Source Water Assessment for Reich RV Park

A Hydrogeologic Susceptibility and Vulnerability Assessment

DRINKING WATER PROTECTION PROGRAM REPORT 588
PWSID 225990.001

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Source Water Assessment for Reich RV Park

By Alaska Department of Environmental Conservation

DRINKING WATER PROTECTION PROGRAM REPORT 588

The Drinking Water Protection Program 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. If you have any additional information that may affect the results of this assessment, please contact the Program Coordinator of DWPP, (907) 269-7521.

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION: 2002

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Hydrogeologic Susceptibility and Vulnerability Assessment for Reich RV Park Public Drinking Water Source, Palmer, Alaska

By Chris Miller, ADEC

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Reich RV Park is a Class B (transient/non-community) drinking water source consisting of one well. Identified potential and current sources of contaminants for Reich RV Park include: paved roads, residential and large capacity septic systems, residential areas, motor vehicle dealerships, campgrounds and RV parks and salvage yards. These existing and potential sources of contamination are considered a source of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, Reich RV Park public water source received vulnerability rating of **Very High** for bacteria and viruses and Nitrate and/or nitrites and **Medium** for volatile organic chemicals.

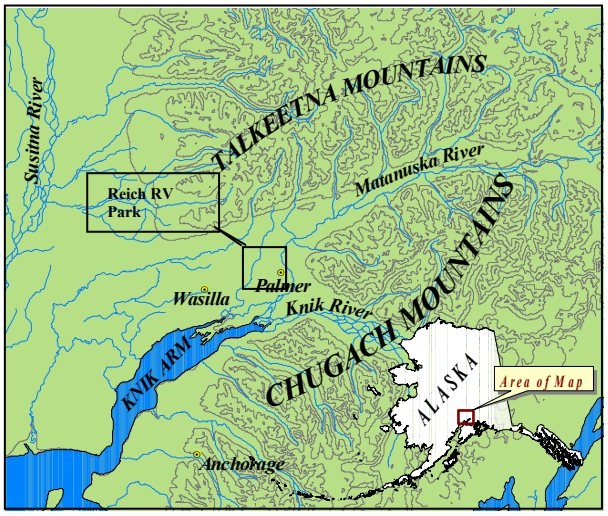

Figure 1. Index Map showing the location of the Matanuska-Susitna Valley and Reich RV Park

INTRODUCTION

The purpose of this environmental assessment is to provide public water system owners/operators, communities, and local governments with information they can use to preserve the quality of Alaska's public drinking water supplies. This assessment was completed for the Reich RV Park source of public drinking water. This source consists of one well in the Sutton area (Figure 1). This assessment, known under the Alaska Drinking Water Protection Program as the Source Water Assessment, has combined a review of the natural hydrogeologic sensitivity with potential and existing contaminant risks to arrive at an overall vulnerability of the drinking water source to contamination. This assessment has been completed as a basis for local voluntary protection efforts and to assist agencies in their efforts to reduce risk to this public drinking water supply.

DESCRIPTION OF THE MATANUSKA-SUSITNA VALLEY-AREA, ALASKA

Location

The Matanuska-Susitna Valley is part of the lowland lying about 50 miles north of Anchorage in south-central Alaska. The well described in this report is part of the Matanuska River Watershed. This study area is roughly bounded on the north by the Talkeetna Mountains; on the west by Wasilla Creek; on the south by the Knik River; and on the east by the Chugach Mountains. The area covers approximately 150 square miles.

Climate

The climate of the Matanuska-Susitna Valley is the result of a combination of marine and continental influences. The climate is somewhat transitional in that it does not experience large daily and annual temperature fluctuations like those experienced in the

interior of Alaska nor does it experience high amounts of precipitation typified by gulf coast regions. Mean annual precipitation is approximately 15 inches per year. On the average, the Valley receives a total snow accumulation of 58 inches per year. Precipitation generally increased inland toward the Talkeetna Mountains where annual precipitation may exceed 60 inches. Mean daily temperature ranges from 67° F during July to 5° F in January (Western Regional Climate Center, 2000)

Physiography and Groundwater Conditions

The Matanuska-Susitna Valley is surrounded by rugged mountains that rise abruptly above the valley floor. The Chugach Mountains at the southern edge of the valley reach altitudes greater than 6300 feet. These mountains are composed primarily of metamorphosed sedimentary marine and volcanic rocks. Along the northern edge of the valley, peaks in the Talkeetna Mountains reach altitudes of 3000 to 5000 feet. The Talkeetna Mountains are composed mainly of igneous rocks, chiefly granite intrusives and subordinate lavas and tuffs; Cretaceous and Tertiary sedimentary rocks form the south flank of the mountains. Although the altitude of the valley floor ranges from sea level at Knik Arm to 1000 feet at the base of Wishbone Hill, the local relief is commonly not more than 100 to 200 feet.

The Matanuska and Knik River's drain the area. These rivers are braided glacial outwash streams having wide floodplains. Drainage is poor in many interstream tracts resulting in large areas of swampy ground with shallow lakes occupying depressions.

The Matanuska-Susitna Valley is floored with unconsolidated deposits, chiefly glacial drift that represents several episodes of glacial advances and retreats. The drift includes till, outwash stream deposits, and estuarine and lake deposits. Physiographic features formed by these deposits in or adjacent to the study area include end moraine, lateral moraines, eskers, crevasse fillings, and other pitted

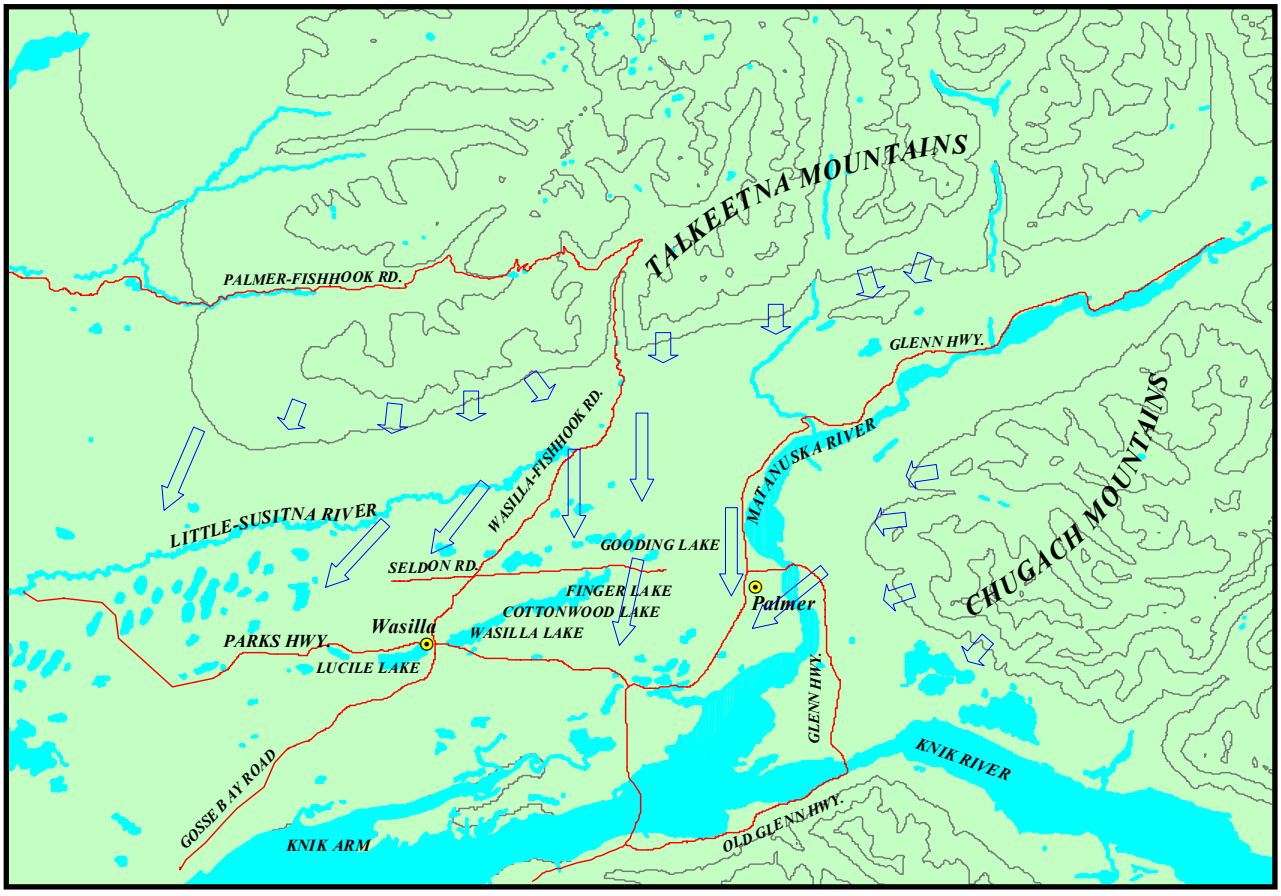

Figure 2. Map showing groundwater flow in the Matanuska-Susitna Valley (Jokela, Munter and Evans, 1991).

features, river terraces, outwash floodplains and an extensive estuarine flat (Trainer, 1960).

The glacial till and bedrock form aquifers of minor importance. The chief hydrologic significance of the till is in confining the artesian aquifer. Generally, the till is poorly permeable, although locally thin layers of sand may yield small quantities of water. Till that is present at or near the land surface in much of the area makes the acquisition of shallow groundwater difficult. The bedrock is poorly permeable. It yields water only from fractures, whose location and frequency cannot be easily predicted.

The chief aquifers are composed of outwash sand and gravel laid down by melt-water streams or in lakes. The outwash deposits are of two chief forms. The first consists of sheet-like deposits that lie just beneath the ground surface. These deposits range in thickness from a few feet to more than 100 feet. They typically rest on till or bedrock. The water in these deposits is unconfined. The other outwash deposits are buried beneath till. They are known to be as much as 50 to 60 feet thick, and probably are considerably thicker in some places. They commonly contain confined, or artesian, groundwater. Well logs and data from pumping tests suggest that outwash sand and gravel form a continuous or nearly continuous sheet in an area of more than 10 square miles north and west of Palmer (Jakola et al, 1991).

In the Mat-Su Valley, groundwater is primarily recharged by snowmelt and precipitation infiltrating both directly and also from the infiltration into the foothill slopes of the Talkeetna and Chugach Mountains. In addition,, aquifers may be recharged by streams where surface water percolates into surrounding permeable sediments (losing reaches of streams). This is the case for the water-table aquifers in the terrace south of Palmer and in the Bodenburg Butte area, which receive underground flow from the Matanuska River. Groundwater flow in the confined aquifers is generally from the north and north-northwest. The direction of groundwater flow in the upper unconfined aquifer is more variable due to the influence from surficial topography as well as its close connection with surface water bodies (Trainer,1960).

REICH RV PARK PUBLIC WATER SOURCE

Reich RV Park public water source is a Class B (transient/non-community) water source, which is privately owned and operated. The source consists of one well located off the Glenn Highway and Cienna Avenue. The well is at an approximate elevation of 150 feet above sea level. It is unknown whether the well is grouted. Records show the well penetrates a layer of "hard pan" from 30 to 40ft below the surface (bls) and sand and gravel from 55 to 80 feet below the surface. The depth of the well is 80 ft bls and it is screened for 5 feet at an unknown depth. The well had a static water level of 53 feet below the surface at the time of drilling (10/28/94).

