

Source Water Assessment

A Hydrogeologic Susceptibility and
Vulnerability Assessment for
the Eagle Crest Condos
Drinking Water System,
Valdez, Alaska

PWSID # 298002.001

June 2004

DRINKING WATER PROTECTION PROGRAM REPORT 1370
Alaska Department of Environmental Conservation

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

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

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Source Water Assessment for Eagle Crest Condos Public Water System Source of Public Drinking Water, Valdez, Alaska

Drinking Water Protection Program Alaska Department of Environmental Conservation

EXECUTIVE SUMMARY

The Eagle Crest Condos Public Water System (PWS) has one well. Well construction details are unavailable, however, it is assumed the well (PWS No. 298002.001) has been used as a drinking water source since it was drilled in August of 1981.

The well is a Class A (community and non-transient non-community) water system located at Eagle Crest Condos, Milepost 4 in Valdez, Alaska. Available records indicate that the system has a 500-gallon storage tank and the water is filtered. This system operates year round and serves approximately 100 residents through three service connections. The wellhead received a susceptibility rating of **Low** and the aquifer received a susceptibility rating of **Medium**. Combining these two ratings produce a **Low** rating for the natural susceptibility of the well.

Identified potential and current sources of contaminants for the public drinking water source include: a domestic wastewater treatment plant and ADEC recognized contaminated sites. A detailed inventory can be found in Table 1 of Appendix B. These identified potential and existing sources of contamination are considered 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 well received a vulnerability rating of **Medium** for nitrates and nitrites, and volatile organic chemicals, **Low** for bacteria and viruses, heavy metals, cyanide and other inorganic chemicals, synthetic organic chemicals, and other organic chemicals.

PUBLIC DRINKING WATER SYSTEM

The Eagle Crest Condos PWS well is a Class A (community/non-transient/non-community) public water system. The system is located at Eagle Crest Condos, Milepost 4 in Valdez, Alaska (Sec. 32, T008S, R006W, Copper River Meridian, see Map A of Appendix A). The community of Valdez is

located on the north shore of Port Valdez, a deep-water fjord in Prince William Sound. Valdez is 305 road miles east of Anchorage, and 364 road miles south of Fairbanks. The community has a population of 4,060 (ADCED, 2003). Total annual precipitation in Valdez is 62 inches, including approximately 325 inches of snowfall. Temperatures can be as extreme as 21 to 61 °F.

The community of Valdez obtains most of their water supply from the community water system. The majority of households in Valdez are fully plumbed (ADCED, 2003). Valdez residents rely on the Copper Valley Electric for electricity, which is hydro-electric with diesel as backup. The City provides a refuse collector, which is dumped at the City landfill.

Construction details were not available in ADEC records, and it is assumed based on a nearby well that the depth of the well is 50 feet below the ground surface. It is assumed that the well is screened in a confined aquifer. The well is not located within a floodplain.

Information acquired from a December 2002 sanitary survey for the PWS 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 well is grouted according to ADEC regulations. Proper grouting provides added protection against contaminants traveling along the well casing annulus and into source waters.

Valdez is a narrow, steep-walled fjord in the Chugach Mountains and is the northeastern most extension of Price William Sound. The topography and drainage of Valdez are directly related to past and present alpine glacial activity. Valdez Glacier has scoured and shaped the valley. In the past, other smaller glaciers have filled the valleys and coalesced with Valdez Glacier to completely cover the area. All of the glaciers have been receding during historical time and continue their retreat. The resultant topography is comprised of a gently sloping glacial outwash

apron, which laps up against the ice scoured bedrock spurs. Valdez Glacier extends down to the City of Valdez from the northeast, and its delta coalesces with the delta deposited by Lowe River flowing from the east (Northern Technical Services, 1978).

Deposits in the Valdez area consist of two main units including bedrock and glaciofluvial outwash. The bedrock consists of interbedded slate, phillite, and greywacke prevailing in thick beds. The bedrock sequence also includes minor amounts of argillite and some arkosic sandstone, which grades locally in to conglomerate (Northern Technical Services, 1978).

Glaciofluvial materials constitute the deposits in the river valleys leading into Valdez. The outwash plains of the Robe River, the Lowe River, and the stream from Valdez Glacier coalesce to form a broad delta at the eastern end of Valdez. The grain size of the alluvium ranges from silt, sand, and gravel near the tidewater and becomes increasingly coarse upstream (Northern Technical Services, 1978).

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 Eagle Crest Condos 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 Eagle Crest Condos 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 Eagle Crest Condos PWS 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, and
- 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 7 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

It is assumed that the Eagle Crest Condos PWS’s water well is completed 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	0	Low
Susceptibility of the Aquifer	14	Medium
Natural Susceptibility	14	Low

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	25	Medium
Nitrates and/or Nitrites	27	Medium
Volatile Organic Chemicals	40	Very High
Heavy Metals, Cyanide and		
Other Inorganic Chemicals	12	Low
Synthetic Organic Chemicals	12	Low
Other Organic Chemicals	12	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:

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

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	35	Low
Nitrates and Nitrites	40	Medium
Volatile Organic Chemicals	55	Medium
Heavy Metals, Cyanide and		
Other Inorganic Chemicals	25	Low
Synthetic Organic Chemicals	25	Low
Other Organic Chemicals	25	Low

Bacteria and Viruses

The contaminant risk for bacteria and viruses is **Medium**. The risk is primarily attributed to the presence of a domestic wastewater treatment plant in Zone A. Numerous other potential contaminant sources are also found within the protection area (see Table 2 – Appendix B).

Coliforms (a bacteria) are found naturally in the environment and although they aren't necessarily a health threat, they are an indicator of other potentially harmful bacteria in the water, more specifically, fecal coliforms and E. coli, which only come from human and animal fecal waste. Harmful bacteria can cause diarrhea, cramps, nausea, headaches, or other symptoms (EPA, 2002). Positive samples increase the overall vulnerability of the drinking water source, indicating that the source is susceptible to bacteria and virus contamination.

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 **Low**.

Nitrates and Nitrites

The contaminant risk for nitrates and nitrites is **Medium**. The risk to this source of public drinking water is primarily attributed to the presence of a domestic wastewater treatment plant in Zone A.

Numerous other potential contaminant sources are also found within the protection area (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 they have not exceeded the 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. Consequently, the presence of nitrate may be attributed to the large-capacity septic system within the vicinity.

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 **Medium**.

Volatile Organic Chemicals

The contaminant risk for volatile organic chemicals is **Very High**. The risk is primarily attributed to the presence of a DEC recognized contaminated site in Zone A. Numerous other potential contaminant sources are also found within the protection area (see Table 4 – Appendix B).

No VOCs have been reported in recent (within five years) sampling events (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 **Medium**.

Heavy Metals, Cyanide and Other Inorganic Chemicals

The contaminant risk for heavy metals, cyanide and other inorganic chemicals is **Low**. The risk is primarily attributed to only a few potential contaminants with low risk rankings in Zone A (see Table 5 – Appendix B).

Based on review of recent sampling records for this PWS, low levels of copper and lead have been detected, however they have not exceeded their MCLs of 1.3 and .015 mg/L, respectively (see Chart

9 – Contaminant Risks for Heavy Metals, Cyanide, and Other Inorganic Chemicals in Appendix D).

The reported concentrations of copper and lead are likely attributed to the water treatment/conveyance system.

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 **Low**.

Synthetic Organic Chemicals

The contaminant risk for synthetic organic chemicals is **Low**. The risk is primarily attributed only two potential contaminant sources with low risk rankings in Zone A (see Table 6 – Appendix B).

No recent sampling data was available in ADEC records for the Eagle Crest Condos PWS (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 **Low**.

Other Organic Chemicals

The contaminant risk for other organic chemicals is **Low**. The risk is primarily attributed to only a few potential contaminants with low risk rankings in Zone A (see Table 7 – Appendix B).

No recent sampling data was available in ADEC records for the Eagle Crest Condos PWS (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 **Low**.

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 Valdez 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.

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- Alaska Department of Community and Economic Development (ADCED), 2003 [WWW document]. URL: http://www.dced.state.ak.us/cbd/commdb/CF_COMDB.htm
- Alaska Department of Environmental Conservation, Contaminated Sites Database, 2003 [WWW database], URL http://www.state.ak.us/dec/dspar/csites/cs_search.htm
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- Northern Technical Services, 1978, Information from Preliminary Site and Soils Investigation of Proposed Plant Sites at Valdez and Kenai, Alaska for Alaska Petrochemical Company.
- United States Environmental Protection Agency (EPA), 2002 [WWW document]. URL <http://www.epa.gov/safewater/mcl.html>.

APPENDIX A

Drinking Water Protection Area Location Map (Map A)

APPENDIX B

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

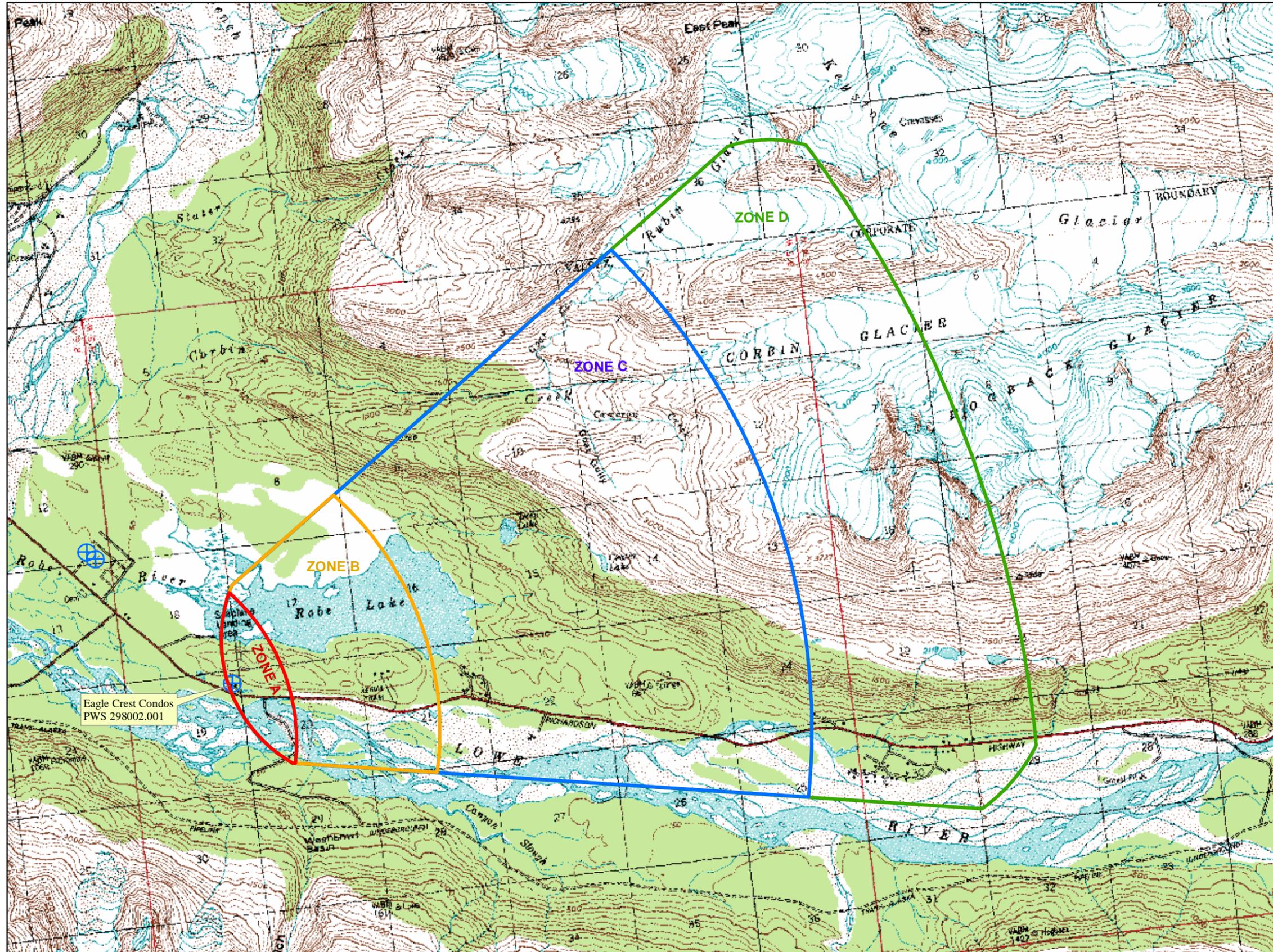
APPENDIX C

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

APPENDIX D

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

Public Water Well System for PWS #298002.001 Eagle Crest Condos



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)

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.

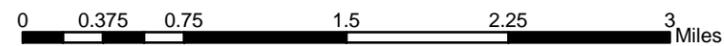
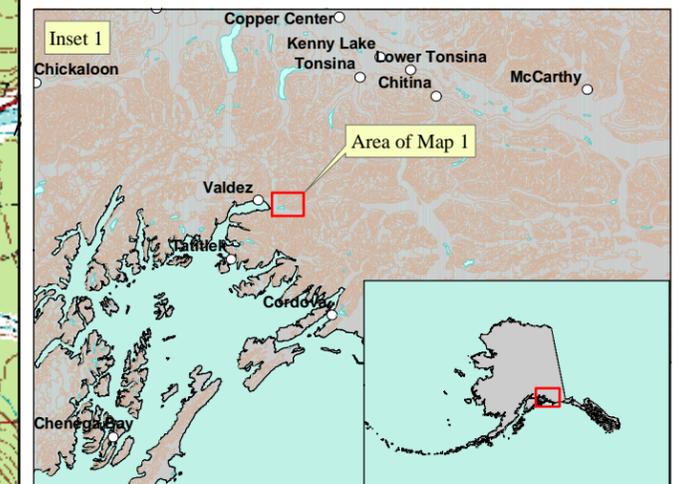


Table 1**Contaminant Source Inventory for
Eagle Crest Condos****PWSID 298002.001**

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Map Number	Comments
Domestic wastewater treatment plants	D05	D05-01	A	C	Added per operator comment 7/9/2004
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	A	C	Eagle Crest Condominiums, Reckey# 1995240112001, Status: Closed, Soils contaminated from old heating oil tanks.
Highways and roads, dirt/gravel	X24	X24-01	A	C	Assume 1-20 roads in Zone A
Highways and roads, dirt/gravel	X24	X24-02	B	C	Assume 1-20 roads in Zone B
Highways and roads, dirt/gravel	X24	X24-03	C	C	Assume 1-20 roads in Zone C
Metals mining, placer (active or inactive?)	E04	E04-01	D	C	BLACK BEAR NO. 1-4: PLACER
Metals mining, placer (active or inactive?)	E04	E04-02	D	C	LOWE RIVER: PLACER

*Contaminant Source Inventory and Risk Ranking for
Eagle Crest Condos
Sources of Bacteria and Viruses*

PWSID 298002.001

Table 2

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater treatment plants	D05	D05-01	A	Medium	C	Added per operator comment 7/9/2004
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

*Contaminant Source Inventory and Risk Ranking for
Eagle Crest Condos
Sources of Nitrates/Nitrites*

PWSID 298002.001

Table 3

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater treatment plants	D05	D05-01	A	Medium	C	Added per operator comment 7/9/2004
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

*Contaminant Source Inventory and Risk Ranking for
Eagle Crest Condos
Sources of Volatile Organic Chemicals*

PWSID 298002.001

Table 4

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater treatment plants	D05	D05-01	A	Low	C	Added per operator comment 7/9/2004
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	A	High	C	Eagle Crest Condominiums, Reckey# 1995240112001, Status: Closed, Soils contaminated from old heating oil tanks.
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

*Contaminant Source Inventory and Risk Ranking for
Eagle Crest Condos*

PWSID 298002.001

Table 5

Sources of Heavy Metals, Cyanide and Other Inorganic Chemicals

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater treatment plants	D05	D05-01	A	Low	C	Added per operator comment 7/9/2004
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	A	Low	C	Eagle Crest Condominiums, Reckey# 1995240112001, Status: Closed, Soils contaminated from old heating oil tanks.
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

*Contaminant Source Inventory and Risk Ranking for
Eagle Crest Condos
Sources of Synthetic Organic Chemicals*

PWSID 298002.001

Table 6

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater treatment plants	D05	D05-01	A	Low	C	Added per operator comment 7/9/2004
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	A	Low	C	Eagle Crest Condominiums, Reckey# 1995240112001, Status: Closed, Soils contaminated from old heating oil tanks.

