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# Source Water Assessment

A Hydrogeologic Susceptibility and  
Vulnerability Assessment for  
City of Egegik  
Drinking Water System,  
Egegik, Alaska

PWSID # 262238.002

April 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1064  
Alaska Department of Environmental Conservation

# Source Water Assessment for City of Egegik Drinking Water System Egegik, Alaska

PWSID # 262238.002

DRINKING WATER PROTECTION PROGRAM REPORT 1064

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 City of Egegik Source of Public Drinking Water, Egegik, Alaska

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## Drinking Water Protection Program Alaska Department of Environmental Conservation

### EXECUTIVE SUMMARY

The City of Egegik has four Public Water System (PWS) wells. The well (PWS No. 262238.002) has been used as a drinking water source since it was drilled in 1997. This source water assessment report is exclusively limited to PWSID #262238.002.

The well is a Class A (community and non-transient non-community) water system located on Central Street in Egegik, Alaska. Available records indicate that there is secondary storage of drinking water, with a combined capacity of 22,200-gallons, and that the untreated drinking water source is derived directly from the wellhead. This system operates year round and serves approximately 620 residents and 120 non-residents through 64 service connections. The wellhead received a susceptibility rating of **Very High** and the aquifer received a susceptibility rating of **Very High**. Combining these two ratings produce a **Very High** rating for the natural susceptibility of the well.

Identified potential and current sources of contaminants for the public drinking water source include: Laundromats, a domestic wastewater treatment plant disposal pond/lagoon, nonresidential pit toilets, seafood processing, septic systems, aboveground fuel tanks, an ADEC contaminated site, water supply wells, cemeteries, petroleum product bulk station/terminals, an airport, roads, firehouses, electric power generation, and landfills. 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 contaminant categories.

Overall, the water well received a vulnerability rating of **Very High** for the bacteria and viruses, nitrates and nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals contaminant categories.

### PUBLIC DRINKING WATER SYSTEM

The City of Egegik well is a Class A (community/non-transient/non-community) public water system. The system is located on Central Street in Egegik, Alaska (Sec. 1, T23S, R50W, Seward Meridian; see Map A of Appendix A). Egegik is located on the south bank of the Egegik River on the Alaska Peninsula, 100 miles southwest of Dillingham and 326 air miles southwest of Anchorage. The community has a population of 84 (ADCED, 2003). Average annual precipitation in Egegik is 26 inches, including approximately 45 inches of snowfall. Temperatures range from 44 to 65°F in summer and -24 to 40°F in winter.

The community of Egegik obtains most of their water supply from community wells. Many households are served by the piped sewage collection system and the remaining households use honey buckets, septic tanks, wastewater holding tanks, or seepage pits (ADCED, 2003). Egegik receives electrical power from the Egegik Light & Power Company. Power generating facilities are fueled by diesel. Refuse is collected by individuals and transported to the landfill (ADCED, 2003).

According to information supplied by ADEC for the City of Egegik PWS, the depth of the primary water well is 100 feet below the ground surface and is screened in a confined aquifer based on available construction details. The well is located within a floodplain.

Information acquired from a June 1998 sanitary survey for the public water system indicated that the land surface was sloped away from the well. Generally, land surfaces that slope away from the wellhead promote surface water drainage, which reduces the potential of contaminant migration down the well casing annulus. The sanitary survey indicates that the well is not grouted according to ADEC regulations. Proper grouting provides added protection against contaminants traveling along the well casing annulus and into source waters.

The entire Bristol Bay area was formerly covered by glaciers and the topography is representative of a postglacial area. Soils information is limited. Generally, the soils consist of silty sand overlying relatively clean sand. The silty soils are slightly frost-susceptible. Isolated pockets of permafrost are scattered throughout the area (DOWL, 1982).

## 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 protection area 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 for the City of Egegik PWS. The input parameters describing the attributes of the aquifer in this calculation were adopted from Groundwater (Freeze and Cherry, 1979). Available geology and groundwater contours were also considered to take into account any uncertainties in groundwater flow and aquifer characteristics to arrive at a meaningful protection area.

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 (Please refer to the Guidance Manual for Class A Public Water Systems for additional information).

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        |

The DWPA for the City of Egegik PWS was determined using an analytical calculation and includes Zones A, B, C, and D (See Map A 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 City of Egegik 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 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 C 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 4 in Appendix B contain the ranking of potential and existing sources of contamination with respect to bacteria and viruses, nitrates and/or nitrites, volatile organic chemicals, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

## VULNERABILITY OF THE 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. 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, cyanide and other inorganic chemicals, 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 City of Egegik’s water well is in a confined aquifer. Confined aquifers are less susceptible to potential groundwater quality impacts posed by the migration of surface water contaminants downward from the surface. Table 2 shows the susceptibility scores and ratings for this PWS.

**Table 2. Susceptibility**

|                                | Score | Rating    |
|--------------------------------|-------|-----------|
| Susceptibility of the Wellhead | 25    | Very High |
| Susceptibility of the Aquifer  | 22    | Very High |
| Natural Susceptibility         | 47    | Very 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                          | 50    | Very High |
| Heavy Metals, Cyanide and Other Inorganic Chemicals | 45    | Very High |
| Synthetic Organic Chemicals                         | 50    | Very High |
| Other Organic Chemicals                             | 50    | Very 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:

$$\begin{array}{rcl}
 \text{Natural Susceptibility (0 – 50 points)} & & \\
 + & & \\
 \text{Contaminant Risks (0 – 50 points)} & & \\
 = & & \\
 \text{Vulnerability of the} & & \\
 \text{Drinking Water Source to Contamination (0 – 100).} & & 
 \end{array}$$

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 six categories of drinking water contaminants. Note: scores are rounded off to the nearest five.

**Table 4. Overall Vulnerability**

| Category  | Score | Rating    |
|---|-------|-----------|
| Bacteria and Viruses                                | 100   | Very High |
| Nitrates and Nitrites                               | 100   | Very High |
| Volatile Organic Chemicals                          | 100   | Very High |
| Heavy Metals, Cyanide and Other Inorganic Chemicals | 90    | Very High |
| Synthetic Organic Chemicals                         | 100   | Very High |
| Other Organic Chemicals                             | 100   | Very High |

### Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Very High**. The risk is primarily attributed to the presence of a domestic wastewater treatment plant disposal pond/lagoon and landfills in Zones A, B, and D (see Table 2 – Appendix B).

No positive bacteria counts have been reported in recent (within five years) sampling events (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.

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

### Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Very High**. The risk to this source of public drinking water is primarily attributed to the presence of a domestic wastewater treatment plant disposal pond/lagoon and landfills in Zones A, B, and D (see Table 3 – Appendix B).

Nitrates are very mobile, moving at approximately the same rate as water. The sampling history for this well indicates that low levels of nitrates have been detected in recent sampling events. However, the reported concentrations of nitrates do not exceed the maximum contaminant level (MCL) of 10 mg/L. Nitrate concentrations in uncontaminated groundwater are typically less than 2 mg/L; therefore, nitrate concentrations above 2 mg/L may be indicative of man-made sources (See Chart 5 - Contaminant Risks for Nitrates and/or Nitrites in Appendix D).

Nitrate levels are often derived from the decomposition of organic matter in soils. Although the nitrate source is unknown, such occurrences may be attributed to septic systems or other sources. After combining the contaminant risk for nitrates and nitrites with the natural susceptibility of the well, the overall vulnerability of the well to nitrate and nitrite contamination is **Very High**.

### Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Very High**. The risk is primarily attributed to the presence of an ADEC recognized contaminated site, petroleum product bulk station/terminals, an airport, and landfills located in Zones A, B, and D.

Numerous other potential contaminant sources are

also found within the protection area (see Table 4 – Appendix B).

All recent sampling data for VOCs were below the detection levels for the City of Egegik (See Chart 7 – Contaminant Risks for Volatile Organic Chemicals in Appendix D).

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 **Very High**.

#### **Heavy Metals, Cyanide and Other Inorganic Chemicals**

The contaminant risk for heavy metals, cyanide and other inorganic chemicals is **Very High**. The risk is primarily attributed to the presence of landfills in Zones B and D. Numerous other potential contaminant sources are also found within the protection area (see Table 5 – Appendix B).

Based on review of recent sampling records for this public water system, moderate levels of copper, fluoride, and arsenic have been detected, but have not exceeded their respective MCLs of 1.3 mg/L, 4.0 mg/L, and 0.05 mg/L (see Chart 9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

After combining the contaminant risk for heavy metals, cyanide and other inorganic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Very High**.

#### **Synthetic Organic Chemicals**

The contaminant risk for synthetic organic chemicals is **Very High**. The risk is primarily attributed to the presence of landfills in Zones B and D. Numerous other potential contaminant sources are also found within the protection area (see Table 6 – Appendix B).

No recent sampling data was available in ADEC records for the City of Egegik (See Chart 11 – Contaminant Risks for Synthetic Organic Chemicals in Appendix D).

After combining the contaminant risk for synthetic organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Very High**.

#### **Other Organic Chemicals**

The contaminant risk for other organic chemicals is **Very High**. The risk is primarily attributed to the presence of landfills, electric power generation, and petroleum product bulk station/terminals in Zones A, B, and D. Numerous other potential contaminant sources are also found within the protection area (see Table 7 – Appendix B).

No recent sampling data was available in ADEC records for the City of Egegik (See Chart 13 – Contaminant Risks for Other Organic Chemicals in Appendix D).

After combining the contaminant risk for other organic chemicals with the natural susceptibility of the well, the overall vulnerability of the well to contamination is **Very High**.

#### **Using the Source Water Assessment**

This assessment of contaminant risks can be used as a foundation for local voluntary protection efforts as well as a basis for the continuous efforts on the part of the community of Egegik to protect public health. It is anticipated that Source Water Assessments will be updated every five years to reflect any changes in the vulnerability and/or susceptibility of the drinking water source.



## REFERENCES

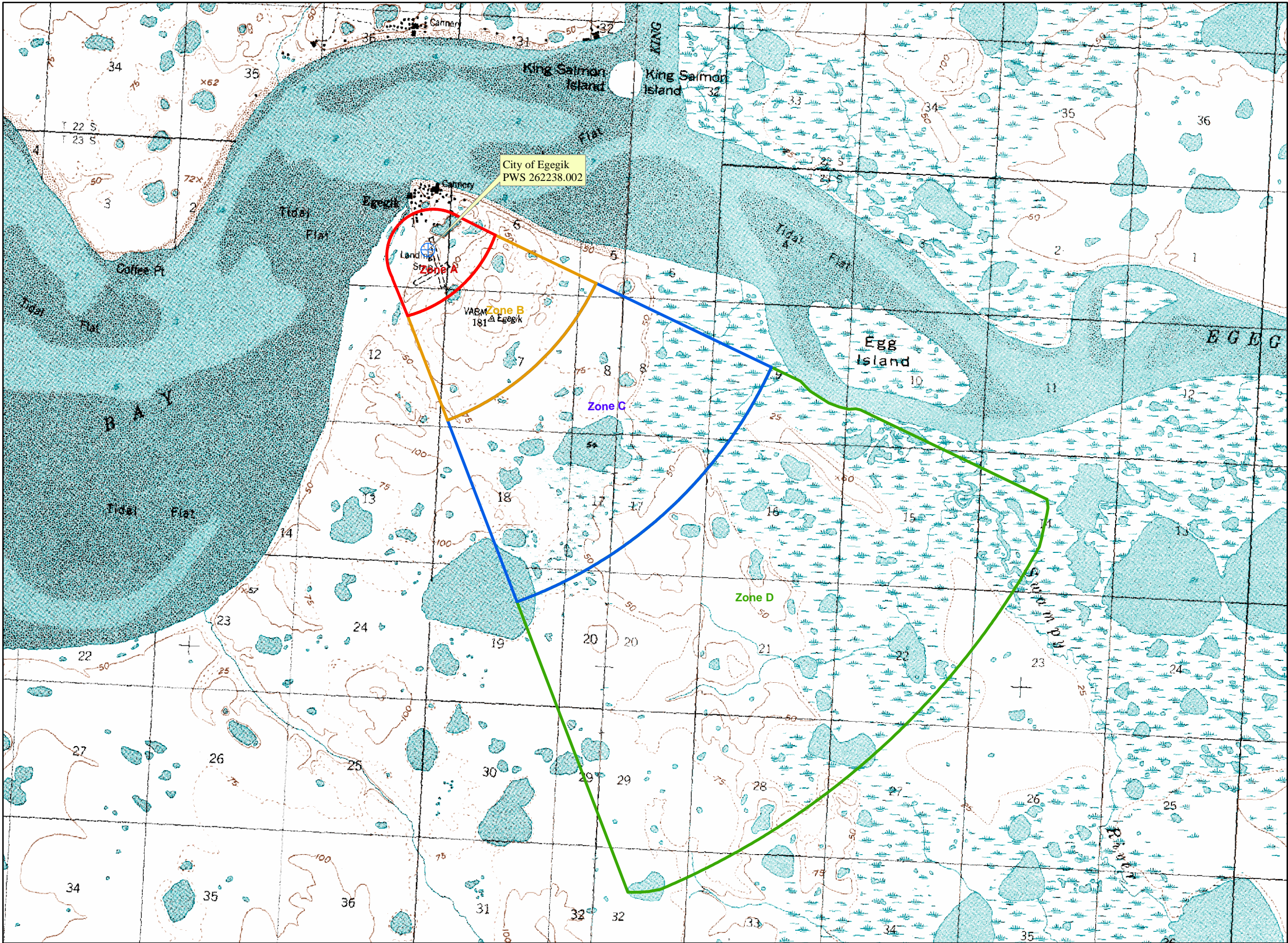
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## **APPENDIX A**

### **Drinking Water Protection Area Location Map (Map A)**



Public Water Well System for PWS #262238.002 City of Egegik



LEGEND

Public Water System Well

Hydrography/Physical

- Parcels
- Stream
- Lake or Pond
- Contours

Transportation

- Primary Route (Class 1)
- Secondary Route (Class 2)
- Road (Class 3)
- Road (Class 4)
- Road (Class 5, Four-wheel drive)

Groundwater Protection Zones

- Zone A Protection Area- Several Months Travel Time
- Zone B Protection Area- 2 Years Travel Time
- Zone C Protection Area- 5 Years Travel Time
- Zone D Protection Area- 10 Years Travel Time

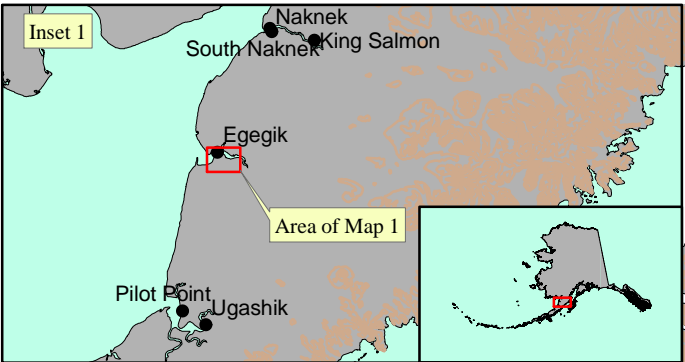
Data Sources:  
Contaminant Sources, Public Water System Wells, Contours  
Alaska Department of Environmental Conservation (ADEC)

Critical Facilities, Federal Emergency Management Agency (FEMA)

All other data:  
United States Geological Survey (USGS)

Drinking Water Protection Areas based on "Alaska Drinking  
Water Protection Program - Guidance Manual for Class A  
Public Water Systems" published by ADEC

URS Corporation does not guarantee the accuracy or  
validity of the data provided.



