Source Water Assessment for Tanaina Elementary School Wasilla, Alaska

A Hydrogeologic Susceptibility and Vulnerability Analysis

DRINKING WATER PROTECTION PROGRAM REPORT 161
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A Hydrogeologic Susceptibility and Vulnerability Analysis

By Sarah A. Bendewald

Drinking Water Protection Program
Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Public Water System for Tanaina Elementary School is a Class A (non-transient/non-community) water system consisting of one well in the Wasilla area. Identified potential and current sources of contaminants for Tanaina Elementary School include: residential and large capacity septic systems, highways and roads, an aboveground fuel tank, and approximately 97 acres of residential area. These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, synthetic organic chemicals, and other organic chemicals. Overall, the public water sources for Tanaina Elementary School received a vulnerability rating of **Medium** for bacteria and viruses, nitrates and nitrites, and volatile organic chemicals, and **Low** for heavy metals, synthetic organic chemicals, and other organic chemicals.

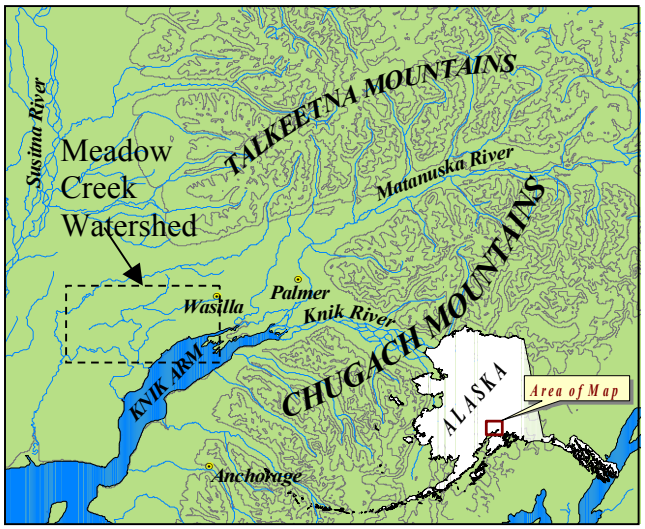


Figure 1. Index Map showing the location of the Matanuska-Susitna Valley and the Meadow Creek Watershed.

INTRODUCTION

The purpose of this environmental assessment is to provide public water system owners and/or 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 source of public drinking water serving Tanaina Elementary School. This water system consists of one well in the Wasilla area. 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 WATERSHED, ALASKA

Location

The Meadow Creek watershed is located within the Matanuska-Susitna Borough in southcentral Alaska. The Borough encompasses a total of 24,694 square miles supporting a population of approximately 60,000. It 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).* This area between the Matanuska and Susitna Valleys is commonly referred to as the Mat-Su Valley. The Meadow Creek watershed extends from an area northwest of Wasilla to the west end of Big Lake, and contains 115 lakes, including Big Lake *(Jokela, Munter and Evans, 1991)* (see Figure 1). The towns of Wasilla, Big Lake, and Houston lie on the outskirts of its boundaries.

Climate

The climate in the Mat-Su Valley is considered transitional between the extreme temperature fluctuations of Interior Alaska and the wet conditions of the coastal areas.

The Meadow Creek watershed is less than 15 miles from Knik Arm and less than 75 miles from Prince William Sound. Summer temperatures are more moderate than those in the Interior due to the proximity to the coast. The Chugach and Talkeetna Mountains and the Alaska Range also protect the area from the frigid cold of the Interior Alaska winter and act to break up strong storm fronts *(Brabets, 1997), (Western Regional Climate Center, 2000)*.

The Meadow Creek watershed area averages about 18 inches of precipitation per year, including about 59 inches of snowfall. Winter thaws can decrease snow cover to a few inches. Mean monthly high temperatures range from about 22 degrees Farenheight in December and January to 69 degrees in July. The frost-free period in spring and summer averages 115 days, with the first frost usually arriving by September 1.

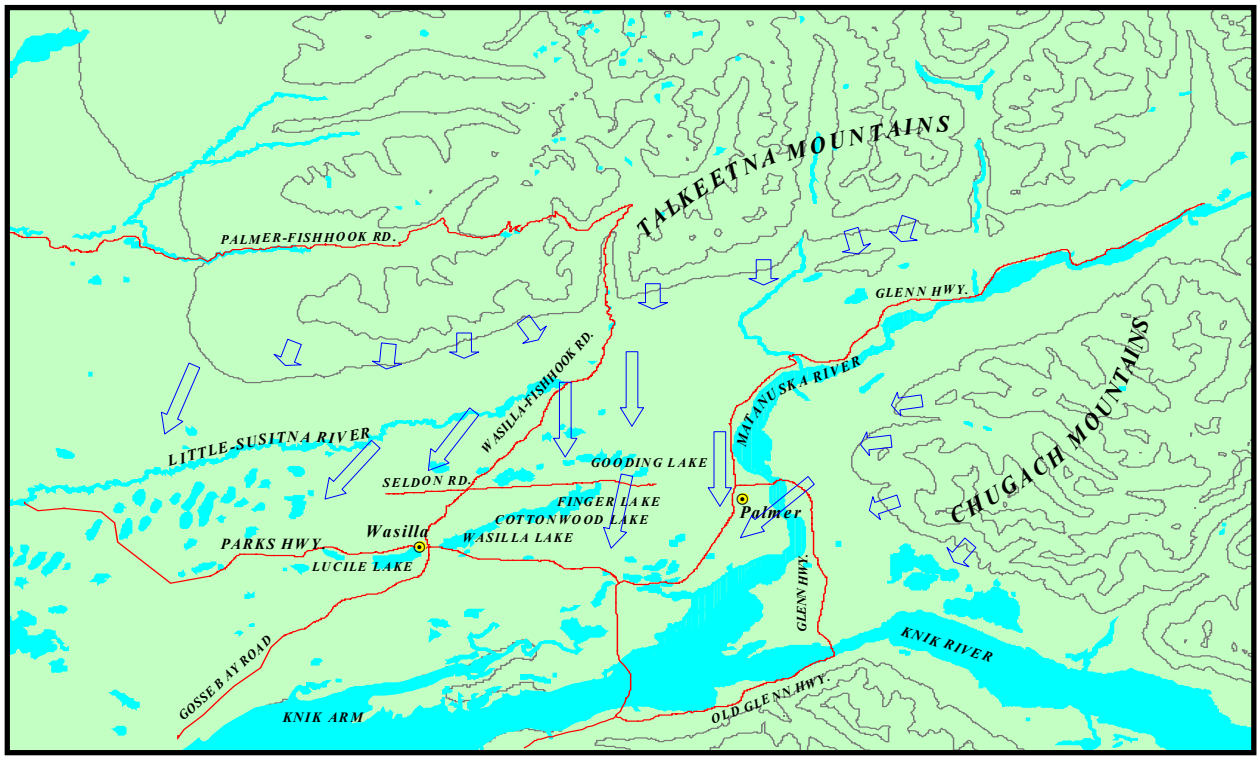
The record low for Wasilla was –50 degrees in January 1947. The highest recorded temperature was 90 degrees in 1969 *(Wickersham Alaska Corporation, 1986)*.

Physiography and Groundwater Conditions

Glacial forces during the end of the last ice age shaped the Mat-Su Valley. Several glacial advances and retreats left a complex system of hills, ridges, lakes, and lowlands that define the topography of today.

Surface elevations in the Mat-Su Valley range from sea level where the Knik and Matanuska Rivers enter the Cook Inlet to well over 6,000 feet in the peaks that bound the area. Landforms in the area consist of undulating ridges of glacial till and flat benches of sand and gravel outwash *(Matanuska-Susitna Borough)*. The Meadow Creek watershed lies in relatively flat area of the Matanuska River valley.

The regional geology and ground water conditions of the Mat-Su Valley vary greatly by location. Glacial advances and retreats also formed a fluctuating subsurface system of unconsolidated layers comprised of fine- to coarse-grained particles (clay to boulders) and consolidated confining



layers. 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 moving towards
Cook Inlet *(Jokela, Munter and Evans, 1991).* The numerous confining layers in the area, ranging from less than 1 foot thick to 60 feet thick, divide the unconsolidated layers.

Groundwater flow in the deeper confined aquifers of the Mat-Su Valley is generally north to south in the central region of the valley flowing toward the Matanuska River and gradually becoming more northeast to southwest in the western region. The direction of groundwater flow in the upper unconfined aquifers 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). The groundwater flow direction of the Meadow Creek watershed was generally found to be northeast to southwest in both the unconfined and confined aquifers.

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.

TANAINA ELEMENTARY SCHOOL'S PUBLIC DRINKING WATER SYSTEM

Tanaina Elementary School's public water system is a Class A (non-transient/non-community) water system, which is owned and operated by Matanuska-Susitna Borough School District. The system consists of one well, which is located north of the school (T18N, R1W, Section 33), on Lucille Street at an elevation of approximately 450 feet above sea level.

According to the most recent Sanitary Survey (01/21/97) the ground surrounding the well site slopes away from the well providing satisfactory drainage. The well was properly installed with a cap which may provide protection against contaminants from entering the source waters at the well casing. Installation of the well occurred November 26,1983 to a total depth of 138 feet below ground surface and was completed in both 6" and 8" well casing. It is not indicated on the well log whether the well was properly grouted at the time of drilling. Proper grouting provides added protection against contaminants travelling along the well casing and into source waters.

This system operates from September to June and serves 575 non-residents through one service connection.

ASSESSMENT AND PROTECTION AREA FOR TANAINA ELEMENTARY SCHOOL'S DRINKING WATER SOURCE

The Drinking Water Protection and Assessment Area that has been established for Tanaina Elementary School's source of drinking water 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. The zones around the drinking water source outline the most critical area for the preservation of the quality of the drinking water for this system. For simplicity, this area will be known as your Drinking Water Protection Area and will serve as the focus for voluntary protection efforts.

Conceptually, groundwater enters the aquifer systems through infiltration of direct precipitation within the area and also from the infiltration into the foothill slopes of the Talkeetna Mountains. An analytical calculation was used to determine 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 U.S. Geological Survey (*Patrick, Brabets, and Glass, 1989*). This analytical calculation was used as a guide as the first step in establishing the protection area for each public drinking water source in Anchorage. Additional methods were further employed to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at meaningful and conservative protection areas 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 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 Area for Tanaina Elementary School contains four zones, Zone A through 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 wells may be on the order of several days to several hours. Zone A also extends downgradient from the wells to take into account the area of the aquifer that is influenced by pumping of the wells. Zone B corresponds to a time-of-travel of less than two years. Zones C and D correspond to those areas between 5 years and 10 years time-of-travel, respectively.

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within the Drinking Water Protection Area for Tanaina Elementary School. 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
- Heavy metals, cyanide, and other inorganic chemicals
- Synthetic organic chemicals
- Other organic chemicals

Maps 2 and 3 in Appendix C depict the Contaminant Source Inventory for Tanaina Elementary School. Table 1 in Appendix B lists the inventoried potential sources of contamination within Zones A through D. Below is a summary of the contaminant sources inventoried within the Drinking Water Protection Area for Tanaina Elementary School:

- Residential septic systems;
- a large capacity septic system;
- a Class V motor vehicle waste injection well;
- highways and roads;
- approximately 97 acres of residential area; and
- an aboveground storage tank.

These potential and existing contaminant sources present risk for all six categories of drinking water contaminants for Tanaina Elementary School's source of public drinking water.

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 public drinking water wells.

VULNERABILITY OF TANAINA ELEMENTARY SCHOOL'S DRINKING WATER SOURCE

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

- natural susceptibility; and
- contaminant risks.

Each of the six categories of drinking water contaminants have been analyzed and an overall vulnerability score of 0 to 100 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 well serving Tanaina Elementary School was completed in an unconfined aquifer. The depth to the water table is approximately 80 feet below land surface. The saturated thickness of the aquifer in which the well is screened in is approximately 55 feet and composed of sand and gravel with some silt. The absence of a confining layer means that contaminants that enter the

subsurface within the vicinity of the well and Drinking Water Protection Area may enter the aquifer uninhibited, although the relatively deeper depth to the water table will provide some protection.

Combining the susceptibility of the wellhead and the aquifer to contamination leads to a score (0 – 50 points) and rating of overall Susceptibility of the well to contamination (See Appendix D). Table 1 depicts the overall Susceptibility score and rating for the sources of public drinking water serving Tanaina Elementary School.

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

	Score	Rating
Susceptibility of the Wellheads	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. 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 any 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	32	High
Nitrates and/or Nitrites	35	High
Volatile Organic Chemicals	27	Medium
Heavy Metals, Cyanide, And Other Inorganic Chemicals	14	Low
Synthetic Organic Chemicals	12	Low
Other Organic Chemicals	14	Low

Appendix D contains fourteen charts, which together form the 'Vulnerability Analysis' for a Class A 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 14 contain the Contaminant Risks and Vulnerability Analysis for nitrates and nitrites, volatile organic chemicals, heavy metals, synthetic organic chemicals, and other organic chemicals, 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 Tanaina Elementary School's Public Drinking Water Source to Contamination by Category

Category	Score	Rating
Bacteria and Viruses	55	Medium
Nitrates and Nitrites	55	Medium
Volatile Organic Chemicals	50	Medium
Heavy Metals, Cyanide, and Other Inorganic Chemicals	35	Low
Synthetic Organic Chemicals	35	Low
Other Organic Chemicals	35	Low

Tables 2 through 7 in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, heavy metals, synthetic organic chemicals, and other organic chemicals, respectively.

Overall, contaminant risks for bacteria and viruses are medium with the large capacity and residential septic systems driving the increase of contaminant risks. Combining this potential bacteria and viruses contamination risk with the natural susceptibility of the well leads to an overall vulnerability to contamination of medium.

Other low potential and existing sources of contamination for bacteria and viruses include activities associated with residential areas, and highways and roads.

Historical sampling data indicates that nitrates were detected at 6% of the maximum contaminant level (MCL) in Tanaina Elementary School's source waters during the most recent sampling event (August 9, 2000). Nitrates were not detected in the previous 5 years of sampling (See Chart 5 – Contaminant Risks for Nitrates and/or Nitrites in Appendix D). Overall, contaminant risks for nitrates and/or nitrites are medium with the one large capacity septic system and the density of residential septic systems driving the increase of contaminant risks. Combining this potential nitrates and/or nitrites contamination risk with the natural susceptibility of the well leads to an overall vulnerability to contamination of medium.

Other low potential and existing sources of nitrates and/or nitrites for Tanaina Elementary School's source waters include activities associated with residential areas, and highways and roads.

Overall, contaminant risk for volatile organic chemicals is medium with an above ground storage tank driving the increase of contaminant risks. The above ground tank is double walled and used by Tanaina Elementary to store 500 gallons of diesel fuel for use in their standby generator.

Other low potential and existing sources of volatile organic chemicals include activities associated with residential areas and septic systems. (See "Overall Rank after Analysis" in Table 4 of Appendix A).

Overall, contaminant risks for heavy metals, cyanide and other inorganic chemicals is low with highways and roads, residential septic systems and residential areas driving the increase of potential contaminant risks. Combining this potential contaminant risk with the natural susceptibility of the well leads to an overall vulnerability to contamination of low.

Overall, contaminant risks for synthetic organic chemicals and other organic chemicals is low with highways and roads and residential septic systems driving the increase of potential contaminant risks for both categories. Combining this potential contaminant risk with the natural susceptibility of the well leads to an overall vulnerability to contamination of low.

Other low potential sources of contamination for synthetic organic chemicals and other organic chemicals include activities associated with residential areas.

SUMMARY

A *Source Water Assessment* has been completed for the sources of public drinking water serving Tanaina Elementary School. The overall vulnerability of this source to contamination is **Low** for synthetic organic chemicals, and other organic chemicals and **Medium** for bacteria and viruses, nitrates and/or nitrites, and 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 Tanaina Elementary School to protect public health. It is anticipated that *Source Water Assessments* will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of Tanaina Elementary School 's public drinking water source.