The water system at Reich RV Park serves approximately 56 non-residents and 2 residents through 29 service connections and operates 365 days per year.

ASSESSMENT AND PROTECTION AREA FOR REICH RV PARK DRINKING WATER SOURCE

The Drinking Water Protection and Assessment Area that has been established for Reich RV Park is the area that is most sensitive to contamination. This area has served as a basis for assessing the risk of the drinking water source to contamination. This zone around the drinking water source is the most critical area for the preservation of the quality of the drinking water for this source. For simplicity, this area will be known as your Drinking Water Protection Area and will serve as the area of focus for voluntary protection efforts.

Conceptually, groundwater enters the aquifer systems along the front range of the Talkeetna Mountains and flows toward Cook Inlet. An analytical calculation was used to calculate the size and shape of the area that contributes water to the well. The input parameters describing the attributes of the aquifer in this calculation were adopted from the well log and the recent Sanitary Survey. This analytical calculation was used as a guide in establishing the protection area for Reich RV Park. Additional methods were further employed to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful and conservative protection area with respect to public health (Please refer to the Guidance Manual for Class A Public Water Systems for additional information).

The Drinking Water Protection Areas established for wells by the Alaska Department of Environmental Conservation (ADEC) are separated into zones. These zones correspond to a time-of-travel. Time-of-travel is the time required for water to move in the saturated zone of the ground from a specific point to the well. The Drinking Water Protection Areas for Reich RV Park contains four zones, Zone A, Zone B, Zone C and Zone D (Map 1, Appendix A). Zone A corresponds to the area between the well and the distance equal to ¼ of the distance of the 2-year time-of-travel. Depending on where a contaminant source is located within Zone A,

travel time for a contaminant to the well may be on the order of several days to several hours. Zone A also extends down gradient from the well to take into account the area of the aquifer that is influenced by pumping of the well. The Zone B protection area for Reich RV Park corresponds to a time-of-travel of less than two years and extends toward base of the Talkeetna Mountains. Zone C protection area corresponds to a time-of-travel of greater than 2 years and less than 5 years. Zone D corresponds to a time-of-travel of greater than 5 years and less than 10 years.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within Reich RV Park Drinking Water Protection Area. This survey was completed through a search of agency records and other publicly available information.

Potential sources of contamination to drinking water supplies cover 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 this assessment and 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

RANKING OF CONTAMINANT RISKS

Potential and existing sources of contamination have been identified, sorted, and ranked 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. Contaminant risks are further a function of the number and density of those types of contaminant sources as well as the proximity of those sources to the well (Appendices B & C).

VULNERABILITY OF REICH RV PARK DRINKING WATER SOURCES

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

- Natural susceptibility; and
- Contaminant risks.

Each of the three categories of drinking water contaminants has been analyzed and an overall vulnerability score of 0 to 100 is ultimately assigned:

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

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

A score for the Natural Susceptibility is achieved by analyzing the properties of the well and the aquifer.

Susceptibility of the Wellhead (0 – 25 Points)
+
Susceptibility of the Aquifer (0 – 25 Points)

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

The Reich RV Park well is completed in an unconfined aquifer. The lack of a confining layer increases the chances that contaminants that enter the subsurface may enter the aquifer.

Combining the susceptibilities of the wellhead and the aquifer to contamination leads to a score (0 – 50 points) and rating of overall Susceptibility (Appendix D). Table 1 shows the overall Susceptibility score and rating for Reich RV Park.

Table 1. Natural Susceptibility - Susceptibility of the Wellheads and Aquifer to Contamination

	Score	Rating
Susceptibility of the Wellheads	5	Low
Susceptibility of the Aquifer	25	Very High
Natural Susceptibility	30	High

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. A score (0 – 50 points) and rating of Contaminant Risks (See Appendix D) is assigned based on the findings of the Contaminant Source Inventory (See Appendix B - Table 1 – Table 7). This portion of the analysis examines recent existing

or historical contamination that has been detected at the drinking water sources through routine sampling. It also reviews contamination that has or may have occurred but has not arrived or been detected at the either well. Table 2 summarizes the Contaminant Risks for each category of drinking water contaminants.

Table 2. Contaminant Risks

Contaminant Risks	Score	Rating
Bacteria and Viruses	50	Very High
Nitrates and/or Nitrites	50	Very High
Volatile Organic Chemicals	22	Medium

Appendix D contains seven charts, which together form the 'Vulnerability Analysis' for a Class B public drinking water system. 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 Analysis for nitrates and nitrites and volatile organic, respectively.

Vulnerability of drinking water sources to contamination is the combination of susceptibility of the aquifer and the well with contaminant risks. Table 3 contains the overall vulnerability scores (0 – 100) and ratings for each of the six categories of drinking water contaminants (See Appendix D). Note: scores are rounded off to the nearest five.

Table 3. Overall Vulnerability of Reich RV Park Public Drinking Water Source to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	80	Very High
Nitrates and Nitrites	80	Very High
Volatile Organic Chemicals	50	Medium

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, respectively.

Bacteria and Viruses

The contaminant risk for bacteria and viruses is very high with large capacity and residential septic systems presenting the most significant risk to the drinking water well (See Chart 3 – Contaminant Risks for Bacteria and Viruses in Appendix D). Large capacity septic systems, designated a type of Class V Injection well by the Environmental Protection Agency (EPA), differ from residential septic systems in that they serve multiple dwellings, businesses, or communities.

Recent sampling of Reich RV Park shows no detection of Bacteria and Viruses. 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 very high.

Nitrates/Nitrites

The contaminant risk for nitrates/nitrites is high. Large capacity and residential septic systems, because of their effluent discharge, pose the most significant contaminant 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 Reich RV Park well indicates that low concentrations of nitrate have been detected. Existing nitrate concentration is approximately 0.921 mg/l or 9% of the Maximum Contaminant Level (MCL) of 10mg/l. The MCL is the maximum level of contaminant allowed to exist in drinking water, and still be consumed by humans. This system has been only tested for nitrates and nitrites on one occasssion.

Nitrate concentrations derived from natural sources are typically less than 2 milligrams per liter (mg/l) and are derived primarily from the decomposition of organic matter in soils (Wang, Strelakos, Jokela, 2000). Since the level detected is below 2 mg/l it is suspected that the concentrations are from natural sources.

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 very high.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is medium. The presence of roads, large capacity and

residential septic systems, residential areas and a motor vehicle dealership pose the most significant risk for volatile organic chemicals. (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

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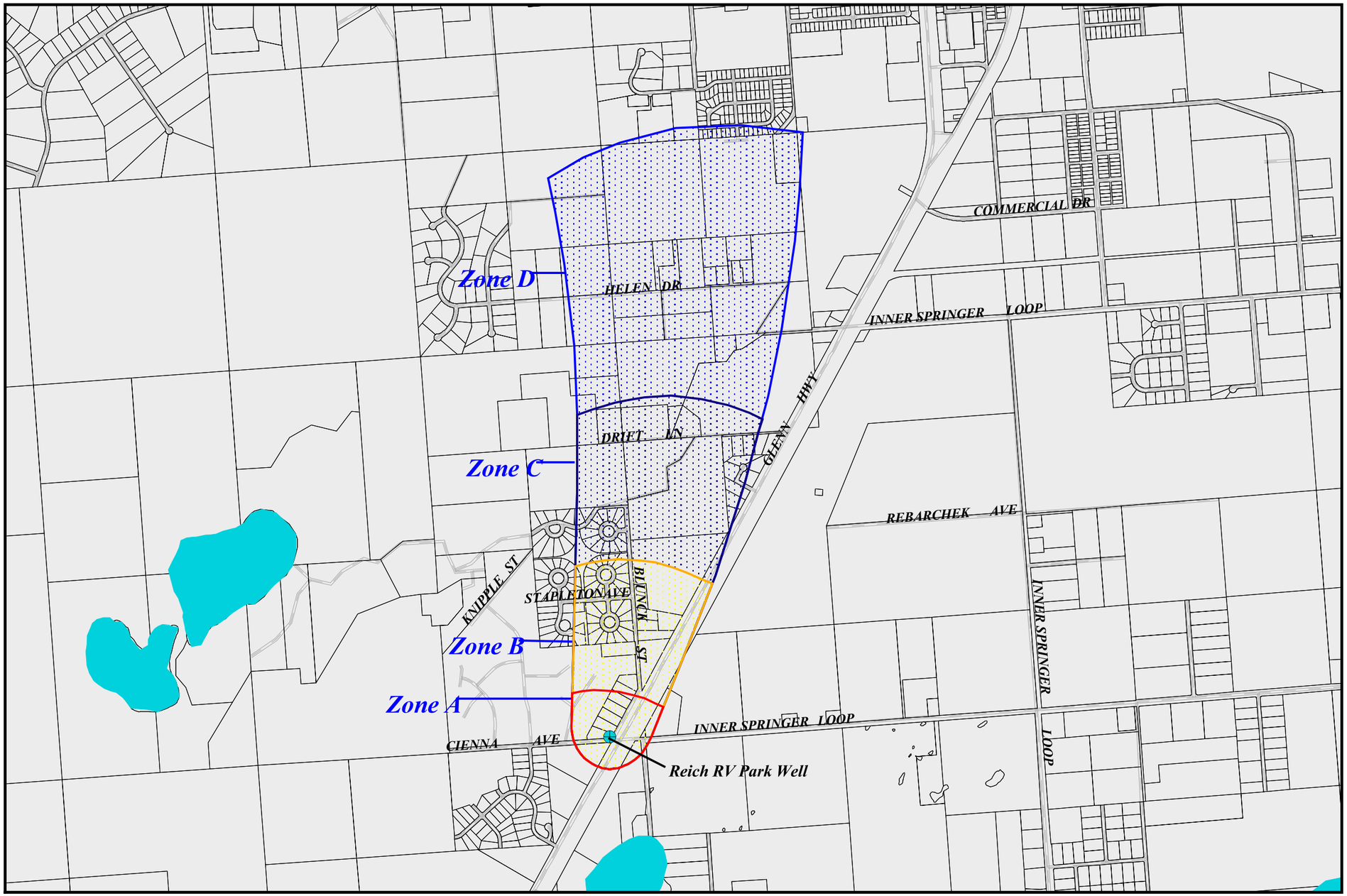
APPENDIX A

Reich RV Park
Drinking Water Protection Area

Drinking Water Protection Area for Reich RV Park



Legend

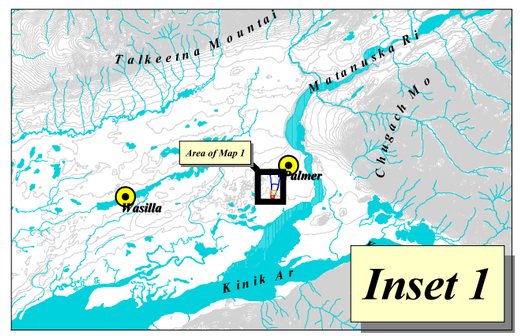
- Cities
- Reich RV Park Public Water System

Zone A Protection Area
- Several Months Travel Time

Zone B Protection Area
- Less than 2 Years Travel Time

Zone C Protection Area
- Less than 5 Years Travel Time

Zone D Protection Area
- Less than 10 Years Travel Time
- Lakes
- Rivers and Streams
- Matanuska Susitna Borough Parcels
- Roads
- Railroad Corridor
- Elevation Contours



