

# **Appendix B-2: Comparison Values (Ecological Endpoint)**

---

- **Apply to surface water medium**
- **Used in conjunction with potential or actual ecological exposures**
- **Based on Aquatic Water Quality Criteria or the Lowest Observed Effects Level**
- **Fresh water and marine (use appropriate column)**

# Appendix B-3: Comparison Values (Ecological Endpoint)

---

- **Apply to sediment medium**
- **Used in conjunction with potential or actual ecological exposures**
- **Based on NOAA Sediment Screening Values and values from the Ontario Ministry of Environment and Energy**
- **Values used represent concentrations that produced response effects in less than 5% of the observations**

# Mechanics of the CHF Calculation

<u>Contaminants</u>		<u>Calculation</u> *****	<u>Rating</u>
Carcinogen A:	[A] <sup>*</sup> max	$\frac{[A]_{\max}^*}{\text{Std}^{**}} + \frac{[B]_{\max}}{\text{Std}^{**}} + \frac{[C]_{\max}}{\text{Std}^{***}} = X_1$	<hr/> >100 = <u>Significant CHF</u> 2-100 = <u>Moderate CHF</u> <2 = <u>Minimal CHF</u>
Carcinogen B:	[B] <sub>max</sub>		
Non-carcinogen C:	[C] <sub>max</sub>		
Ecological D:	[D] <sub>max</sub>	$\frac{[D]_{\max}}{\text{Std}^{****}} = X_2$	
<p>[A]<sup>*</sup> - Maximum concentration in medium            Std<sup>**</sup> - Comparison value based on 10<sup>-4</sup> human cancer incidence            Std<sup>***</sup> - Comparison value based on reference dose for humans            Std<sup>****</sup> - Comparison value for ecological receptors where available</p> <p>*****Use comparison values in Appendix B</p> <p>Note: Contaminants posing a threat to ecological receptors (i.e., ecological contaminants) must be evaluated separately from those posing a threat to human receptors</p>			

# Mechanics of the CHF Calculation— Example\*

<u>Contaminant**</u>	<u>Maximum Concentration (ug/l)</u>	<u>Standard (ug/l)</u>
1,1-Dichloroethylene [carcinogen]	6.8	4.6
1,2-Dichloroethylene (z) [non-carcinogen]	3.3	61.0
Vinyl Chloride [carcinogen]	3.2	2.0
Toluene [non-carcinogen]	16.0	720.0
Manganese [non-carcinogen]	10,700.0	180.0

## Calculation

$$\frac{6.8}{4.6} + \frac{3.3}{61} + \frac{3.2}{2.0} + \frac{16.0}{720} + \frac{10,700}{180} = 62.59$$

>100 = Significant

2-100 = Moderate

<2 = Minimal

\*From Appendix A of Primer  
\*\*Groundwater Medium

# Mechanics of the CHF Calculation for Substances with both Carcinogenic and Non-Carcinogenic Effects

<u>Contaminants</u>	<u>Calculation</u> *****	<u>Rating</u>
Carcinogen A: [A]* <sub>max</sub> Carcinogen B: [B] <sub>max</sub> Non-carcinogen C: [C] <sub>max</sub> Carcinogen/ Non-carcinogen E: [E] <sub>max</sub>	$\frac{[A]^*_{\max}}{\text{Std}^{**}} + \frac{[B]_{\max}}{\text{Std}^{**}} + \frac{[C]_{\max}}{\text{Std}^{***}} + \frac{[E]_{\max}}{\text{Std}^{**}} + \frac{[E]_{\max}}{\text{Std}^{***}} = X_1$	>100 = <u>Significant CHF</u> 2-100 = <u>Moderate CHF</u> <2 = <u>Minimal CHF</u>
Ecological D: [D] <sub>max</sub>	$\frac{[D]_{\max}}{\text{Std}^{****}} = X_2$	
<p>[A]* - Maximum concentration in medium            Std** - Comparison value based on 10<sup>-4</sup> human cancer incidence            Std*** - Comparison value based on reference dose for humans            Std**** - Comparison value for ecological receptors where available</p> <p>*****Use comparison values in Appendix B</p> <p>Note: Contaminants posing a threat to ecological receptors (i.e., ecological contaminants) must be evaluated separately from those posing a threat to human receptors</p>		

