Source Water Assessment:

Hydrogeologic Susceptibility and Vulnerability Assessment for Wasilla Seventh Day Adventist Drinking Water Well, Wasilla, Alaska

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DRINKING WATER PROTECTION PROGRAM REPORT *85*

October 2001

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ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION: OCTOBER 2001

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By Shannon & Wilson, Inc.

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Wasilla Seventh Day Adventist well is a Class B drinking water source consisting of one well. The well is located in the Meadow Creek watershed, in Big Lake, Alaska. Identified potential and current sources of contaminants for Wasilla Seventh Day Adventist include: high-capacity septic systems, rural and residential roads, residential septic systems, heavy equipment rental/storage, paint sales/service business, and approximately 110 acres of residential area. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, Wasilla Seventh Day Adventist public water source received vulnerability ratings of **High** for bacteria and viruses and nitrates and/or nitrites and **Medium** for volatile organic chemicals.

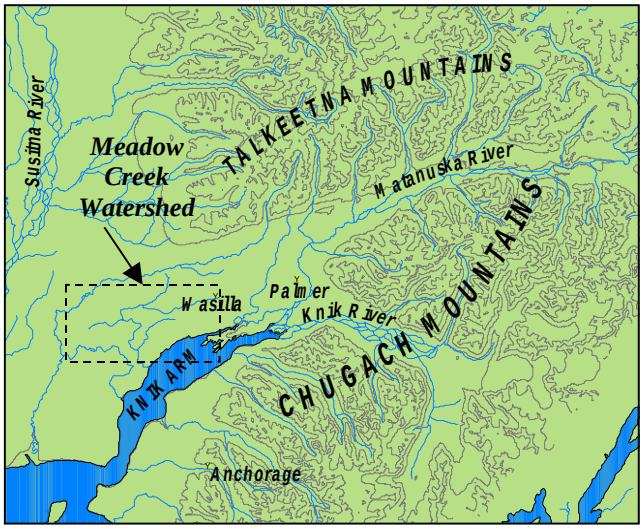

Figure 1. Index Map showing the location of the Matanuska-Susitna Valley and the Meadow Creek Watershed.

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 Wasilla Seventh Day Adventist source of public drinking water. This source consists of one well in the Meadow Creek Watershed (see 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 MEADOW CREEK - AREA, ALASKA

Location

The Meadow Creek watershed, located in southcentral Alaska, lies within the Matanuska-Susitna Borough. The Borough encompasses 24,694 square miles and supports a population in 2000 of 59,322. The Borough is contained within the watersheds of the Matanuska and Susitna Rivers which flow from the glacier melt waters in the Alaska Range, Talkeetna Mountains, and the Chugach Mountains to tidewater in the Knik Arm of Upper Cook Inlet *(Jokela, Munter and Evans, 1991)* (Figure 1). The area between the Matanuska and Susitna Valley is commonly referred to as the Mat-Su Valley. The Meadow Creek watershed contains 115 lakes, including Big Lake, and extends from an area northwest of Wasilla to the west end of Big *Lake (Jokela, Munter and Evans, 1991*), as shown in Figure 1.

The Borough's close proximity to Anchorage and its abundance of surface-water resources has helped contribute to rapid growth over the last two decades. The population has tripled since 1980. As of 1998, approximately 9% of the state population resided in the Matanuska-Susitna Borough. The projected growth rate is expected to be 3.3% per year, three times higher then the state rate. At this rate, the Borough will have approximately 13% of the states population by 2018 *(ADOL, 1999).*

Climate

The Meadow Creek-area 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.

The mean daily temperature ranges from 69.4 degrees Fahrenheit during the summer months to 13.8 degrees Fahrenheit during the winter months. The annual precipitation in the Meadow Creek-area is approximately 20 inches per year and total snow is around 59 inches per year. The average snow depth during snowy months is 6.4 inches *(Western Regional Climate Center, 2000).* Precipitation generally increases inland toward the Talkeetna Mountains where annual precipitation may exceed 60 inches per year *(Brabets, 1997).*

Physiography and Groundwater Conditions

Surface elevations in the Matanuska-Susitna Borough range from sea level where the Knik River and Matanuska River enter the Cook Inlet to well over 6,000 feet in the peaks that bound the area. Glacial moraine and outwash deposits primarily mantle the surface of the Mat-Su Valley.

The regional geology and ground water conditions of the Mat-Su Valley vary greatly depending on location. The terrain is dominated by distinctive landforms created by repeated glacial advances and retreats during the Pleistocene epoch (2 million to 10,000 years before present). The unconsolidated layers, layers of sediment that are not cemented together, are comprised of various mixtures of fine- to coarse-grained particles (clay to boulders). The majority of wells in the Mat-Su Valley are located in unconsolidated layers consisting of relatively well sorted sands and gravels. These unconsolidated layers vary substantially in size and distribution throughout the Valley. In general, the unconsolidated layers increase in thickness as you move towards Cook Inlet. *(Jokela, Munter, Evans, 1991).* Throughout the area numerous confining layers ranging from less than 1-to 60-feet thick separate the unconsolidated layers.

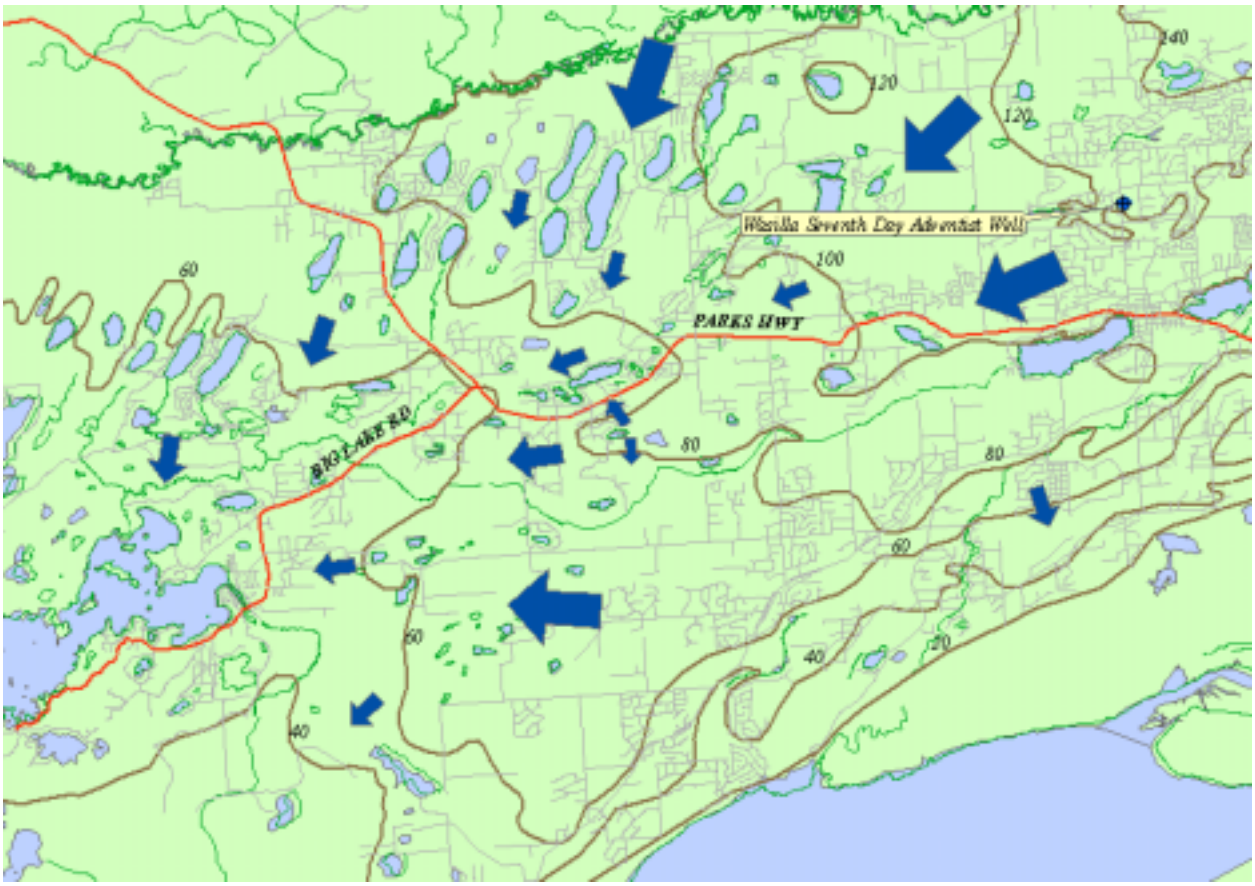

Figure 2. Map showing regional ground-water flow in Matanuska-Susitna Valley. ***(Jokela, Munter and Evans, 1991)***

In the Mat-Su Valley, the groundwater is primarily recharged by snowmelt and precipitation infiltrating into the foothill slopes of the Talkeetna or Chugach Mountains and by direct precipitation and snowmelt throughout the study area.

Groundwater flow in the confined aquifer is generally, north to south in the central region of the valley, toward the Matanuska River in the eastern region and the slope is predominantly northeast to northwest in the western region. The direction of groundwater flow in the upper unconfined aquifer's are more variable due to the influence from surficial topography as well as its close connection with surface water bodies. *(Jokela, Munter and Evans, 1991)* (Figure 2).

WASILLA SEVENTH DAY ADVENTIST PUBLIC WATER SOURCE

Wasilla Seventh Day Adventist public water source is located in the Meadow Creek watershed. The system is a Class B public drinking water source and is owned and operated by the Wasilla Seventh Day Adventist Church. The source consists of one well near the southwestern portion of Lot 7 Riddels Subdivision, 2101 North Lucille, Wasilla, Alaska. The well is located at an elevation of approximately 480 feet above sea level. The well is inferred to top the underlying, unconfined aquifer. A well log for the Wasilla Seventh Day Adventist well was not available for our review, but a well drilled on Lot 2 of Riddels Subdivsion was on file with the Alaska Department of Natural Resources and was reviewed. The well penetrated sand and gravel with varying thicknesses of "hardpan" (assumed to be glacial till) to a depth of 158 feet below the land surface. Other wells in the same section have been drilled to similar depths with static water levels ranging from about 60 feet to 90 feet below the land surface. For the purpose of this study we assumed the well extended to approximately 160 feet with the static water level at about 60 feet.

This water source operates year round. The Wasilla Seventh Day Adventist drinking water source is assumed to serve no residents and approximately 100 non-residents through one service connection.

ASSESSMENT AND PROTECTION AREA FOR WASILLA SEVENTH DAY ADVENTIST DRINKING WATER SOURCE

The Drinking Water Protection and Assessment Area that has been established for Wasilla Seventh Day Adventist 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.

Groundwater recharge for the Wasilla Seventh Day Adventist water system enters the aquifer system through infiltration of direct precipitation within the area. 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 well logs from the surrounding area and from past studies *(Jokela, Munter and Evans, 1991).* This analytical calculation was used as a guide as the first step in establishing the protection area for Wasilla Seventh Day Adventist. Additional methods were further employed to take into account any uncertainties in groundwater flow and aquifer characteristics in an attempt to arrive at a meaningful and conservative protection area with respect to public health (please refer to the Guidance Manual for Class B Public Water Systems for additional information).

The Drinking Water Protection Areas established for wells by the Alaska Department of Environmental Conservation 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 Wasilla Seventh Day Adventist contain four zones, Zone A, Zone B, Zone C and Zone D (See Map 1 in 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 downgradient 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 Wasilla Seventh Day Adventist corresponds to a time-of-travel of less than two years and extends eastward. The Zone C protection area extends from the 2-year time of travel to the 5-year time of travel. Lastly, Zone D extends from Zone C to the end of the protection area, roughly 1.3 miles from the Wasilla Seventh Day Adventist well.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within Wasilla Seventh Day Adventist's Drinking Water Protection Area. This survey was completed through a search of agency records and other publicly available information, as well as a reconnaissance of the area surrounding the well.