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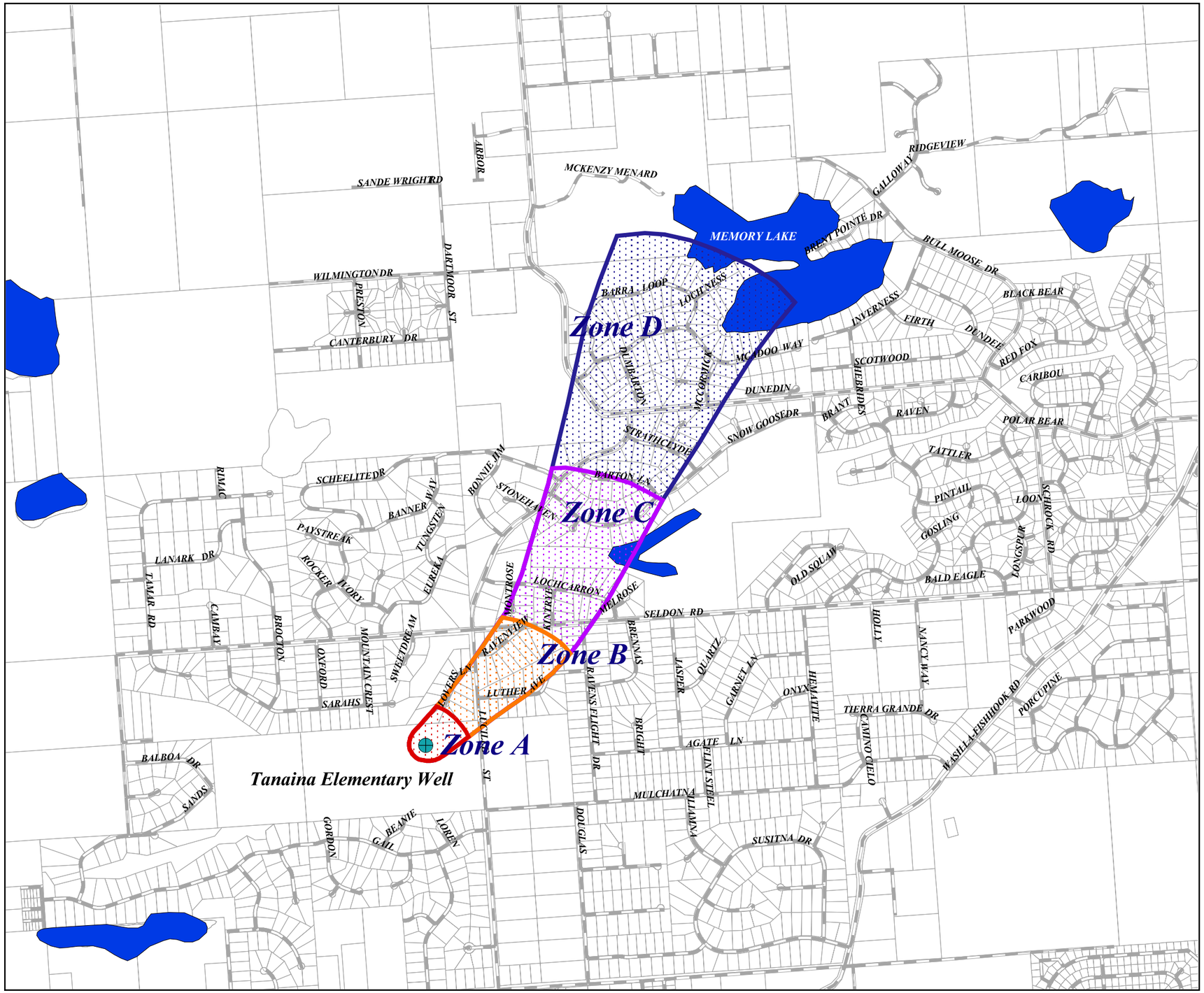
APPENDIX A

Tanaina Elementary School's
Drinking Water Protection Area

Tanaina Elementary Drinking Water Protection Area



0.5 0 0.5 1 Miles

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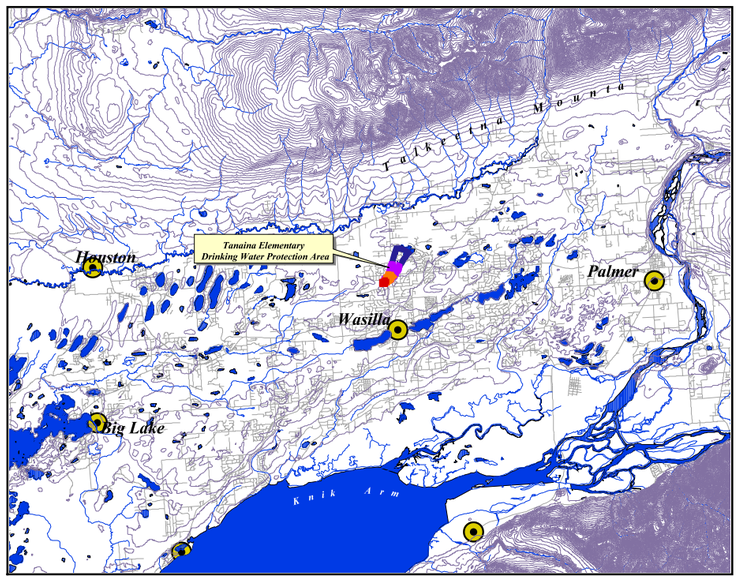
Legend

- 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
- Parcels
- Roads



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Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary School

Table 1

Contaminant Source Inventory for ***Tanaina Elementary***

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Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Residential Areas	R01	R01-01	A	West of Lucille St	2	0.1 acre of residential area in Zone A
Septic systems (serves one single-family home)	R02	R02-01	A	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-02	A	Lover's Lane	3	
Tanks, diesel (above ground)	T06	T06-1	A	Lucille St; Tanaina Elementary School	2	500 gallon double-walled storage tank used for backup generator
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	B	Lover's Lane	3	
Residential Areas	R01	R01-2	B	South of Seldon Rd	2	34 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R02-03	B	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-04	B	Lucille St	3	
Septic systems (serves one single-family home)	R02	R02-05	B	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-06	B	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-07	B	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-08	B	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-09	B	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-10	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-11	B	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-12	B	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-13	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-14	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-15	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-16	B	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-17	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-18	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-19	B	Ravenview	3	

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Location*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-20	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-21	B	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-22	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-23	B	Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-24	B	Seldon Rd	3	
Septic systems (serves one single-family home)	R02	R02-25	B	Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-01	B	Lovers Lane	2	
Highways and roads, paved (cement or asphalt)	X20	X20-02	B	Lucille St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-03	B	Luther Ave	2	
Highways and roads, paved (cement or asphalt)	X20	X20-04	B	Ravenview	2	
Highways and roads, paved (cement or asphalt)	X20	X20-05	B	Seldon Rd	2	
Residential Areas	R01	R01-3	C	North of Seldon Rd	2	63 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R02-26to53	C	North of Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-06	C	Montrose St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-07	C	Ravens Flight Rd	2	
Highways and roads, paved (cement or asphalt)	X20	X20-08	C	Kintrye	2	
Highways and roads, paved (cement or asphalt)	X20	X20-09	C	Lochcarron Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-10	C	Thames	2	
Highways and roads, paved (cement or asphalt)	X20	X20-11	C	Snow Goose Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-12	C	Scheelite Dr	2	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	D	Lochness Cir	3	

Table 2

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary
Sources of Bacteria and Viruses

PWSID 224272.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map Number	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	B	High	1	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-01	A	Low	2	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-02	A	Low	3	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-03	B	Low	4	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-04	B	Low	5	Lucille St	3	
Septic systems (serves one single-family home)	R02	R02-05	B	Low	6	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-06	B	Low	7	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-07	B	Low	8	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-08	B	Low	9	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-09	B	Low	10	Lover's Lane	3	
Residential Areas	R01	R01-01	A	Low		West of Lucille St	2	0.1 acre of residential area in Zone A
Residential Areas	R01	R01-2	B	Low		South of Seldon Rd	2	34 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R02-10	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-11	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-12	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-13	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-14	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-15	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-16	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-17	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-18	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-19	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-20	B	Low		Ravenview	3	

Table 2 (continued)

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary Sources of Bacteria and Viruses

PWSID 224272.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-21	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-22	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-23	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-24	B	Low		Seldon Rd	3	
Septic systems (serves one single-family home)	R02	R02-25	B	Low		Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-01	B	Low		Lovers Lane	2	
Highways and roads, paved (cement or asphalt)	X20	X20-02	B	Low		Lucille St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-03	B	Low		Luther Ave	2	
Highways and roads, paved (cement or asphalt)	X20	X20-04	B	Low		Ravenview	2	
Highways and roads, paved (cement or asphalt)	X20	X20-05	B	Low		Seldon Rd	2	
Residential Areas	R01	R01-3	C	Low		North of Seldon Rd	2	63 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R02-26to53	C	Low		North of Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-06	C	Low		Montrose St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-07	C	Low		Ravens Flight Rd	2	
Highways and roads, paved (cement or asphalt)	X20	X20-08	C	Low		Kintrye	2	
Highways and roads, paved (cement or asphalt)	X20	X20-09	C	Low		Lochcarron Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-10	C	Low		Thames	2	
Highways and roads, paved (cement or asphalt)	X20	X20-11	C	Low		Snow Goose Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-12	C	Low		Scheelite Dr	2	

Table 3

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary
Sources of Nitrates/Nitrites

PWSID 224272.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map Number	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	B	High	1	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-01	A	Low	2	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-02	A	Low	3	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-03	B	Low	4	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-04	B	Low	5	Lucille St	3	
Septic systems (serves one single-family home)	R02	R02-05	B	Low	6	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-06	B	Low	7	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-07	B	Low	8	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-08	B	Low	9	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-09	B	Low	10	Lover's Lane	3	
Residential Areas	R01	R01-01	A	Low		West of Lucille St	2	0.1 acre of residential area in Zone A
Residential Areas	R01	R01-2	B	Low		South of Seldon Rd	2	34 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R02-10	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-11	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-12	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-13	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-14	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-15	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-16	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-17	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-18	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-19	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-20	B	Low		Ravenview	3	

Table 3 (continued)

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary Sources of Nitrates/Nitrites

PWSID 224272.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-21	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-22	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-23	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-24	B	Low		Seldon Rd	3	
Septic systems (serves one single-family home)	R02	R02-25	B	Low		Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-01	B	Low		Lovers Lane	2	
Highways and roads, paved (cement or asphalt)	X20	X20-02	B	Low		Lucille St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-03	B	Low		Luther Ave	2	
Highways and roads, paved (cement or asphalt)	X20	X20-04	B	Low		Ravenview	2	
Highways and roads, paved (cement or asphalt)	X20	X20-05	B	Low		Seldon Rd	2	
Residential Areas	R01	R01-3	C	Low		North of Seldon Rd	2	63 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R02-26to53	C	Low		North of Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-06	C	Low		Montrose St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-07	C	Low		Ravens Flight Rd	2	
Highways and roads, paved (cement or asphalt)	X20	X20-08	C	Low		Kintrye	2	
Highways and roads, paved (cement or asphalt)	X20	X20-09	C	Low		Lochcarron Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-10	C	Low		Thames	2	
Highways and roads, paved (cement or asphalt)	X20	X20-11	C	Low		Snow Goose Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-12	C	Low		Scheelite Dr	2	

Table 4

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary
Sources of Volatile Organic Chemicals

PWSID 224272.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map Number	Comments
Tanks, diesel (above ground)	T06	T06-1	A	Medium	1	Lucille St; Tanaina Elementary School	2	500 gallon double-walled storage tank used for backup generator
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	B	Low	2	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-01	A	Low	3	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-02	A	Low	4	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-03	B	Low	5	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-04	B	Low	6	Lucille St	3	
Septic systems (serves one single-family home)	R02	R02-05	B	Low	7	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-06	B	Low	8	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-07	B	Low	9	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-08	B	Low	10	Luther Ave	3	
Residential Areas	R01	R01-01	A	Low		West of Lucille St	2	0.1 acre of residential area in Zone A
Residential Areas	R01	R01-2	B	Low		South of Seldon Rd	2	34 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R02-09	B	Low		Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-10	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-11	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-12	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-13	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-14	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-15	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-16	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-17	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-18	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-19	B	Low		Ravenview	3	

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary

Sources of Volatile Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-20	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-21	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-22	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-23	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-24	B	Low		Seldon Rd	3	
Septic systems (serves one single-family home)	R02	R02-25	B	Low		Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-01	B	Low		Lovers Lane	2	
Highways and roads, paved (cement or asphalt)	X20	X20-02	B	Low		Lucille St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-03	B	Low		Luther Ave	2	
Highways and roads, paved (cement or asphalt)	X20	X20-04	B	Low		Ravenview	2	
Highways and roads, paved (cement or asphalt)	X20	X20-05	B	Low		Seldon Rd	2	
Residential Areas	R01	R01-3	C	Low		North of Seldon Rd	2	63 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R02-26to53	C	Low		North of Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-06	C	Low		Montrose St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-07	C	Low		Ravens Flight Rd	2	
Highways and roads, paved (cement or asphalt)	X20	X20-08	C	Low		Kintrye	2	
Highways and roads, paved (cement or asphalt)	X20	X20-09	C	Low		Lochcarron Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-10	C	Low		Thames	2	
Highways and roads, paved (cement or asphalt)	X20	X20-11	C	Low		Snow Goose Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-12	C	Low		Scheelite Dr	2	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	D	High		Lochness Cir	3	

Table 5

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

PWSID 224272.001

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	B	Low	1	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-01	A	Low	2	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-02	A	Low	3	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-03	B	Low	4	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-04	B	Low	5	Lucille St	3	
Septic systems (serves one single-family home)	R02	R02-05	B	Low	6	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-06	B	Low	7	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-07	B	Low	8	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-08	B	Low	9	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-09	B	Low	10	Lover's Lane	3	
Residential Areas	R01	R01-01	A	Low		West of Lucille St	2	0.1 acre of residential area in Zone A
Residential Areas	R01	R01-2	B	Low		South of Seldon Rd	2	34 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R02-10	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-11	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-12	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-13	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-14	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-15	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-16	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-17	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-18	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-19	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-20	B	Low		Ravenview	3	

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-21	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-22	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-23	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-24	B	Low		Seldon Rd	3	
Septic systems (serves one single-family home)	R02	R02-25	B	Low		Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-01	B	Low		Lovers Lane	2	
Highways and roads, paved (cement or asphalt)	X20	X20-02	B	Low		Lucille St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-03	B	Low		Luther Ave	2	
Highways and roads, paved (cement or asphalt)	X20	X20-04	B	Low		Ravenview	2	
Highways and roads, paved (cement or asphalt)	X20	X20-05	B	Low		Seldon Rd	2	
Residential Areas	R01	R01-3	C	Low		North of Seldon Rd	2	63 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R02-26to53	C	Low		North of Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-06	C	Low		Montrose St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-07	C	Low		Ravens Flight Rd	2	
Highways and roads, paved (cement or asphalt)	X20	X20-08	C	Low		Kintrye	2	
Highways and roads, paved (cement or asphalt)	X20	X20-09	C	Low		Lochcarron Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-10	C	Low		Thames	2	
Highways and roads, paved (cement or asphalt)	X20	X20-11	C	Low		Snow Goose Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-12	C	Low		Scheelite Dr	2	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	D	High		Lochness Cir	3	

Table 6

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary
Sources of Synthetic Organic Chemicals

PWSID 224272.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map Number	Comments
Septic systems (serves one single-family home)	R02	R02-01	A	Low	1	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-02	A	Low	2	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-03	B	Low	3	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-04	B	Low	4	Lucille St	3	
Septic systems (serves one single-family home)	R02	R02-05	B	Low	5	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-06	B	Low	6	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-07	B	Low	7	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-08	B	Low	8	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-09	B	Low	9	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-10	B	Low	10	Ravenview	3	
Residential Areas	R01	R01-01	A	Low		West of Lucille St	2	0.1 acre of residential area in Zone A
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	B	Low		Lover's Lane	3	
Residential Areas	R01	R01-2	B	Low		South of Seldon Rd	2	34 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R02-11	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-12	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-13	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-14	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-15	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-16	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-17	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-18	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-19	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-20	B	Low		Ravenview	3	