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Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Reich RV Park

Table 1

Contaminant Source Inventory for ***Reich RV Park***

PWSID 225990.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Map Number*	*Comments*
Cropland	A02	A02	A	2	Inner Springer Loop
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	2	Town and Country Lane and Cienna Avenue
Highways and roads, paved (cement or asphalt)	X20	X20	A	2	5 paved roads in Zone A
Motor vehicle dealerships - cars, trucks, motor cycles, ATV's, snow machines, boats (without service department)	C26	C26	B	2	Glenn Highway
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	B	2	Stapelton Ave and Iris Circle
Residential Areas	R01	R01	B	2	17 acres
Septic systems (serves one single-family home)	R02	R02	B	2	17 residential septics in Zone B
Highways and roads, paved (cement or asphalt)	X20	X20	B	2	5 paved roads in Zone B
Campgrounds and RV Parks	X35	X35-01	B	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-03	C	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-04	C	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-05	C	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-07	C	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	C	3	
Scrap, salvage, or junk yards	D59	D59-01	C	3	
Scrap, salvage, or junk yards	D59	D59-02	C	3	
Residential Areas	R01	R01-02	C	3	55 acres
Septic systems (serves one single-family home)	R02	R02	C	3	8 residential septic systems
Highways and roads, paved (cement or asphalt)	X20	X20	C	3	5 paved roads

Table 2

Contaminant Source Inventory and Risk Ranking for Reich RV Park

Sources of Bacteria and Viruses

PWSID 225990.001

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	Town and Country Lane and Cienna Avenue
Highways and roads, paved (cement or asphalt)	X20	X20	A	Low	2	5 paved roads in Zone A
Motor vehicle dealerships - cars, trucks, motor cycles, ATV's, snow machines, boats (without service department)	C26	C26	B	Low	2	Glenn Highway
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	B	High	2	Stapelton Ave and Iris Circle
Residential Areas	R01	R01	B	Low	2	17 acres
Septic systems (serves one single-family home)	R02	R02	B	Low	2	17 residential septics in Zone B
Highways and roads, paved (cement or asphalt)	X20	X20	B	Low	2	5 paved roads in Zone B
Campgrounds and RV Parks	X35	X35-01	B	Low	2	

Table 3

Contaminant Source Inventory and Risk Ranking for Reich RV Park

Sources of Nitrates/Nitrites

PWSID 225990.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Cropland	A02	A02	A	High	2	Inner Springer Loop
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	High	2	Town and Country Lane and Cienna Avenue
Highways and roads, paved (cement or asphalt)	X20	X20	A	Low	2	5 paved roads in Zone A
Motor vehicle dealerships - cars, trucks, motor cycles, ATV's, snow machines, boats (without service department)	C26	C26	B	Low	2	Glenn Highway
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	B	High	2	Stapelton Ave and Iris Circle
Residential Areas	R01	R01	B	Low	2	17 acres
Septic systems (serves one single-family home)	R02	R02	B	Low	2	17 residential septics in Zone B
Highways and roads, paved (cement or asphalt)	X20	X20	B	Low	2	5 paved roads in Zone B
Campgrounds and RV Parks	X35	X35-01	B	Low	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-03	C	High	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-04	C	High	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-05	C	High	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-07	C	High	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	C	High	3	
Residential Areas	R01	R01-02	C	Low	3	55 acres
Septic systems (serves one single-family home)	R02	R02	C	Low	3	8 residential septic systems
Highways and roads, paved (cement or asphalt)	X20	X20	C	Low	3	5 paved roads

Table 4

Contaminant Source Inventory and Risk Ranking for Reich RV Park
Sources of Volatile Organic Chemicals

PWSID 225990.001

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	Town and Country Lane and Cienna Avenue
Highways and roads, paved (cement or asphalt)	X20	X20	A	Low	2	5 paved roads in Zone A
Motor vehicle dealerships - cars, trucks, motor cycles, ATV's, snow machines, boats (without service department)	C26	C26	B	Low	2	Glenn Highway
Motor vehicle dealerships - cars, trucks, motor cycles, ATV's, snow machines, boats (without service department)	C26	C26	B	Low	2	Glenn Highway
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	B	Low	2	Stapelton Ave and Iris Circle
Residential Areas	R01	R01	B	Low	2	17 acres
Septic systems (serves one single-family home)	R02	R02	B	Low	2	17 residential septics in Zone B
Highways and roads, paved (cement or asphalt)	X20	X20	B	Low	2	5 paved roads in Zone B
Campgrounds and RV Parks	X35	X35-01	B	Low	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-03	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-04	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-05	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-07	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	C	Low	3	
Scrap, salvage, or junk yards	D59	D59-01	C	Low	3	
Scrap, salvage, or junk yards	D59	D59-02	C	Low	3	
Residential Areas	R01	R01-02	C	Low	3	55 acres
Septic systems (serves one single-family home)	R02	R02	C	Low	3	8 residential septic systems

Table 4 (continued)

Contaminant Source Inventory and Risk Ranking for Reich RV Park

Sources of Volatile Organic Chemicals

PWSID 225990.001

Contaminant Source Type	***Contaminant Source ID***	***CS ID tag***	***Zone***	***Risk Ranking for Analysis***	***Map Number***	***Comments***
Highways and roads, paved (cement or asphalt)	X20	X20	C	Low	3	5 paved roads

Table 5

Contaminant Source Inventory and Risk Ranking for Reich RV Park

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 225990.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Cropland	A02	A02	A	Medium	2	Inner Springer Loop
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	2	Town and Country Lane and Cienna Avenue
Highways and roads, paved (cement or asphalt)	X20	X20	A	Low	2	5 paved roads in Zone A
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	B	Low	2	Stapelton Ave and Iris Circle
Residential Areas	R01	R01	B	Low	2	17 acres
Septic systems (serves one single-family home)	R02	R02	B	Low	2	17 residential septics in Zone B
Highways and roads, paved (cement or asphalt)	X20	X20	B	Low	2	5 paved roads in Zone B
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-03	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-04	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-05	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-07	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	C	Low	3	
Scrap, salvage, or junk yards	D59	D59-01	C	High	3	
Scrap, salvage, or junk yards	D59	D59-02	C	High	3	
Residential Areas	R01	R01-02	C	Low	3	55 acres
Septic systems (serves one single-family home)	R02	R02	C	Low	3	8 residential septic systems
Highways and roads, paved (cement or asphalt)	X20	X20	C	Low	3	5 paved roads

Table 6

Contaminant Source Inventory and Risk Ranking for Reich RV Park

Sources of Synthetic Organic Chemicals

PWSID 225990.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Map Number*	*Comments*
Cropland	A02	A02	A	High	2	Inner Springer Loop
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-01	A	Low	2	Town and Country Lane and Cienna Avenue
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	B	Low	2	Stapelton Ave and Iris Circle
Residential Areas	R01	R01	B	Low	2	17 acres
Septic systems (serves one single-family home)	R02	R02	B	Low	2	17 residential septics in Zone B
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-03	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-04	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-05	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-07	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	C	Low	3	
Scrap, salvage, or junk yards	D59	D59-01	C	Medium	3	
Scrap, salvage, or junk yards	D59	D59-02	C	Medium	3	
Residential Areas	R01	R01-02	C	Low	3	55 acres
Septic systems (serves one single-family home)	R02	R02	C	Low	3	8 residential septic systems

Table 7

Contaminant Source Inventory and Risk Ranking for Reich RV Park

Sources of Other Organic Chemicals

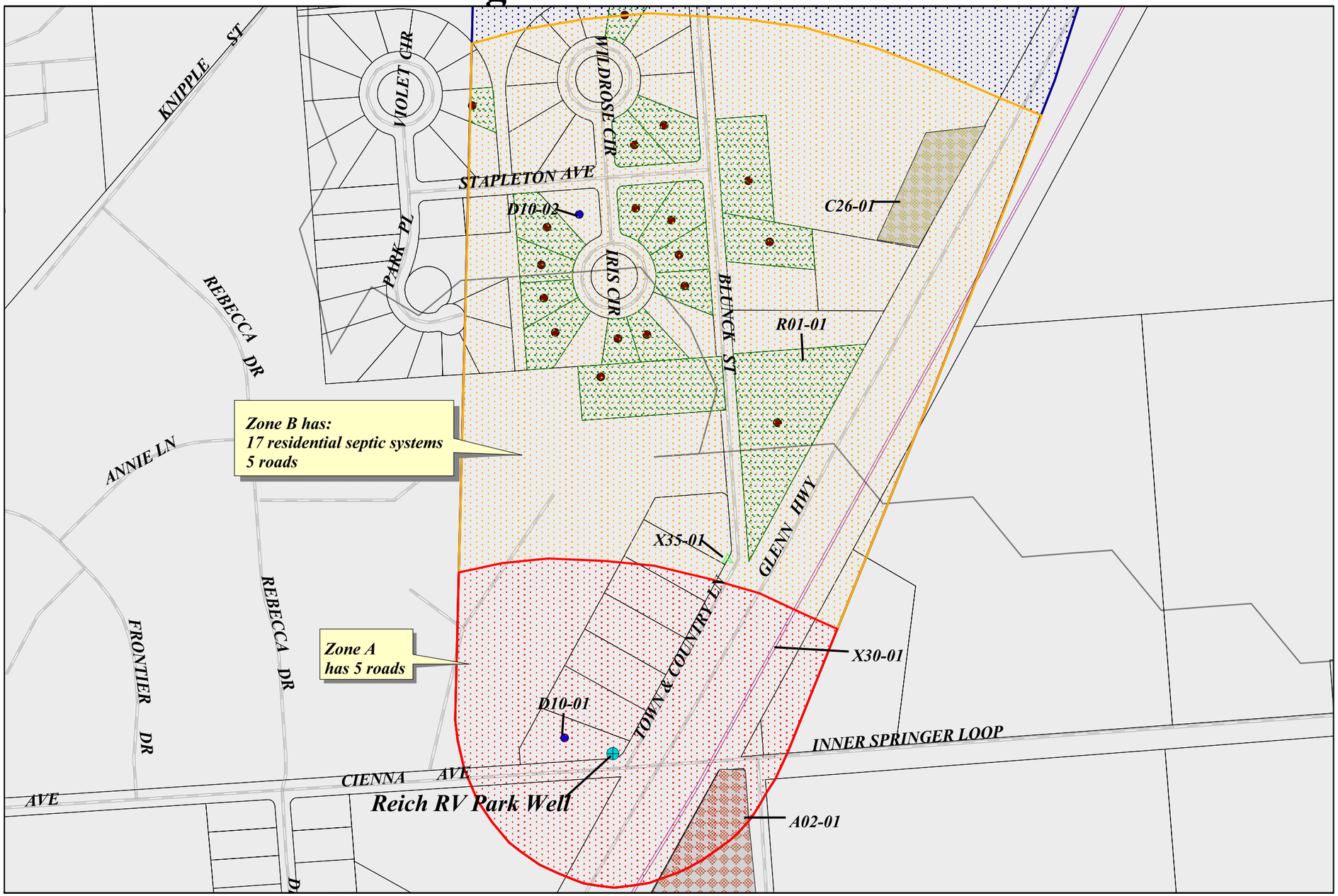
PWSID 225990.001

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	Town and Country Lane and Cienna Avenue
Highways and roads, paved (cement or asphalt)	X20	X20	A	Low	2	5 paved roads in Zone A
Motor vehicle dealerships - cars, trucks, motor cycles, ATV's, snow machines, boats (without service department)	C26	C26	B	Low	2	Glenn Highway
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-02	B	Low	2	Stapelton Ave and Iris Circle
Residential Areas	R01	R01	B	Low	2	17 acres
Septic systems (serves one single-family home)	R02	R02	B	Low	2	17 residential septics in Zone B
Highways and roads, paved (cement or asphalt)	X20	X20	B	Low	2	5 paved roads in Zone B
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-03	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-04	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-05	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-07	C	Low	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	C	Low	3	
Scrap, salvage, or junk yards	D59	D59-01	C	High	3	
Scrap, salvage, or junk yards	D59	D59-02	C	High	3	
Residential Areas	R01	R01-02	C	Low	3	55 acres
Septic systems (serves one single-family home)	R02	R02	C	Low	3	8 residential septic systems
Highways and roads, paved (cement or asphalt)	X20	X20	C	Low	3	5 paved roads