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 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;

Map 2 and Map 3 in Appendix C depict the Contaminant Source Inventory for Wasilla Seventh Day Adventist. Inventoried potential sources of contamination within Zones A through Zone B were associated with residential and commercial type activities (see Table 1 in Appendix B). Zone C contains roads, residential, and minimal commercial activity. Only high and very high potential and existing sources of contamination were inventoried within Zone D. Although some medium risk sources are noted on the Map and Tables, these sources were not included in the vulnerability analysis. Below is a summary of the contaminant sources inventoried within the Wasilla Seventh Day Adventist protection area:

- Large-capacity septic systems;
- Approximately 110 acres of residential area;
- Activities associated with roads;
- Equipment rental/storage;
- Single family septic systems.

These potential contaminant sources present risk for all three categories of drinking water contaminants for Wasilla Seventh Day Adventist drinking water source.

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.

VULNERABILITY OF WASILLA SEVENTH DAY ADVENTIST 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)

Wasilla Seventh Day Adventist's well is completed in an unconfined aquifer setting. Therefore, contaminants that enter the subsurface within the vicinity of the well and Drinking Water Protection Area may enter the aquifer uninhibited by the absence of any protective layer. We do not know if the well is grouted but assume the well is capped, site drainage is away from the well and the well is not located in a floodplain. For purposes of this study, it is assumed that the well is not grouted. The absence of grouting can allow the transport of contaminants from the surface along the well casing. Combining the susceptibility of the wellhead and the aquifer to contamination leads to a score (0 – 50 points) and rating of overall Susceptibility (See Appendix D). Table 1 shows the overall Susceptibility score and rating for Wasilla Seventh Day Adventist.

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

	Score	Rating
Susceptibility of the Wellhead	5	Low
Susceptibility of the Aquifer	17	High
Natural Susceptibility	22	Medium

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. Large-capacity septic systems, approximately 110 acres of residential area, residential

septic systems, and rural and residential roads contribute the highest risk for potential contamination to the Wasilla Seventh Day Adventist source of public drinking water.

A score (0 – 50 points) and rating of Contaminant Risks (See Appendix D) is assigned based on the findings of the Contaminant Source Inventory (Appendix B - Table 1 – Table 4). This portion of the analysis examines any existing or historical contamination that has been detected at the drinking water source through routine sampling. It also reviews contamination that has or may have occurred but has not arrived or been detected at the 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	23	Medium

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 Analysis for nitrates and nitrites and volatile organic chemicals, respectively.

Vulnerability of the drinking water source 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 three categories of drinking water contaminants (See Appendix D). Note: scores are rounded off to the nearest five.

Table 3. Overall Vulnerability of Wasilla Seventh Day Adventist Public Drinking Water Source to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	70	High
Nitrates and Nitrites	70	High
Volatile Organic Chemicals	45	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, and volatile organic chemicals.

Overall, the contaminant risks for bacteria and viruses and nitrate/nitrites category are very high with large capacity septic systems driving the scores. Combining the potential contamination risk for each category with the susceptibility of the well, yields an overall vulnerability to these contaminants as high for this source of public drinking water.

Nitrates and/or nitrites are found in natural background concentrations at the site, as elsewhere in Alaska. The sampling history of the Wasilla Seventh Day Adventist source water indicates low concentrations of nitrate were reported in December 1997, November 1998, and December 1999. (see Chart 6-Contaminant Risks for Nitrates/Nitrites in Appendix D). Existing nitrate contamination is less than 10% of the allowable limit (MCL) for this contaminant. Due to high solubility and weak retention by soil, nitrates are very mobile in soil, moving approximately the same rate as water. Nevertheless, the current nitrate concentration in the Wasilla Seventh Day Adventist water source remains at safe levels, with respect to human health.

Significant high risk sources for volatile organic chemicals (VOCs), such as fuel/heating fuel tanks gasoline storage facilities, service stations motor vehicle/engine repair, dry cleaners, etc were not identified within the well's protection area, although these sources may exist. The public water system is not required to sample for volatile organic chemicals (VOCs), thus it is unknown if any VOCs from these types of sources are reaching the source.

SUMMARY

A *Source Water Assessment* has been completed for the Wasilla Seventh Day Adventist source of public drinking water. The overall vulnerability of this source to contamination is **High** for bacteria and viruses and nitrates and/or nitrites and **Medium** for volatile organic chemicals. This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of the Alaska Department of Environmental Conservation to protect public health. It is anticipated that *Source Water Assessments* will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of the public drinking water source.

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APPENDIX A

Wasilla Seventh Day Adventist
Drinking Water Protection Area

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Wasilla Seventh Day Adventist

APPENDIX C

Wasilla Seventh Day Adventist
Drinking Water Protection Area
and Potential & Existing Contaminant Sources

APPENDIX D

Vulnerability Analysis for Wasilla Seventh Day Adventist Public Drinking Water Source

Chart 1. Susceptibility of the Wellhead – Wasilla Seventh Day Adventist

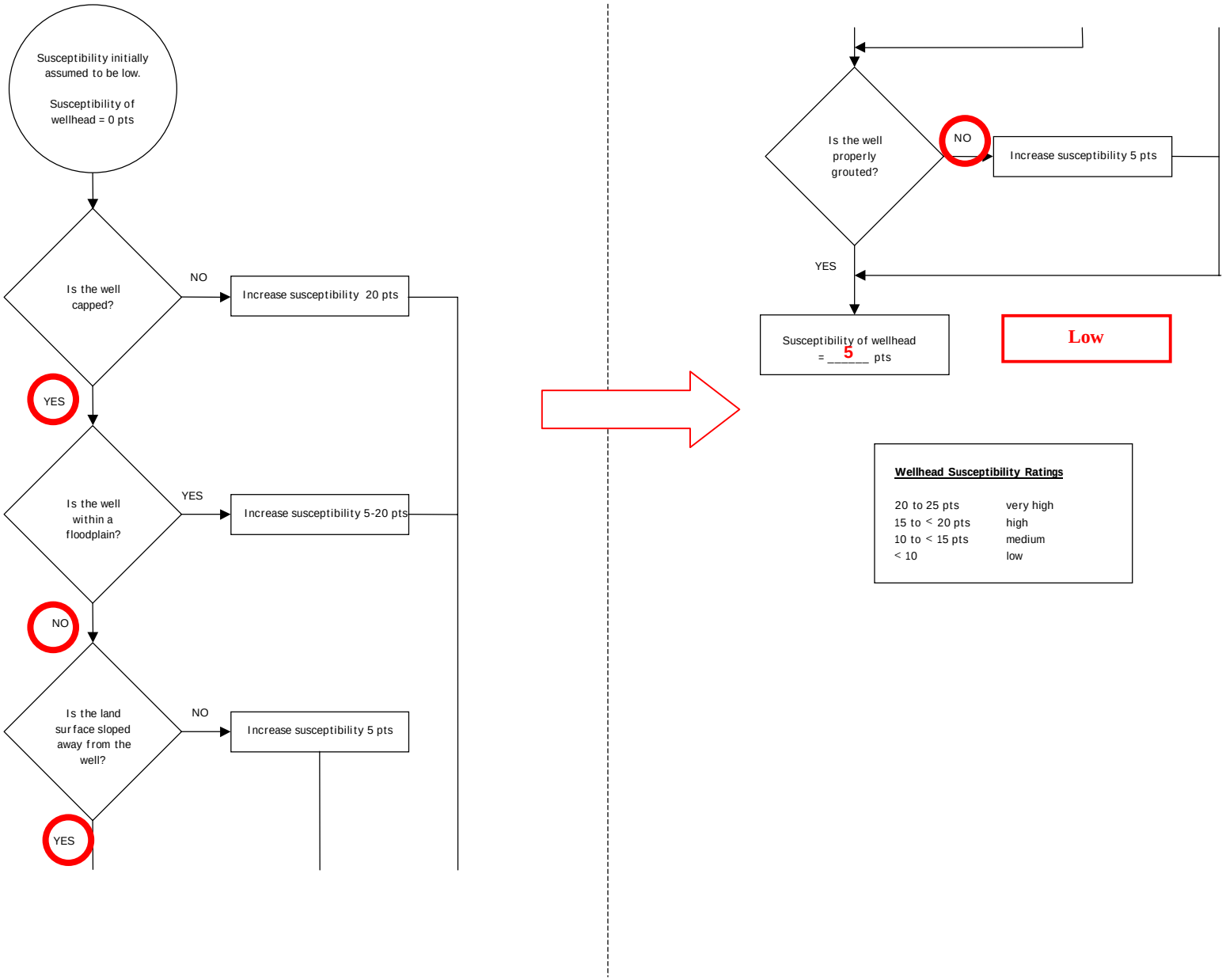
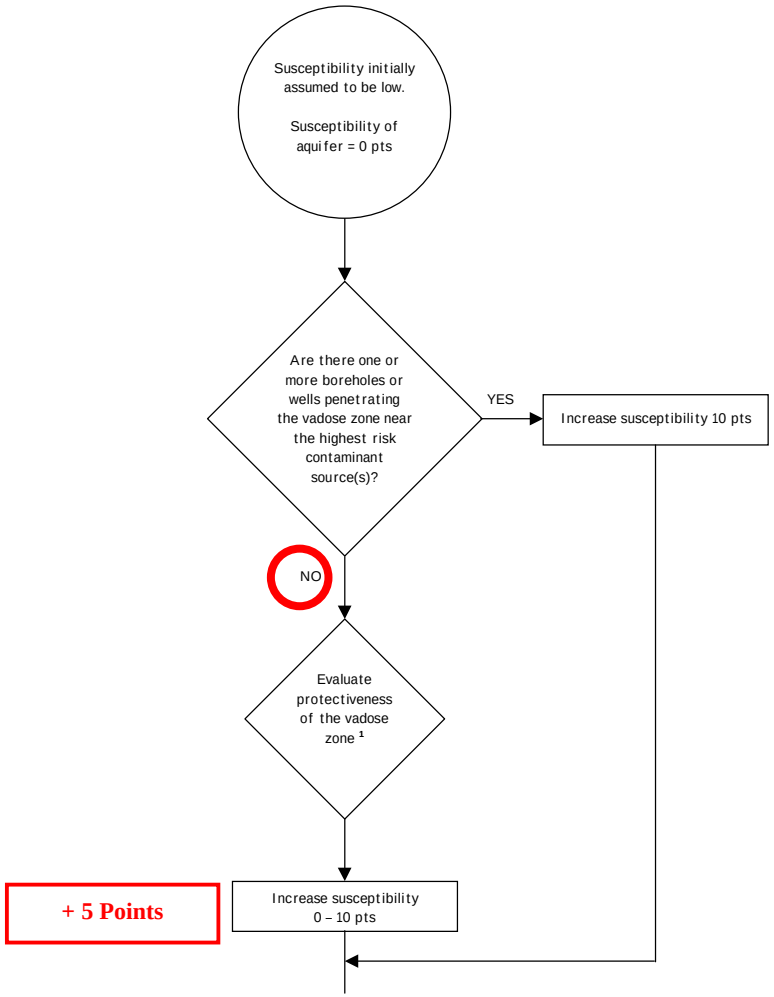
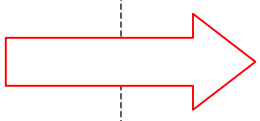
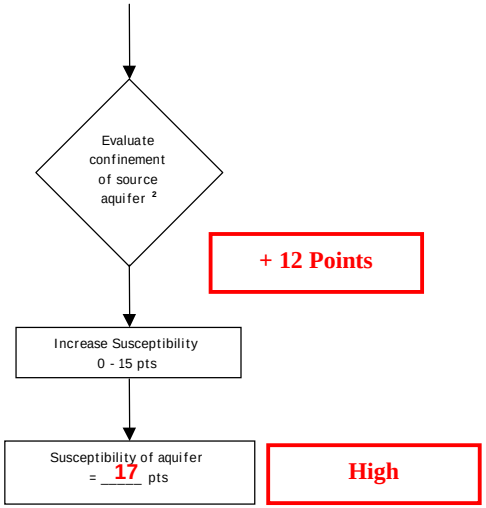


Chart 2. Susceptibility of the Aquifer – Wasilla Seventh Day Adventist







1. Protectiveness of the Vadose Zone

- net recharge (function of precipitation, slope of land surface, & permeability of soils)
  [0 – 10 pts; 50% weight]
- depth to water table (unconfined aquifer) or top of confining layer (confined aquifer)
  [interpolate linearly: 100' – 20', 0 – 5 pts; 20' – 0', 5 – 10 pts; 50% weight]

Precipitation=20"/Yr.= 4 pts.
Soil = Silt/Loam = 4 pts.
Slope = 0-5% = 10 pts.
18 pts./3 = 6 pts.
6 pts. X 50% = **3 pts.**

Depth to water table = 60 feet
Interpolate linearly = 3 pts.
3 pts. X 50% = **1.5 pts.**

Total = 5 of 10 Points

2. Degree of Confinement

- confined verses unconfined aquifer
  [confined: K ≤ 10^{-6} cm/s, minimum thickness of at least one layer = 20 ft, interpolate linearly 100' – 20', 0 – 10 pts; unconfined = 10 - 15 pts; 65% weight]
- density of boreholes and wells penetrating the confining layer (confined aquifer) or the water table (unconfined aquifer)
  [confined: 0 – 15 pts; unconfined = 10-15 pts; 35% weight]

Unconfined Aquifer

Well depth unknown (wells around 100ft. deep according ADNR database) =10 pts.
Several wells/boreholes in proximity = 15 pts.

