

Source Water Assessment

A Hydrogeologic Susceptibility and
Vulnerability Assessment for
Village Mobile Home Park Drinking
Water System,
Fairbanks area, Alaska
PWSID # 310803

DECEMBER 2002

DRINKING WATER PROTECTION PROGRAM REPORT Report 785
Alaska Department of Environmental Conservation

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Mobile Home Park Drinking Water
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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 Village Mobile Home Park Source of Public Drinking Water, Fairbanks Area, Alaska

Drinking Water Protection Program Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The public water system for Village Mobile Home Park is a Class A water system (community) consisting of one well along Howland Loop Road approximately 3 miles north of Fairbanks, Alaska. The wellhead received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **High**. Combining these two ratings produces a **Medium** rating for the natural susceptibility of the well. Identified potential and current sources of contaminants for Village Mobile Home Park public drinking water source include: residential septic systems, a large capacity septic system, fuel storage tanks, roads, and residential area. These identified potential and existing sources of contamination are considered as sources of bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide, and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals. Combining the natural susceptibility of the well with the contaminant risk, the public water source for Village Mobile Home Park received a vulnerability rating of **High** for heavy metals and nitrates and/or nitrites, a **Medium** for bacteria and viruses, and volatile organic chemicals, and a **Low** for synthetic organic chemicals and other organic chemicals.

VILLAGE MOBILE HOME PARK PUBLIC DRINKING WATER SYSTEM

Village Mobile Home Park public water system is a Class A (community) water system. The system consists of one well along Howland Loop Road between McGrath and Lowell Roads approximately 3 miles north of Fairbanks, Alaska (T1N, R1W, Section 24) (See Map 1 of Appendix A). Fairbanks and its surrounding communities are located in the Fairbanks North Star Borough which is near the center of Alaska (Please see the inset of Map 1 in Appendix A for location). The Borough's current population is 82,840 making it the second-largest population center in the state (ADCED, 2002). Communities located within the Borough include : College, Eielson Air Force Base, Ester, Fairbanks, Fox, Harding Lake, Moose Creek, North Pole, Pleasant Valley, Salcha, and Two Rivers.

The majority of residents in the Fairbanks area use individual wells or hauled water, and septic systems (ADCED, 2002). Heating oil (commonly stored in both above and below ground 275 to 500-gallon tanks) is most commonly used for heating homes and buildings (ADCED, 2002). Refuse is transported to the Fairbanks North Star Borough landfill.

The Fairbanks area includes two distinct topographic areas: the floodplain of the Tanana River and the Chena River, and the uplands north of this floodplain. The well for Village Mobile Home Park is located in the uplands at an elevation of approximately 725 feet above sea level.

According to the well log, the depth of the well is 218 feet and is screened in bedrock. Bedrock in this area is predominantly a metamorphosed marine mud deposit, called a pelitic schist. The schist is locally intruded by granitic rocks – granite and quartz diorite. Groundwater in the bedrock is principally contained in fractures. The water wells in this area with the greatest well recharge appear to be in quartz veins, quartzite, and siliceous schist (Nelson, 1978).

Groundwater in the uplands is recharged by local precipitation. Outflow of ground water in the uplands primarily occurs two ways. In areas under artesian pressure (pressure caused by overlying permafrost), water can flow to the surface through thawed conduits within the permafrost. Otherwise groundwater will flow under the permafrost (if present) and out to the groundwater beneath the adjacent flood plain or creek valley (Nelson, 1978).

The most recent Sanitary Survey (10/9/01) indicates the well was installed with a cap providing a sanitary seal. A properly installed sanitary seal may provide protection against contaminants from entering the source waters at the well casing. The land surface is also appropriately sloped away from the well providing adequate surface water drainage. The well is not grouted according to ADEC regulations. Proper grouting provides added protection against contaminants travelling along the well casing and into source waters. The well is not located in a known floodplain.

This system operates year-round and serves approximately 160 residents through 75 service connections.

DRINKING WATER PROTECTION AREA

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

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

An outline of the immediate watershed was used to determine the size and shape of the protection area for Village Mobile Home Park. Available geology was also considered to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful protection area (Please refer to the Guidance Manual for Class A Public Water Systems for additional information).

The protection areas established for wells by the ADEC are usually separated into four zones, limited by the watershed. These zones correspond to differences in the time-of-travel (TOT) of the water moving through the aquifer to the well. The protection area for Village Mobile Home Park is limited by its immediate watershed and includes only Zone A (See Map 1 of Appendix A). 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*), and State of Alaska Department of Water Resources (*Jokela et. al., 1991*).

The time of travel 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 |

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 Village Mobile Home Park protection area. 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 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.

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 time-of-travel 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 7 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 VILLAGE MOBILE HOME PARK DRINKING WATER SYSTEM

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

- Natural susceptibility; and
- Contaminant risks.

Appendix D contains fourteen 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 14 contain the Contaminant Risks and Vulnerability Analyses for nitrates and nitrites, volatile organic chemicals, heavy metals, synthetic organic chemicals, and other 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 Village Mobile Home Park is completed in a confined fractured bedrock aquifer. The nearly impermeable confining layers above the aquifer create a barrier to contaminants traveling downward from the surface with the precipitation and surface water runoff. Although the aquifer is relatively protected in the area of the well, the water supply wells upgradient of the well offer an easy pathway for contaminants to travel down into the confined aquifer and towards the well. Table 2 shows the Susceptibility scores and ratings for Village Mobile Home Park.

Table 2. Susceptibility

| | Score | Rating |
|--------------------------------|-------|--------|
| Susceptibility of the Wellhead | 5 | Low |
| Susceptibility of the Aquifer | 15 | Medium |
| Natural Susceptibility | 20 | Medium |

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 | 37 | High |
| Nitrates and/or Nitrites | 45 | Very High |
| Volatile Organic Chemicals | 35 | High |
| Heavy Metals, Cyanide and Other Inorganic Chemicals | 50 | Very High |
| Synthetic Organic Chemicals | 10 | Low |
| Other Organic Chemicals | 10 | Low |

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

$$\begin{aligned} &\text{Natural Susceptibility (0 – 50 points)} \\ &+ \\ &\text{Contaminant Risks (0 – 50 points)} \\ &= \end{aligned}$$

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 | 55 | Medium |
| Nitrates and Nitrites | 65 | High |
| Volatile Organic Chemicals | 55 | Medium |
| Heavy Metals, Cyanide, and Other Inorganic Chemicals | 70 | High |
| Synthetic Organic Chemicals | 30 | Low |
| Other Organic Chemicals | 30 | Low |

Bacteria and Viruses

The contaminant risk for bacteria and viruses is high with the large capacity septic system and the density of residential septic systems nearest to the well representing the greatest risk 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. Bacteria and viruses have not been detected during recent sampling of this water system. After combining the contaminant risk for bacteria and viruses with the natural susceptibility of the well, the overall vulnerability of the well to contamination is medium.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is very high with the septic system nearest the well representing the greatest risk to this source of public drinking water (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Nitrates are very mobile, moving at approximately the same rate as water. Sampling history for the Village Mobile Home Park well indicates that low concentrations of nitrate have been detected in the drinking water. Existing nitrate concentration is approximately 0.17 mg/L or about 17% of the Maximum Contaminant Level (MCL) of 10 mg/L. The MCL is the maximum level of contaminant that is allowed to exist in drinking water by the Environmental Protection Agency (EPA). Nitrate concentrations have remained consistent with concentrations varying from 1.69 to 1.95 mg/L within the past 5 years. After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is high with the density of heating oil storage tanks creating the greatest risk for volatile organic chemicals (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

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

Volatile Organic Chemicals were not detected during the most recent sampling on 12/26/00. After combining the contaminant risk for volatile organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is medium.

Heavy Metals, Cyanide, and Other Inorganic Chemicals

The contaminant risk for heavy metals is very high with the gasoline storage tanks in the protection area creating risk (See Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

Arsenic was detected at a significant level (0.008 mg/L) when it was most recently sampled on 8/13/93. The EPA's MCL for arsenic is 0.010 mg/L. The concentrations of arsenic in the water could be from the natural erosion of the bedrock in the area. Prolonged exposure of arsenic may cause skin damage, problems with the circulatory system, and may increase the risk of cancer (EPA, 2002). Barium, cadmium, fluoride, mercury, and selenium were detected in very low concentrations during the most recent sampling on 8/13/93. Antimony, beryllium, cyanide, nickel, and thallium were not detected during recent sampling periods (most recent was on 12/26/00). After combining the contaminant risk for heavy metals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is high.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is low with the residential activities creating risk. Synthetic Organic Chemicals were sampled for in 1985 but not detected. After combining the contaminant risk with the natural susceptibility of the well, the overall vulnerability to synthetic organic chemicals of the well is low (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

Other Organic Chemicals

The contaminant risk for other organic chemicals is low with the residential activities within the protection area creating the risk. After combining the contaminant risk with the natural susceptibility of the well, the overall vulnerability to other organic chemicals of the well is low (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

Other organic chemicals have not been sampled for in Village Mobile Home Park's drinking water system.

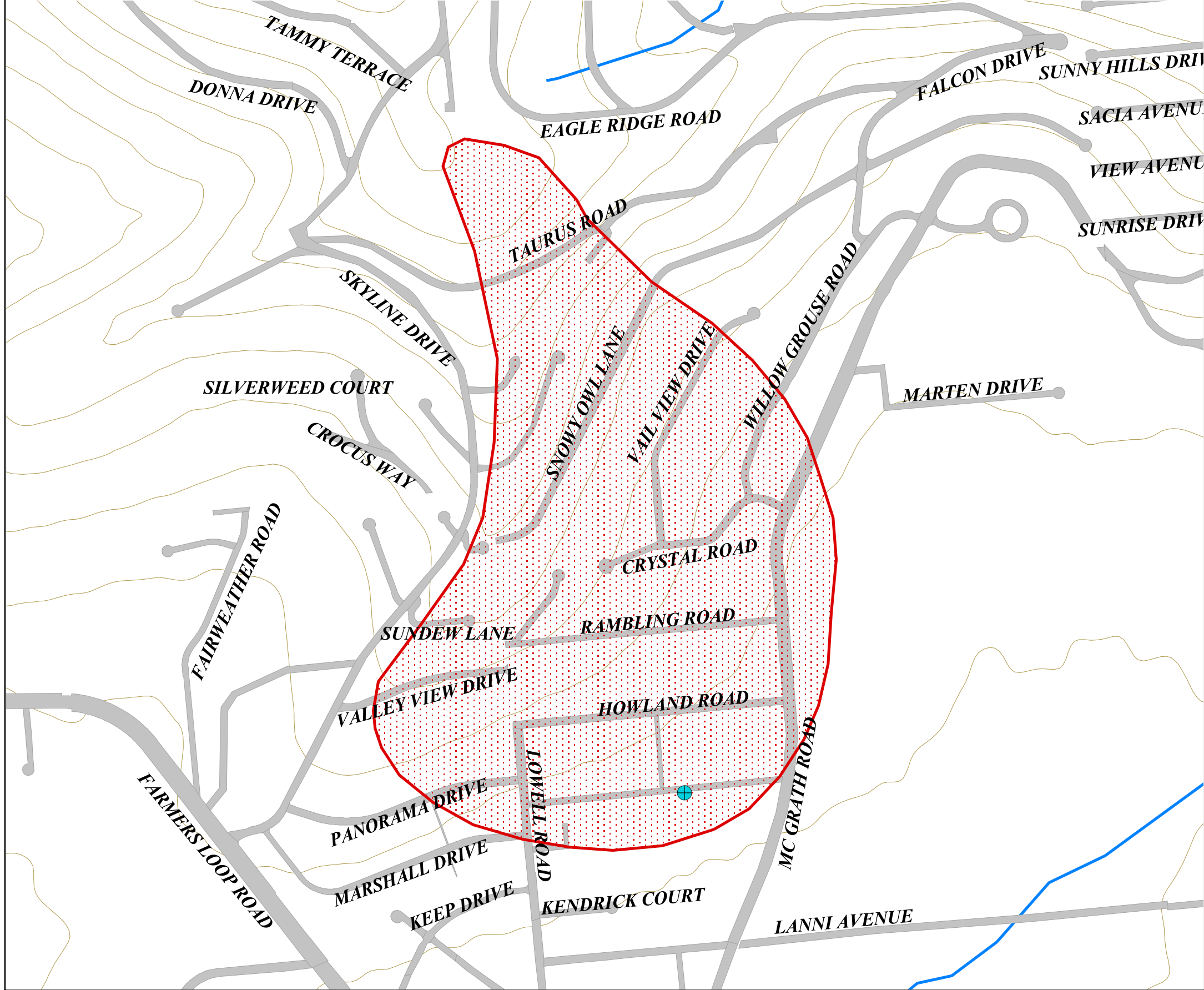
REFERENCES

- Alaska Department of Community and Economic Development (ADCED), 2002 [WWW document]. URL http://www.dced.state.ak.us/mra/CF_BLOCK.cfm.
- Forbes, R.B. and Weber, F.R., 1981. Bedrock Geologic Map of the Fairbanks Mining District, Alaska. Funded by the State of Alaska, US Geological Survey, and The National Science Foundation.
- Freeze, R.A. and Cherry, J.A., 1979. Groundwater. Prentice-Hall, Englewood Cliffs, NJ.
- Jokela, J.B., Munter, J.A., and Evans, J.G., 1991, Ground-water resources of the Palmer-Big Lake area, Alaska: a conceptual model. Division of Geological & Geophysical Surveys Reports of Investigations 90-4, State of Alaska Department of Natural Resources, Fairbanks, AK.
- King, P.B., compiler, 1969, Tectonic map of North America: US Geological Survey Map, (scale 1:5,000,000) 2 sheets.
- Nelson, Gordon L., 1978, Hydrologic Information for Land-Use Planning, Fairbanks Vicinity, Alaska. US Department of the Interior Geological Survey Open File Report 78-959, 47p.
- Patrick, L.D., Brabets, T.P., and Glass, R.L., 1989, Simulation of ground-water flow at Anchorage, Alaska: US Geological Survey Water-Resources Investigations Report 88-4139, 41p.
- United States Environmental Protection Agency (EPA), 2002 [WWW document]. URL <http://www.epa.gov/safewater/mcl.html>.





APPENDIX A

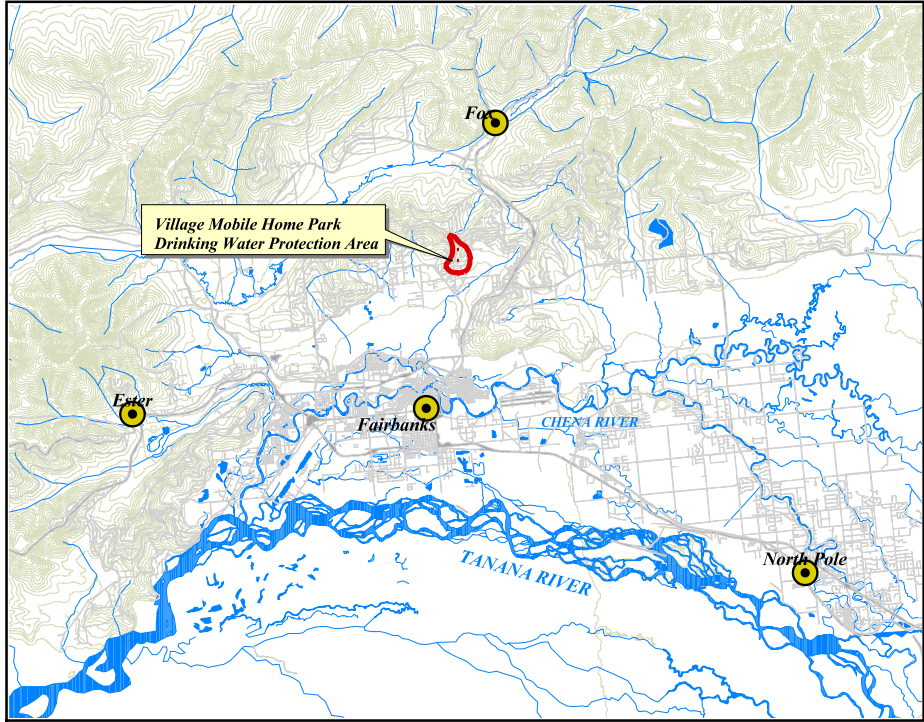
Village Mobile Home Park Drinking Water Protection Area Location Map (Map 1)

Village Mobile Home Park Drinking Water Protection Area



Legend

-  Village Mobile Home Park
-  Zone A Protection Area
-  Roads
-  Rivers and streams
-  Elevation Contours (20 m)



PWSID 310803



Map 1

APPENDIX B

Contaminant Source Inventory and Risk Ranking for Village Mobile Home Park (Tables 1-7)