# Mechanics of the CHF Calculation— Example 2\*

<u>Contaminant<sup>2</sup></u>	<u>Maximum Concentration (ug/l)</u>	<u>Standard (ug/l)</u>
Cr** [non-carcinogen]	1,390 ug/l	180 ug/l
Pb** [non-carcinogen]	1,400 ug/l	4 ug/l
Cd** [non-carcinogen]	128 ug/l	18 ug/l
Cr***	880 ppm	26 ppm
Pb***	385 ppm	31 ppm
Cd***	10 ppm	0.6 ppm

$$\frac{1,390}{180} + \frac{1,400}{4} + \frac{128}{18} = 365 = \text{Significant}$$

$$\frac{880}{26} + \frac{385}{31} + \frac{10}{0.6} = 62.9 = \text{Moderate}$$

\*From Appendix A of Primer  
 \*\*Surface water medium, human exposure  
 \*\*\*Sediment, ecological exposure

# Mechanics of Surface Water/ Sediment Evaluation

- **Summary of Relative Risk Site Evaluation possibilities**

Receptor Endpoint \ Medium	Surface Water	Sediment
<b>Human</b>	CHF = Sum of Ratios using Appendix B-1 (water); MPF; RF	CHF = Sum of Ratios using Appendix B-1 (soil); MPF; RF
<b>Ecological</b>	CHF = Sum of Ratios using Appendix B-2 (fresh or marine); MPF; RF	CHF = Sum of Ratios using Appendix B-3; MPF; RF

- **Evaluate separately; take the highest rating**

# Migration Pathway Factor (MPF)

---

- Each media pathway evaluated (groundwater, surface water/ sediment, soil)
- Three tiers
  - ***Evident***: Contamination is present at, is moving toward, or has moved to a point of exposure
  - ***Potential***: Contamination has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information not sufficient to make determination of Evident or Confined
  - ***Confined***: Potential for contaminant migration from source is limited due to geological structures or physical controls
- Opportunity for technical input from regulators and community

# Receptor Factor

---

- **Receptors (human or sensitive ecological species/ environments) evaluated for each media**
- **Three tiers**
  - ***Identified*: Receptors are threatened or have access to potentially contaminated media**
  - ***Potential*: Receptors are not threatened but have potential access to media of concern**
  - ***Limited*: Receptors are not threatened or have little or no access to potentially contaminated media**
- **Opportunity for technical input from regulators and community**

# Site Evaluation Factor Information for Groundwater

FACTOR	RATING	DEFINITION
<b>Contaminant Hazard Factor (CHF)*</b>	Significant	Sum of ratios [maximum concentration/comparison value] > 100
	Moderate	Sum of ratios [maximum concentration/comparison value] = 2 - 100
	Minimal	Sum of ratios [maximum concentration/comparison value] < 2
<b>Migration Pathway Factor (MPF)**</b>	Evident	Analytical data or observable evidence indicates that contamination in the groundwater is moving or has moved away from the source area
	Potential	Contamination in the groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined
	Confined	Information indicates that the potential for contaminant migration from the source via the groundwater is limited (due to geological structures or physical controls)
<b>Receptor Factor (RF)**</b>	Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer)
	Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer)
	Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only)

\*Evaluate using comparison values in Appendix B-1

\*\*Evaluate using definitions and detailed instructions in Section 3.4

# Site Evaluation Factor Information for Surface Water/Sediment

FACTOR	RATING	DEFINITION
<b>Contaminant Hazard Factor (CHF)*</b>	Significant	Sum of ratios [maximum concentration/comparison value] > 100
	Moderate	Sum of ratios [maximum concentration/comparison value] = 2 - 100
	Minimal	Sum of ratios [maximum concentration/comparison value] < 2
<b>Migration Pathway Factor (MPF)**</b>	Evident	Analytical data or observable evidence indicates that contamination in the media is present at, moving toward, or has moved to a point of exposure
	Potential	Contamination in surface water or sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined
	Confined	Information indicates a low potential for contaminant migration from the source to a potential point of exposure (could be due to presence of geological structures or physical controls)
<b>Receptor Factor (RF)**</b>	Identified	Receptors identified that have access to surface water or sediment to which contamination has moved or can move
	Potential	Potential for receptors to have access to surface water or sediment to which contamination has moved or can move
	Limited	Little or no potential for receptors to have access to surface water or sediment to which contamination has moved or can move

