

Source Water Assessment

A Hydrogeologic Susceptibility and
Vulnerability Assessment for
Westmark Tok,
Tok, Alaska
PWSID #380947

DRINKING WATER PROTECTION PROGRAM REPORT NO. 910

Alaska Department of Environmental Conservation

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The Drinking Water Protection Program (DWPP) is producing Source Water Assessments in compliance with the Safe Drinking Water Act Amendments of 1996. Each assessment includes a delineation of the source water area, an inventory of potential and existing contaminant sources that may impact the water, a risk ranking for each of these contaminants, and an evaluation of the potential vulnerability of these drinking water sources.

These assessments are intended to provide public water systems owners/operators, communities, and local governments with the best available information that may be used to protect the quality of their drinking water. The assessments combine information obtained from various sources, including the U.S. Environmental Protection Agency, Alaska Department of Environmental Conservation (ADEC), public water system owners/operators, and other public information sources. The results of this assessment are subject to change if additional data becomes available. It is anticipated this assessment will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of public drinking water source. If you have any additional information that may affect the results of this assessment, please contact the Program Coordinator of DWPP, (907) 269-7521.

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Source Water Assessment for Westmark Tok, Tok, Alaska

Drinking Water Protection Program Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for Westmark Tok is a Class B (transient/non-community) water system consisting of one well. The Westmark Tok is located at the intersection of the Alaska Highway and the Tok Cutoff, Tok, Alaska. The wellhead received a susceptibility rating of **Medium** and the aquifer received a susceptibility rating of **Very High**. Combining these two ratings produces a **High** rating for the natural susceptibility of the well. Identified potential and current sources of contaminants for Westmark Tok public drinking water source include large-capacity septic systems; RV dump station; single-family septic systems; aboveground heating oil tanks; DEC-recognized contaminated site; closed leaking underground storage tank; paved highways and roads; campgrounds and RV parks; laundromats (without drycleaning); and a road/highway maintenance depot (including salt/sand storage areas). These identified potential and existing sources of contamination are considered sources of bacteria and viruses, nitrates and/or nitrites, and volatile organic chemicals. Overall, the public water sources for Westmark Tok received a vulnerability rating of **Very High** for bacteria and viruses, and nitrates and nitrites; and **High** for volatile organic chemicals.

WESTMARK TOK PUBLIC DRINKING WATER SYSTEM

Westmark Tok public water system is a Class B (transient/non-community) water system. The system consists of one well located at the intersection of the Alaska Highway and the Tok Cutoff, Tok, Alaska (See Map 1 of Appendix A). Tok is located at the junction of the Alaska Highway and the Tok cutoff to the Glenn Highway, 200 miles southeast of Fairbanks. Tok is called the "Gateway to Alaska" as it is the first major community upon entering Alaska, 93 miles from the Canadian border. The population of Tok is approximately 1,400.

Tok averages about 15 inches of precipitation per year, including 33 inches of snow. Although the quality of the groundwater can vary significantly in a short distance, groundwater supplies are generally abundant in the area. Static water levels in these wells are generally 50 to 80 feet below the surface.

The coarse, alluvial, sandy gravel aquifer generally provides sufficient water, even in the winter when infiltration is low.

The Tok area topography varies from about 1,275 feet along the Tanana River to over 5,000 feet in the Alaska Range. Drainages along the Alaska Highway in this area generally flow northwest.

According to a Sanitary Survey dated June 7, 2000, the existing well was installed in 1985 with 6-inch diameter casing to a depth of 76 feet below ground surface. It is assumed that the length of the well screen is 10 feet. The Survey indicates that the land surface is not sloped away from the well providing adequate surface water drainage. Because the well was installed prior to 1992 it is assumed that it is not grouted according to ADEC standards. Proper grouting provides added protection against contaminants traveling along the well casing and into source waters.

This system operates year round and serves approximately 60 residents and 700 non-residents through five service connections.

WESTMARK TOK DRINKING WATER PROTECTION AREA

In order to evaluate whether a drinking water source is at risk, we must first evaluate what are the most likely pathways for surface contamination to reach the groundwater. These areas are determined by looking at the characteristics of the soil, groundwater, aquifer, and well.

The most probable area for contamination to reach the drinking water well is the area that contributes water to the well, the groundwater recharge area. This area is designated as the Drinking Water Protection Area (DWPA). Because releases of contaminants within the DWPA are most likely to impact the drinking water well, this area will serve as the focus for voluntary protection efforts.

An analytical calculation was used to determine the size and shape of the DWPA. The input parameters describing the attributes of the aquifer in this calculation were estimated from information contained in the well logs and/or the Sanitary Survey. Additional methods were also used to take into account any

uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful DWPA (Please refer to the Guidance Manual for Class B Public Water Systems for additional information).

The DWPA's established for wells by the ADEC are usually separated into four zones. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well.

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

Table 1. Definition of Zones

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

The DWPA for Westmark Tok extends approximately two miles south of the well. Development in the vicinity of the well extends throughout Zone D (See Map 1 of Appendix A).

INVENTORY OF POTENTIAL AND EXISTING CONTAMINANT SOURCES

The Drinking Water Protection Program has completed an inventory of potential and existing sources of contamination within the Westmark Tok DWPA. This inventory was completed through a search of agency records and other publicly-available information. Potential sources of contamination to the drinking water aquifer include a wide range of categories and types. Potential drinking water contaminants are found within agricultural, residential, commercial, and industrial areas, but can also occur within areas that have little or no development.

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

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

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

RANKING OF CONTAMINANT RISKS

Once the potential and existing sources of contamination have been identified, they are assigned a ranking according to what type and level of risk they represent. Ranking of contaminant risks for a “potential” or “existing” source of contamination is a function of toxicity and volumes of specific contaminants associated with that source. Rankings include:

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

The TOT for contaminants within the water varies and is dependent on the physical and chemical characteristics of each contaminant. Bacteria and Viruses are only inventoried in Zones A and B because of their short life span. Only “Very High” and “High” rankings are inventoried within the outer Zone D due to the probability of contaminant dilution by the time the contaminants get to the well.

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

VULNERABILITY OF WESTMARK TOK DRINKING WATER SYSTEM

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

- Natural susceptibility; and
- Contaminant risks.

Appendix D contains eight charts, which together form the ‘Vulnerability Analysis’ for a source water assessment for a public drinking water source. Chart 1 analyzes the ‘Susceptibility of the Wellhead’ to contamination by looking at the construction of the well and its surrounding area. Chart 2 analyzes the ‘Susceptibility of the Aquifer’ to contamination by looking at the naturally occurring attributes of the water source and influences on the groundwater system that might lead to contamination. Chart 3 analyzes ‘Contaminant Risks’ for the drinking water source with respect to bacteria and viruses. The ‘Contaminant Risks’ portion of the analysis considers potential sources of contaminants as well as a review of contamination that has or may have occurred, but has not arrived or been detected at the well. Lastly, Chart 4

contains the ‘Vulnerability Analysis for Bacteria and Viruses’. Charts 5 through 8 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites and volatile organic chemicals, respectively.

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

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

+

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

=

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

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

Natural Susceptibility Ratings

40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

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

Table 2. Susceptibility

	Score	Rating
Susceptibility of the Wellhead	10	Medium
Susceptibility of the Aquifer	23	Very High
Natural Susceptibility	33	High

Contaminant risks to a drinking water source depend on the type, number or density, and distribution of contaminant sources. This score has been derived from an examination of existing and historical contamination that has been detected at the drinking water source through routine sampling. It also evaluates potential sources of contamination. Flow charts are used to assign a point score, and ratings are assigned in the same way as for the natural susceptibility:

Contaminant Risk Ratings

40 to 50 pts	Very High
30 to < 40 pts	High
20 to < 30 pts	Medium
< 20 pts	Low

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

Table 3. Contaminant Risks

Category	Score	Rating
Bacteria and Viruses	50	Very High
Nitrates and/or Nitrites	50	Very High
Volatile Organic Chemicals	35	High

Finally, an overall vulnerability score is assigned for each water system by combining each of the contaminant risk scores with the natural susceptibility score:

Natural Susceptibility (0 – 50 points)

+

Contaminant Risks (0 – 50 points)

=

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

Again, rankings are assigned according to a point score:

Overall Vulnerability Ratings

80 to 100 pts	Very High
60 to < 80 pts	High
40 to < 60 pts	Medium
< 40 pts	Low

Table 4 contains the overall vulnerability scores (0 - 100) and ratings for each of the three categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

Table 4. Overall Vulnerability

Category	Score	Rating
Bacteria and Viruses	85	Very High
Nitrates and Nitrites	85	Very High
Volatile Organic Chemicals	70	High

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Very High** with large-capacity septic systems; RV dump stations; single-family septic systems; paved highways and roads; campgrounds and RV parks; and laundromats (without drycleaning) representing the risks to the drinking water well (See Chart 3 – Contaminant Risks for Bacteria and Viruses in Appendix D).

Only a small amount of bacteria and viruses are required to endanger public health. Recent sampling events indicated no positive results were detected for bacteria and viruses. However, after combining the contaminant risks with the overall natural susceptibility of the well, the vulnerability of the well to contamination by bacteria and viruses is **Very High**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Very High** with large-capacity septic systems; RV dump stations; single-family septic systems; paved highways and roads; campgrounds and RV parks; and laundromats (without drycleaning) representing the risks to this source of public drinking water (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Sampling history for The Westmark Tok indicates that nitrates have been detected in the water, but only in very low concentrations (with the most recent detections averaged at 0.50 mg/L) or 5% of the Maximum Contaminant Level (MCL). The MCL is the maximum level of contaminant that is allowed to exist in drinking water and still be consumed by humans without harmful health effects. Due to the high solubility and weak retention by soil, nitrates are very mobile, moving at approximately the same rate as water.