10(65%) + 15(35%) **=12 pts.**

Total = 12 of 15 Points

Aquifer Susceptibility Ratings

20 to 25 pts	very high
15 to < 20 pts	high
10 to < 15 pts	medium
< 10	low

High

Chart 3. Contaminant risks for Wasilla Seventh Day Adventist Church – Bacteria & Viruses

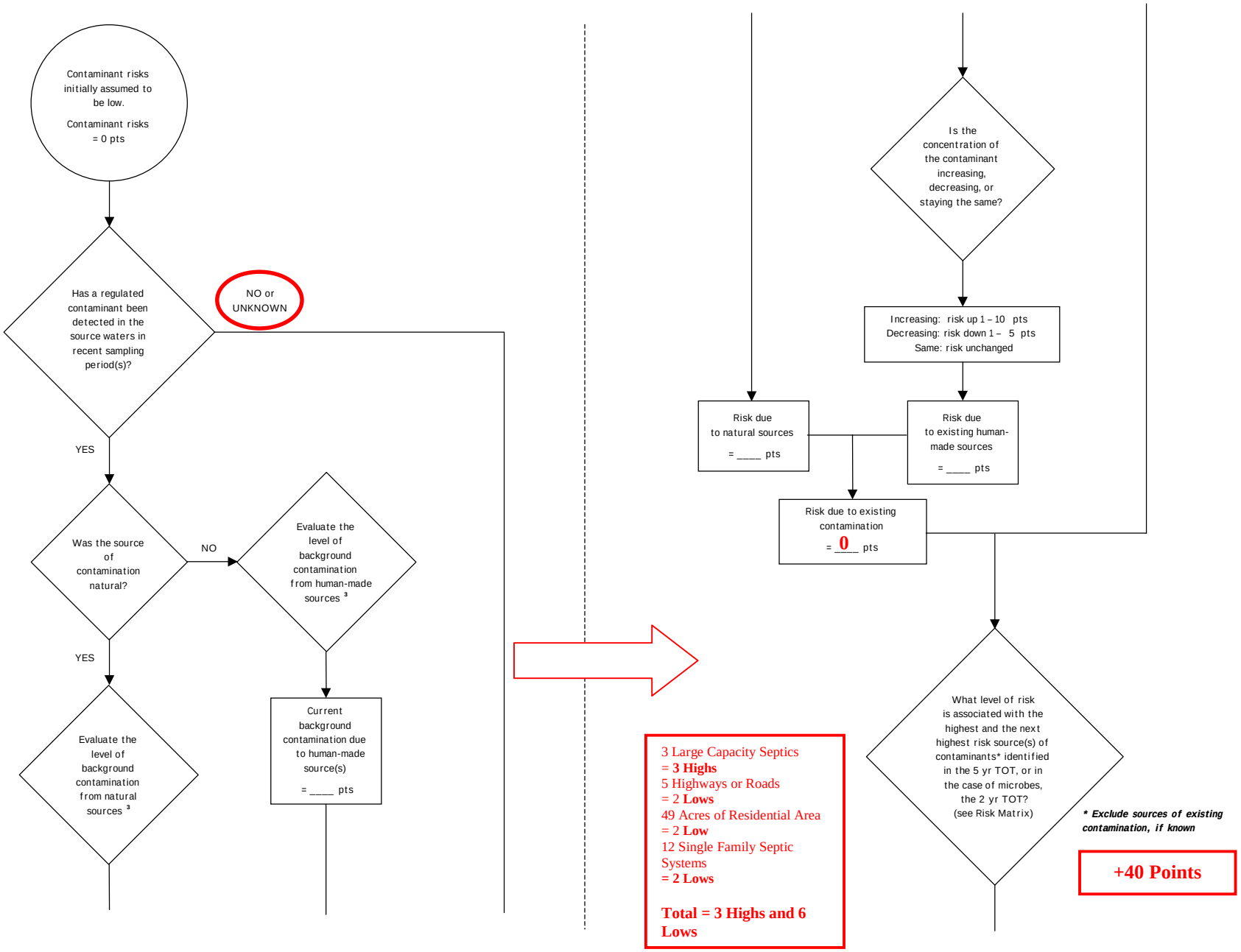


Chart 3. Contaminant risks for Wasilla Seventh Day Adventist Church – Bacteria & Viruses (Continued)

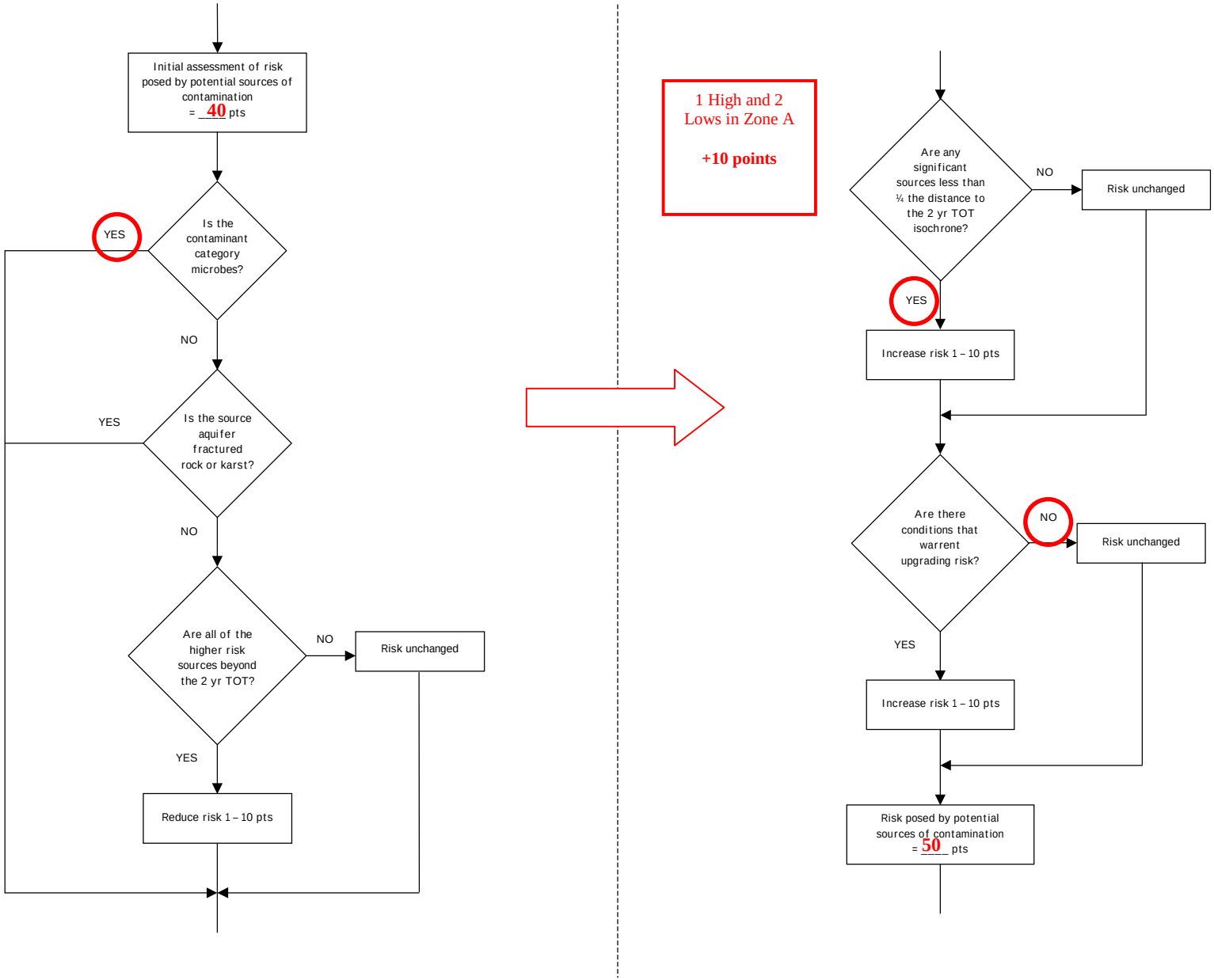
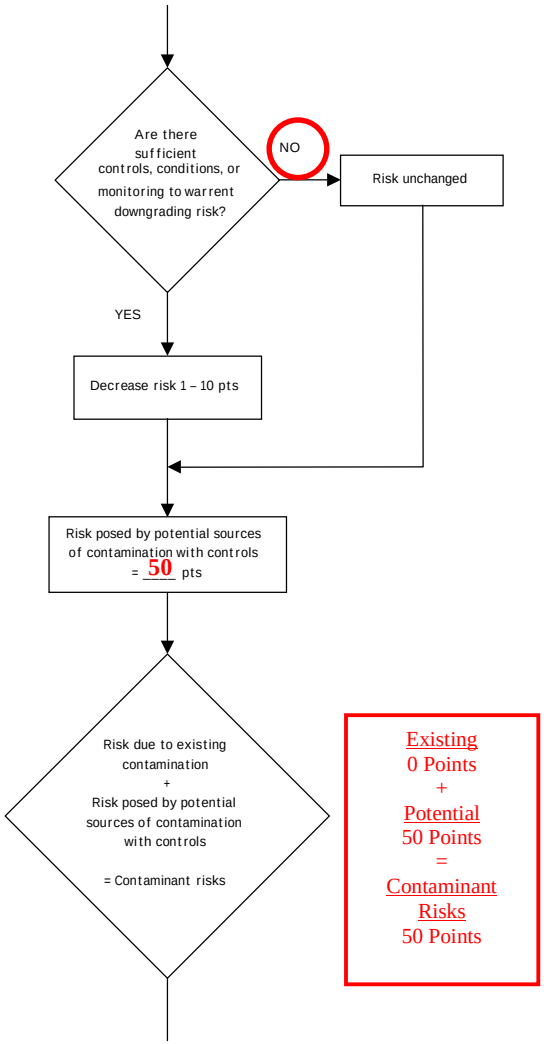


Chart 3. Contaminant risks for Wasilla Seventh Day Adventist Church– Bacteria & Viruses (Continued)



Existing
0 Points
+
Potential
50 Points
=
Contaminant Risks
50 Points

* Truncate risk at 50 pts

Contaminant risks*
= 50 pts

Very High

3. Level of Background Contamination

> MCL	21 - 50 pts
0.5 MCL to < MCL	11 - 20 pts
0.2 MCL to < 0.5 MCL	6 - 10 pts
'detect' to < 0.2 MCL	0 - 5 pts

Contaminant Risk Ratings

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

Sample Date	Result
1/29/01	Not Detected (ND)
5/22/00	ND
2/23/00	ND
11/10/99	ND
9/07/99	ND

Table 1. Risk Matrix for Contaminant Sources for Wasilla Seventh Day Adventist Church– Bacteria & Viruses

Level of Risk Associated with the Highest Risk Sources

3 Highs and 6 Lows	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

Chart 4. Vulnerability Analysis for Wasilla Seventh Day Adventist Church – Bacteria & Viruses