Table 1

**Contaminant Source Inventory for
FNSB - Weller Elementary**

PWSID 310251.001

| Contaminant Source Type | Contaminant Source ID | CS ID tag | Zone | Map Number | Comments |
|---|------------------------------|------------------|-------------|-------------------|---|
| Construction trade areas and materials | C09 | C09-1 | A | 2 | 935 Highland Street |
| Residential Areas | R01 | | A | 2 | Approximately 400 acres of residential area |
| Septic systems (serves one single-family home) | R02 | | A | 2 | Approximately 137 septic systems (approximated by number of parcels designated as residential) |
| Tanks, heating oil, residential (above ground) | R08 | | A | 2 | Approximately 137 heating oil tanks (approximated by number of parcels designated as residential) |
| Open Leaking Underground Fuel Storage Tank (LUST) Sites | U07 | U07-1 | A | 2 | Waste oil tank at the Firehouse |
| Highways and roads, dirt/gravel | X24 | | A | 2 | Approximately 11 roads located within the protection area |
| Firehouses | X38 | X38-1 | A | 2 | 585 Steele Creek Road |

Table 2

*Contaminant Source Inventory and Risk Ranking for
FNSB - Weller Elementary
Sources of Bacteria and Viruses*

PWSID 310251.001

| <i>Contaminant Source Type</i> | <i>Contaminant Source ID</i> | <i>CS ID tag</i> | <i>Zone</i> | <i>Risk Ranking for Analysis</i> | <i>Map Number</i> | <i>Comments</i> |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Septic systems (serves one single-family home) | R02 | | A | Low | 2 | Approximately 137 septic systems (approximated by number of parcels designated as residential) |
| Highways and roads, dirt/gravel | X24 | | A | Low | 2 | Approximately 11 roads located within the protection area |
| Residential Areas | R01 | | A | Low | 2 | Approximately 400 acres of residential area |

Table 3

*Contaminant Source Inventory and Risk Ranking for
FNSB - Weller Elementary
Sources of Nitrates/Nitrites*

PWSID 310251.001

| <i>Contaminant Source Type</i> | <i>Contaminant Source ID</i> | <i>CS ID tag</i> | <i>Zone</i> | <i>Risk Ranking for Analysis</i> | <i>Map Number</i> | <i>Comments</i> |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Septic systems (serves one single-family home) | R02 | | A | Low | 2 | Approximately 137 septic systems (approximated by number of parcels designated as residential) |
| Highways and roads, dirt/gravel | X24 | | A | Low | 2 | Approximately 11 roads located within the protection area |
| Residential Areas | R01 | | A | Low | 2 | Approximately 400 acres of residential area |

Table 4

*Contaminant Source Inventory and Risk Ranking for
FNSB - Weller Elementary
Sources of Volatile Organic Chemicals*

PWSID 310251.001

| <i>Contaminant Source Type</i> | <i>Contaminant Source ID</i> | <i>CS ID tag</i> | <i>Zone</i> | <i>Risk Ranking for Analysis</i> | <i>Map Number</i> | <i>Comments</i> |
|---|------------------------------|------------------|-------------|----------------------------------|-------------------|---|
| Highways and roads, dirt/gravel | X24 | | A | Low | 2 | Approximately 11 roads located within the protection area |
| Septic systems (serves one single-family home) | R02 | | A | Low | 2 | Approximately 137 septic systems (approximated by number of parcels designated as residential) |
| Residential Areas | R01 | | A | Low | 2 | Approximately 400 acres of residential area |
| Tanks, heating oil, residential (above ground) | R08 | | A | Medium | 2 | Approximately 137 heating oil tanks (approximated by number of parcels designated as residential) |
| Construction trade areas and materials | C09 | C09-1 | A | Low | 2 | 935 Highland Street |
| Open Leaking Underground Fuel Storage Tank (LUST) Sites | U07 | U07-1 | A | Low | 2 | Waste oil tank at the Firehouse |
| Firehouses | X38 | X38-1 | A | Low | 2 | 585 Steele Creek Road |

Table 5

*Contaminant Source Inventory and Risk Ranking for
FNSB - Weller Elementary
Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals*

PWSID 310251.001

| <i>Contaminant Source Type</i> | <i>Contaminant Source ID</i> | <i>CS ID tag</i> | <i>Zone</i> | <i>Risk Ranking for Analysis</i> | <i>Map Number</i> | <i>Comments</i> |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Septic systems (serves one single-family home) | R02 | | A | Low | 2 | Approximately 137 septic systems (approximated by number of parcels designated as residential) |
| Highways and roads, dirt/gravel | X24 | | A | Low | 2 | Approximately 11 roads located within the protection area |
| Residential Areas | R01 | | A | Low | 2 | Approximately 400 acres of residential area |
| Construction trade areas and materials | C09 | C09-1 | A | Low | 2 | 935 Highland Street |
| Firehouses | X38 | X38-1 | A | Low | 2 | 585 Steele Creek Road |

Table 6

*Contaminant Source Inventory and Risk Ranking for
FNSB - Weller Elementary
Sources of Synthetic Organic Chemicals*

PWSID 310251.001

| <i>Contaminant Source Type</i> | <i>Contaminant Source ID</i> | <i>CS ID tag</i> | <i>Zone</i> | <i>Risk Ranking for Analysis</i> | <i>Map Number</i> | <i>Comments</i> |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Residential Areas | R01 | | A | Low | 2 | Approximately 400 acres of residential area |
| Septic systems (serves one single-family home) | R02 | | A | Low | 2 | Approximately 137 septic systems (approximated by number of parcels designated as residential) |

Table 7

*Contaminant Source Inventory and Risk Ranking for
FNSB - Weller Elementary
Sources of Other Organic Chemicals*

PWSID 310251.001

| <i>Contaminant Source Type</i> | <i>Contaminant Source ID</i> | <i>CS ID tag</i> | <i>Zone</i> | <i>Risk Ranking for Analysis</i> | <i>Map Number</i> | <i>Comments</i> |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Highways and roads, dirt/gravel | X24 | | A | Low | 2 | Approximately 11 roads located within the protection area |
| Septic systems (serves one single-family home) | R02 | | A | Low | 2 | Approximately 137 septic systems (approximated by number of parcels designated as residential) |
| Residential Areas | R01 | | A | Low | 2 | Approximately 400 acres of residential area |
| Construction trade areas and materials | C09 | C09-1 | A | Low | 2 | 935 Highland Street |

APPENDIX C

Village Mobile Home Park Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map 2)

Village Mobile Home Park Drinking Water Protection Area with Potential and Existing Contaminant Sources



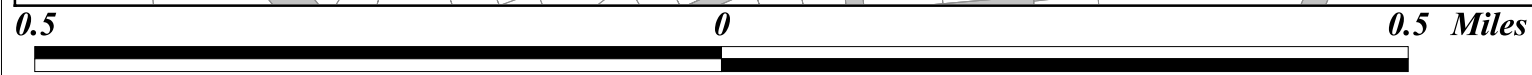
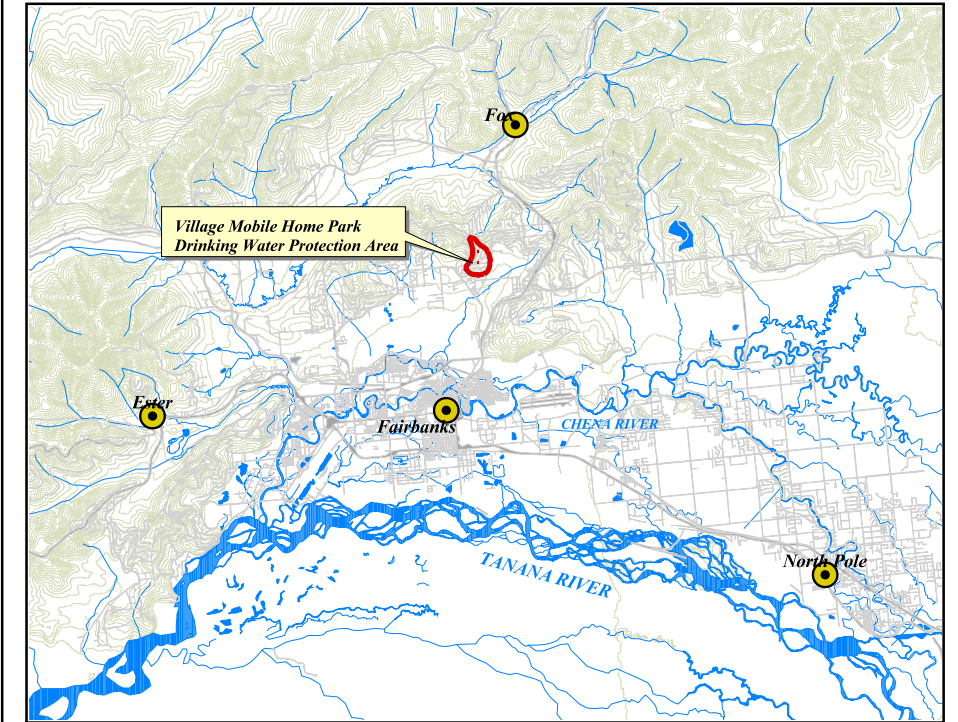
Approximately 121 residential septic systems (R02) within Zone A

Approximately 175 acres of residential area (R01)

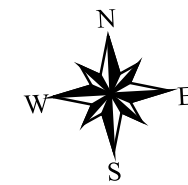
Approximately 235 residential above ground heating oil storage tanks (R08) within Zone A

Legend

- Village Mobile Home Park
- Zone A Protection Area
- Contaminant Sources**
- Large Capacity Septic System (D10)
- Above Ground Gasoline Storage Tanks (T10)
- Residential Area (R01)
- Residential septic systems (R02) and heating oil AST (R08)
- Residential above ground heating oil tanks (R08)
- Parcels
- Roads



PWSID 310803



Map 2

APPENDIX D

Vulnerability Analysis for Village Mobile Home Park Public Drinking Water Source (Charts 1-14)