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

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **High** with large-capacity septic systems; RV dump stations; single-family septic systems; aboveground heating oil tanks; paved highways and roads; campgrounds and RV parks; laundromats (without drycleaning); and a road/highway maintenance depots (including salt/sand storage) the only known risks for volatile organic chemicals (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

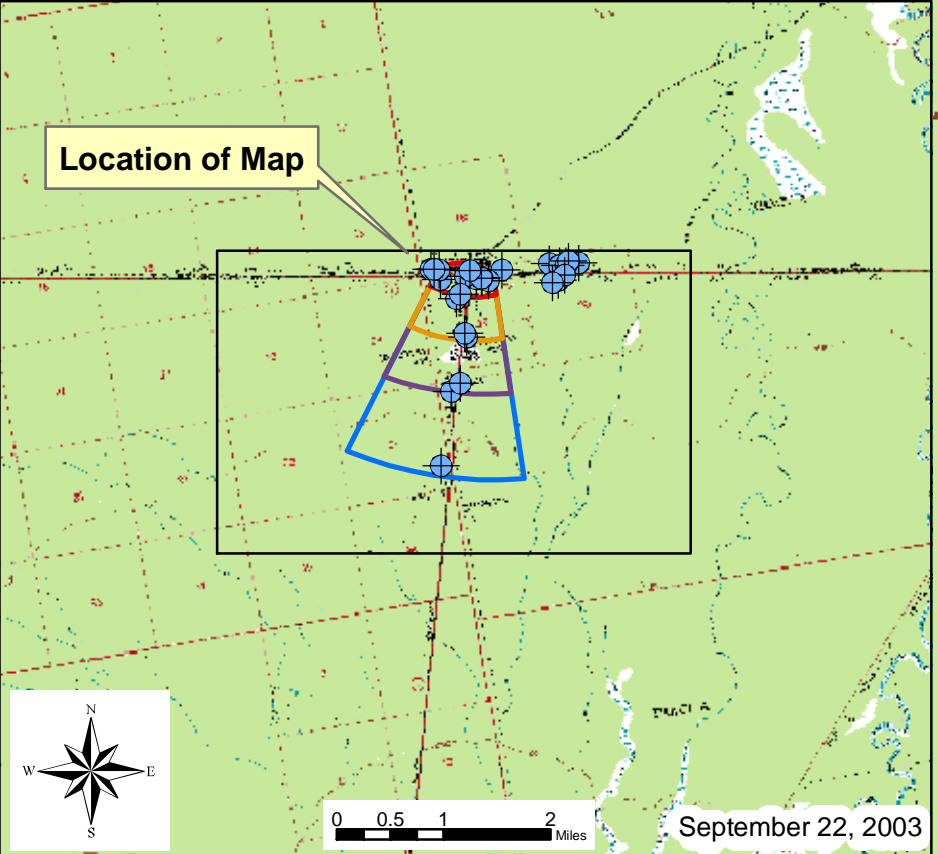
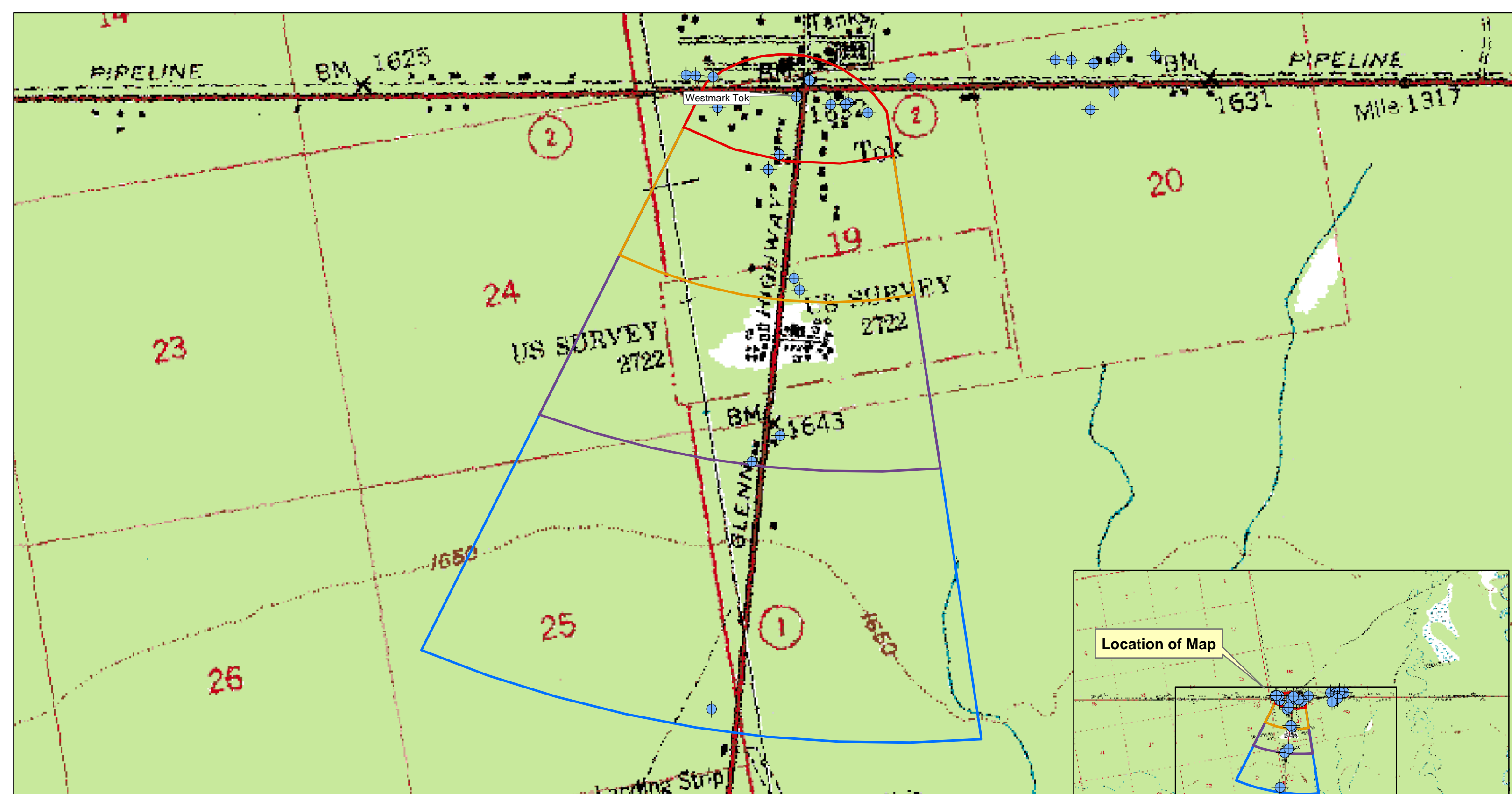
No recent volatile organics sample data for the drinking water at Westmark Tok was available. However, after combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination by volatile organic chemicals is **High**.

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APPENDIX A

Westmark Tok Drinking Water Protection Area Location Map (Map 1)



Map 1: Westmark Tok Drinking Water Protection Areas

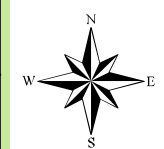
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Data Sources:
Background image - USGS 1:63,000 mapping

- Legend**
- ⊕ Public Drinking Water Systems
 - DWPA Zone A**
Several Months Travel Time
 - DWPA Zone B**
Less than 2 Years Travel Time
 - DWPA Zone C**
Less than 5 Years Travel Time
 - DWPA Zone D**
Less than 10 Years Travel Time



September 22, 2003

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Westmark Tok (Tables 1-4)

Table 1**Contaminant Source Inventory for
Westmark Tok****PWSID 380947.001**

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	2	Tok Civic Center Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	2	Wadsworth Camper City Cabana Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	A	2	Young's Café Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	A	2	Three Bears Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-5	A	2	Snowshoe Gateway Motel and Gift Septic System
RV dump stations	D18	D18-1	A	2	Golden Bear Camper Park Dump Station
Septic systems (serves one single-family home)	R02	R02-1	A	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-2	A	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-3	A	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-4	A	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-5	A	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-1	A	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-2	A	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-3	A	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-4	A	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-5	A	2	Residence Southwest of Westmark Tok
Tanks, heating oil, nonresidential (aboveground)	T14	T14-1	A	2	Tok Civic Center Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-2	A	2	Wadsworth Camper City Cabana Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-3	A	2	Young's Café Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-4	A	2	Three Bears Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-5	A	2	Snowshoe Gateway Motel and Gift Heating Oil Tank
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-1	A	2	DEC Recognized Contaminated Site
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U08-1	A	2	Closed Leaking Underground Storage Tank (Benzene)
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	2	Alaska Highway

Table 1 (continued)

**Contaminant Source Inventory for
Westmark Tok**

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Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	2	Glenn Highway
Campgrounds and RV Parks	X35	X35-1	A	2	Golden Bear Camper Park
Laundromats without dry cleaning	C22	C22-1	B	2	Golden Bear Camper Park Laundromat
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10	B	2	Tok Lodge Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	B	2	Golden Bear Camper Park Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-7	B	2	Golden Bear Motel Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-8	B	2	Septic System for Tok Schools
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-9	B	2	Tok Liquor and Mini Mart Septic System
Septic systems (serves one single-family home)	R02	R02-6	B	2	Residence West of Golden Bear Motel
Septic systems (serves one single-family home)	R02	R02-7	B	2	Residence Southwest of Golden Bear Motel
Septic systems (serves one single-family home)	R02	R02-8	B	2	Residence West of Tok Liquor and Mini Mart
Tanks, heating oil, residential (above ground)	R08	R08-6	B	2	Residence West of Golden Bear Motel
Tanks, heating oil, residential (above ground)	R08	R08-7	B	2	Residence Southwest of Golden Bear Motel
Tanks, heating oil, residential (above ground)	R08	R08-8	B	2	Residence West of Tok Liquor and Mini Mart
Tanks, heating oil, nonresidential (aboveground)	T14	T14-6	B	2	Golden Bear Motel Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-7	B	2	Tok Liquor and Mini Mart Heating Oil Storage Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-8	B	2	Tok Lodge Heating Oil Storage Tank
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-2	B	2	DEC Recognized Contaminated Site
Road/highway maintenance depots (including salt/sand storage)	X32	X32-1	B	2	Road Maintenance Facility for Tok areas)
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-11	C	2	Mae's Hamburger Joint Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-12	C	2	DOT & PF Tok Combined Facility Septic System
Septic systems (serves one single-family home)	R02	R02-10	C	2	Residence South of Tok Lodge

Table 1 (continued)**Contaminant Source Inventory for
Westmark Tok****PWSID 380947.001**

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Septic systems (serves one single-family home)	R02	R02-11	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-12	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-13	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-14	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-15	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-16	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-17	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-18	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-19	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-20	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-21	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-22	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-23	C	2	Residence South of Tok Lodge
Septic systems (serves one single-family home)	R02	R02-9	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-10	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-11	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-12	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-13	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-14	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-15	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-16	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-17	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-18	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-19	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-20	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-21	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-22	C	2	Residence South of Tok Lodge

Table 1 (continued)**Contaminant Source Inventory for
Westmark Tok****PWSID 380947.001**

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Tanks, heating oil, residential (above ground)	R08	R08-23	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-24	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-24	C	2	Residence South of Tok Lodge
Tanks, heating oil, residential (above ground)	R08	R08-9	C	2	Residence South of Tok Lodge
Tanks, heating oil, nonresidential (aboveground)	T14	T14-10	C	2	DOT & PF Tok Combined Facility Heating Oil Storage Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-9	C	2	Mae's Hamburger Joint Heating Oil Storage Tank
Laundromats without dry cleaning	C22	C22-2	D	2	Sourdough Campground Laundromat
Septic systems (serves one single-family home)	R02	R02-25	D	2	Residence South of DOT & PF Tok Combined Facility
Tanks, heating oil, residential (above ground)	R08	R08-25	D	2	Residence South of DOT & PF Tok Combined Facility
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-3	D	2	AT & T Alascom Tok Terminal Station
Closed Leaking Underground Fuel Storage Tank (LUST) Sites	U08	U08-2	D	2	Tok Junction Microwave Repeater Closed UST
Campgrounds and RV Parks	X35	X35-2	D	2	Sourdough Campground

