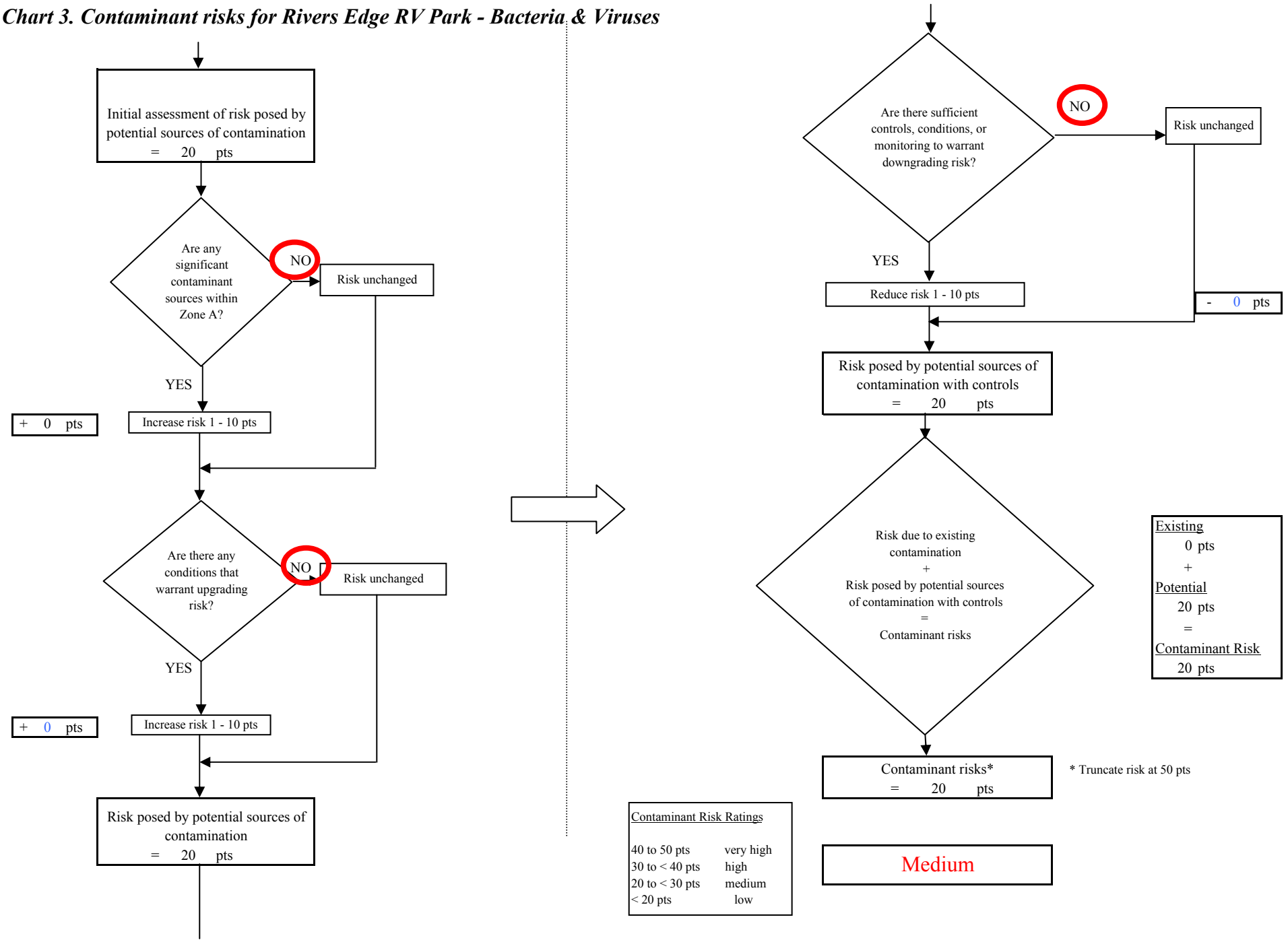


Chart 4. Vulnerability analysis for Rivers Edge RV Park - Bacteria & Viruses

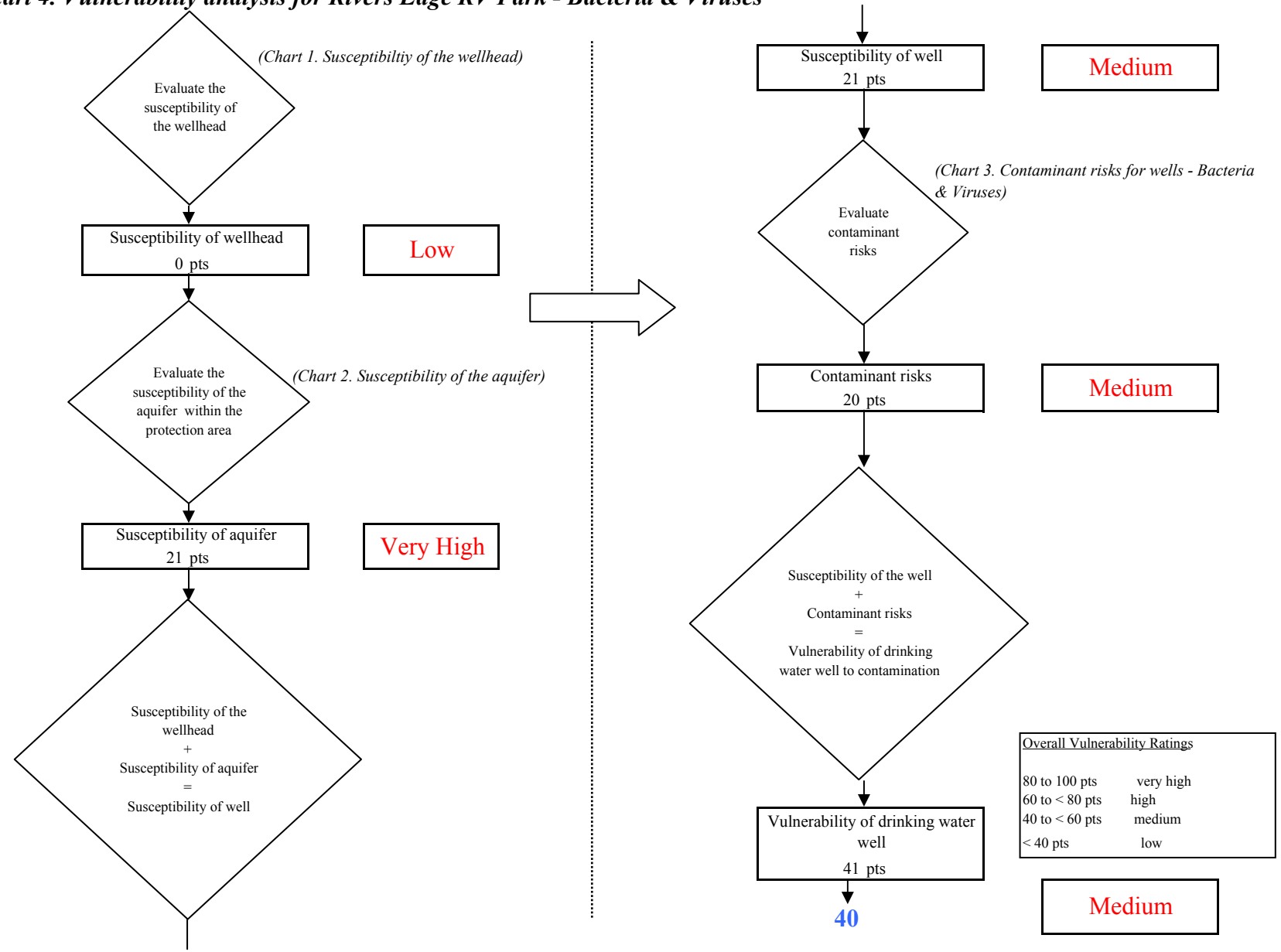


Chart 5. Contaminant risks for Rivers Edge