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-21	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-22	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-23	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-24	B	Low		Seldon Rd	3	
Septic systems (serves one single-family home)	R02	R02-25	B	Low		Seldon Rd	3	
Residential Areas	R01	R01-3	C	Low		North of Seldon Rd	2	63 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R02-26to53	C	Low		North of Seldon Rd	3	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	D	Low		Lochness Cir	3	

Table 7

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary
Sources of Other Organic Chemicals

PWSID 224272.001

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Overall Rank after Analysis	Location	Map Number	Comments
Septic systems (serves one single-family home)	R02	R02-01	A	Low	1	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-02	A	Low	2	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-03	B	Low	3	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-04	B	Low	4	Lucille St	3	
Septic systems (serves one single-family home)	R02	R02-05	B	Low	5	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-06	B	Low	6	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-07	B	Low	7	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-08	B	Low	8	Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-09	B	Low	9	Lover's Lane	3	
Septic systems (serves one single-family home)	R02	R02-10	B	Low	10	Ravenview	3	
Residential Areas	R01	R01-01	A	Low		West of Lucille St	2	0.1 acre of residential area in Zone A
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	B	Low		Lover's Lane	3	
Residential Areas	R01	R01-2	B	Low		South of Seldon Rd	2	34 acres of residential area in Zone B
Septic systems (serves one single-family home)	R02	R02-11	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-12	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-13	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-14	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-15	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-16	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-17	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-18	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-19	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-20	B	Low		Ravenview	3	

Contaminant Source Inventory and Risk Ranking for Tanaina Elementary

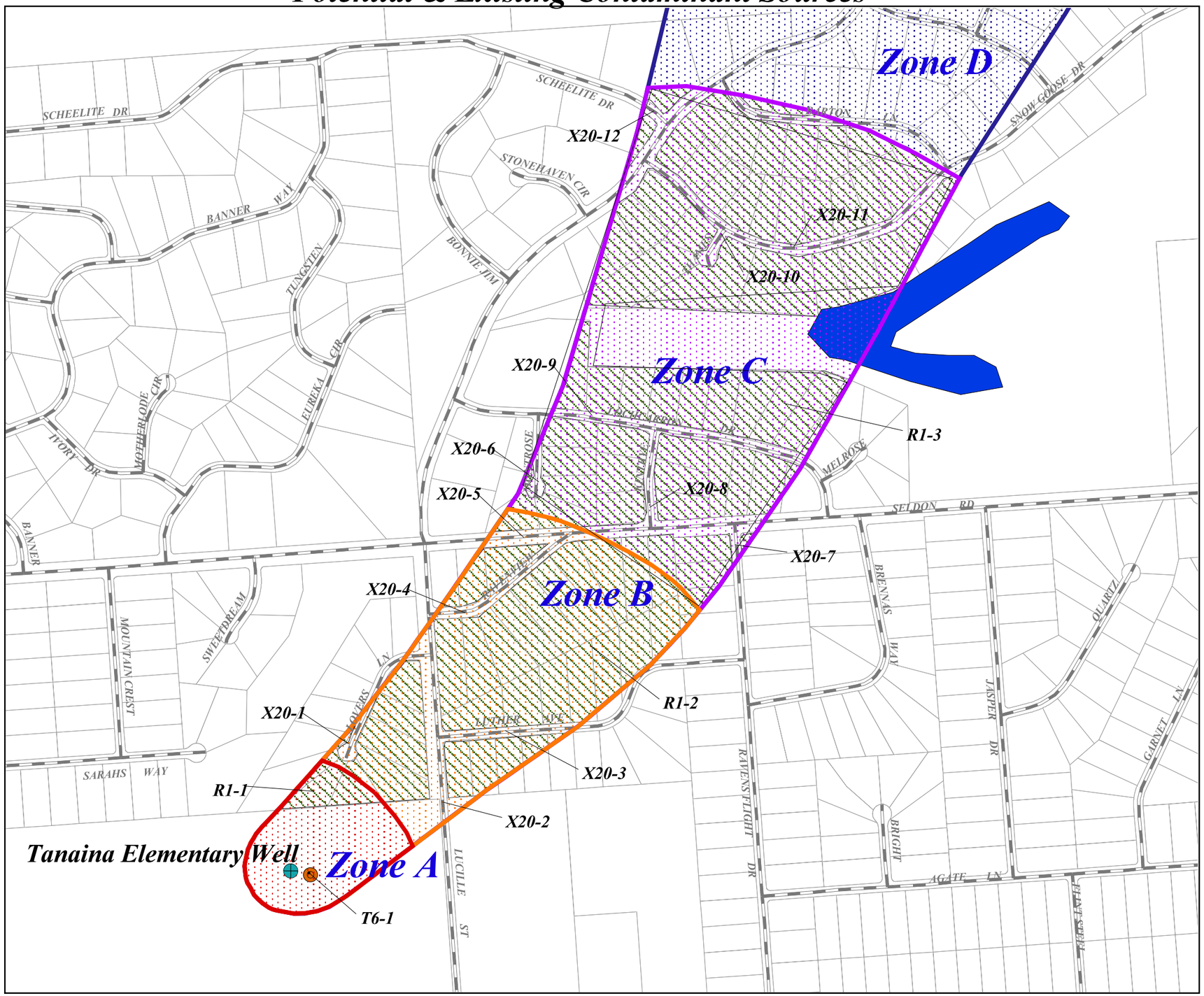
Sources of Other Organic Chemicals

Contaminant Source Type	*Contaminant Source ID*	*CS ID tag*	*Zone*	*Risk Ranking for Analysis*	*Overall Rank after Analysis*	*Location*	*Map Number*	*Comments*
Septic systems (serves one single-family home)	R02	R02-21	B	Low		Luther Ave	3	
Septic systems (serves one single-family home)	R02	R02-22	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-23	B	Low		Ravenview	3	
Septic systems (serves one single-family home)	R02	R02-24	B	Low		Seldon Rd	3	
Septic systems (serves one single-family home)	R02	R02-25	B	Low		Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-01	B	Low		Lovers Lane	2	
Highways and roads, paved (cement or asphalt)	X20	X20-02	B	Low		Lucille St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-03	B	Low		Luther Ave	2	
Highways and roads, paved (cement or asphalt)	X20	X20-04	B	Low		Ravenview	2	
Highways and roads, paved (cement or asphalt)	X20	X20-05	B	Low		Seldon Rd	2	
Residential Areas	R01	R01-3	C	Low		North of Seldon Rd	2	63 acres of residential area in Zone C
Septic systems (serves one single-family home)	R02	R02-26to53	C	Low		North of Seldon Rd	3	
Highways and roads, paved (cement or asphalt)	X20	X20-06	C	Low		Montrose St	2	
Highways and roads, paved (cement or asphalt)	X20	X20-07	C	Low		Ravens Flight Rd	2	
Highways and roads, paved (cement or asphalt)	X20	X20-08	C	Low		Kintrye	2	
Highways and roads, paved (cement or asphalt)	X20	X20-09	C	Low		Lochcarron Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-10	C	Low		Thames	2	
Highways and roads, paved (cement or asphalt)	X20	X20-11	C	Low		Snow Goose Dr	2	
Highways and roads, paved (cement or asphalt)	X20	X20-12	C	Low		Scheelite Dr	2	
Injection wells (Class V) Motor Vehicle Waste Disposal Well	D42	D42-1	D	High		Lochness Cir	3	

APPENDIX C

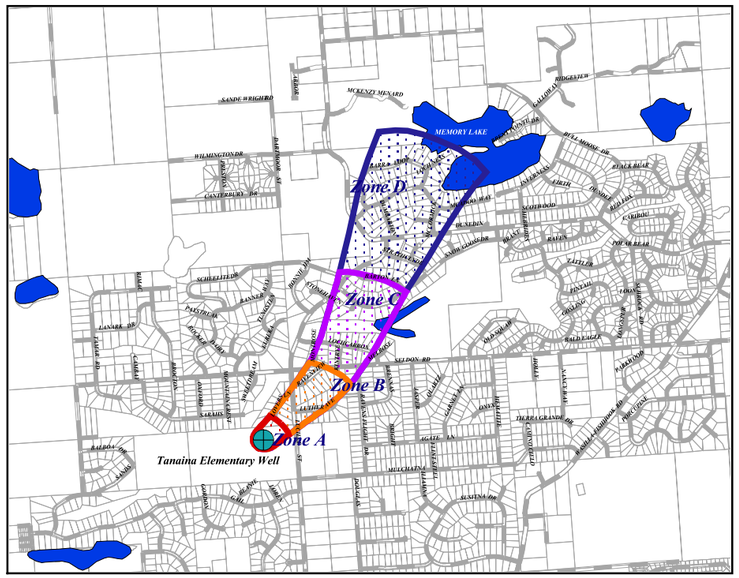
Tanaina Elementary School's
Drinking Water Protection Area
and Potential & Existing Contaminant Sources

Tanaina Elementary Drinking Water Protection Area with Potential & Existing Contaminant Sources



Legend

- 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
- Parcels
- Roads (X20)
- Residential Areas (R1)
- Above Ground Diesel Tank (T6)



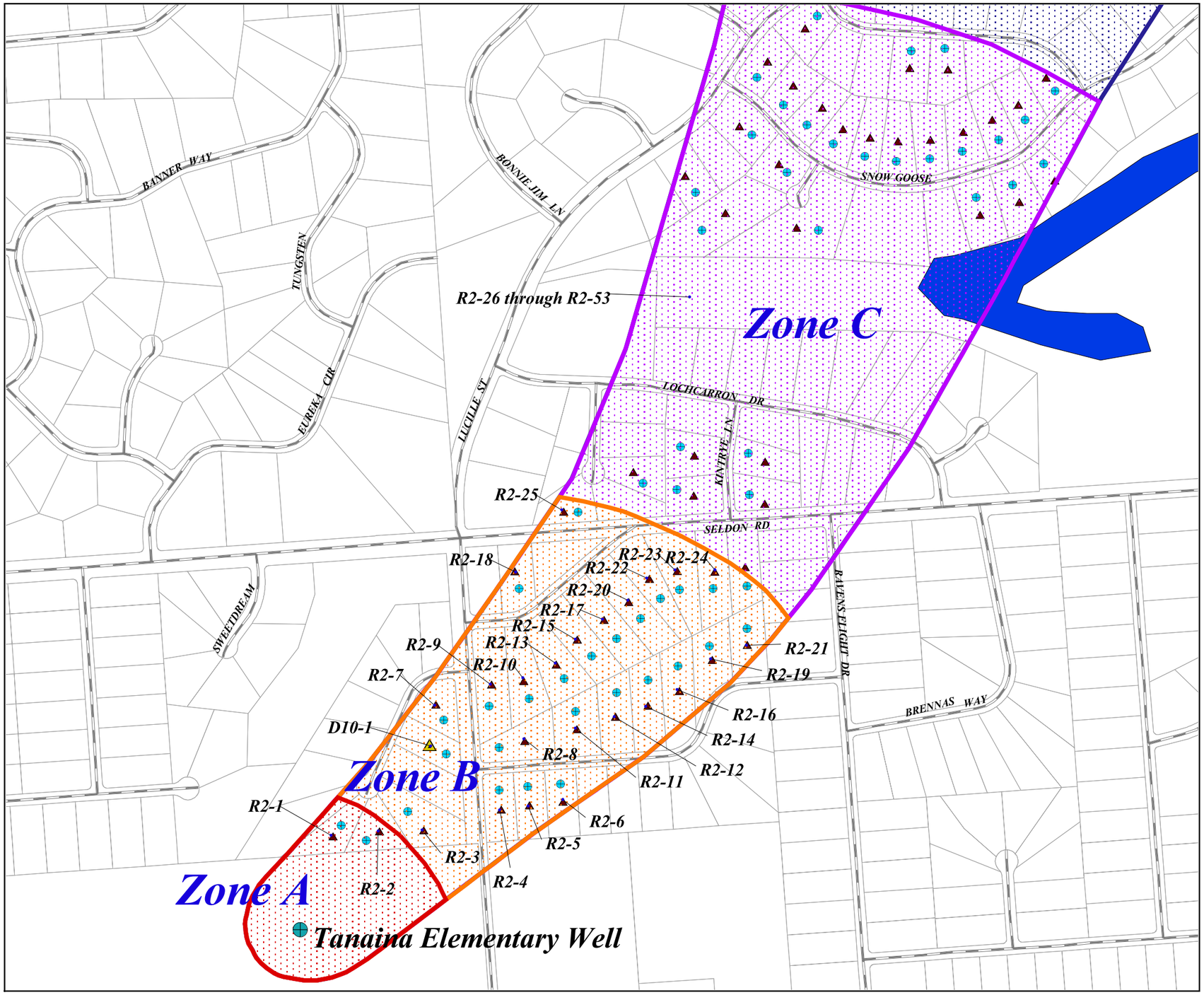
0.25 0 0.25 0.5 Miles

PWSID 224272.001

N W E S

Map 2

Tanaina Elementary Drinking Water Protection Area with Potential & Existing Contaminant Sources



Legend

- Public Water System

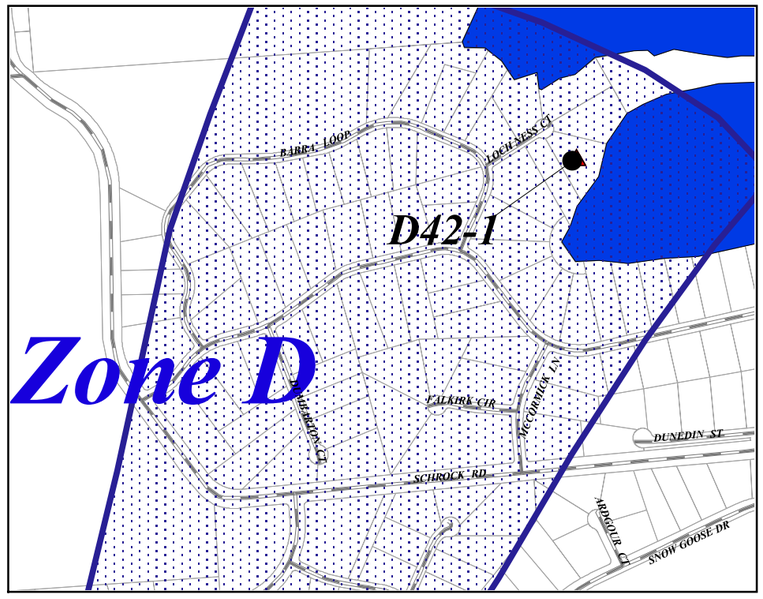
Zone A Protection Area
- Several Months Travel Time

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
- Parcels
- Roads

Septic Systems
- Large Capacity Septic System (D10)
- Motor Vehicle Waste Class V Injection Well (D42)
- Single Family Septic System (R2)
- Private Wells



N
W
E
S

PWSID 224272.001

Map 3

APPENDIX D

Vulnerability Analysis for Tanaina Elementary School's Public Drinking Water Source