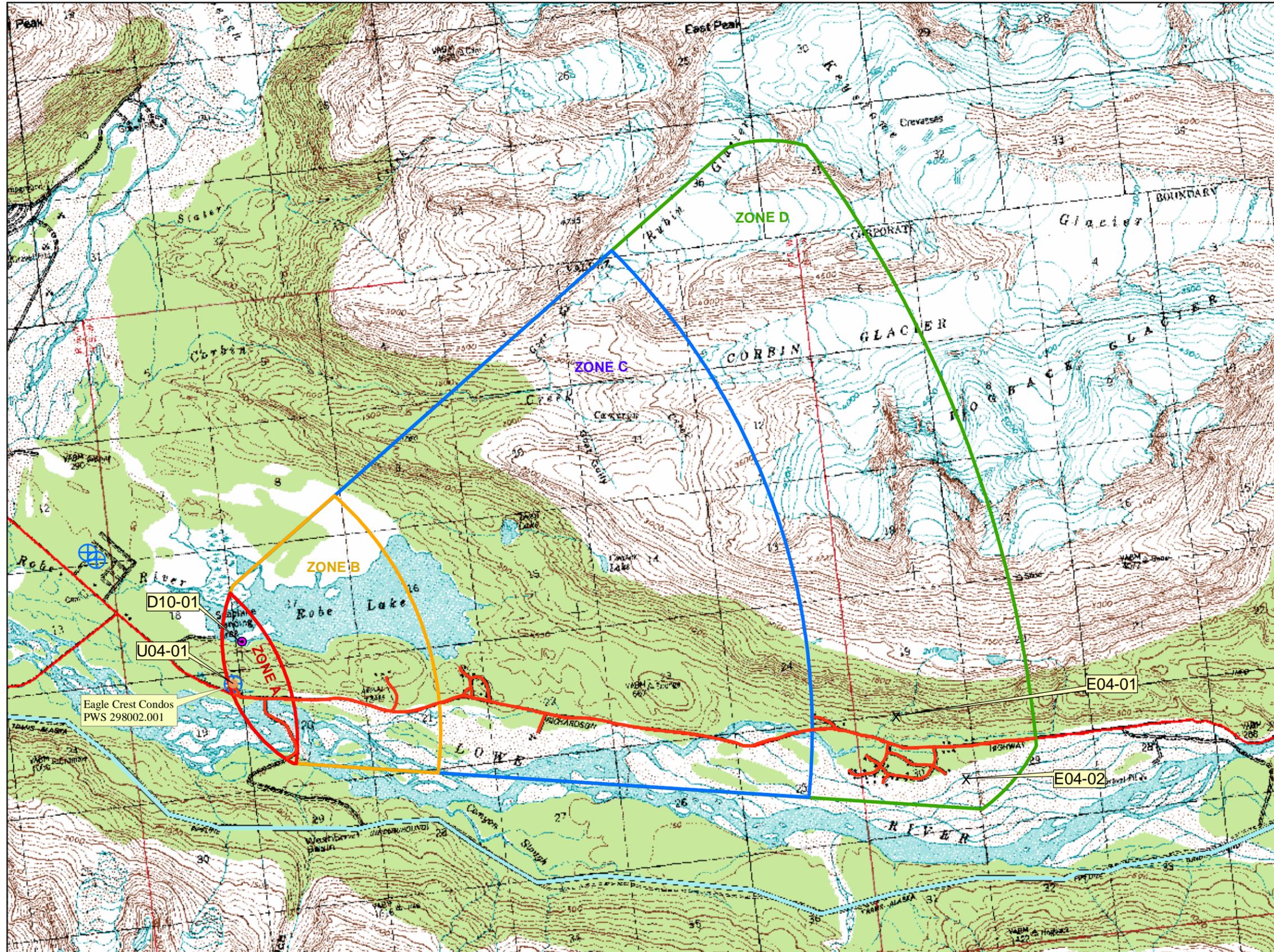
*Contaminant Source Inventory and Risk Ranking for
Eagle Crest Condos
Sources of Other Organic Chemicals*

PWSID 298002.001

Table 7

Contaminant Source Type	Contaminant Source ID	CS ID tag	Zone	Risk Ranking for Analysis	Map Number	Comments
Domestic wastewater treatment plants	D05	D05-01	A	Low	C	Added per operator comment 7/9/2004
Contaminated sites, DEC recognized, non-Superfund, non-RCRA	U04	U04-01	A	Low	C	Eagle Crest Condominiums, Reckey# 1995240112001, Status: Closed, Soils contaminated from old heating oil tanks.
Highways and roads, dirt/gravel	X24	X24-01	A	Low	C	Assume 1-20 roads in Zone A
Highways and roads, dirt/gravel	X24	X24-02	B	Low	C	Assume 1-20 roads in Zone B

**Public Water Well System for PWS #298002.001 Eagle Crest Condos
Showing Potential and Existing Sources of Contamination**



LEGEND

⊕ Public Water System Well

Hydrography/Physical	Transportation
▭ Parcels	— Primary Route (Class 1)
~ Stream	— Secondary Route (Class 2)
▭ Lake or Pond	— Road (Class 3)
~ Contours	⋯ 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

- ⊕ Injection wells (Class V) Large-Capacity Septic System (Drainfield Disposal Method) (D10)
- ⊗ Metals, mining, placer (E04)
- ▭ Contaminated sites, DEC recognized, non-Superfund, non-RCRA (U04)

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

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.

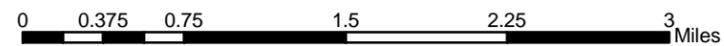
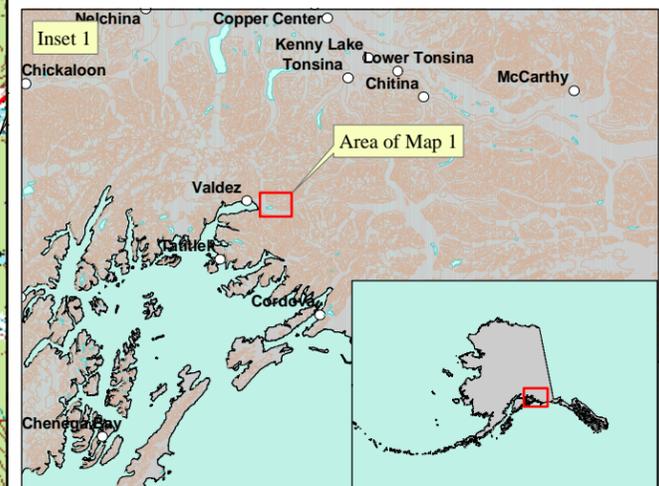


Chart 1. Susceptibility of the wellhead - Eagle Crest Condos (PWS No. 298002.001)

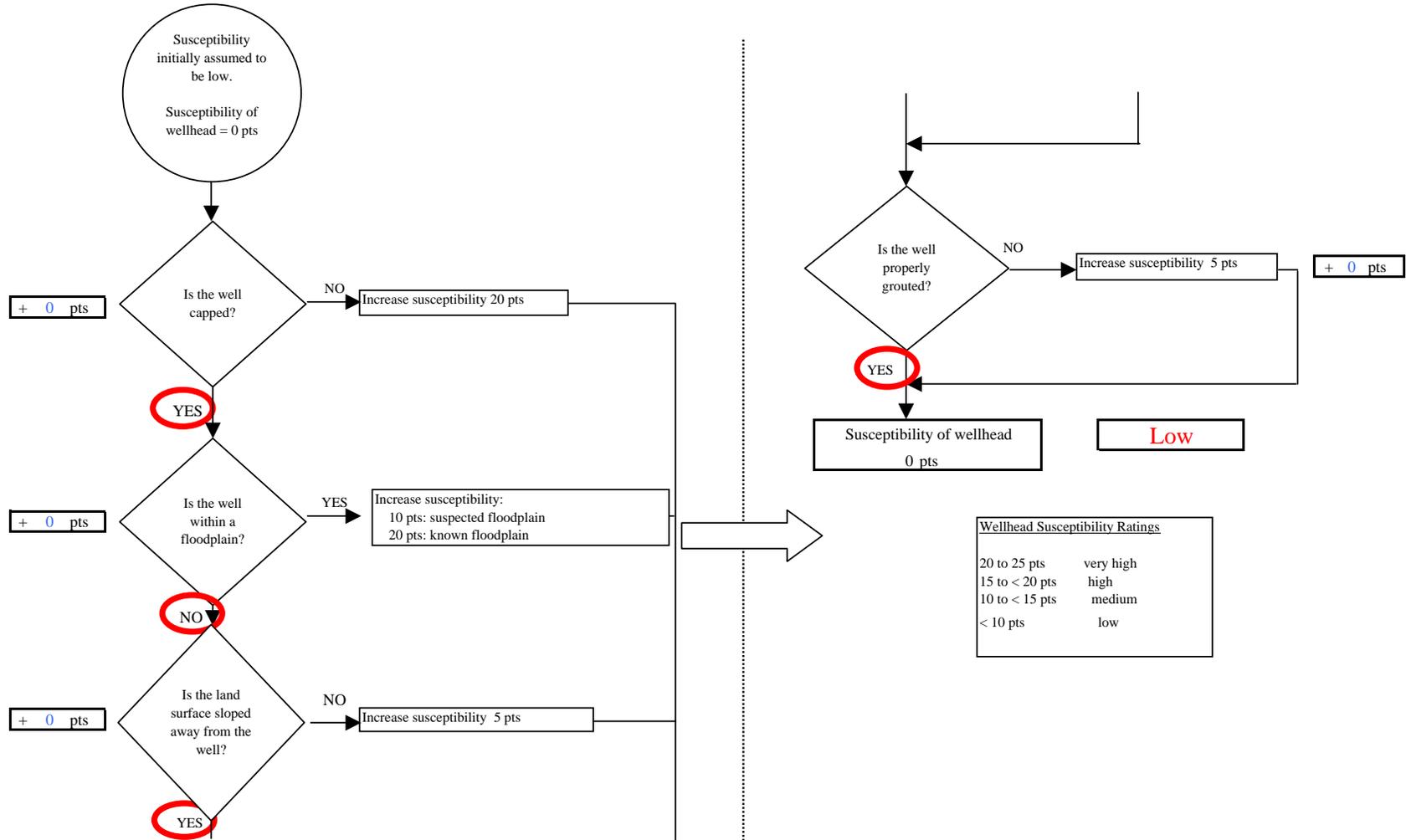


Chart 2. Susceptibility of the aquifer Eagle Crest Condos (PWS No. 298002.001)