RV Park - Nitrates and Nitrites

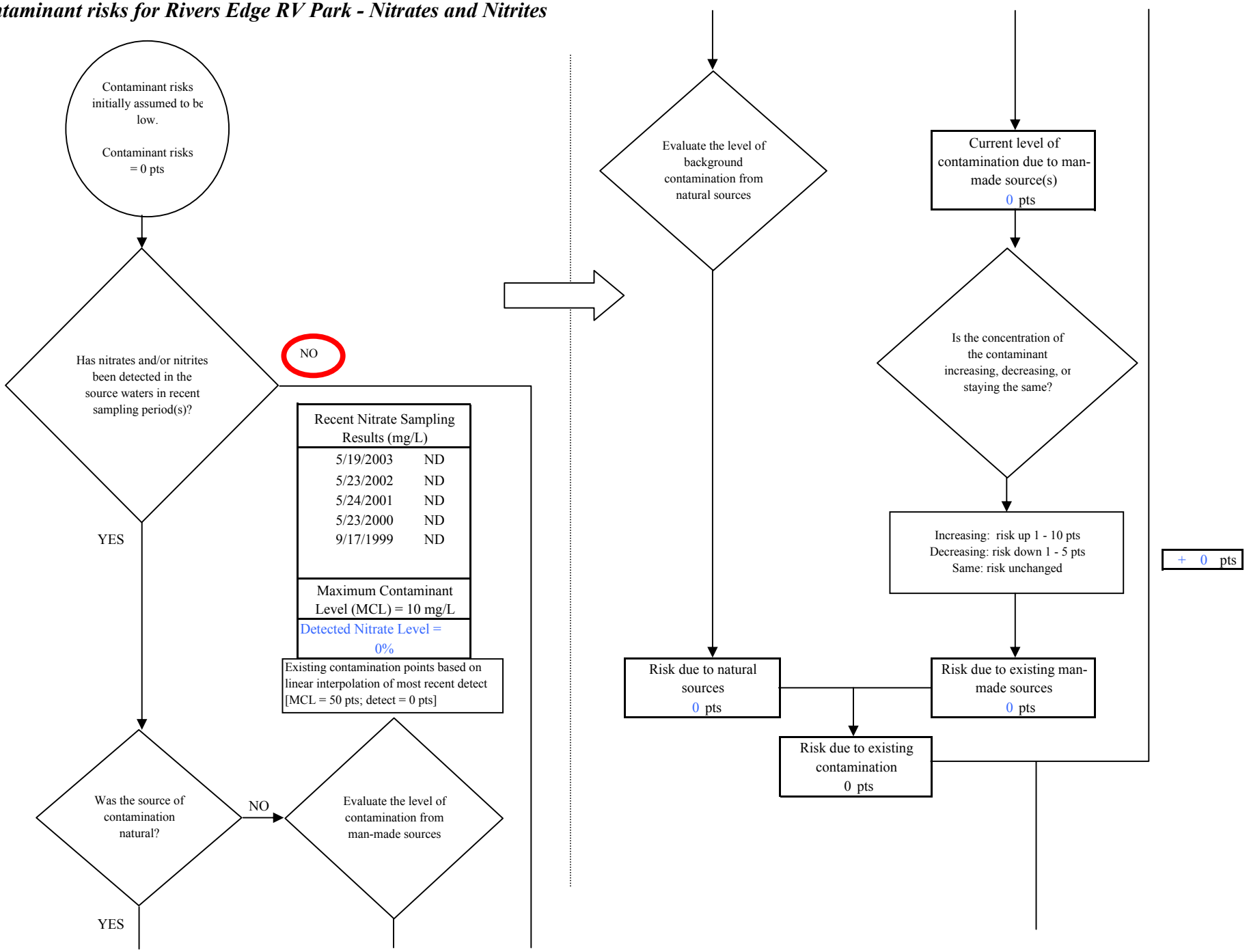


Chart 5. Contaminant risks for Rivers Edge RV Park - Nitrates and Nitrites

+ 20 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)	1	0	1
Low(s)	1	5	6

	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.

Initial assessment of risk posed by potential sources of contamination = 20 pts

Is the source aquifer fractured rock or karst?