Chart 1. Susceptibility of the wellhead - Village Mobile Home Park

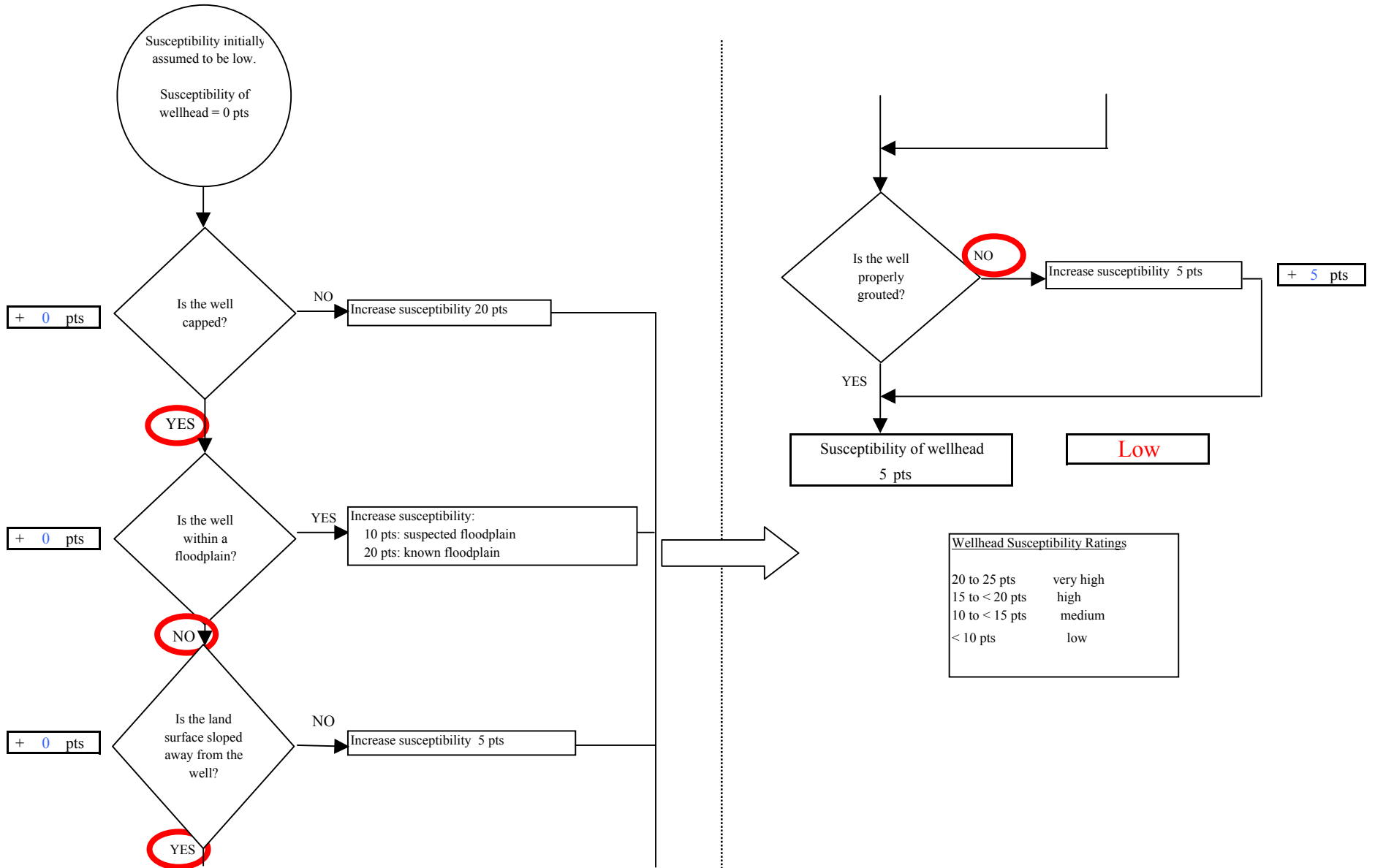


Chart 2. Susceptibility of the aquifer - Village Mobile Home Park

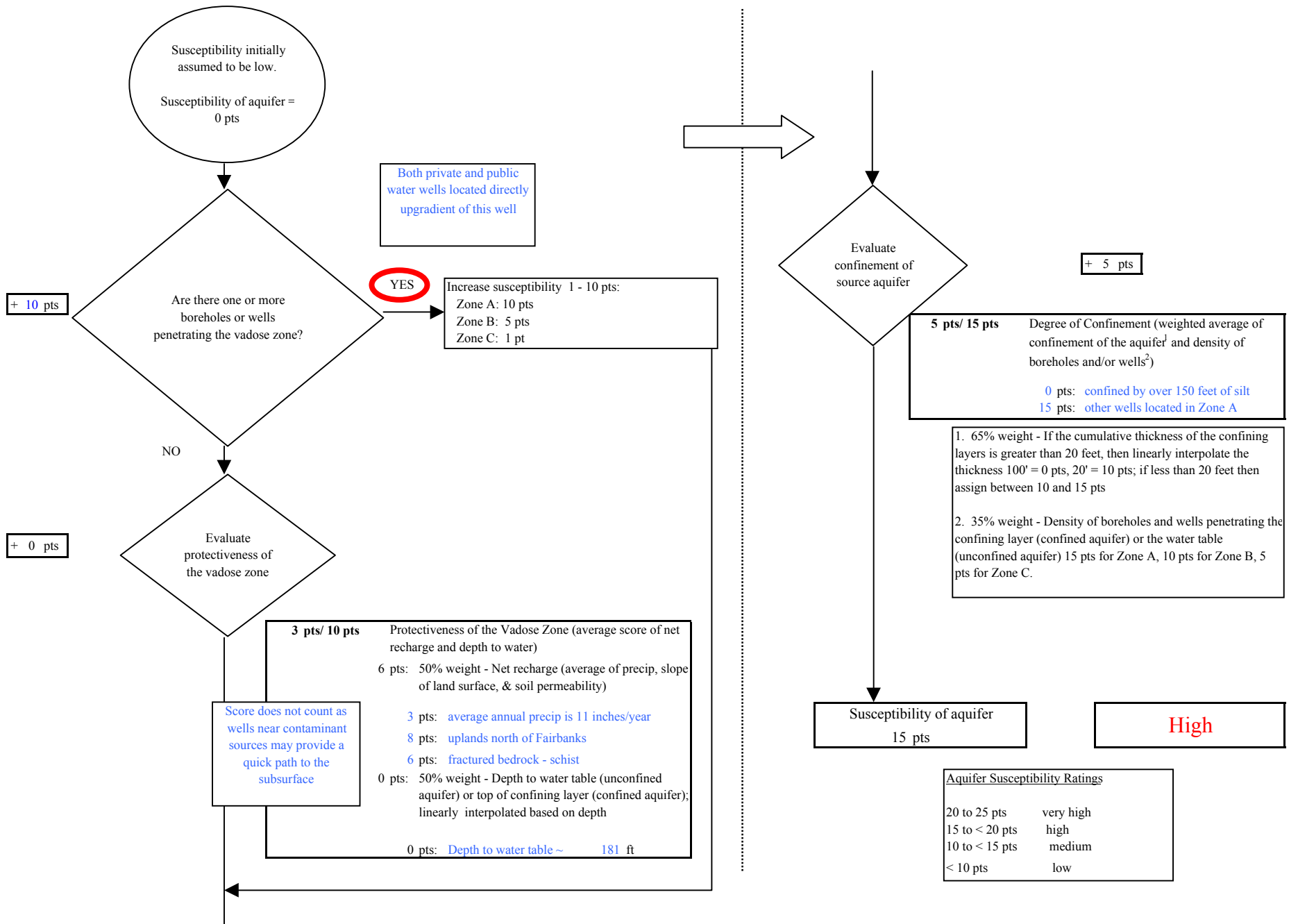
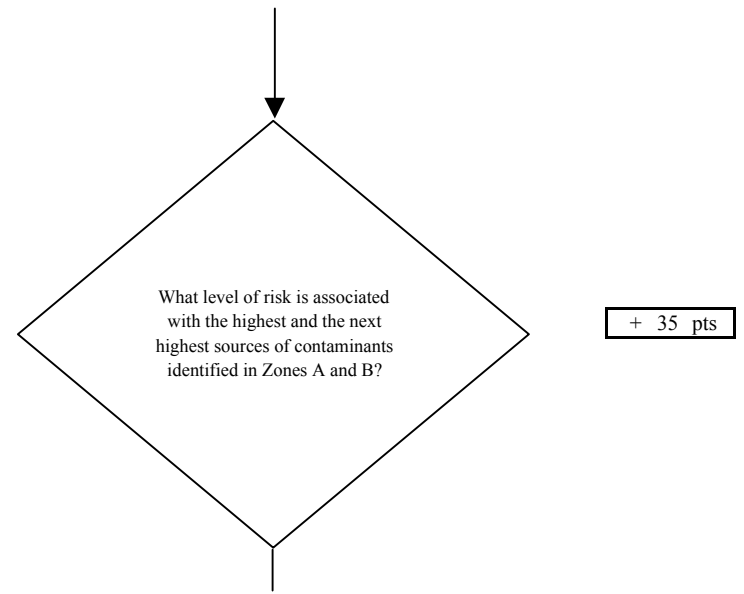
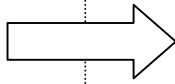
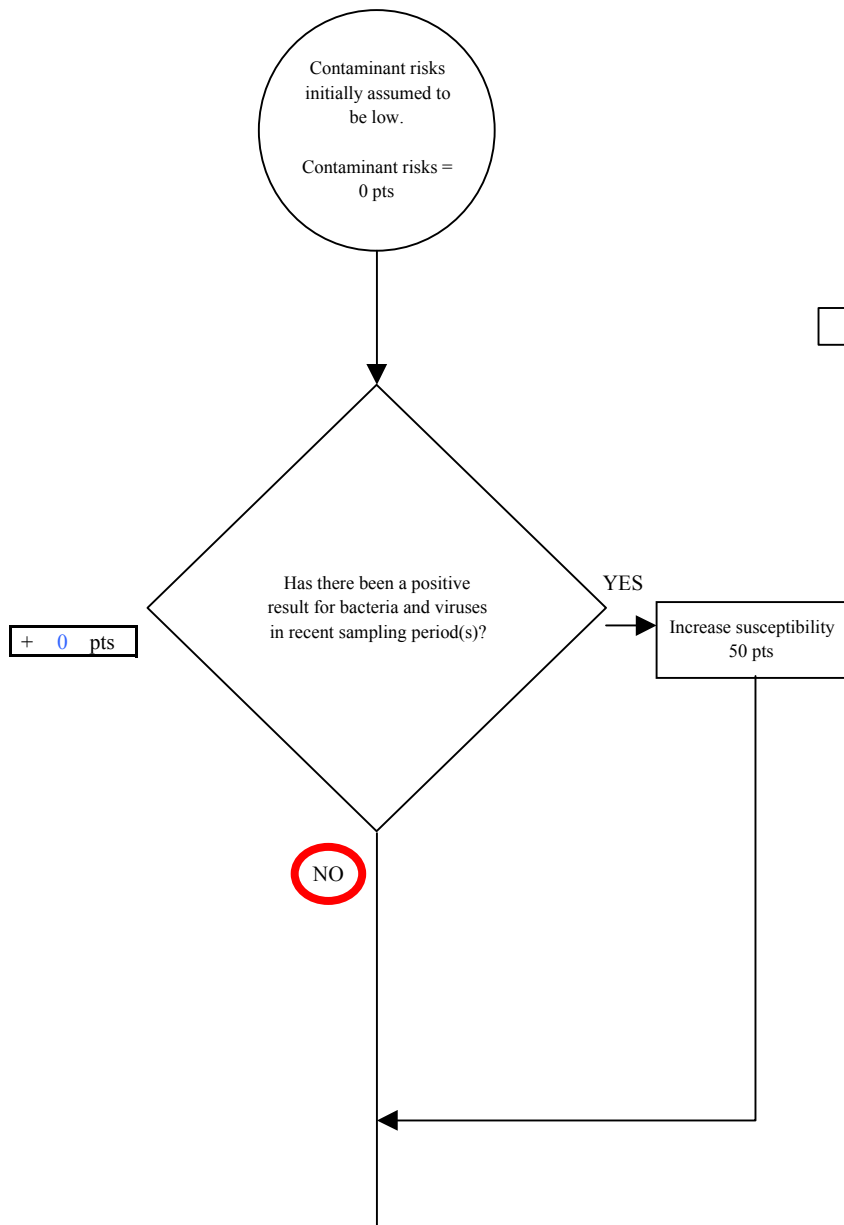


Chart 3. Contaminant risks for Village Mobile Home Park - Bacteria & Viruses



Risk Rankings for Contaminant Sources Identified in Zones A and B

| | Zone A | Zone B | Total |
|--------------|--------|--------|-------|
| Very High(s) | 0 | 0 | 0 |
| High(s) | 1 | 0 | 1 |
| Medium(s) | 0 | 0 | 0 |
| Low(s) | 126 | 0 | 126 |

| | 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 | ≥ 3 sources + 5 pts | ≥ 10 sources + 5 pts |
| HIGH | ---- | ---- | ≥ 1 source + 10 pts | ≥ 2 sources + 10 pts |
| VERY HIGH | ---- | ---- | ---- | ≥ 1 source + 10 pts |

Matrix Score 35

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 Village Mobile Home Park - Bacteria & Viruses

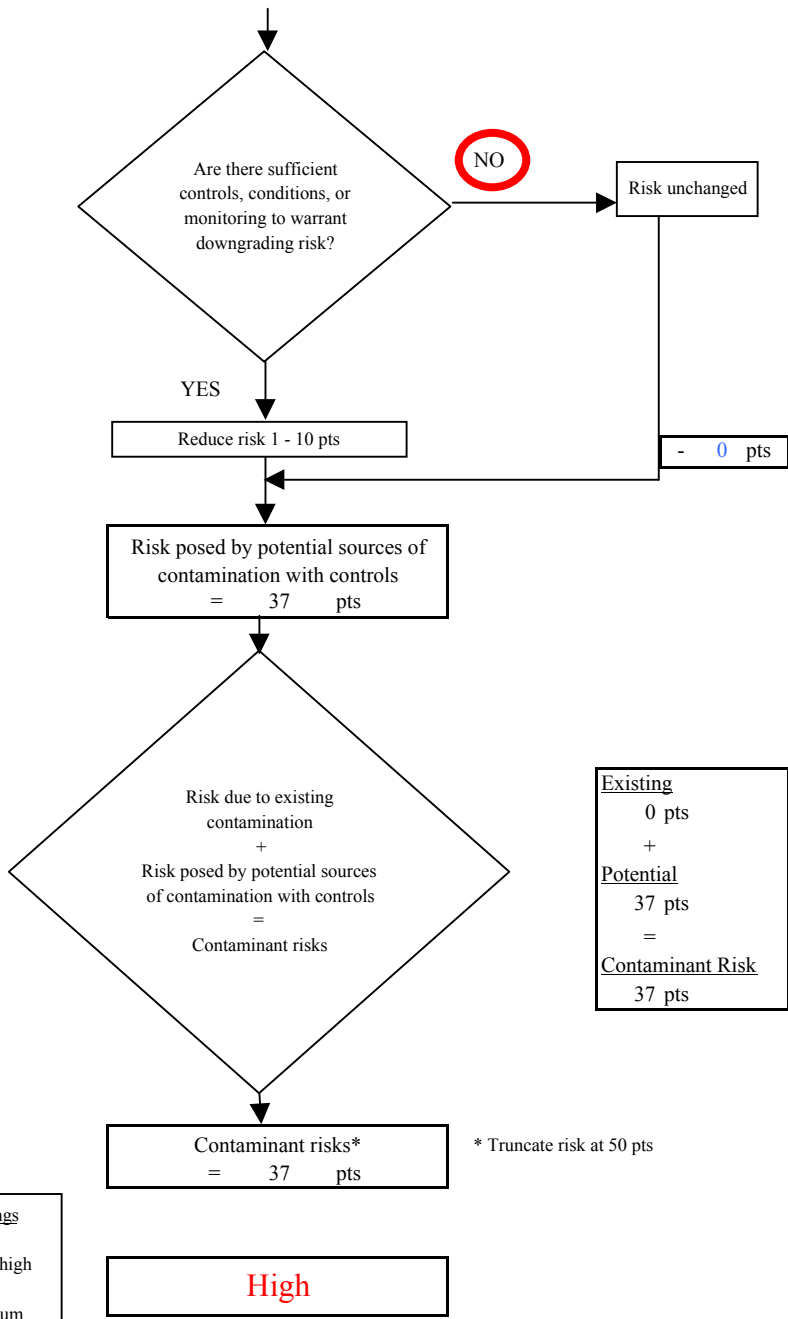
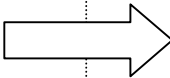
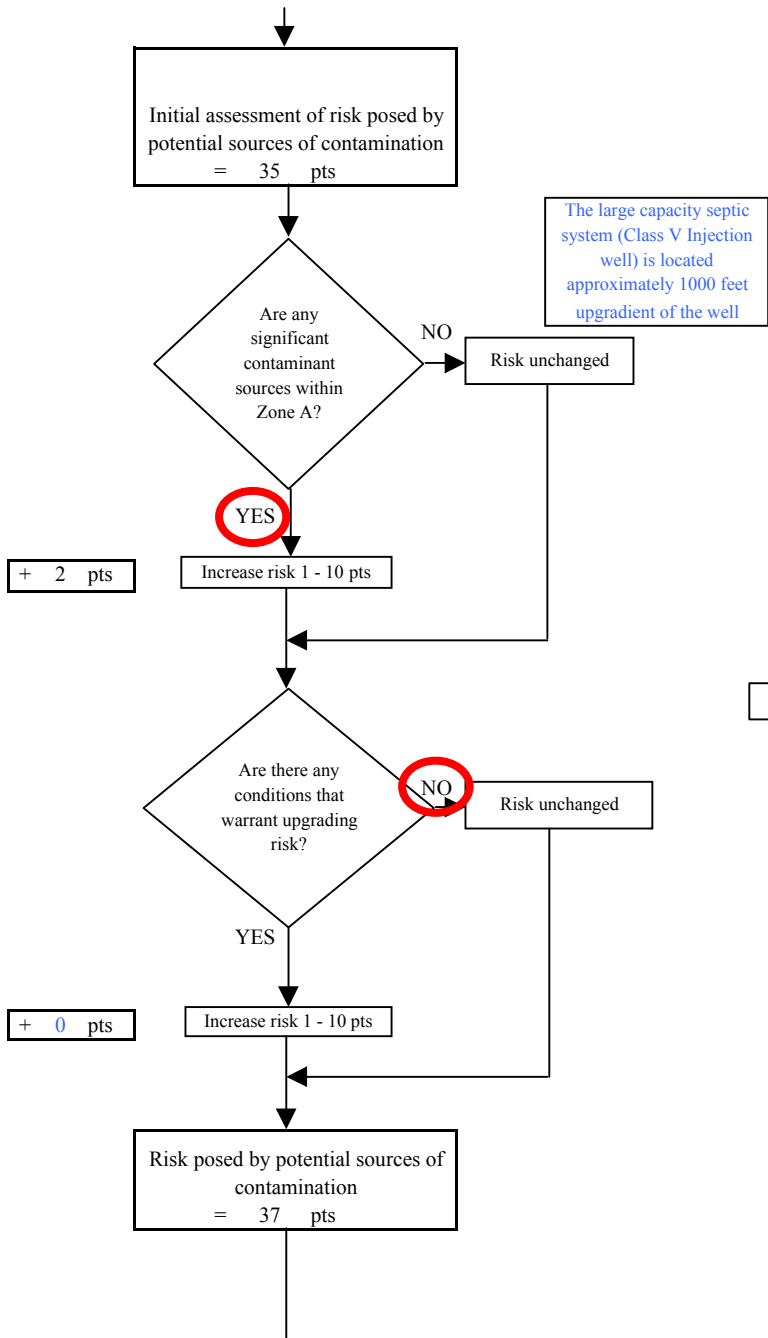


Chart 4. Vulnerability analysis for Village Mobile Home Park - Bacteria & Viruses