Chart 1. Susceptibility of the wellhead - Taniana Elementary School

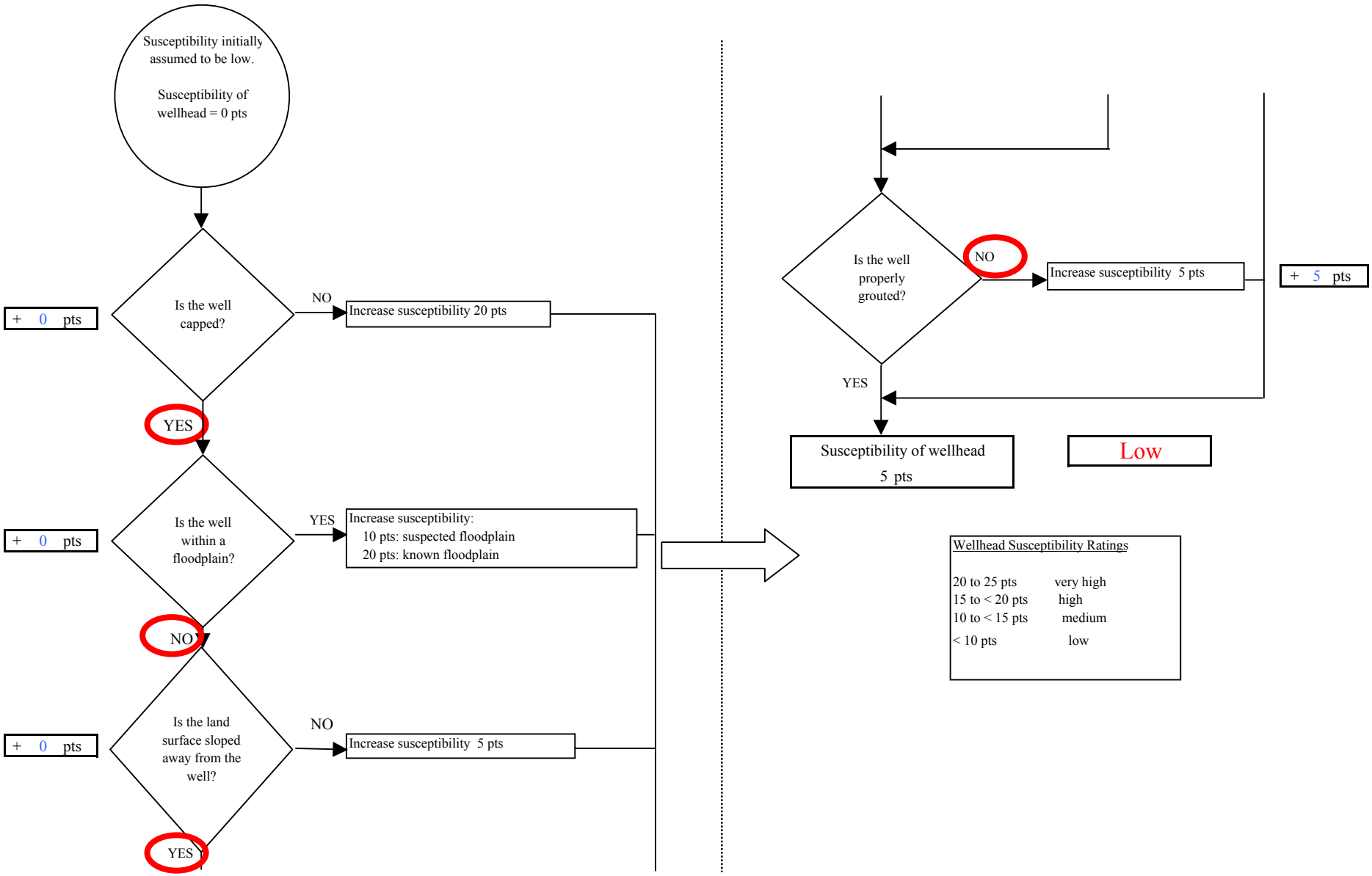


Chart 2. Susceptibility of the aquifer - Tanaina Elementary School

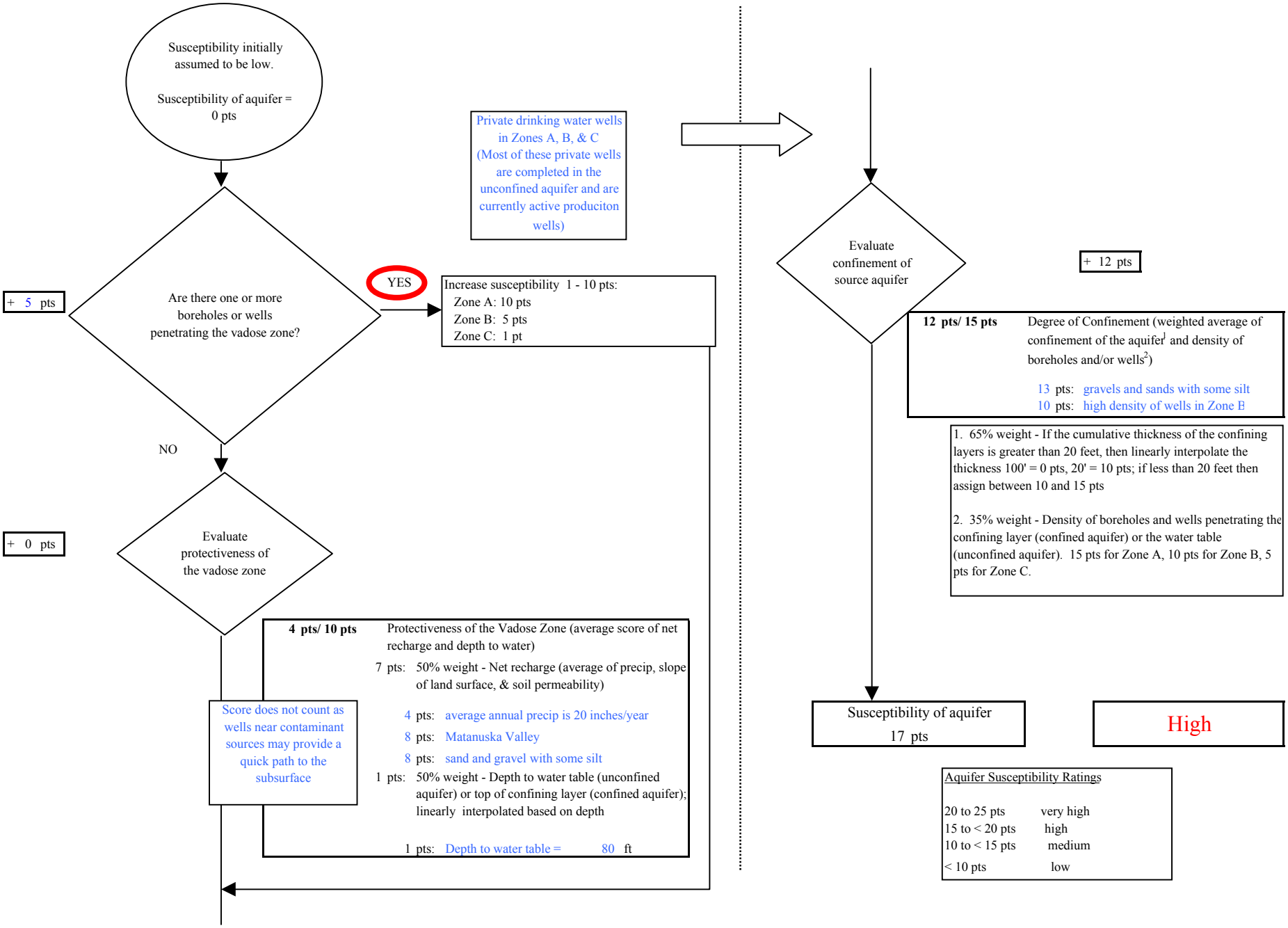
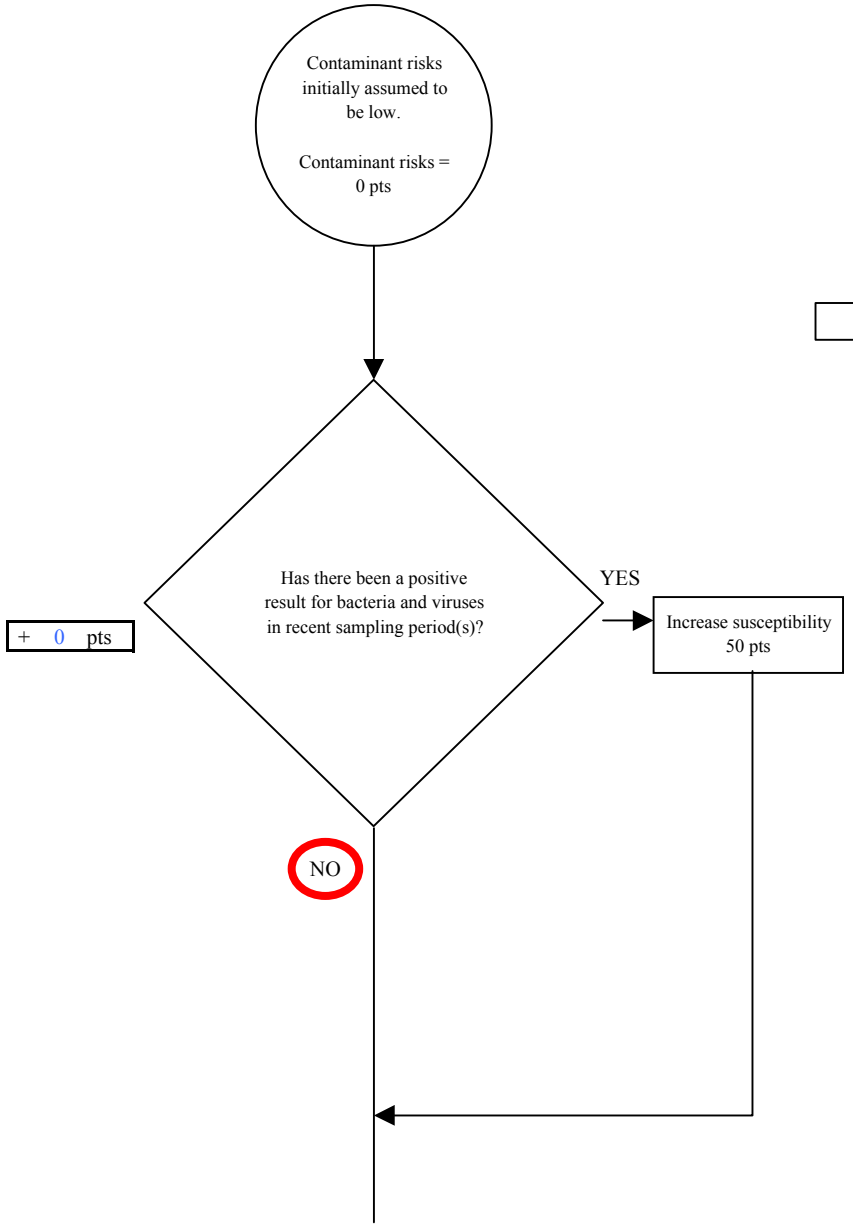
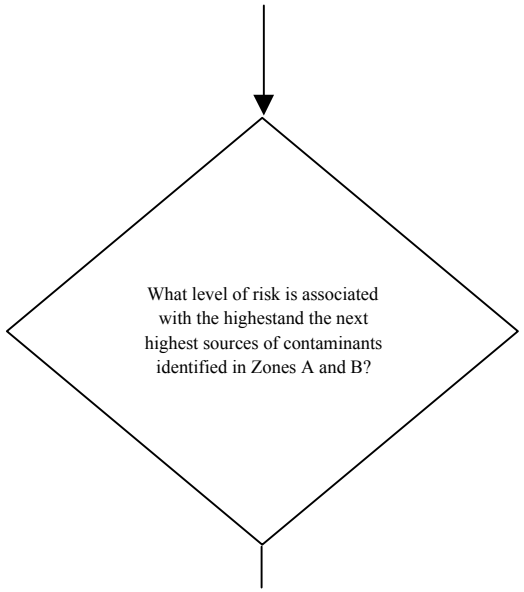


Chart 3. Contaminant risks for Tanaina Elementary School - Bacteria & Viruses





+ 30 pts

Risk Rankings for Contaminant Sources Identified in Zones A and B

	Zone A	Zone B	Total
Very Highs(s)	0	0	0
High(s)	0	1	1
Medium(s)	0	0	0
Low(s)	3	5	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 30

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

Chart 3. Contaminant risks for Tanaina Elementary School - Bacteria & Viruses

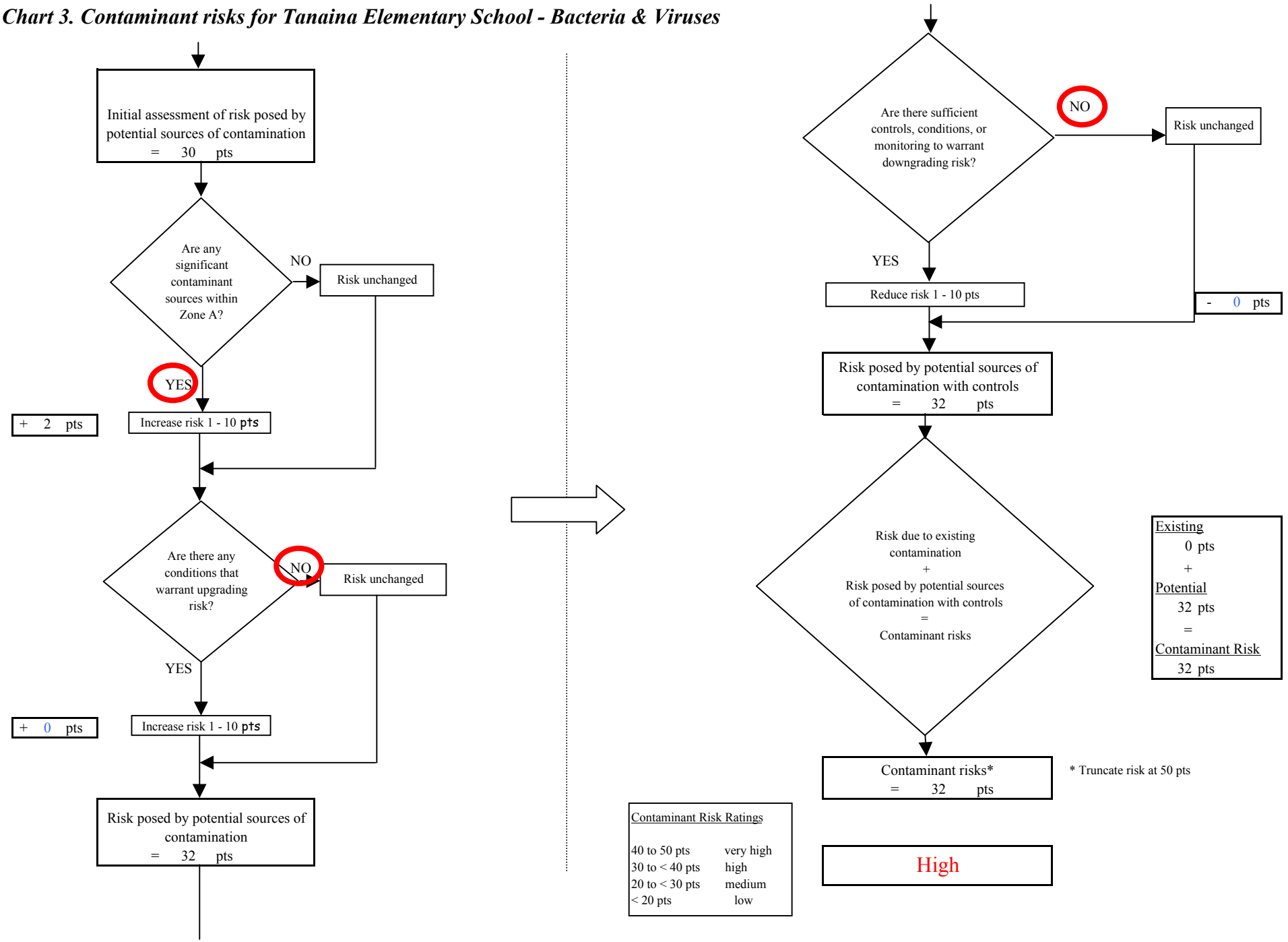


Chart 4. Vulnerability analysis for Taniana Elementary School - Bacteria & Viruses