**Contaminant Source Inventory and Risk Ranking for
Westmark Tok
Sources of Bacteria and Viruses**

PWSID 380947.001

Table 2

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Tok Civic Center Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	High	2	Wadsworth Camper City Cabana Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	A	High	2	Young's Café Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	A	High	2	Three Bears Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-5	A	High	2	Snowshoe Gateway Motel and Gift Septic System
RV dump stations	D18	D18-1	A	Low	2	Golden Bear Camper Park Dump Station
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-4	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-5	A	Low	2	Residence Southwest of Westmark Tok
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Alaska Highway
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Glenn Highway
Campgrounds and RV Parks	X35	X35-1	A	Low	2	Golden Bear Camper Park
Laundromats without dry cleaning	C22	C22-1	B	Low	2	Golden Bear Camper Park Laundromat
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10	B	High	2	Tok Lodge Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	B	High	2	Golden Bear Camper Park Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-7	B	High	2	Golden Bear Motel Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-8	B	High	2	Septic System for Tok Schools
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-9	B	High	2	Tok Liquor and Mini Mart Septic System

**Contaminant Source Inventory and Risk Ranking for
Westmark Tok
Sources of Bacteria and Viruses**

PWSID 380947.001

Table 2 (continued)

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Septic systems (serves one single-family home)	R02	R02-6	B	Low	2	Residence West of Golden Bear Motel
Septic systems (serves one single-family home)	R02	R02-7	B	Low	2	Residence Southwest of Golden Bear Motel
Septic systems (serves one single-family home)	R02	R02-8	B	Low	2	Residence West of Tok Liquor and Mini Mart

**Contaminant Source Inventory and Risk Ranking for
Westmark Tok
Sources of Nitrates/Nitrites**

PWSID 380947.001

Table 3

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	High	2	Tok Civic Center Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	High	2	Wadsworth Camper City Cabana Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	A	High	2	Young's Café Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	A	High	2	Three Bears Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-5	A	High	2	Snowshoe Gateway Motel and Gift Septic System
RV dump stations	D18	D18-1	A	Low	2	Golden Bear Camper Park Dump Station
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-4	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-5	A	Low	2	Residence Southwest of Westmark Tok
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Alaska Highway
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Glenn Highway
Campgrounds and RV Parks	X35	X35-1	A	Low	2	Golden Bear Camper Park
Laundromats without dry cleaning	C22	C22-1	B	Low	2	Golden Bear Camper Park Laundromat
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10	B	High	2	Tok Lodge Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	B	High	2	Golden Bear Camper Park Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-7	B	High	2	Golden Bear Motel Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-8	B	High	2	Septic System for Tok Schools
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-9	B	High	2	Tok Liquor and Mini Mart Septic System

**Contaminant Source Inventory and Risk Ranking for
Westmark Tok
Sources of Nitrates/Nitrites**

PWSID 380947.001

Table 3 (continued)

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Septic systems (serves one single-family home)	R02	R02-6	B	Low	2	Residence West of Golden Bear Motel
Septic systems (serves one single-family home)	R02	R02-7	B	Low	2	Residence Southwest of Golden Bear Motel
Septic systems (serves one single-family home)	R02	R02-8	B	Low	2	Residence West of Tok Liquor and Mini Mart
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-11	C	High	2	Mae's Hamburger Joint Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-12	C	High	2	DOT & PF Tok Combined Facility Septic System

**Contaminant Source Inventory and Risk Ranking for
Westmark Tok
Sources of Volatile Organic Chemicals**

PWSID 380947.001

Table 4

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-1	A	Low	2	Tok Civic Center Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-2	A	Low	2	Wadsworth Camper City Cabana Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-3	A	Low	2	Young's Café Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-4	A	Low	2	Three Bears Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-5	A	Low	2	Snowshoe Gateway Motel and Gift Septic System
RV dump stations	D18	D18-1	A	Low	2	Golden Bear Camper Park Dump Station
Septic systems (serves one single-family home)	R02	R02-1	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-2	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-3	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-4	A	Low	2	Residence Southwest of Westmark Tok
Septic systems (serves one single-family home)	R02	R02-5	A	Low	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-1	A	Medium	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-2	A	Medium	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-3	A	Medium	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-4	A	Medium	2	Residence Southwest of Westmark Tok
Tanks, heating oil, residential (above ground)	R08	R08-5	A	Medium	2	Residence Southwest of Westmark Tok
Tanks, heating oil, nonresidential (aboveground)	T14	T14-1	A	Low	2	Tok Civic Center Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-2	A	Low	2	Wadsworth Camper City Cabana Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-3	A	Low	2	Young's Café Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-4	A	Low	2	Three Bears Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-5	A	Low	2	Snowshoe Gateway Motel and Gift Heating Oil Tank

**Contaminant Source Inventory and Risk Ranking for
Westmark Tok
Sources of Volatile Organic Chemicals**

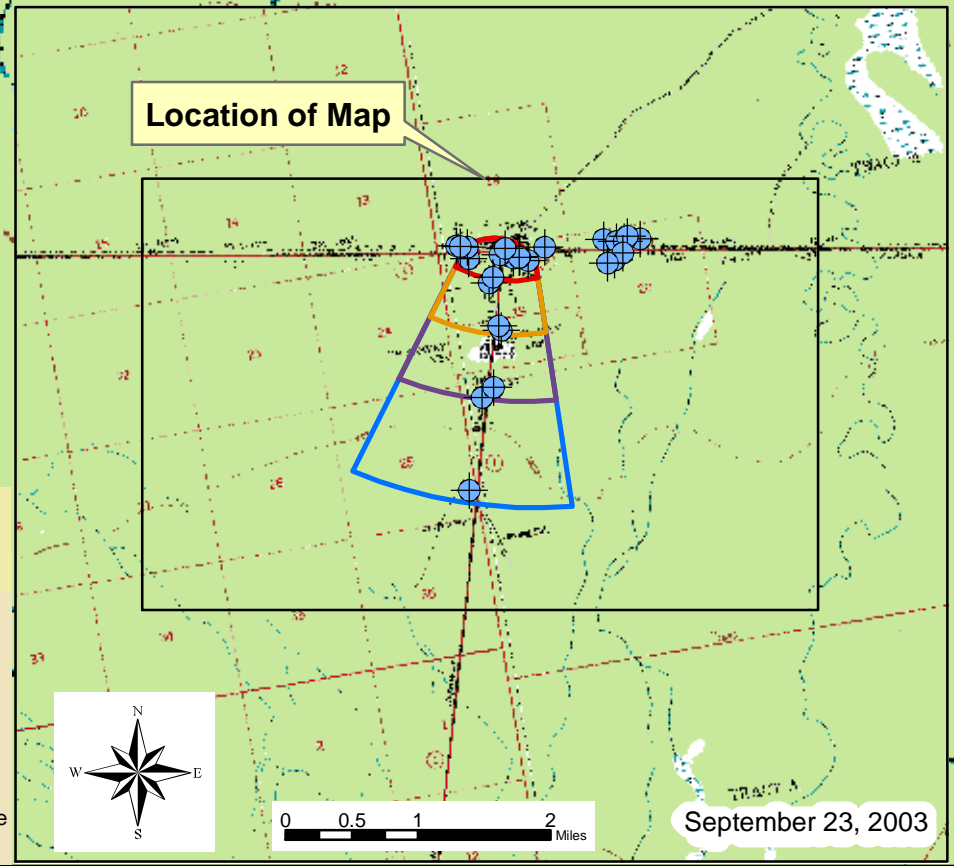
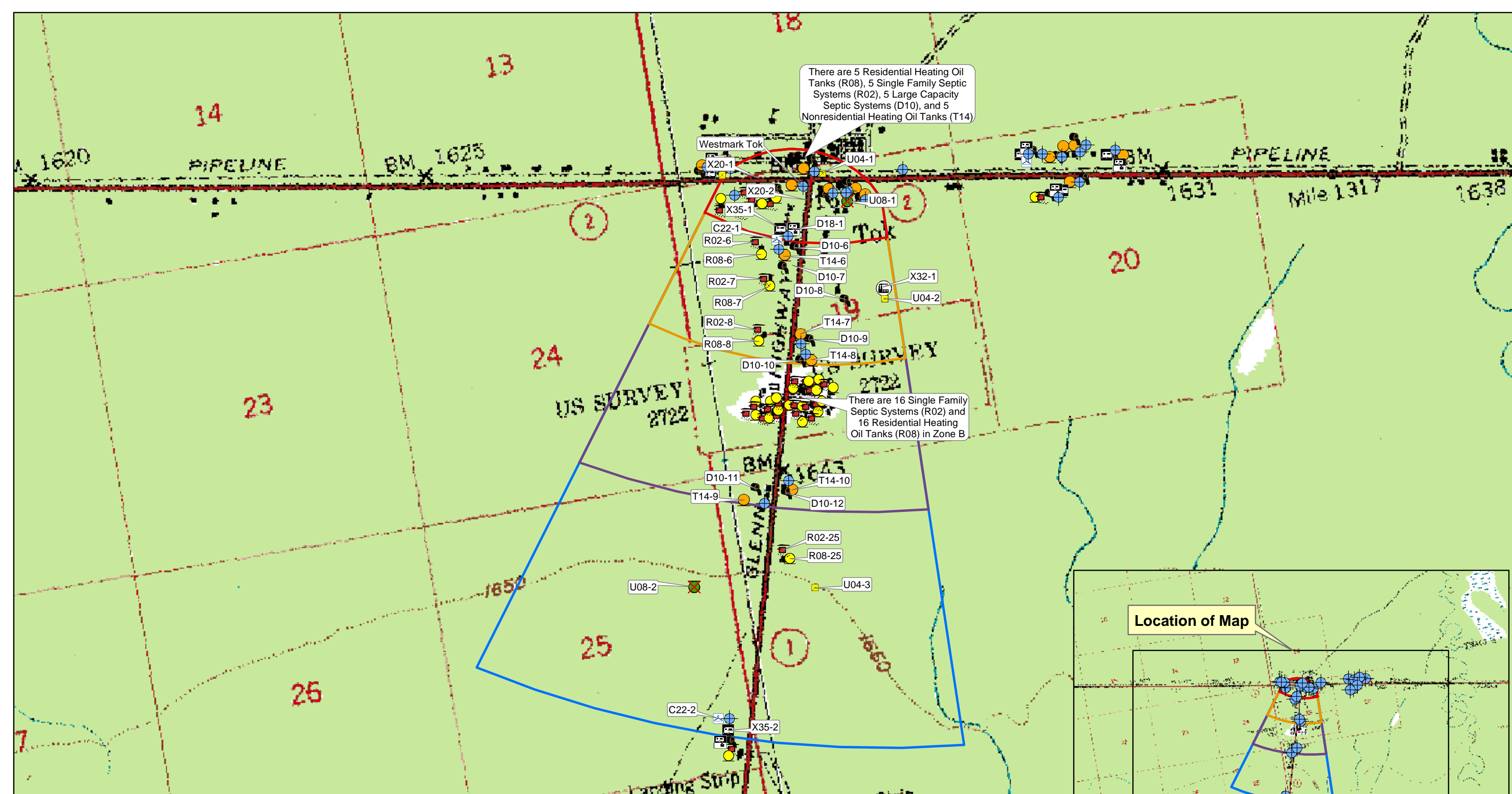
PWSID 380947.001

Table 4 (continued)