0 0.5 1 2 3 4 Miles

City of Egegik  
PWS 262238.002

Appendix A Map A



## **APPENDIX B**

### **Contaminant Source Inventory and Risk Ranking (Tables 1-7)**

**Table 1**

**Contaminant Source Inventory for  
City of Egegik**

**PWSID 262238.002**

| <b>Contaminant Source Type</b>                              | <b>Contaminant Source ID</b> | <b>CS ID tag</b> | <b>Zone</b> | <b>Map Number</b> | <b>Comments</b>  |
|---|------------------------------|------------------|-------------|-------------------|--|
| Laundromats without dry cleaning                            | C22                          | C22-01           | A           | C                 |  |
| Domestic wastewater treatment plant disposal ponds/lagoons  | D02                          | D02-01           | A           | C                 |  |
| Pit toilets (open hole), nonresidential (one or more)       | D16                          | D16-01           | A           | C                 | Assume 1 disposal pit in Zone A  |
| Seafood processing  | N10                          | N10-01           | A           | C                 | Ward's Cove Packing  |
| Septic systems (serves one single-family home)              | R02                          | R02-01           | A           | C                 | Assume 10 or less residential septic systems in Zone A   |
| Tanks, heating oil, residential (above ground)              | R08                          | R08-01           | A           | C                 | Assume 10 or less residential heating oil tanks in Zone A                                      |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-01           | A           | C                 | Egegik Light & Power   |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-02           | A           | C                 | Teachers Quarters  |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-03           | A           | C                 | ATT  |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-04           | A           | C                 | Closed Russian Orthodox Church   |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-05           | A           | C                 | Community Bible Church   |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-06           | A           | C                 | Community Hall   |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-07           | A           | C                 | Fire Station   |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-08           | A           | C                 | City Office  |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-09           | A           | C                 | Post Office  |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-10           | A           | C                 | Egegik School  |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-11           | A           | A                 | Washeteria   |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-12           | A           | C                 | Washeteria   |
| Tanks, heating oil, nonresidential (aboveground)            | T14                          | T14-13           | A           | C                 | Washeteria   |
| Contaminated sites, DEC recognized, non-Superfund, non-RCRA | U04                          | U04-01           | A           | C                 | Egegik Light & Power, RecKey #1994250122301, Status: Inactive, petroleum ground contamination. |
| Water supply wells  | W09                          | W09-01           | A           | C                 | 1 water supply well in Zone A  |
| Cemeteries  | X01                          | X01-01           | A           | C                 | Community Bible Cemetery   |
| Cemeteries  | X01                          | X01-02           | A           | C                 | Old Cemetery   |
| Petroleum product bulk station/terminals                    | X11                          | X11-01           | A           | C                 | Egegik Light & Power   |

| <i>Contaminant Source Type</i>           | <i>Contaminant Source ID</i> | <i>CS ID tag</i> | <i>Zone</i> | <i>Map Number</i> | <i>Comments</i>              |
|--|------------------------------|------------------|-------------|-------------------|------------------------------|
| Petroleum product bulk station/terminals | X11                          | X11-02           | A           | C                 |                              |
| Airports                                 | X14                          | X14-01           | A           | C                 | Egegik Landing Strip-Retired |
| Highways and roads, dirt/gravel          | X24                          | X24-01           | A           | C                 | Assume 1-20 roads in Zone A  |
| Electric power generation (fossil fuels) | X36                          | X36-01           | A           | C                 | Egegik Light & Power         |
| Firehouses                               | X38                          | X38-01           | A           | C                 |                              |
| Landfills (municipal; Class III)         | D51                          | D51-01           | B           | C                 | Egegik Landfill-Closed       |
| Landfills (municipal; Class III)         | D51                          | D51-02           | D           | C                 |                              |

**Table 2**

*Contaminant Source Inventory and Risk Ranking for  
City of Egegik  
Sources of Bacteria and Viruses*

**PWSID 262238.002**

| <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>  |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Laundromats without dry cleaning                           | C22                          | C22-01           | A           | Low                              | C                 |  |
| Domestic wastewater treatment plant disposal ponds/lagoons | D02                          | D02-01           | A           | High                             | C                 |  |
| Pit toilets (open hole), nonresidential (one or more)      | D16                          | D16-01           | A           | Medium                           | C                 | Assume 1 disposal pit in Zone A                        |
| Seafood processing   | N10                          | N10-01           | A           | Medium                           | C                 | Ward's Cove Packing                                    |
| Septic systems (serves one single-family home)             | R02                          | R02-01           | A           | Low                              | C                 | Assume 10 or less residential septic systems in Zone A |
| Highways and roads, dirt/gravel                            | X24                          | X24-01           | A           | Low                              | C                 | Assume 1-20 roads in Zone A                            |
| Landfills (municipal; Class III)                           | D51                          | D51-01           | B           | High                             | C                 | Egegik Landfill-Closed                                 |
| Landfills (municipal; Class III)                           | D51                          | D51-02           | D           | High                             | C                 |  |

**Table 3**

*Contaminant Source Inventory and Risk Ranking for  
City of Egegik  
Sources of Nitrates/Nitrites*

**PWSID 262238.002**

| <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>  |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Laundromats without dry cleaning                           | C22                          | C22-01           | A           | Low                              | C                 |  |
| Domestic wastewater treatment plant disposal ponds/lagoons | D02                          | D02-01           | A           | High                             | C                 |  |
| Pit toilets (open hole), nonresidential (one or more)      | D16                          | D16-01           | A           | Medium                           | C                 | Assume 1 disposal pit in Zone A                        |
| Seafood processing   | N10                          | N10-01           | A           | Low                              | C                 | Ward's Cove Packing                                    |
| Septic systems (serves one single-family home)             | R02                          | R02-01           | A           | Low                              | C                 | Assume 10 or less residential septic systems in Zone A |
| Cemeteries   | X01                          | X01-01           | A           | Medium                           | C                 | Community Bible Cemetery                               |
| Cemeteries   | X01                          | X01-02           | A           | Medium                           | C                 | Old Cemetery   |
| Airports   | X14                          | X14-01           | A           | Low                              | C                 | Egegik Landing Strip-Retired                           |
| Highways and roads, dirt/gravel                            | X24                          | X24-01           | A           | Low                              | C                 | Assume 1-20 roads in Zone A                            |
| Landfills (municipal; Class III)                           | D51                          | D51-01           | B           | Very High                        | C                 | Egegik Landfill-Closed                                 |
| Landfills (municipal; Class III)                           | D51                          | D51-02           | D           | Very High                        | C                 |  |



Table 4

*Contaminant Source Inventory and Risk Ranking for  
City of Egegik  
Sources of Volatile Organic Chemicals*

PWSID 262238.002

| <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>  |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Laundromats without dry cleaning                           | C22                          | C22-01           | A           | Low                              | C                 |  |
| Domestic wastewater treatment plant disposal ponds/lagoons | D02                          | D02-01           | A           | Low                              | C                 |  |
| Pit toilets (open hole), nonresidential (one or more)      | D16                          | D16-01           | A           | Low                              | C                 | Assume 1 disposal pit in Zone A  |
| Septic systems (serves one single-family home)             | R02                          | R02-01           | A           | Low                              | C                 | Assume 10 or less residential septic systems in Zone A   |
| Tanks, heating oil, residential (above ground)             | R08                          | R08-01           | A           | Medium                           | C                 | Assume 10 or less residential heating oil tanks in Zone A                                      |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-01           | A           | Low                              | C                 | Egegik Light & Power   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-02           | A           | Low                              | C                 | Teachers Quarters  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-03           | A           | Low                              | C                 | ATT  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-04           | A           | Low                              | C                 | Closed Russian Orthodox Church   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-05           | A           | Low                              | C                 | Community Bible Church   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-06           | A           | Low                              | C                 | Community Hall   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-07           | A           | Low                              | C                 | Fire Station   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-08           | A           | Low                              | C                 | City Office  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-09           | A           | Low                              | C                 | Post Office  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-10           | A           | Low                              | C                 | Egegik School  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-11           | A           | Low                              | A                 | Washeteria   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-12           | A           | Low                              | C                 | Washeteria   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-13           | A           | Low                              | C                 | Washeteria   |
| Contaminated sites, DEC recognized, non-Superfund non-RCRA | U04                          | U04-01           | A           | High                             | C                 | Egegik Light & Power, RecKey #1994250122301, Status: Inactive, petroleum ground contamination. |
| Petroleum product bulk station/terminals                   | X11                          | X11-01           | A           | Very High                        | C                 | Egegik Light & Power   |
| Petroleum product bulk station/terminals                   | X11                          | X11-02           | A           | Very High                        | C                 |  |
| Airports   | X14                          | X14-01           | A           | High                             | C                 | Egegik Landing Strip-Retired   |
| Highways and roads, dirt/gravel                            | X24                          | X24-01           | A           | Low                              | C                 | Assume 1-20 roads in Zone A  |

**Table 4 (continued)**

*Contaminant Source Inventory and Risk Ranking for  
City of Egegik  
Sources of Volatile Organic Chemicals*

**PWSID 262238.002**

| <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>        |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|------------------------|
| Electric power generation (fossil fuels) | X36                          | X36-01           | A           | Medium                           | C                 | Egegik Light & Power   |
| Firehouses                               | X38                          | X38-01           | A           | Low                              | C                 |                        |
| Landfills (municipal; Class III)         | D51                          | D51-01           | B           | High                             | C                 | Egegik Landfill-Closed |
| Landfills (municipal; Class III)         | D51                          | D51-02           | D           | High                             | C                 |                        |

Table 5

*Contaminant Source Inventory and Risk Ranking for  
City of Egegik  
Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals*

PWSID 262238.002

| <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>  |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Domestic wastewater treatment plant disposal ponds/lagoons | D02                          | D02-01           | A           | Low                              | C                 |  |
| Pit toilets (open hole), nonresidential (one or more)      | D16                          | D16-01           | A           | Low                              | C                 | Assume 1 disposal pit in Zone A  |
| Septic systems (serves one single-family home)             | R02                          | R02-01           | A           | Low                              | C                 | Assume 10 or less residential septic systems in Zone A   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-01           | A           | Low                              | C                 | Egegik Light & Power   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-02           | A           | Low                              | C                 | Teachers Quarters  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-03           | A           | Low                              | C                 | ATT  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-04           | A           | Low                              | C                 | Closed Russian Orthodox Church   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-05           | A           | Low                              | C                 | Community Bible Church   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-06           | A           | Low                              | C                 | Community Hall   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-07           | A           | Low                              | C                 | Fire Station   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-08           | A           | Low                              | C                 | City Office  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-09           | A           | Low                              | C                 | Post Office  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-10           | A           | Low                              | C                 | Egegik School  |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-11           | A           | Low                              | A                 | Washeteria   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-12           | A           | Low                              | C                 | Washeteria   |
| Tanks, heating oil, nonresidential (aboveground)           | T14                          | T14-13           | A           | Low                              | C                 | Washeteria   |
| Contaminated sites, DEC recognized, non-Superfund non-RCRA | U04                          | U04-01           | A           | Low                              | C                 | Egegik Light & Power, RecKey #1994250122301, Status: Inactive, petroleum ground contamination. |
| Cemeteries   | X01                          | X01-01           | A           | Low                              | C                 | Community Bible Cemetery   |
| Cemeteries   | X01                          | X01-02           | A           | Low                              | C                 | Old Cemetery   |
| Petroleum product bulk station/terminals                   | X11                          | X11-01           | A           | Low                              | C                 | Egegik Light & Power   |
| Petroleum product bulk station/terminals                   | X11                          | X11-02           | A           | Low                              | C                 |  |
| Airports   | X14                          | X14-01           | A           | Low                              | C                 | Egegik Landing Strip-Retired   |
| Highways and roads, dirt/gravel                            | X24                          | X24-01           | A           | Low                              | C                 | Assume 1-20 roads in Zone A  |

**Table 5 (continued)**

*Contaminant Source Inventory and Risk Ranking for  
City of Egegik  
Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals*

**PWSID 262238.002**

| <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>        |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|------------------------|
| Electric power generation (fossil fuels) | X36                          | X36-01           | A           | Medium                           | C                 | Egegik Light & Power   |
| Firehouses                               | X38                          | X38-01           | A           | Low                              | C                 |                        |
| Landfills (municipal; Class III)         | D51                          | D51-01           | B           | High                             | C                 | Egegik Landfill-Closed |
| Landfills (municipal; Class III)         | D51                          | D51-02           | D           | High                             | C                 |                        |

Table 6

*Contaminant Source Inventory and Risk Ranking for  
City of Egegik  
Sources of Synthetic Organic Chemicals*

PWSID 262238.002

| <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>  |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Domestic wastewater treatment plant disposal ponds/lagoons | D02                          | D02-01           | A           | Low                              | C                 |  |
| Septic systems (serves one single-family home)             | R02                          | R02-01           | A           | Low                              | C                 | Assume 10 or less residential septic systems in Zone A   |
| Contaminated sites, DEC recognized, non-Superfund non-RCRA | U04                          | U04-01           | A           | Low                              | C                 | Egegik Light & Power, RecKey #1994250122301, Status: Inactive, petroleum ground contamination. |
| Cemeteries   | X01                          | X01-01           | A           | Medium                           | C                 | Community Bible Cemetery   |
| Cemeteries   | X01                          | X01-02           | A           | Medium                           | C                 | Old Cemetery   |
| Petroleum product bulk station/terminals                   | X11                          | X11-01           | A           | Low                              | C                 | Egegik Light & Power   |
| Petroleum product bulk station/terminals                   | X11                          | X11-02           | A           | Low                              | C                 |  |
| Airports   | X14                          | X14-01           | A           | Medium                           | C                 | Egegik Landing Strip-Retired   |
| Landfills (municipal; Class III)                           | D51                          | D51-01           | B           | Very High                        | C                 | Egegik Landfill-Closed   |
| Landfills (municipal; Class III)                           | D51                          | D51-02           | D           | Very High                        | C                 |  |

Table 7

*Contaminant Source Inventory and Risk Ranking for  
City of Egegik  
Sources of Other Organic Chemicals*

PWSID 262238.002

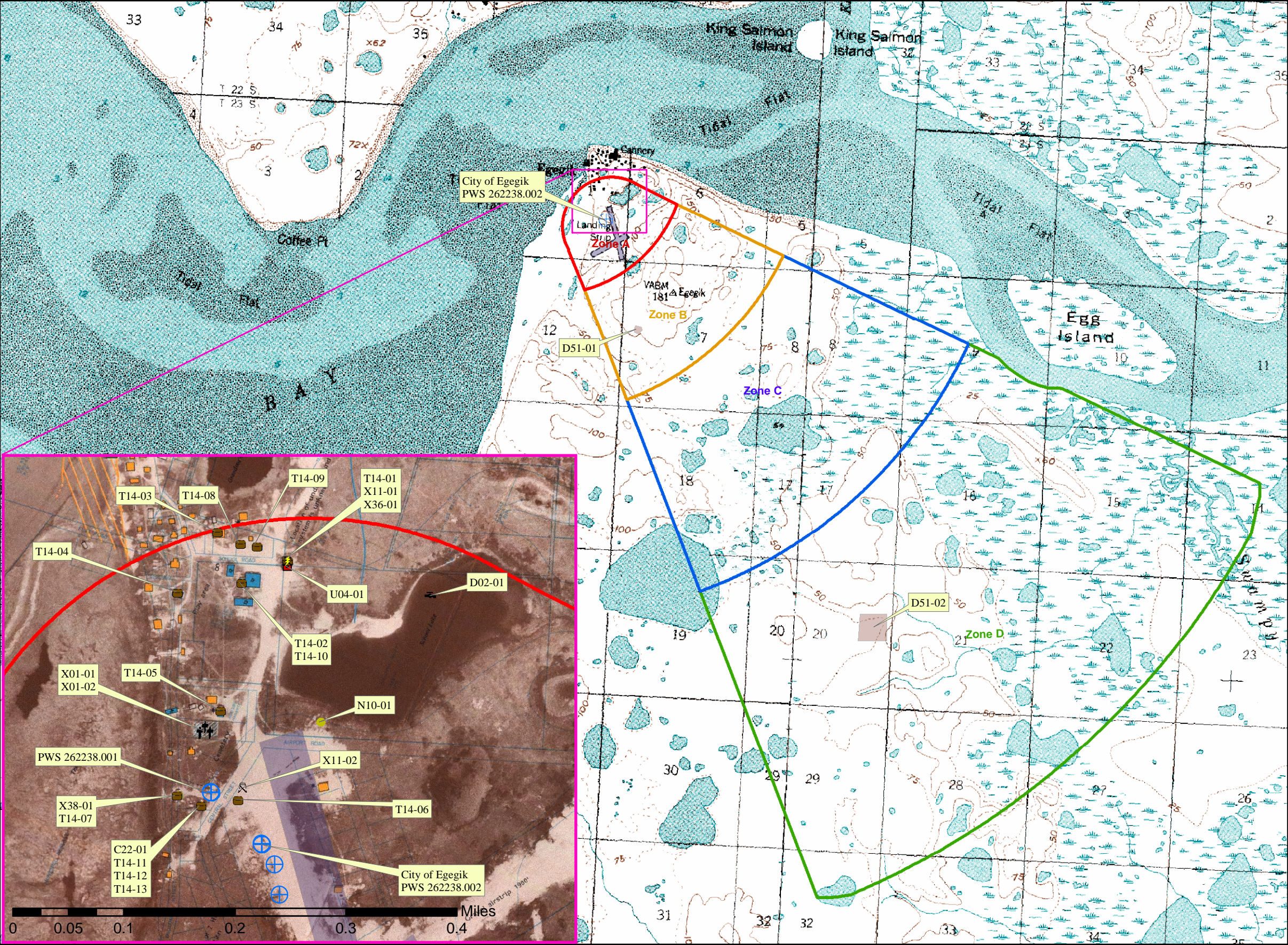
| <i>Contaminant Source Type</i>                             | <i>Contaminant Source ID</i> | <i>CS ID tag</i> | <i>Zone</i> | <i>Risk Ranking for Analysis</i> | <i>Map Number</i> | <i>Comments</i>  |
|--|------------------------------|------------------|-------------|----------------------------------|-------------------|--|
| Domestic wastewater treatment plant disposal ponds/lagoons | D02                          | D02-01           | A           | Low                              | C                 |  |
| Septic systems (serves one single-family home)             | R02                          | R02-01           | A           | Low                              | C                 | Assume 10 or less residential septic systems in Zone A   |
| Contaminated sites, DEC recognized, non-Superfund non-RCRA | U04                          | U04-01           | A           | Low                              | C                 | Egegik Light & Power, RecKey #1994250122301, Status: Inactive, petroleum ground contamination. |
| Petroleum product bulk station/terminals                   | X11                          | X11-01           | A           | High                             | C                 | Egegik Light & Power   |
| Petroleum product bulk station/terminals                   | X11                          | X11-02           | A           | High                             | C                 |  |
| Airports   | X14                          | X14-01           | A           | Medium                           | C                 | Egegik Landing Strip-Retired   |
| Highways and roads, dirt/gravel                            | X24                          | X24-01           | A           | Low                              | C                 | Assume 1-20 roads in Zone A  |
| Electric power generation (fossil fuels)                   | X36                          | X36-01           | A           | High                             | C                 | Egegik Light & Power   |
| Landfills (municipal; Class III)                           | D51                          | D51-01           | B           | Very High                        | C                 | Egegik Landfill-Closed   |
| Landfills (municipal; Class III)                           | D51                          | D51-02           | D           | Very High                        | C                 |  |