\* Evaluate using comparison values in Appendix B-1 for surface water and sediments for human receptors. Use comparison values in Appendix B-2 for surface water and ecological receptors, and comparison values in Appendix B-3 for sediments and ecological receptors.

\*\*Evaluate using definitions and detailed instructions in Section 3.5

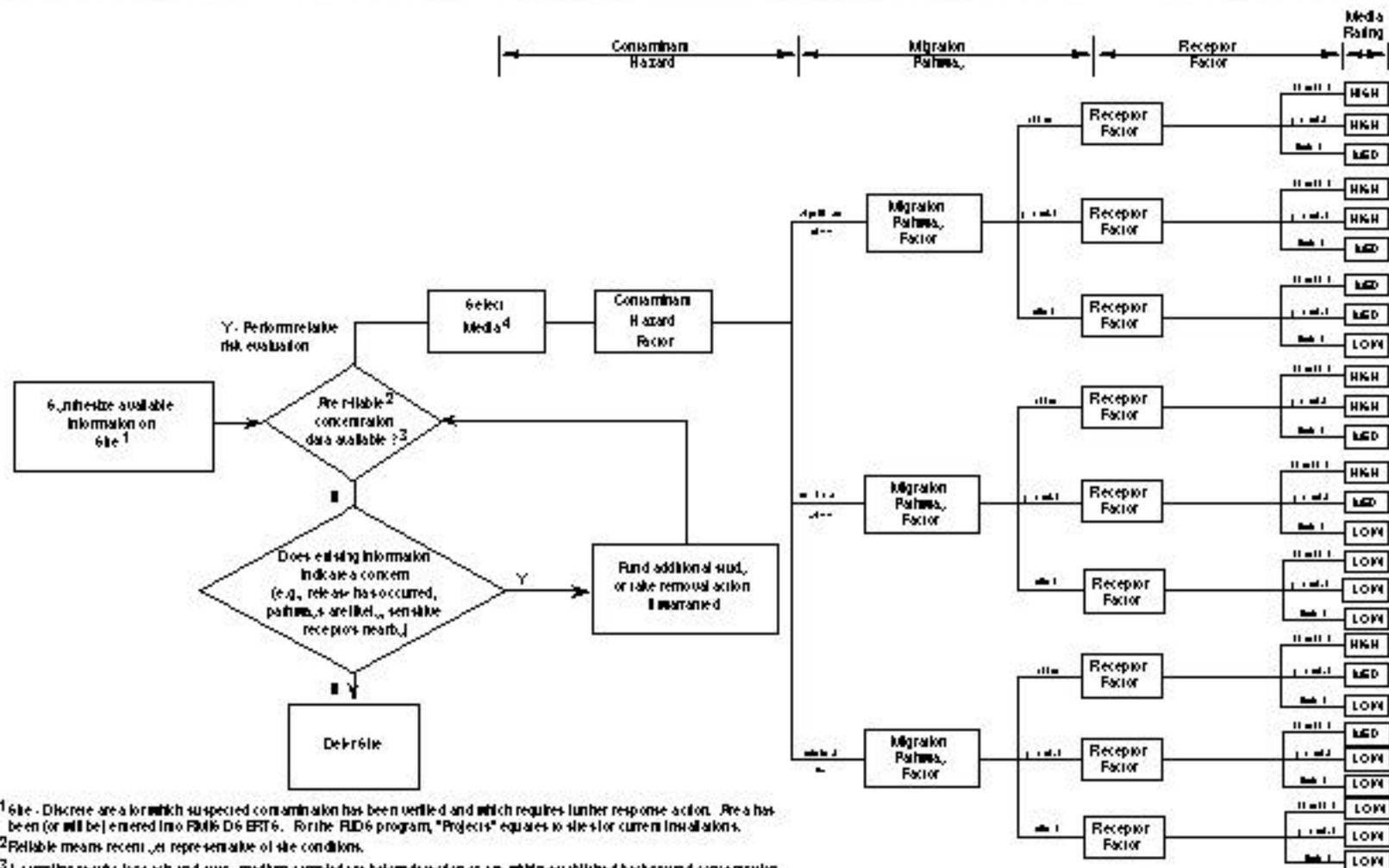
# Site Evaluation Factor Information for Soils