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Highways and roads, paved (cement or asphalt)	X20	X20-1	A	Low	2	Alaska Highway
Highways and roads, paved (cement or asphalt)	X20	X20-2	A	Low	2	Glenn Highway
Campgrounds and RV Parks	X35	X35-1	A	Low	2	Golden Bear Camper Park
Laundromats without dry cleaning	C22	C22-1	B	Low	2	Golden Bear Camper Park Laundromat
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-10	B	Low	2	Tok Lodge Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-6	B	Low	2	Golden Bear Camper Park Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-7	B	Low	2	Golden Bear Motel Septic System
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-8	B	Low	2	Septic System for Tok Schools
Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method)	D10	D10-9	B	Low	2	Tok Liquor and Mini Mart Septic System
Septic systems (serves one single-family home)	R02	R02-6	B	Low	2	Residence West of Golden Bear Motel
Septic systems (serves one single-family home)	R02	R02-7	B	Low	2	Residence Southwest of Golden Bear Motel
Septic systems (serves one single-family home)	R02	R02-8	B	Low	2	Residence West of Tok Liquor and Mini Mart
Tanks, heating oil, residential (above ground)	R08	R08-6	B	Medium	2	Residence West of Golden Bear Motel
Tanks, heating oil, residential (above ground)	R08	R08-7	B	Medium	2	Residence Southwest of Golden Bear Motel
Tanks, heating oil, residential (above ground)	R08	R08-8	B	Medium	2	Residence West of Tok Liquor and Mini Mart
Tanks, heating oil, nonresidential (aboveground)	T14	T14-6	B	Low	2	Golden Bear Motel Heating Oil Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-7	B	Low	2	Tok Liquor and Mini Mart Heating Oil Storage Tank
Tanks, heating oil, nonresidential (aboveground)	T14	T14-8	B	Low	2	Tok Lodge Heating Oil Storage Tank
Road/highway maintenance depots (including salt/sand storage areas)	X32	X32-1	B	Low	2	Road Maintenance Facility for Tok
Tanks, heating oil, nonresidential (aboveground)	T14	T14-9	C	Low	2	Mae's Hamburger Joint Heating Oil Storage Tank

APPENDIX C

Westmark Tok Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map 2)



Map 2: Drinking Water Protection Areas for Westmark Tok and Potential and Existing Sources of Contamination

PWSID: 380947.001



0 460 920 1,840 2,760 3,680 Feet

1:19,288

Data Sources:
Background image - USGS 1:63,000 mapping

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> Public Drinking Water Systems Closed Leaking UST (U08) Laundromat (C22) RV Dumpstation (D18) Single Family Septic System (R02) Open Leaking UST (U07) | <ul style="list-style-type: none"> Residential Heating Oil Tank (R08) RV Park (X35) DEC Recognized Contaminated Site (U04) Gas Station (C15) Nonresidential Heating Oil Tank (T14) ADOT Maintenance Depot (X32) Large Capacity Septic System (D10) | <ul style="list-style-type: none"> DWPA Zone A
Several Months Travel Time DWPA Zone B
Less than 2 Years Travel Time DWPA Zone C
Less than 5 Years Travel Time DWPA Zone D
Less than 10 Years Travel Time |
|--|--|--|

APPENDIX D

Vulnerability Analysis for Westmark Tok Public Drinking Water Source (Charts 1-8)