YES

NO

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

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

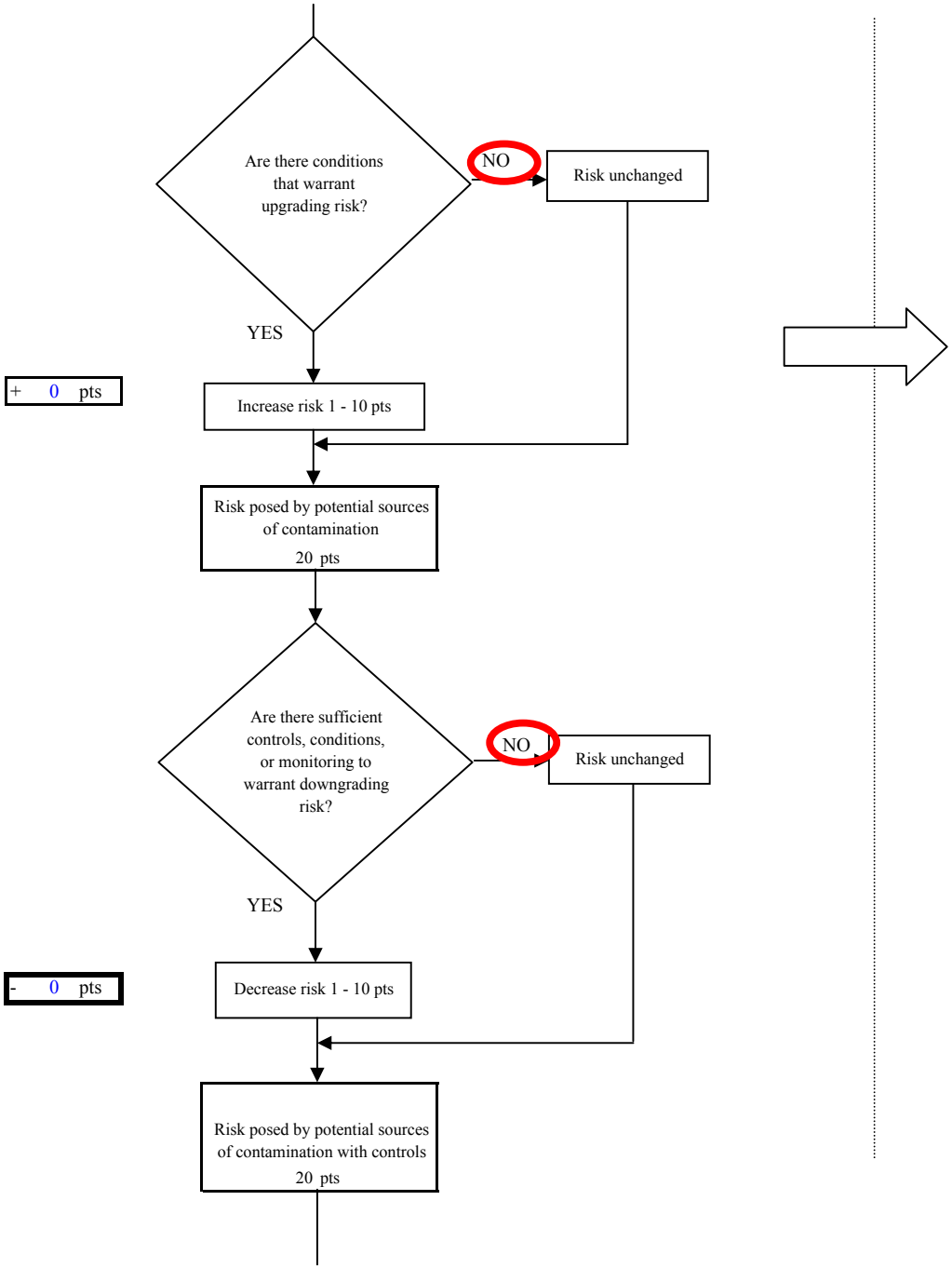
Risk unchanged

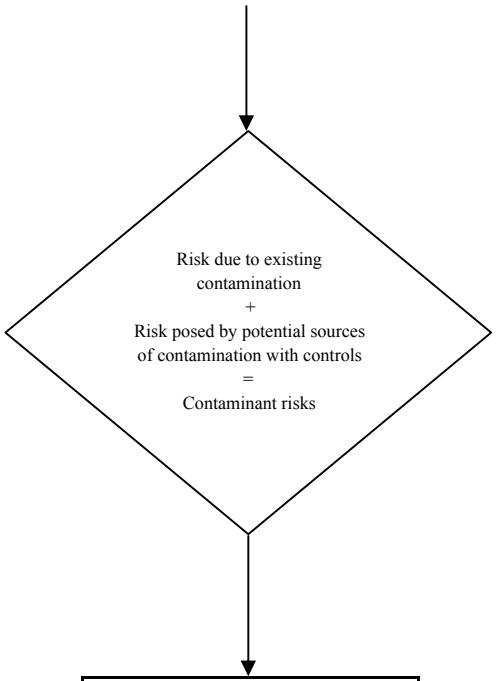
YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 5. Contaminant risks for Rivers Edge RV Park - Nitrates and Nitrites