FACTOR	RATING	DEFINITION
<b>Contaminant Hazard Factor (CHF)*</b>	Significant	Sum of ratios [maximum concentration/comparison value] > 100
	Moderate	Sum of ratios [maximum concentration/comparison value] = 2 - 100
	Minimal	Sum of ratios [maximum concentration/comparison value] < 2
<b>Migration Pathway Factor (MPF)**</b>	Evident	Analytical data or observable evidence that contamination is present at, is moving toward, or has moved to a point of exposure
	Potential	Contamination has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined
	Confined	Low possibility for contamination to be present at or migrate to a point of exposure
<b>Receptor Factor (RF)**</b>	Identified	Receptors identified that have access to contaminated soil
	Potential	Potential for receptors to have access to contaminated soil
	Limited	Little or no potential for receptors to have access to contaminated soil

\*Evaluate using comparison values in Appendix B-1

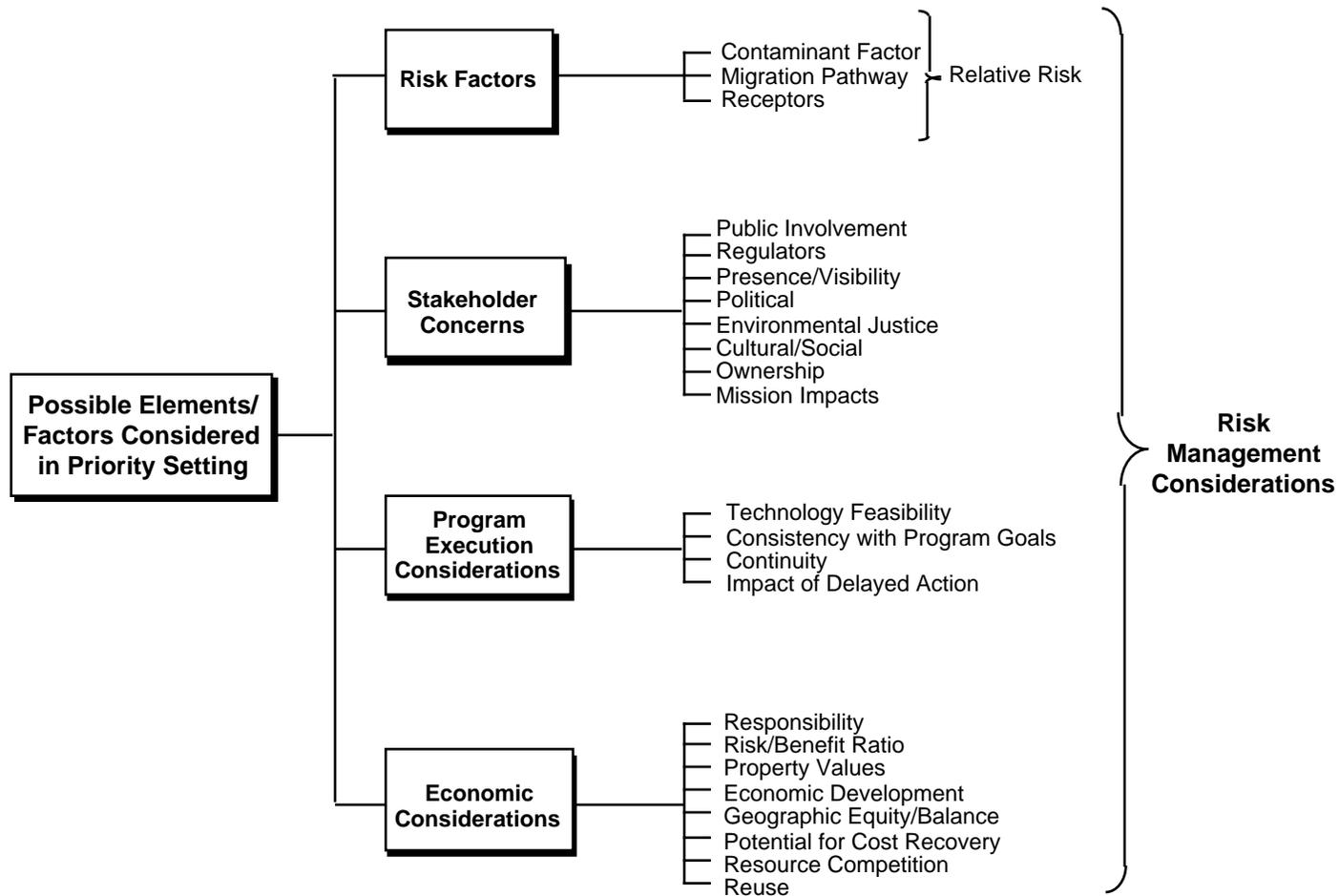
\*\*Evaluate using definitions and detailed instructions in Section 3-6