## **APPENDIX C**

### **Drinking Water Protection Area and Potential and Existing Contaminant Sources (Map C)**



Public Water Well System for PWS #262238.002 City of Egegik  
Showing Potential and Existing Sources of Contamination



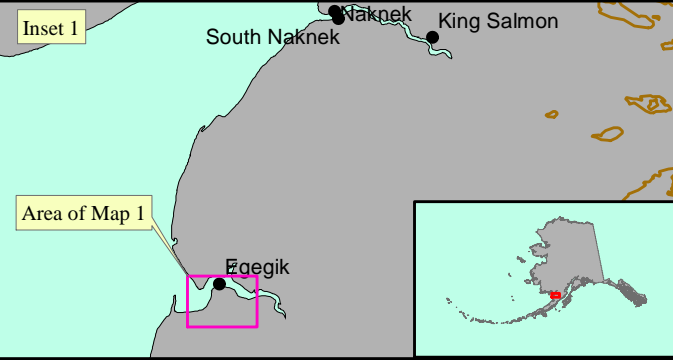
LEGEND

- Public Water System Well
- Hydrography/Physical**
  - Parcels
  - Stream
  - Lake or Pond
  - Contours
- Transportation**
  - Primary Route (Class 1)
  - Secondary Route (Class 2)
  - Road (Class 3)
  - Road (Class 4)
  - Road (Class 5, Four-wheel drive)
- Groundwater Protection Zones**
  - Zone A Protection Area- Several Months Travel Time
  - Zone B Protection Area- 2 Years Travel Time
  - Zone C Protection Area- 5 Years Travel Time
  - Zone D Protection Area- 10 Years Travel Time
- Existing or Potential Contaminant Sources**
  - Washeteria (C22)
  - Domestic wastewater treatment plant disposal pond/lagoon (D02)
  - Seafood processing (N10)
  - Nonresidential aboveground heating oil tanks (T14)
  - Contaminated sites, DEC recognized, non-Superfund, non-RCRA (U04)
  - Cemetery (X01)
  - Petroleum product bulk station/terminal (X11)
  - Electric power generation (fossil fuels) (X36)
  - Firehouse (X38)
  - Municipal landfill (Class III) (D51)
  - Airport (X14)

Data Sources:  
Contaminant Sources, Public Water System Wells, Contours  
Alaska Department of Environmental Conservation (ADEC)  
Critical Facilities, Federal Emergency Management Agency (FEMA)

All other data:  
United States Geological Survey (USGS)

Drinking Water Protection Areas based on "Alaska Drinking  
Water Protection Program - Guidance Manual for Class A  
Public Water Systems" published by ADEC  
URS Corporation does not guarantee the accuracy or  
validity of the data provided.



City of Egegik  
PWS 262238.002

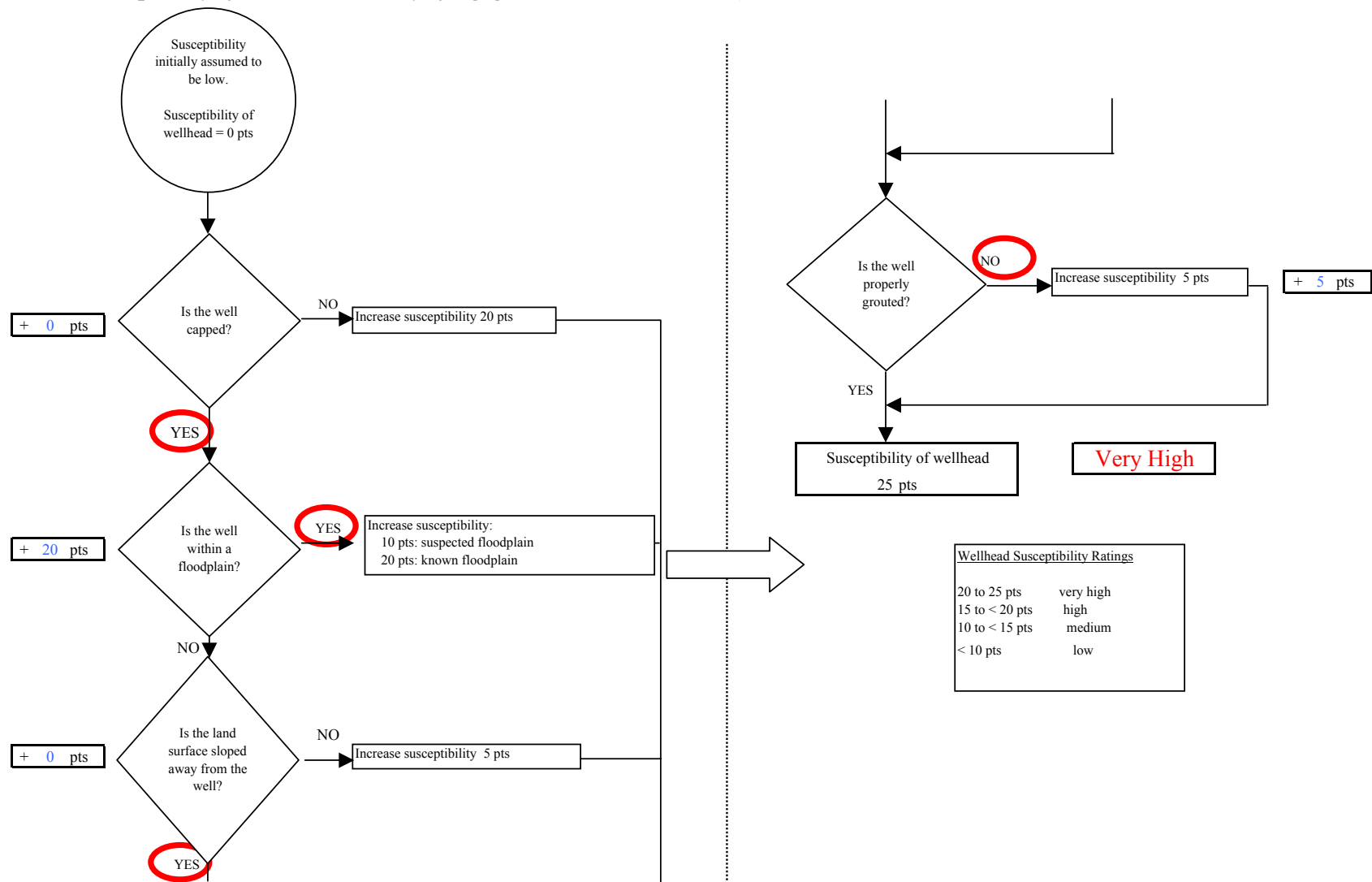
Appendix C Map C



## **APPENDIX D**

### **Vulnerability Analysis for Public Drinking Water Source (Charts 1-14)**

Chart 1. Susceptibility of the wellhead - City of Egegik (PWS No. 262238.002)



**Chart 2. Susceptibility of the aquifer City of Egegik (PWS No. 262238.002)**

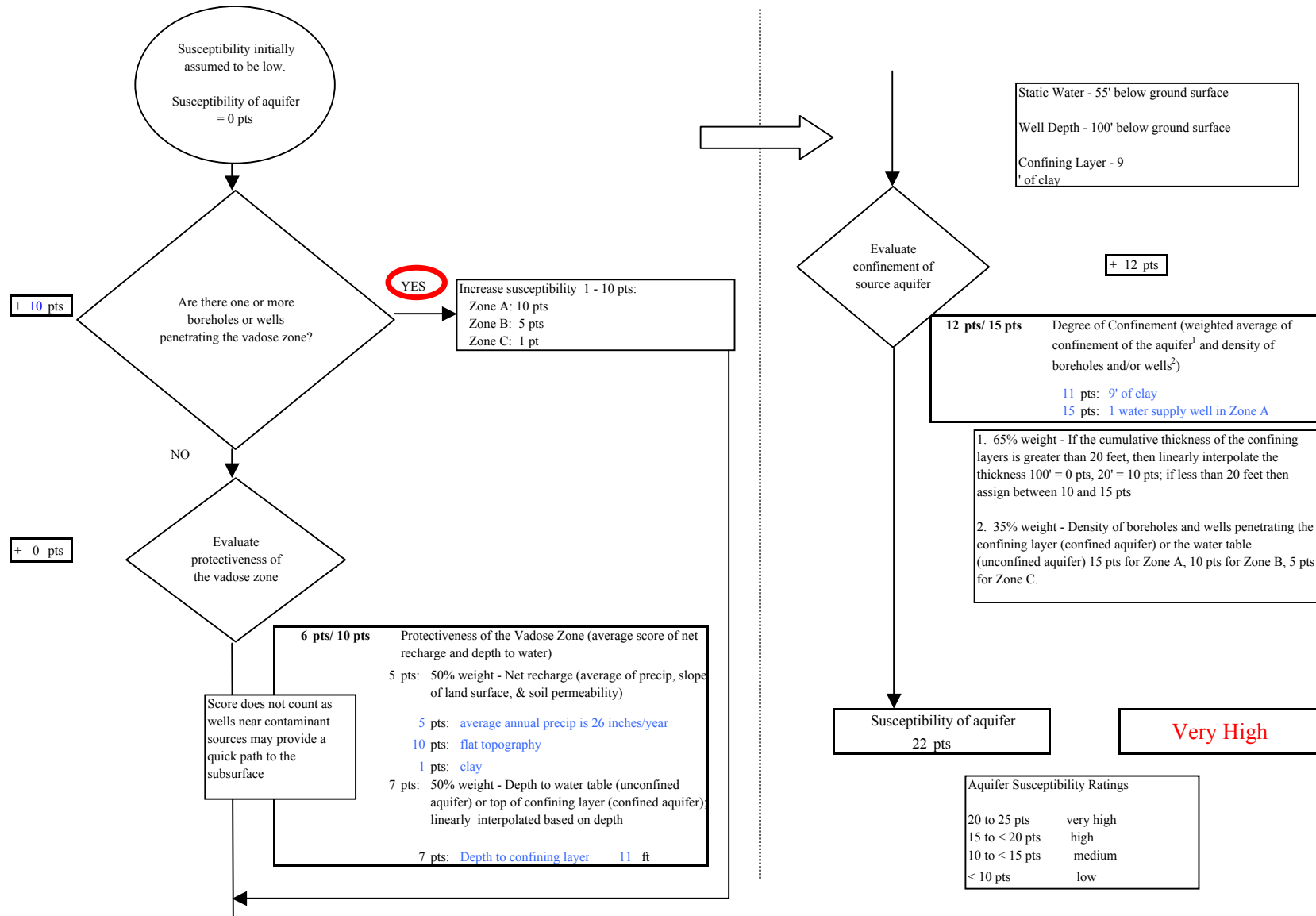
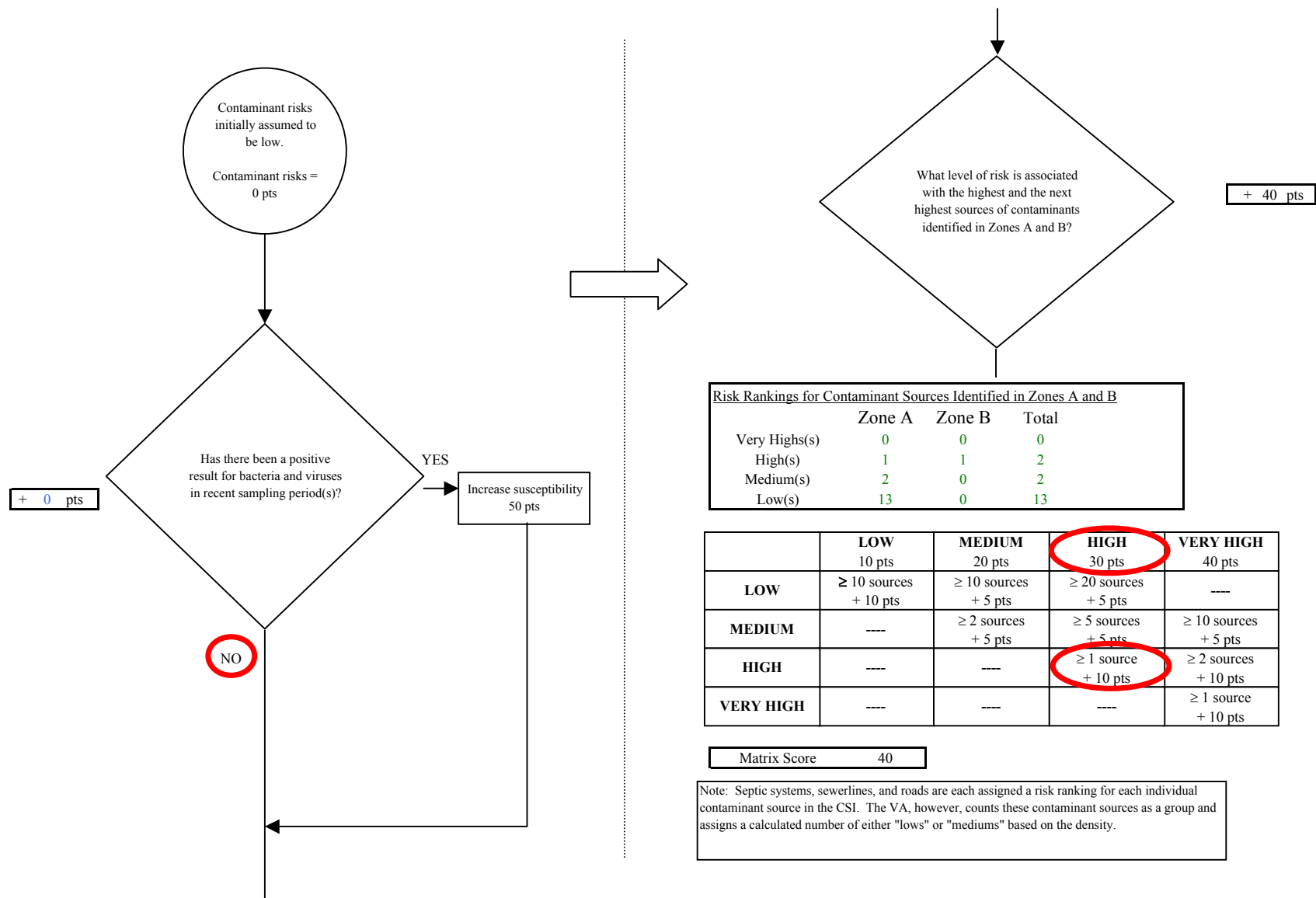
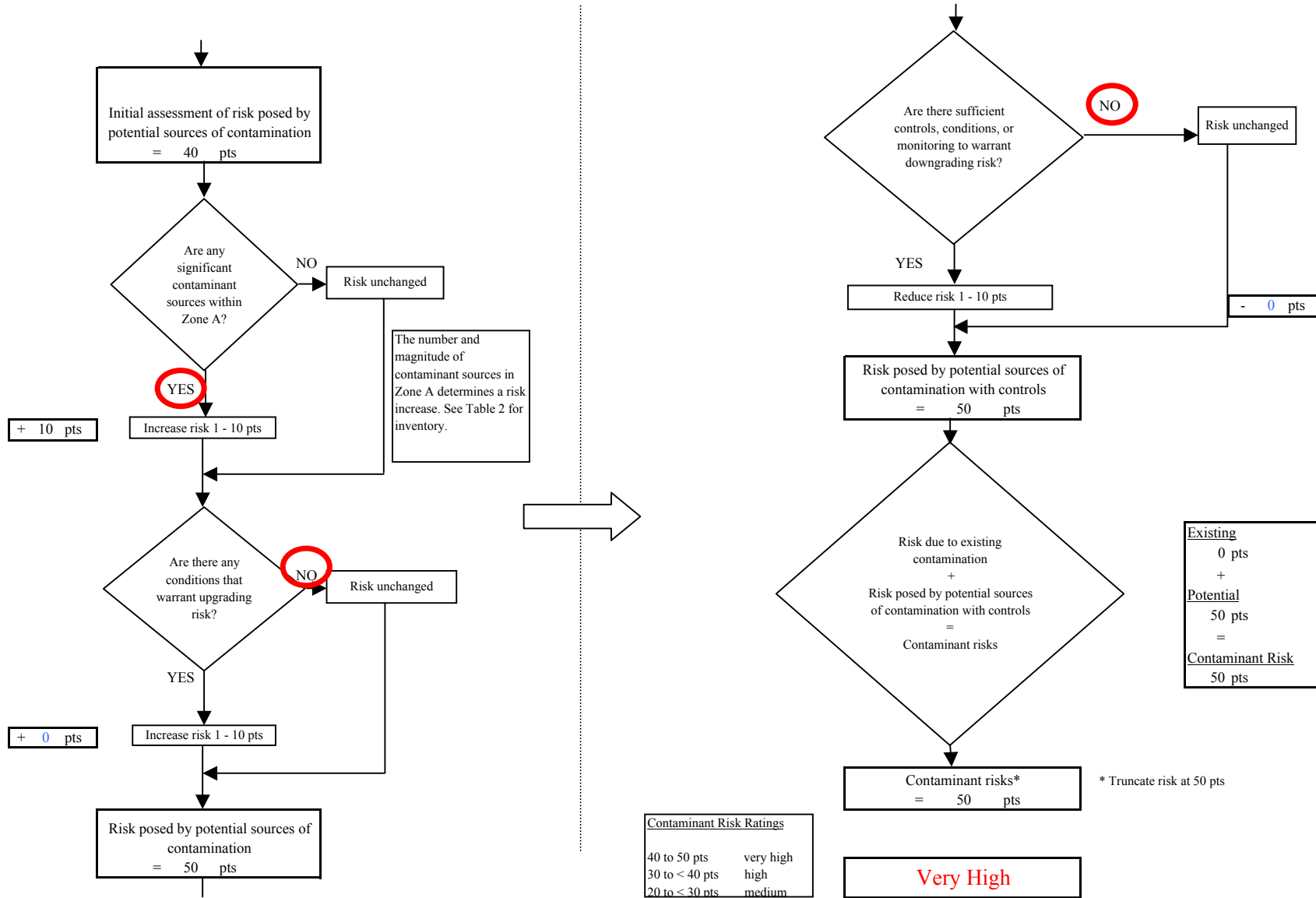