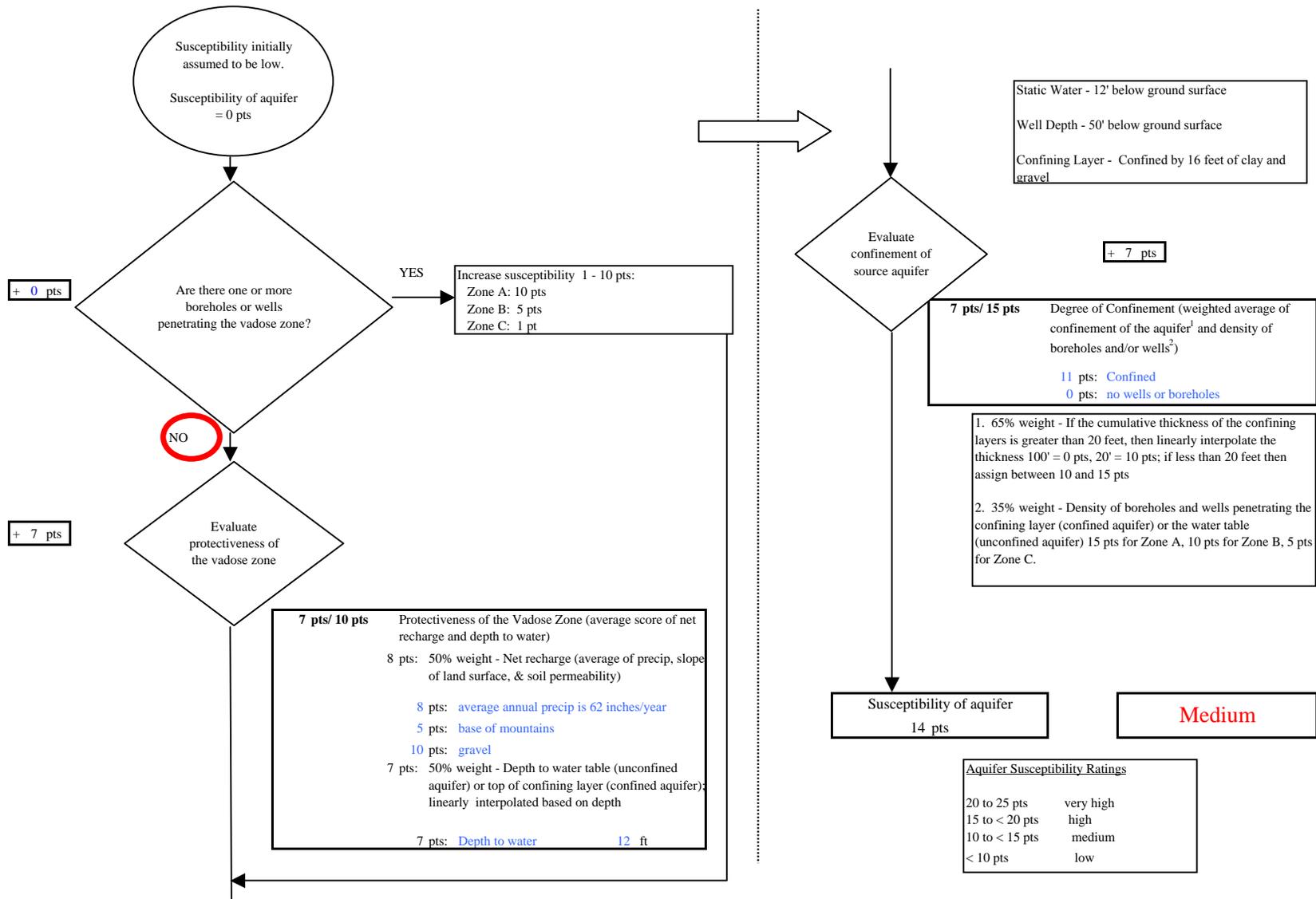


Chart 3. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Bacteria & Viruses

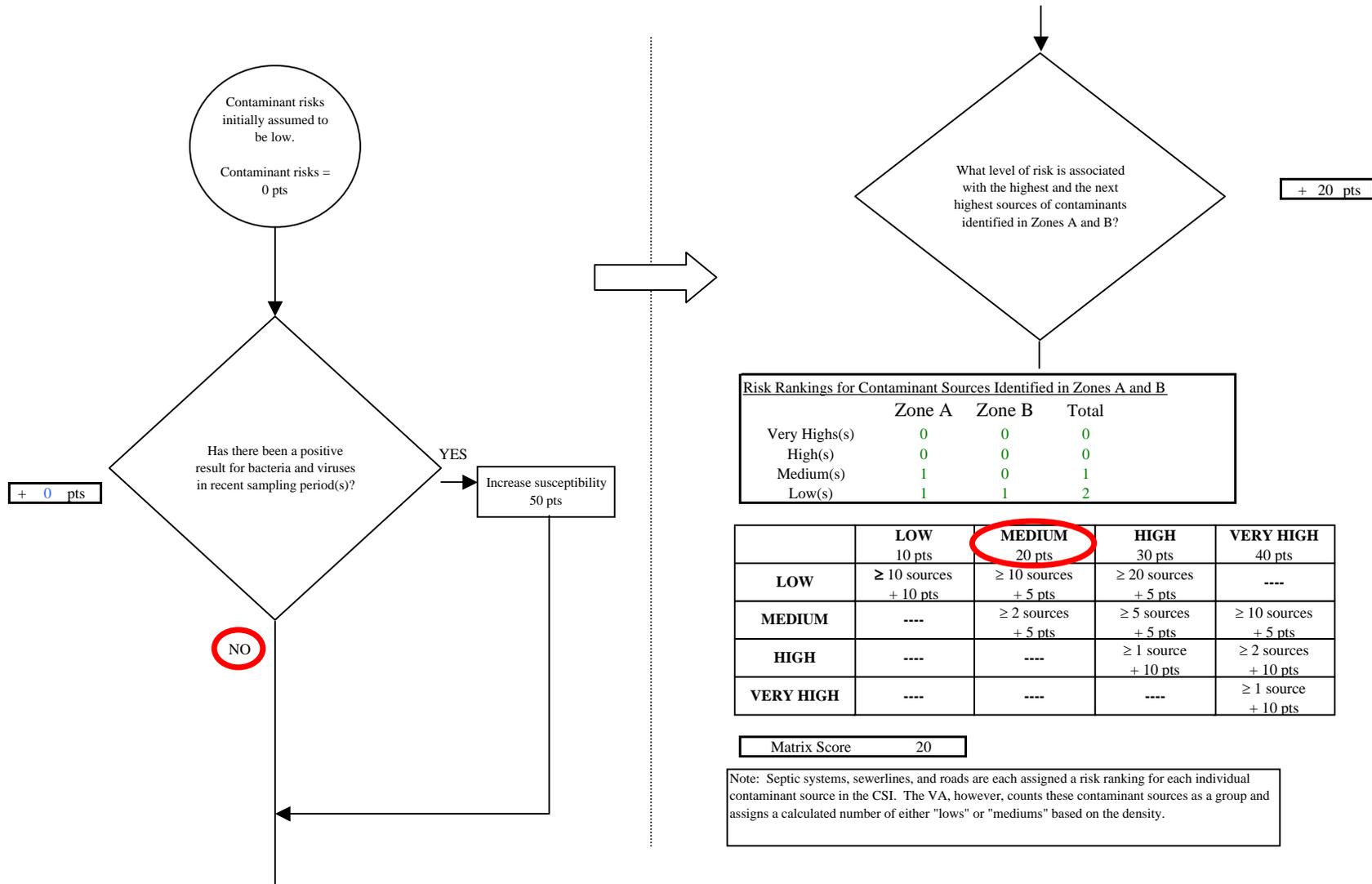


Chart 3. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Bacteria & Viruses

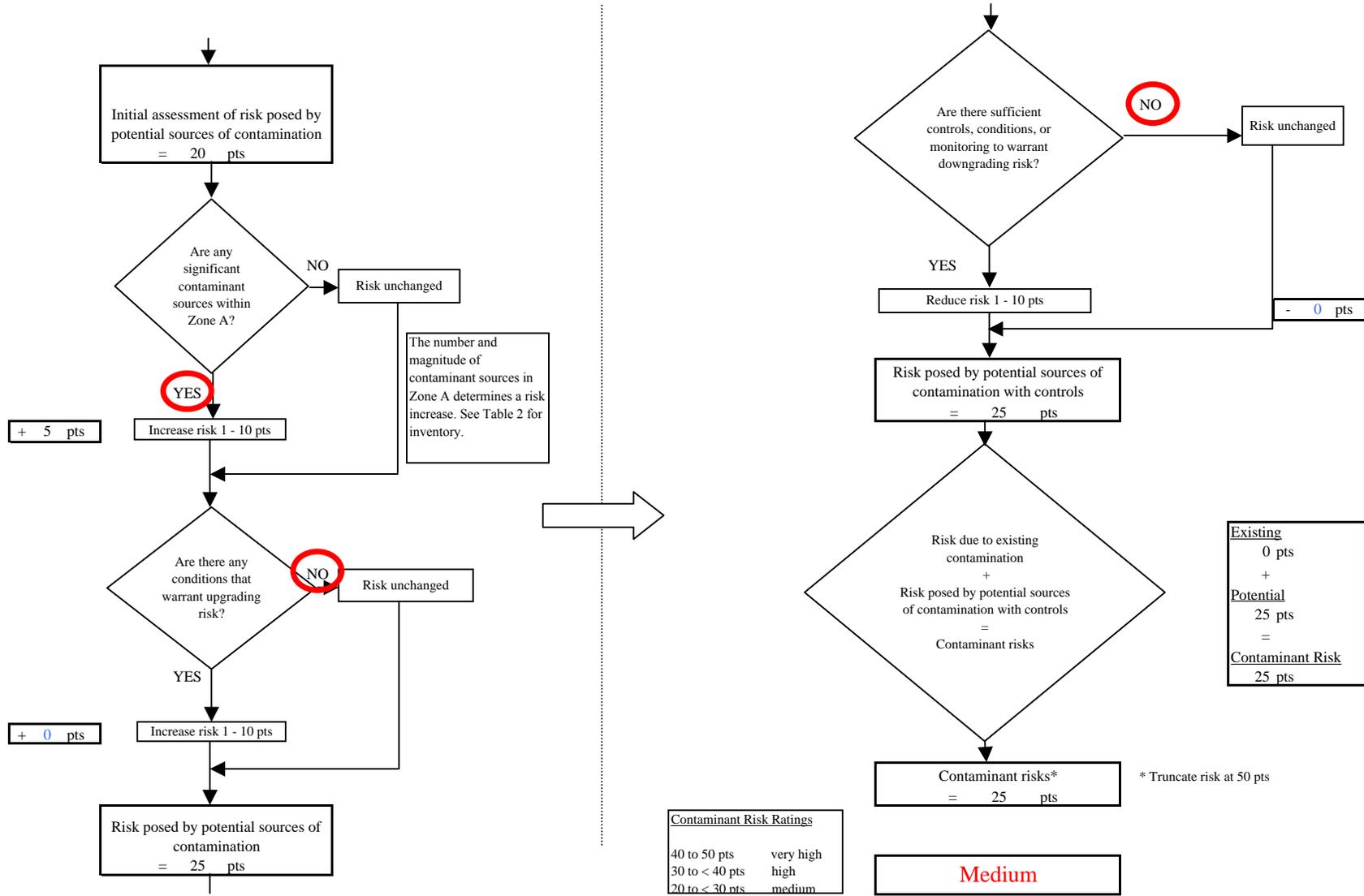


Chart 4. Vulnerability analysis for Eagle Crest Condos (PWS No. 298002.001) - Bacteria & Viruses

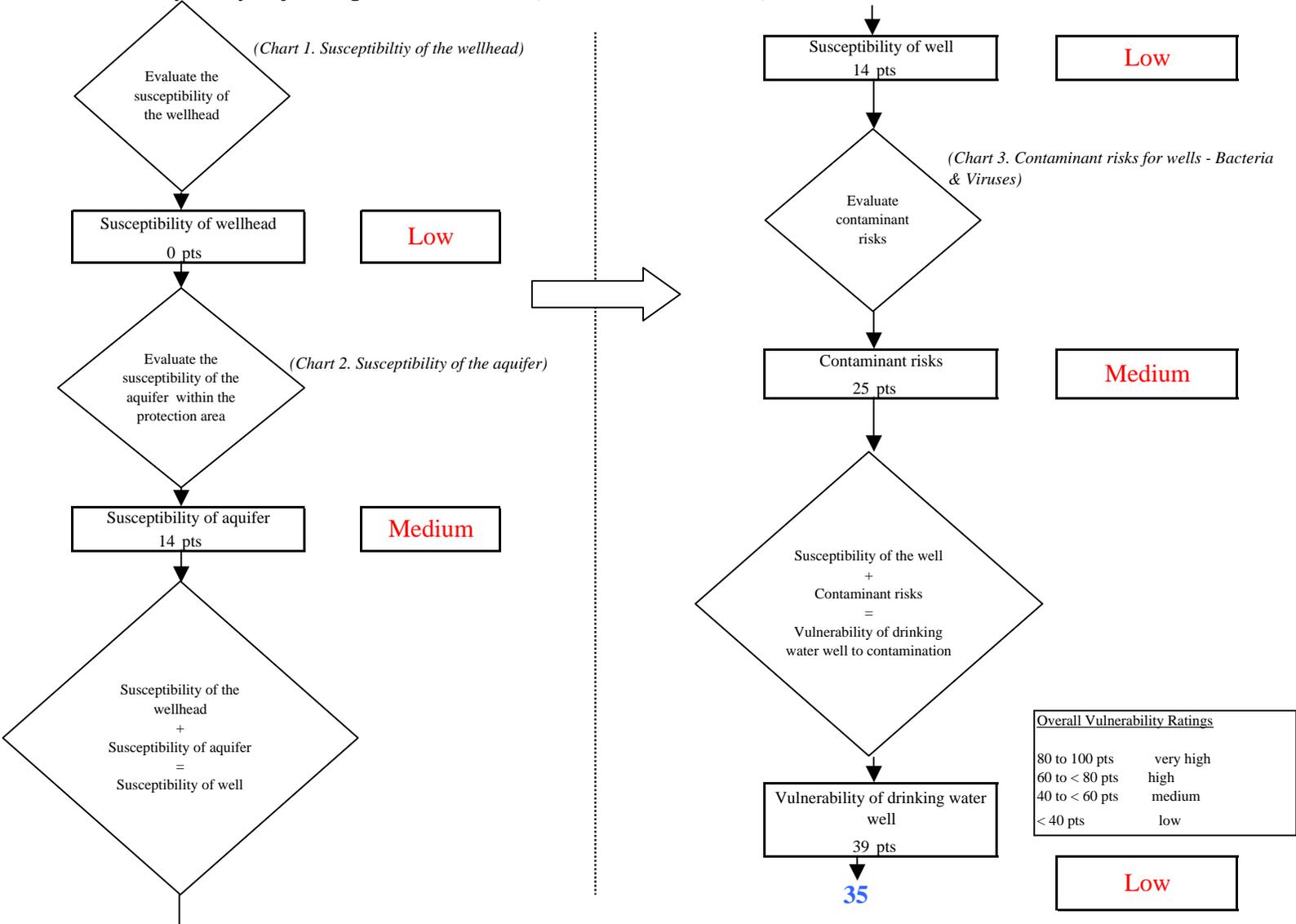


Chart 5. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Nitrates and Nitrites

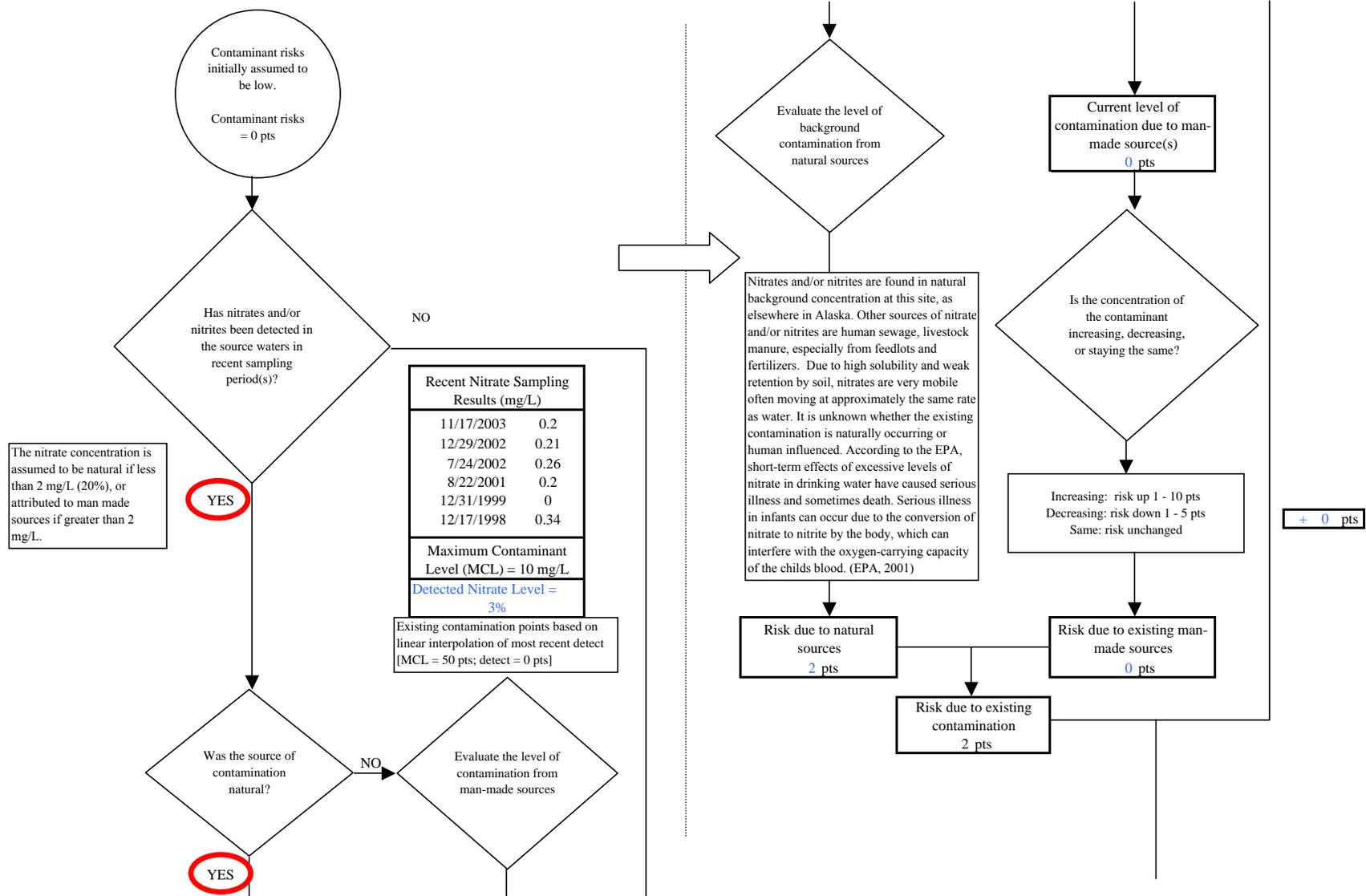


Chart 5. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Nitrates and Nitrites