# Risk-Based Site Evaluation Framework: Decision Flowchart



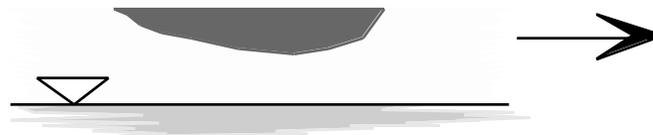
- <sup>1</sup> Site - Discrete areas for which suspected contamination has been verified and which requires further response action. Area has been (or will be) entered into RMD's D6 ERT's. For the RMD's program, "Projects" equates to sites for current installations.
- <sup>2</sup> Reliable means recent, or representative of site conditions.
- <sup>3</sup> If sampling results for each and every medium sampled are below detection or are within established background concentration ranges, the site is automatically categorized as Low.
- <sup>4</sup> Media - Conduct relative risk evaluations by media: groundwater, surface water, sediment, soil. If reliable data are not available for a medium, that medium is assigned a rating of "Not Evaluated" (N/E).

# Considerations in a Priority Setting



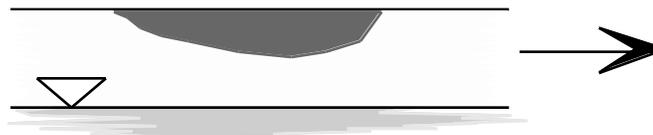
# Relative Risk Site Evaluation— Issue Clarification

1. No reliable analytical data for a site



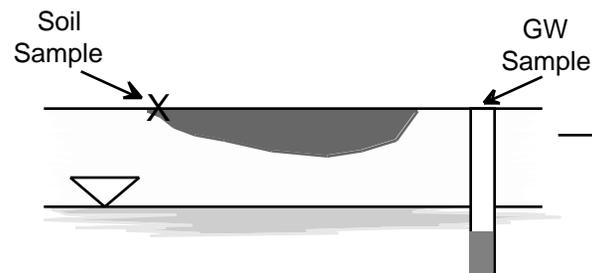
Site categorized as Not Evaluated (NE)

2. Site in Remedies in Place (RIP) or in Response Complete (RC) status



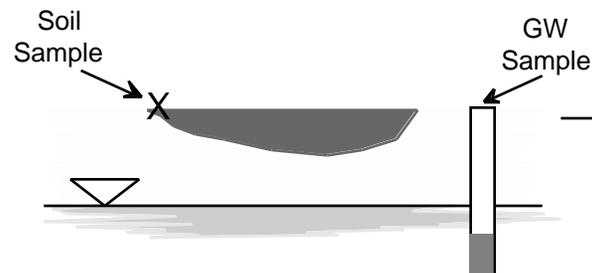
Do not perform relative risk site evaluation. They are Not Required (NR).