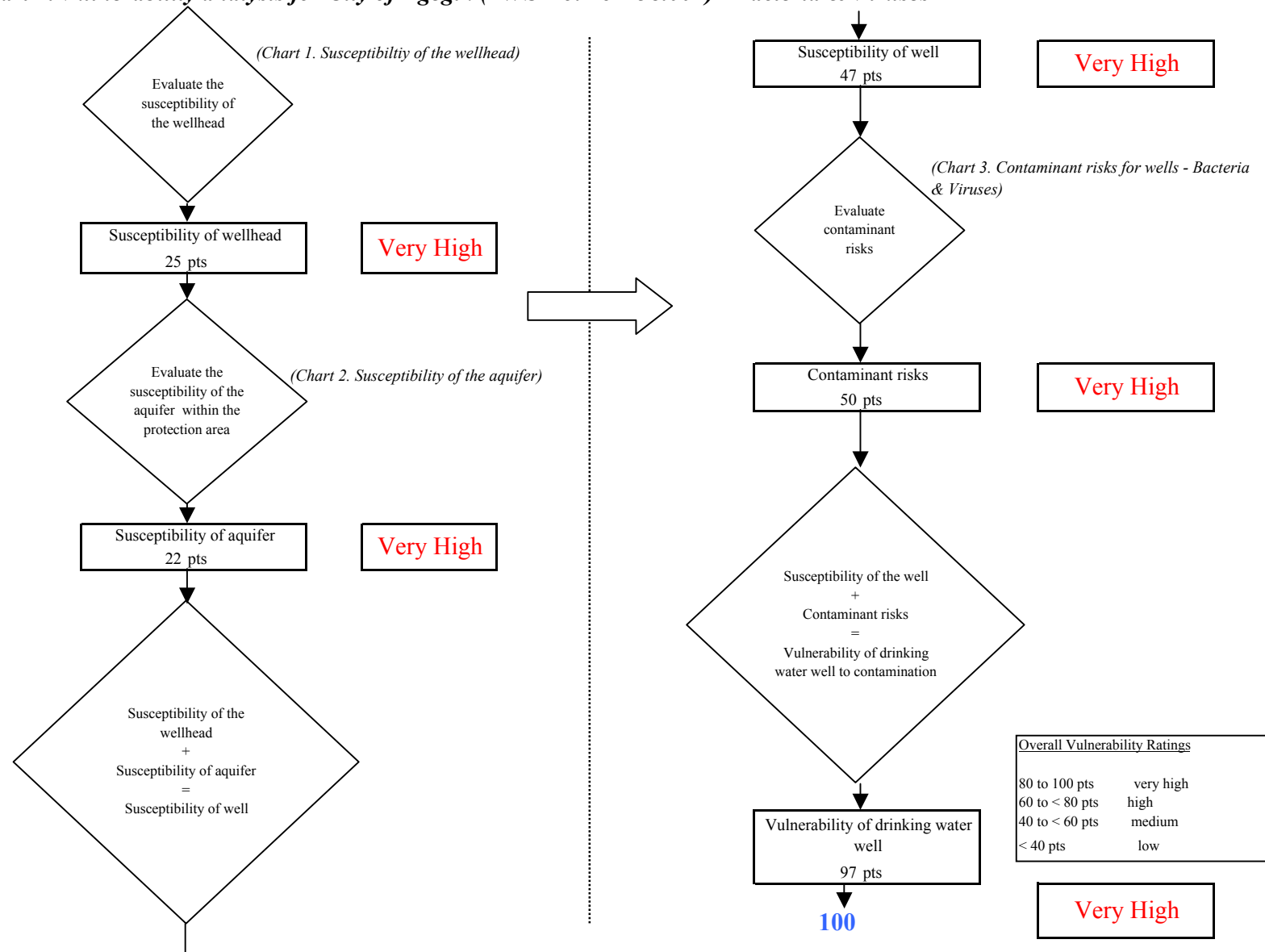
Chart 3. Contaminant risks for City of Egegik (PWS No. 262238.002) - Bacteria & Viruses



**Chart 3. Contaminant risks for City of Egegik (PWS No. 262238.002) - Bacteria & Viruses**



**Chart 4. Vulnerability analysis for City of Egegik (PWS No. 262238.002) - Bacteria & Viruses**



**Chart 5. Contaminant risks for City of Egegik (PWS No. 262238.002) - Nitrates and Nitrites**

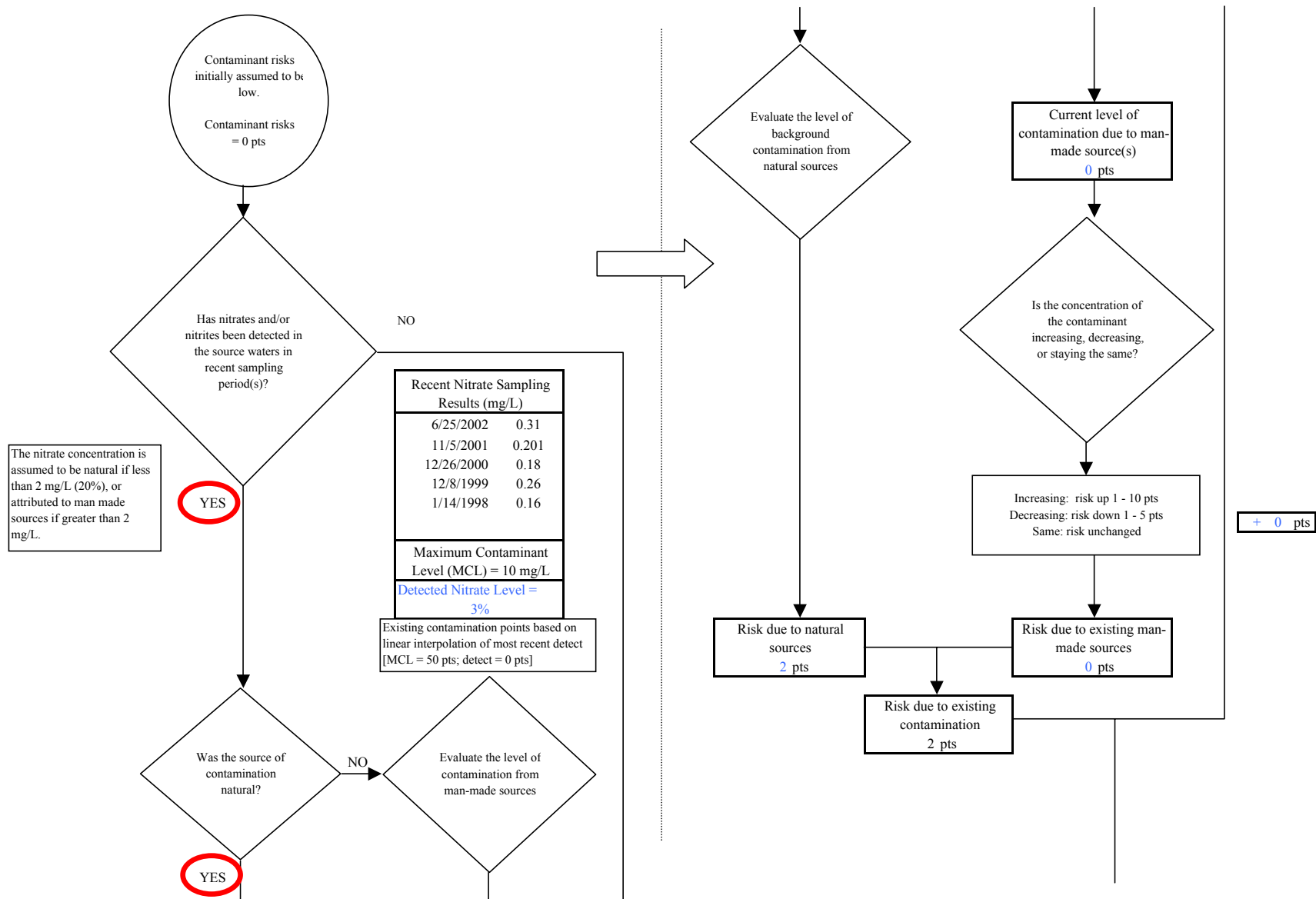
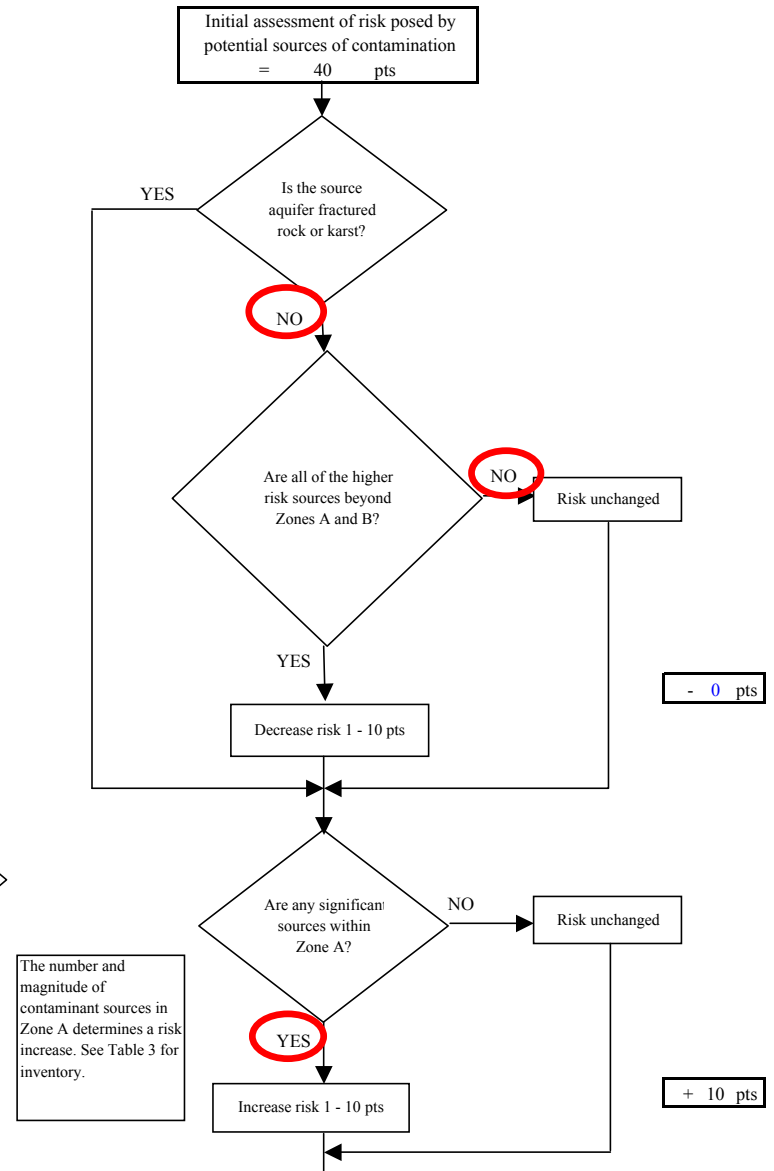
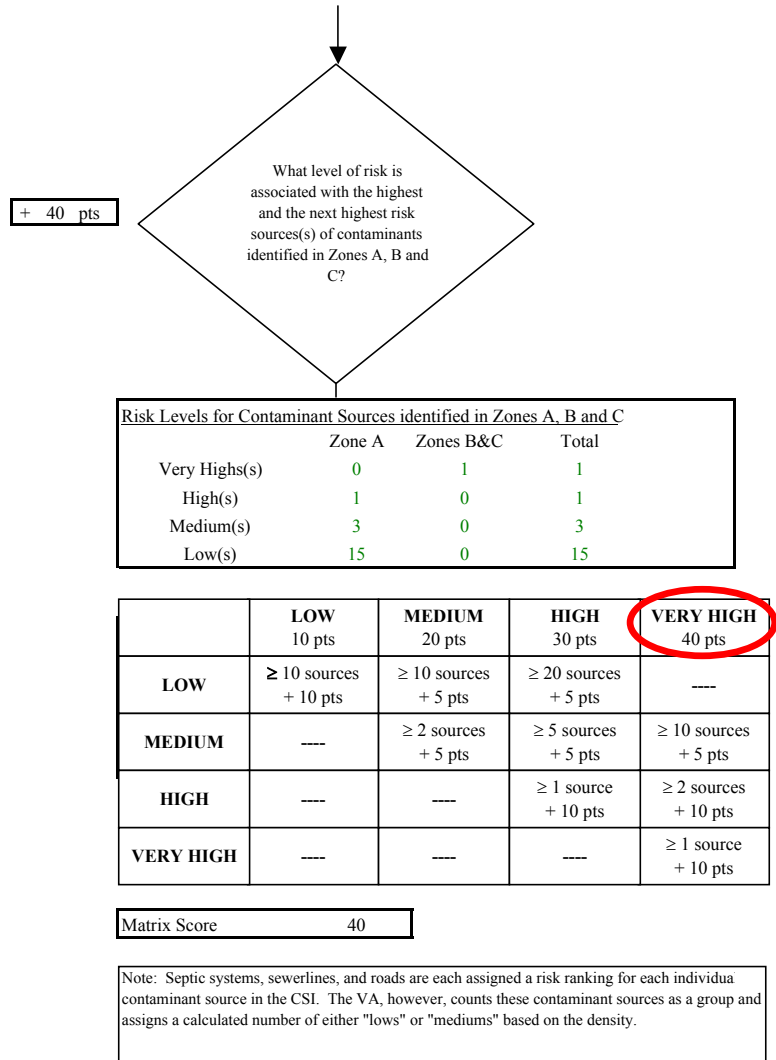


Chart 5. Contaminant risks for City of Egegik (PWS No. 262238.002) - Nitrates and Nitrites