Chart 1. Susceptibility of the wellhead - Westmark Tok

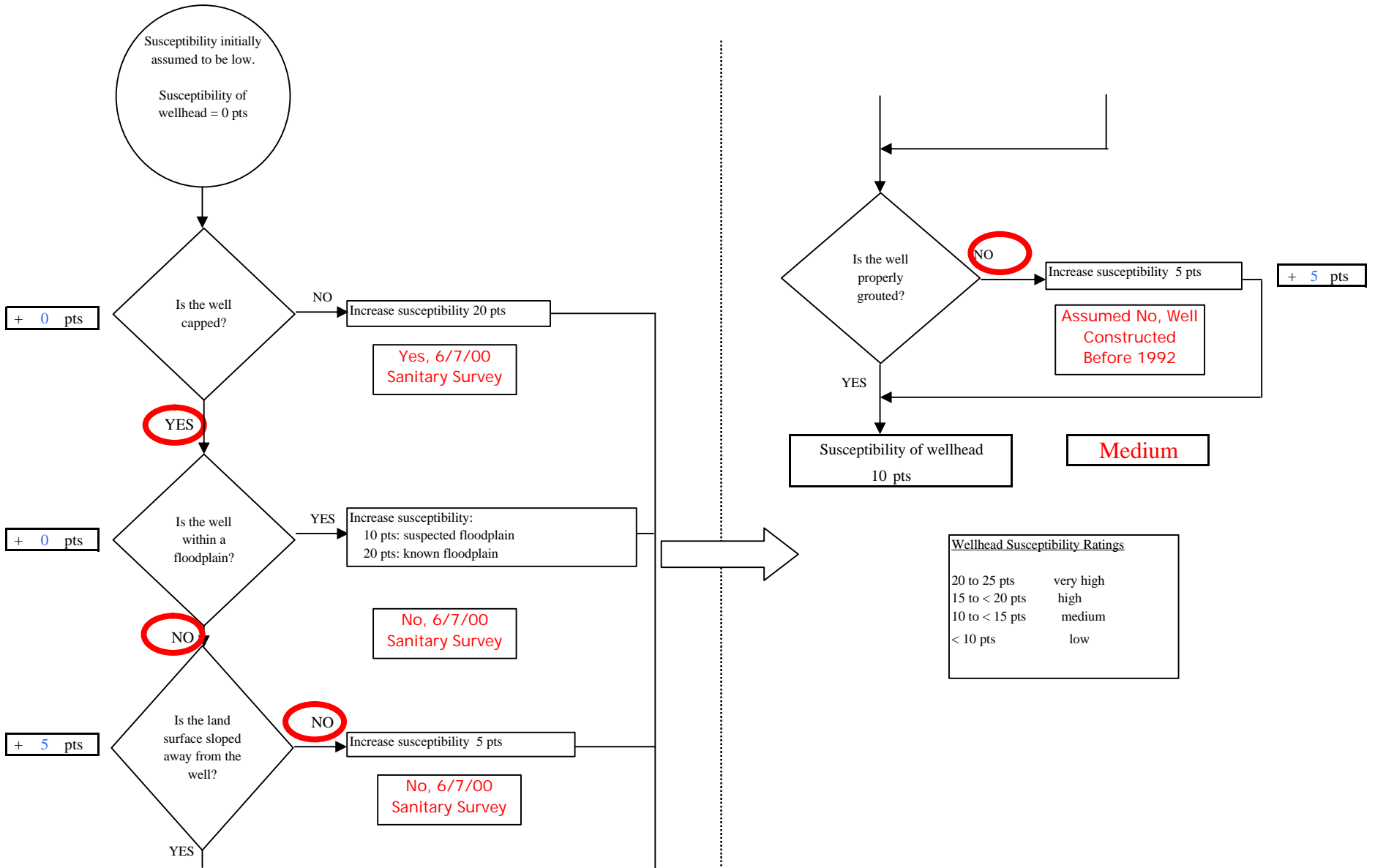


Chart 2. Susceptibility of the aquifer - Westmark Tok

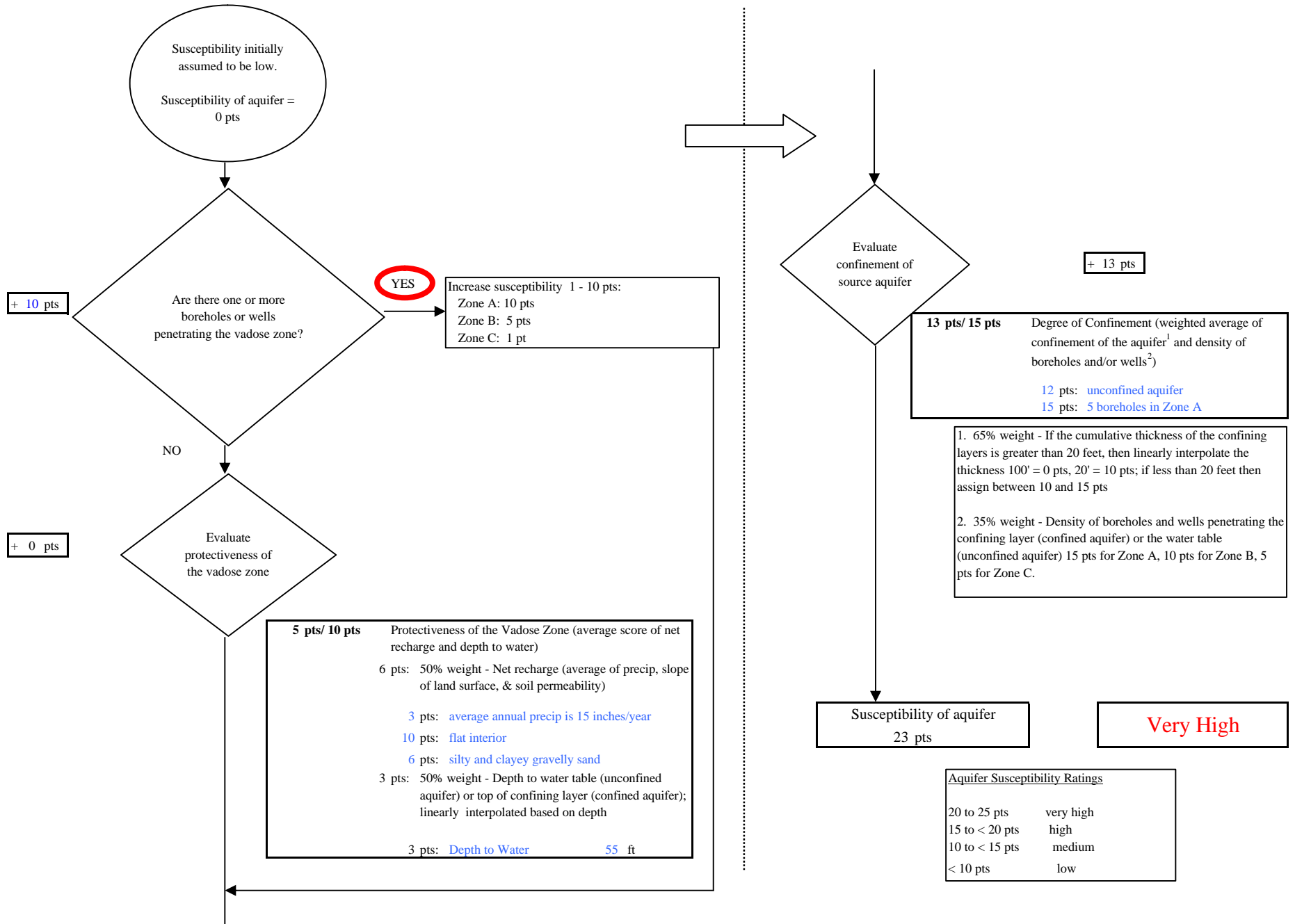


Chart 3. Contaminant risks for Westmark Tok - Bacteria & Viruses

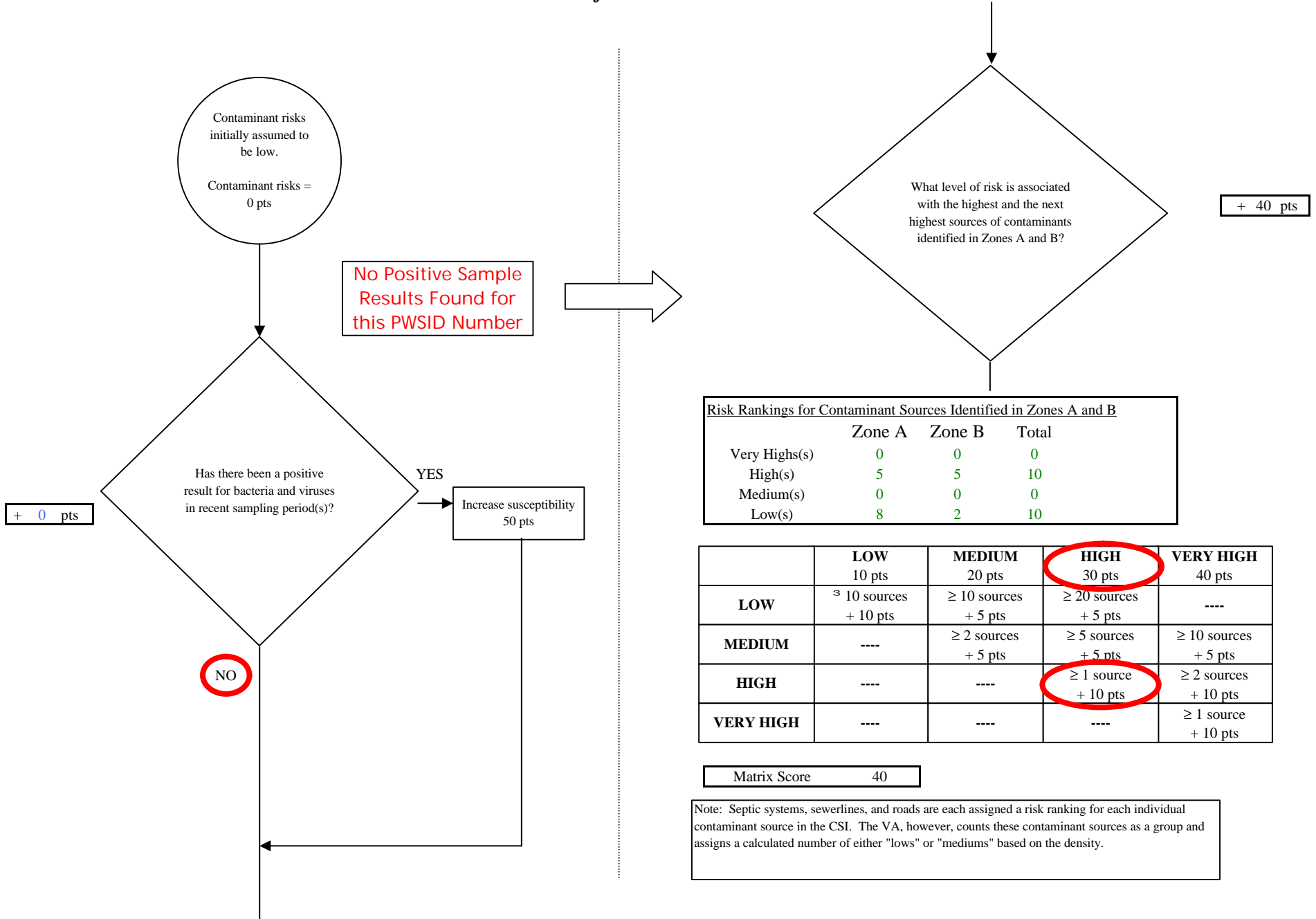
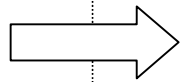
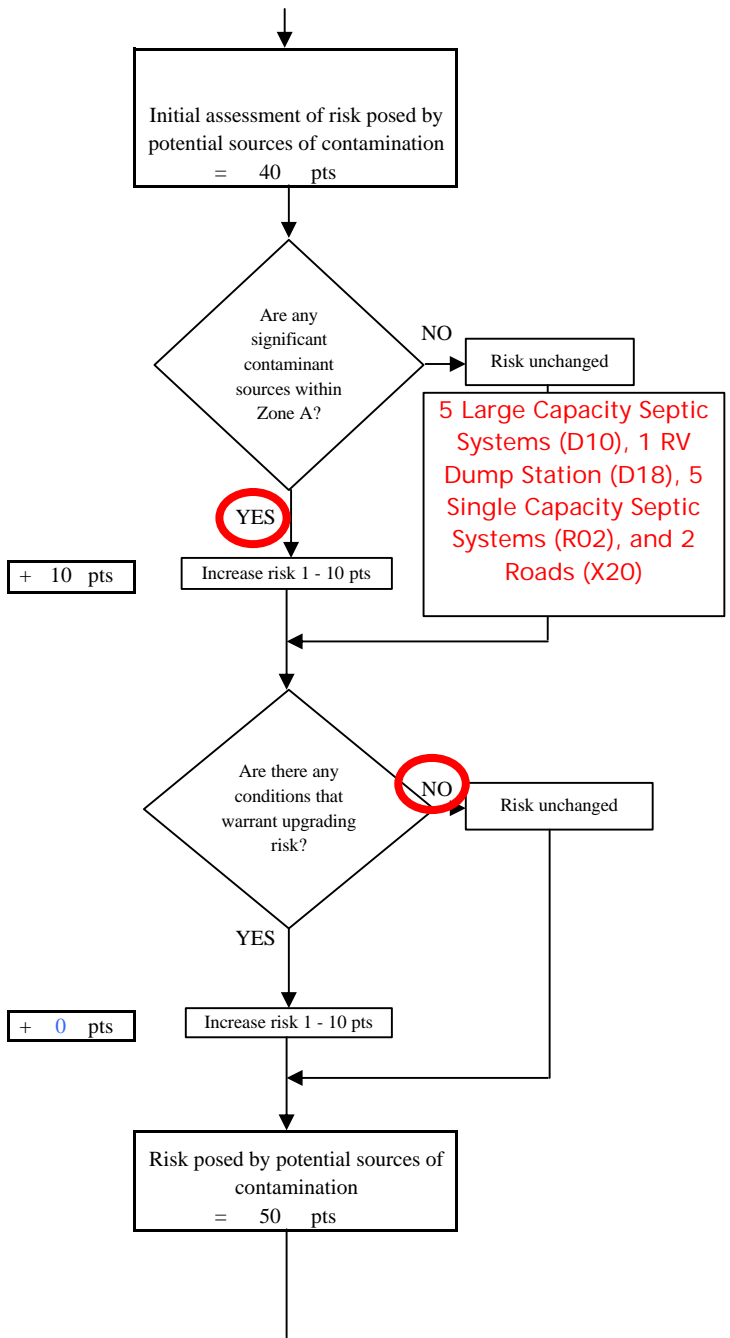


Chart 3. Contaminant risks for Westmark Tok - Bacteria & Viruses



Contaminant Risk Ratings	
40 to 50 pts	very high
30 to < 40 pts	high
20 to < 30 pts	medium
< 20 pts	low