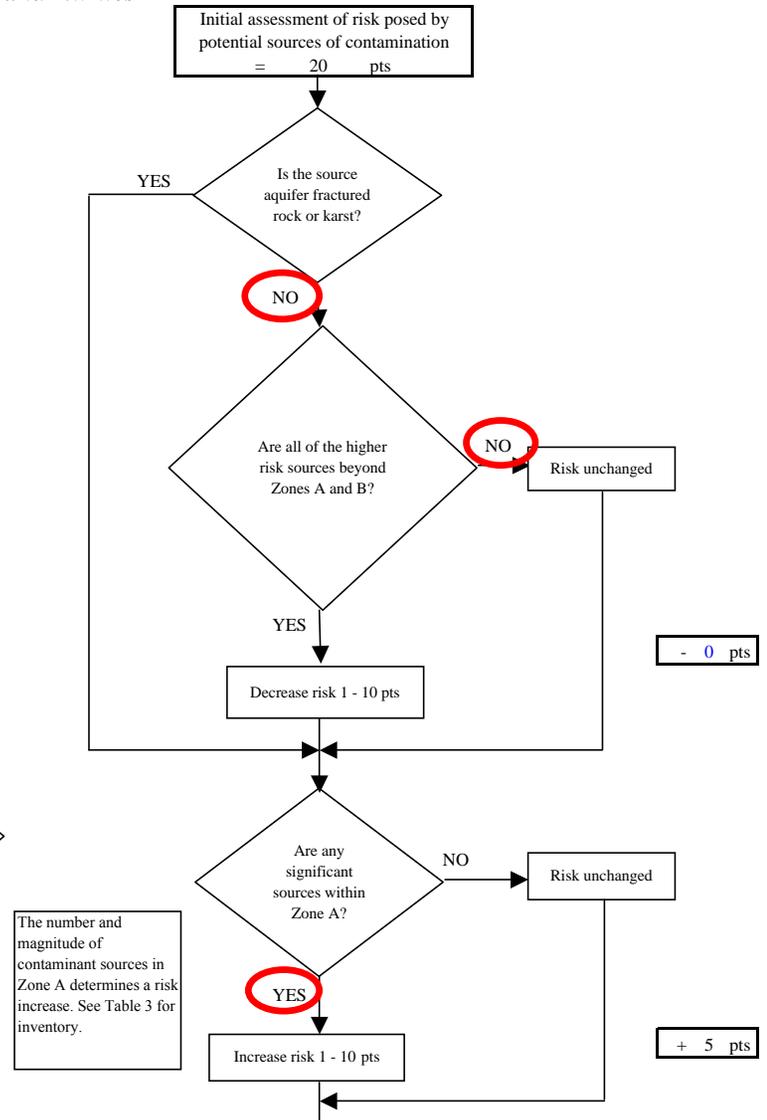
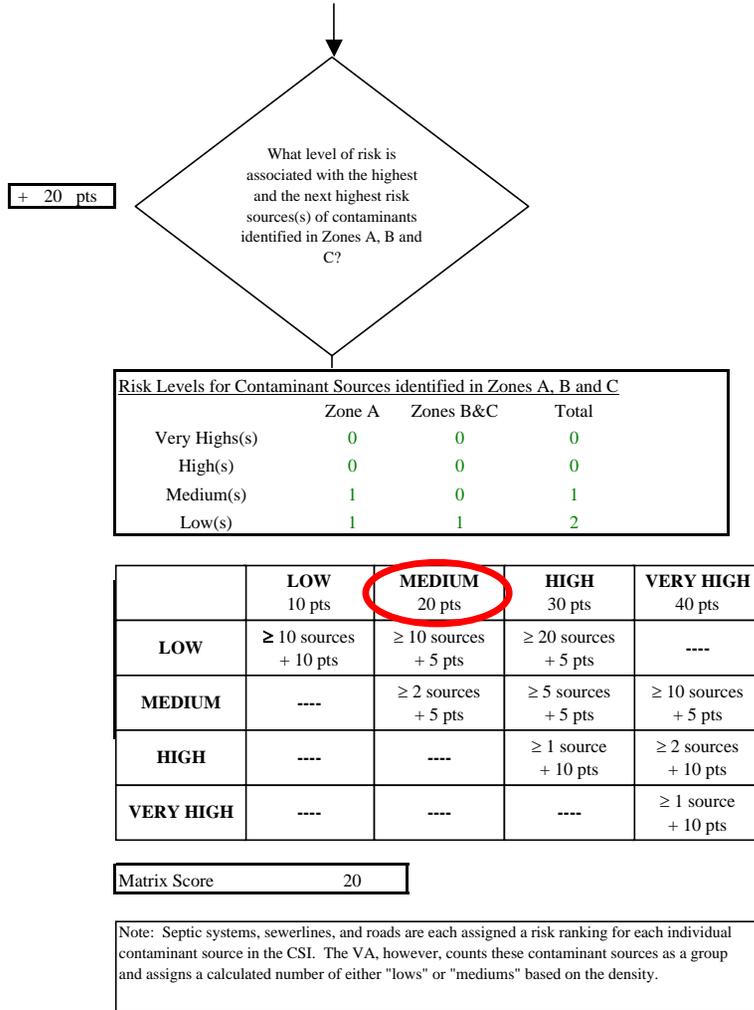


Chart 5. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Nitrates and Nitrites

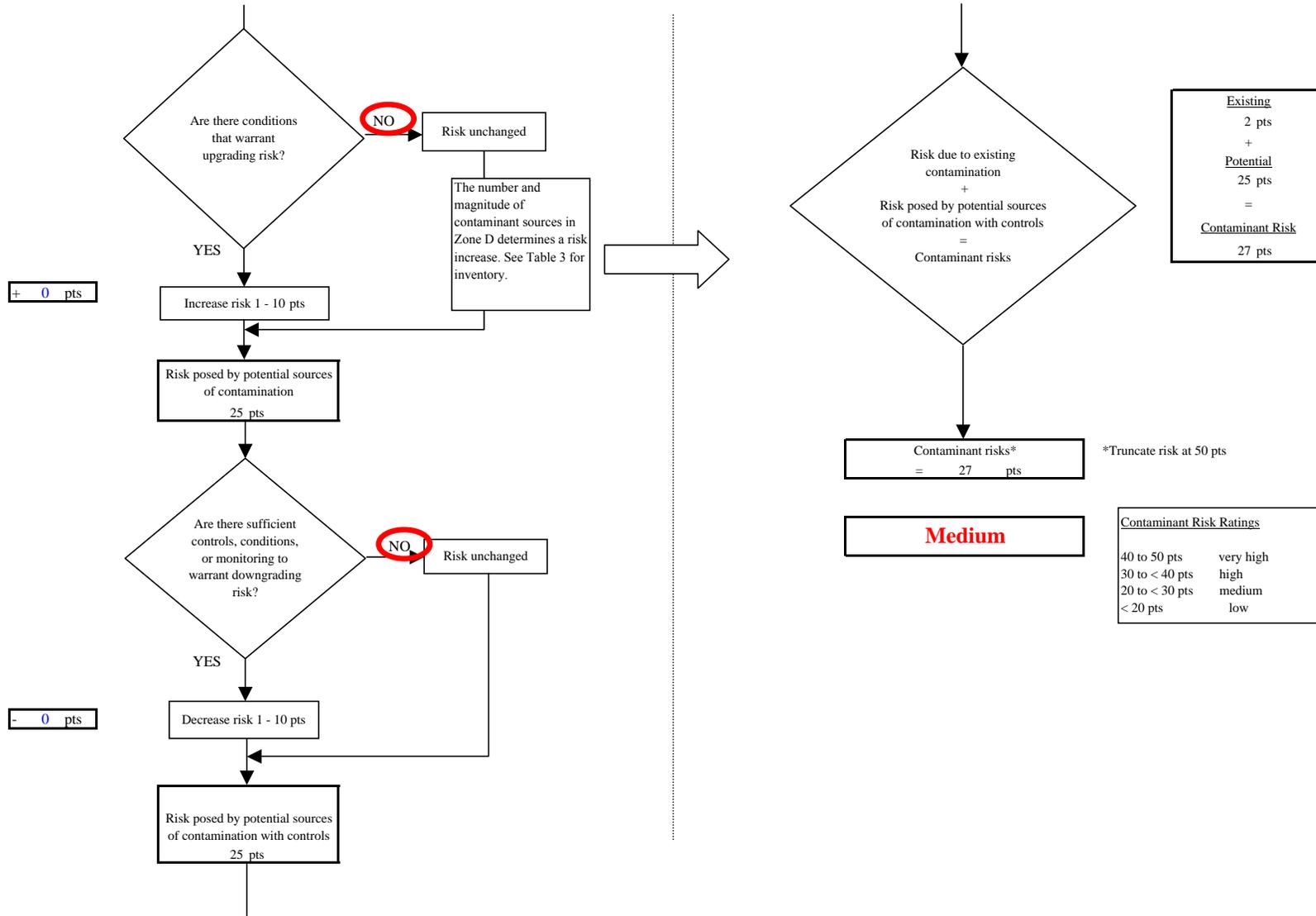


Chart 6. Vulnerability analysis for Eagle Crest Condos (PWS No. 298002.001) - Nitrates and Nitrites

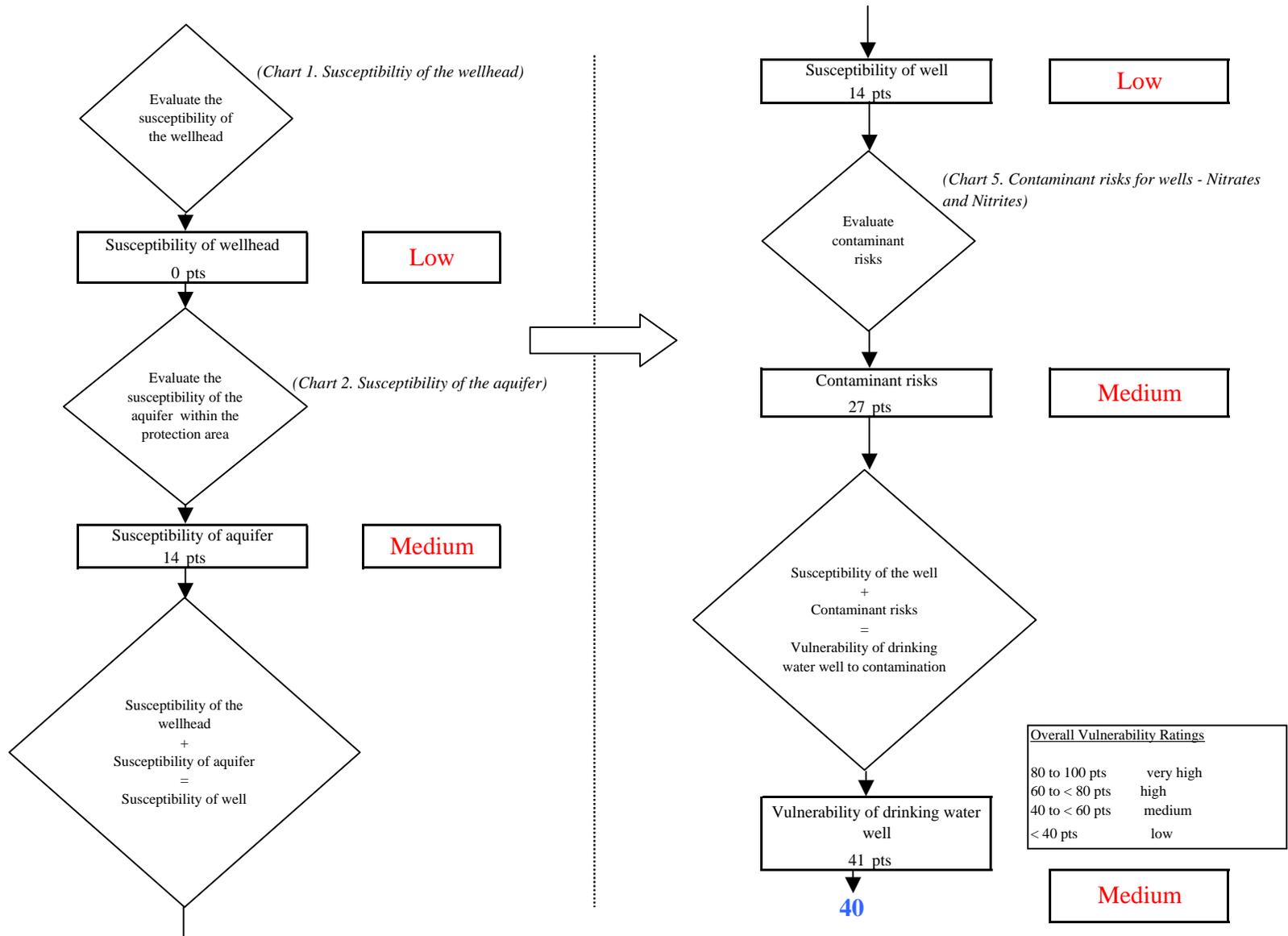


Chart 7. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Volatile Organic Chemicals