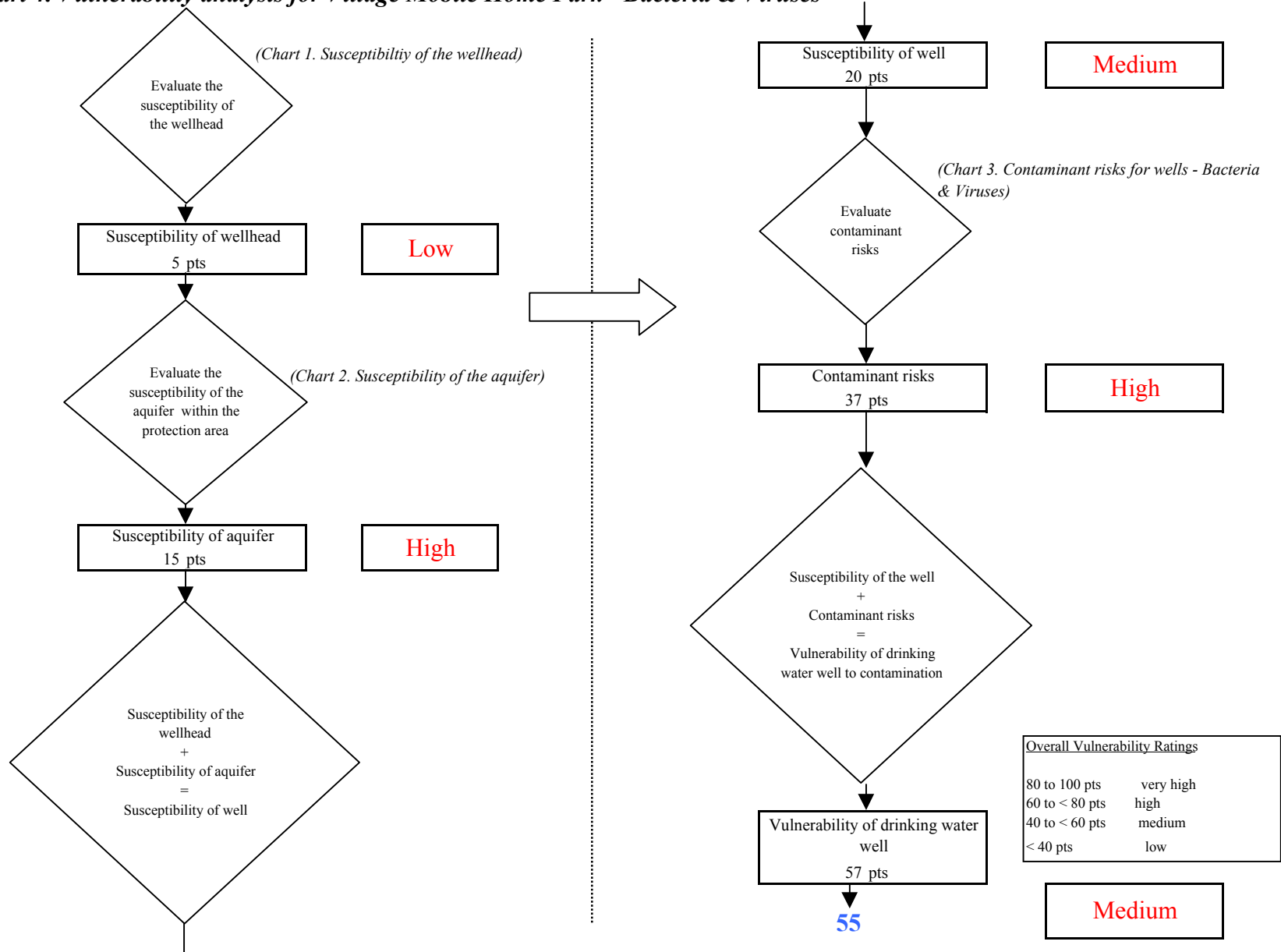


Chart 5. Contaminant risks for Village Mobile Home Park - Nitrates and Nitrites

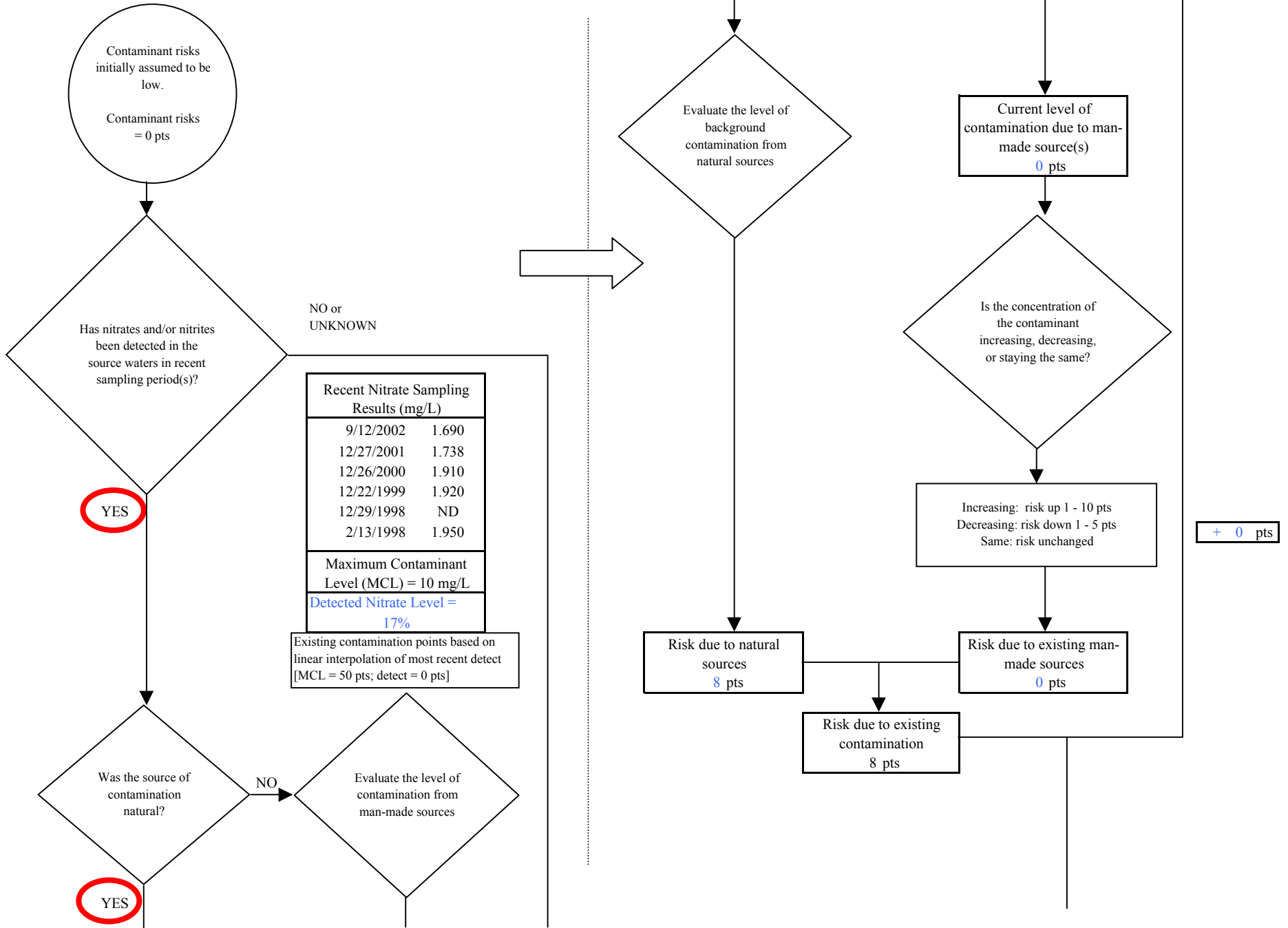
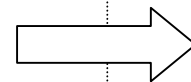
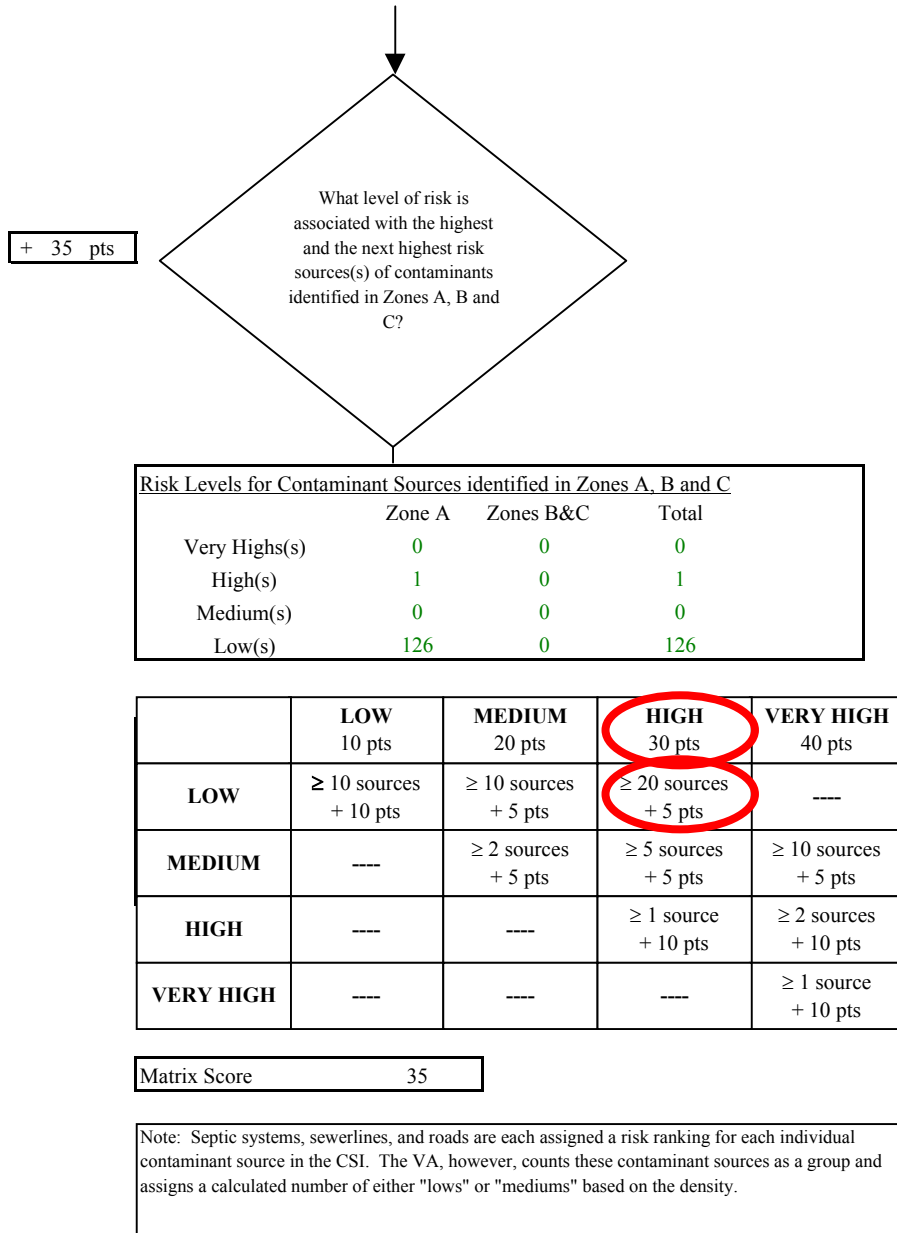


Chart 5. Contaminant risks for Village Mobile Home Park - Nitrates and Nitrites



The large capacity septic system (Class V Injection well) is located approximately 1000 feet upgradient of the well

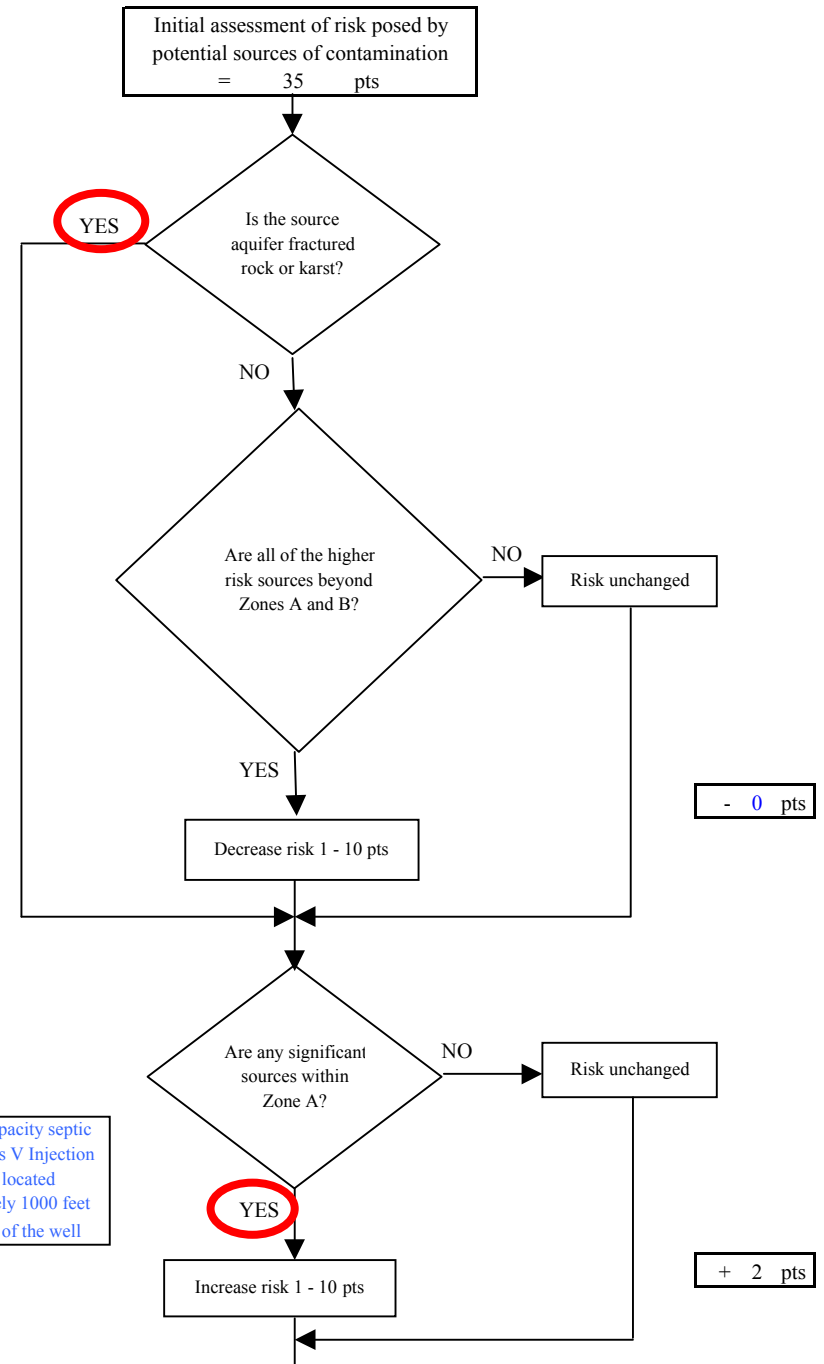


Chart 5. Contaminant risks for Village Mobile Home Park - Nitrates and Nitrites

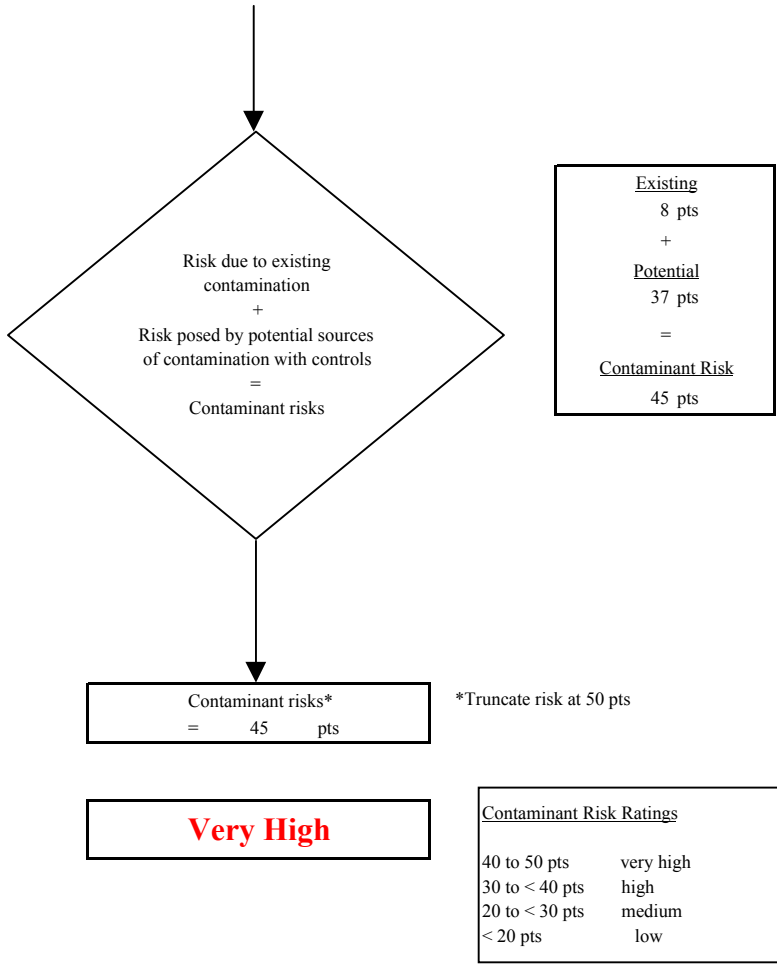
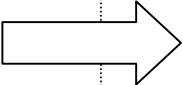
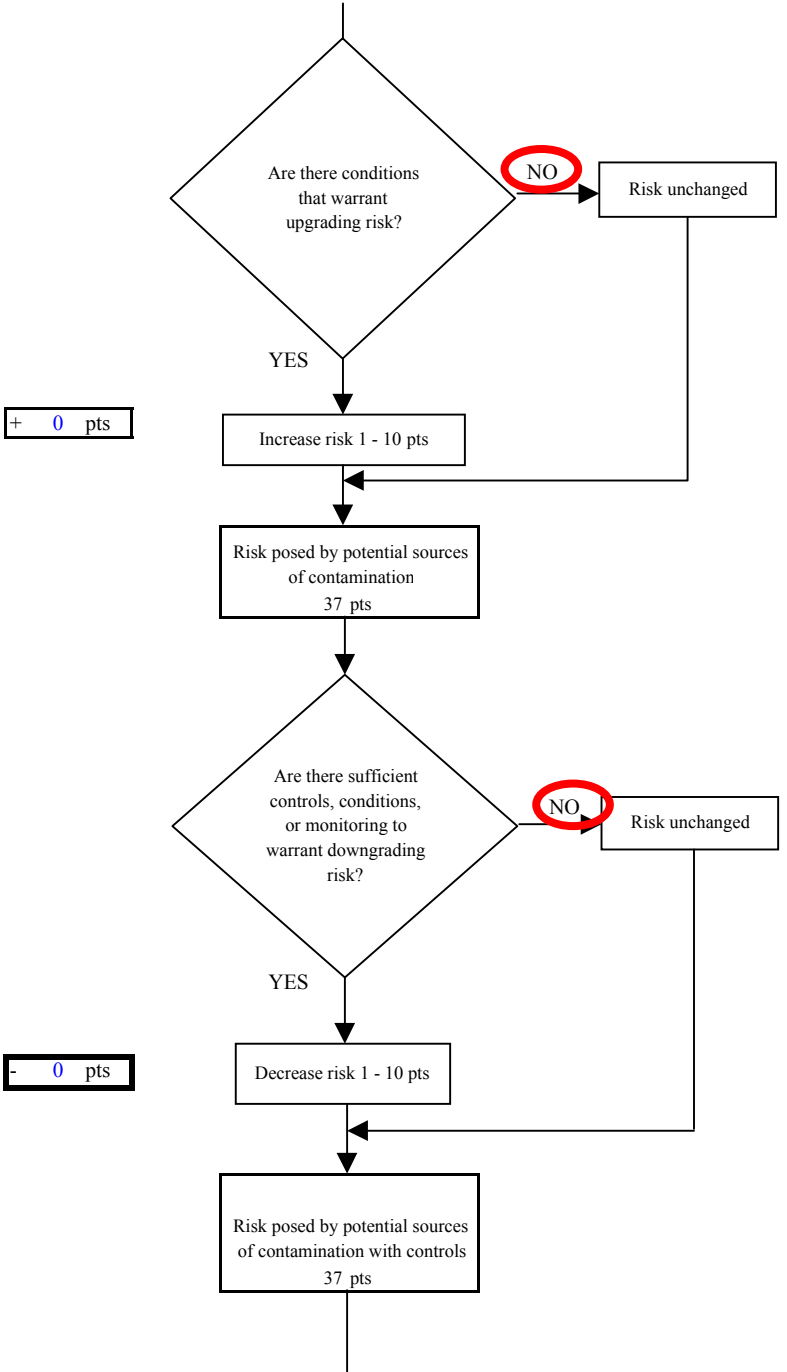


Chart 6. Vulnerability analysis for Village Mobile Home Park - Nitrates and Nitrites