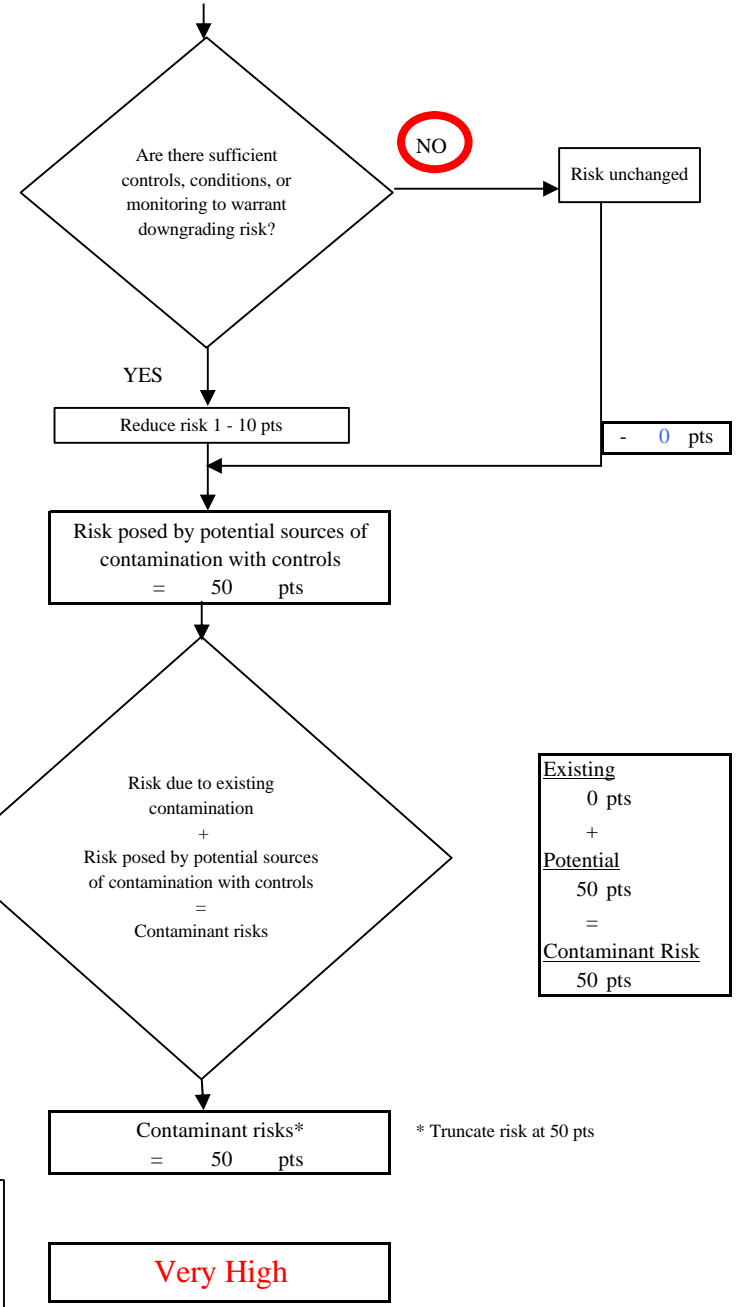


Chart 4. Vulnerability analysis for Westmark Tok - Bacteria & Viruses

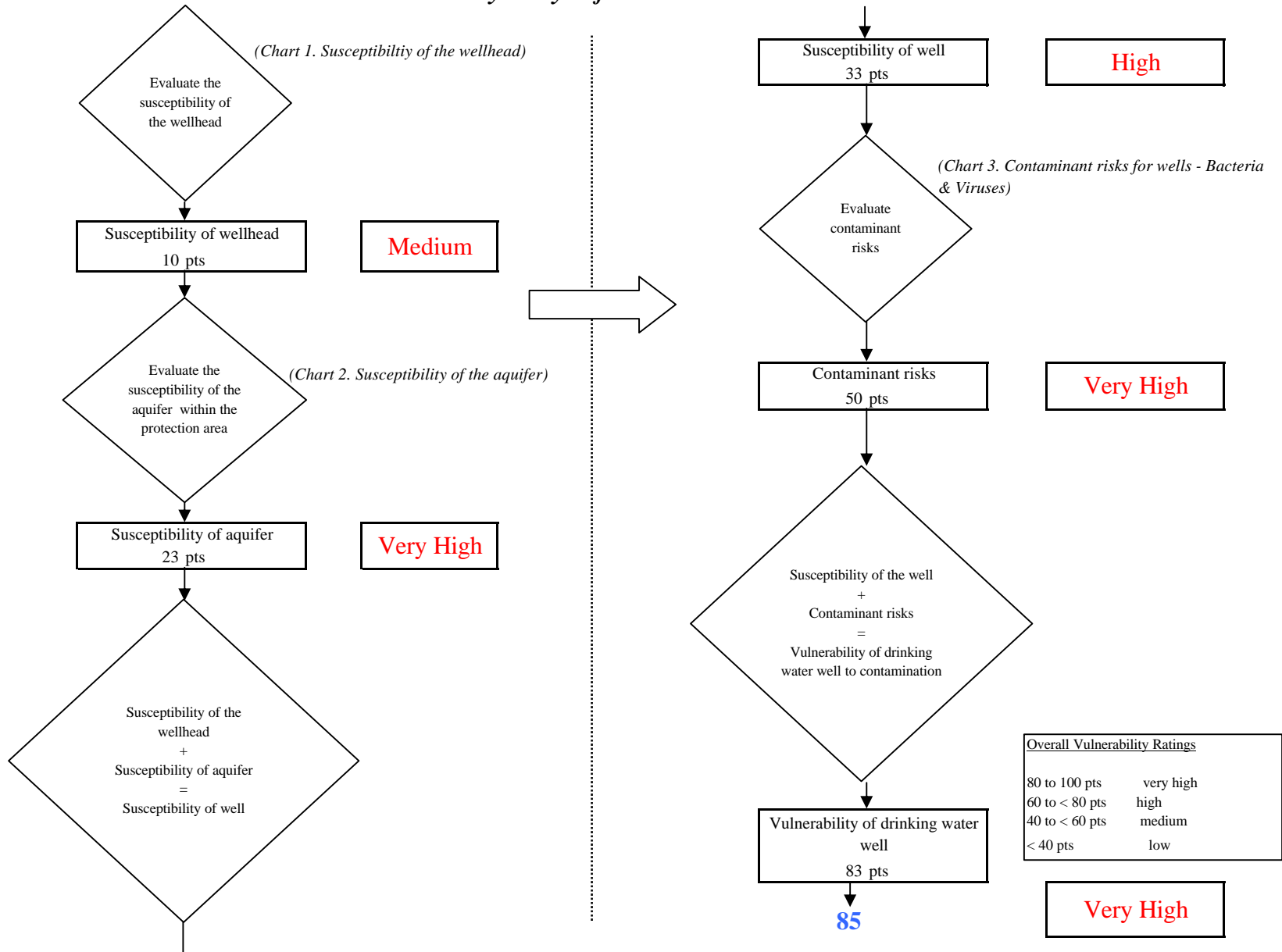


Chart 5. Contaminant risks for Westmark Tok - Nitrates and Nitrites

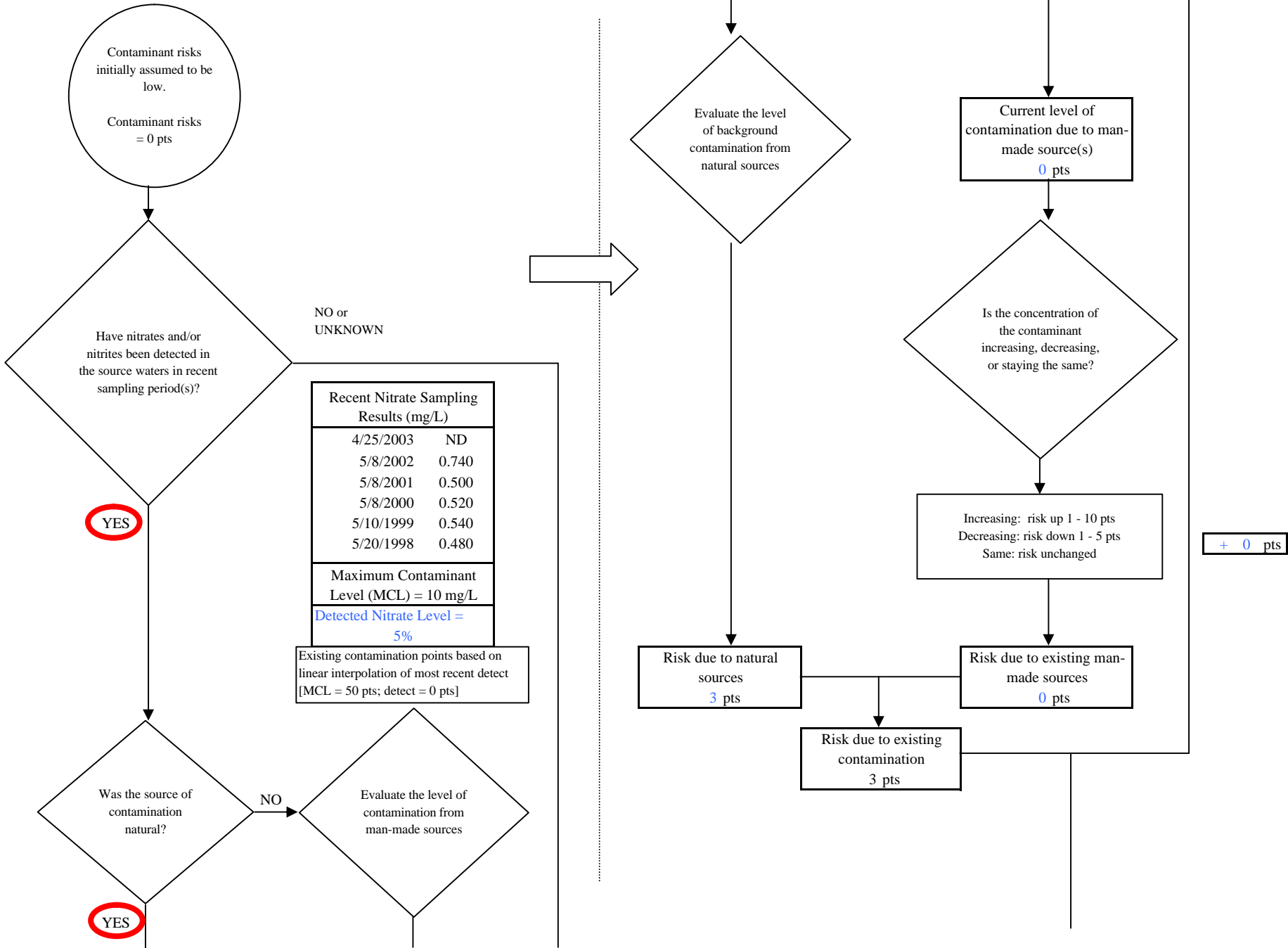
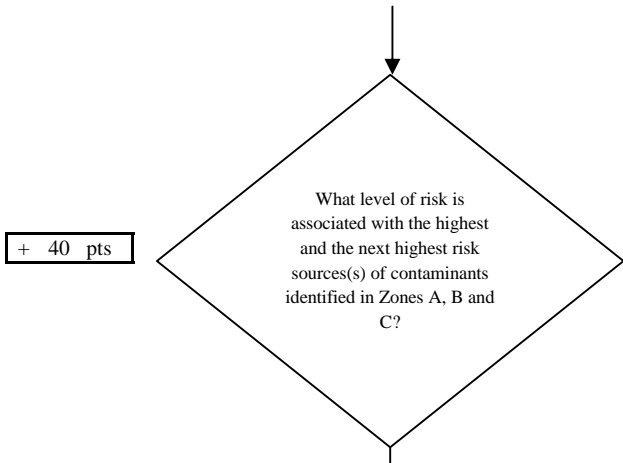


Chart 5. Contaminant risks for Westmark Tok - Nitrates and Nitrites

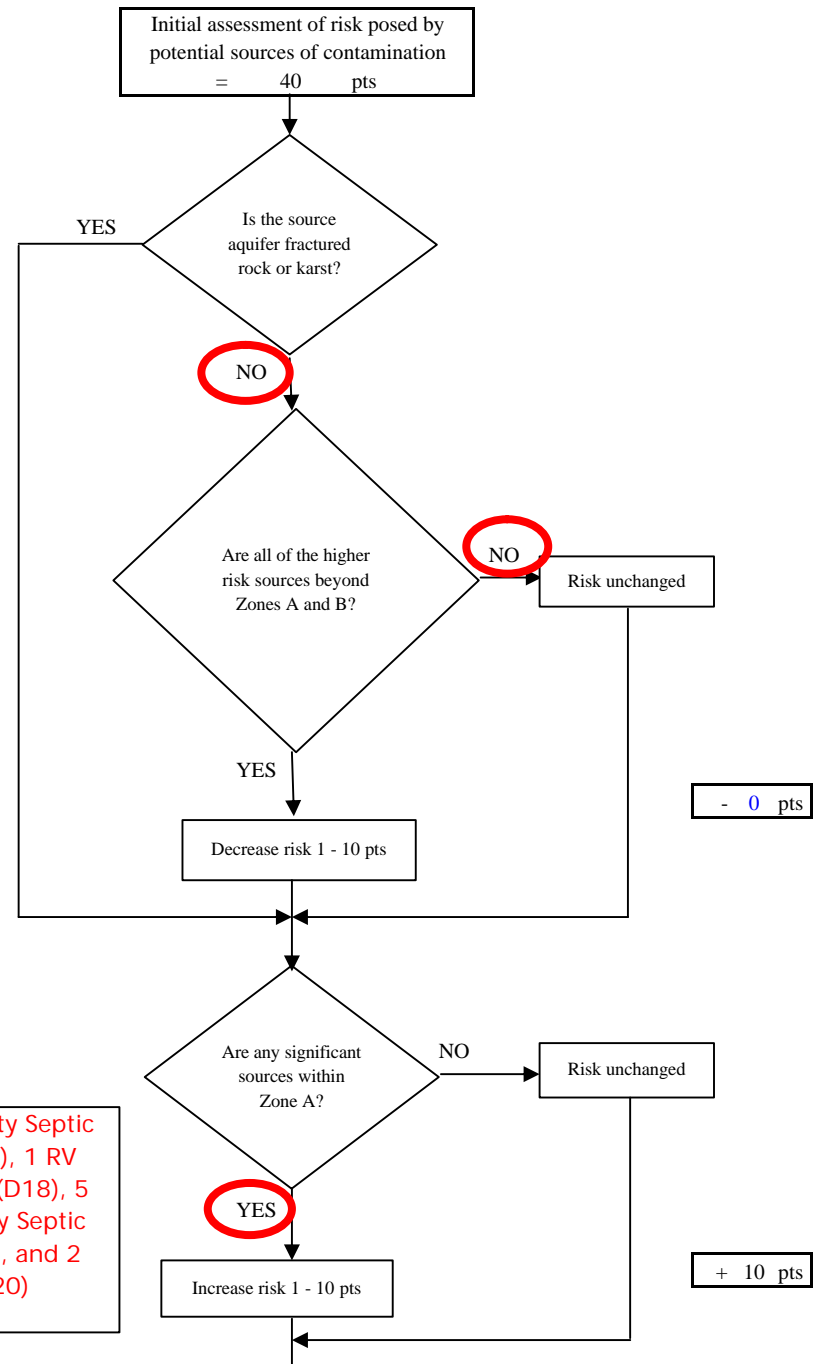


Risk Levels for Contaminant Sources identified in Zones A, B and C			
	Zone A	Zones B&C	Total
Very High(s)	0	0	0
High(s)	5	7	12
Medium(s)	0	0	0
Low(s)	8	2	10