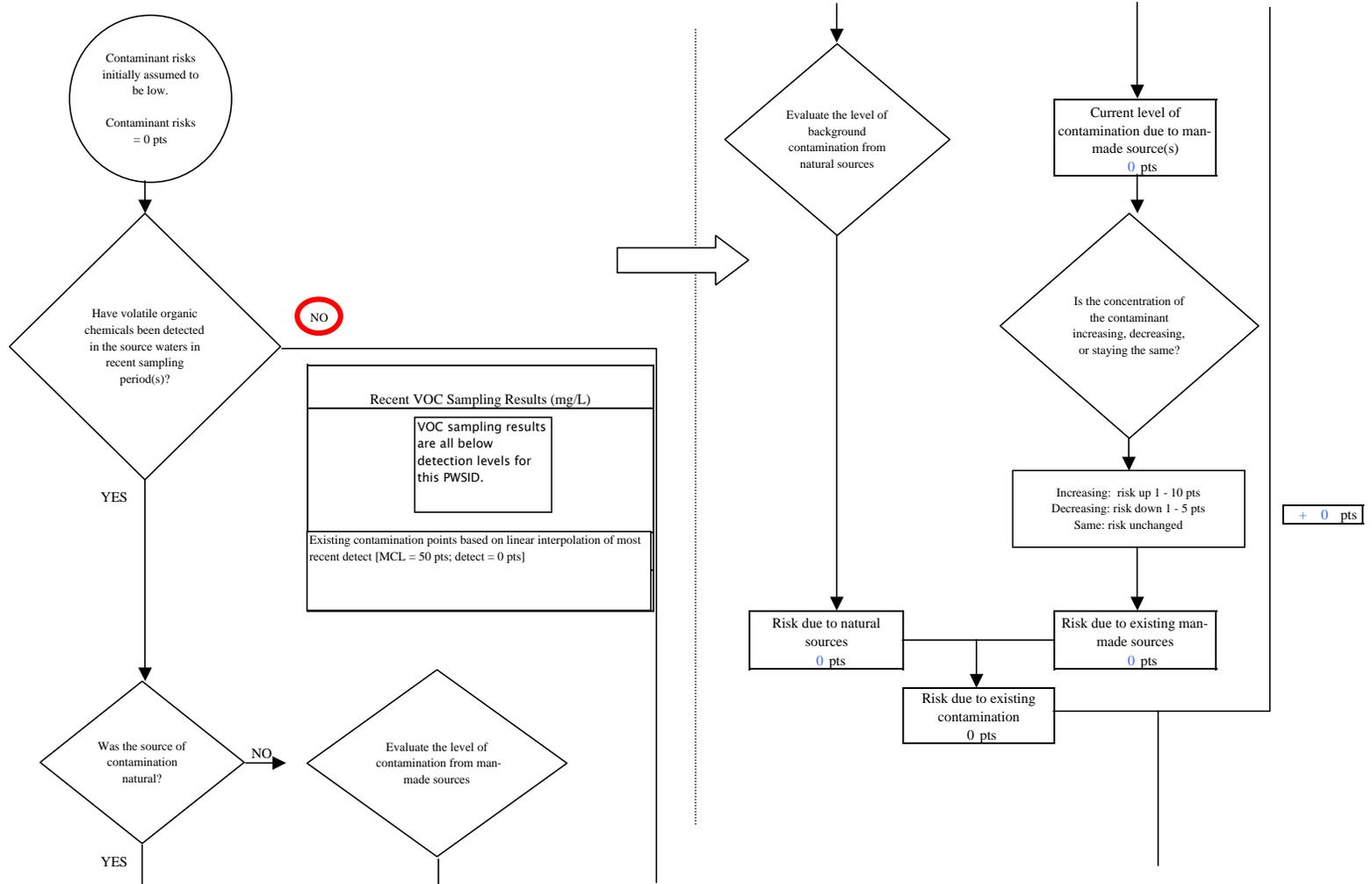


Chart 7. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Volatile Organic Chemicals

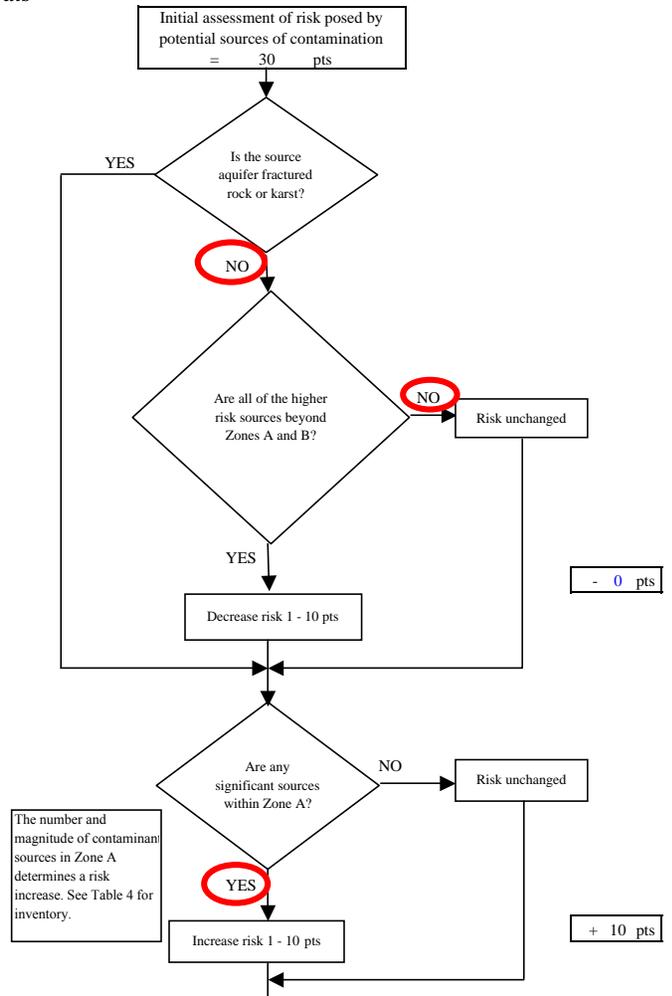
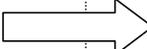
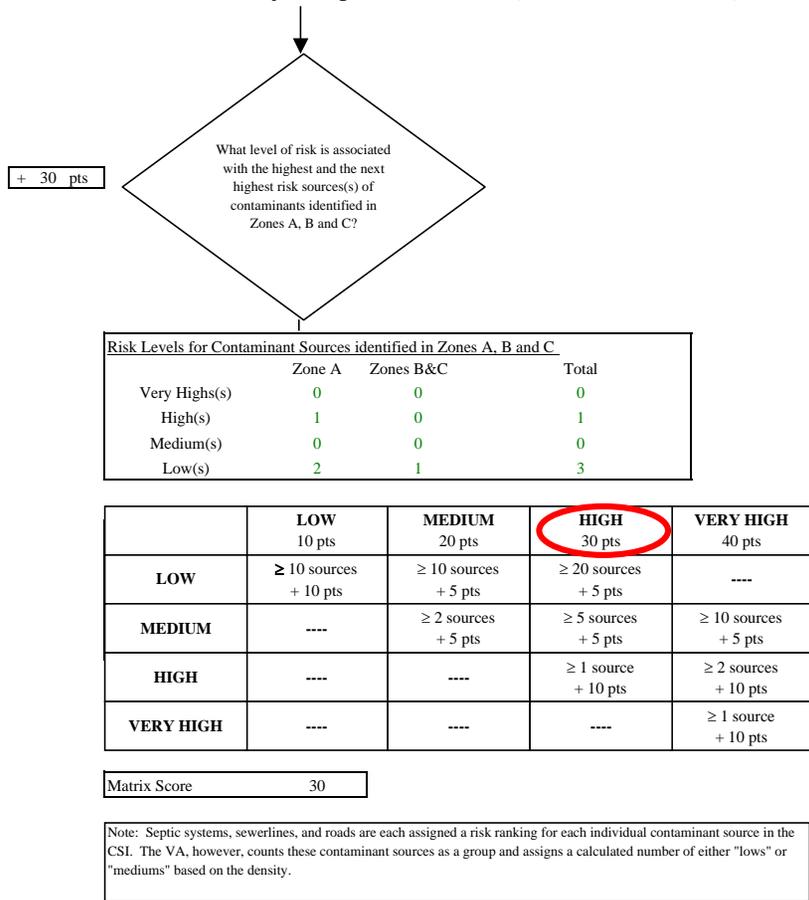


Chart 7. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Volatile Organic Chemicals

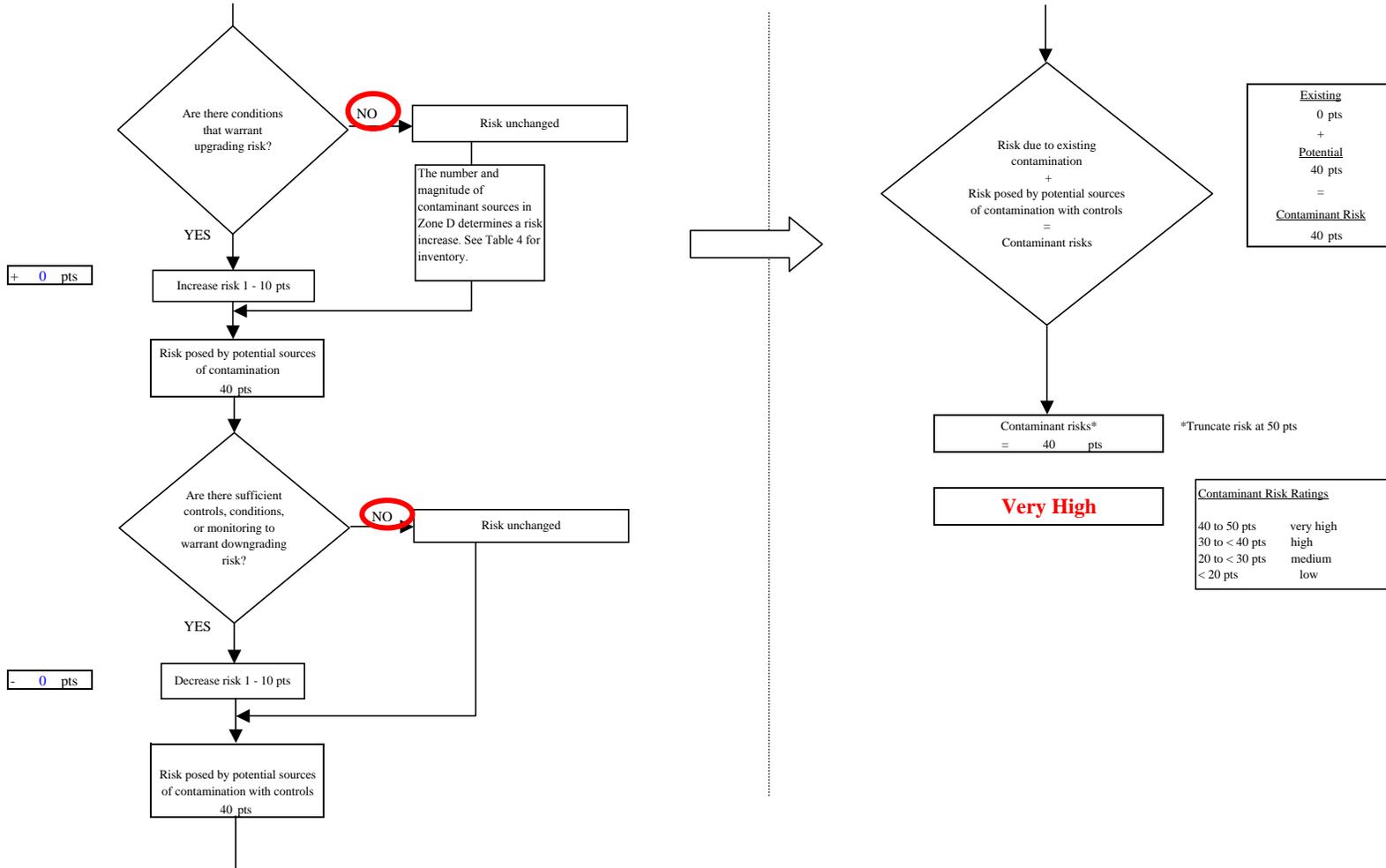


Chart 8. Vulnerability analysis for Eagle Crest Condos (PWS No. 298002.001) - Volatile Organic Chemicals