APPENDIX C

Reich RV Park
Drinking Water Protection Area
And Potential & Existing Contaminant Sources

Drinking Water Protection Area for Reich RV Park and Potential and Existing Sources of Contamination



Legend

- Cities
- Reich RV Park Public Water System

Zone A Protection Area
- Several Months Travel Time

Zone B Protection Area
- Less than 2 Years Travel Time

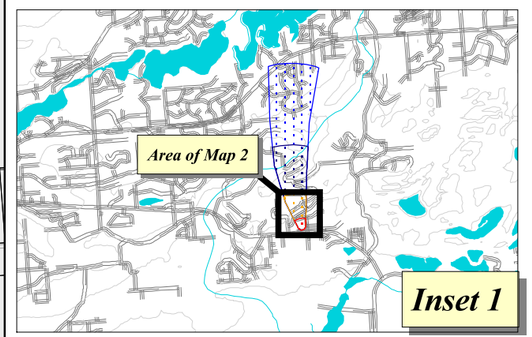
Zone C Protection Area
- Less than 5 Years Travel Time

Zone D Protection Area
- Less than 10 Years Travel Time
- Residential (R02)

Setpics (R02)
- Injection wells (Class V) Large Capacity Septic System) (D10)
- Septic systems (serves one single-family home) (R02)

Potential and Existing Souces of Contamination
- Body shops (automotive) (C05)
- Campgrounds and RV Parks) (X35)

Potential and Existing Sources of Contamination
- Cropland (A02)
- Junk Yard (D59)
- Motor vehicle dealerships without service shope (X35)
- Railroad Corridor
- Lakes
- Rivers and Streams
- Matanuska Susitna Borough Parcels
- Roads
- Elevation Contours



N
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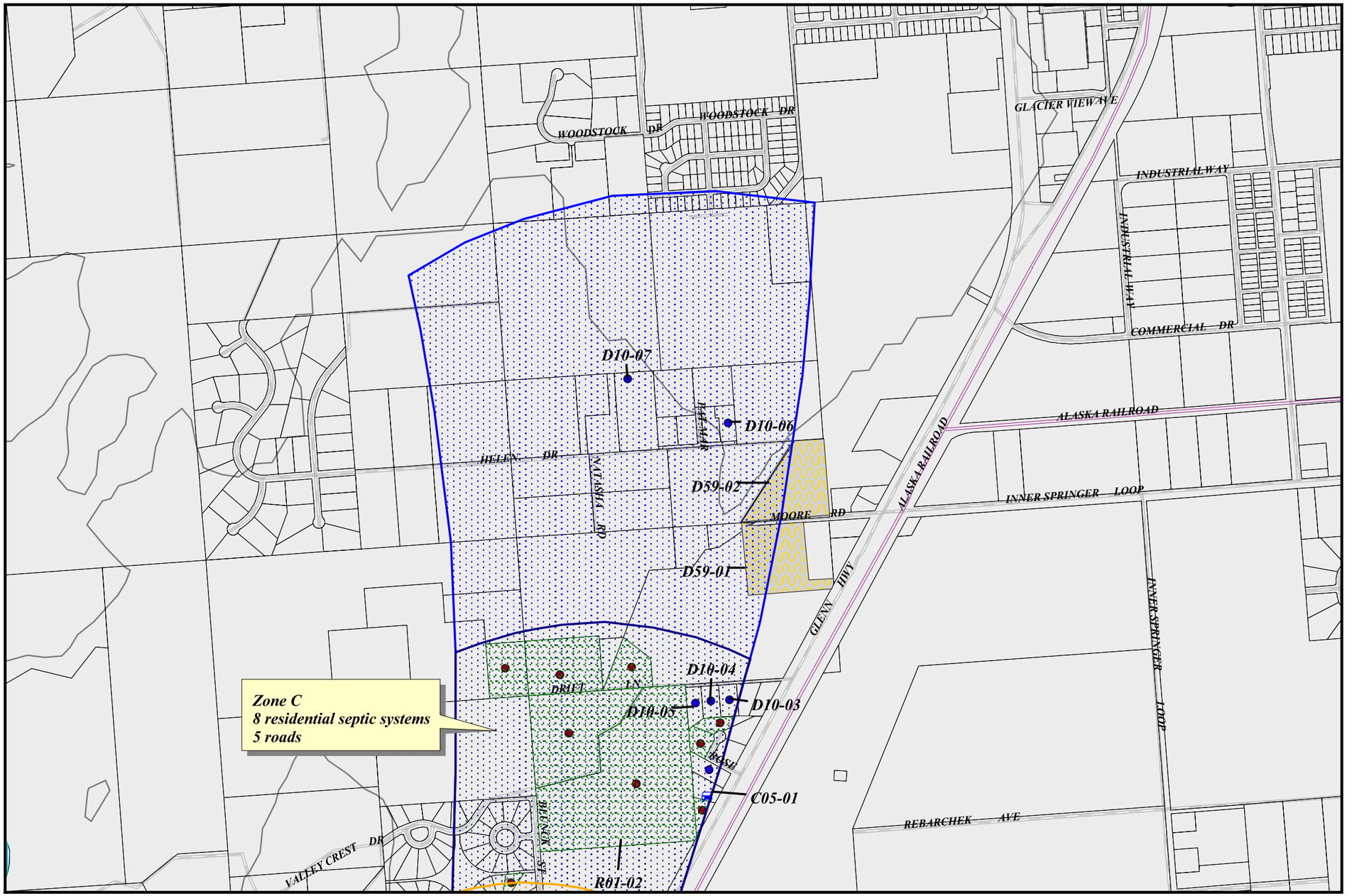
600 0 600 Feet

PWSID 225990.001

Map 2

Drinkingwater Protection Area for Reich RV Park and Potential and Exisiting Sources of Contamination



900 0 900 Feet

PWSID 225990.001

Legend

- Cities
- Reich RV Park Public Water System

Zone A Protection Area
- Several Months Travel Time

Zone B Protection Area
- Less than 2 Years Travel Time

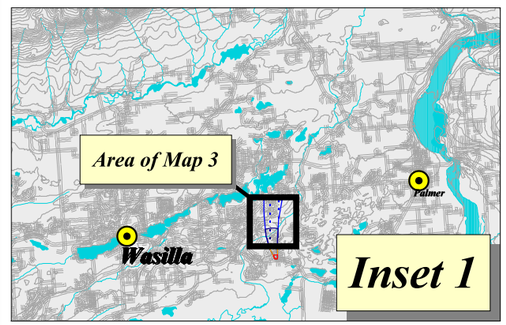
Zone C Protection Area
- Less than 5 Years Travel Time

Zone D Protection Area
- Less than 10 Years Travel Time
- Residential (R02)

Setpics (R02)
- Injection wells (Class V) Large Capacity Septic System) (D10)
- Septic systems (serves one single-family home) (R02)

Potential and Existing Souces of Contamination
- Body shops (automotive) (C05)

Potential and Existing Sources of Contamination
- Junk Yard (D59)
- Railroad Corridor
- Lakes
- Rivers and Streams
- Matanuska Susitna Borough Parcels
- Roads
- Elevation Contours