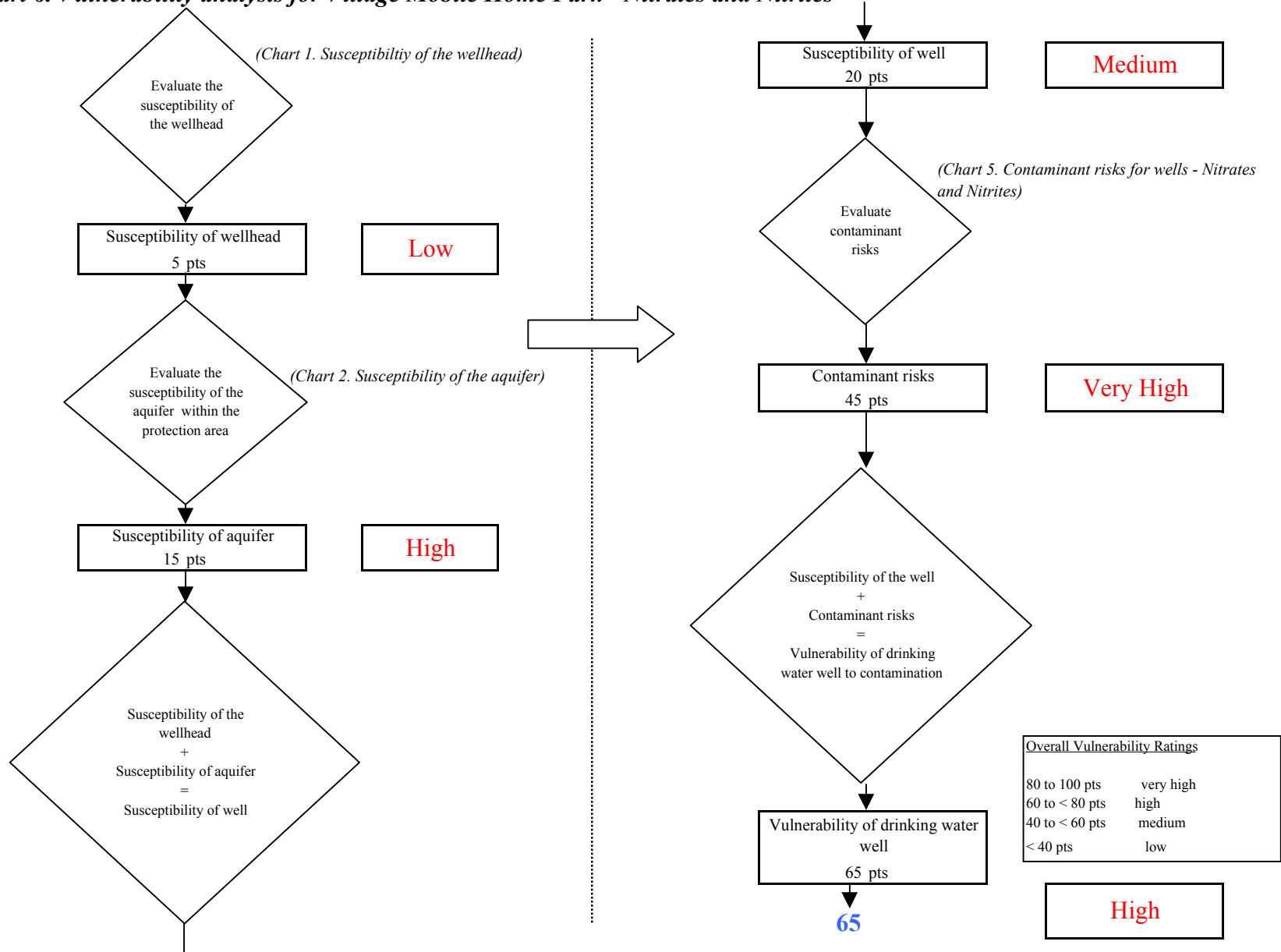


Chart 7. Contaminant risks for Village Mobile Home Park - Volatile Organic Chemicals

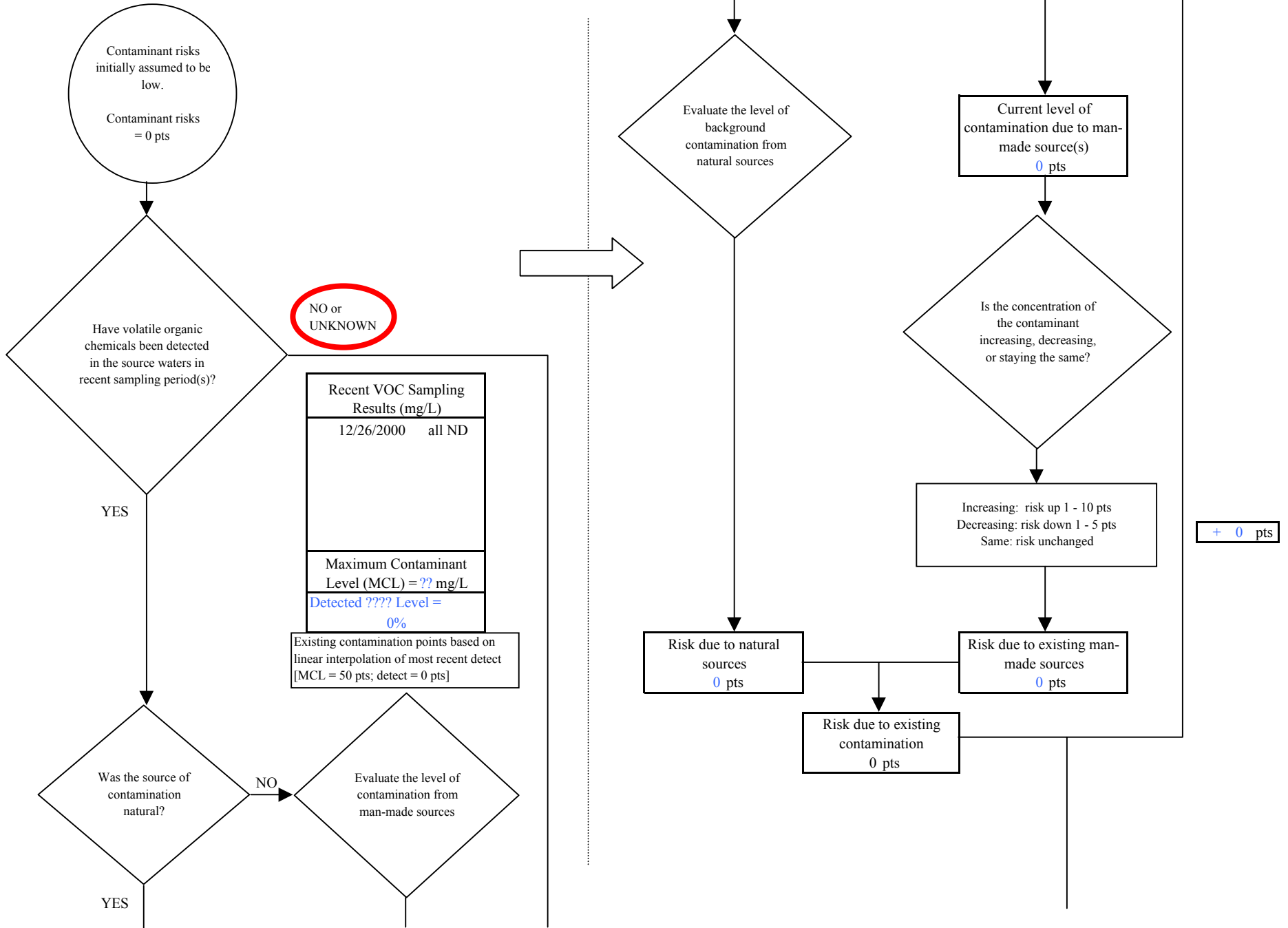
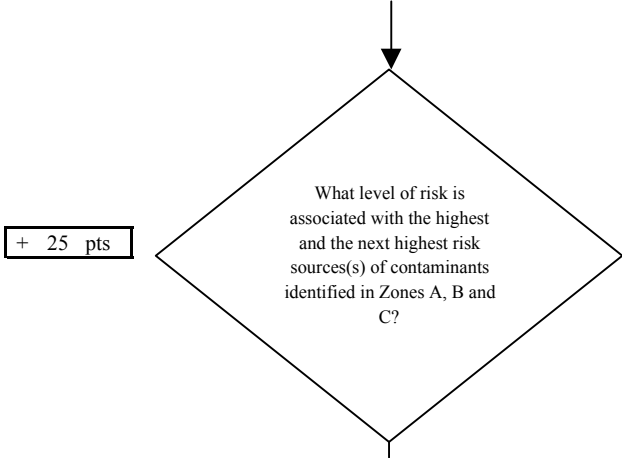


Chart 7. Contaminant risks for Village Mobile Home Park - Volatile Organic Chemicals



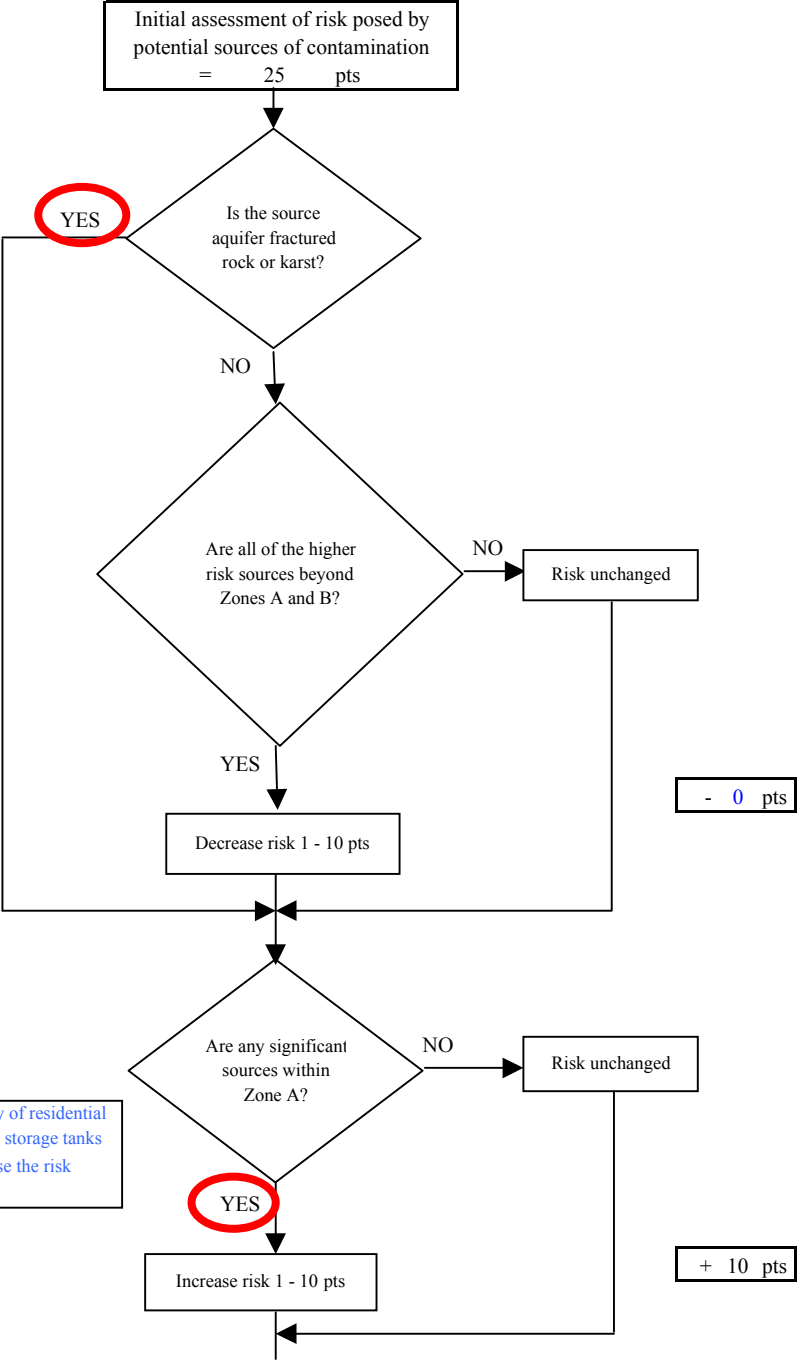
+ 25 pts

| Risk Levels for Contaminant Sources identified in Zones A, B and C | | | |
|--|--------|-----------|-------|
| | Zone A | Zones B&C | Total |
| Very Highs(s) | 0 | 0 | 0 |
| High(s) | 0 | 0 | 0 |
| Medium(s) | 238 | 0 | 238 |
| Low(s) | 13 | 0 | 13 |

| | 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.



- 0 pts

+ 10 pts

Chart 7. Contaminant risks for Village Mobile Home Park - Volatile Organic Chemicals

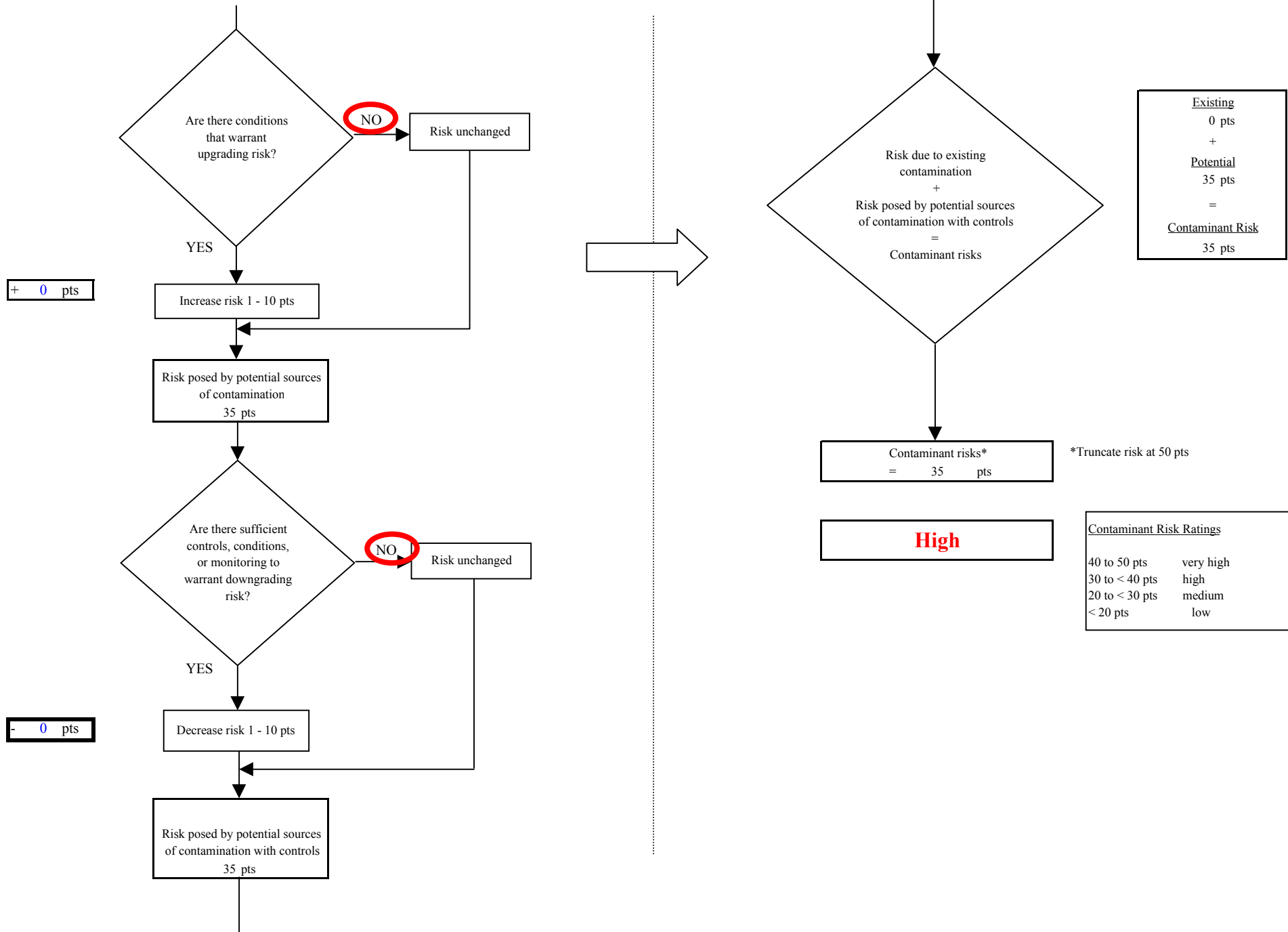


Chart 8. Vulnerability analysis for Village Mobile Home Park - Volatile Organic Chemicals