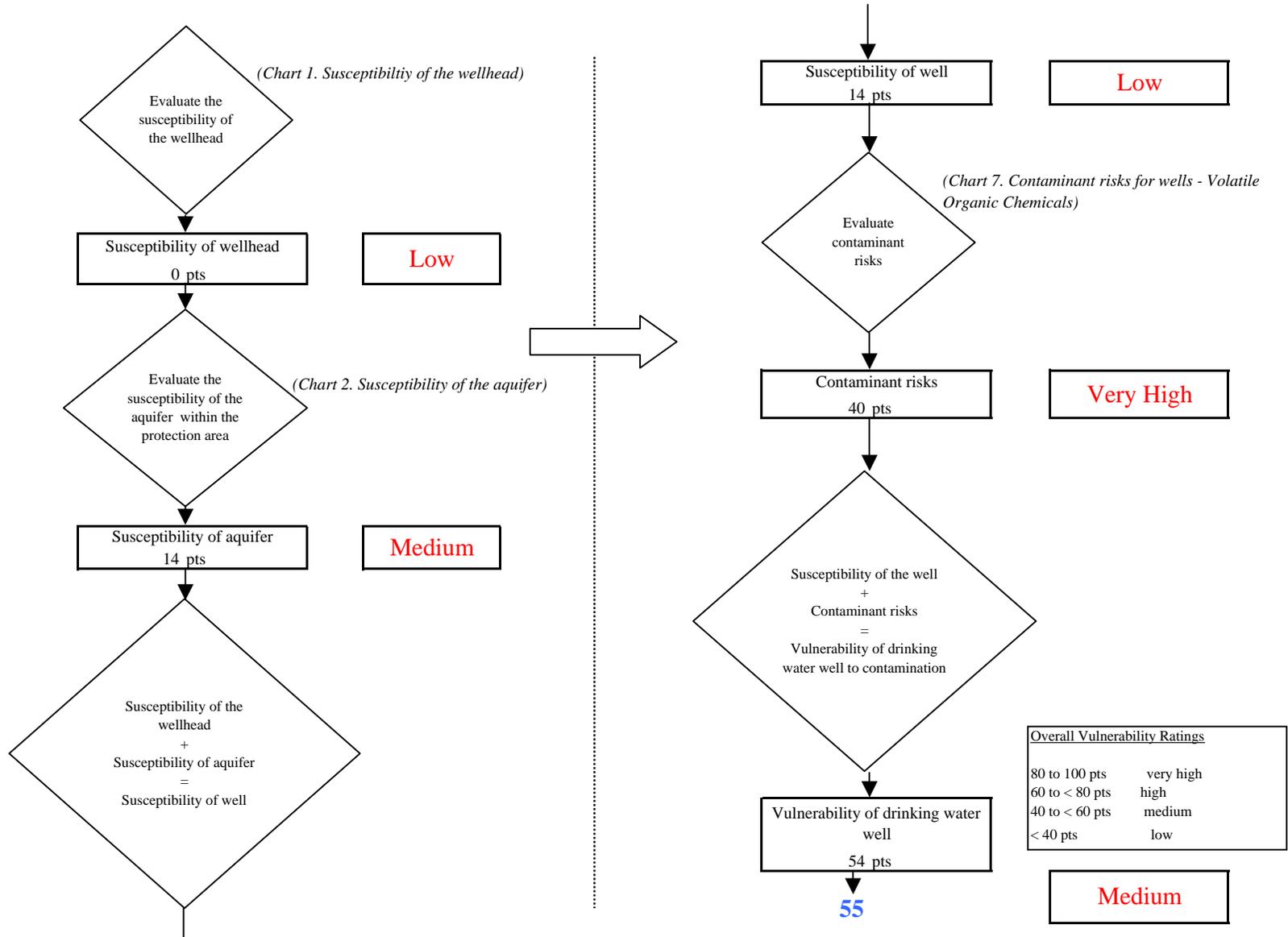


Chart 9. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

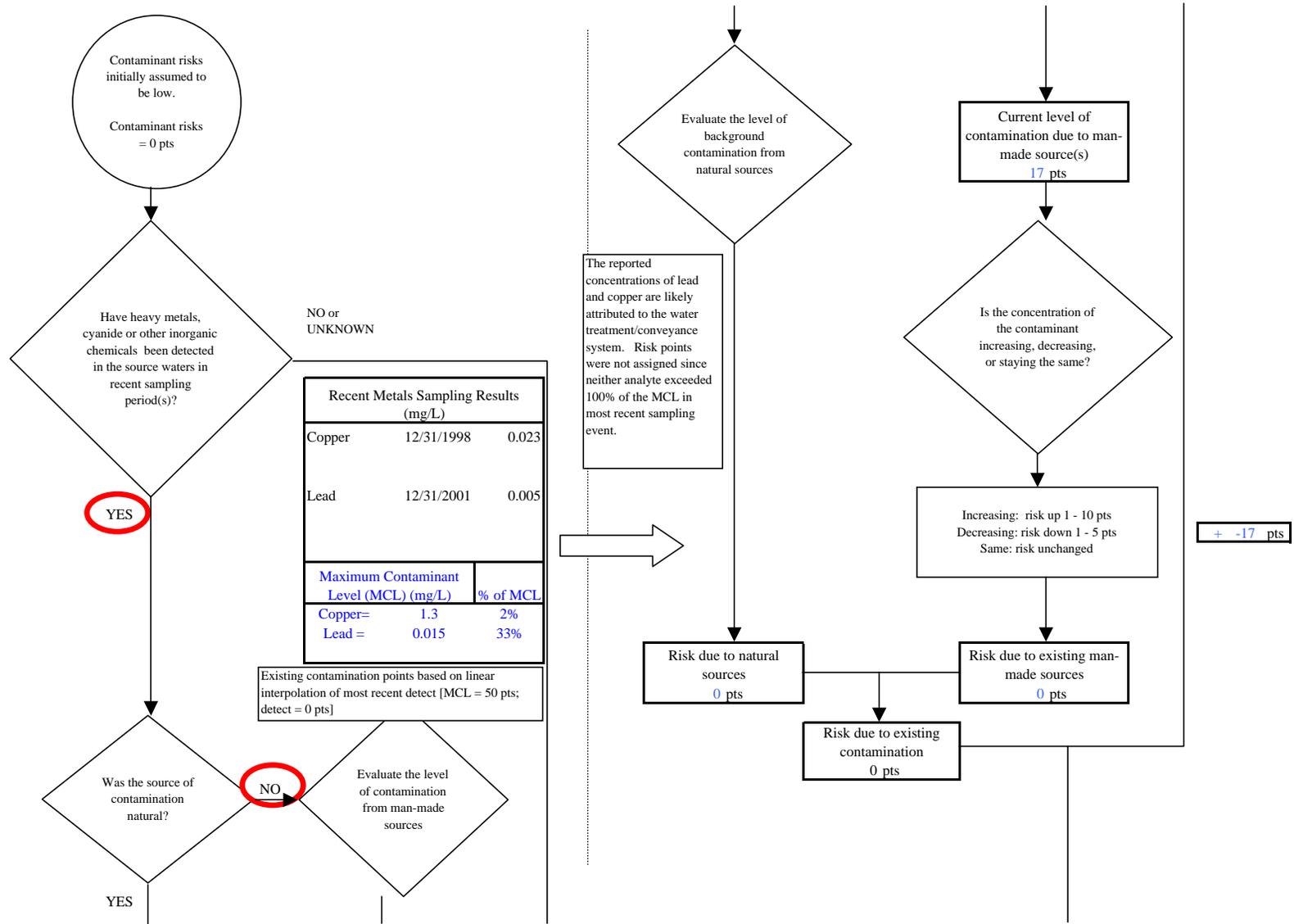


Chart 9. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

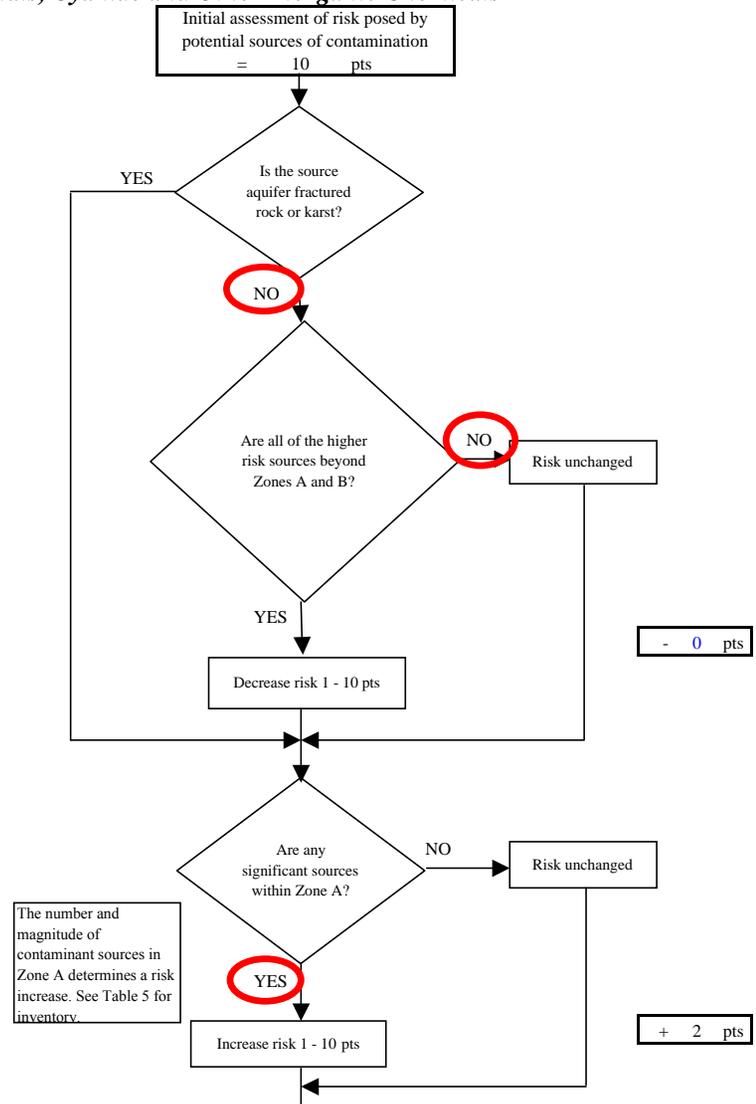
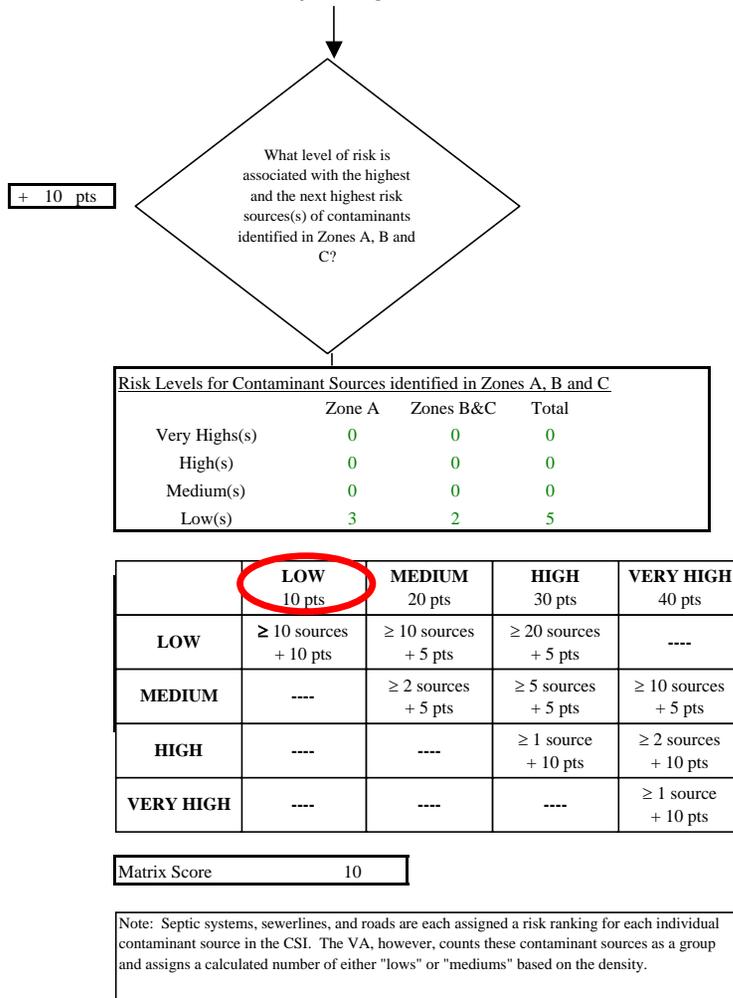


Chart 9. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

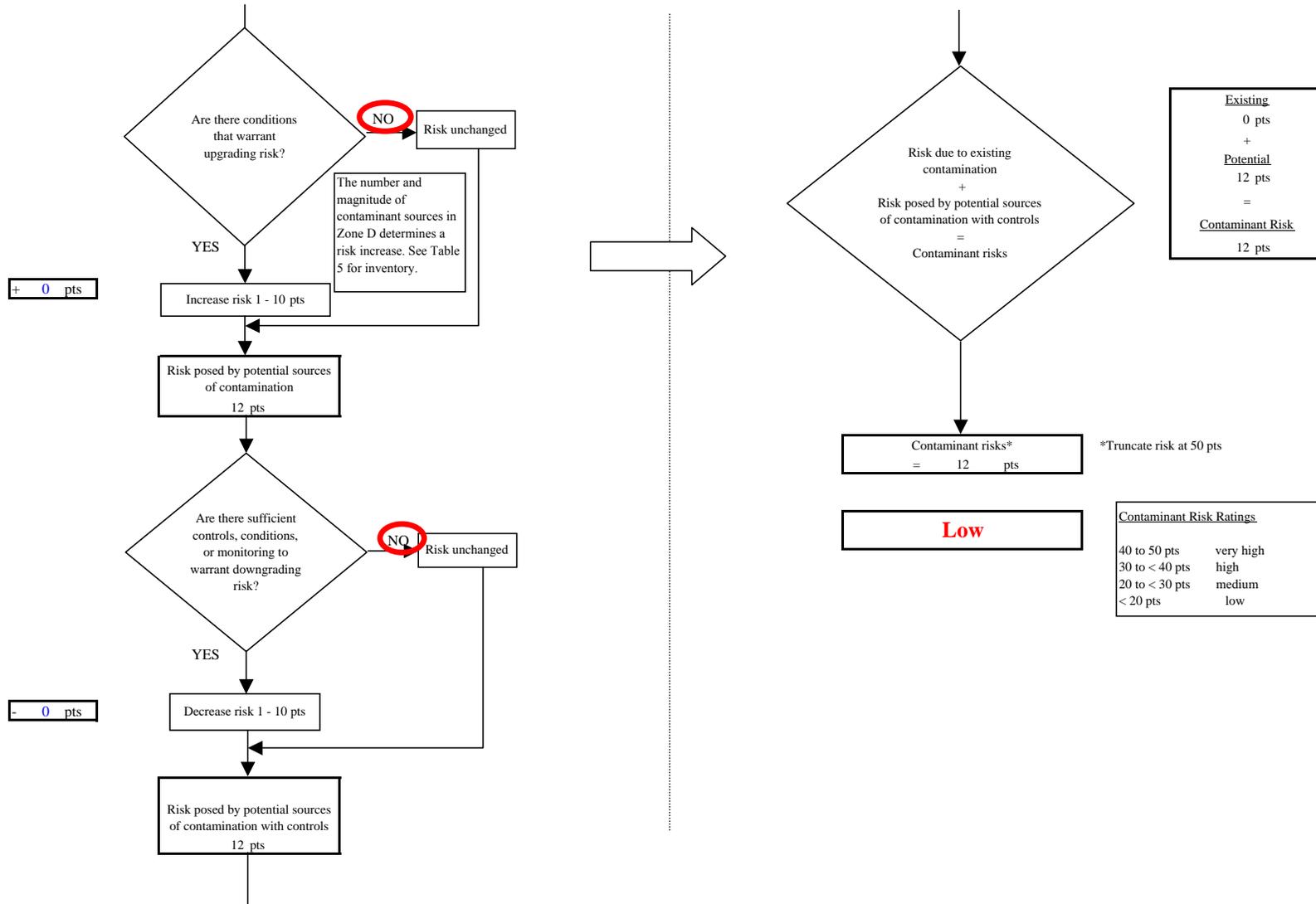


Chart 10. Vulnerability analysis for Eagle Crest Condos (PWS No. 298002.001) - Heavy Metals, Cyanide and Other Inorganic Chemicals

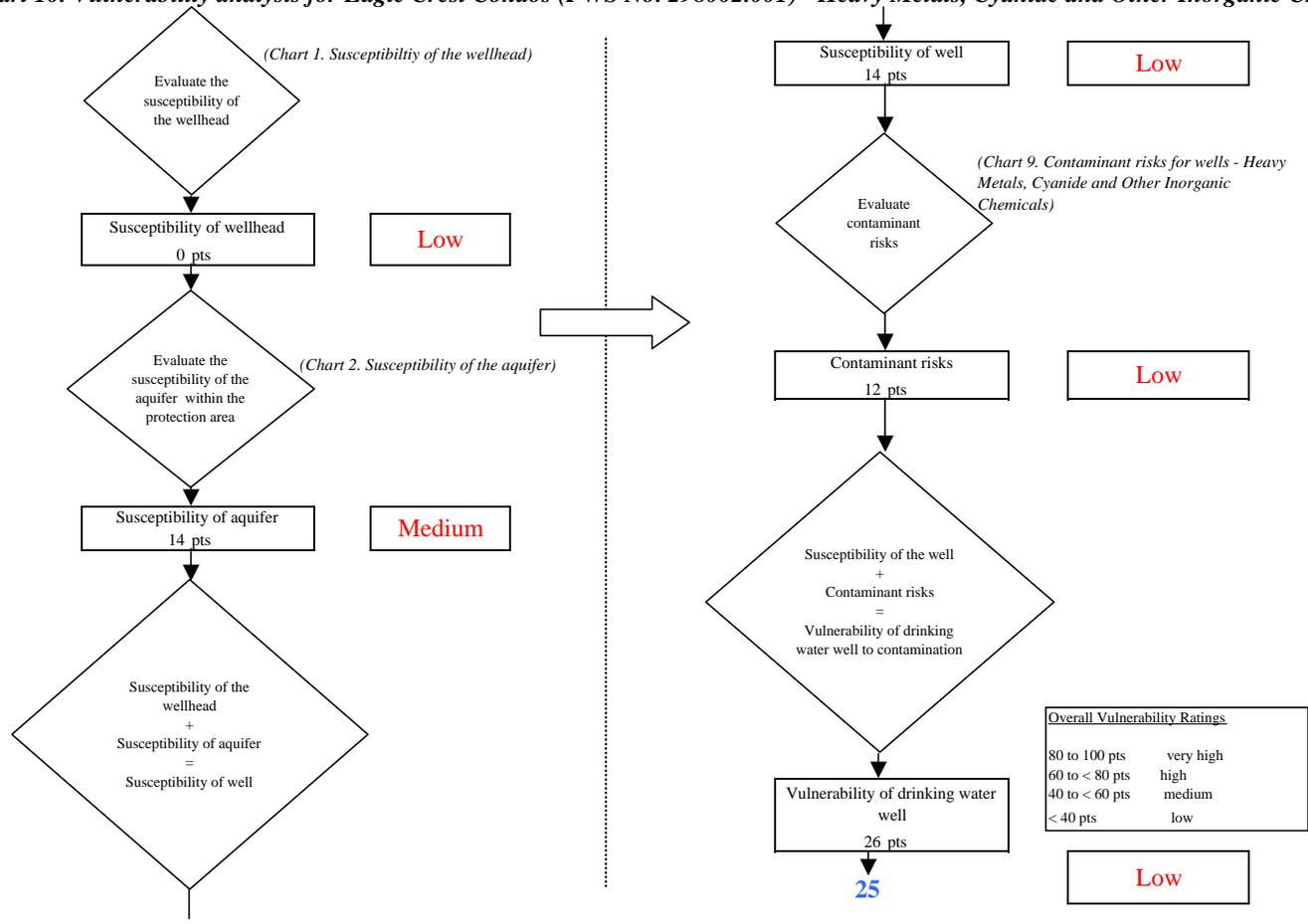


Chart 11. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Synthetic Organic Chemicals