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

Contaminant risks*
= 20 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 Rivers Edge RV Park - Nitrates and Nitrites

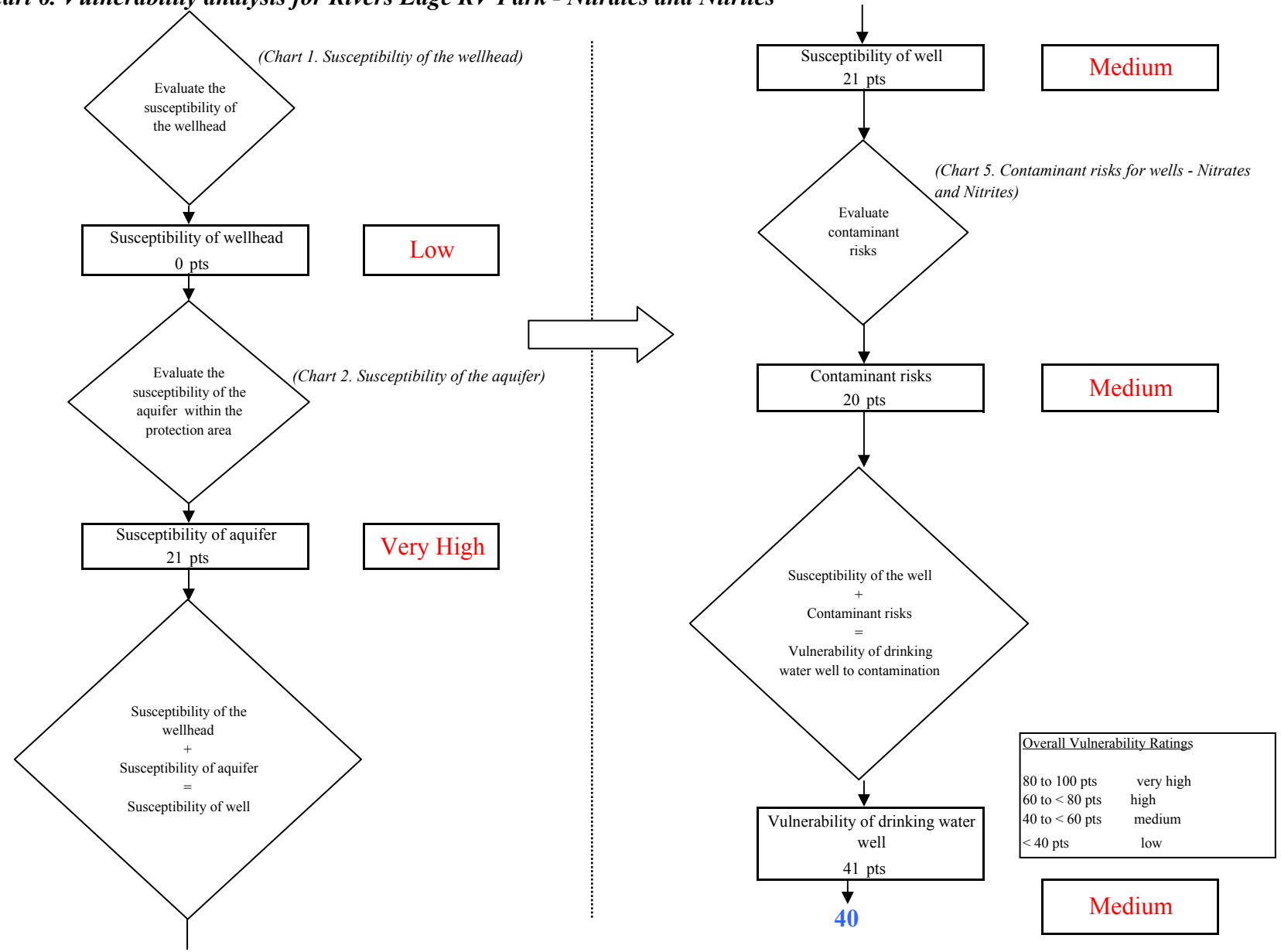


Chart 7. Contaminant risks for Rivers Edge RV Park - Volatile Organic Chemicals

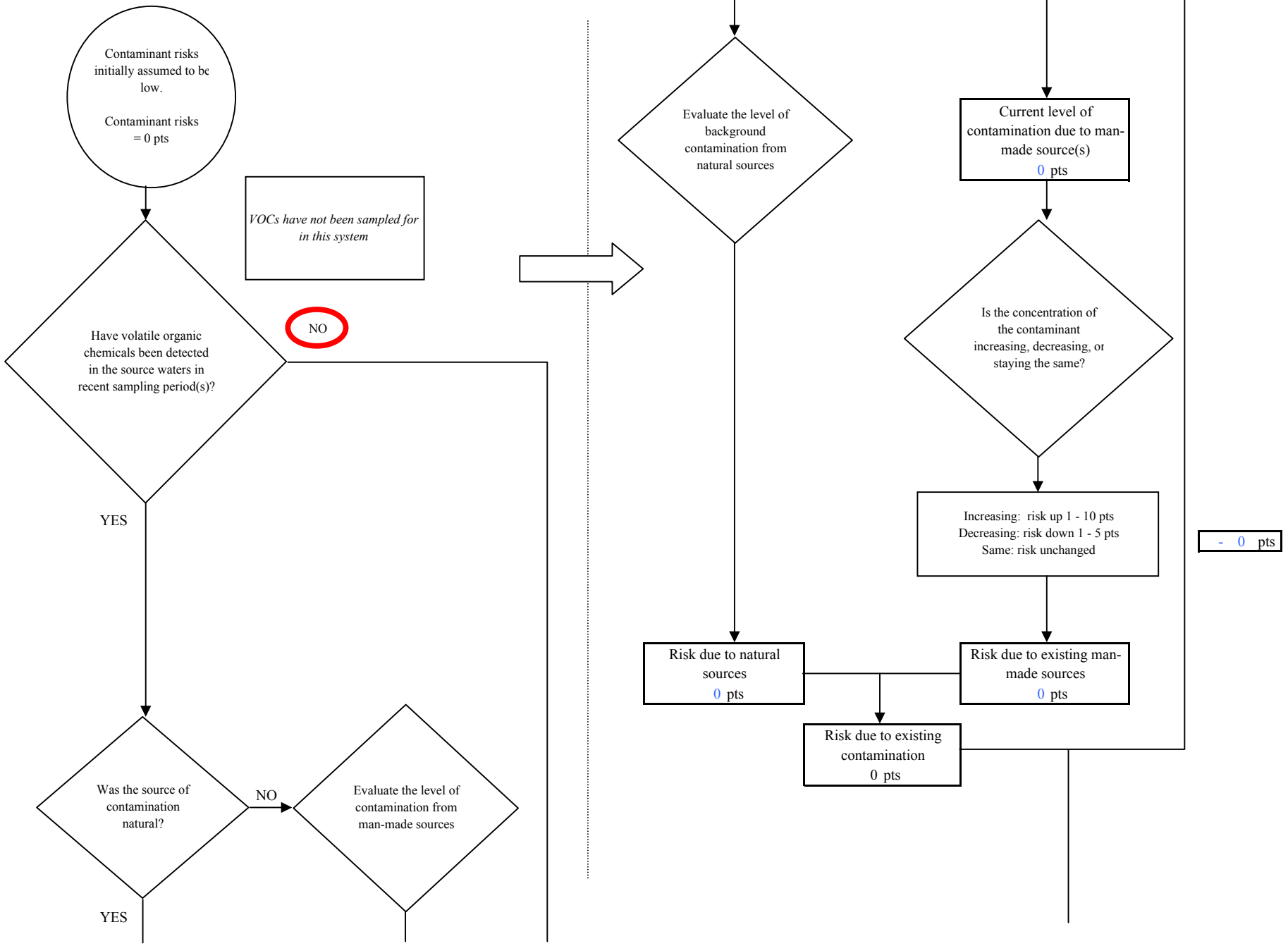


Chart 7. Contaminant risks for Rivers Edge RV Park - Volatile Organic Chemicals

+ 40 pts

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

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	4	4
Medium(s)	1	2	3
Low(s)	1	9	10

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

Matrix Score 40

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

Initial assessment of risk posed by potential sources of contamination = 40 pts

Is the source aquifer fractured rock or karst?