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

Matrix Score 40

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



5 Large Capacity Septic Systems (D10), 1 RV Dump Station (D18), 5 Single Capacity Septic Systems (R02), and 2 Roads (X20)

Chart 5. Contaminant risks for Westmark Tok - Nitrates and Nitrites

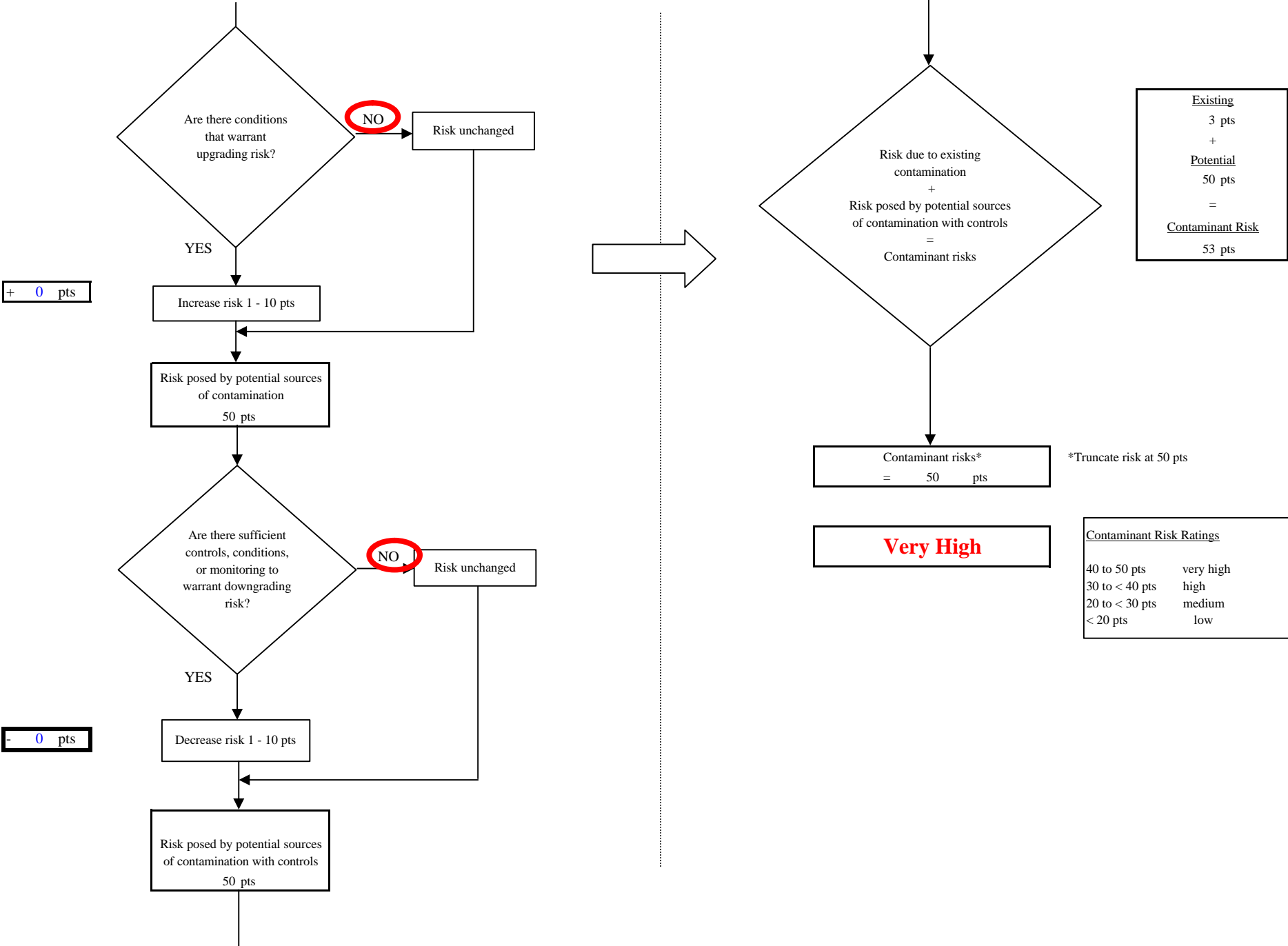


Chart 6. Vulnerability analysis for Westmark Tok - Nitrates and Nitrites

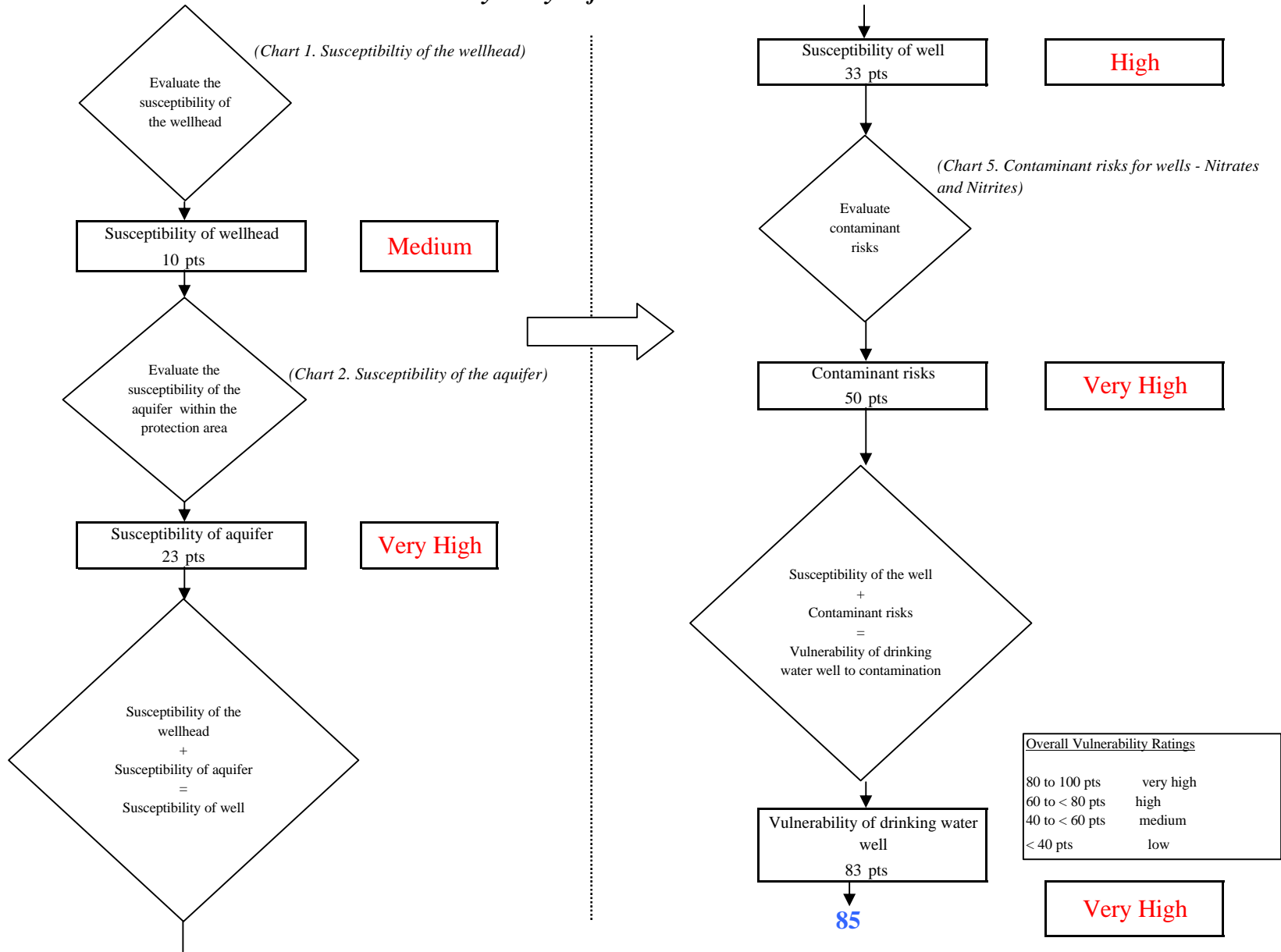


Chart 7. Contaminant risks for Westmark Tok - Volatile Organic Chemicals

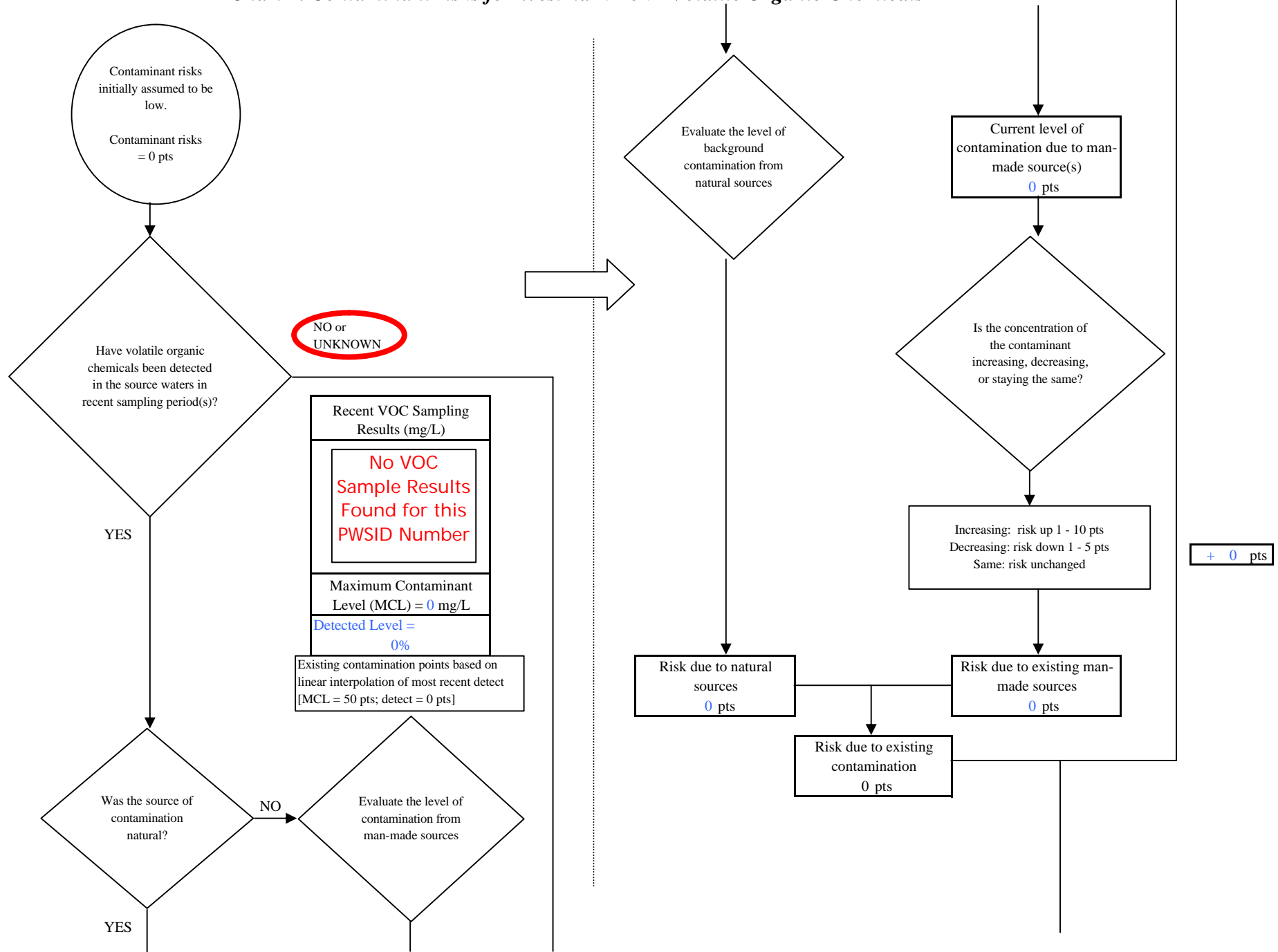
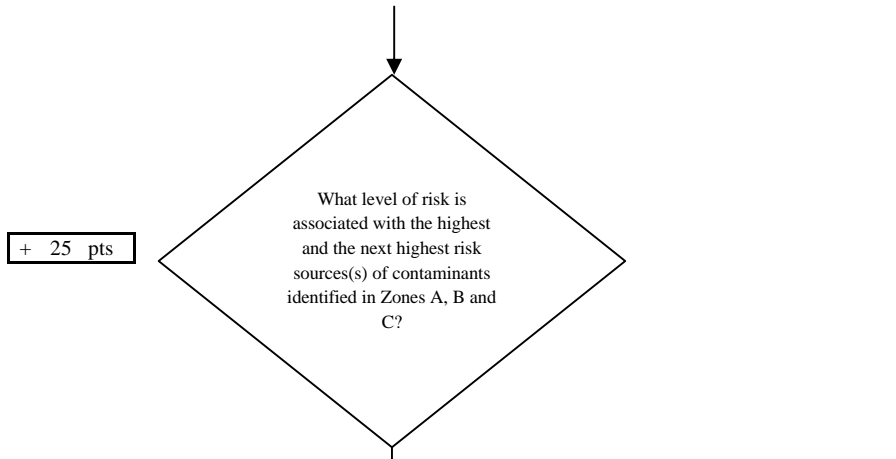


Chart 7. Contaminant risks for Westmark Tok - Volatile Organic Chemicals