3. Analytical data within established background levels



Evaluated as *Low* in Primer

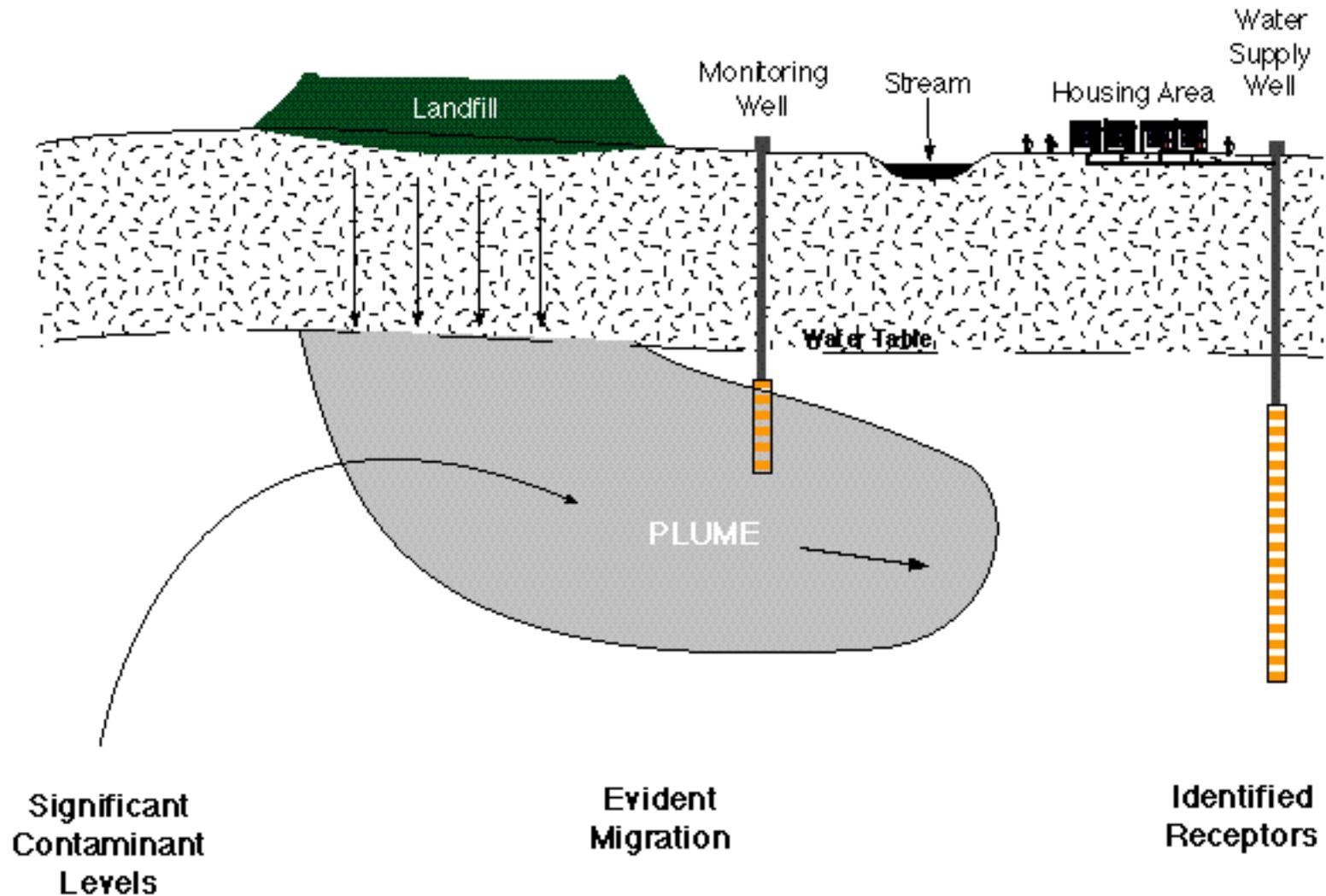
4. Analytical results are below method detection limit