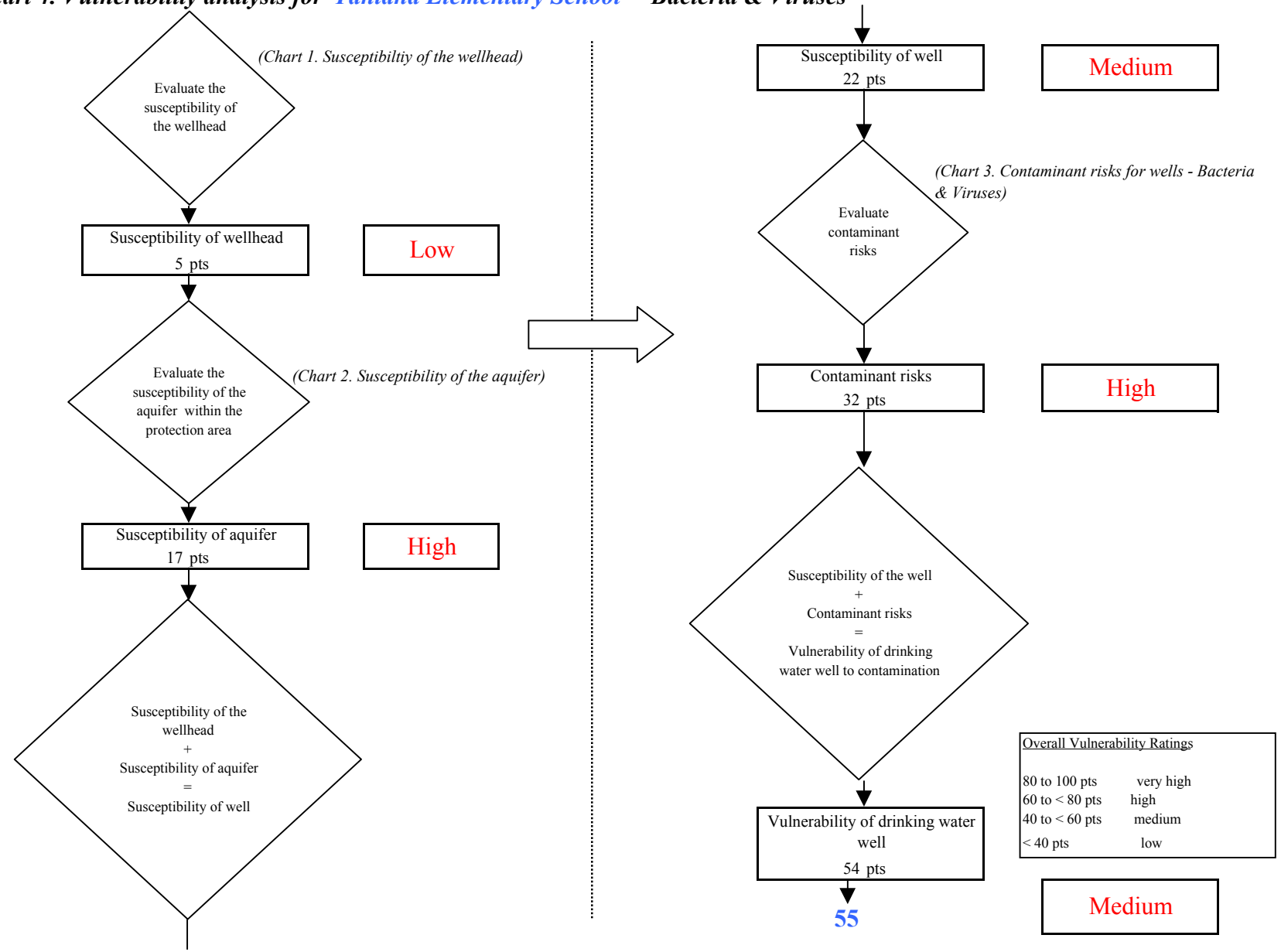


Chart 5. Contaminant risks for Taniana Elementary School - Nitrates and Nitrites

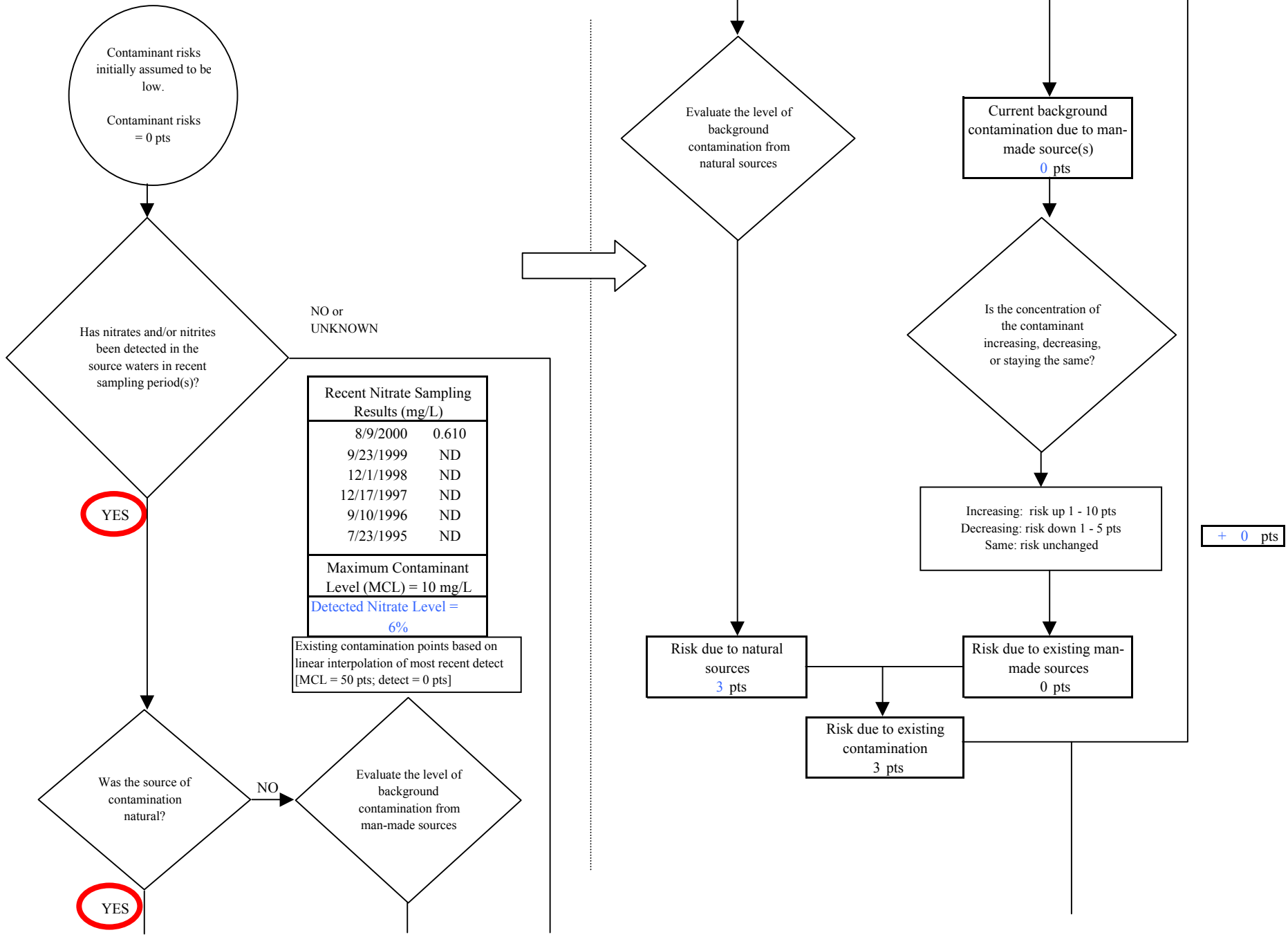


Chart 5. Contaminant risks for Taniana Elementary School - Nitrates and Nitrites

+ 30 pts

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

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

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

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

Matrix Score 30

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

Initial assessment of risk posed by potential sources of contamination = 30 pts

Is the source aquifer fractured rock or karst?

YES

NO

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

NO → Risk unchanged

YES → Decrease risk 1 - 10 pts

- 0 pts

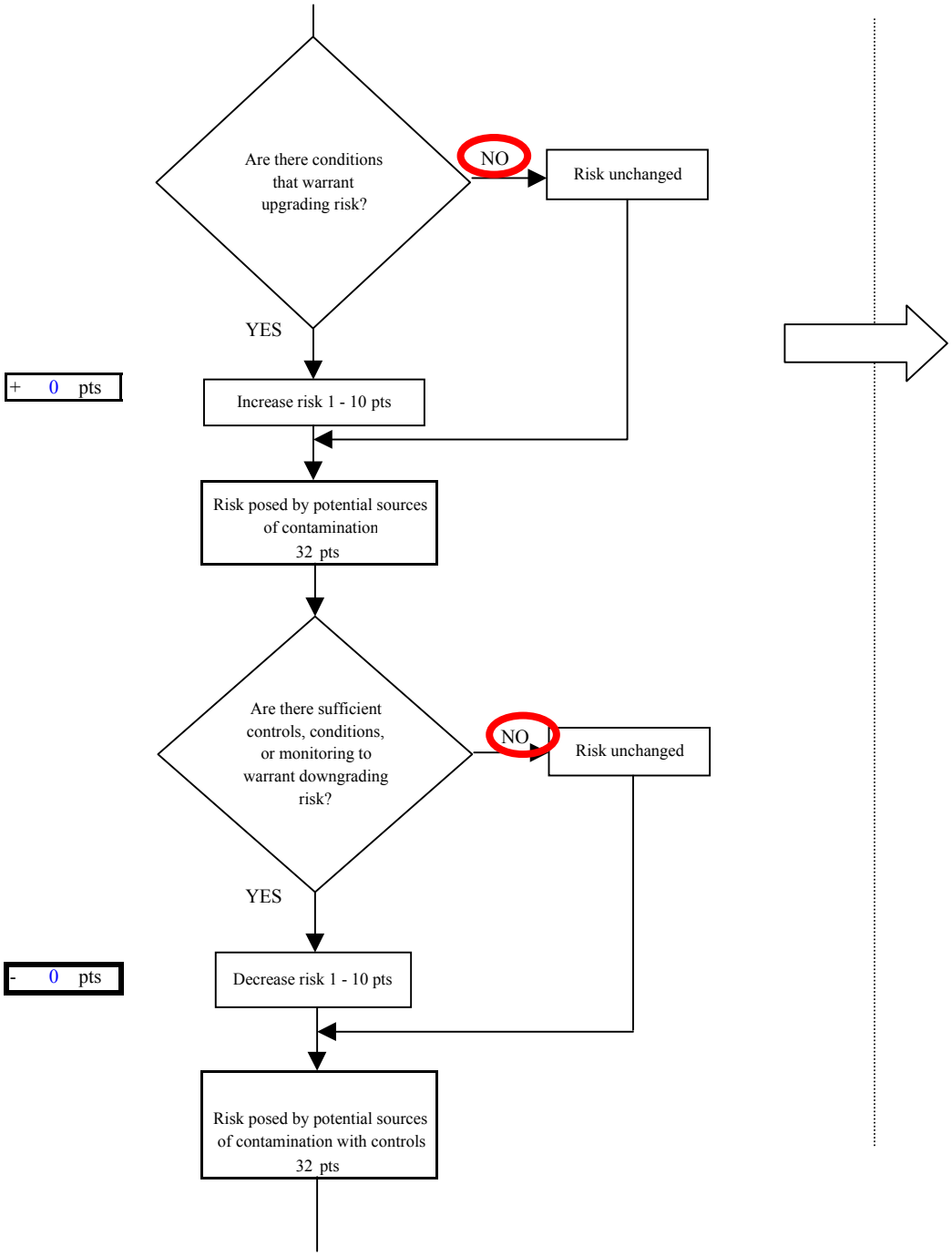
Are any significant sources within Zone A?

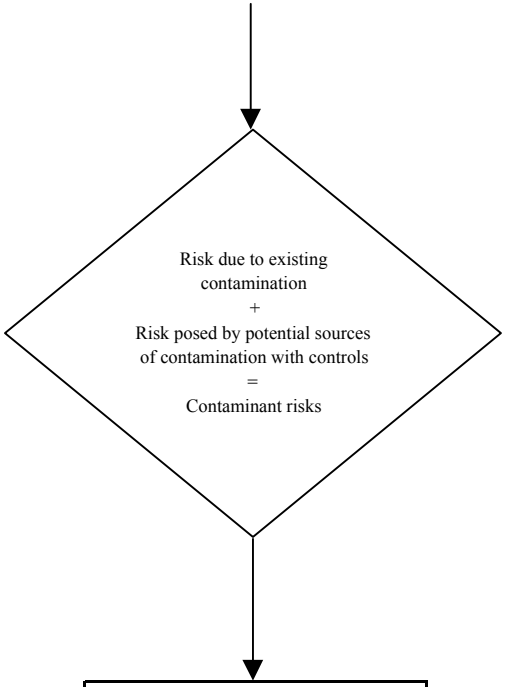
NO → Risk unchanged

YES → Increase risk 1 - 10 pts

+ 2 pts

Chart 5. Contaminant risks for Taniana Elementary School - Nitrates and Nitrites





Existing
3 pts
+
Potential
32 pts
=
Contaminant Risk
35 pts

Contaminant risks*
= 35 pts

*Truncate risk at 50 pts

High

Contaminant Risk Ratings

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

Chart 6. Vulnerability analysis for Tanaina Elementary School - Nitrates and Nitrites

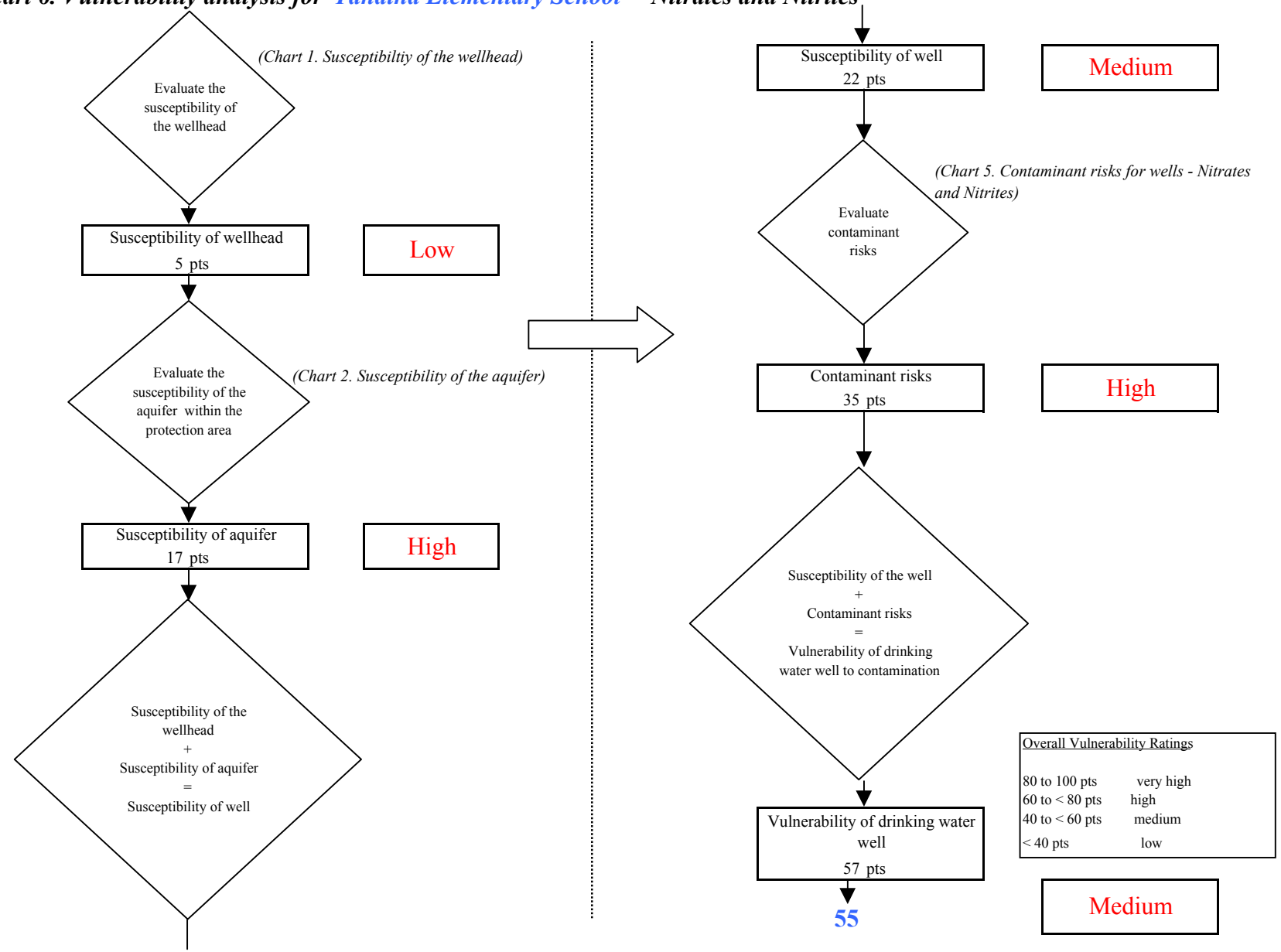


Chart 7. Contaminant risks for Tanaina Elementary School - Volatile Organic Chemicals