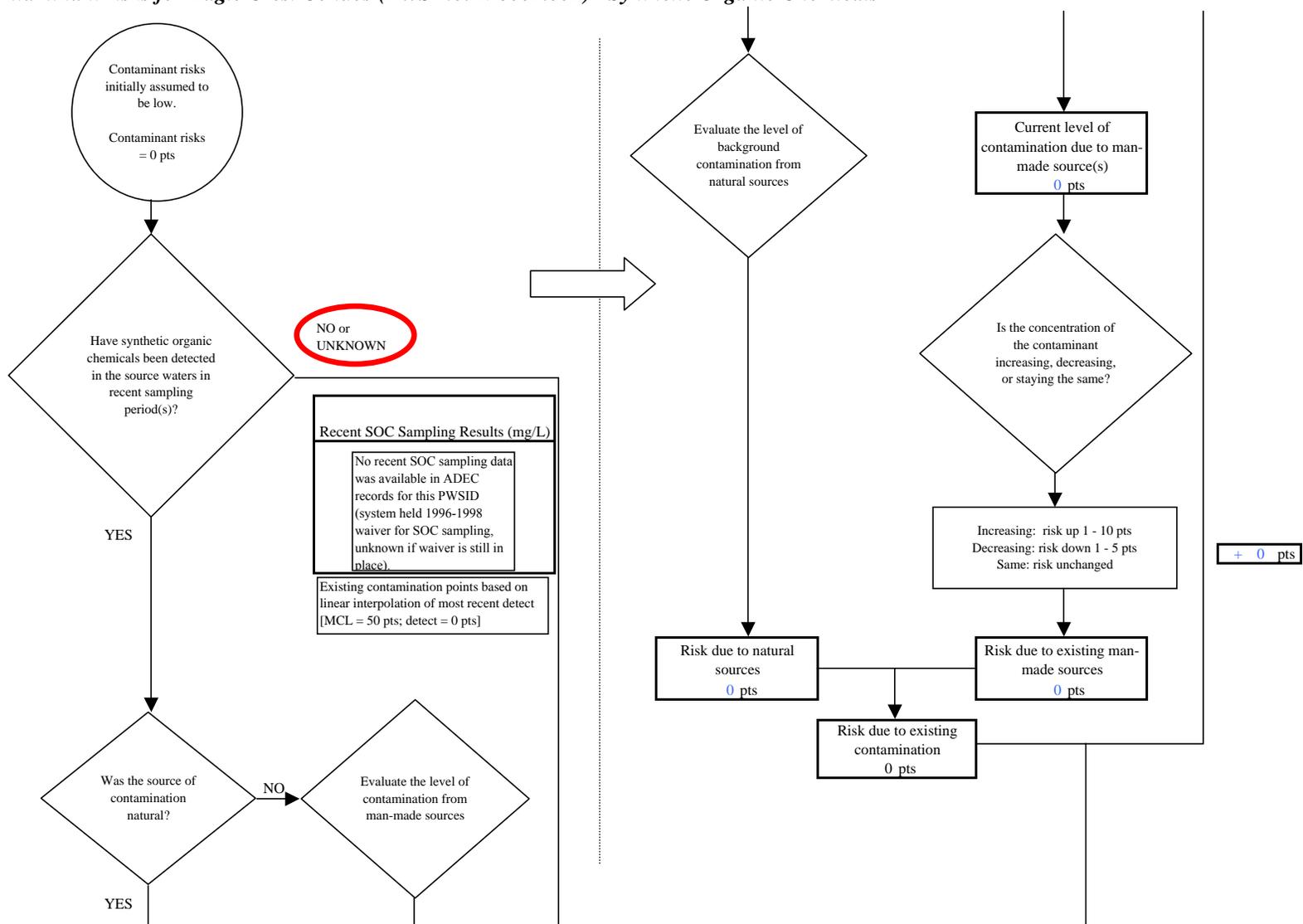


Chart 11. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Synthetic Organic Chemicals

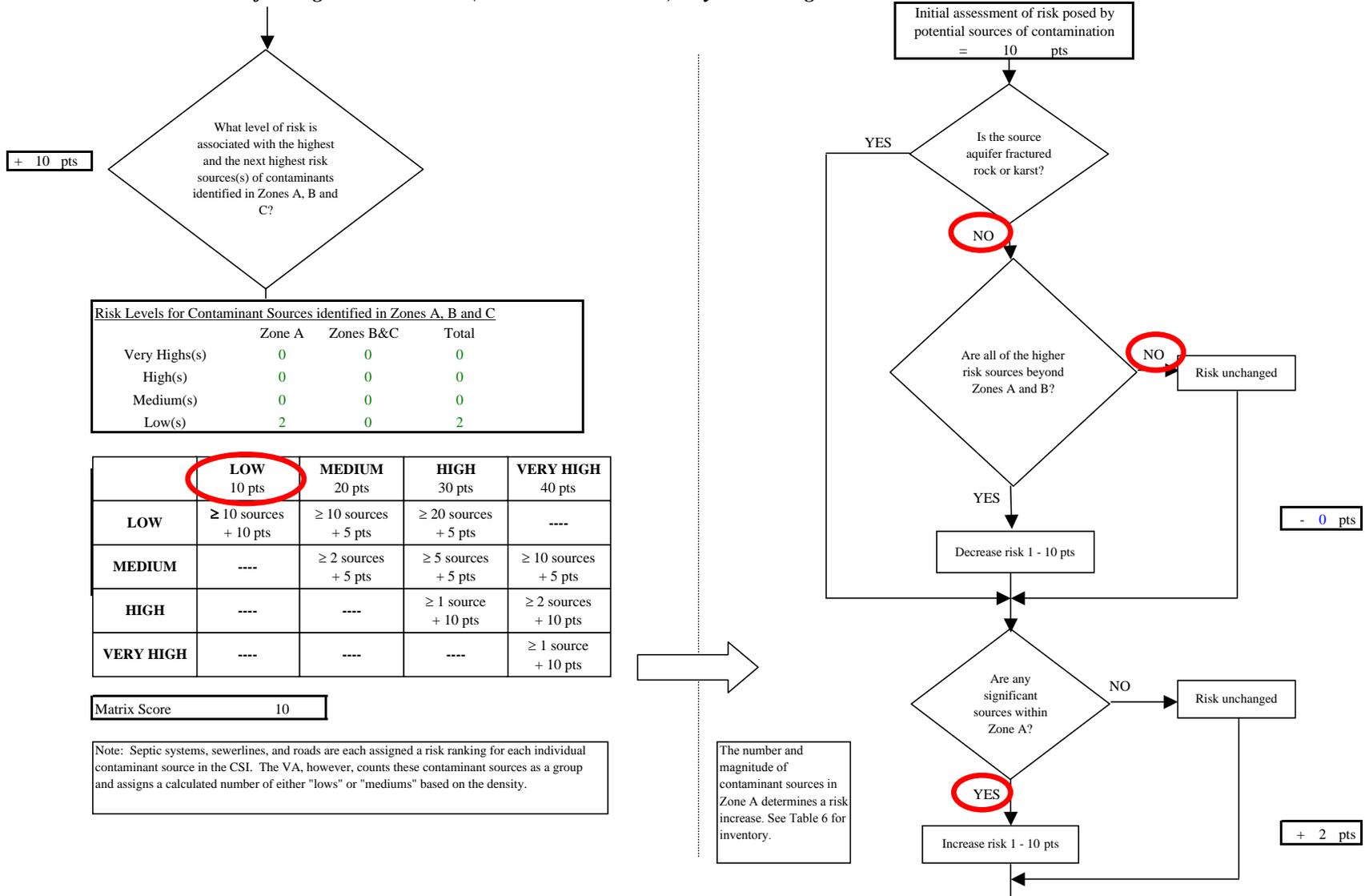


Chart 11. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Synthetic Organic Chemicals

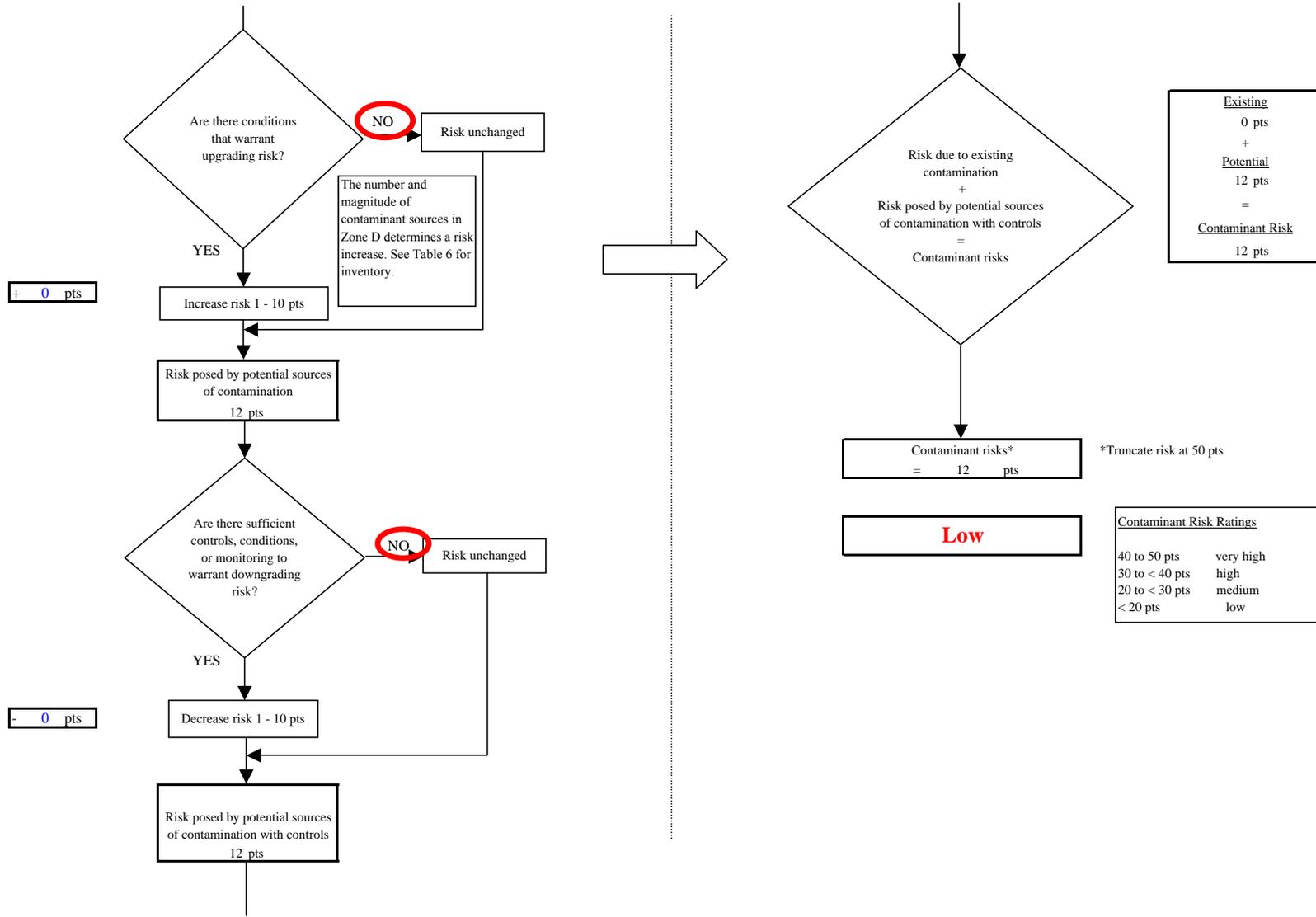


Chart 12. Vulnerability analysis for Eagle Crest Condos (PWS No. 298002.001) - Synthetic Organic Chemicals