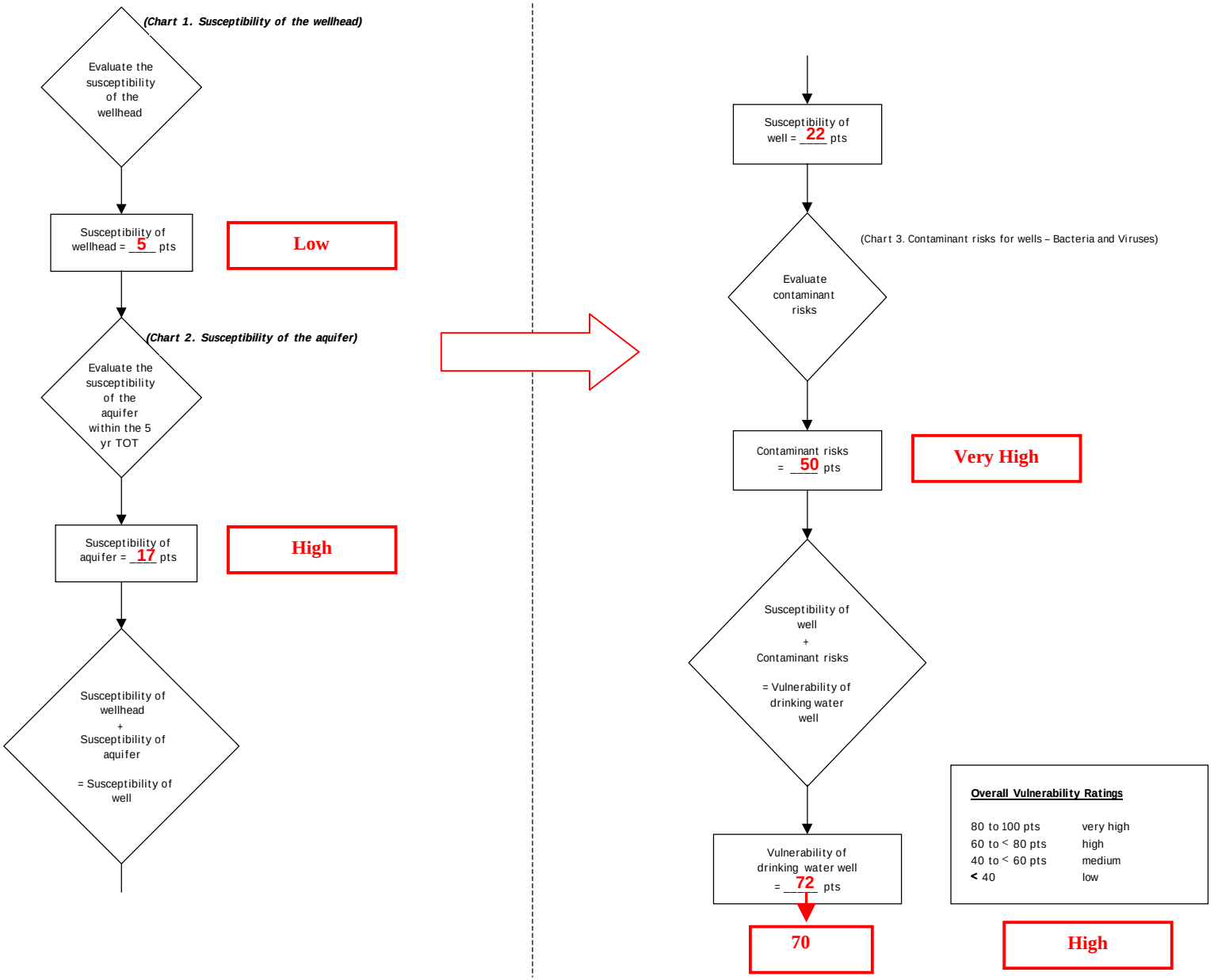


Chart 5. Contaminant Risks for Wasilla Seventh Day Adventist Church – Nitrates and Nitrites

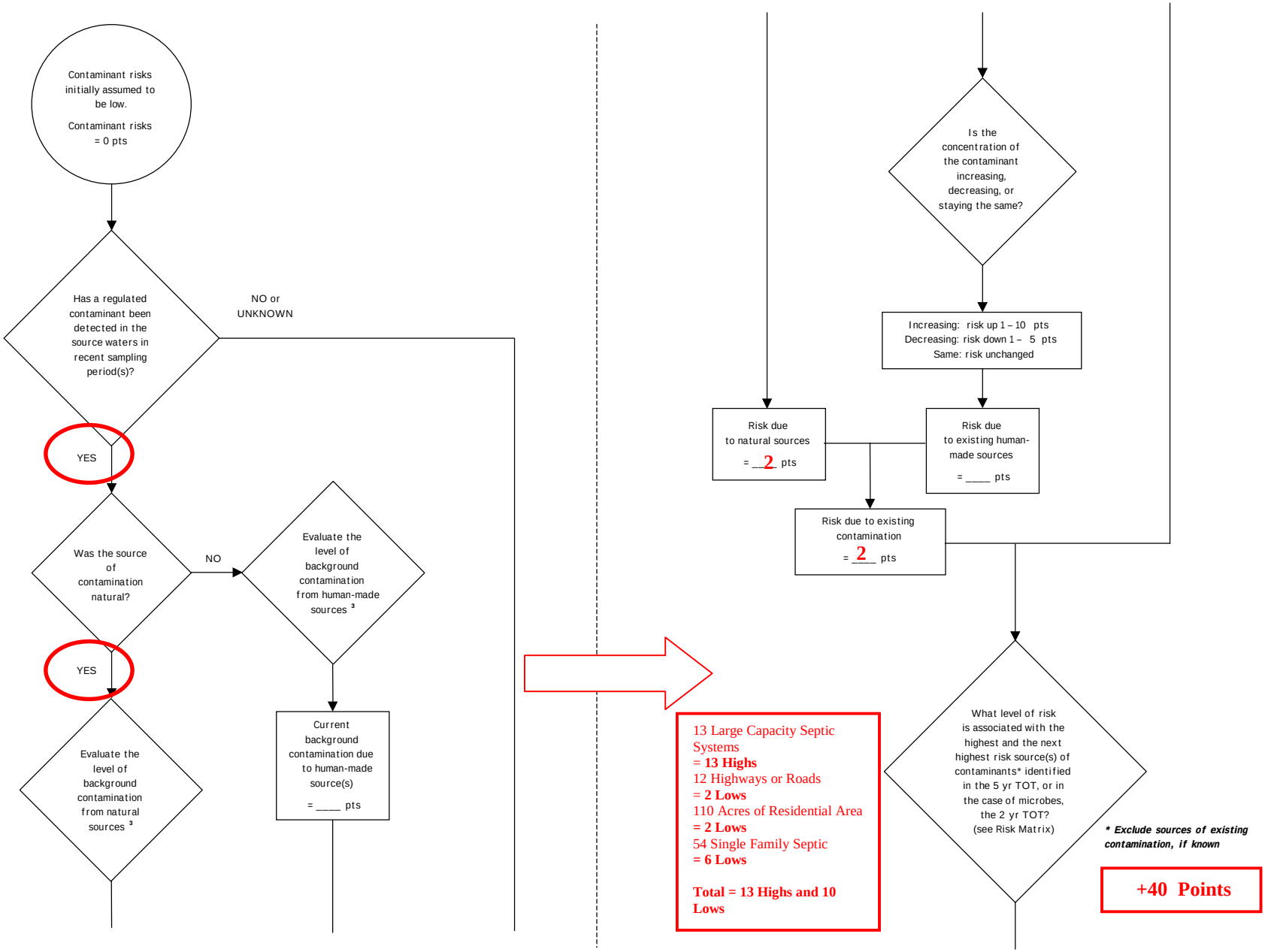


Chart 5. Contaminant risks for Wasilla Seventh Day Adventist Church – Nitrates and Nitrites (Continued)

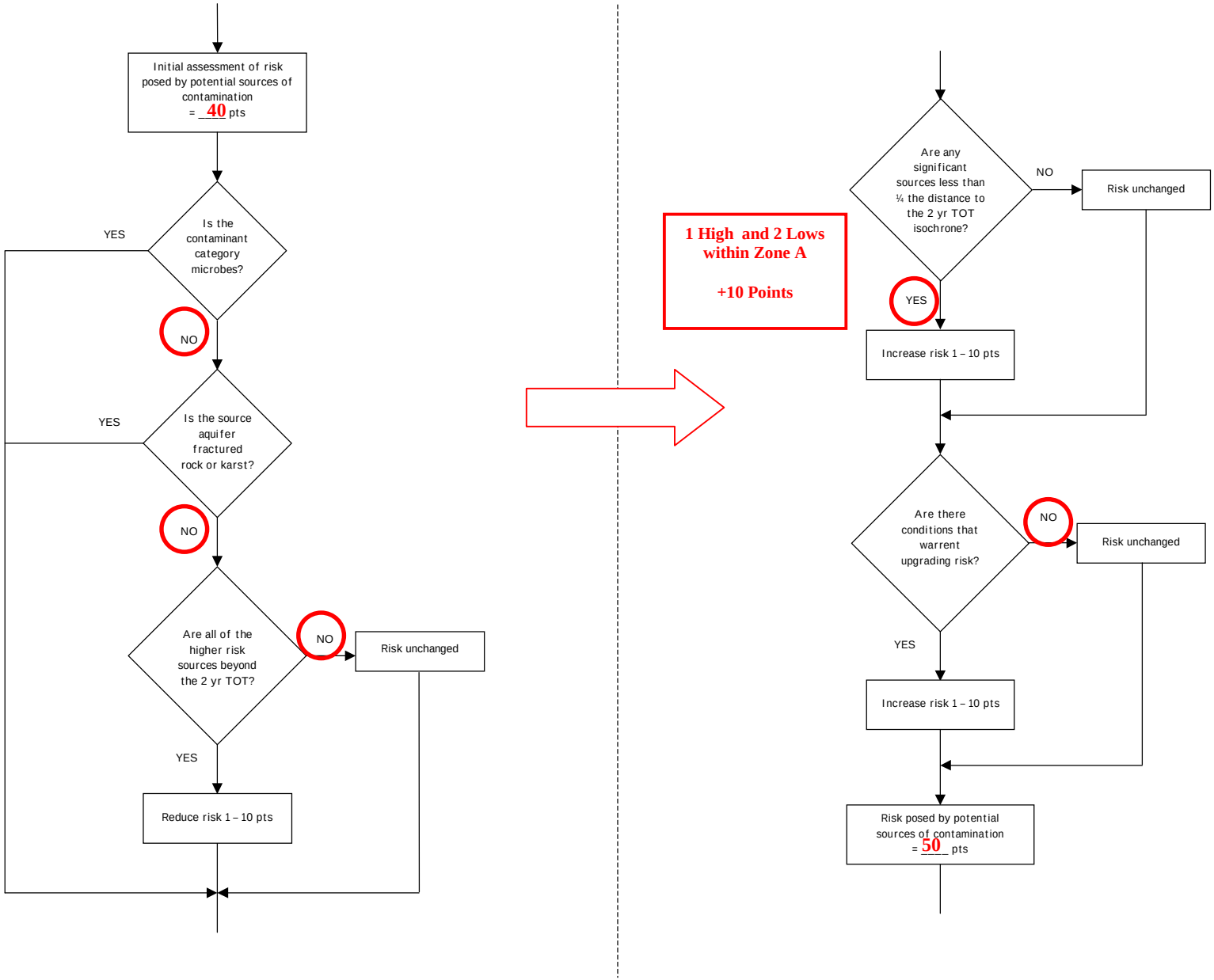
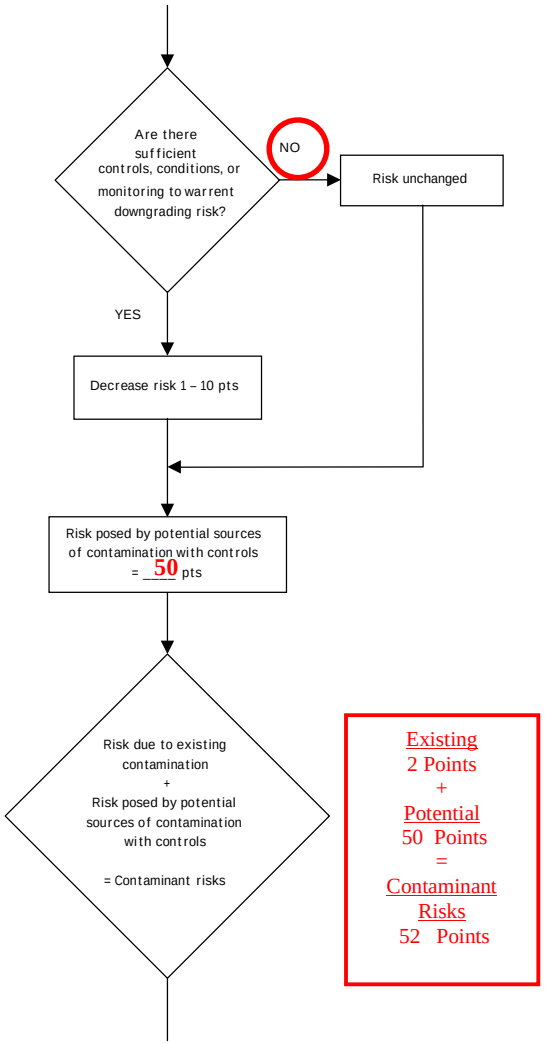