Evaluated as *Low* in Primer

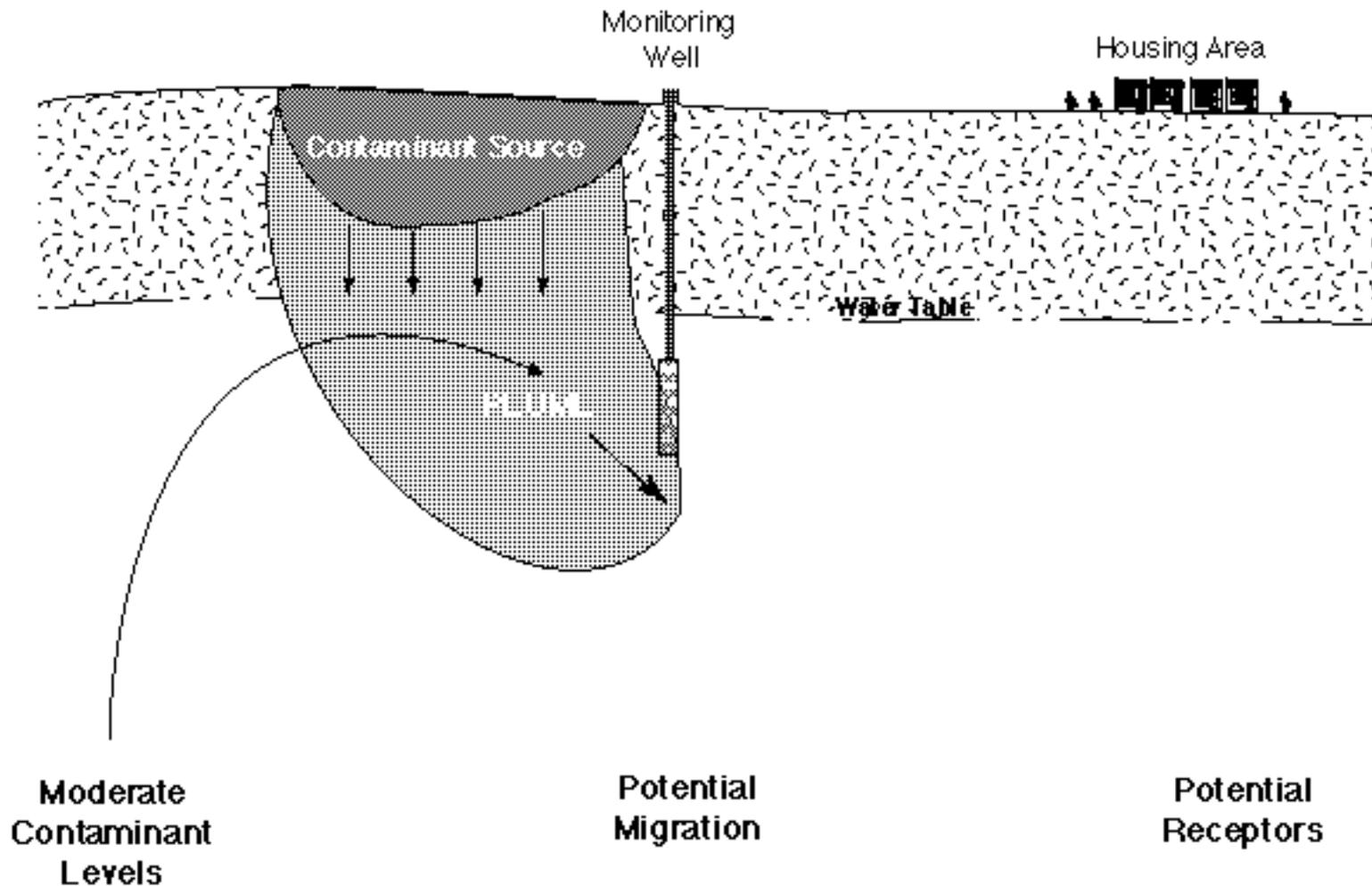
# Relative Risk Site Evaluation Scenarios