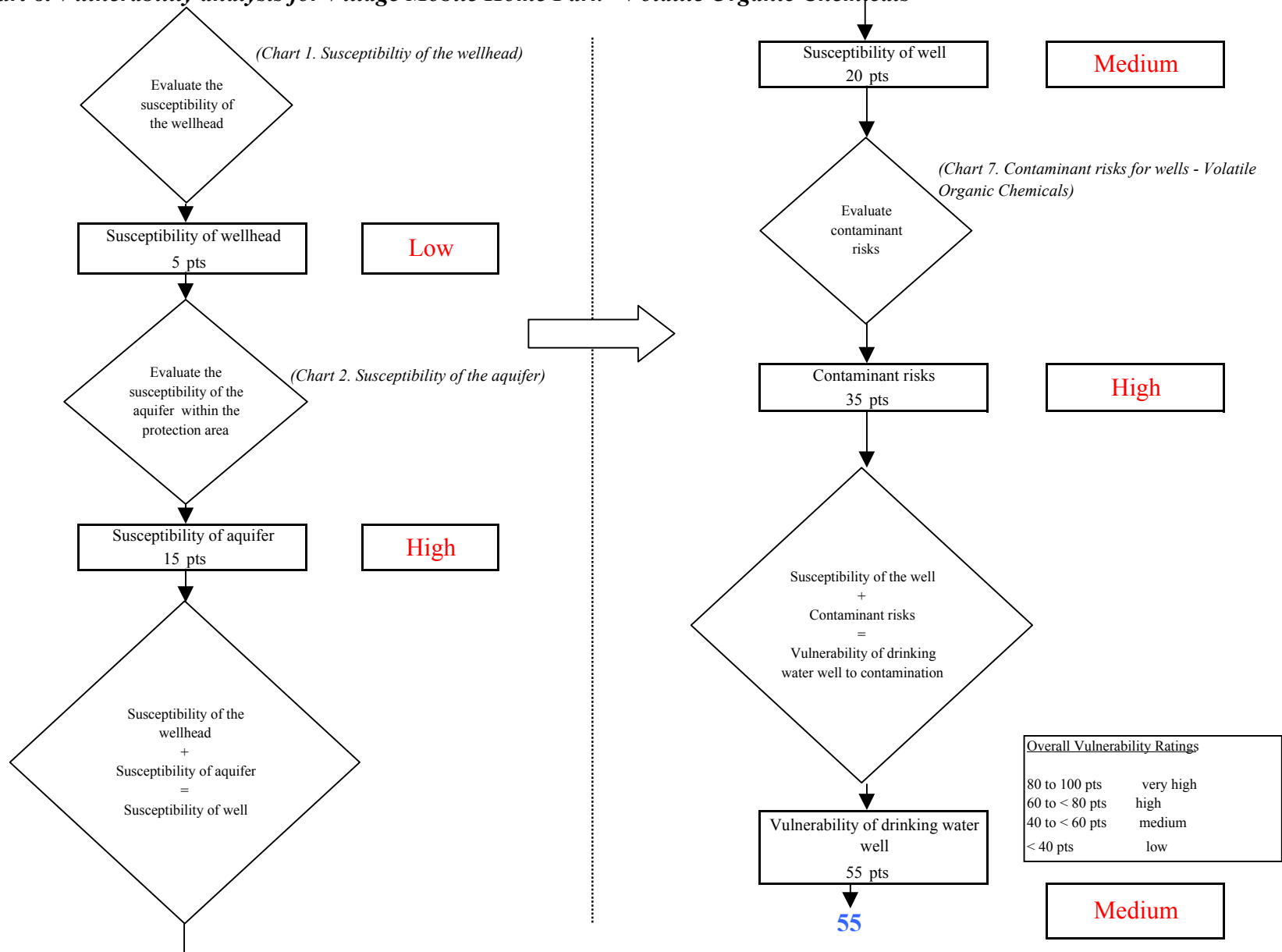


Chart 9. Contaminant risks for Village Mobile Home Park - Heavy Metals, Cyanide and Other Inorganic Chemicals

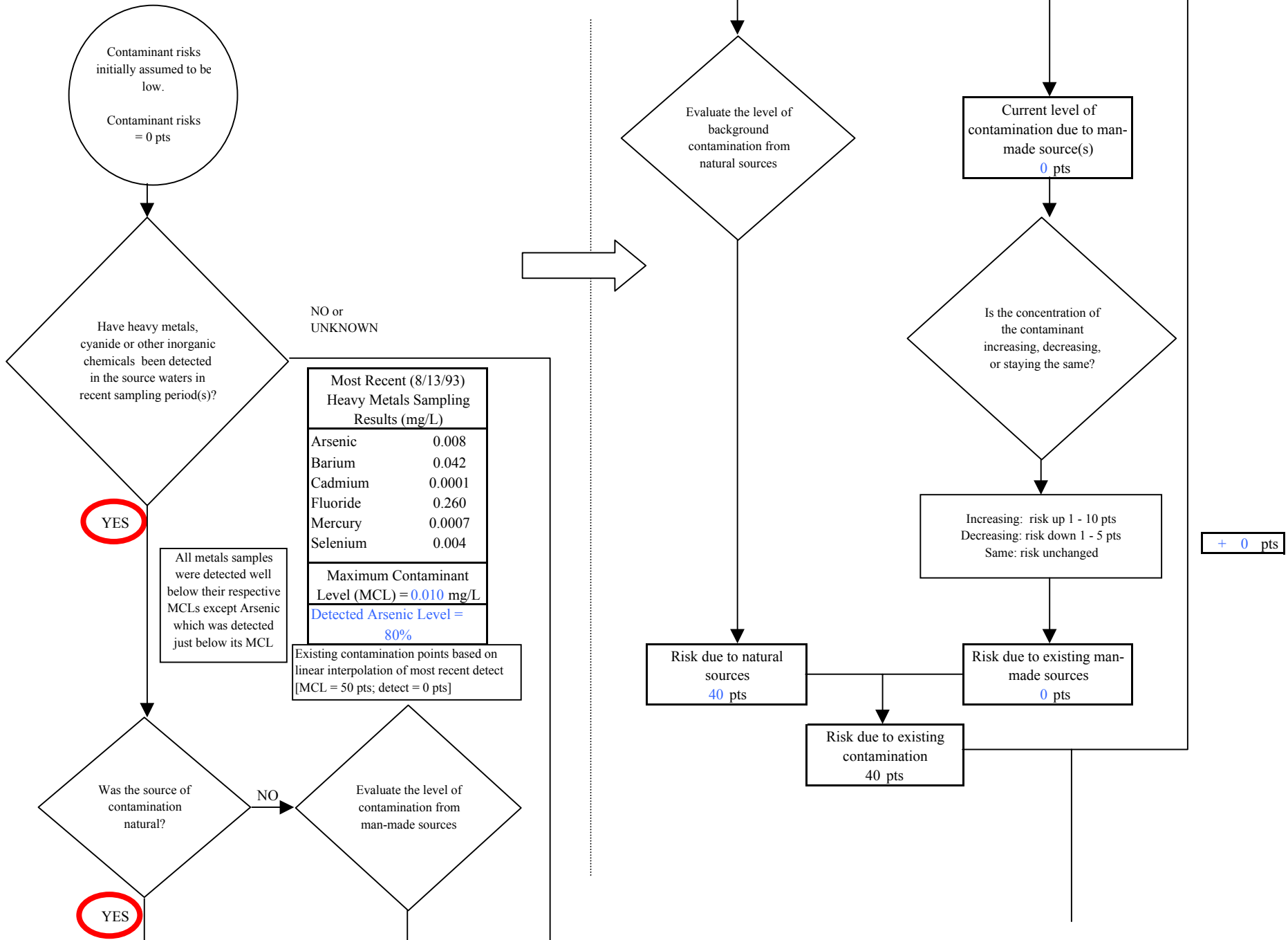
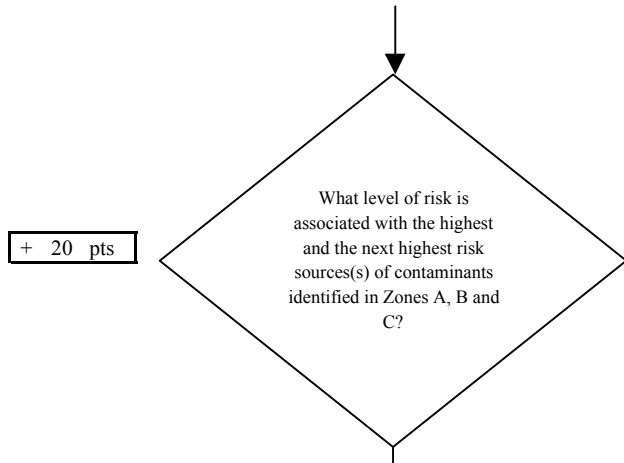


Chart 9. Contaminant risks for Village Mobile Home Park - Heavy Metals, Cyanide and Other Inorganic Chemicals



+ 20 pts

| Risk Levels for Contaminant Sources identified in Zones A, B and C | | | |
|--|--------|-----------|-------|
| | Zone A | Zones B&C | Total |
| Very Highs(s) | 0 | 0 | 0 |
| High(s) | 0 | 0 | 0 |
| Medium(s) | 2 | 0 | 2 |
| Low(s) | 6 | 0 | 6 |

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

Matrix Score 20

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

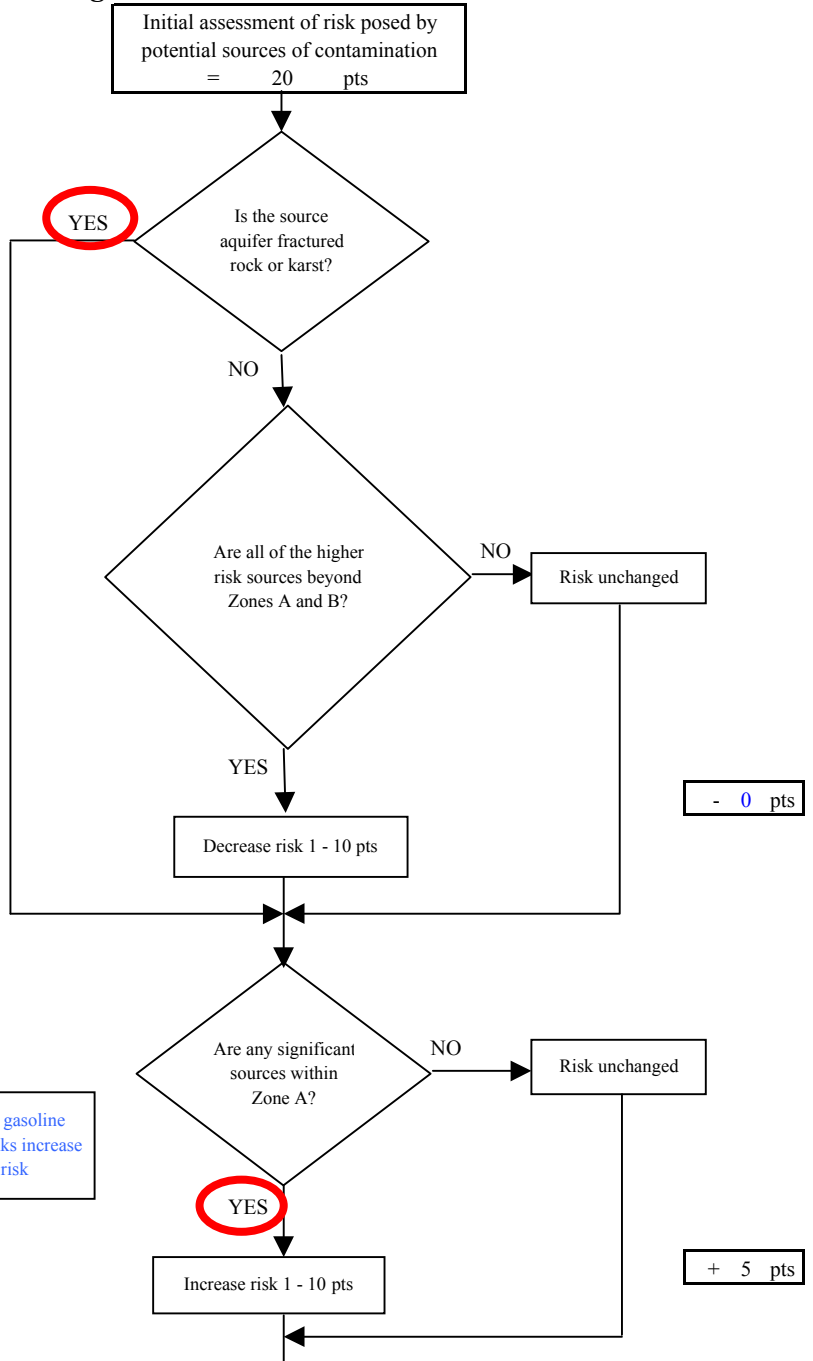
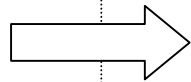


Chart 9. Contaminant risks for Village Mobile Home Park - Heavy Metals, Cyanide and Other Inorganic Chemicals

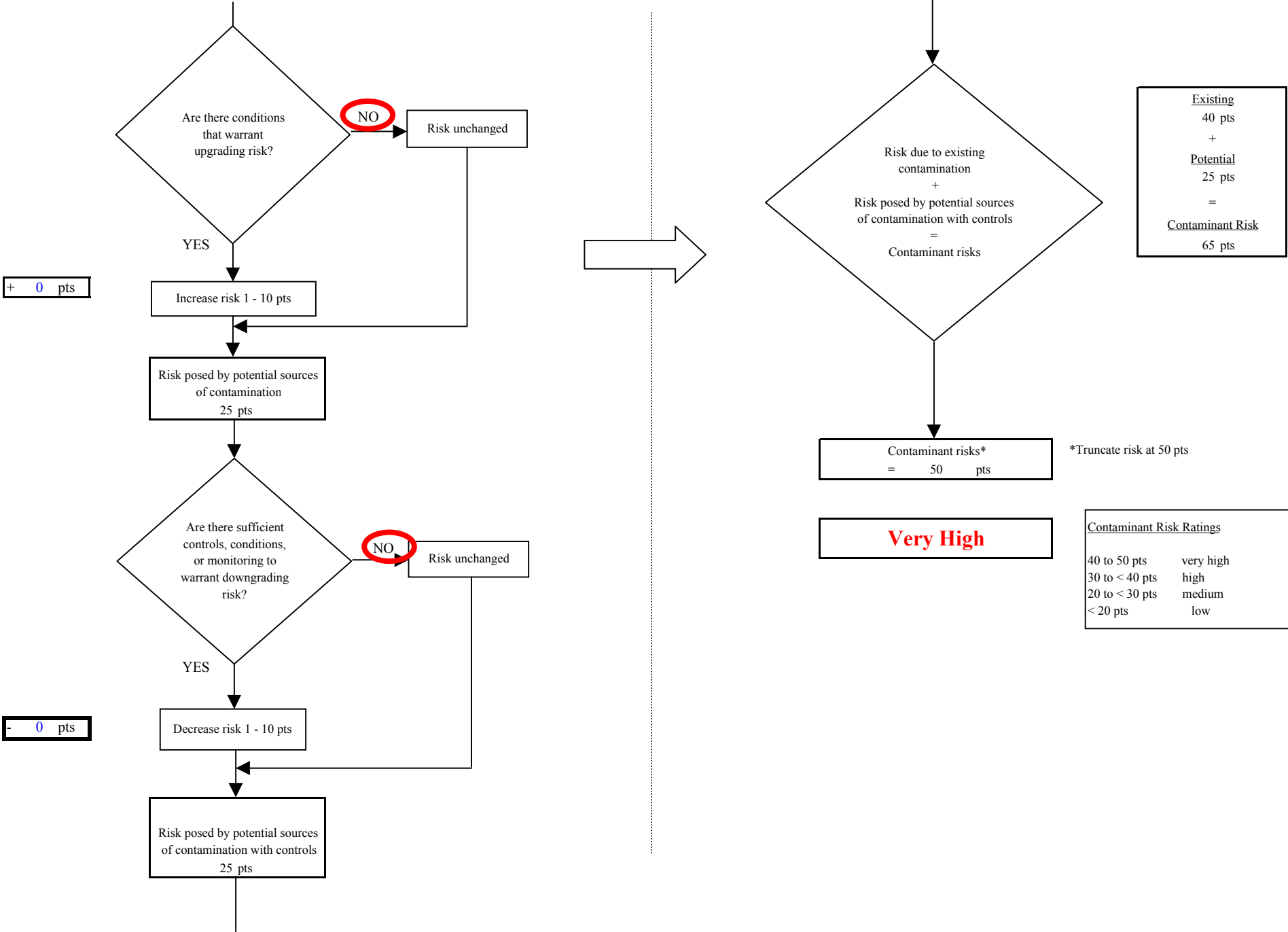


Chart 10. Vulnerability analysis for Village Mobile Home Park - Heavy Metals, Cyanide and Other Inorganic Chemicals