Chart 5. Contaminant risks for Wasilla Seventh Day Adventist Church – Nitrates and Nitrites (Continued)



Existing
2 Points
+
Potential
50 Points
=
Contaminant Risks
52 Points

* Truncate risk at 50 pts

Contaminant risks*
= 50 pts

Very High

3. Level of Background Contamination

> MCL	21 - 50 pts
0.5 MCL to < MCL	11 - 20 pts
0.2 MCL to < 0.5 MCL	6 - 10 pts
'detect' to < 0.2 MCL	0 - 5 pts

Contaminant Risk Ratings

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

Sample Date	Concentration
2/06/01	Not Detected (ND)
2/05/01	ND
12/08/99	0.62 mg/L
11/04/98	0.61 mg/L
12/29/97	0.78 mg/L

Maximum Contaminant Level (MCL)= 10mg/L
(0.78 mg/L)/(10 mg/L) = 0.078 of MCL

Interpolated Linearly = **2 Points**

Table 2. Risk Matrix for Contaminant Sources for Wasilla Seventh Day Adventist Church– Nitrates and Nitrites

Level of Risk Associated with the Highest Risk Sources

13 Highs and 10 Lows	**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

Chart 6. Vulnerability analysis for Wasilla Seventh Day Adventist Church – Nitrates and Nitrites

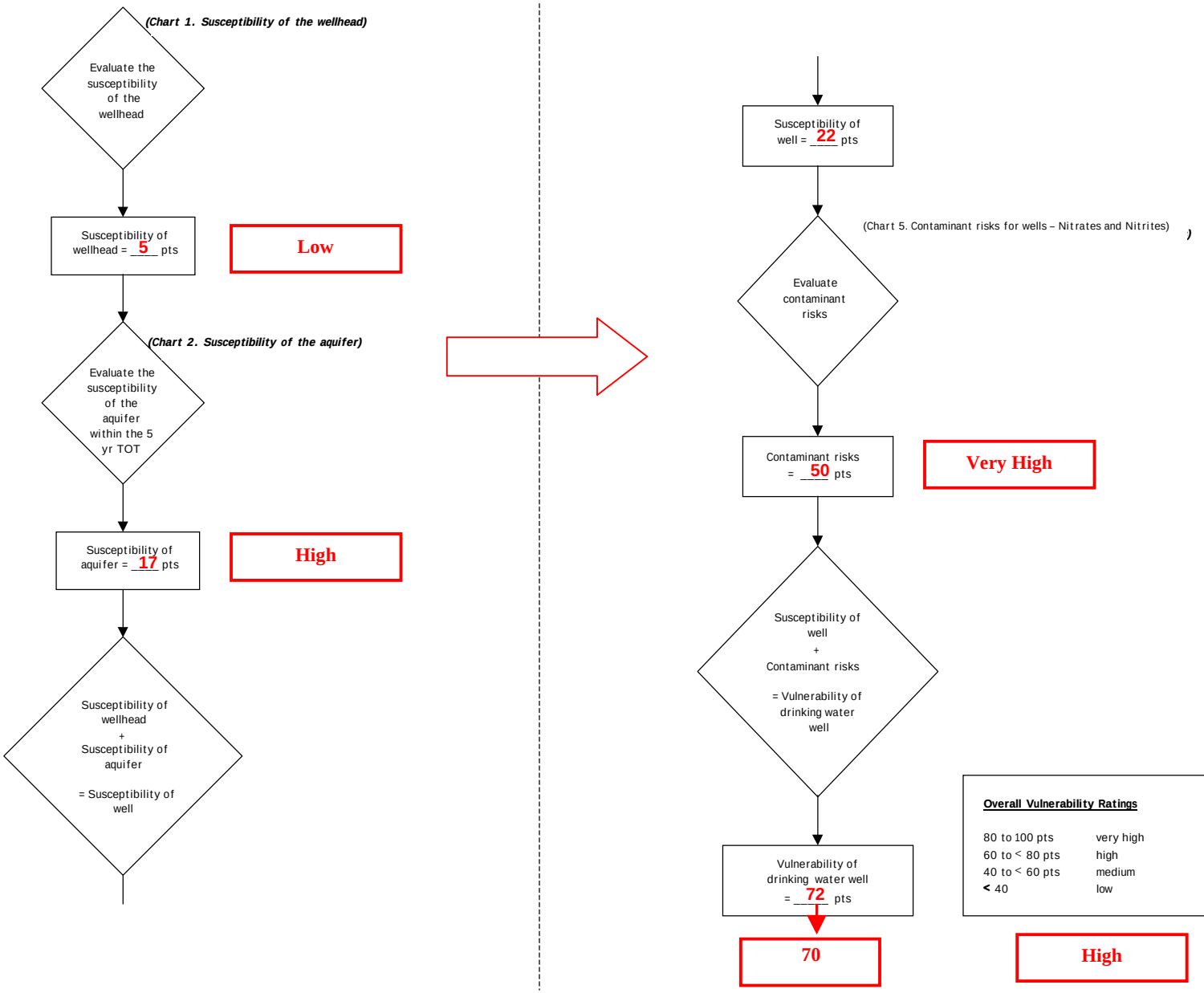


Chart 7. Contaminant Risks for Wasilla Seventh Day Adventist Church – Volatile Organic Chemicals

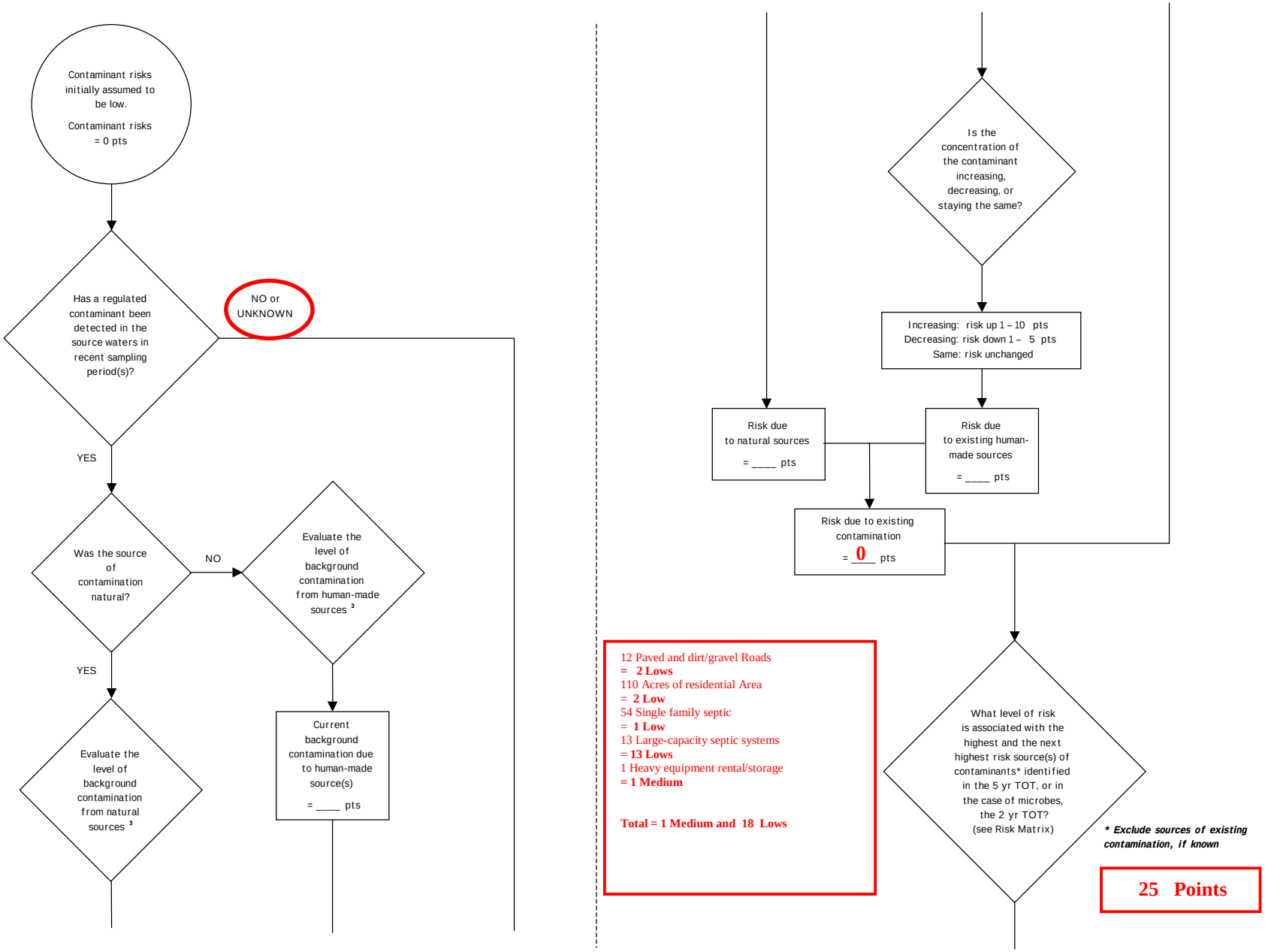


Chart 7. Contaminant Risks for Wasilla Seventh Day Adventist Church– Volatile Organic Chemicals (Continued)