YES

NO

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

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 0 pts

Chart 7. Contaminant risks for Rivers Edge RV Park - Volatile Organic Chemicals

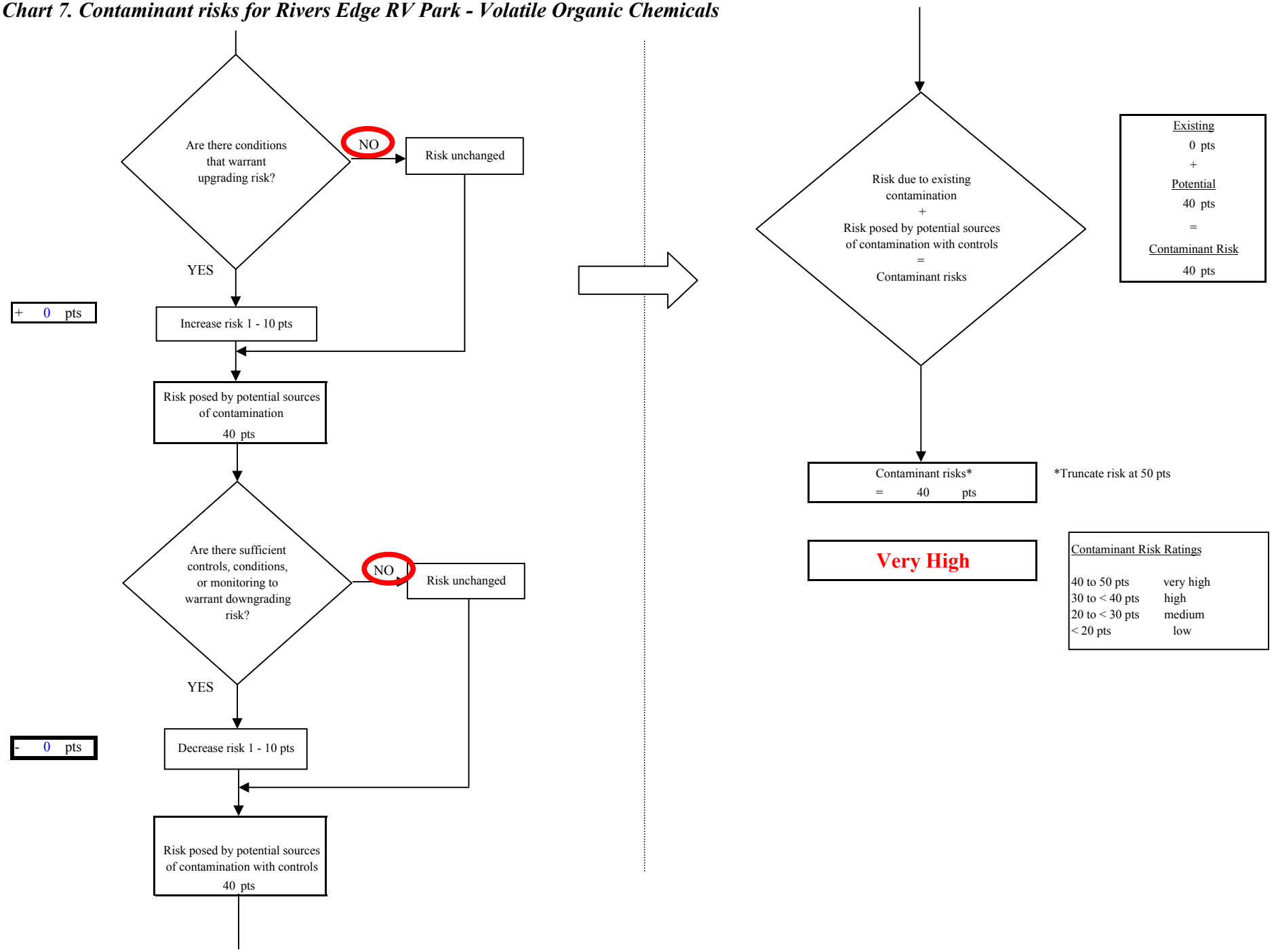


Chart 8. Vulnerability analysis for Rivers Edge RV Park - Volatile Organic Chemicals