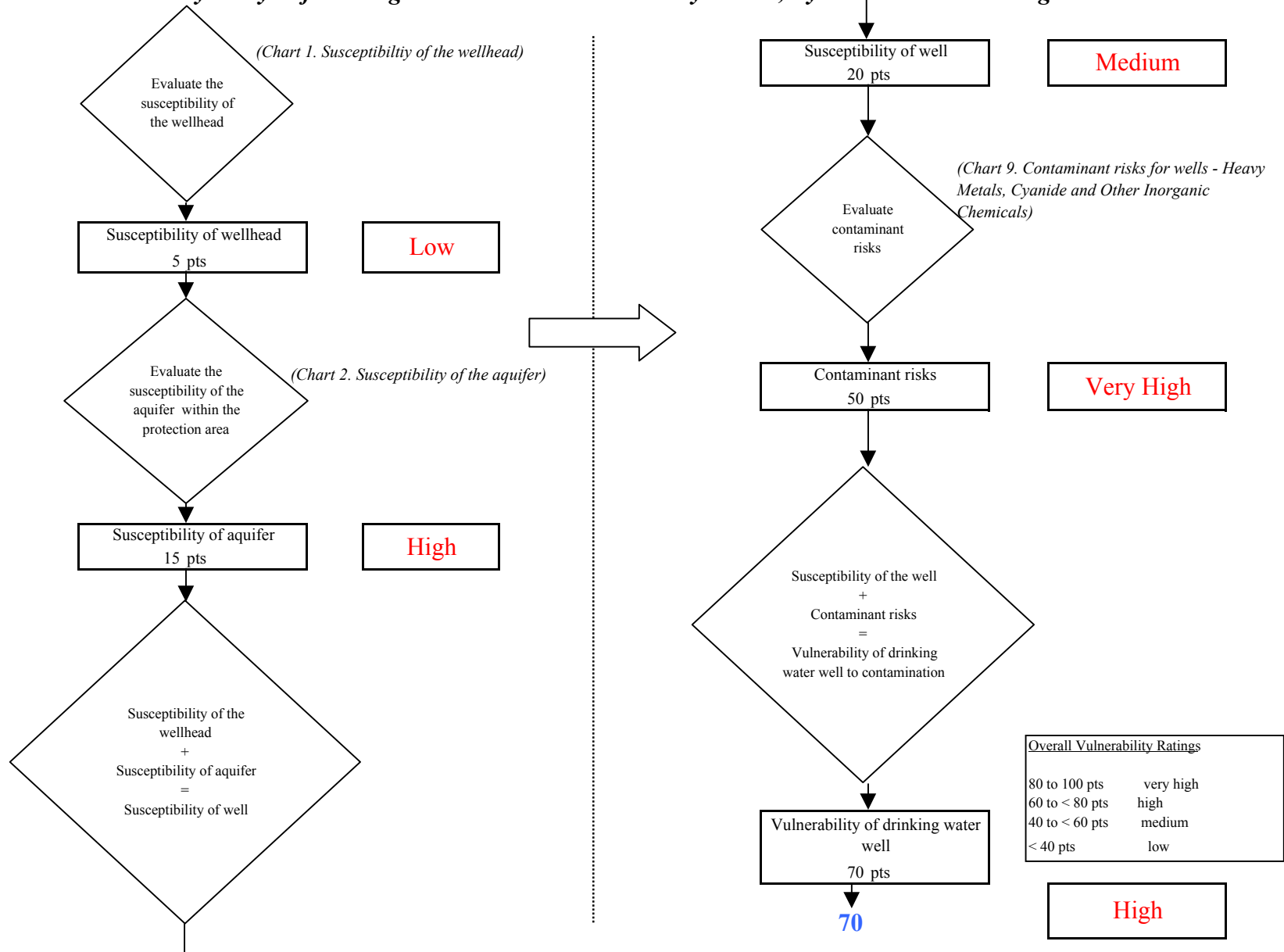


Chart 11. Contaminant risks for Village Mobile Home Park - Synthetic Organic Chemicals

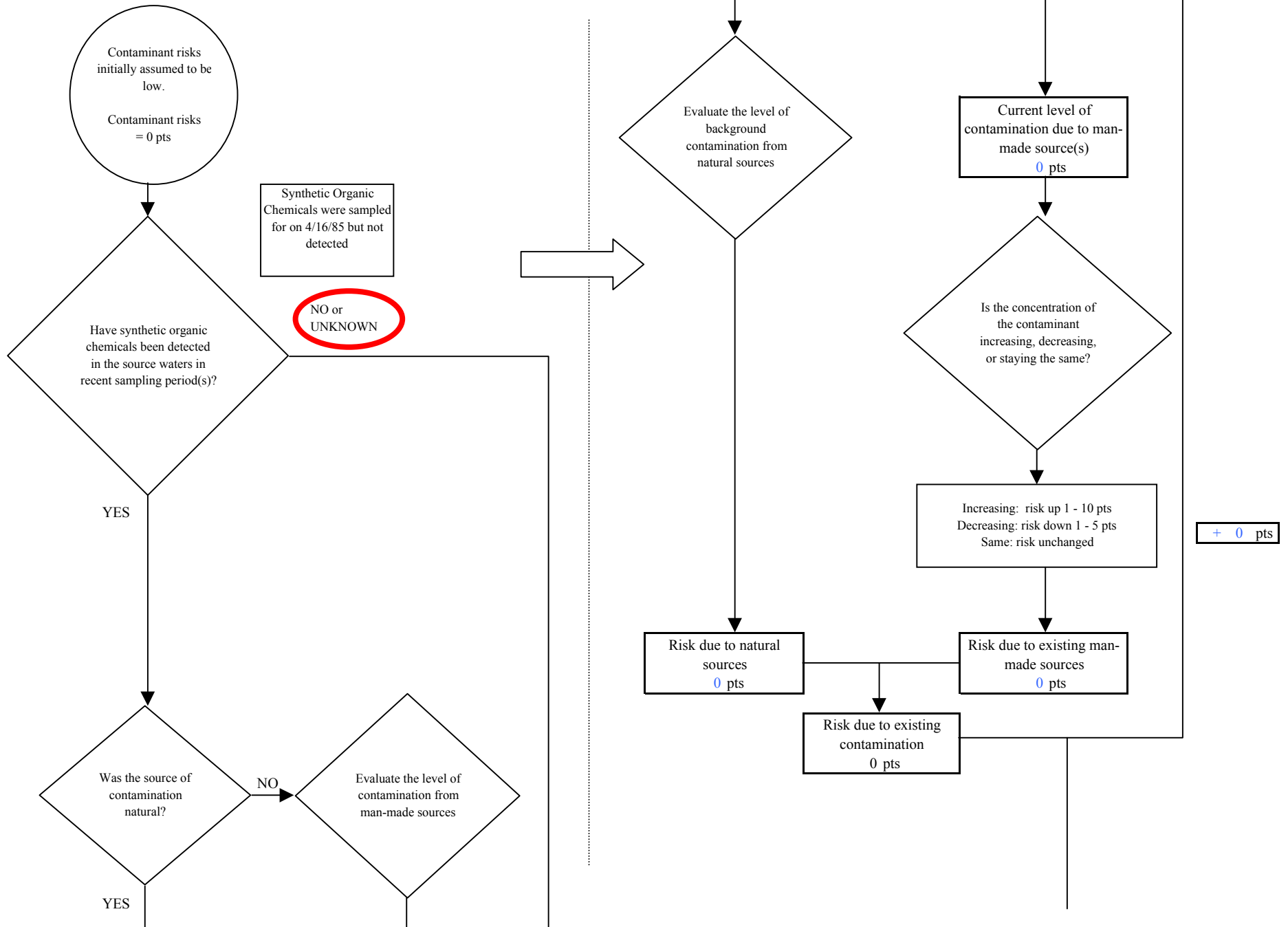
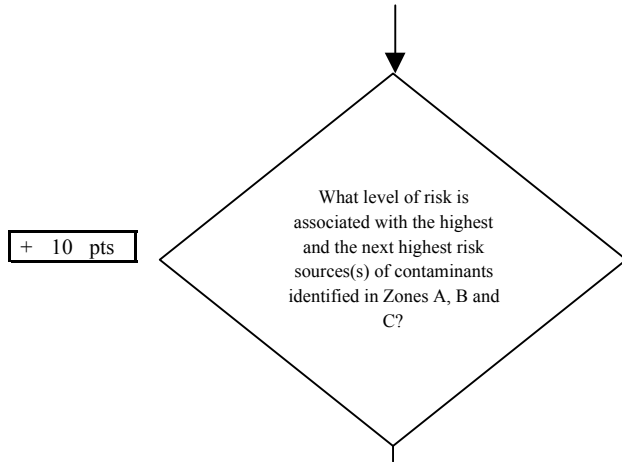


Chart 11. Contaminant risks for Village Mobile Home Park - Synthetic Organic Chemicals



| 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) | 0 | 0 | 0 |
| Low(s) | 4 | 0 | 4 |

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

Matrix Score 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.

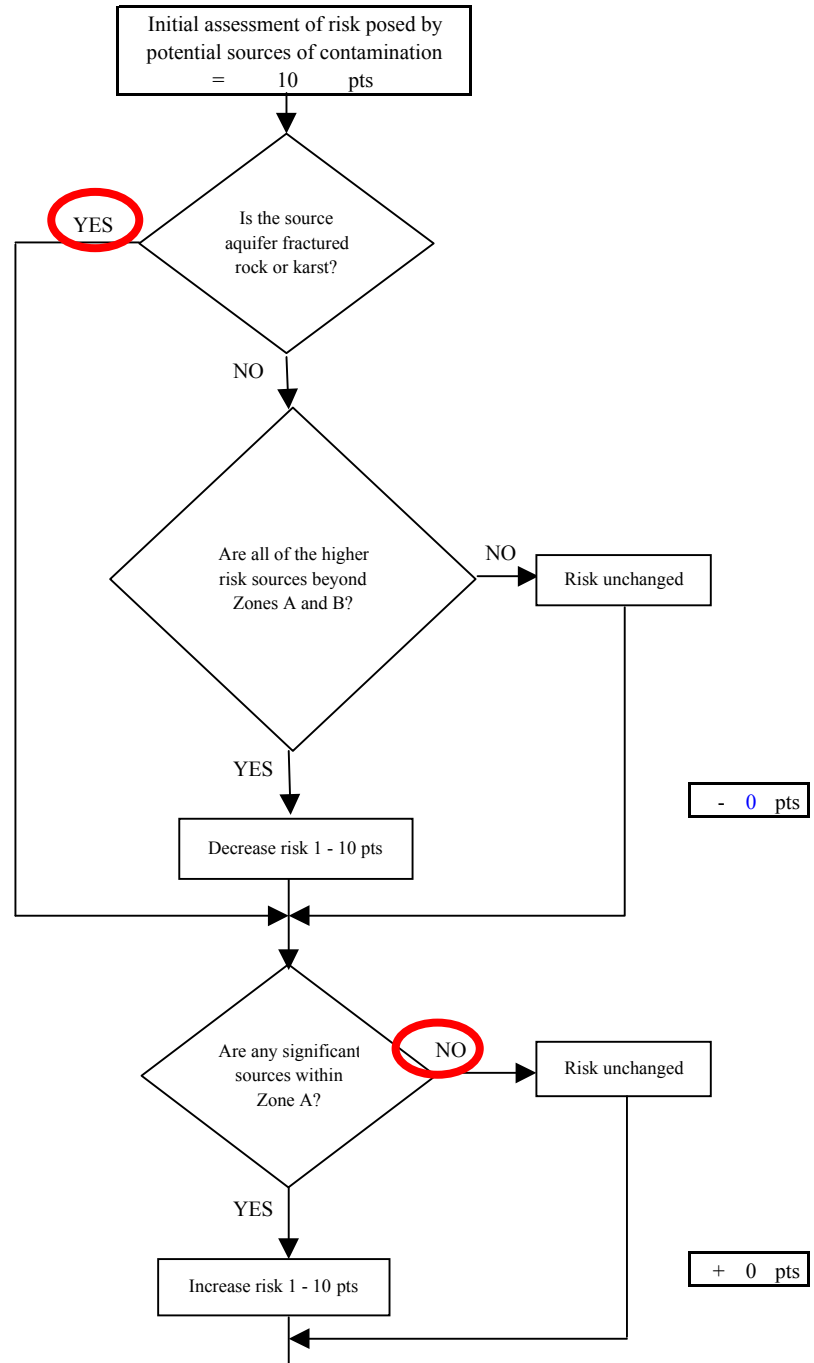
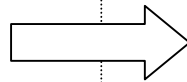


Chart 11. Contaminant risks for Village Mobile Home Park - Synthetic Organic Chemicals

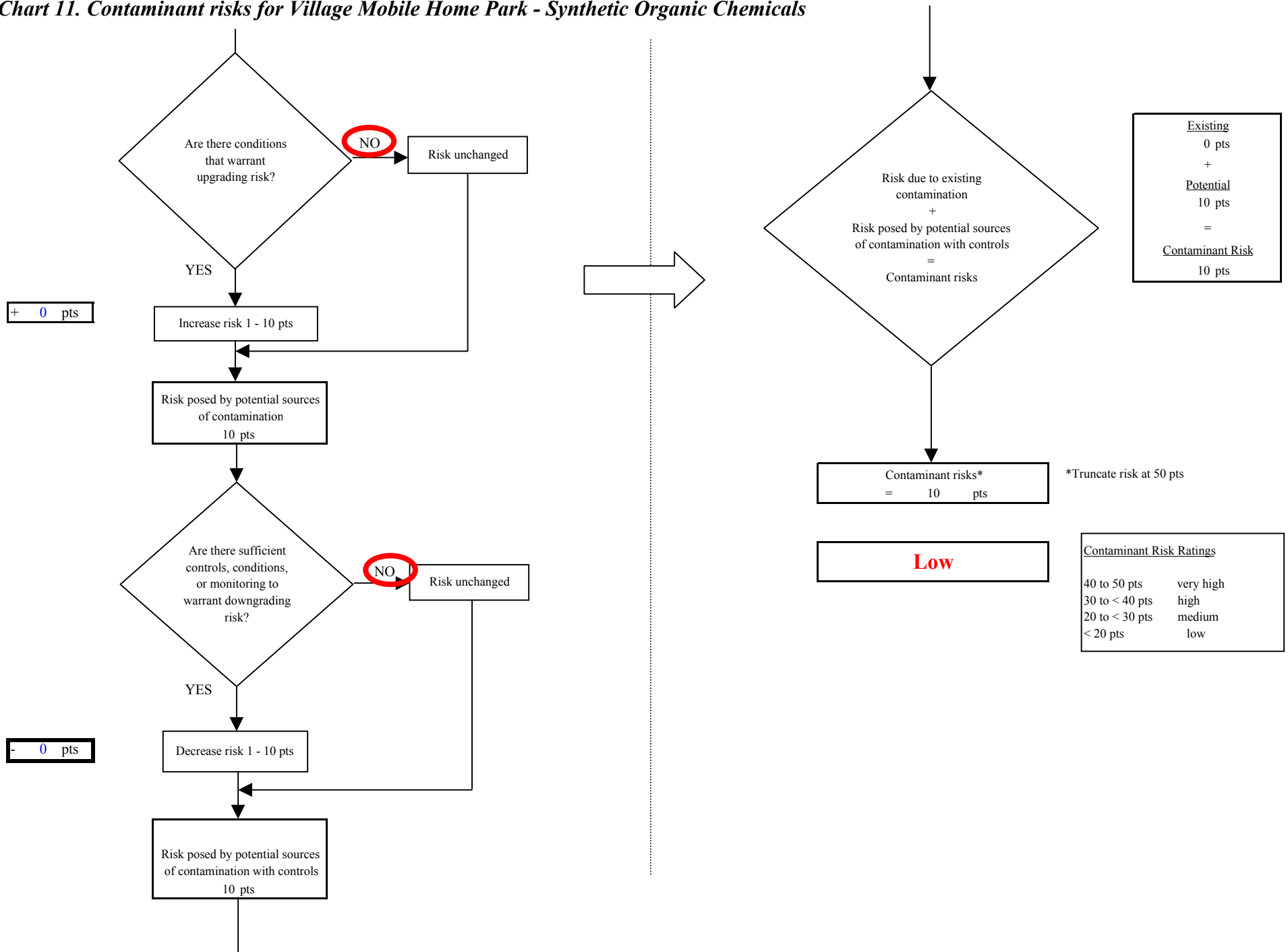


Chart 12. Vulnerability analysis for Village Mobile Home Park - Synthetic Organic Chemicals