N
W E
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Map 3

APPENDIX D

Vulnerability Analysis for Reich RV Park Public Drinking Water Source

Chart 1. Susceptibility of the wellhead - Reich RV Park

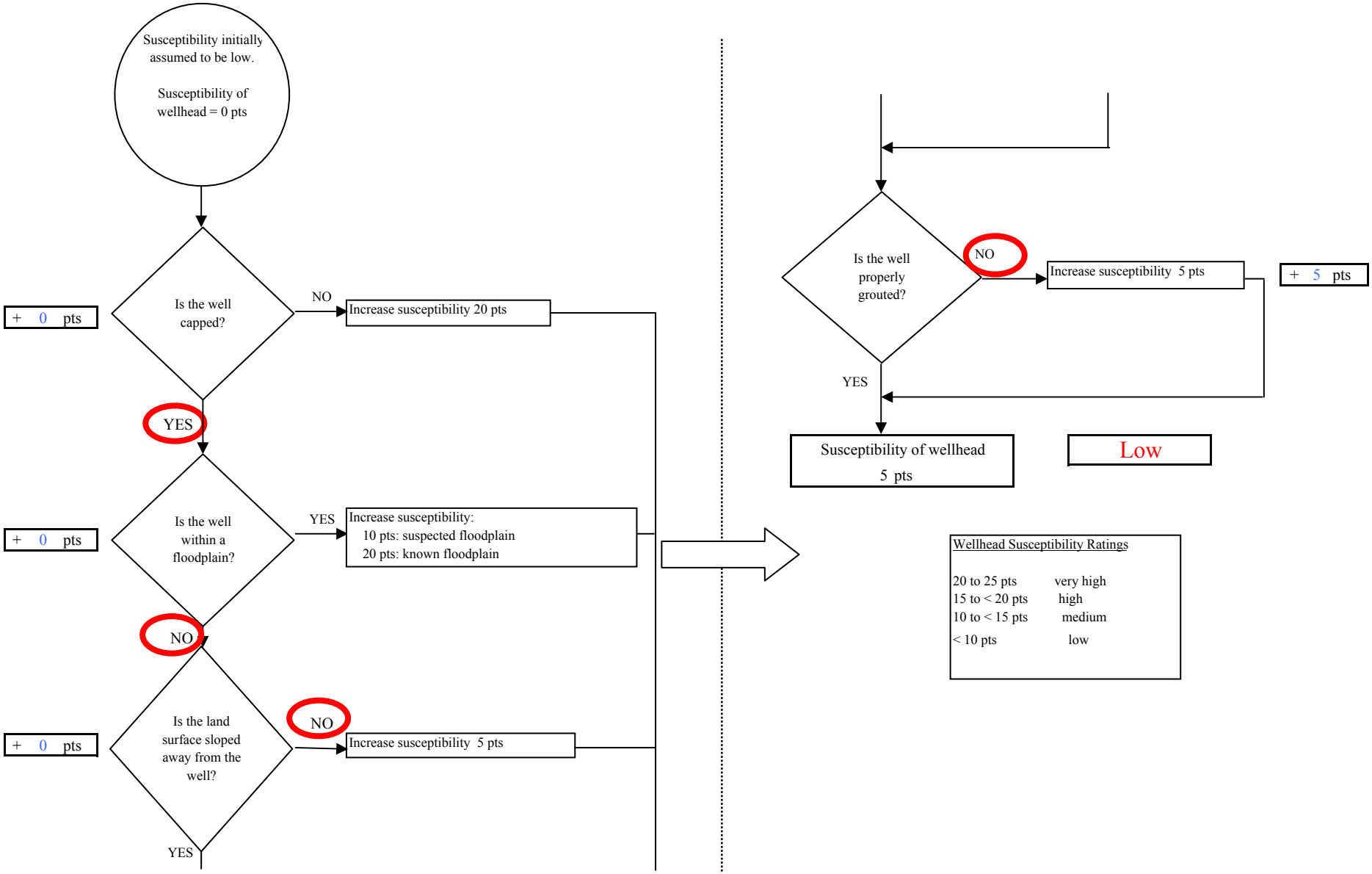


Chart 2. Susceptibility of the aquifer - Reich RV Park

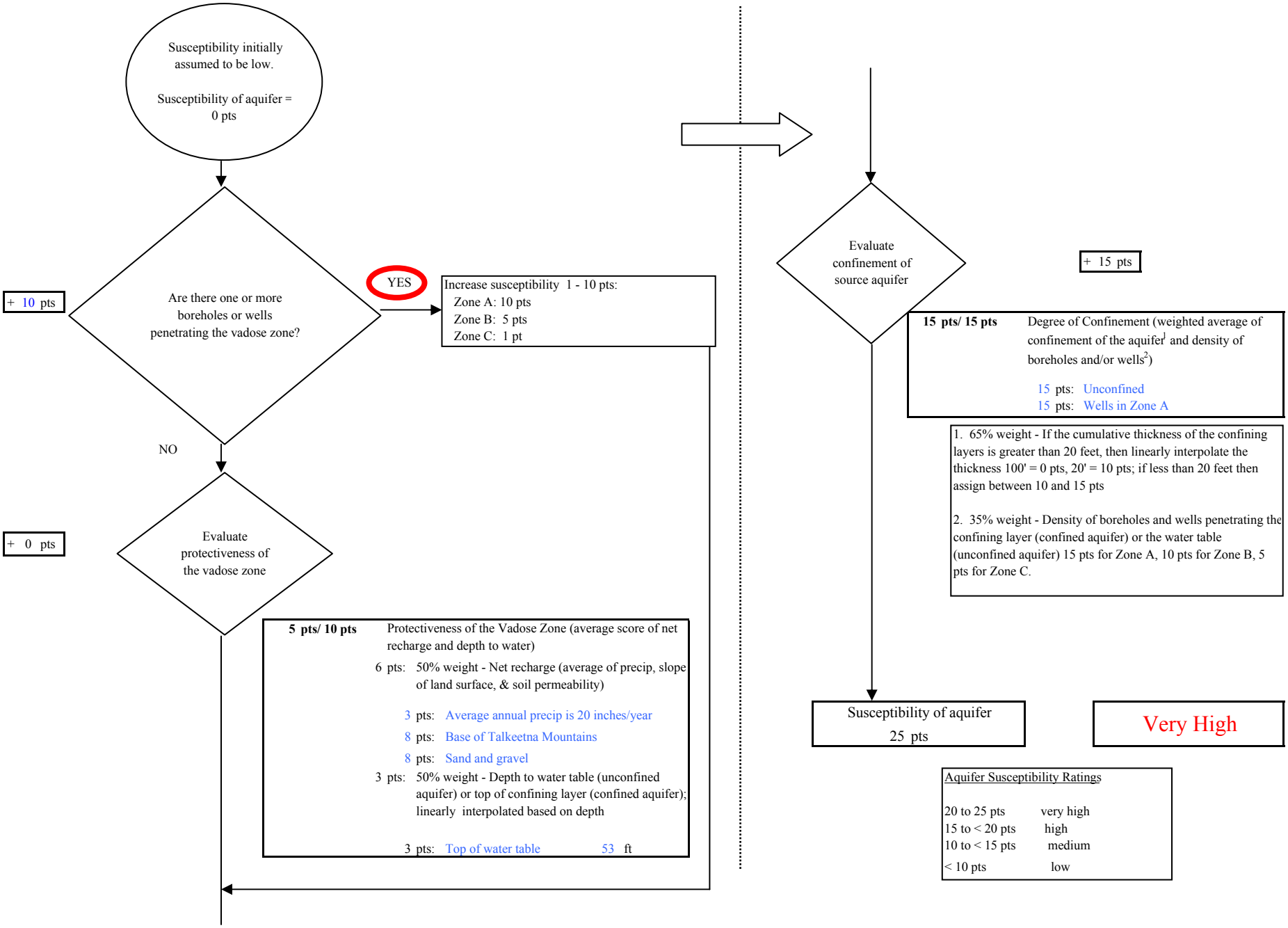
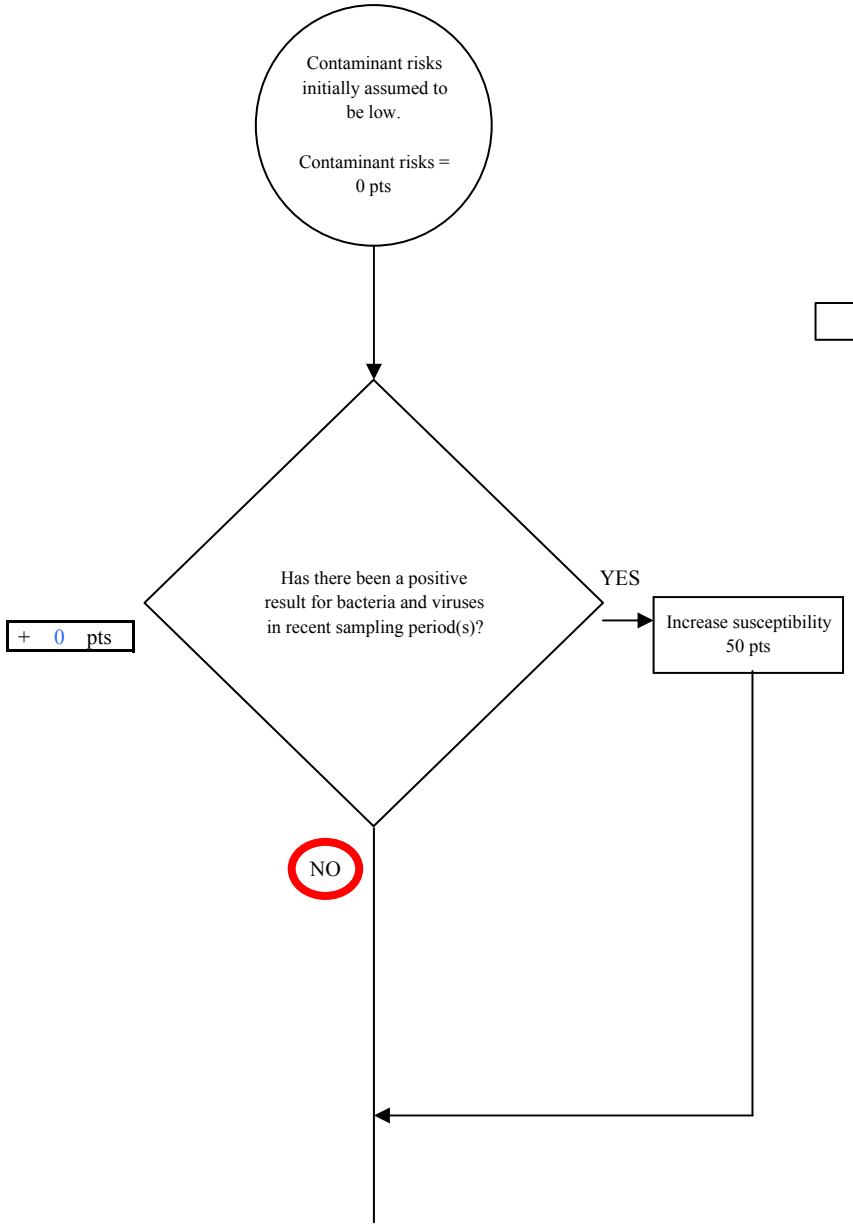
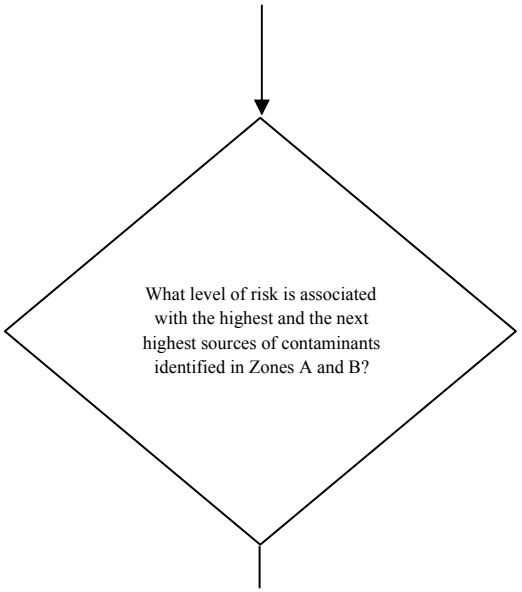


Chart 3. Contaminant risks for Reich RV Park - Bacteria & Viruses





+ 40 pts

Risk Rankings for Contaminant Sources Identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	1	1	2
Medium(s)	0	0	0
Low(s)	1	6	7