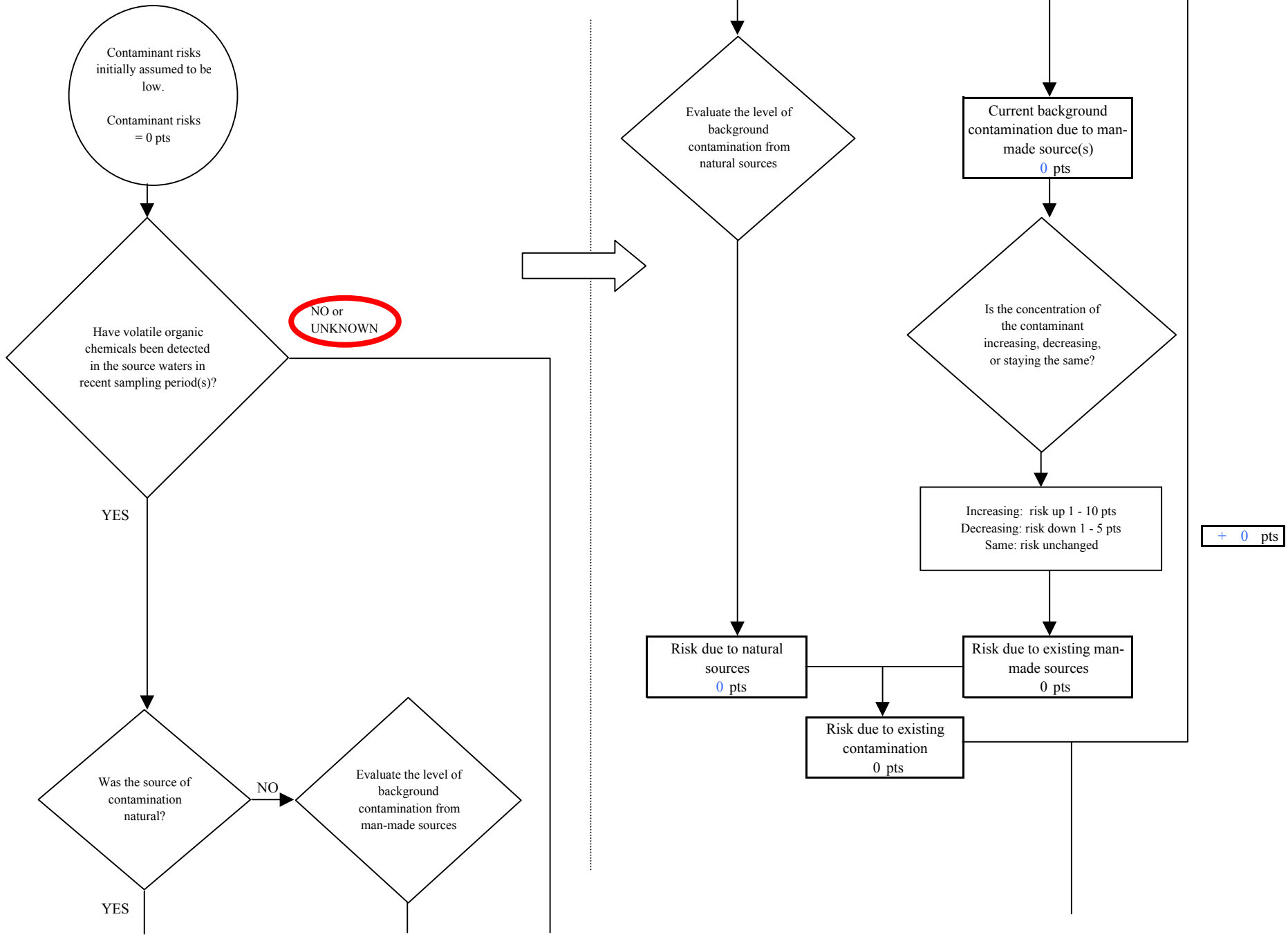


Chart 7. Contaminant risks for Tanaina Elementary School - Volatile Organic Chemicals

+ 20 pts

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

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	1	0	1
Low(s)	2	5	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 20

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

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

Is the source aquifer fractured rock or karst?

YES

NO

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

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 5 pts

Chart 7. Contaminant risks for Tanaina Elementary School - Volatile Organic Chemicals

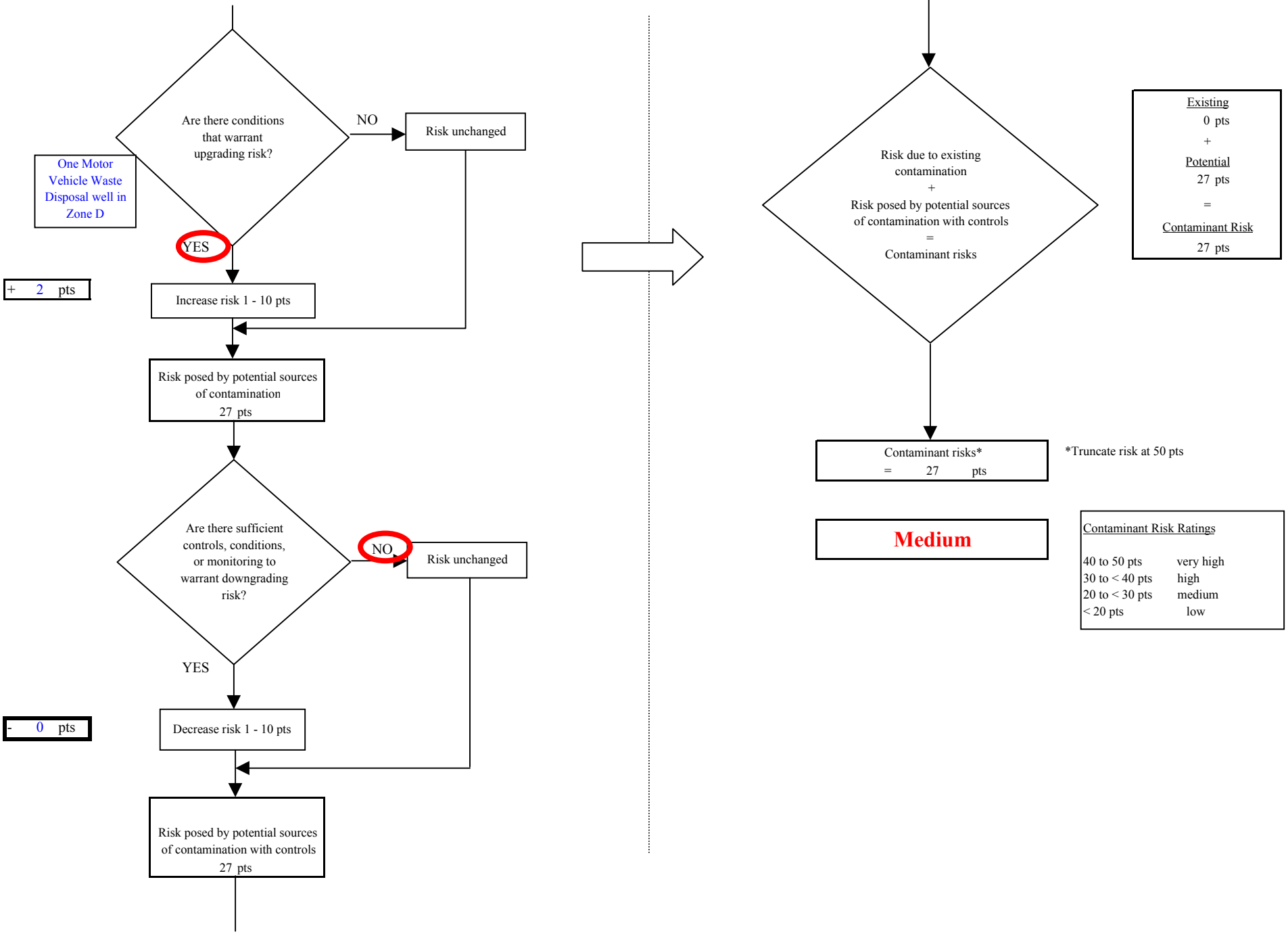


Chart 8. Vulnerability analysis for Tanaina Elementary School - Volatile Organic Chemicals

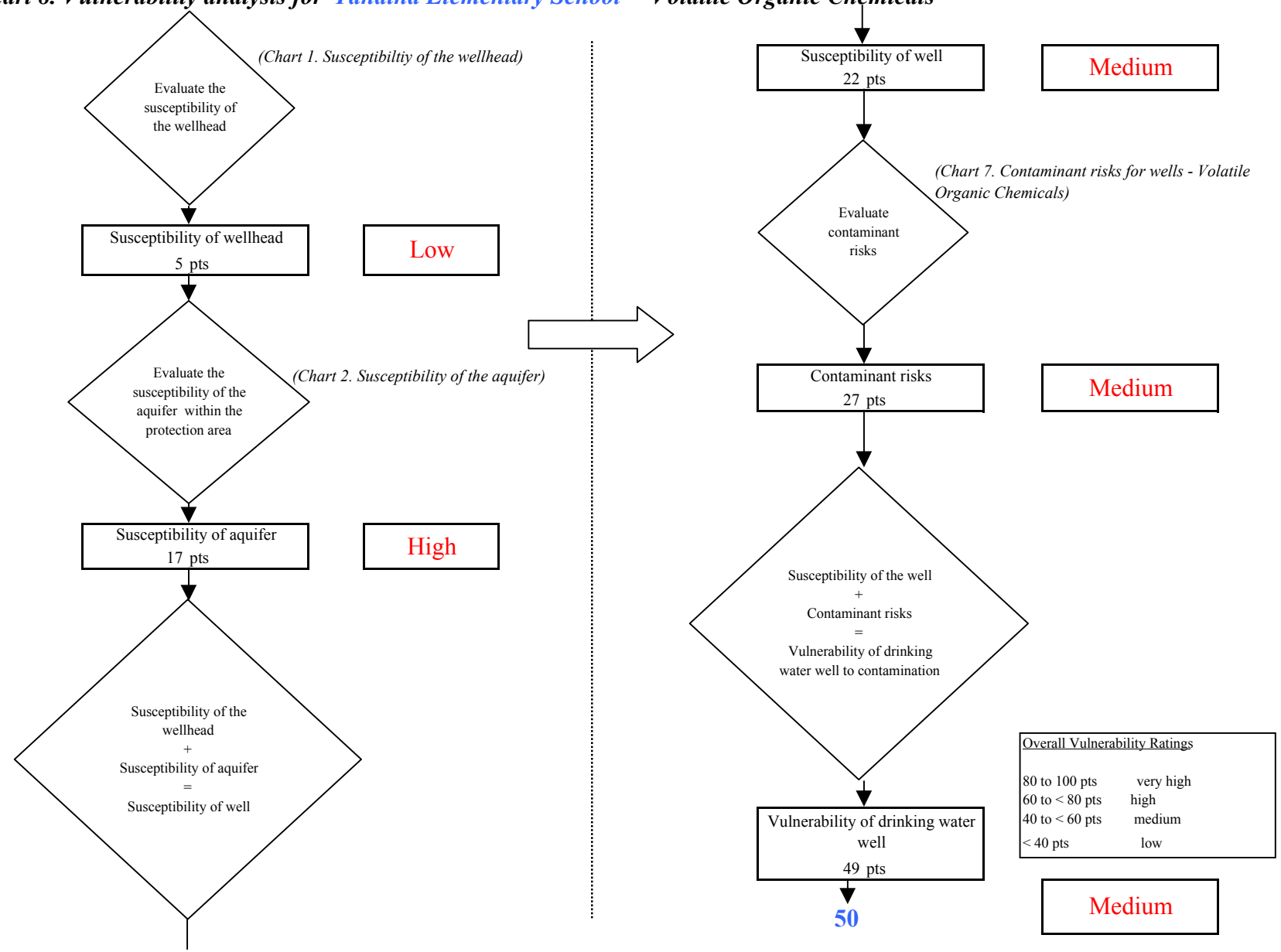


Chart 9. Contaminant risks for Tanaina Elementary - Heavy Metals, Cyanide and Other Inorganic Chemicals

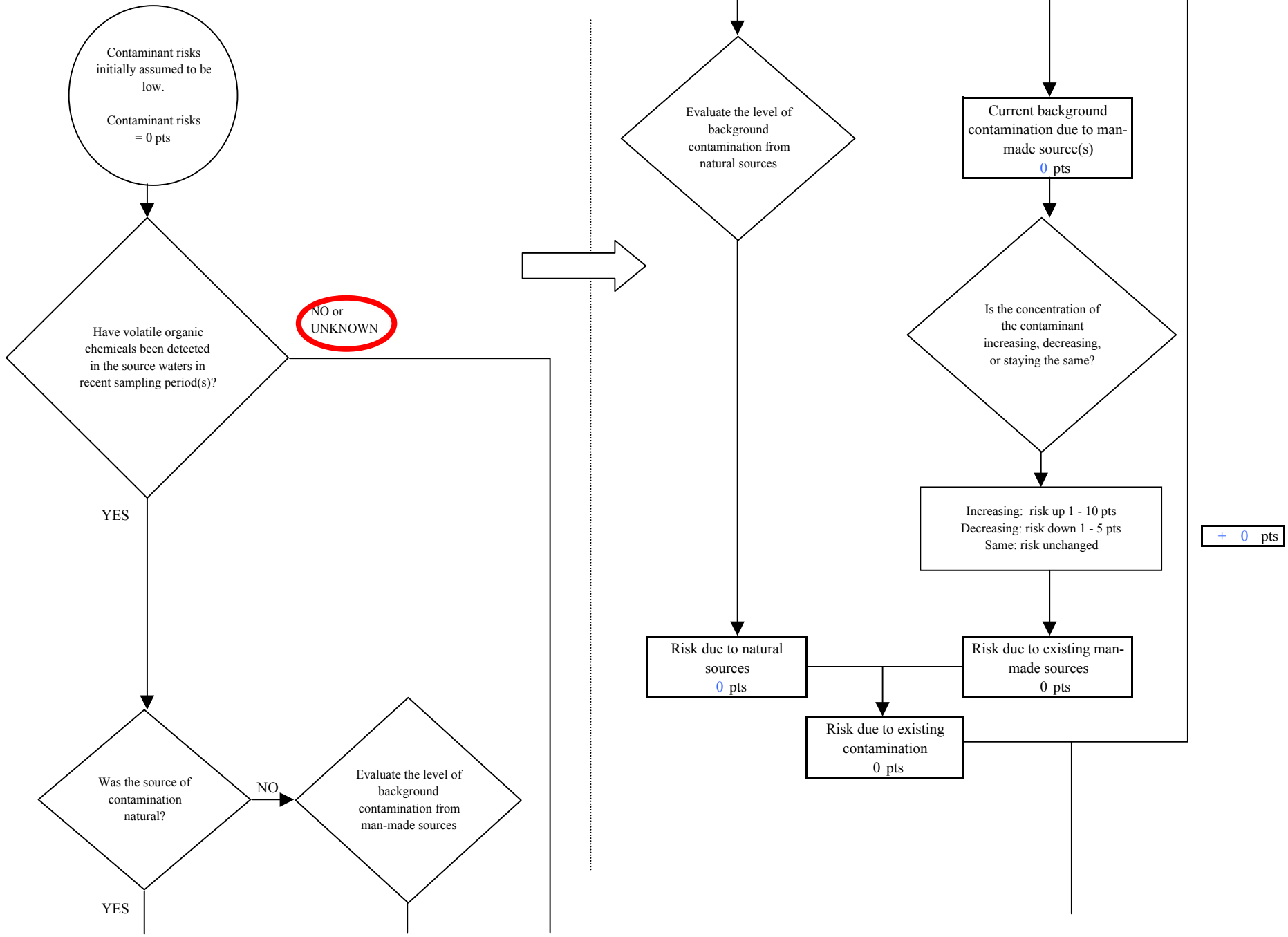


Chart 9. Contaminant risks for Tanaina Elementary - Heavy Metals, Cyanide and Other Inorganic Chemicals

+ 10 pts

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

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	5	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 10

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

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

Is the source aquifer fractured rock or karst?