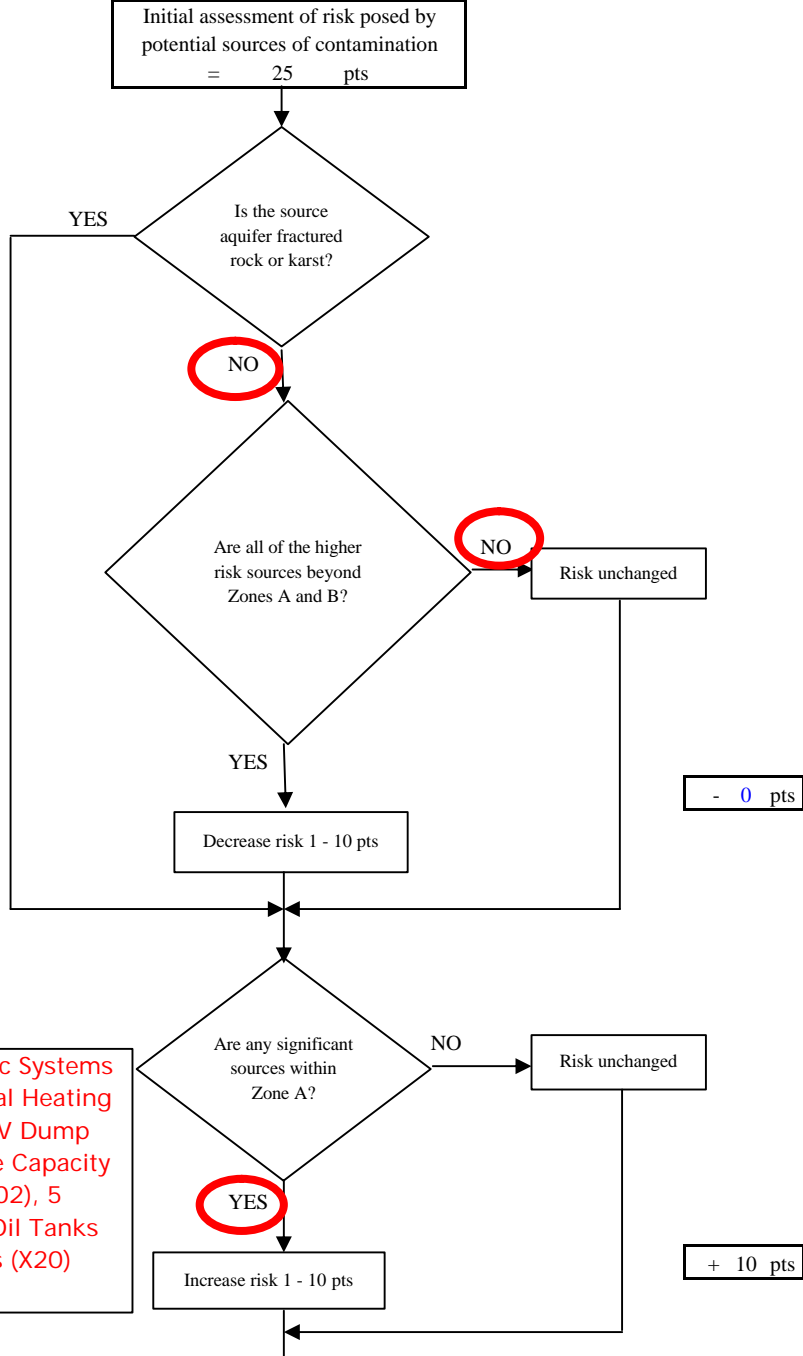


Risk Levels for Contaminant Sources identified in Zones A, B and C			
	Zone A	Zones B&C	Total
Very Highs(s)	0	0	0
High(s)	0	0	0
Medium(s)	5	3	8
Low(s)	14	12	26

	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 25

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.



5 Large Capacity Septic Systems (D10), 5 Nonresidential Heating Oil Tanks (T14), 1 RV Dump Station (D18), 5 Single Capacity Septic Systems (R02), 5 Residential Heating Oil Tanks (R08), and 2 Roads (X20)

Chart 7. Contaminant risks for Westmark Tok - Volatile Organic Chemicals

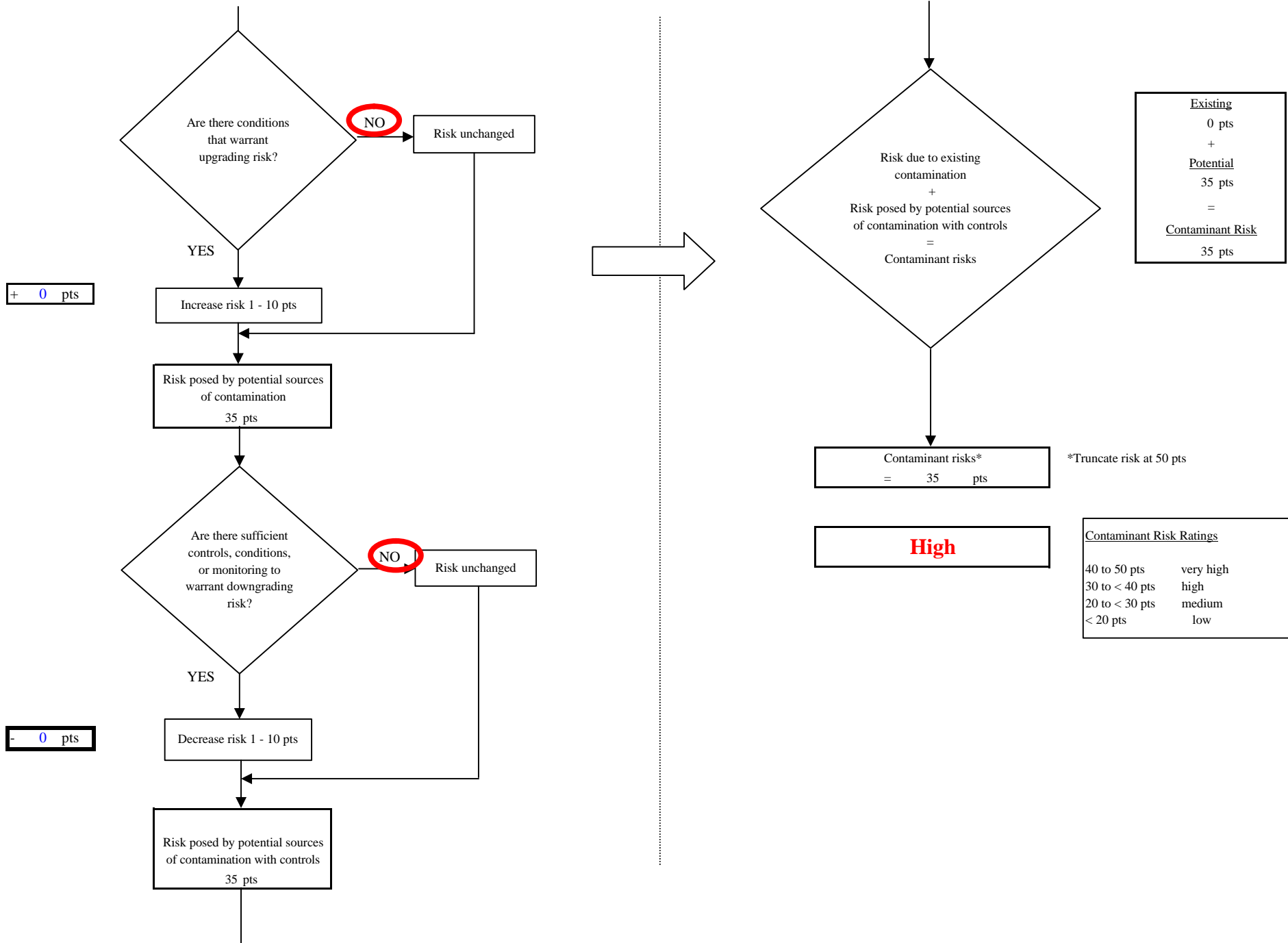


Chart 8. Vulnerability analysis for Westmark Tok - Volatile Organic Chemicals