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

Matrix Score 40

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

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

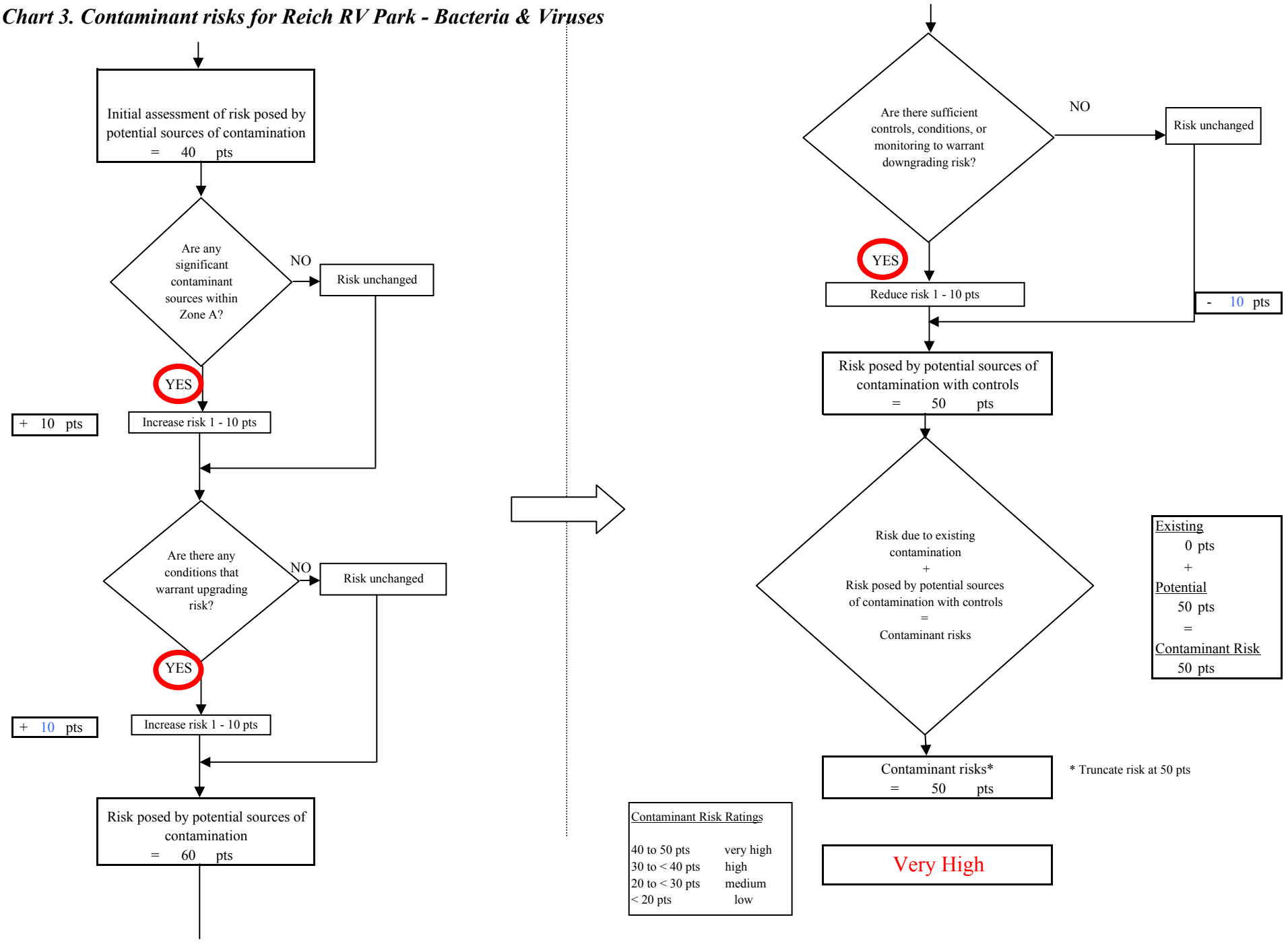


Chart 4. Vulnerability analysis for Reich RV Park - Bacteria & Viruses

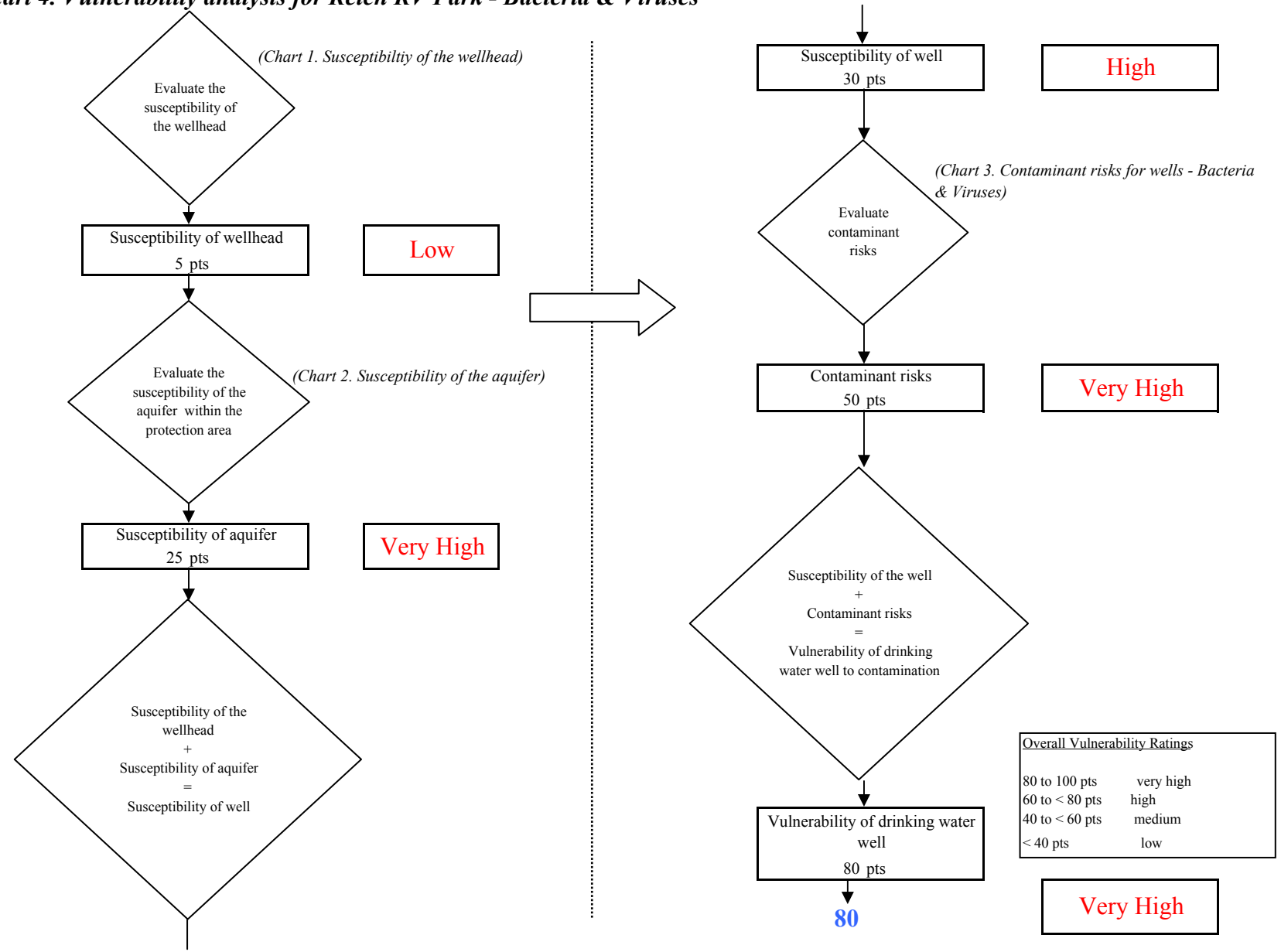


Chart 5. Contaminant risks for Reich RV Park - Nitrates and Nitrites

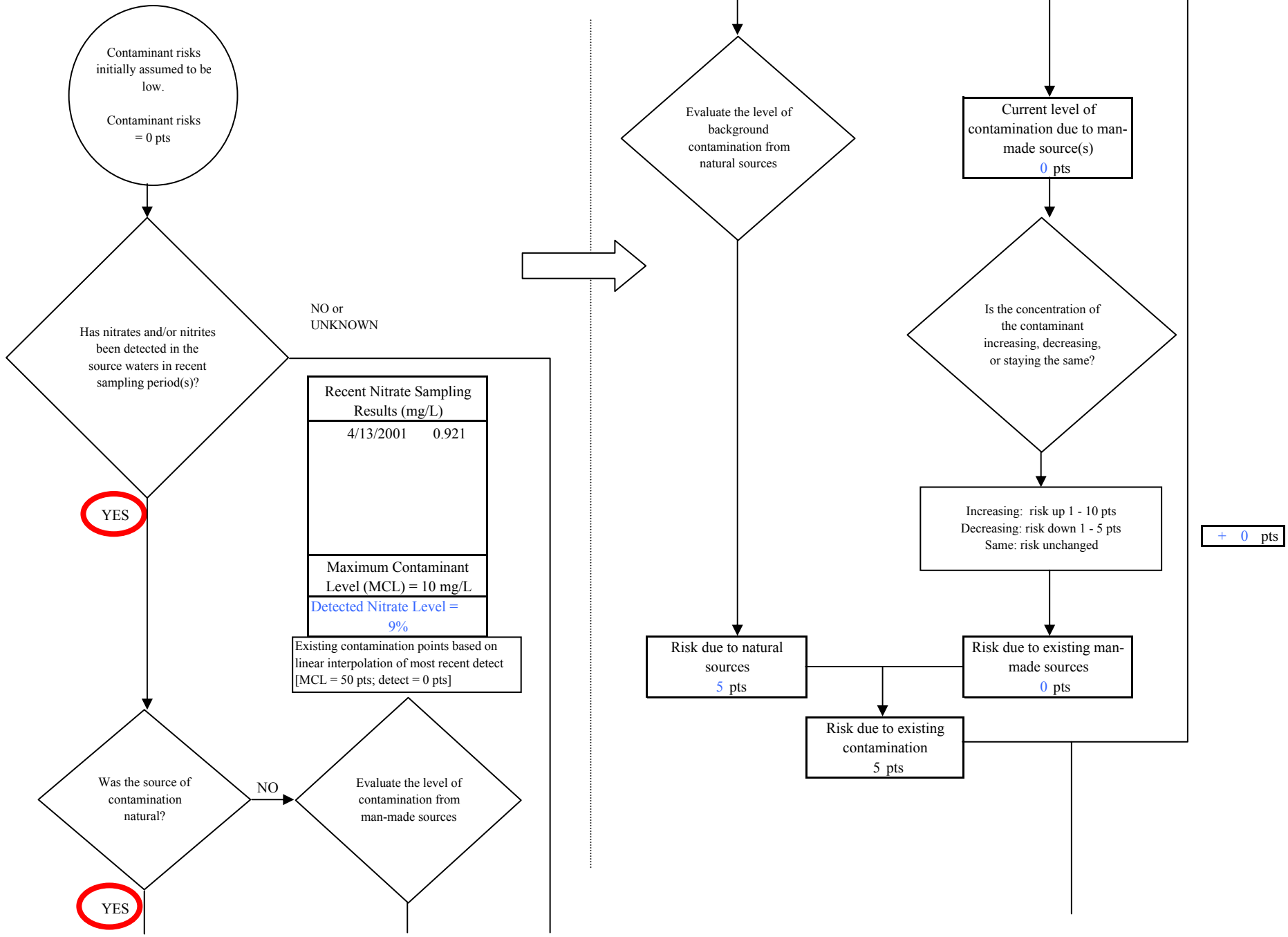


Chart 5. Contaminant risks for Reich RV Park - Nitrates and Nitrites

+ 40 pts

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

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	2	6	8
Medium(s)	0	0	0
Low(s)	1	7	8