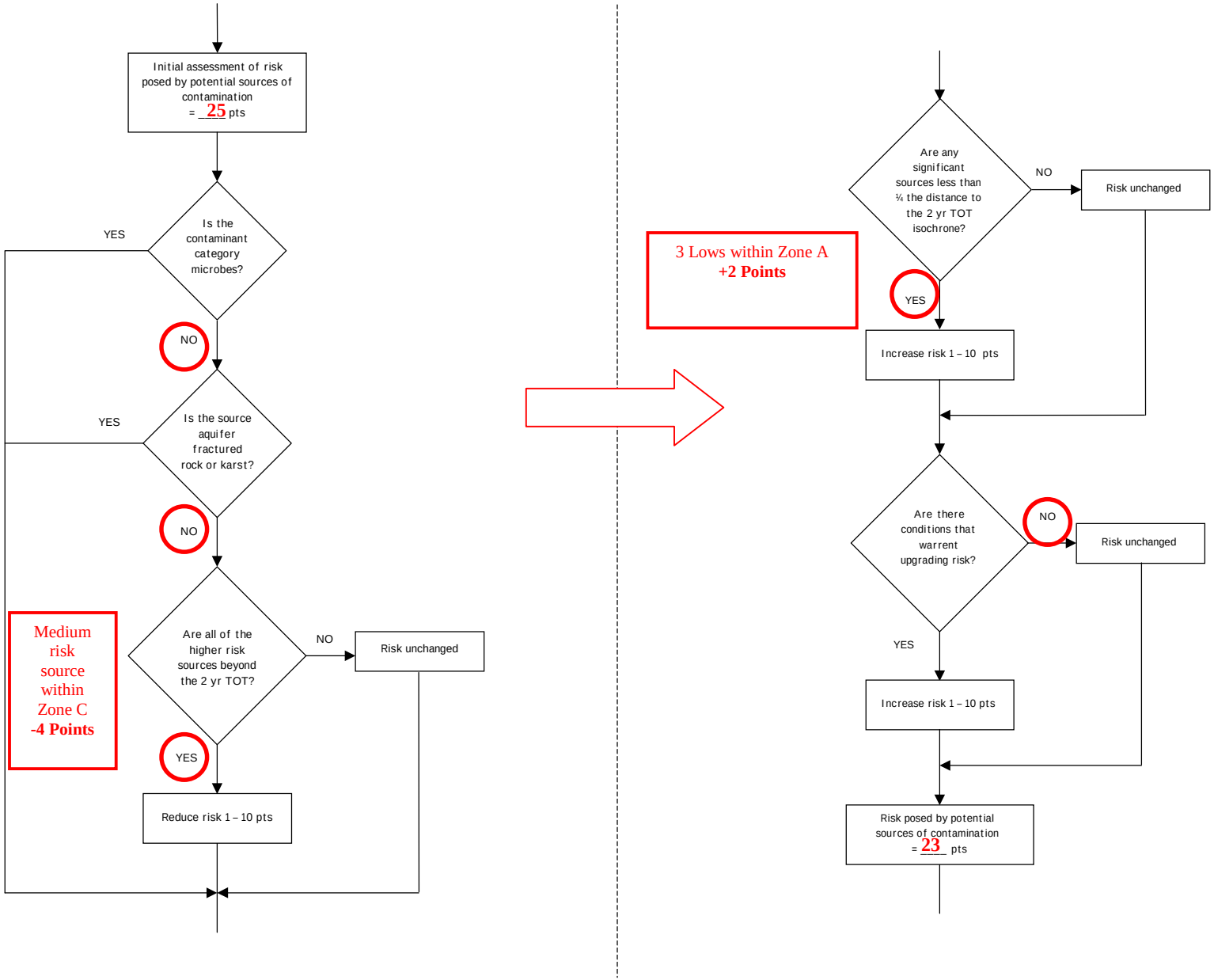
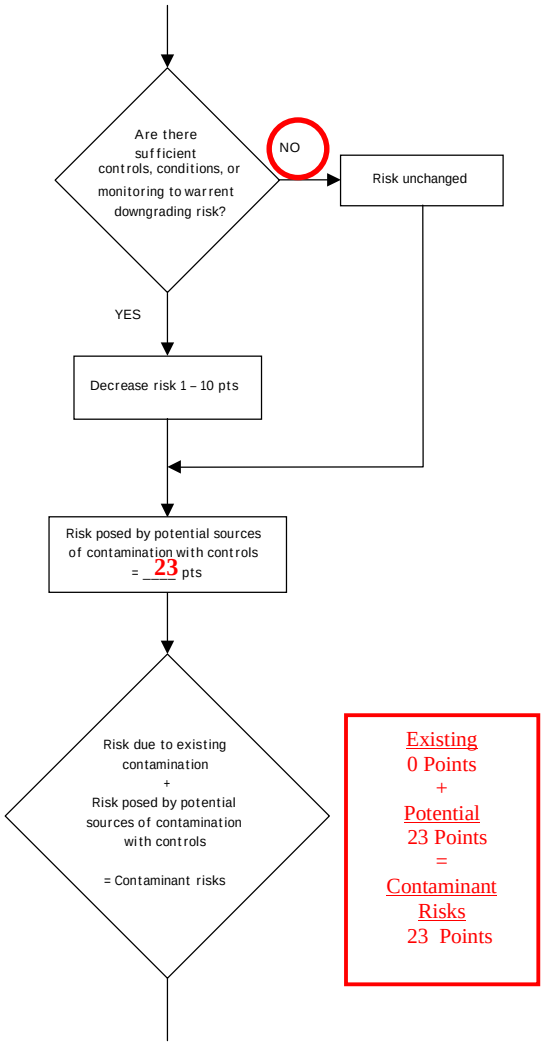


Chart 7. Contaminant Risks for Wasilla Seventh Day Adventist Church– Volatile Organic Chemicals (Continued)



Existing
0 Points
+
Potential
23 Points
=
Contaminant Risks
23 Points

* Truncate risk at 50 pts

Contaminant risks*
= 23 pts

Medium

3. Level of Background Contamination

> MCL	21 - 50 pts
0.5 MCL to < MCL	11 - 20 pts
0.2 MCL to < 0.5 MCL	6 - 10 pts
'detect' to < 0.2 MCL	0 - 5 pts

Contaminant Risk Ratings

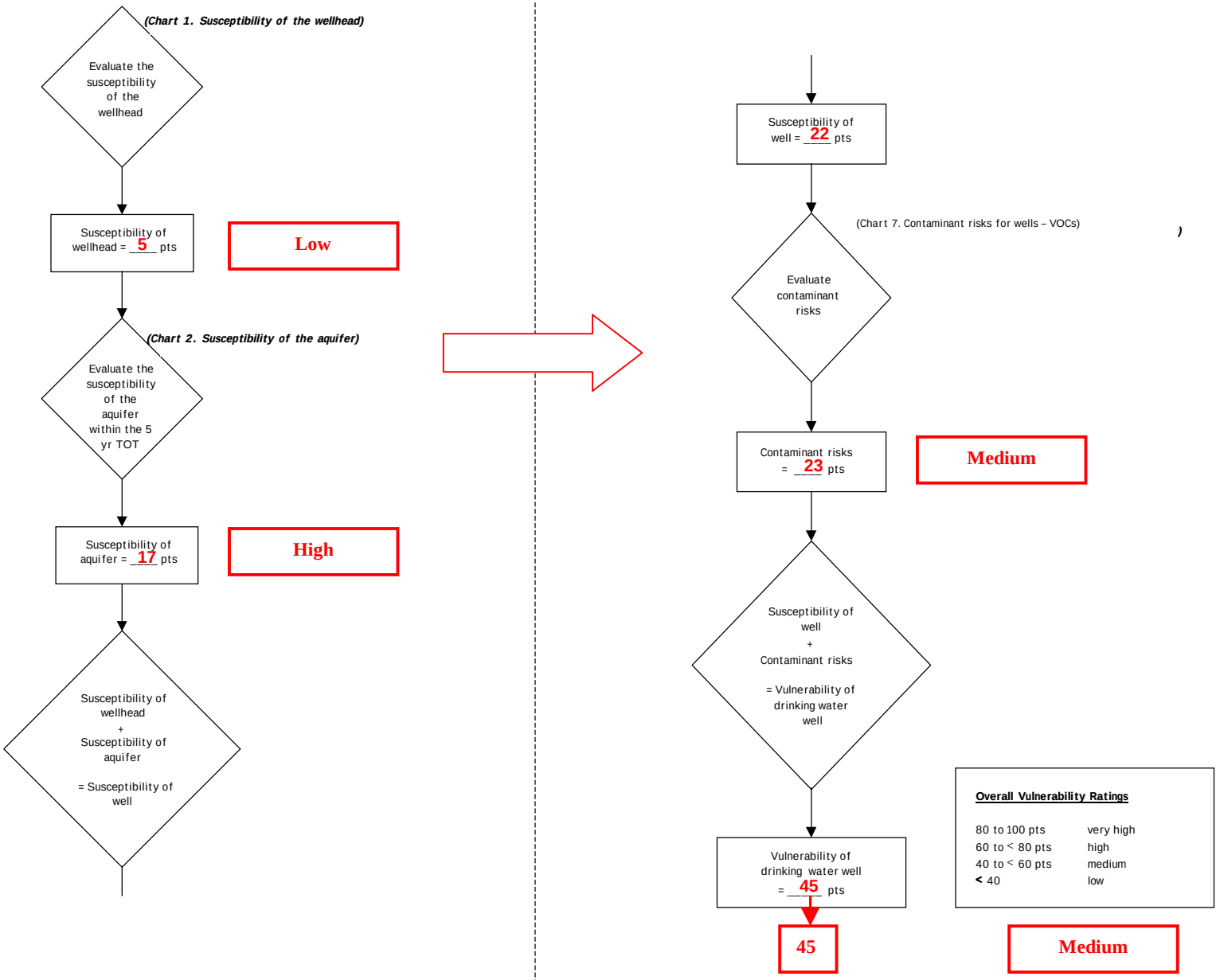
40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20	low

Table 3. Risk Matrix for Contaminant Sources for Wasilla Seventh Day Adventist Church– Volatile Organic Chemicals

Level of Risk Associated with the Highest Risk Sources

1 Medium and 18 Lows	**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

Chart 8. **Vulnerability Analysis for Wasilla Seventh Day Adventist Church –** ***Volatile Organic Chemicals***



Contaminant Source Category	*Contaminant Source ID*	*CS ID Tag*	*Zone*	*Location*	*Map*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-1*	*A*	*West of Lucille Street, north of Jensen Circle*	*3*	
Residential Areas	*R1*	*R1-1*	*A*	*East of Lucille St*	*2*	*13 acres*
Highways and roads, paved (cement or asphalt)	*X20*	*X20-1*	*A*	*Lucille Street*	*2*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-2*	*B*	*East of Lucille Street, between Mulchatna Drive and Spruce Avenue*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-3*	*B*	*South of Mulchatna Drive, west of Douglas Drive*	*3*	
Residential Areas	*R1*	*R1-2*	*B*	*North and south of Mulchatna Drive*	*2*	*36 acres*
Septic systems (serves one single-family home)	*R2*	*R2-1*	*B*	*West of Douglas Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-2*	*B*	*West of Douglas Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-3*	*B*	*East of Douglas Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-4*	*B*	*On Coyote Circle*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-5*	*B*	*On Coyote Circle*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-6*	*B*	*On Coyote Circle*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-7*	*B*	*On Mulchatna Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-8*	*B*	*On Mulchatna Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-9*	*B*	*On Mulchatna Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-10*	*B*	*On Ravens Flight Drive*	*3*	

Contaminant Source Category	Contaminant Source ID	CS ID Tag	Zone	Location	Map	Comments
Septic systems (serves one single-family home)	R2	R2-11	B	On Ravens Flight Drive	3	
Septic systems (serves one single-family home)	R2	R2-12	B	On Ravens Flight Drive	3	
Highways and roads, dirt/gravel	X24	X24-1	B	Mulchatna Drive	2	
Highways and roads, dirt/gravel	X24	X24-2	B	Douglas Drive	2	
Highways and roads, dirt/gravel	X24	X24-3	B	Howling Wolf Lane	2	
Highways and roads, dirt/gravel	X24	X24-4	B	Ravens Flight Drive	2	
Heavy equipment rental/storage	C18	C18-1	C	South of Agate Ln	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	C	North of Mulchatna Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-5	C	North of Mulchatna Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	C	North of Mulchatna Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-7	C	North of Mulchatna Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-8	C	North of Mulchatna Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-9	C	North of Mulchatna Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10	C	North of Mulchatna Drive	3	

Contaminant Source Category	*Contaminant Source ID*	*CS ID Tag*	*Zone*	*Location*	*Map*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-11*	*C*	*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-12*	*C*	*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-13*	*C*	*North of Mulchatna Drive*	*3*	
Residential Areas	*R1*	*R1-3*	*C*	*North of Mulchatna Drive*	*2*	*61 acres*
Septic systems (serves one single-family home)	*R2*	*R2-13--R2-54*	*C*	*41 Septics within Zone C*	*3*	
Highways and roads, dirt/gravel	*X24*	*X24-5*	*C*	*Agate Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-6*	*C*	*Iliamna Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-7*	*C*	*Flint Steel Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-8*	*C*	*Bright Place*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-9*	*C*	*Jasper Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-10*	*C*	*Garnet Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-11*	*C*	*Quartz Circle*	*2*	
Heavy equipment rental/storage	*C18*	*C18-2*	*D*	*On Onyx Circle*	*3*	
Paint sales /service	*C32*	*C32-1*	*D*	*On Quartz Circle*	*3*	