**Chart 5. Contaminant risks for City of Egegik (PWS No. 262238.002) - Nitrates and Nitrites**

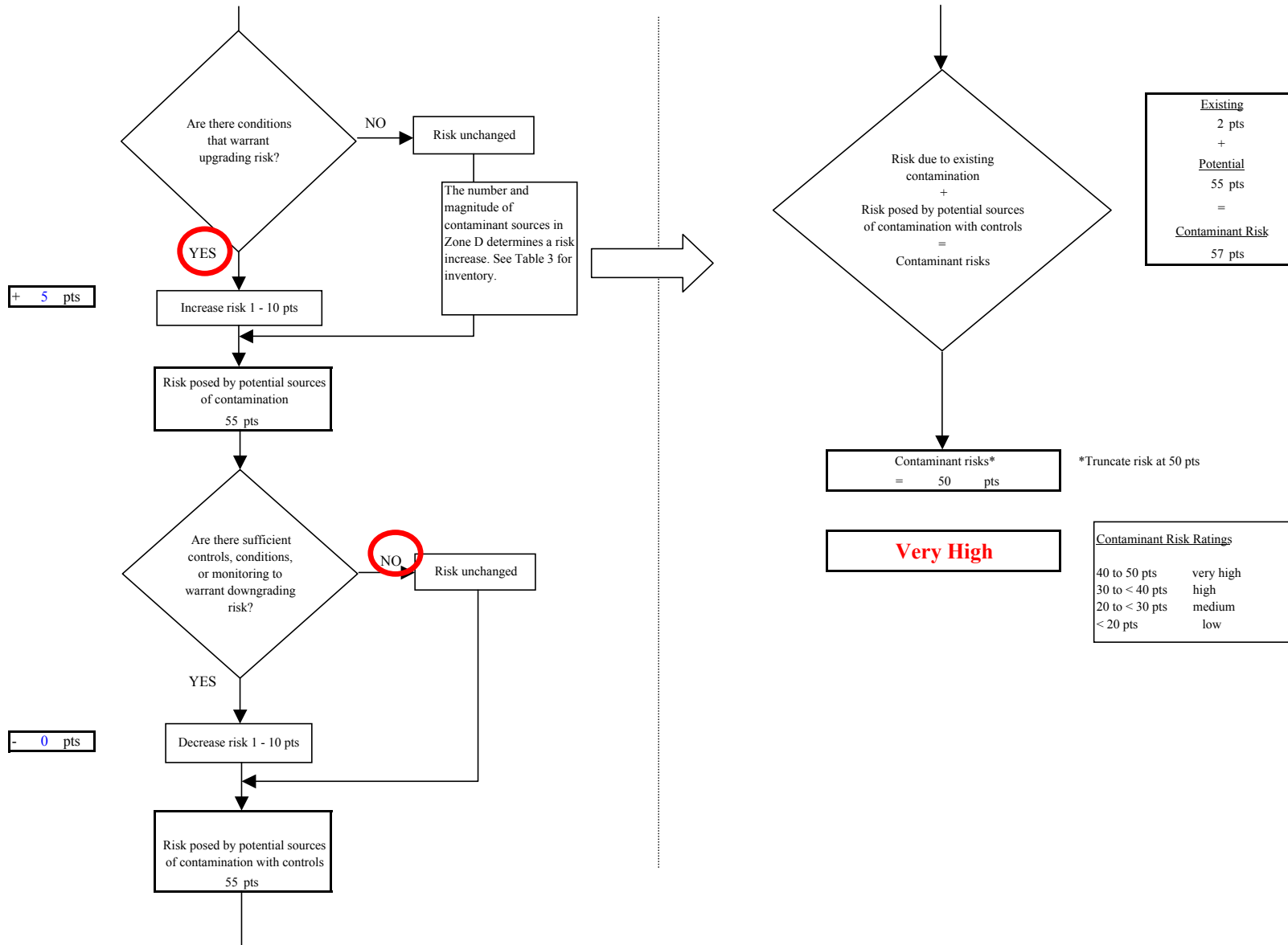
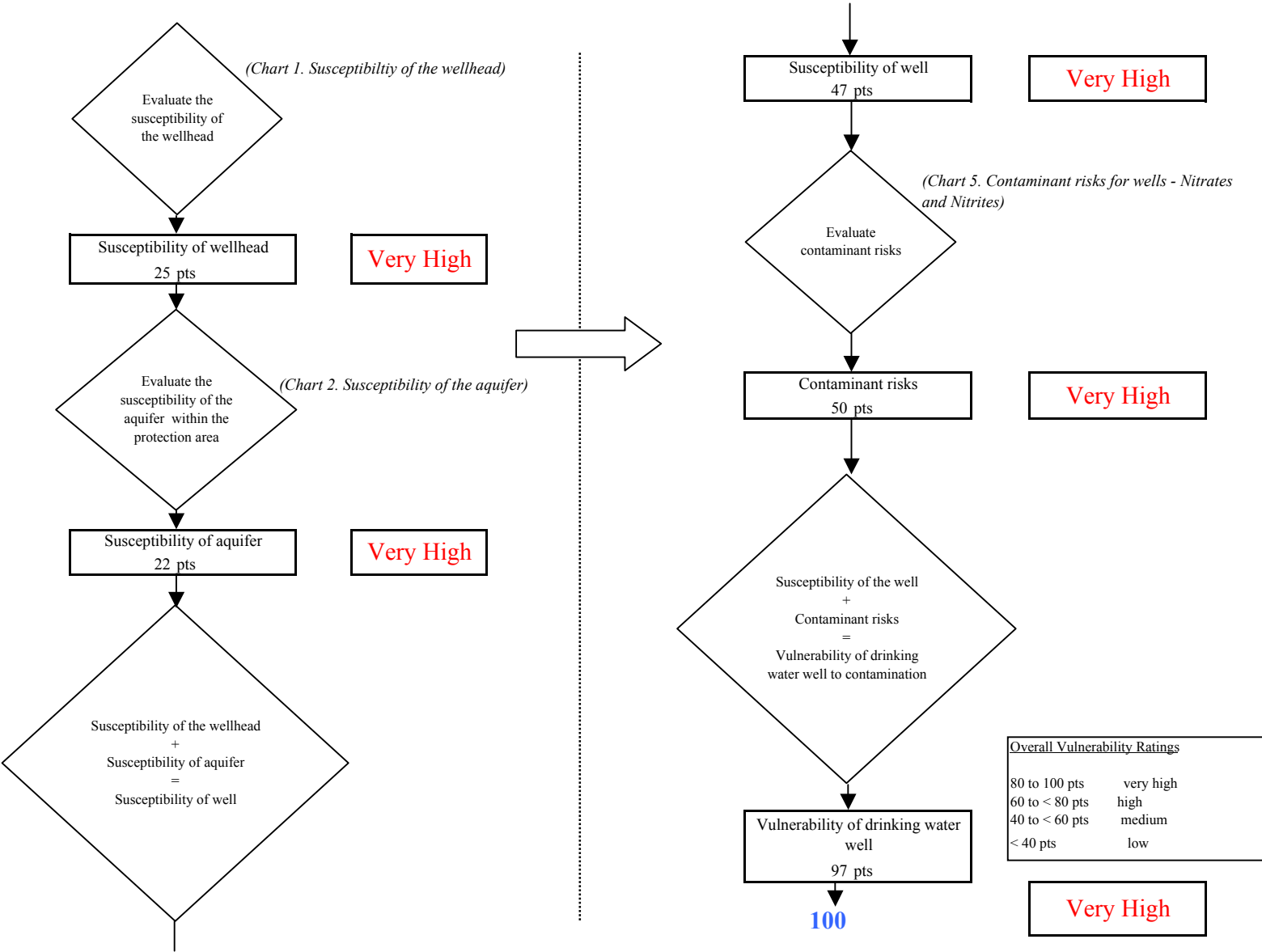


Chart 6. Vulnerability analysis for City of Egegik (PWS No. 262238.002) - Nitrates and Nitrites



**Chart 7. Contaminant risks for City of Egegik (PWS No. 262238.002) - Volatile Organic Chemicals**

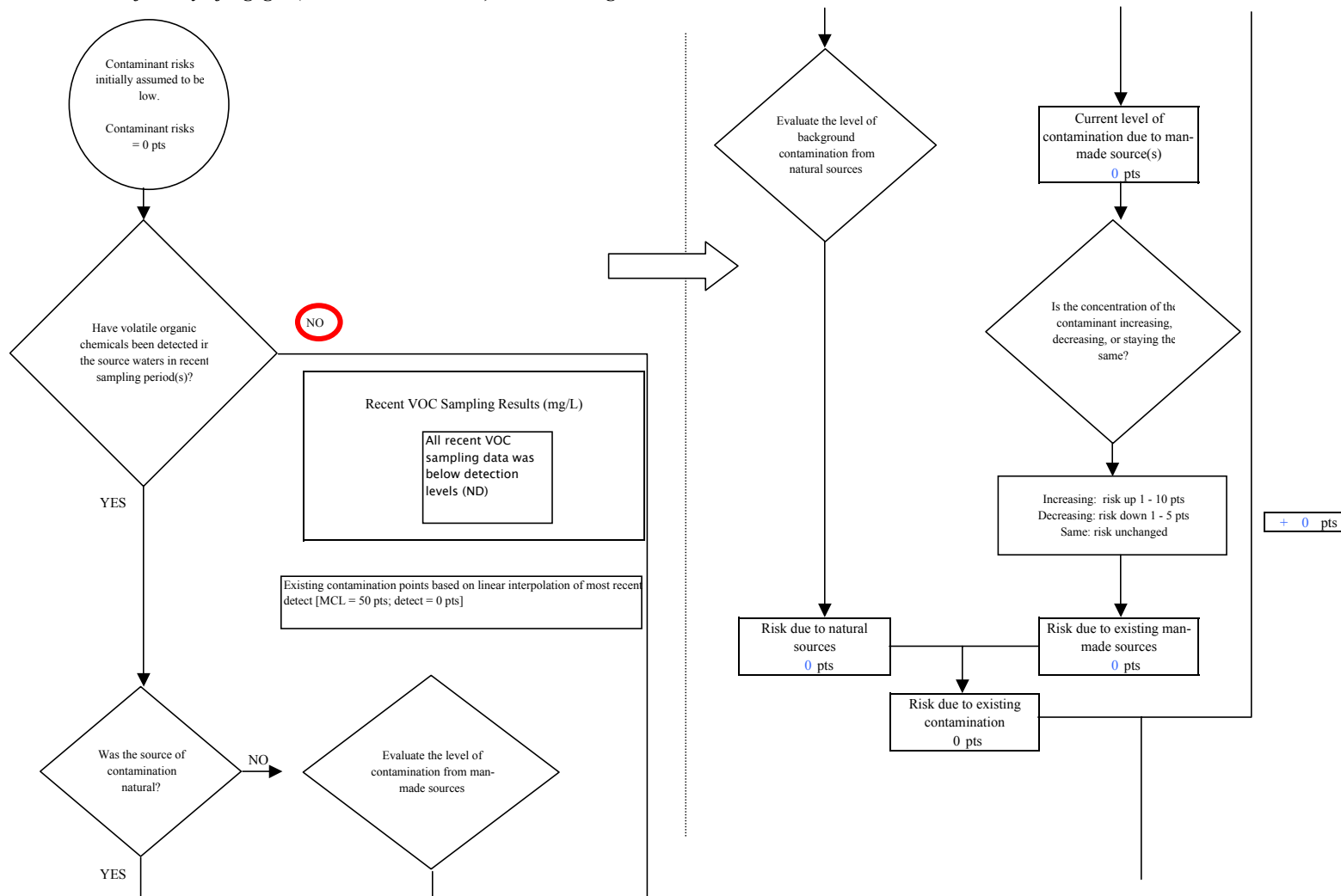
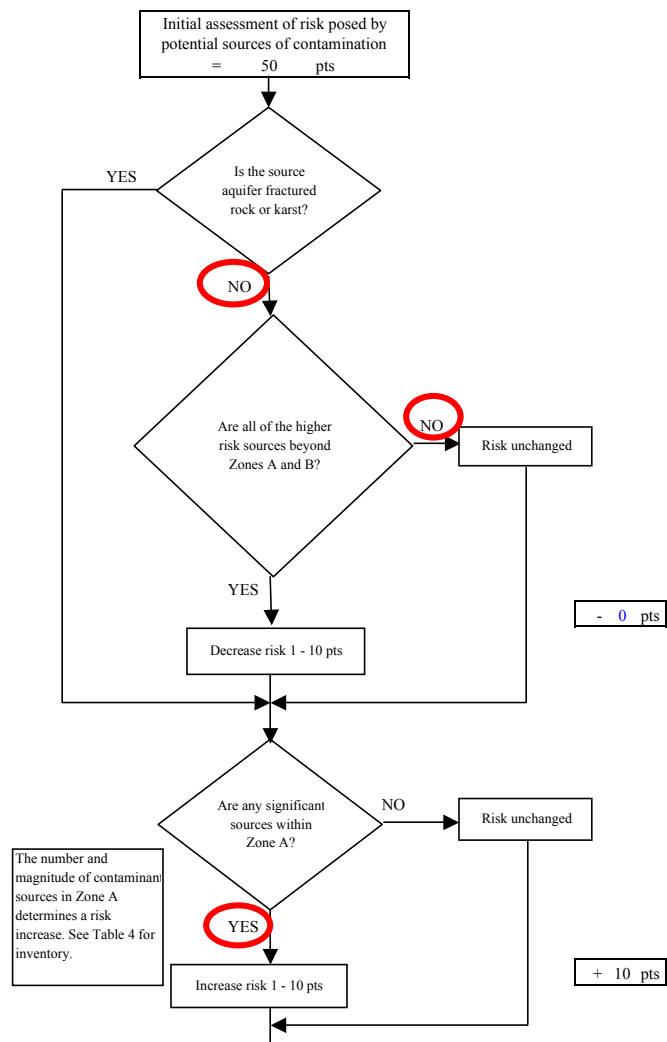
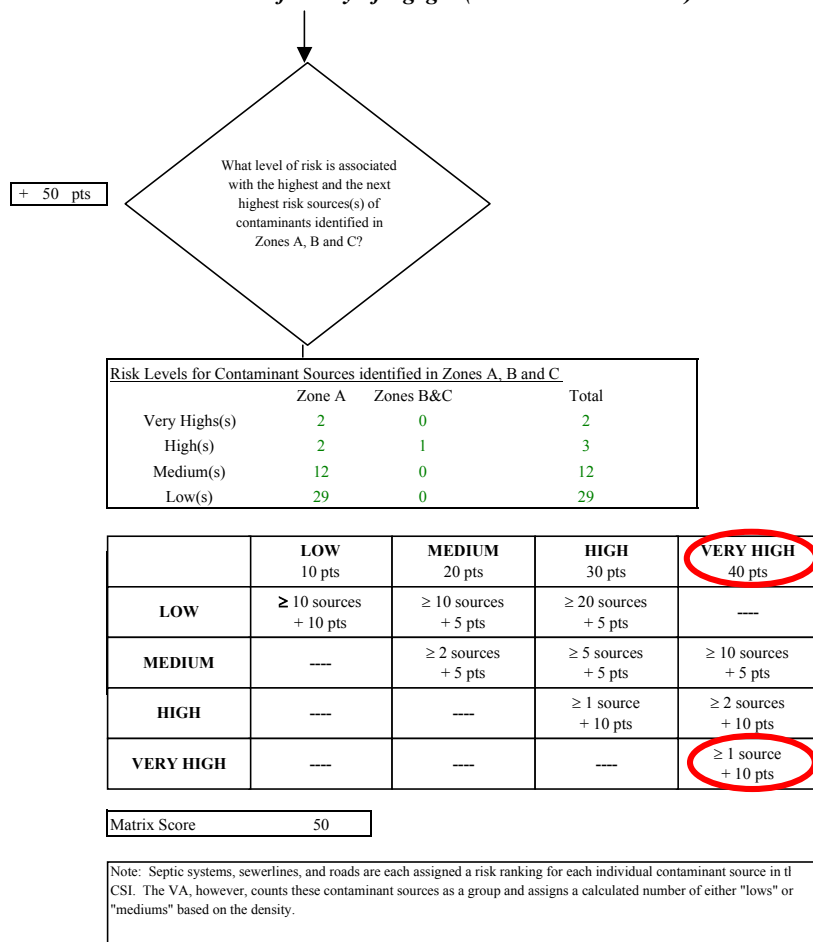


Chart 7. Contaminant risks for City of Egegik (PWS No. 262238.002) - Volatile Organic Chemicals