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

Matrix Score 40

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

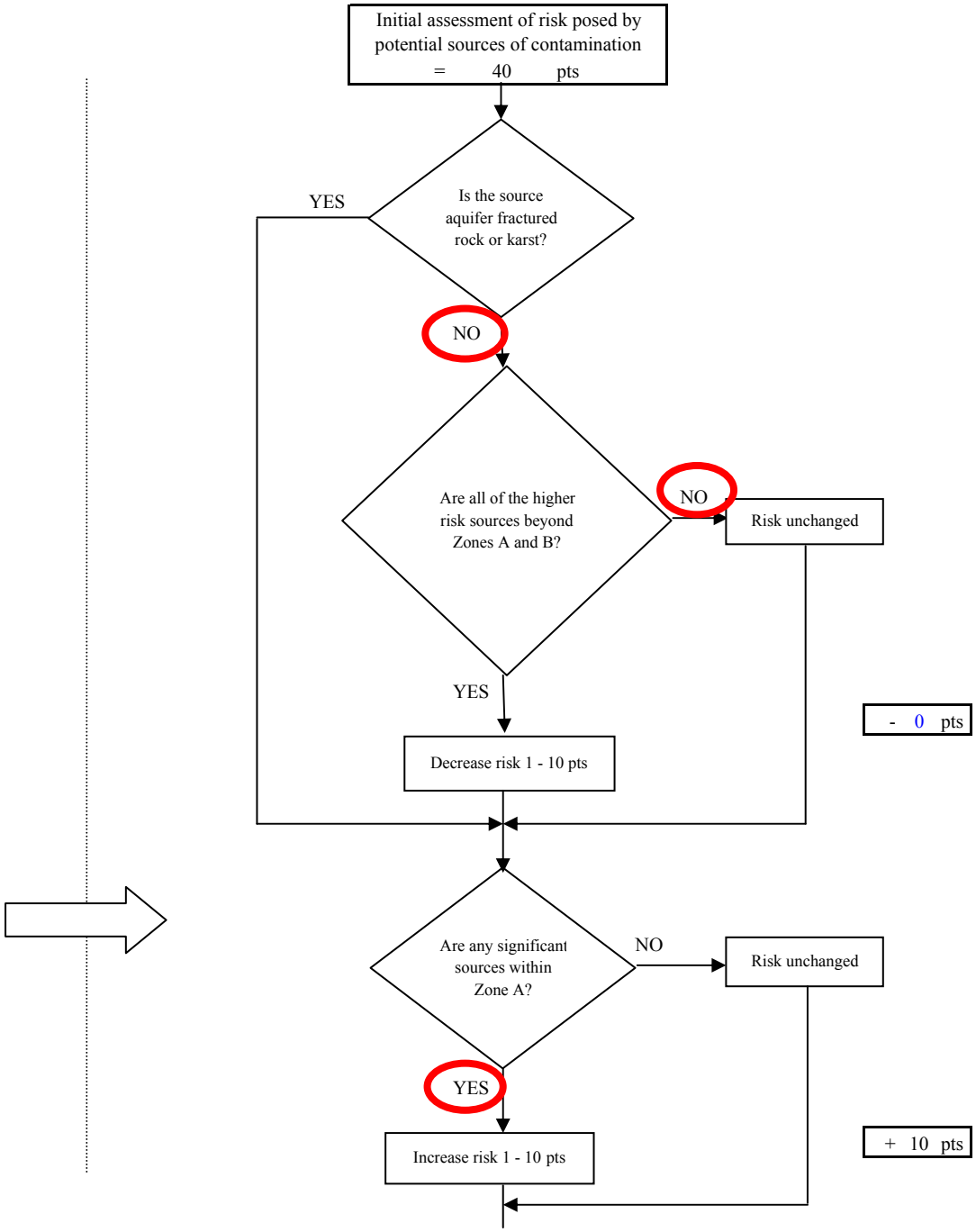


Chart 5. Contaminant risks for Reich RV Park - Nitrates and Nitrites

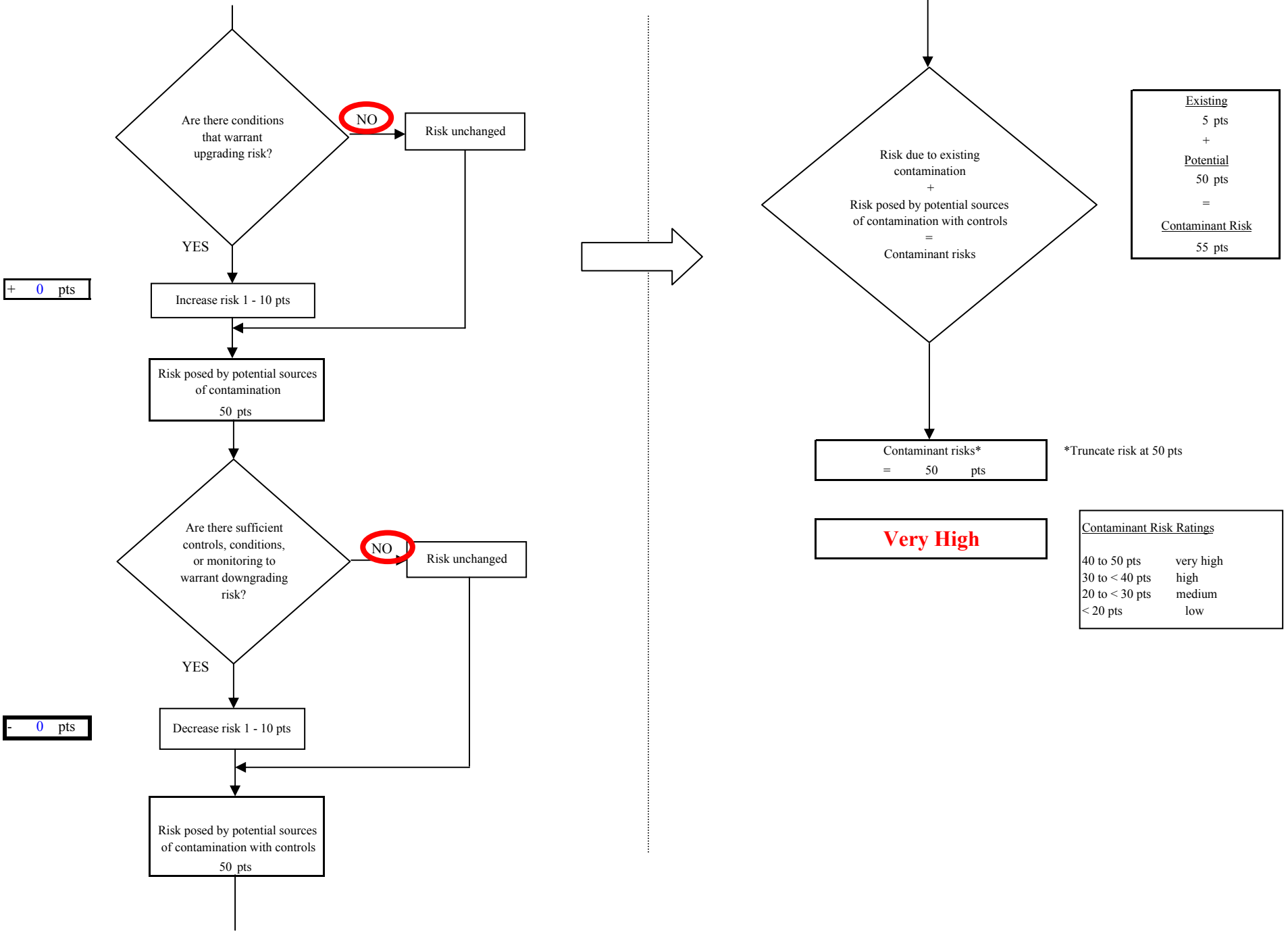


Chart 6. Vulnerability analysis for Reich RV Park - Nitrates and Nitrites

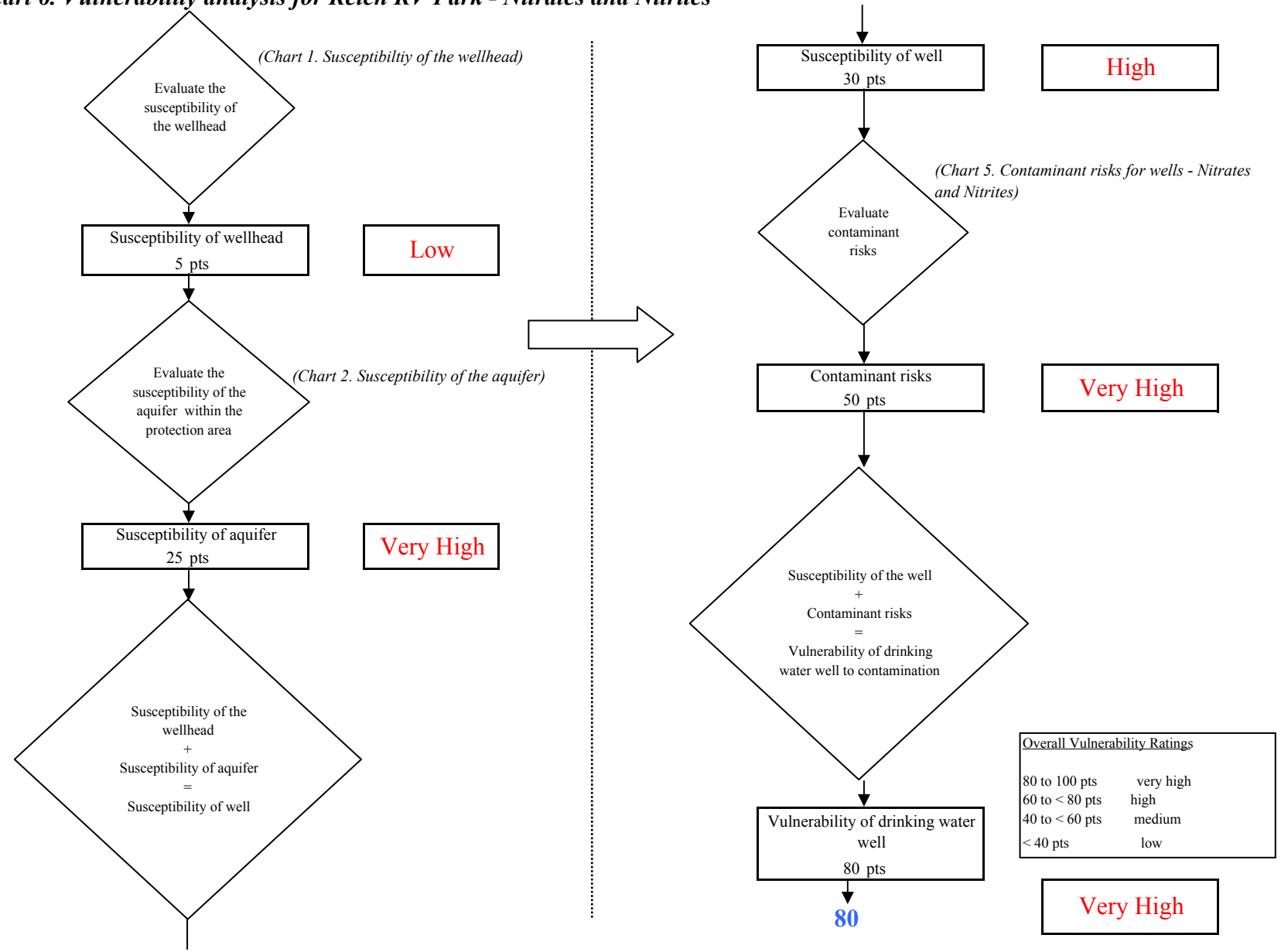


Chart 7. Contaminant risks for Reich RV Park - Volatile Organic Chemicals

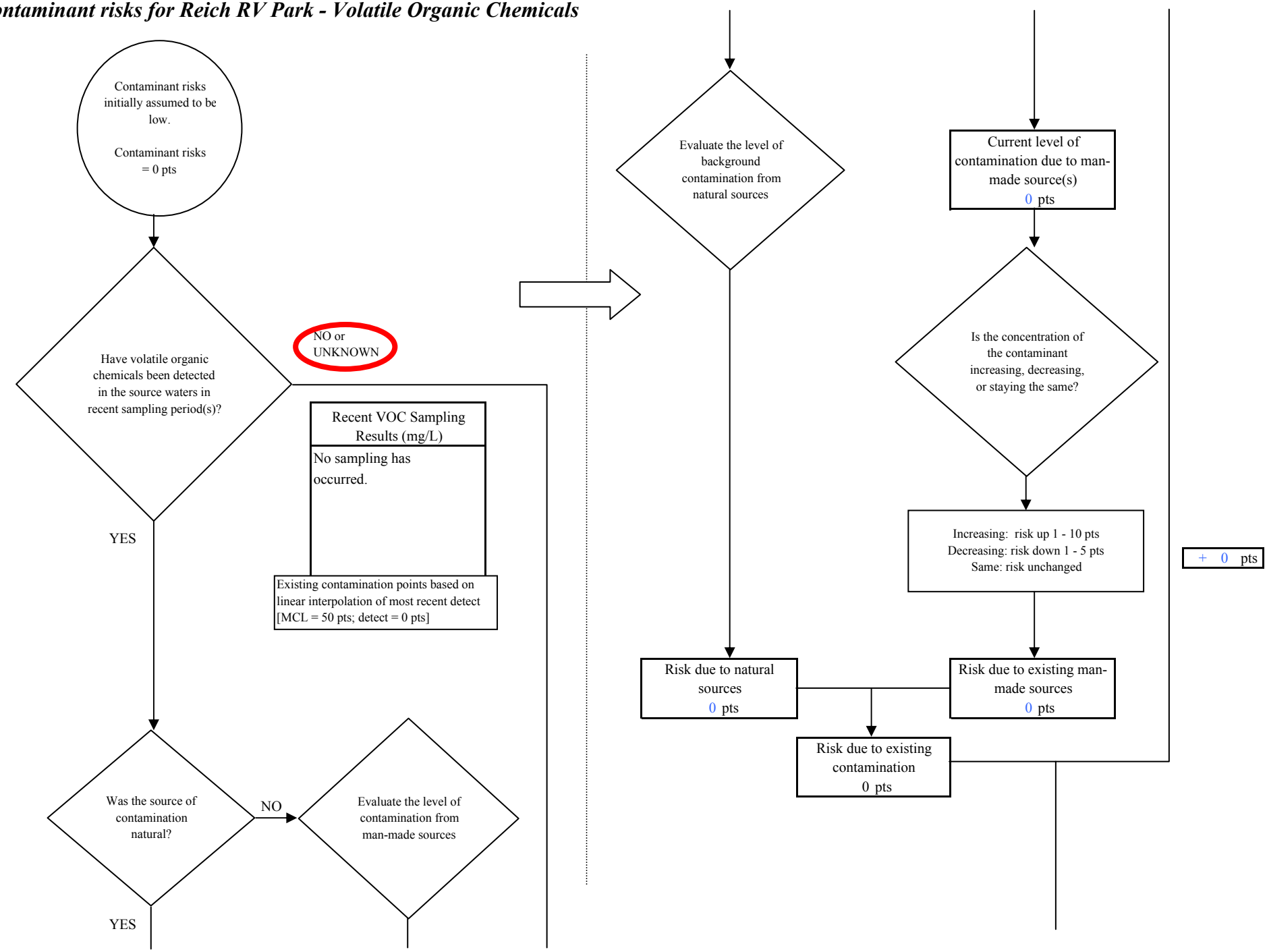
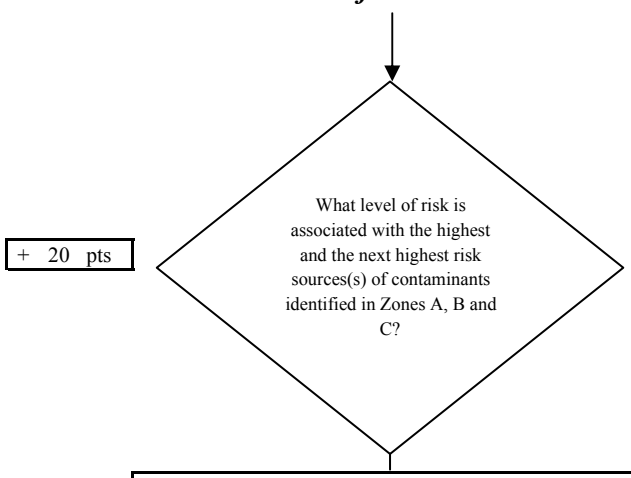