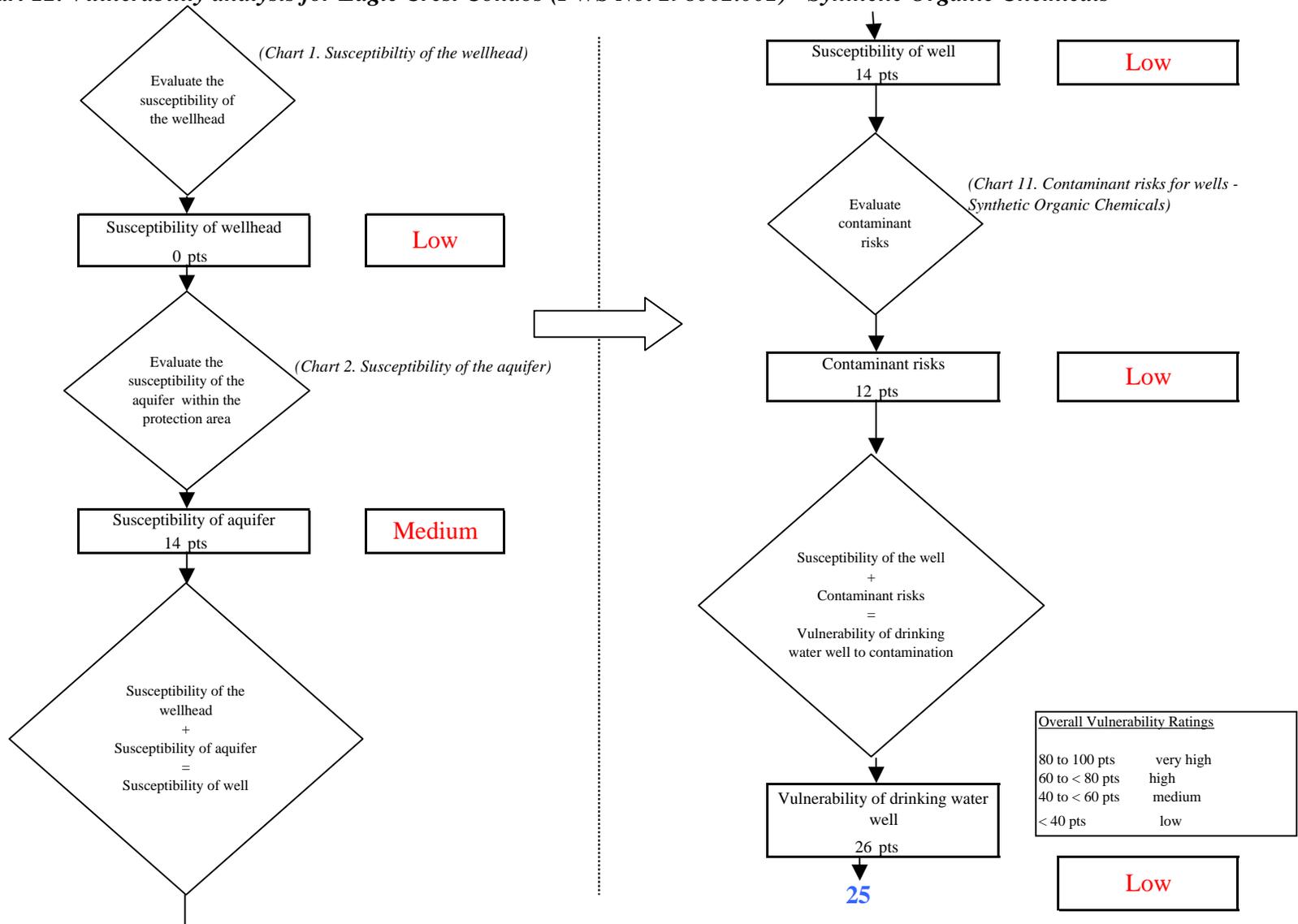


Chart 13. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Other Organic Chemicals

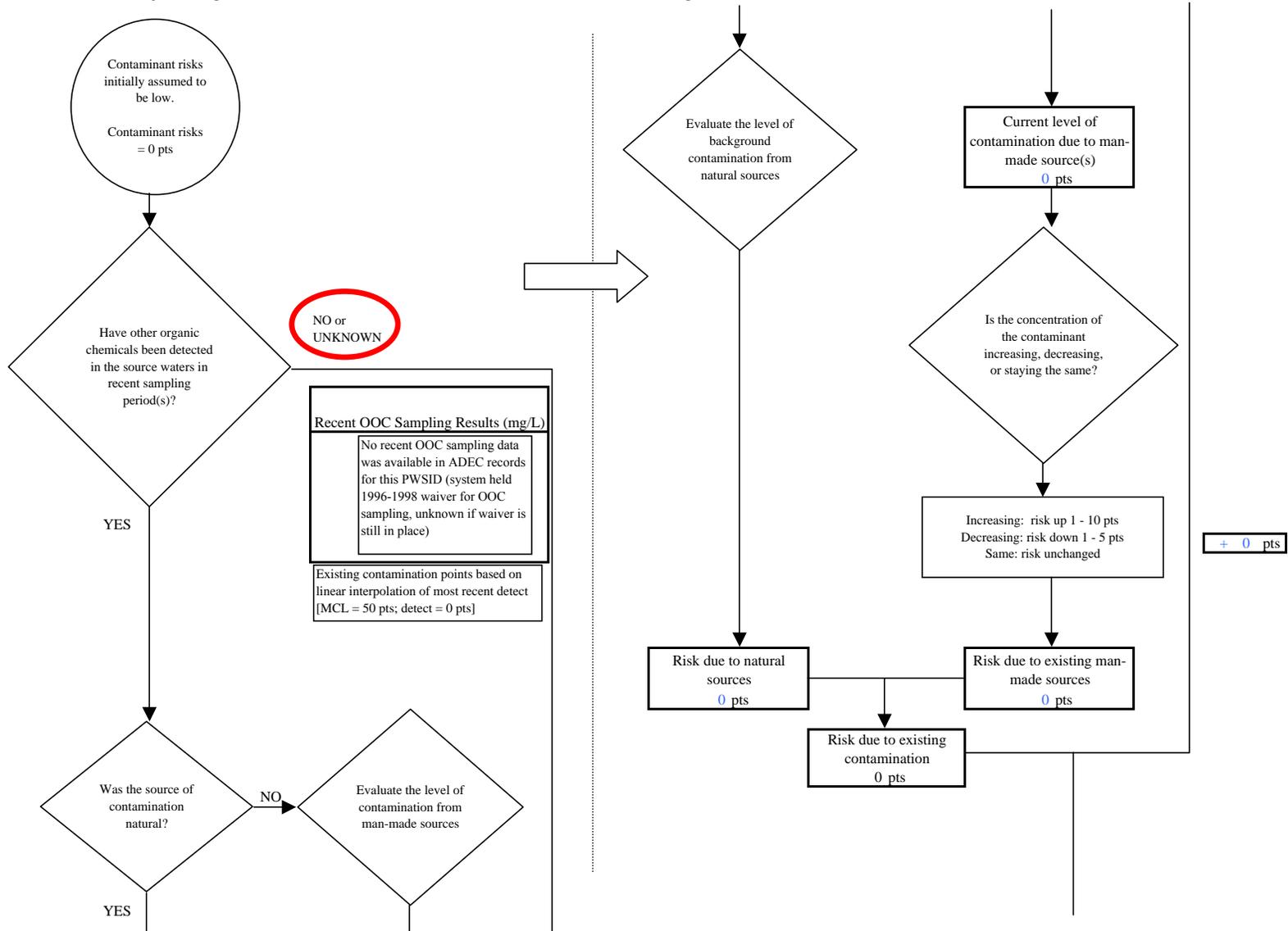


Chart 13. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Other Organic Chemicals

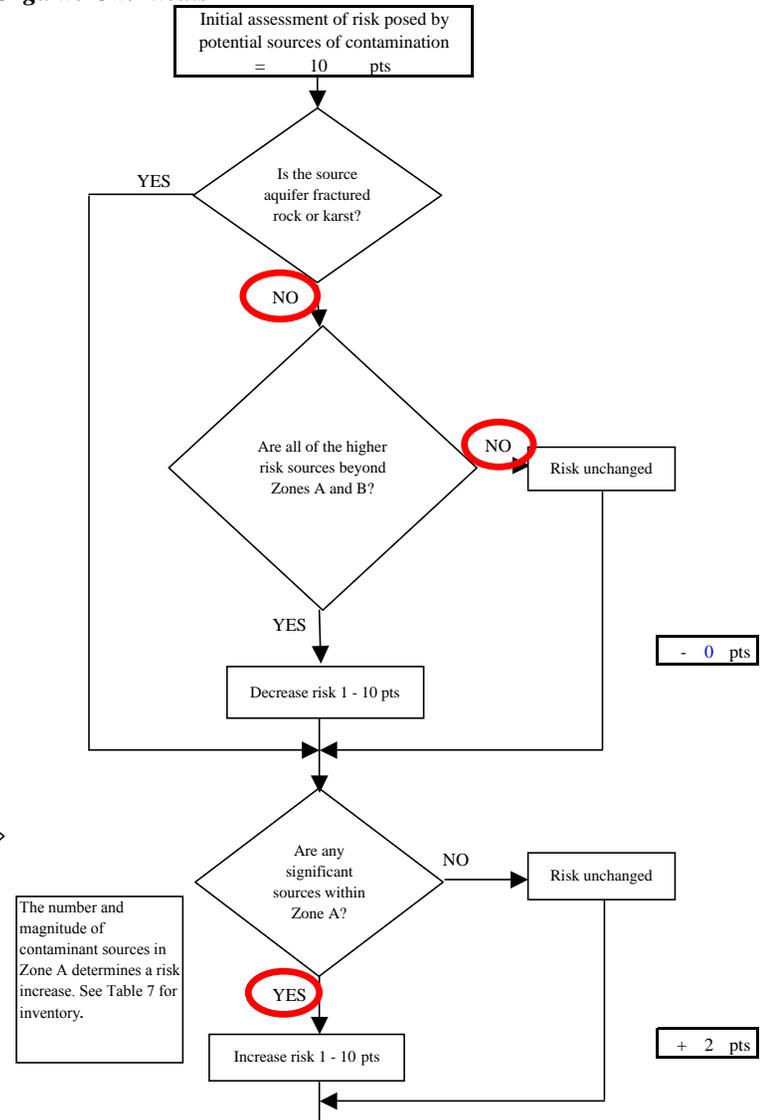
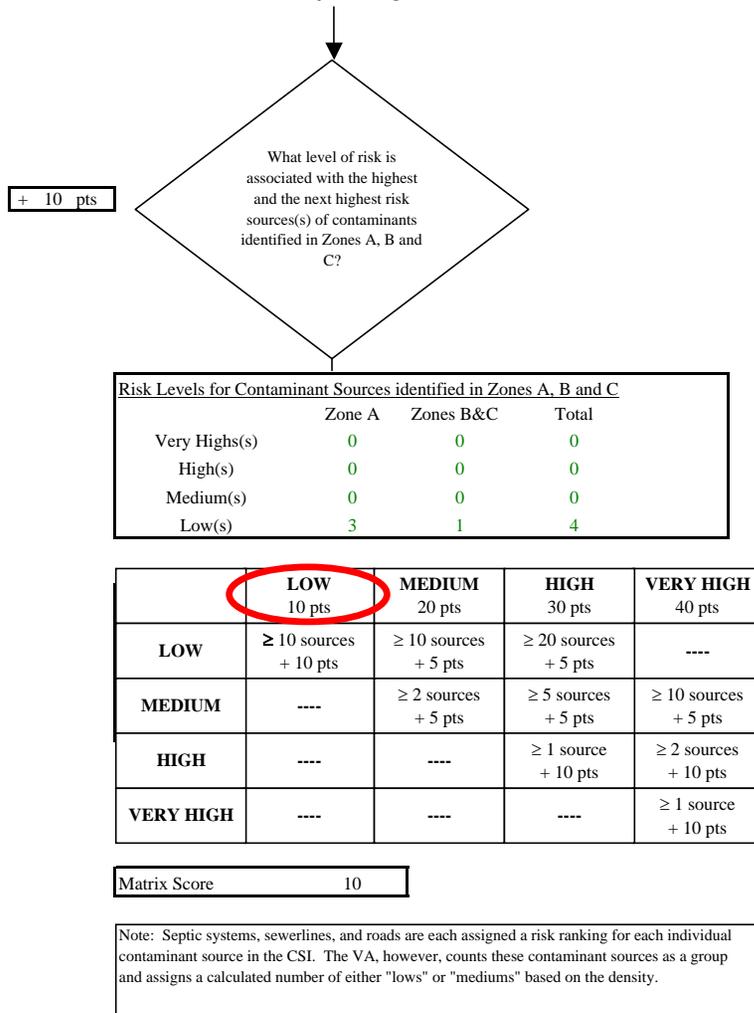


Chart 13. Contaminant risks for Eagle Crest Condos (PWS No. 298002.001) - Other Organic Chemicals

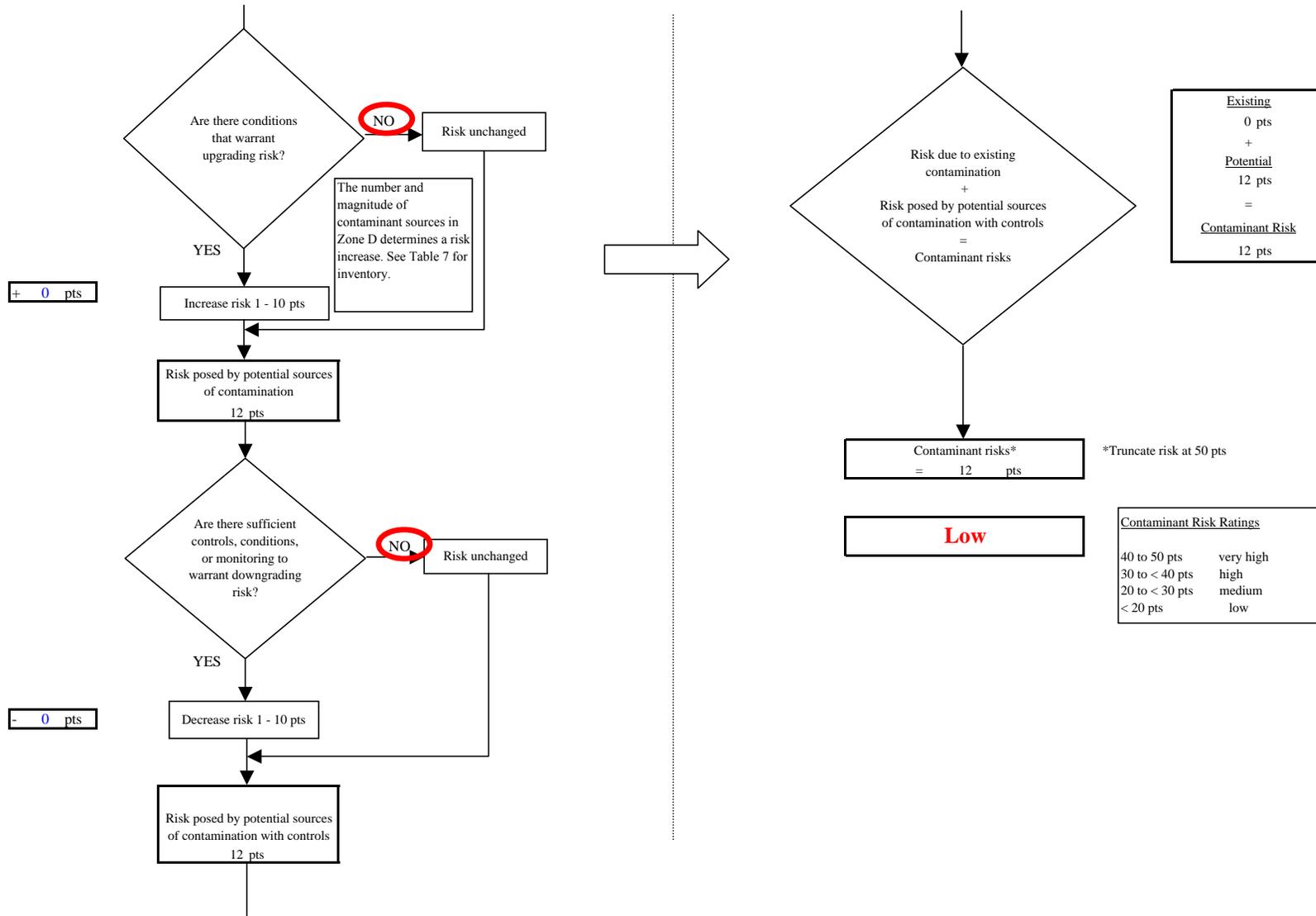


Chart 14. Vulnerability analysis for Eagle Crest Condos (PWS No. 298002.001) - Other Organic Chemicals