**Chart 7. Contaminant risks for City of Egegik (PWS No. 262238.002) - Volatile Organic Chemicals**

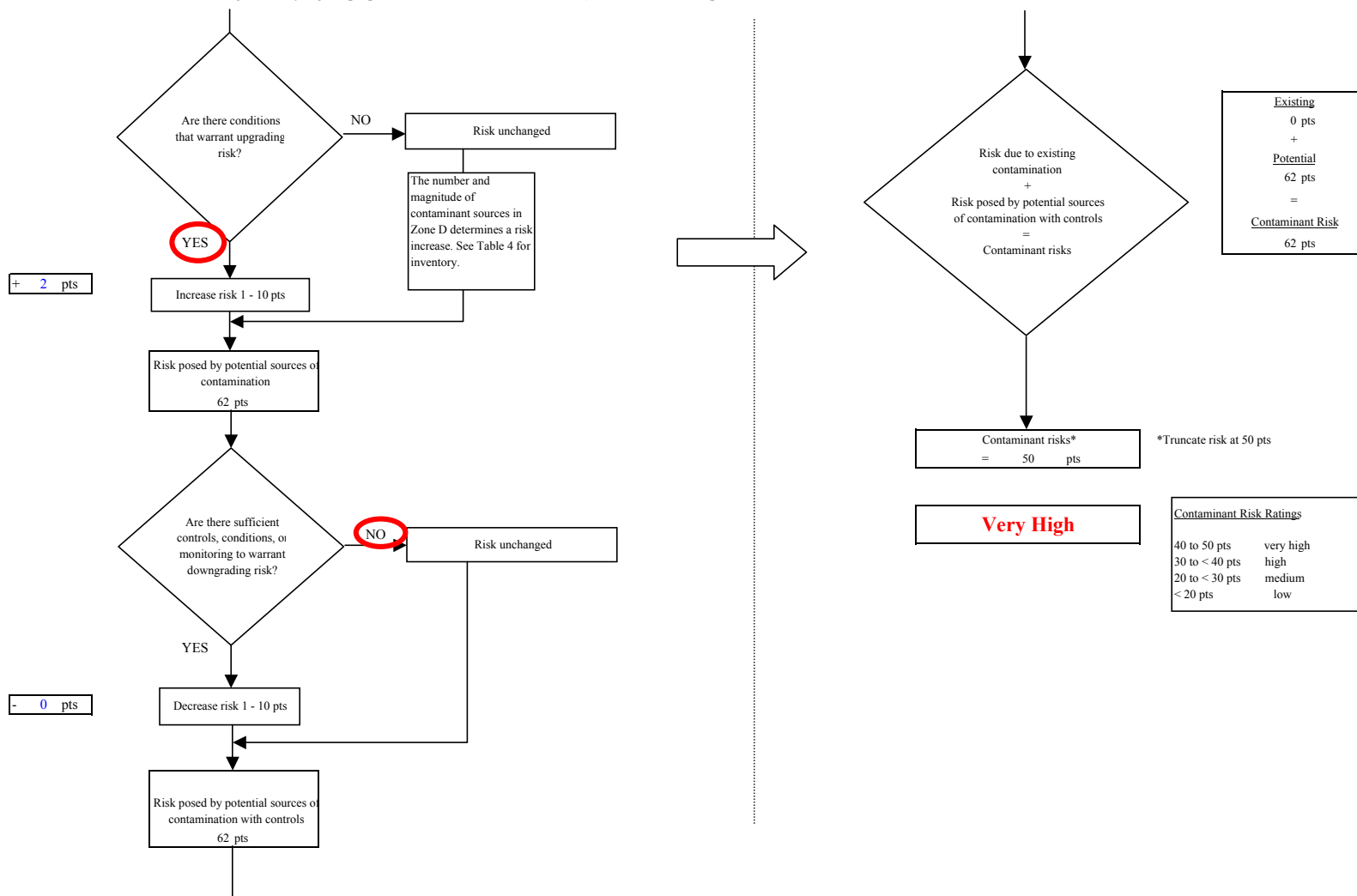
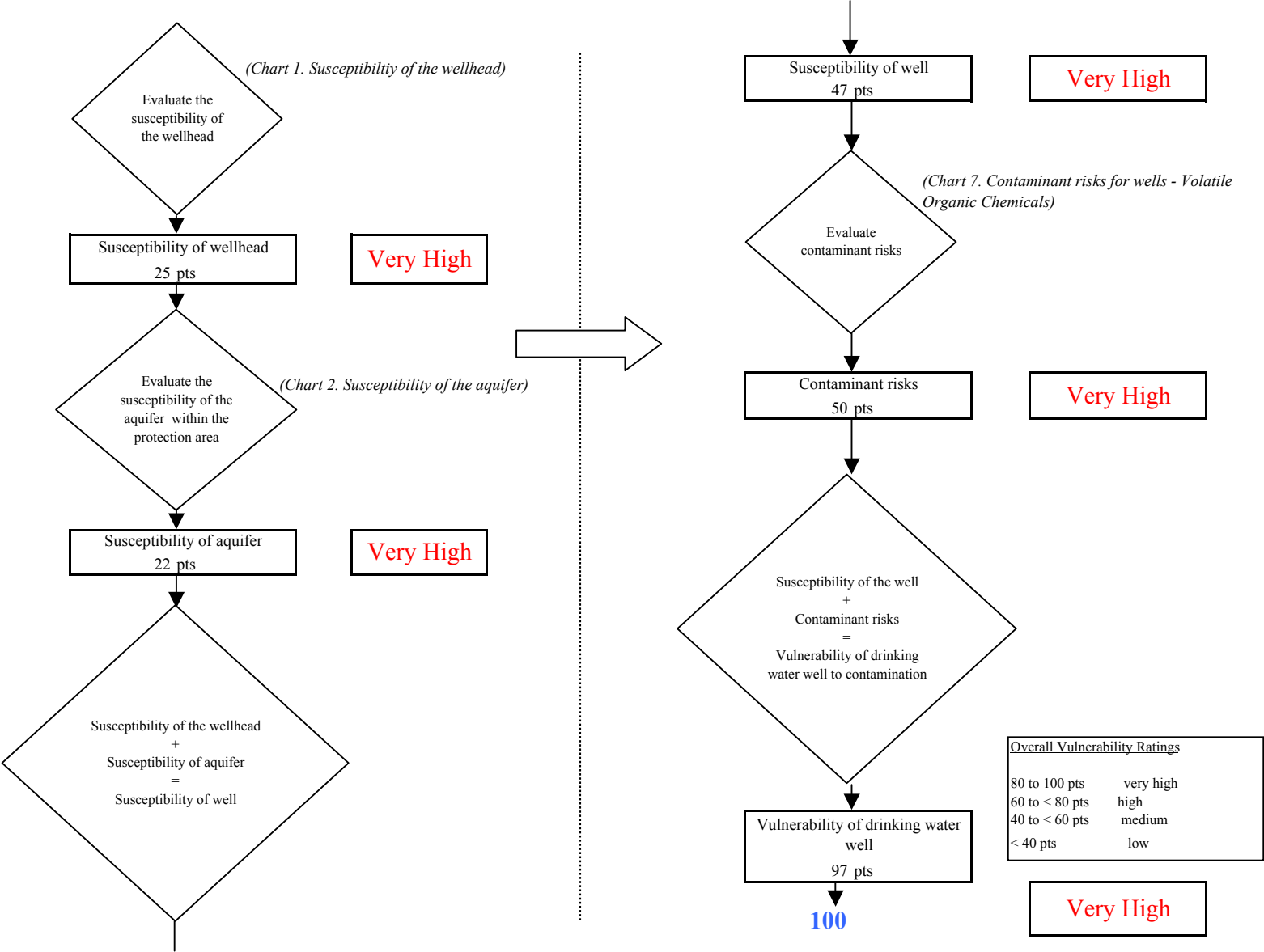
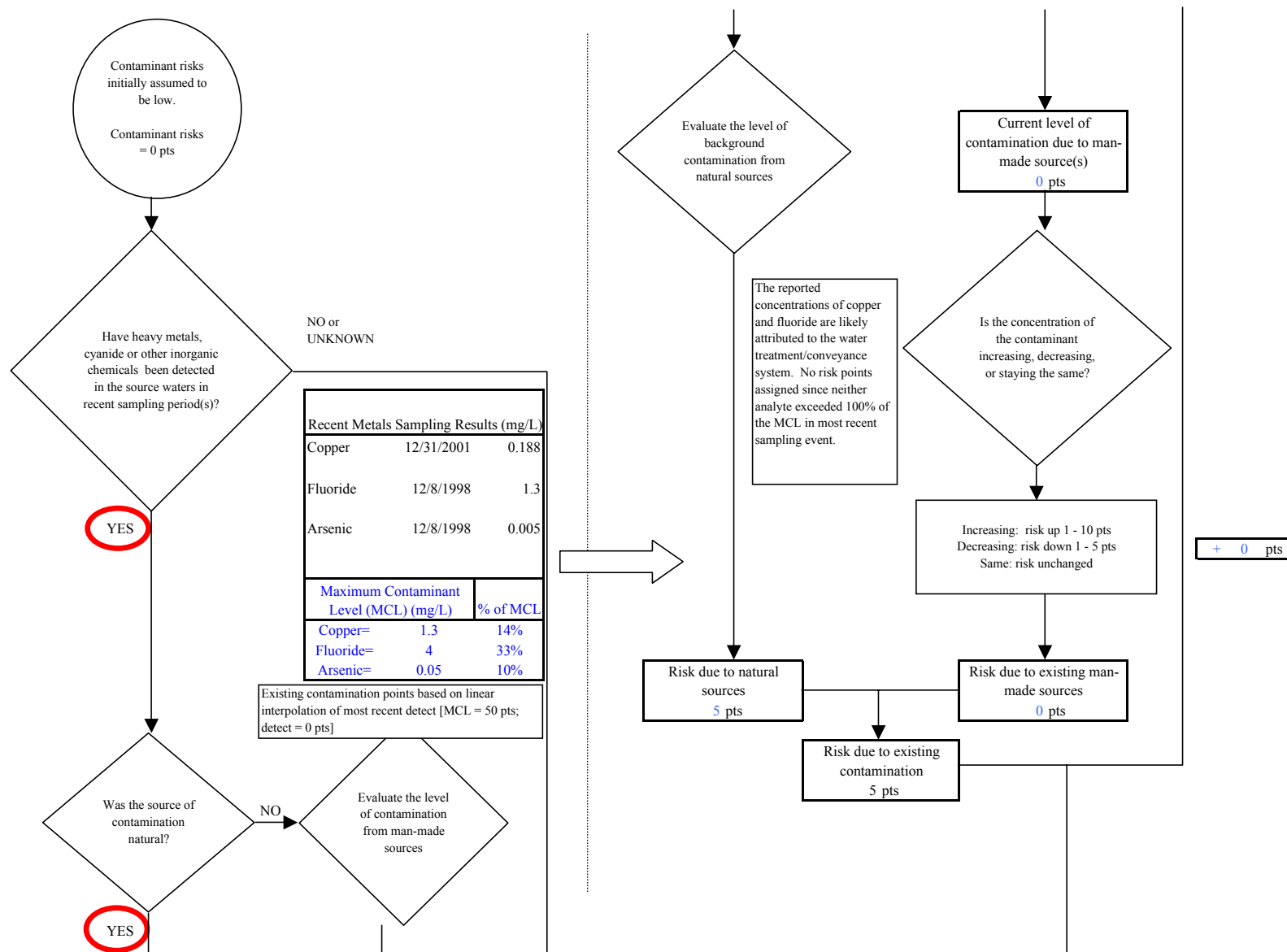


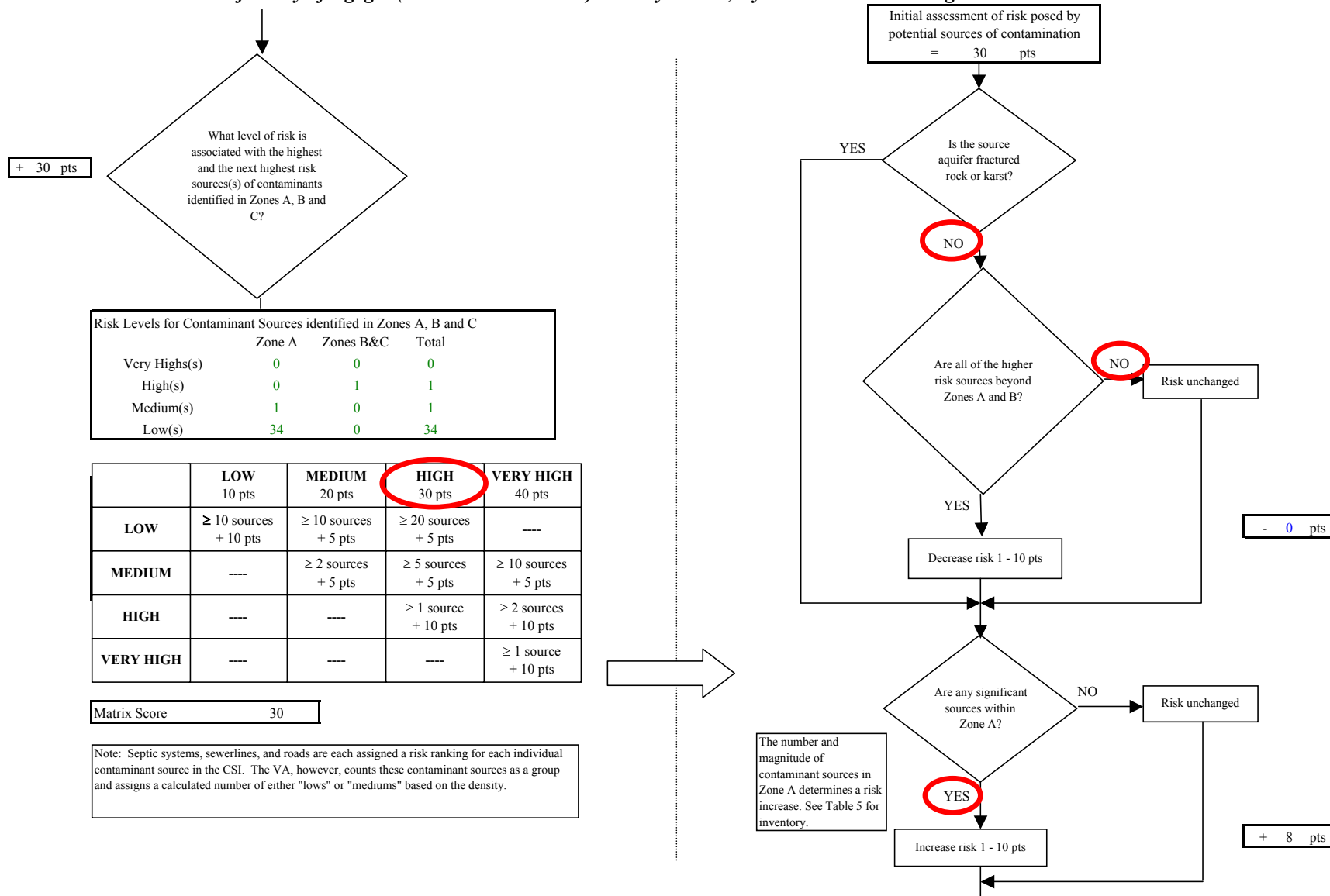
Chart 8. Vulnerability analysis for City of Egegik (PWS No. 262238.002) - Volatile Organic Chemicals



**Chart 9. Contaminant risks for City of Egegik (PWS No. 262238.002) - Heavy Metals, Cyanide and Other Inorganic Chemicals**

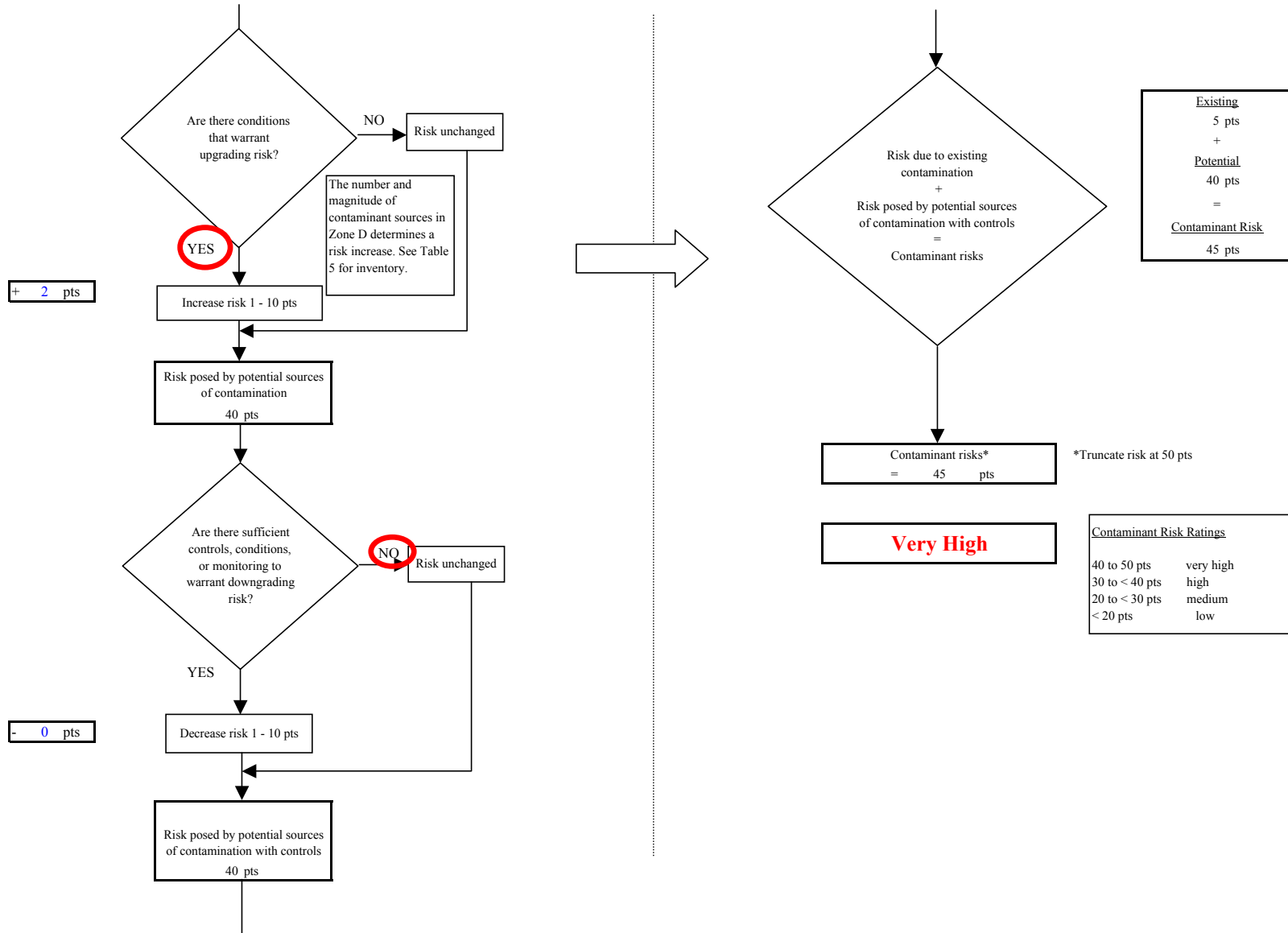


**Chart 9. Contaminant risks for City of Egegik (PWS No. 262238.002) - Heavy Metals, Cyanide and Other Inorganic Chemicals**