Contaminant Source Category	Contaminant Source ID	CS ID Tag	Zone	Risk Ranking for Analysis	Overall Rank After Analysis	Location	Map	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	1	West of Lucille Street, north of Jensen Circle	3	
Residential Areas	R1	R1-1	A	Low		East of Lucille St	2	13 acres
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Very Low		Lucille Street	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	B	High	2	East of Lucille Street, between Mulchatna Drive and Spruce Avenue	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	B	High	3	South of Mulchatna Drive, west of Douglas Drive	3	
Residential Areas	R1	R1-2	B	Low		North and south of Mulchatna Drive	2	36 acres
Septic systems (serves one single-family home)	R2	R2-1	B	Very Low		West of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-2	B	Very Low		West of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-3	B	Very Low		East of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-4	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-5	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-6	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-7	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-8	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-9	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-10	B	Very Low		On Ravens Flight Drive	3	

Contaminant Source Category	*Contaminant Source ID*	*CS ID Tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank After Analysis*	*Location*	*Map*	*Comments*
Septic systems (serves one single-family home)	*R2*	*R2-11*	*B*	*Very Low*		*On Ravens Flight Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-12*	*B*	*Very Low*		*On Ravens Flight Drive*	*3*	
Highways and roads, dirt/gravel	*X24*	*X24-1*	*B*	*Very Low*		*Mulchatna Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-2*	*B*	*Very Low*		*Douglas Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-3*	*B*	*Very Low*		*Howling Wolf Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-4*	*B*	*Very Low*		*Ravens Flight Drive*	*2*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-4*	*C*	*High*	*4*	*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-5*	*C*	*High*	*5*	*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-6*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-7*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-8*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-9*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-10*	*C*	*High*		*North of Mulchatna Drive*	*3*	

Contaminant Source Category	*Contaminant Source ID*	*CS ID Tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank After Analysis*	*Location*	*Map*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-11*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-12*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-13*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Residential Areas	*R1*	*R1-3*	*C*	*Low*		*North of Mulchatna Drive*	*2*	*61 acres*
Septic systems (serves one single-family home)	*R2*	*R2-13--R2-54*	*C*	*Very Low*		*41 Septics within Zone C*	*3*	
Highways and roads, dirt/gravel	*X24*	*X24-5*	*C*	*Very Low*		*Agate Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-6*	*C*	*Very Low*		*Iliamna Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-7*	*C*	*Very Low*		*Flint Steel Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-8*	*C*	*Very Low*		*Bright Place*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-9*	*C*	*Very Low*		*Jasper Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-10*	*C*	*Very Low*		*Garnet Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-11*	*C*	*Very Low*		*Quartz Circle*	*2*	

Contaminant Source Category	Contaminant Source ID	CS ID Tag	Zone	Risk Ranking for Analysis	Overall Rank After Analysis	Location	Map	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	1	West of Lucille Street, north of Jensen Circle	3	
Residential Areas	R1	R1-1	A	Low		East of Lucille St	2	13 acres
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Very Low		Lucille Street	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	B	High	2	East of Lucille Street, between Mulchatna Drive and Spruce Avenue	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	B	High	3	South of Mulchatna Drive, west of Douglas Drive	3	
Residential Areas	R1	R1-2	B	Low		North and south of Mulchatna Drive	2	36 acres
Septic systems (serves one single-family home)	R2	R2-1	B	Very Low		West of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-2	B	Very Low		West of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-3	B	Very Low		East of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-4	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-5	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-6	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-7	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-8	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-9	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-10	B	Very Low		On Ravens Flight Drive	3	

Contaminant Source Category	*Contaminant Source ID*	*CS ID Tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank After Analysis*	*Location*	*Map*	*Comments*
Septic systems (serves one single-family home)	*R2*	*R2-11*	*B*	*Very Low*		*On Ravens Flight Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-12*	*B*	*Very Low*		*On Ravens Flight Drive*	*3*	
Highways and roads, dirt/gravel	*X24*	*X24-1*	*B*	*Very Low*		*Mulchatna Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-2*	*B*	*Very Low*		*Douglas Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-3*	*B*	*Very Low*		*Howling Wolf Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-4*	*B*	*Very Low*		*Ravens Flight Drive*	*2*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-4*	*C*	*High*	*4*	*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-5*	*C*	*High*	*5*	*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-6*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-7*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-8*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-9*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-10*	*C*	*High*		*North of Mulchatna Drive*	*3*	

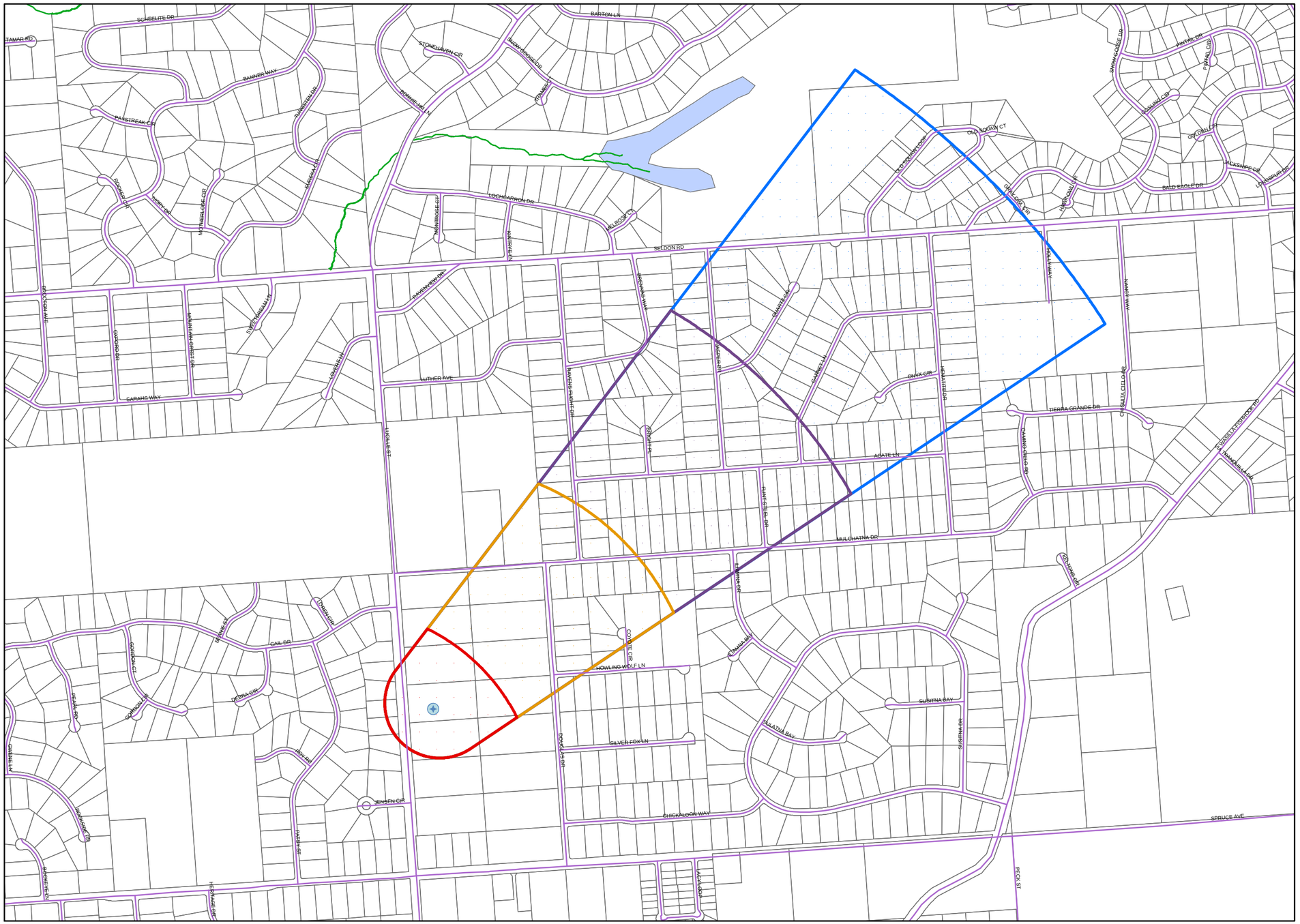
Contaminant Source Category	*Contaminant Source ID*	*CS ID Tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank After Analysis*	*Location*	*Map*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-11*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-12*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-13*	*C*	*High*		*North of Mulchatna Drive*	*3*	
Residential Areas	*R1*	*R1-3*	*C*	*Low*		*North of Mulchatna Drive*	*2*	*61 acres*
Septic systems (serves one single-family home)	*R2*	*R2-13--R2-54*	*C*	*Very Low*		*41 Septics within Zone C*	*3*	
Highways and roads, dirt/gravel	*X24*	*X24-5*	*C*	*Very Low*		*Agate Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-6*	*C*	*Very Low*		*Iliamna Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-7*	*C*	*Very Low*		*Flint Steel Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-8*	*C*	*Very Low*		*Bright Place*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-9*	*C*	*Very Low*		*Jasper Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-10*	*C*	*Very Low*		*Garnet Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-11*	*C*	*Very Low*		*Quartz Circle*	*2*	

Contaminant Source Category	Contaminant Source ID	CS ID Tag	Zone	Risk Ranking for Analysis	Overall Rank After Analysis	Location	Map	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	4	West of Lucille Street, north of Jensen Circle	3	
Residential Areas	R1	R1-1	A	Low	5	East of Lucille St	2	13 acres
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Very Low		Lucille Street	2	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	B	Low		East of Lucille Street, between Mulchatna Drive and Spruce Avenue	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	B	Low		South of Mulchatna Drive, west of Douglas Drive	3	
Residential Areas	R1	R1-2	B	Low		North and south of Mulchatna Drive	2	36 acres
Septic systems (serves one single-family home)	R2	R2-1	B	Very Low		West of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-2	B	Very Low		West of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-3	B	Very Low		East of Douglas Drive	3	
Septic systems (serves one single-family home)	R2	R2-4	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-5	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-6	B	Very Low		On Coyote Circle	3	
Septic systems (serves one single-family home)	R2	R2-7	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-8	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-9	B	Very Low		On Mulchatna Drive	3	
Septic systems (serves one single-family home)	R2	R2-10	B	Very Low		On Ravens Flight Drive	3	

Contaminant Source Category	*Contaminant Source ID*	*CS ID Tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank After Analysis*	*Location*	*Map*	*Comments*
Septic systems (serves one single-family home)	*R2*	*R2-11*	*B*	*Very Low*		*On Ravens Flight Drive*	*3*	
Septic systems (serves one single-family home)	*R2*	*R2-12*	*B*	*Very Low*		*On Ravens Flight Drive*	*3*	
Highways and roads, dirt/gravel	*X24*	*X24-1*	*B*	*Very Low*		*Mulchatna Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-2*	*B*	*Very Low*		*Douglas Drive*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-3*	*B*	*Very Low*		*Howling Wolf Lane*	*2*	
Highways and roads, dirt/gravel	*X24*	*X24-4*	*B*	*Very Low*		*Ravens Flight Drive*	*2*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-4*	*C*	*Low*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-5*	*C*	*Low*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-6*	*C*	*Low*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-7*	*C*	*Low*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-8*	*C*	*Low*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-9*	*C*	*Low*		*North of Mulchatna Drive*	*3*	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	*D10*	*D10-10*	*C*	*Low*		*North of Mulchatna Drive*	*3*	

Contaminant Source Category	Contaminant Source ID	CS ID Tag	Zone	Risk Ranking for Analysis	Overall Rank After Analysis	Location	Map	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-11	C	Low		North of Mulchatna Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-12	C	Low		North of Mulchatna Drive	3	
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-13	C	Low		North of Mulchatna Drive	3	
Residential Areas	R1	R1-3	C	Low		North of Mulchatna Drive	2	61 acres
Heavy equipment rental/storage	C18	C18-1	C	Medium	1	South of Agate Ln	3	
Septic systems (serves one single-family home)	R2	R2-13--R2-54	C	Very Low		41 Septics within Zone C	3	
Highways and roads, dirt/gravel	X24	X24-5	C	Very Low		Agate Lane	2	
Highways and roads, dirt/gravel	X24	X24-6	C	Very Low		Iliamna Drive	2	
Highways and roads, dirt/gravel	X24	X24-7	C	Very Low		Flint Steel Drive	2	
Highways and roads, dirt/gravel	X24	X24-8	C	Very Low		Bright Place	2	
Highways and roads, dirt/gravel	X24	X24-9	C	Very Low		Jasper Drive	2	
Highways and roads, dirt/gravel	X24	X24-10	C	Very Low		Garnet Lane	2	
Highways and roads, dirt/gravel	X24	X24-11	C	Very Low		Quartz Circle	2	
Heavy equipment rental/storage	C18	C18-2	D	Medium	2	On Onyx Circle	3	
Paint sales /service	C32	C32-1	D	Medium	3	On Quartz Circle	3	