Chart 7. Contaminant risks for Reich RV Park - Volatile Organic Chemicals



+ 20 pts

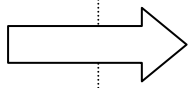
Risk Levels for Contaminant Sources identified in Zones A, B and C

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	14	16

	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.



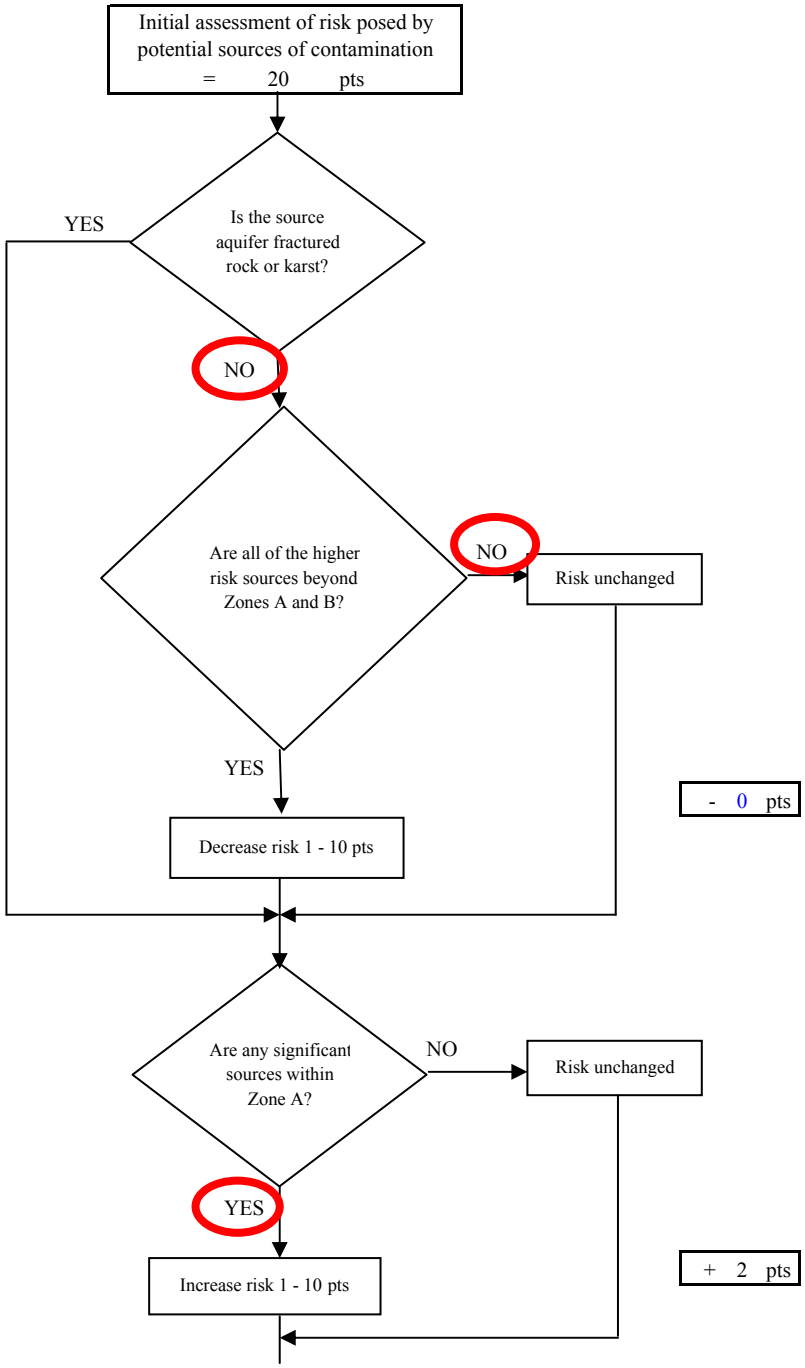


Chart 7. Contaminant risks for Reich RV Park - Volatile Organic Chemicals

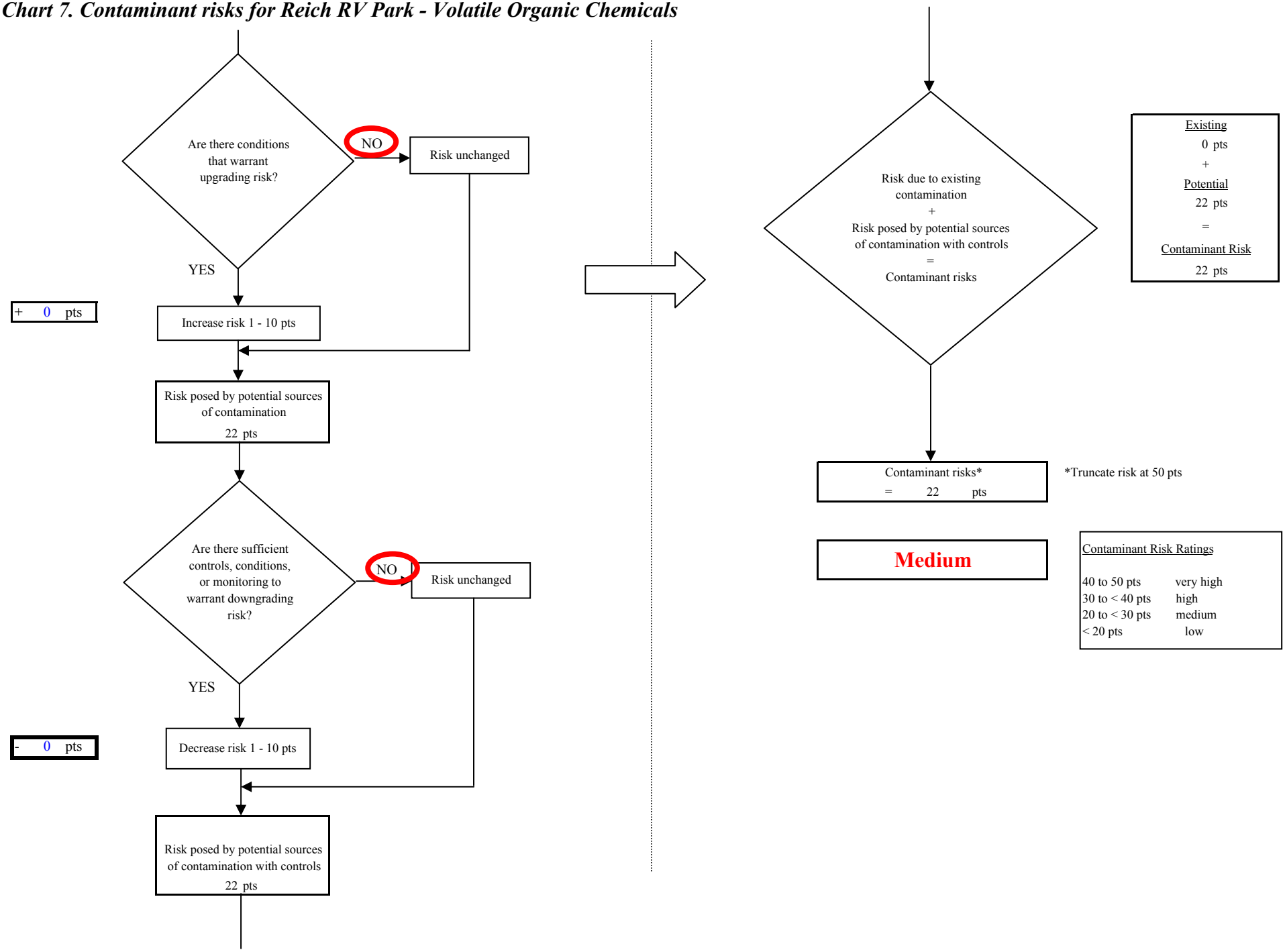


Chart 8. Vulnerability analysis for Reich RV Park - Volatile Organic Chemicals