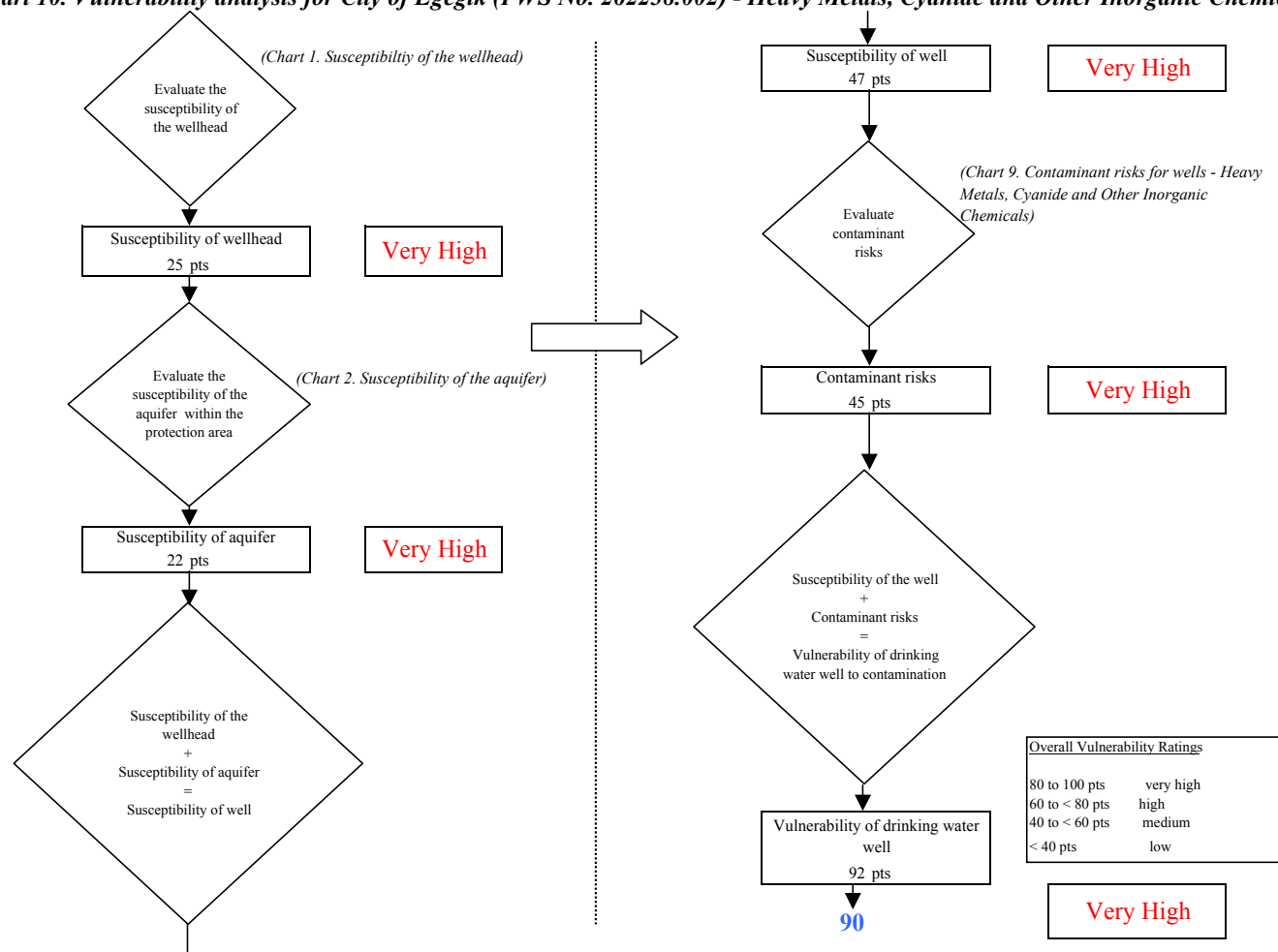




**Chart 9. Contaminant risks for City of Egegik (PWS No. 262238.002) - Heavy Metals, Cyanide and Other Inorganic Chemicals**



**Chart 10. Vulnerability analysis for City of Egegik (PWS No. 262238.002) - Heavy Metals, Cyanide and Other Inorganic Chemicals**



**Chart 11. Contaminant risks for City of Egegik (PWS No. 262238.002) - Synthetic Organic Chemicals**

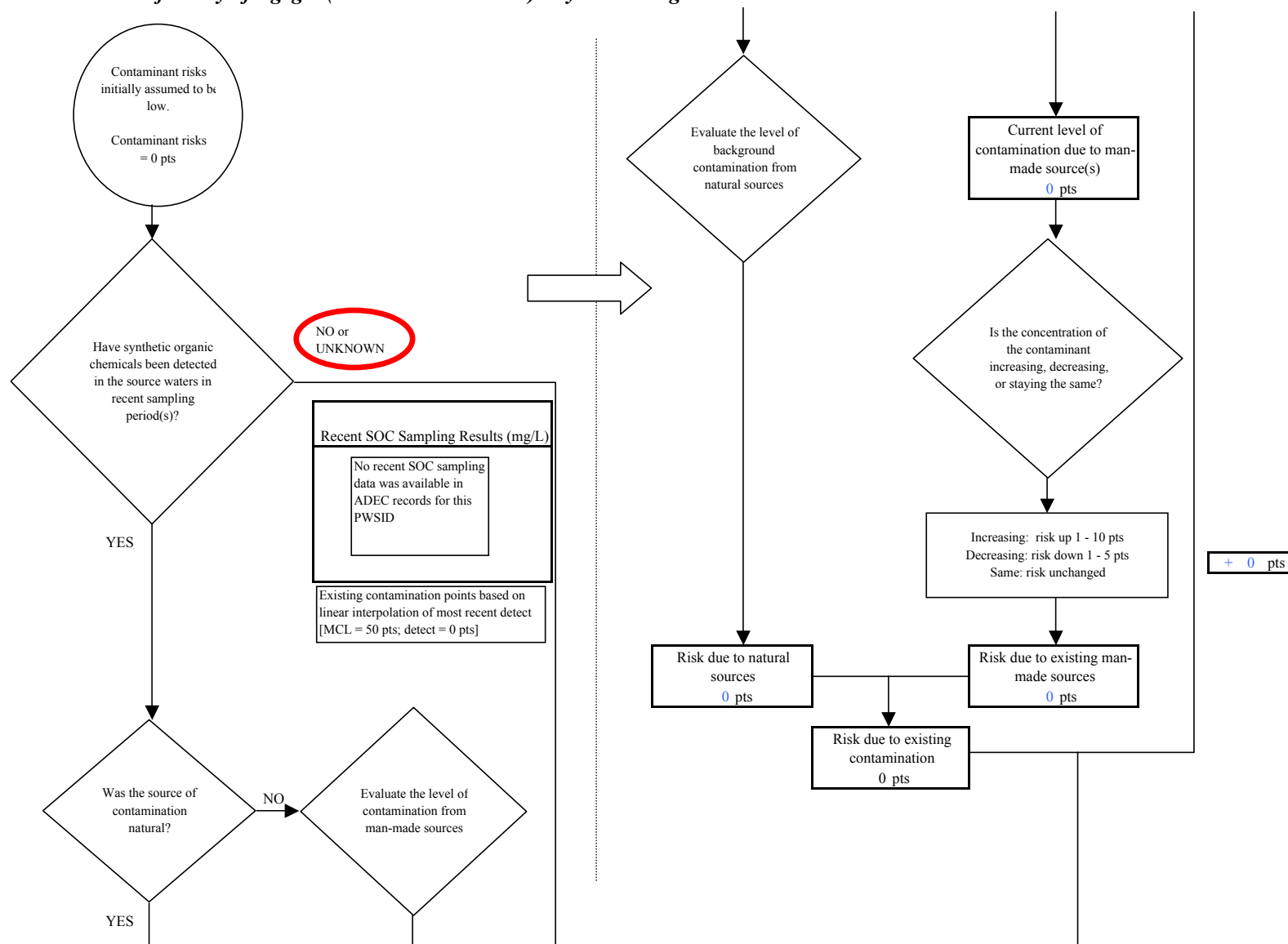
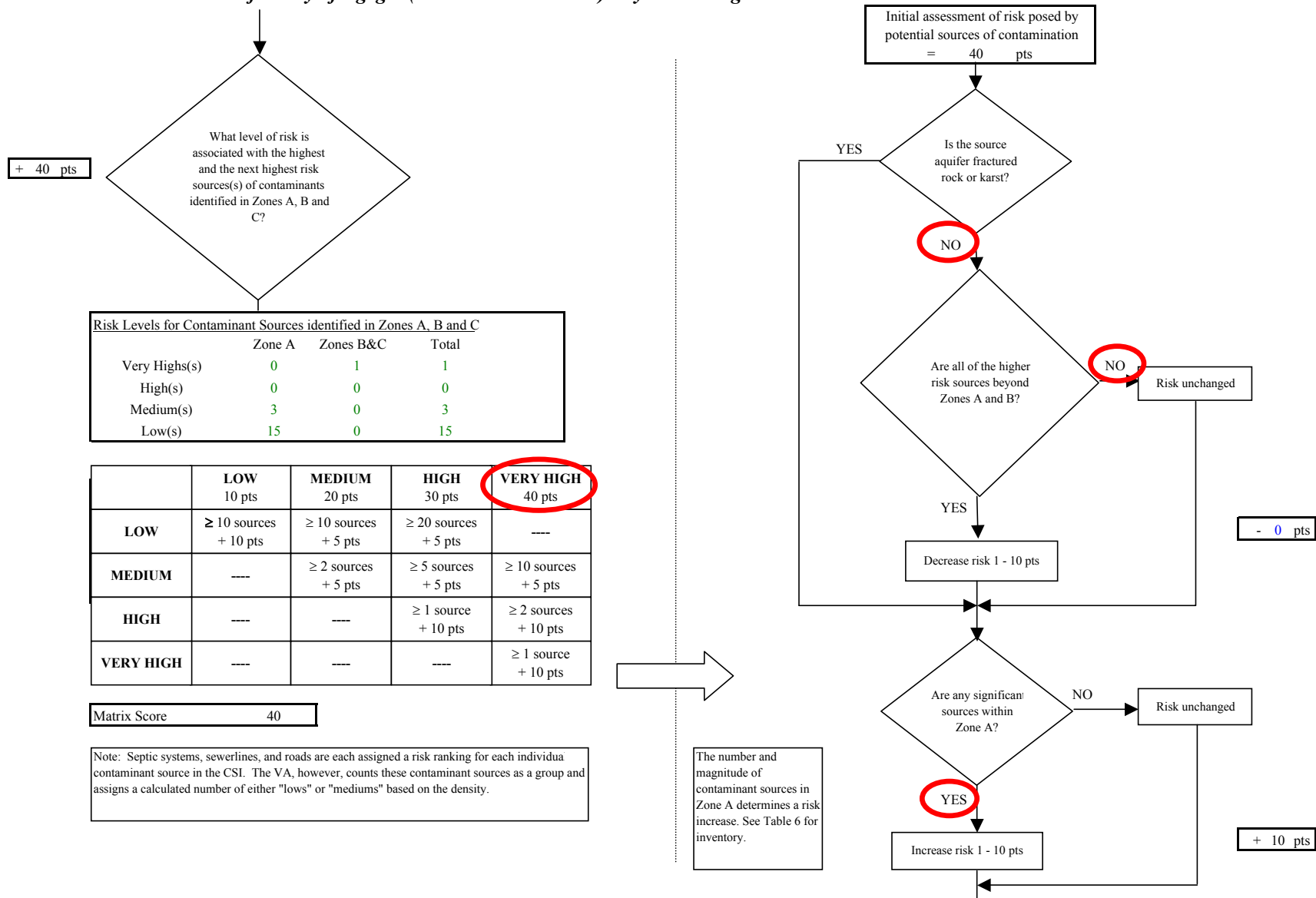
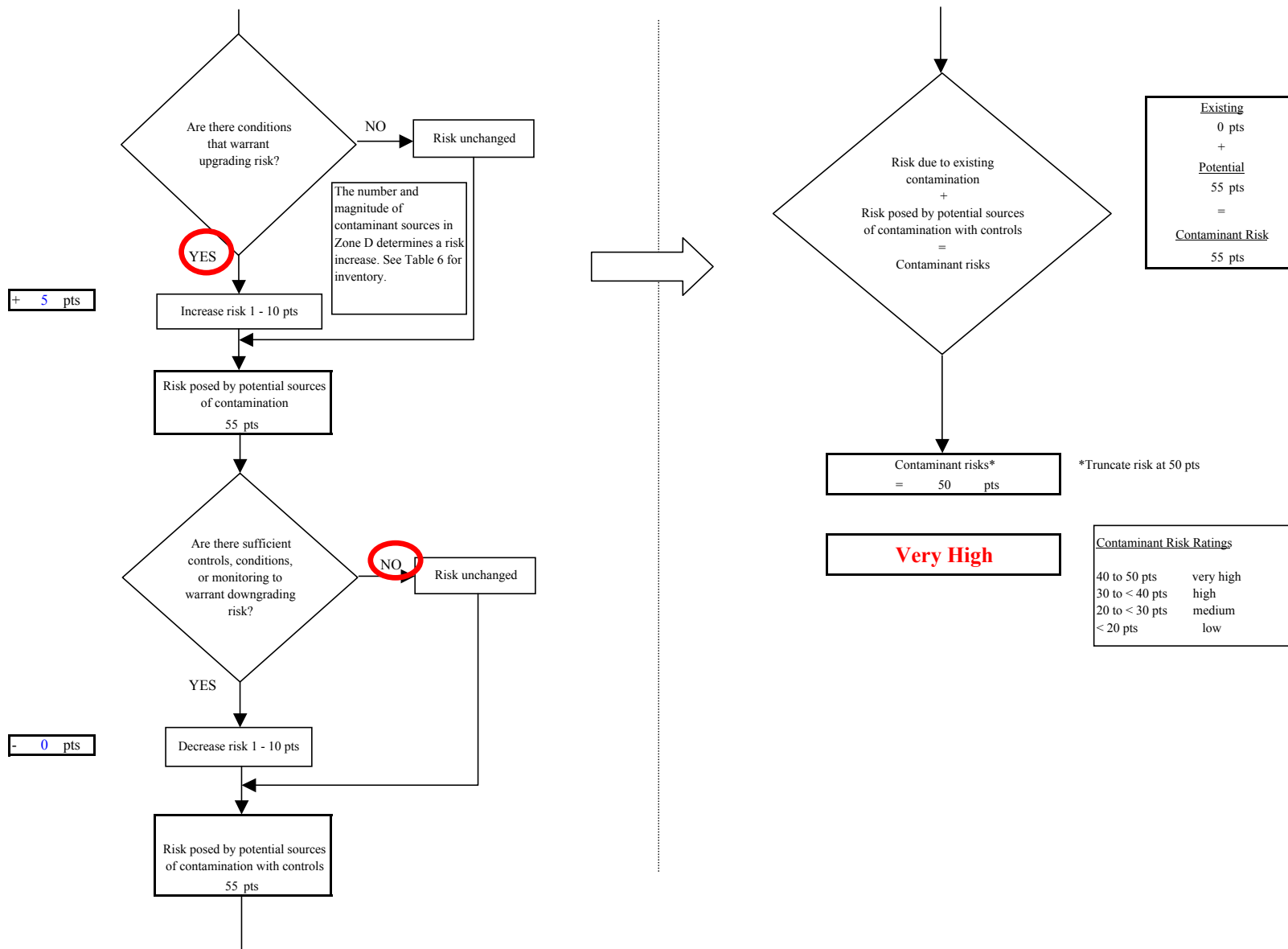