YES

NO

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

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

Risk unchanged

YES

Increase risk 1 - 10 pts

+ 2 pts

Chart 9. Contaminant risks for Tanaina Elementary - Heavy Metals, Cyanide and Other Inorganic Chemicals

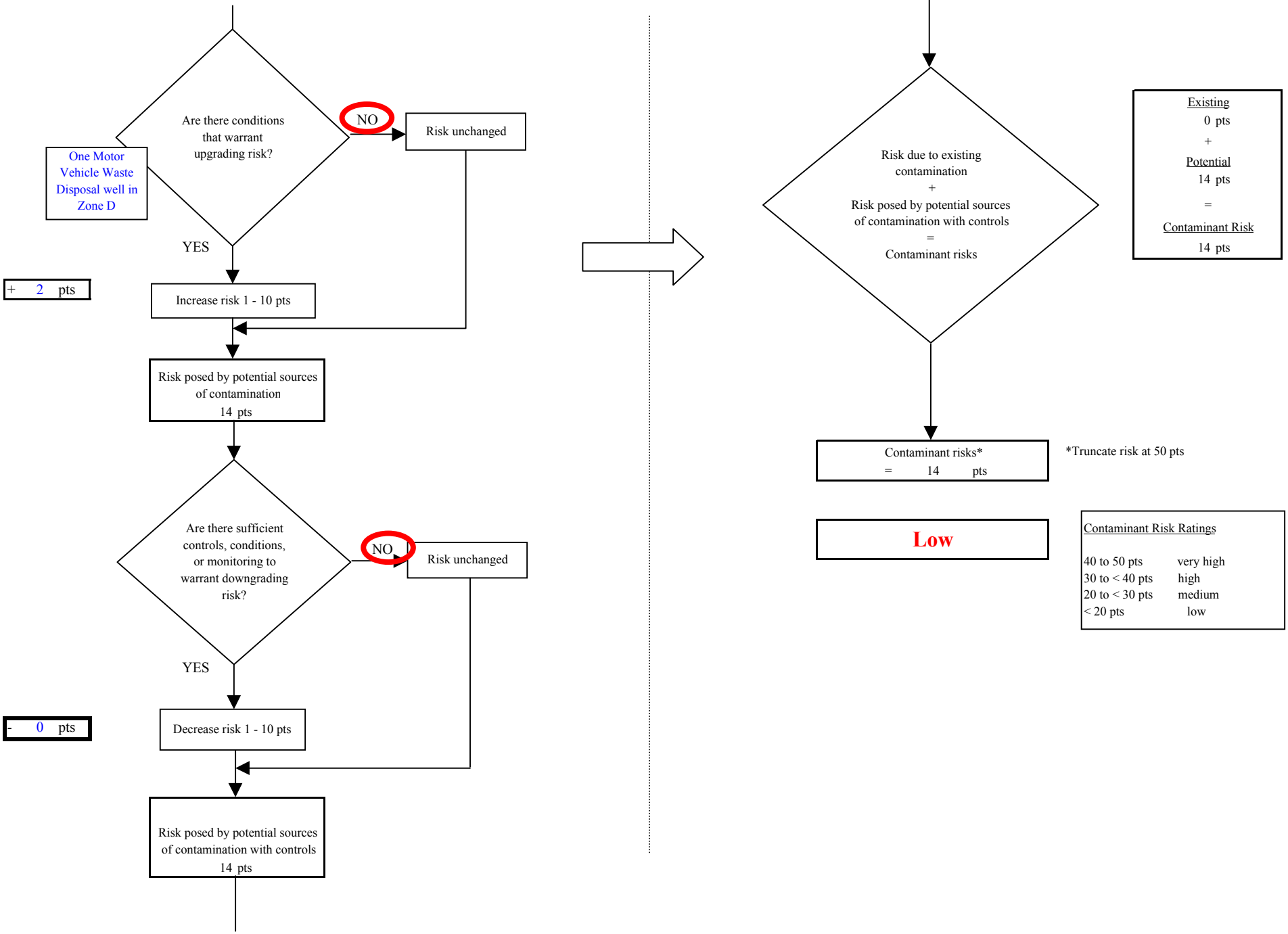


Chart 10. Vulnerability analysis for Tanaina Elementary - Heavy Metals, Cyanide and Other Inorganic Chemicals

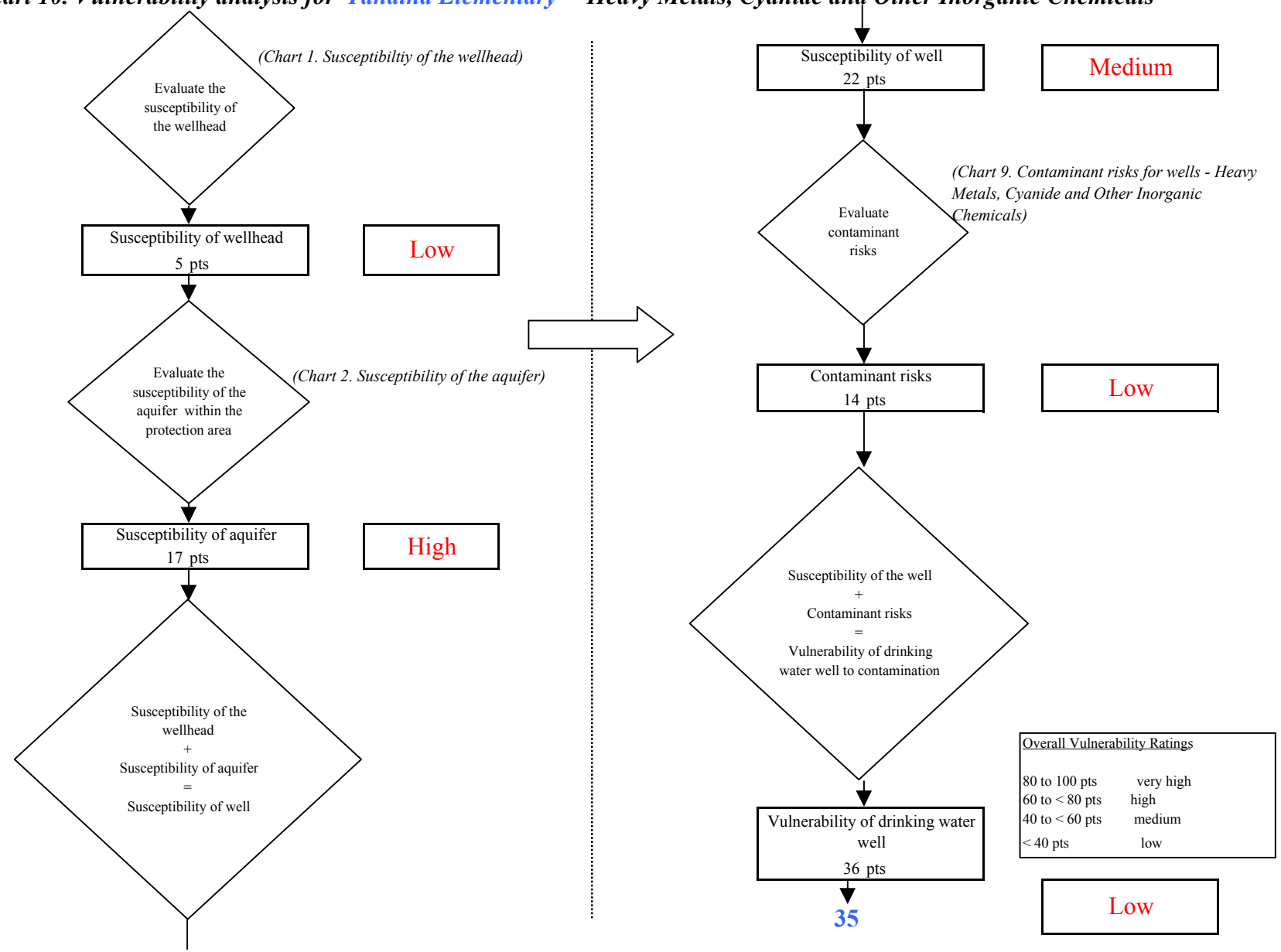


Chart 11. Contaminant risks for Tanaina Elementary School - Synthetic Organic Chemicals

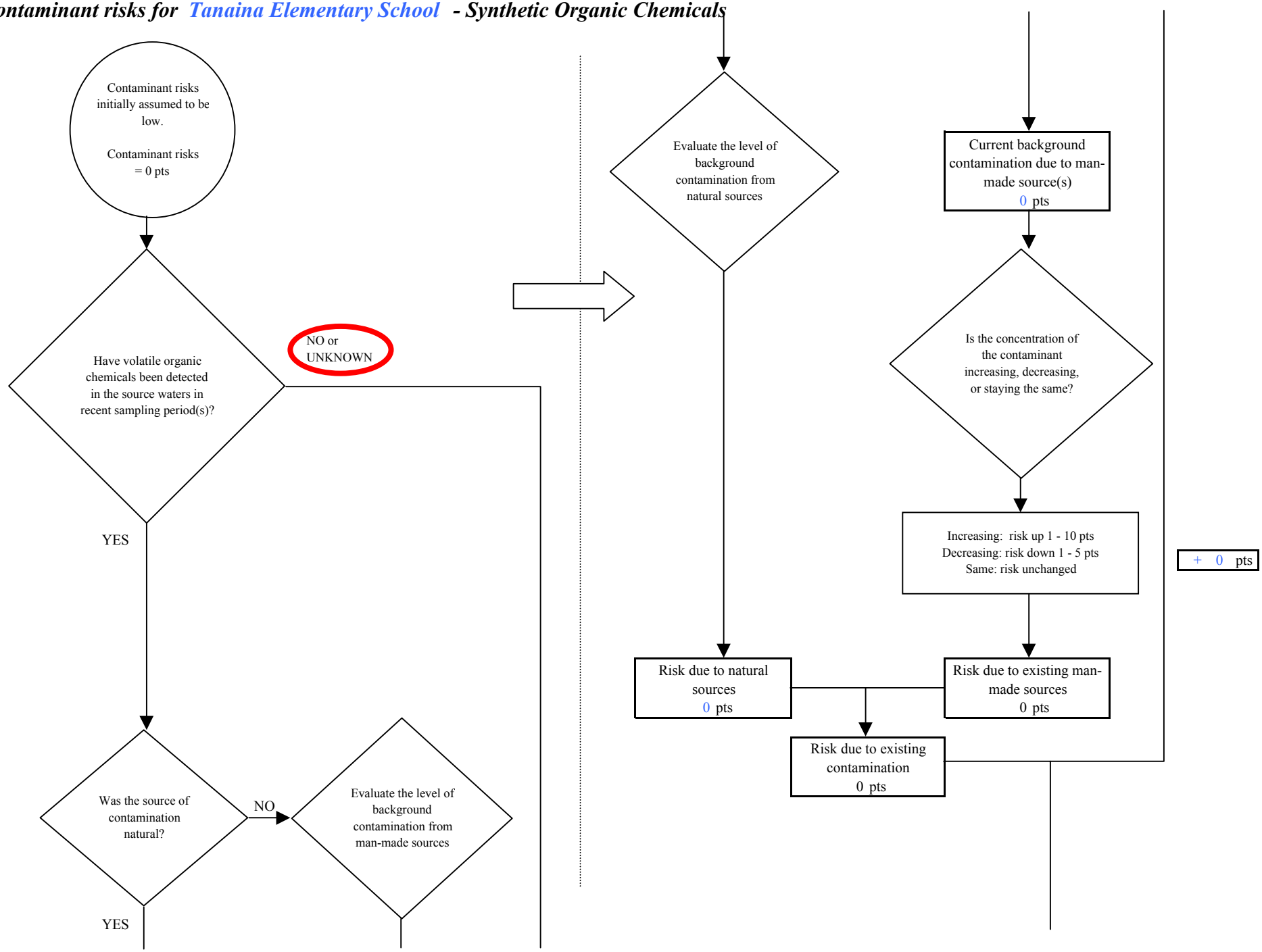


Chart 11. Contaminant risks for Tanaina Elementary School - Synthetic Organic Chemicals

+ 10 pts

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

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	4	6

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

Matrix Score 10

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

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

Is the source aquifer fractured rock or karst?

YES

NO

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

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

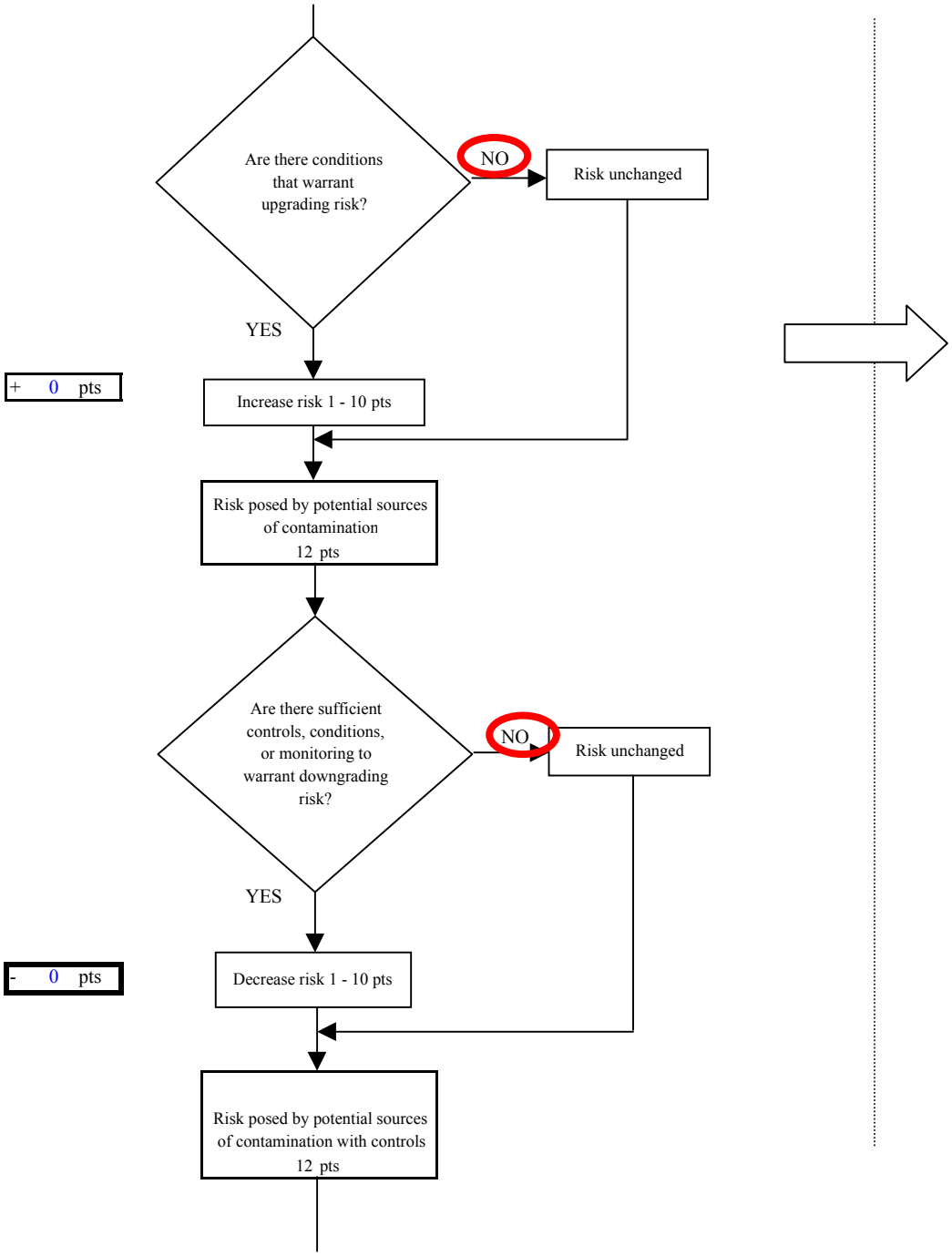
Risk unchanged

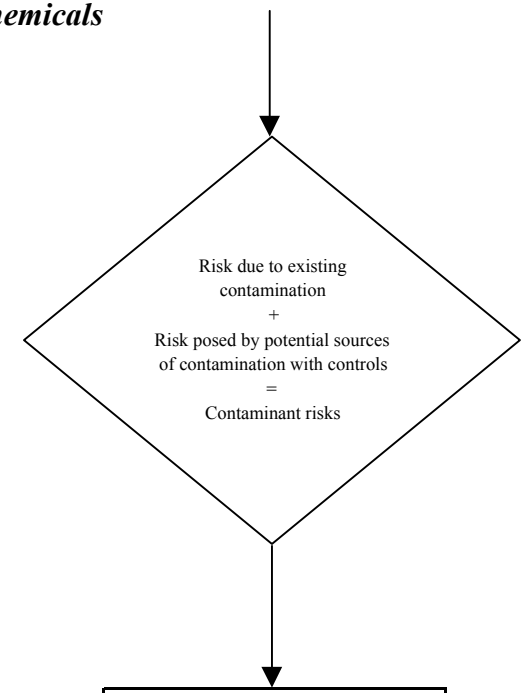
YES

Increase risk 1 - 10 pts

+ 2 pts

Chart 11. Contaminant risks for Tanaina Elementary School - Synthetic Organic Chemicals