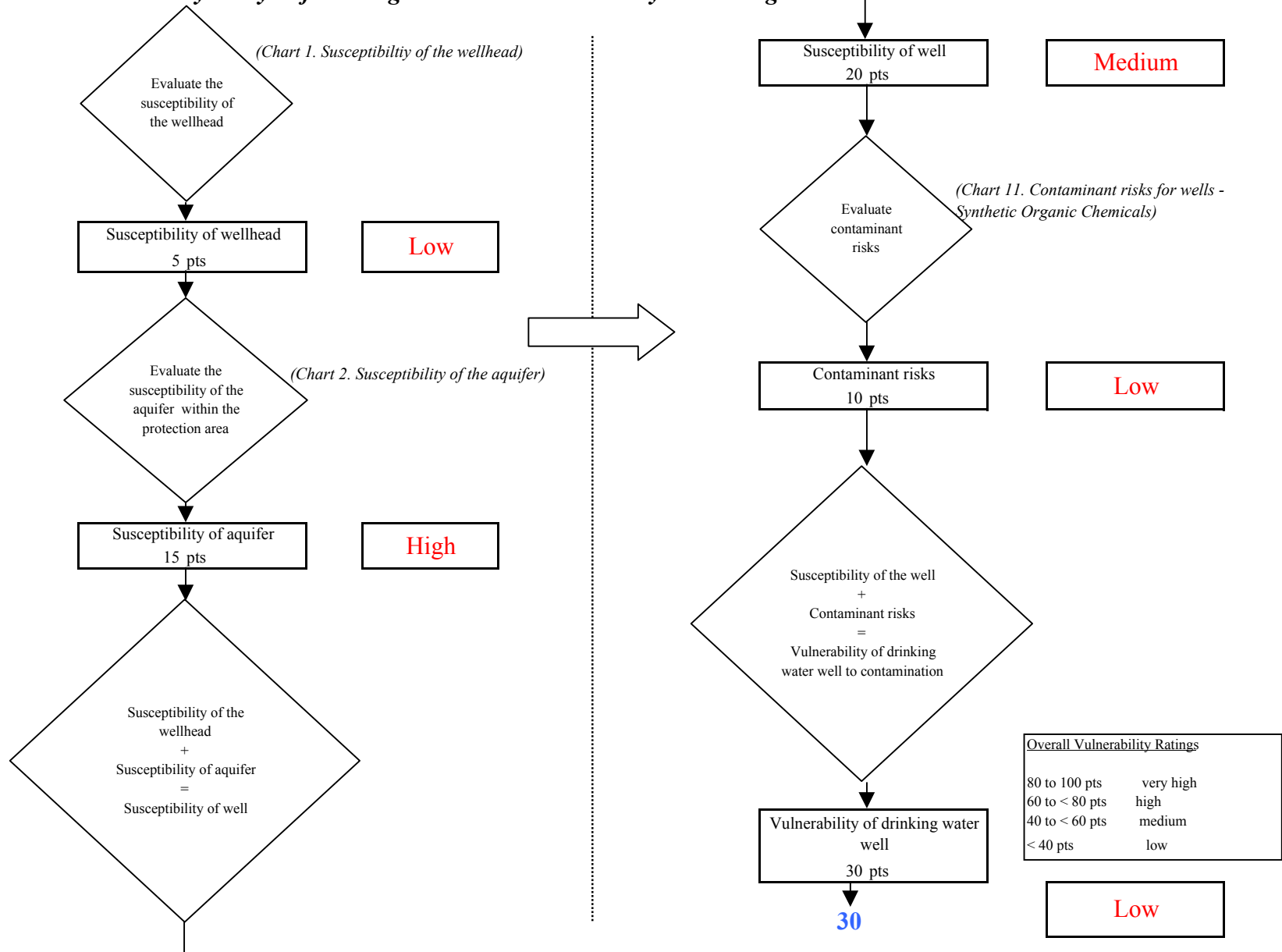


Chart 13. Contaminant risks for Village Mobile Home Park - Other Organic Chemicals

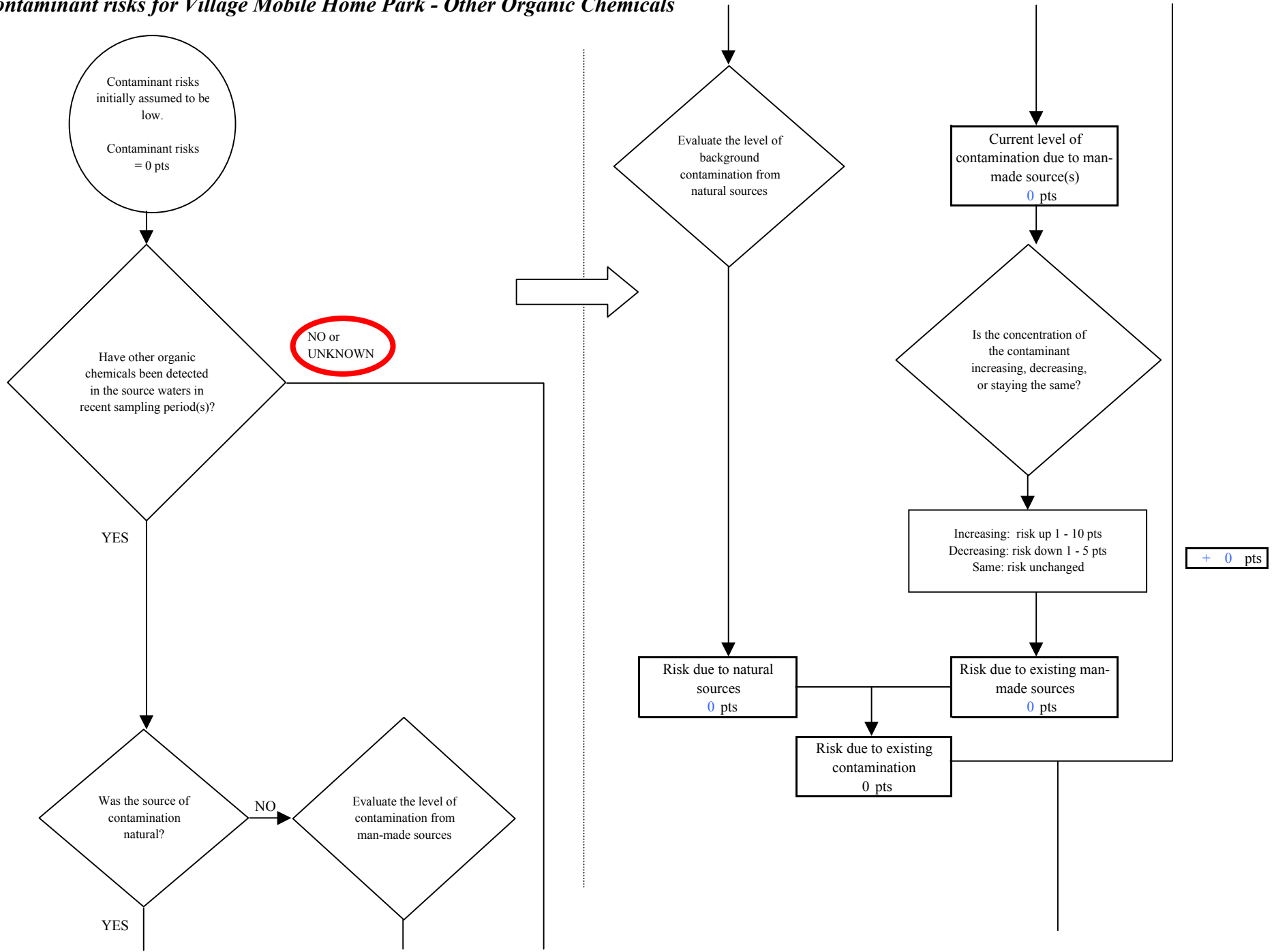
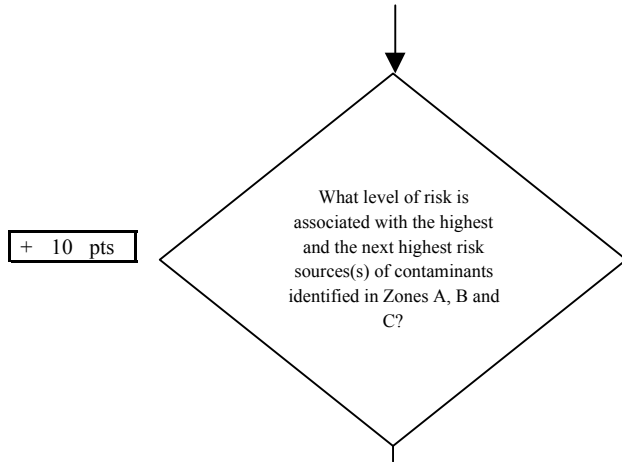


Chart 13. Contaminant risks for Village Mobile Home Park - Other Organic Chemicals



| 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) | 0 | 0 | 0 |
| Low(s) | 4 | 0 | 4 |

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

Matrix Score 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.

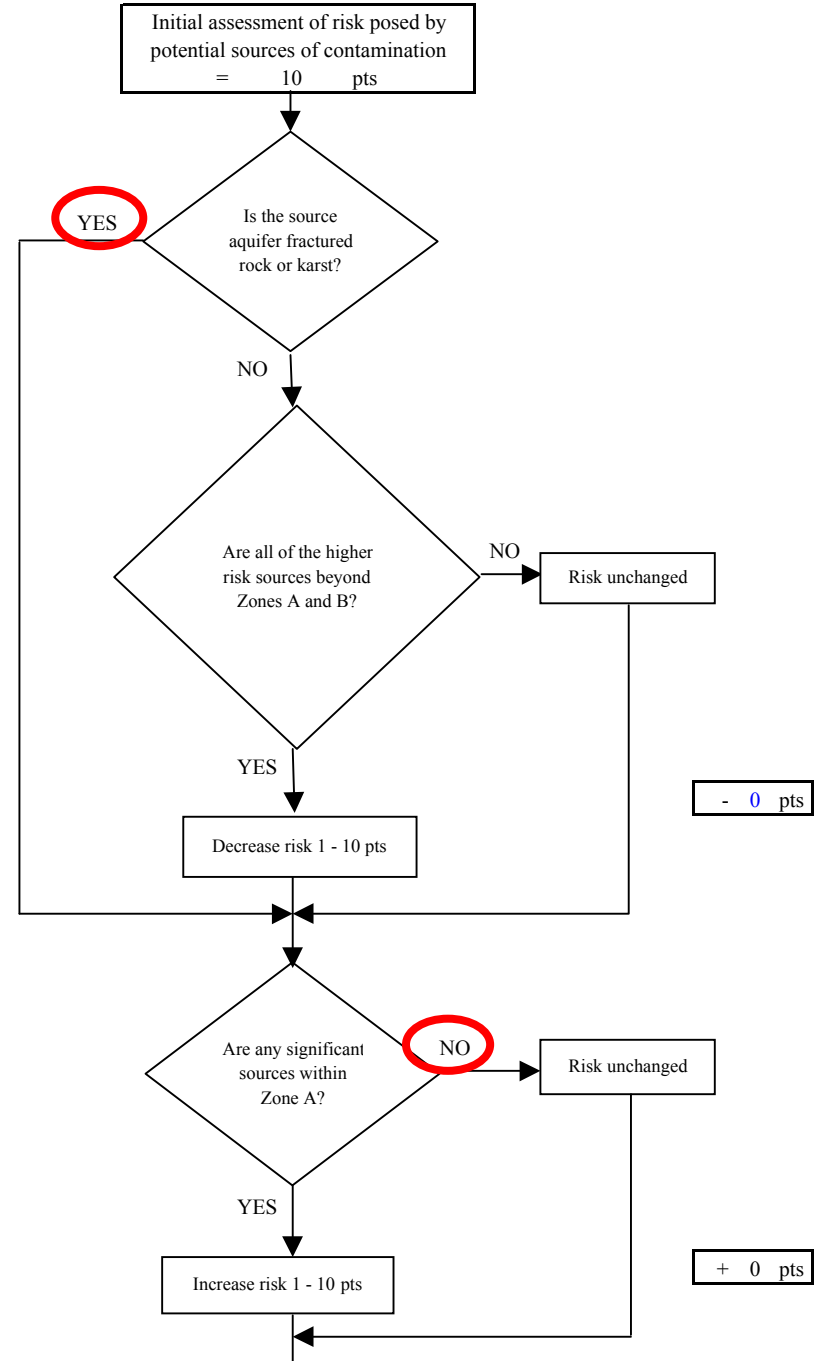
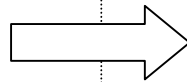


Chart 13. Contaminant risks for Village Mobile Home Park - Other Organic Chemicals

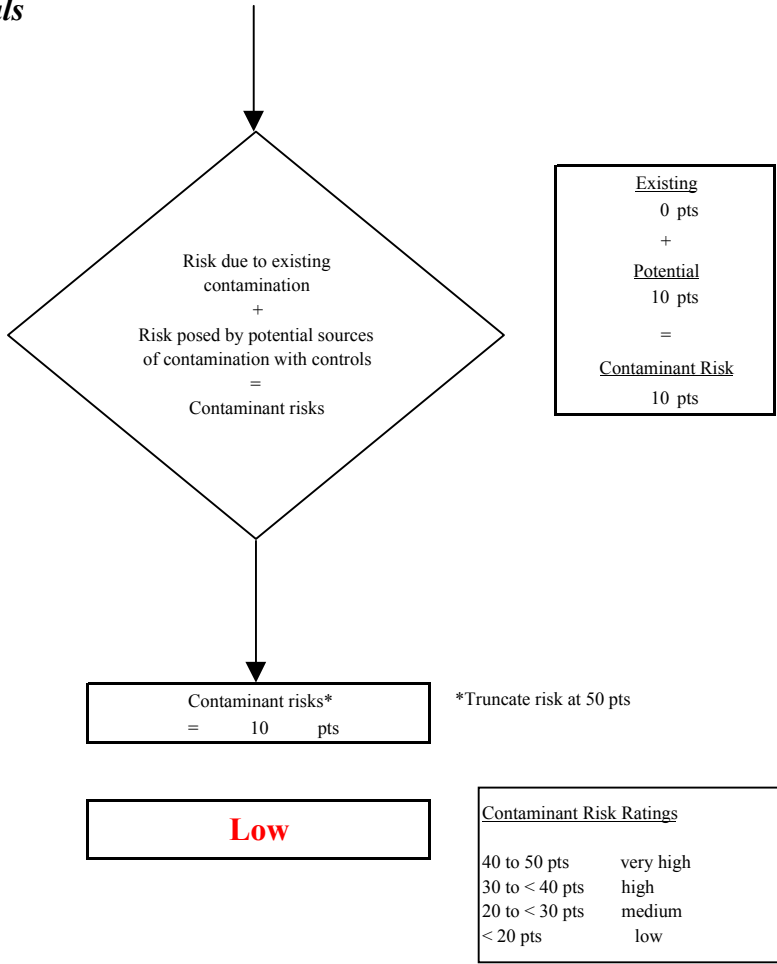
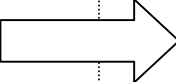
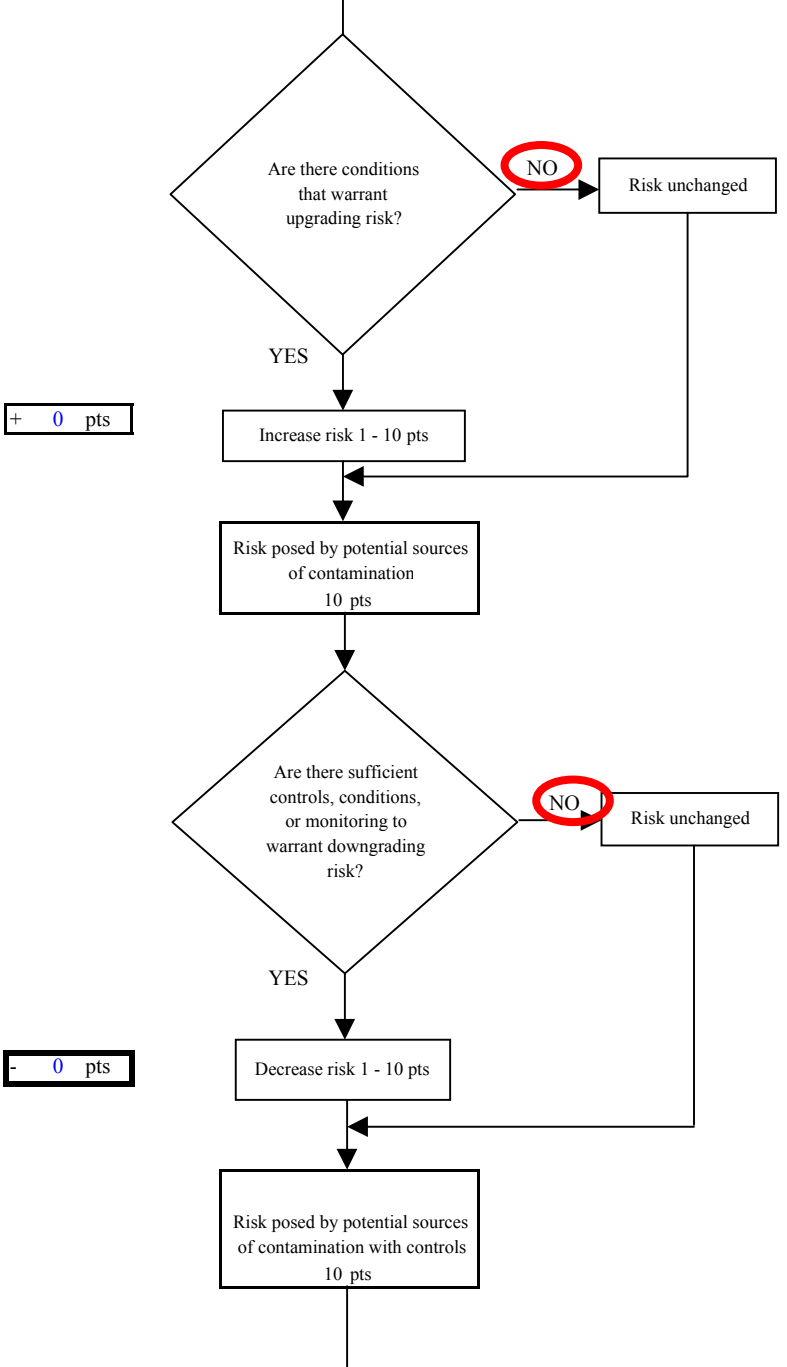


Chart 14. Vulnerability analysis for Village Mobile Home Park - Other Organic Chemicals