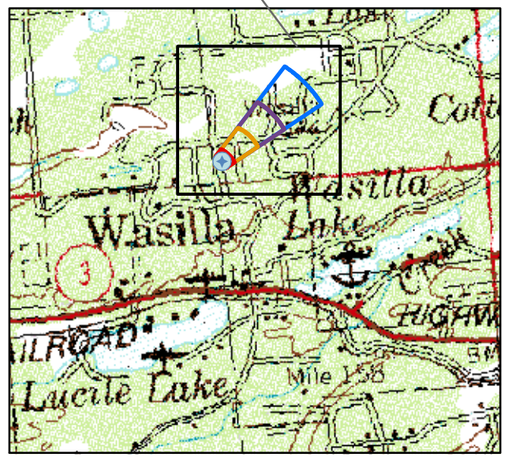
Drinking Water Protection Area for Wasilla Seventh Day Adventist Church



975 0 975 Feet

Wasilla Seventh Day Adventist Well
Rivers
MSB roads
Lakes
MSB parcel core
Zone A Protection Area
Several Months Travel Time
Zone B Protection Area
Less Than 2-Years Travel Time
Zone D Protection Area
Less Than 10-Years Travel Time
Zone C Protection Area
Less Than 5-Years Travel Time

Location of Map



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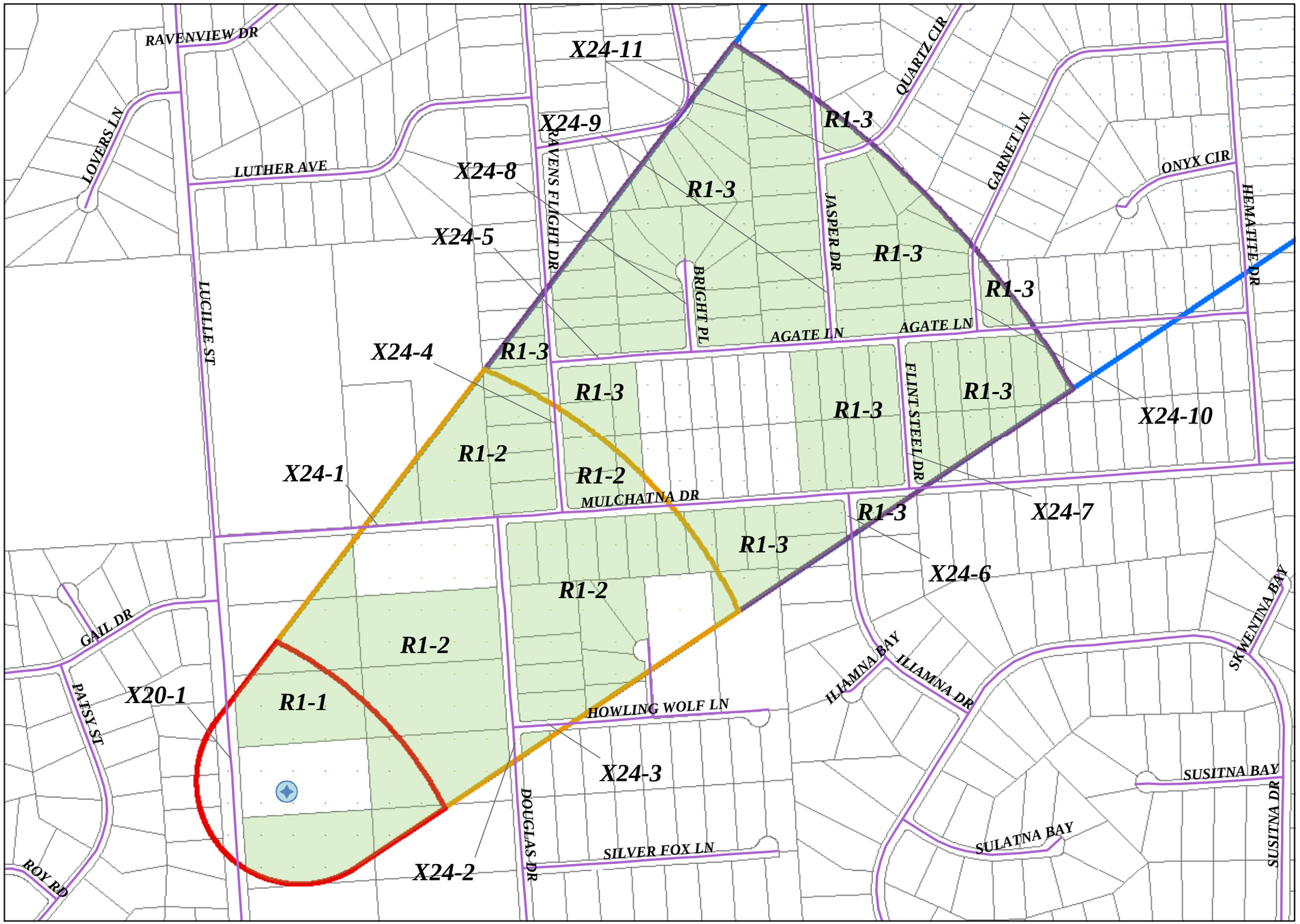
Map 1

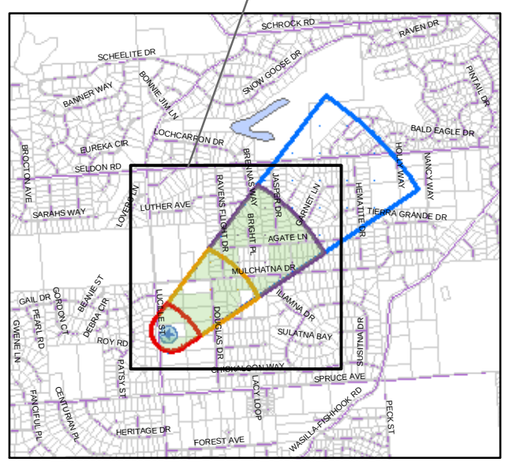
Drinking Water Protection Area for Wasilla Seventh Day Adventist Church and Potential and Existing Sources of Contamination



525 0 525 Feet

Wasilla Seventh Day Adventist Well
Rivers
MSB roads
Lakes
MSB parcel core
Residential Area
Zone A Protection Area
Several Months Travel Time
Zone B Protection Area
Less Than 2-Years Travel Time
Zone D Protection Area
Less Than 10-Years Travel Time
Zone C Protection Area
Less Than 5-Years Travel Time

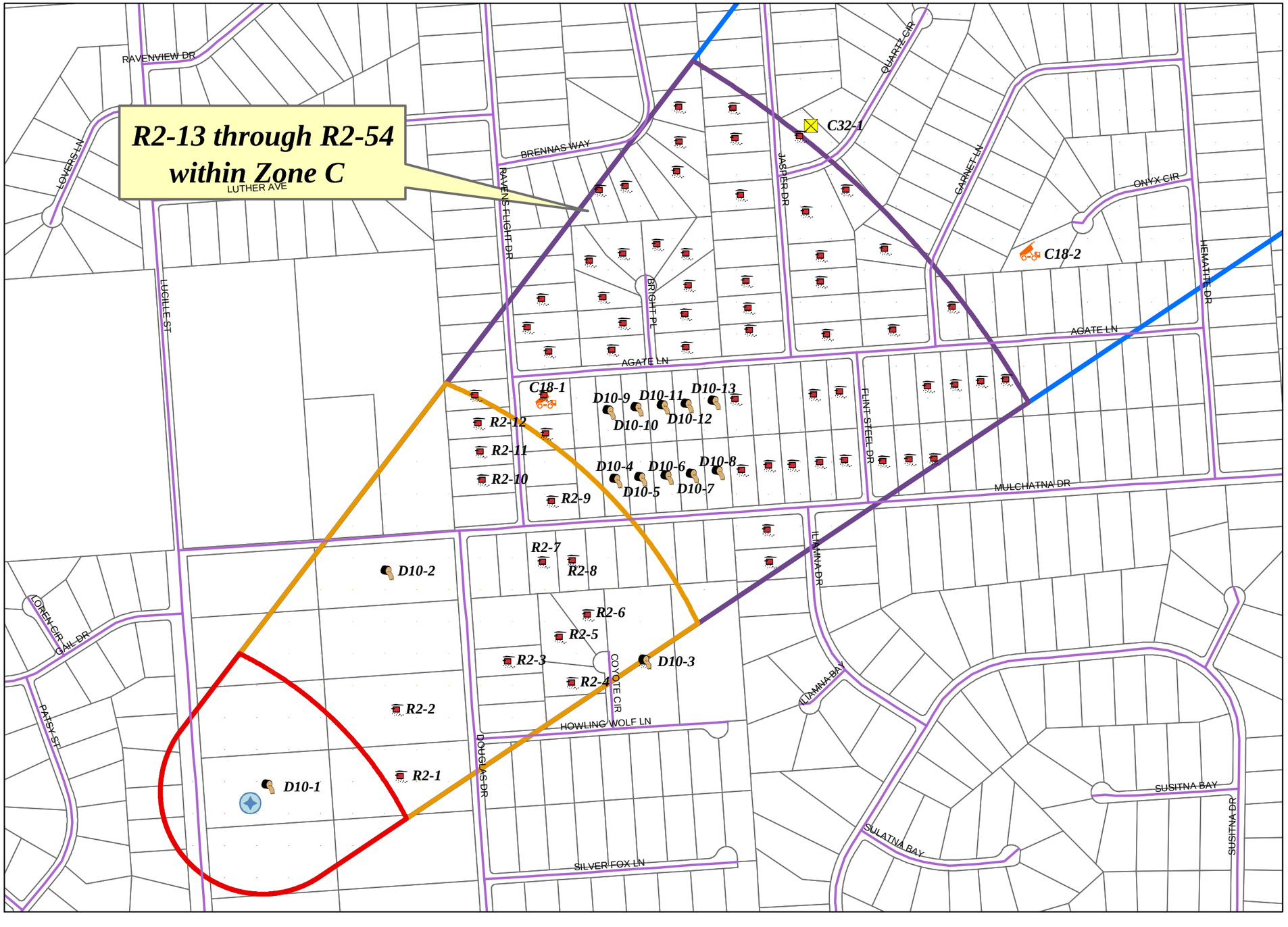
Location of Map



PWSID 225384.001

Map 2

Drinking Water Protection Area for Wasilla Seventh Day Adventist Church and Potential and Existing Sources of Contamination



- Wasilla Seventh Day Adventist Well
- Paint Sales/Service (C32)
- Heavy Equipment Repair/Storage (C18)
- Large Capacity Septic System (D10)
- Single Family Septic System (R2)
- Rivers
- MSB roads
- Lakes
- MSB parcel core

Zone A Protection Area
Several Months Travel Time

Zone B Protection Area
Less Than 2-Years Travel Time

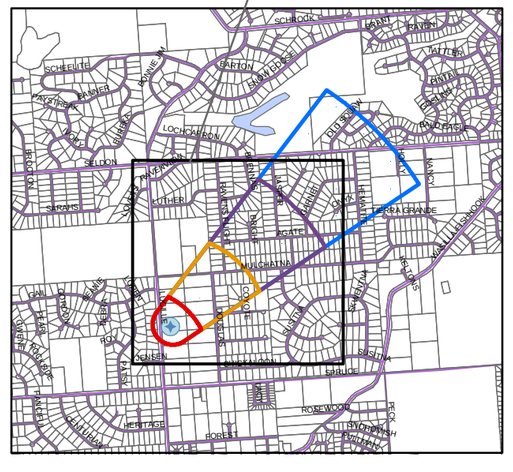
Zone D Protection Area
Less Than 10-Years Travel Time

Zone C Protection Area
Less Than 5-Years Travel Time

525 0 525 Feet

PWSID 225384.001

Location of Map



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Map 3