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

Contaminant risks*
= 12 pts

*Truncate risk at 50 pts

Low

Contaminant Risk Ratings

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

Chart 12. Vulnerability analysis for Tanaina Elementary School - Synthetic Organic Chemicals

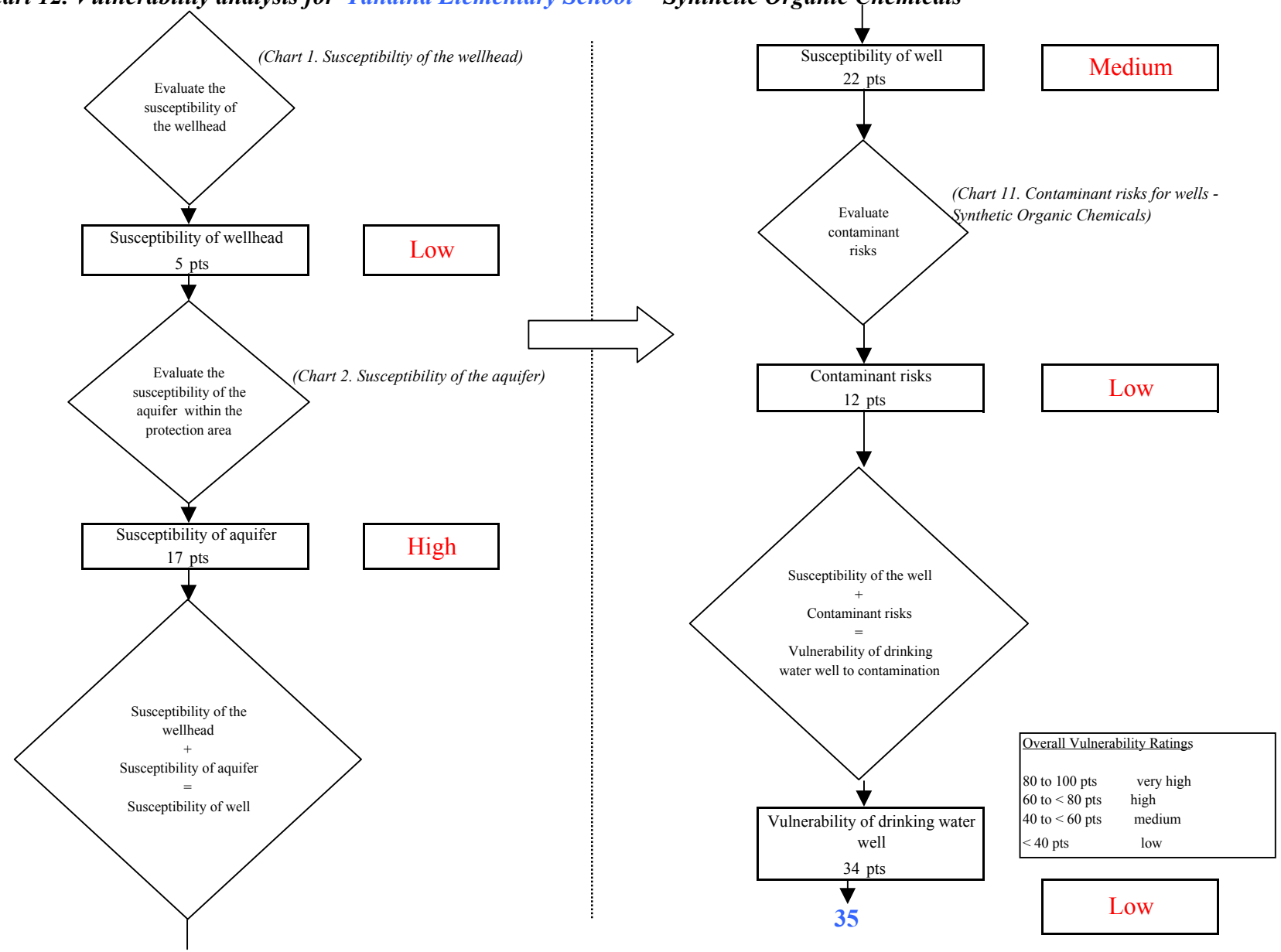


Chart 13. Contaminant risks for Tanaina Elementary - Other Organic Chemicals

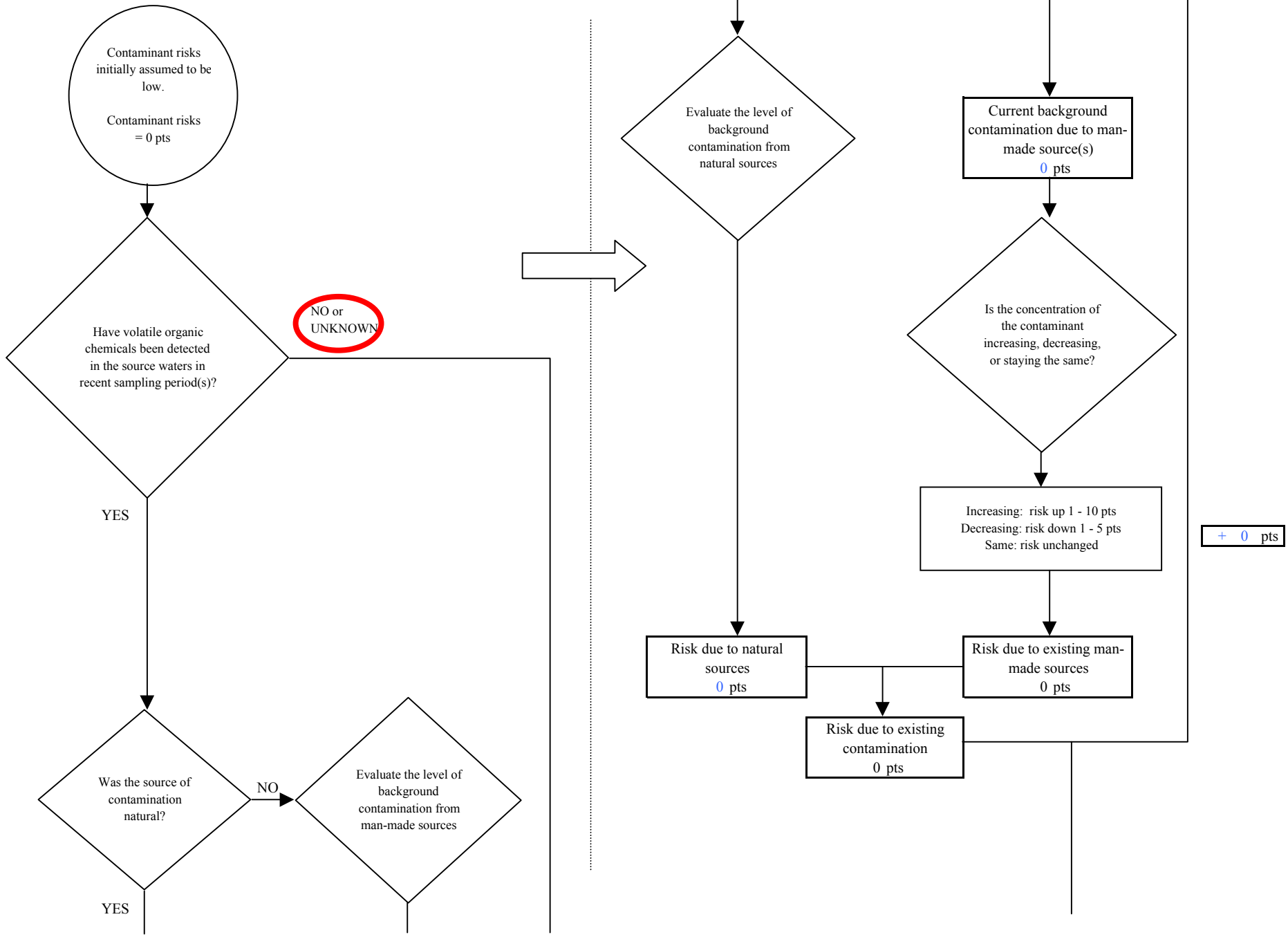


Chart 13. Contaminant risks for Tanaina Elementary - Other Organic Chemicals

+ 10 pts

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

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

	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	0	0	0
Low(s)	2	5	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 10

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

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

Is the source aquifer fractured rock or karst?

YES

NO

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

NO

Risk unchanged

YES

Decrease risk 1 - 10 pts

- 0 pts

Are any significant sources within Zone A?

NO

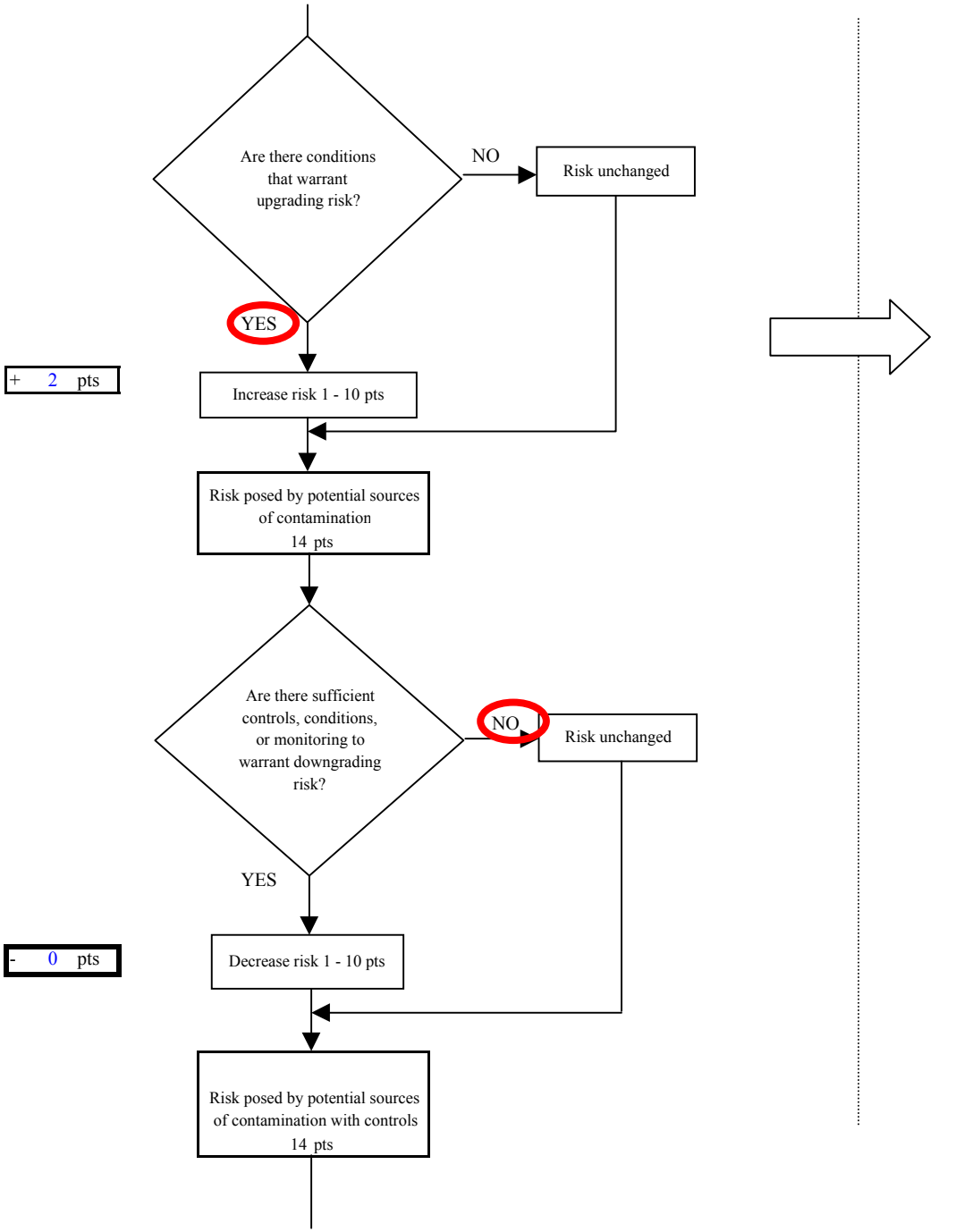
Risk unchanged

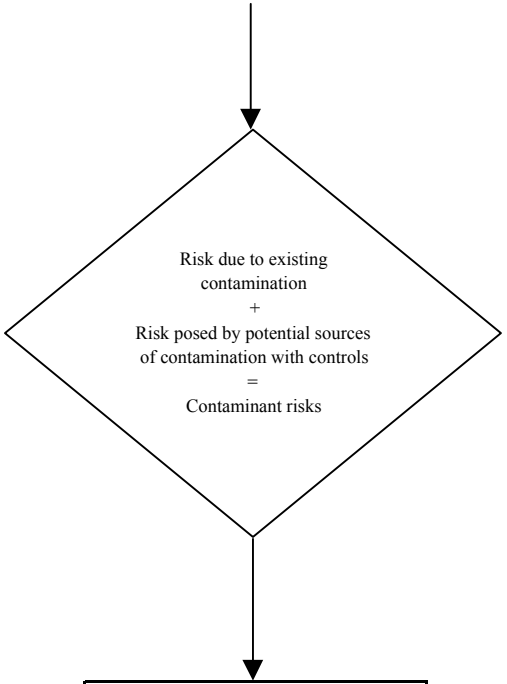
YES

Increase risk 1 - 10 pts

+ 2 pts

Chart 13. Contaminant risks for Tanaina Elementary - Other Organic Chemicals





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

Contaminant risks*
= 14 pts

*Truncate risk at 50 pts

Low

Contaminant Risk Ratings

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

Chart 14. Vulnerability analysis for Tanaina Elementary School - Other Organic Chemicals