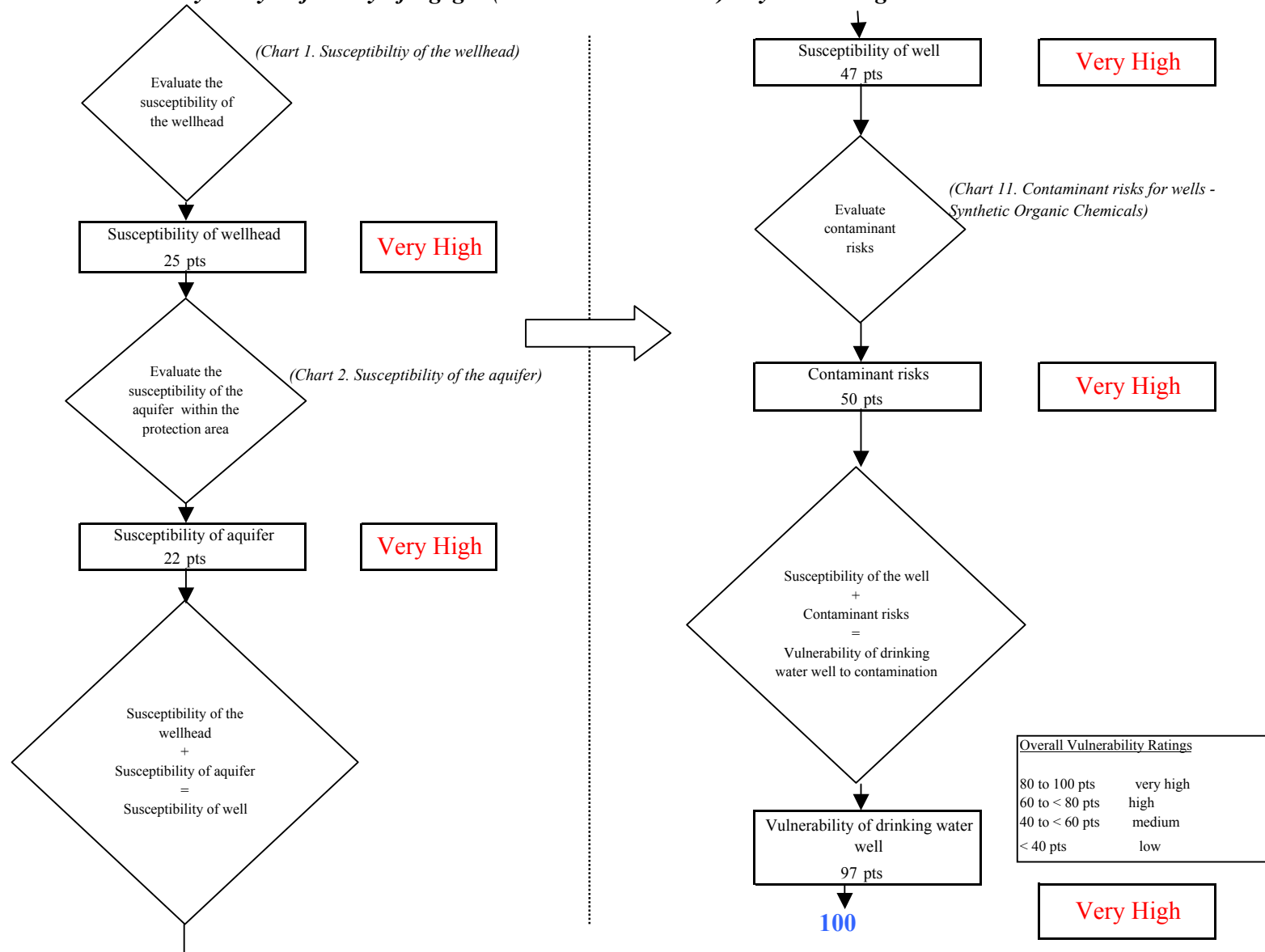
Chart 11. Contaminant risks for City of Egegik (PWS No. 262238.002) - Synthetic Organic Chemicals



**Chart 11. Contaminant risks for City of Egegik (PWS No. 262238.002) - Synthetic Organic Chemicals**



**Chart 12. Vulnerability analysis for City of Egegik (PWS No. 262238.002) - Synthetic Organic Chemicals**



**Chart 13. Contaminant risks for City of Egegik (PWS No. 262238.002) - Other Organic Chemicals**

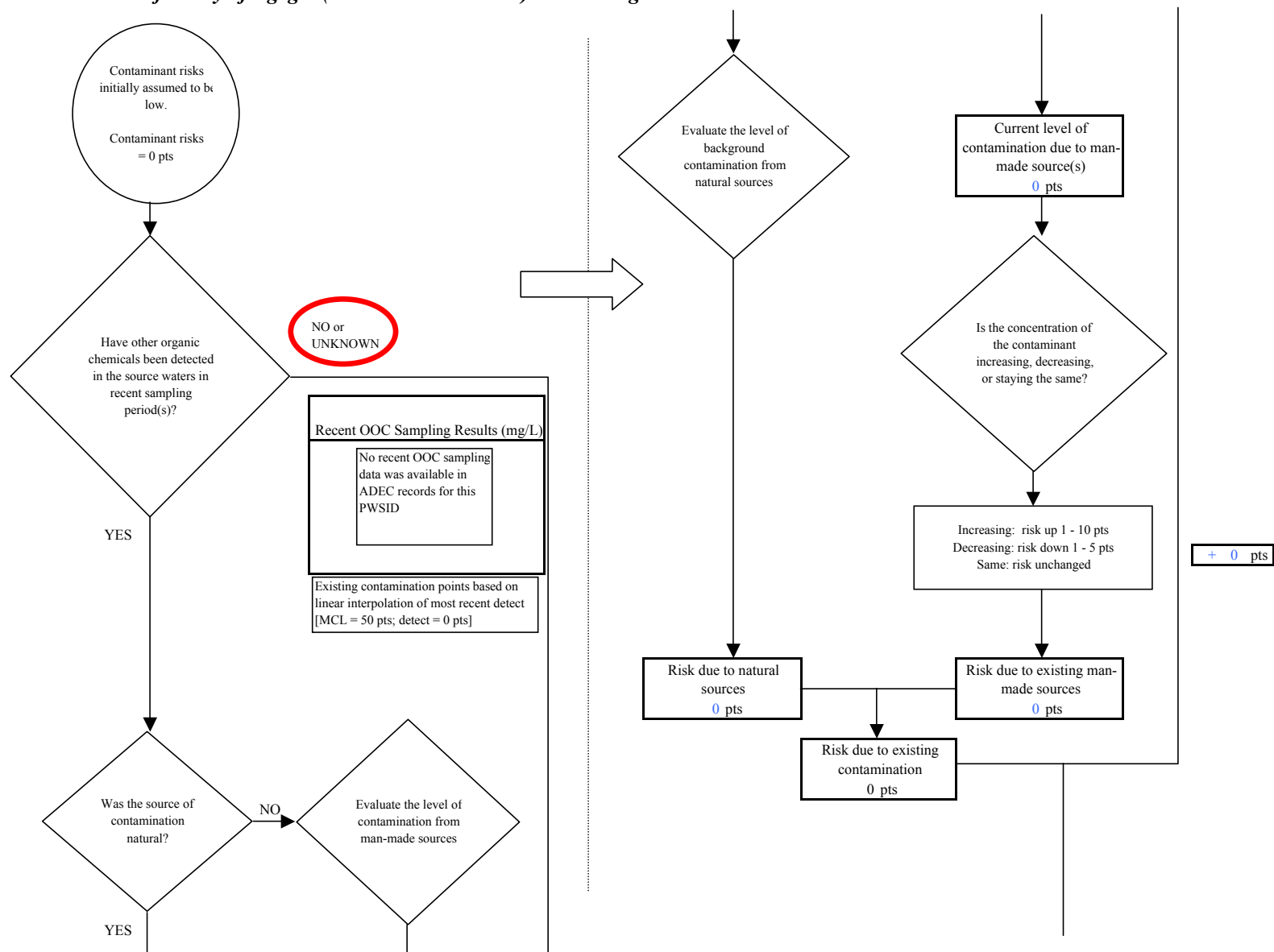
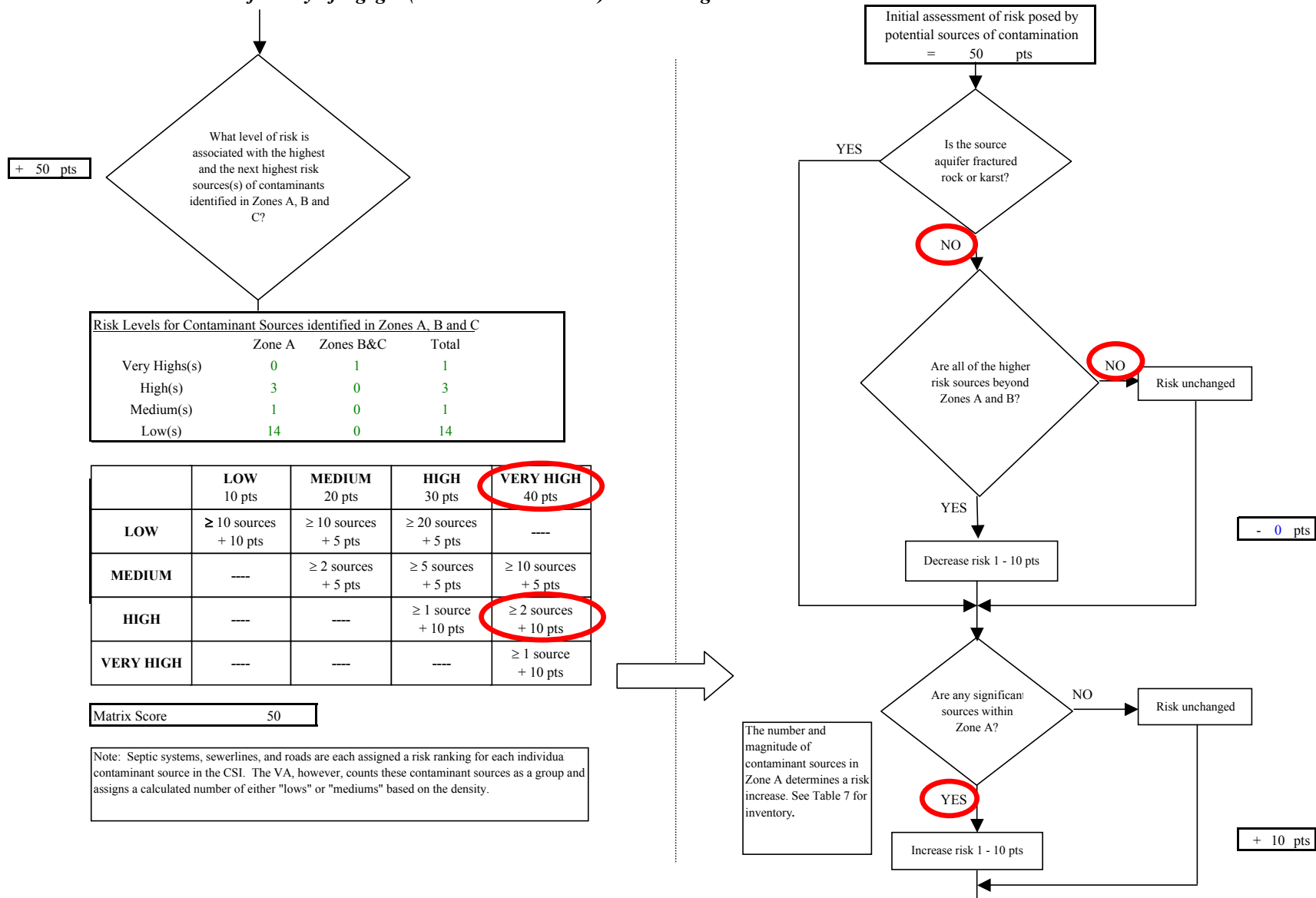




Chart 13. Contaminant risks for City of Egegik (PWS No. 262238.002) - Other Organic Chemicals



**Chart 13. Contaminant risks for City of Egegik (PWS No. 262238.002) - Other Organic Chemicals**

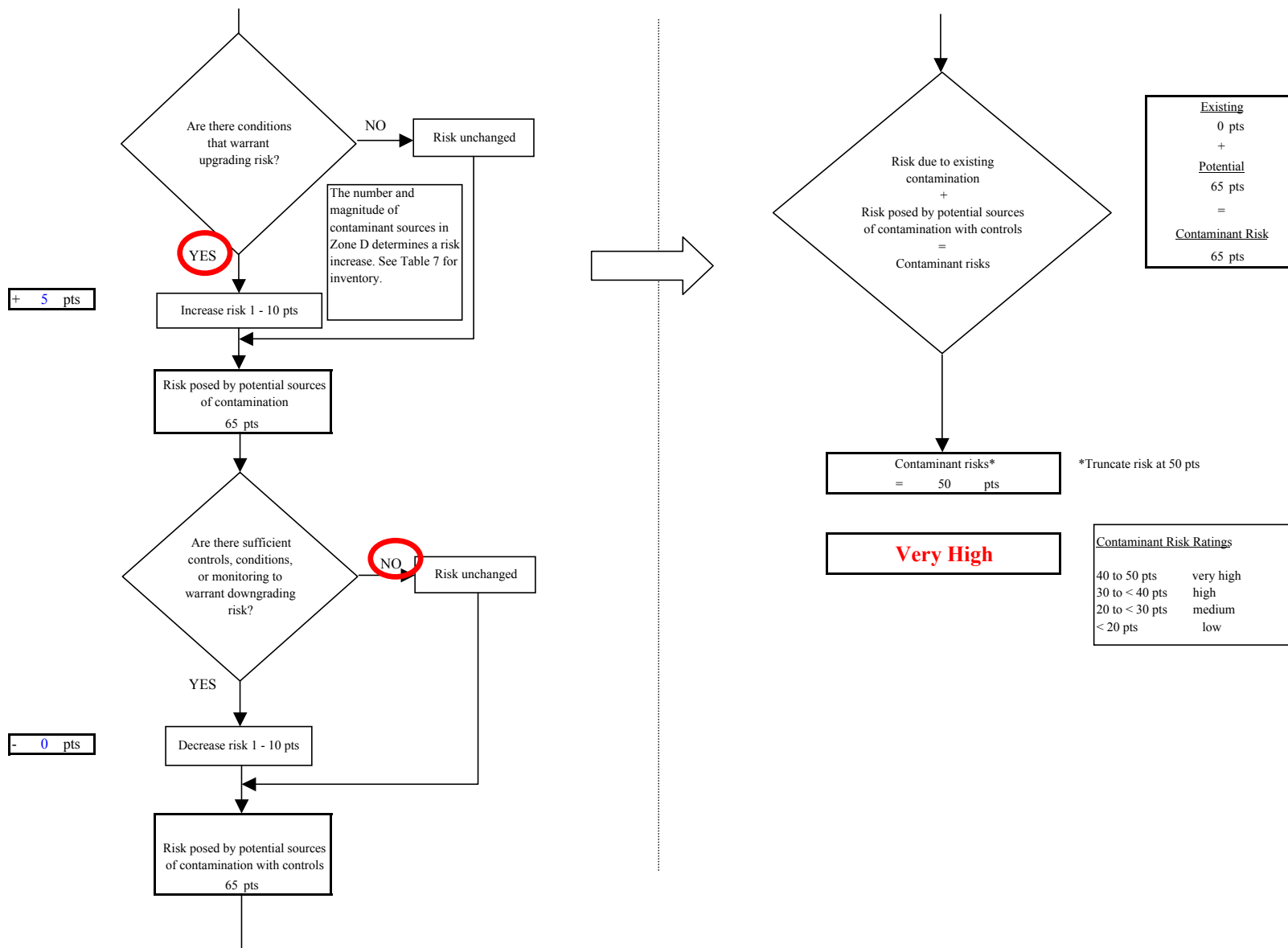


Chart 14. Vulnerability analysis for City of Egegik (PWS No. 262238.002) - Other Organic Chemicals