## High Relative Risk—Groundwater



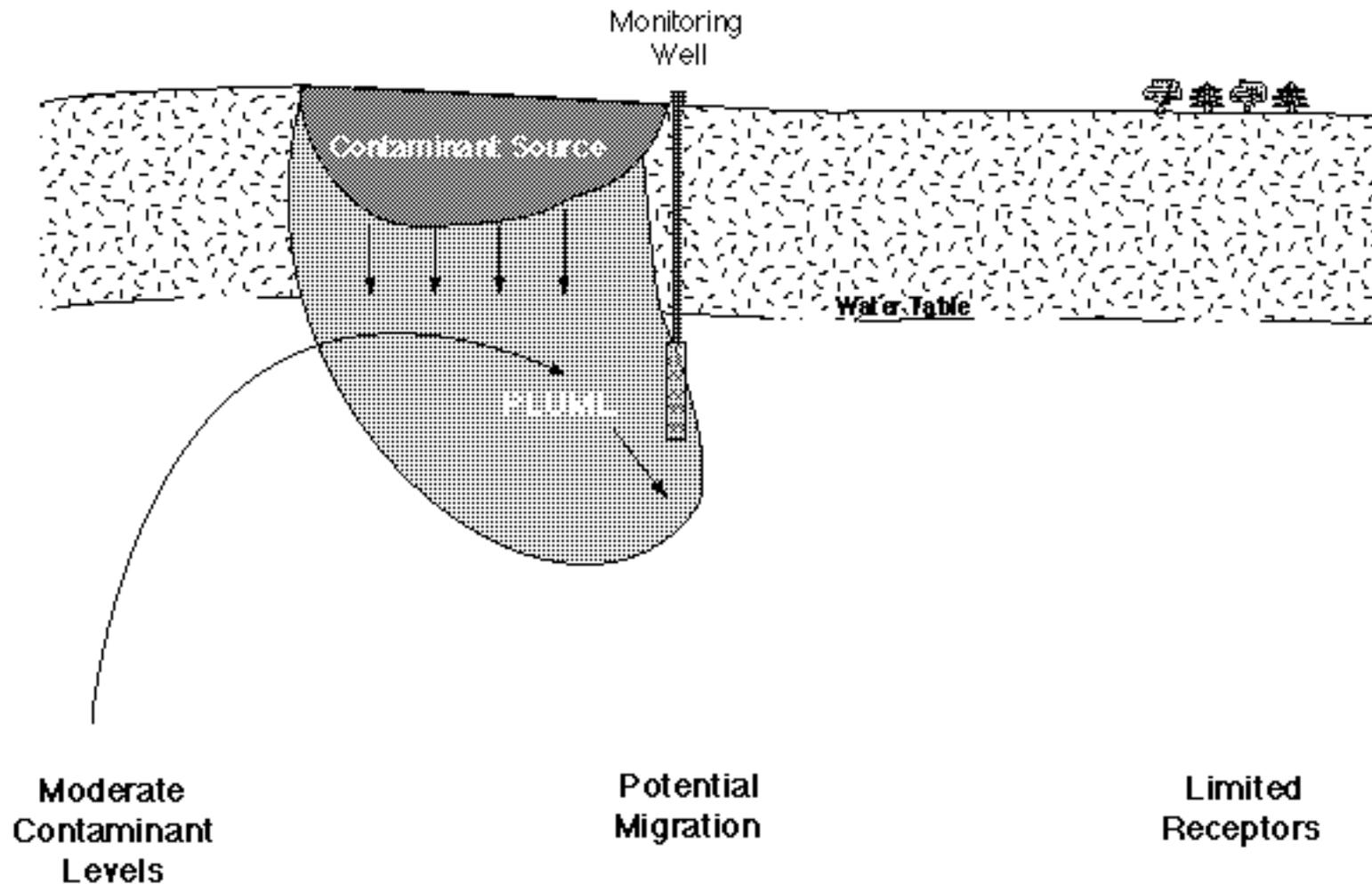
# Relative Risk Site Evaluation Scenarios

## Medium Relative Risk—Groundwater



# Relative Risk Site Evaluation Scenarios

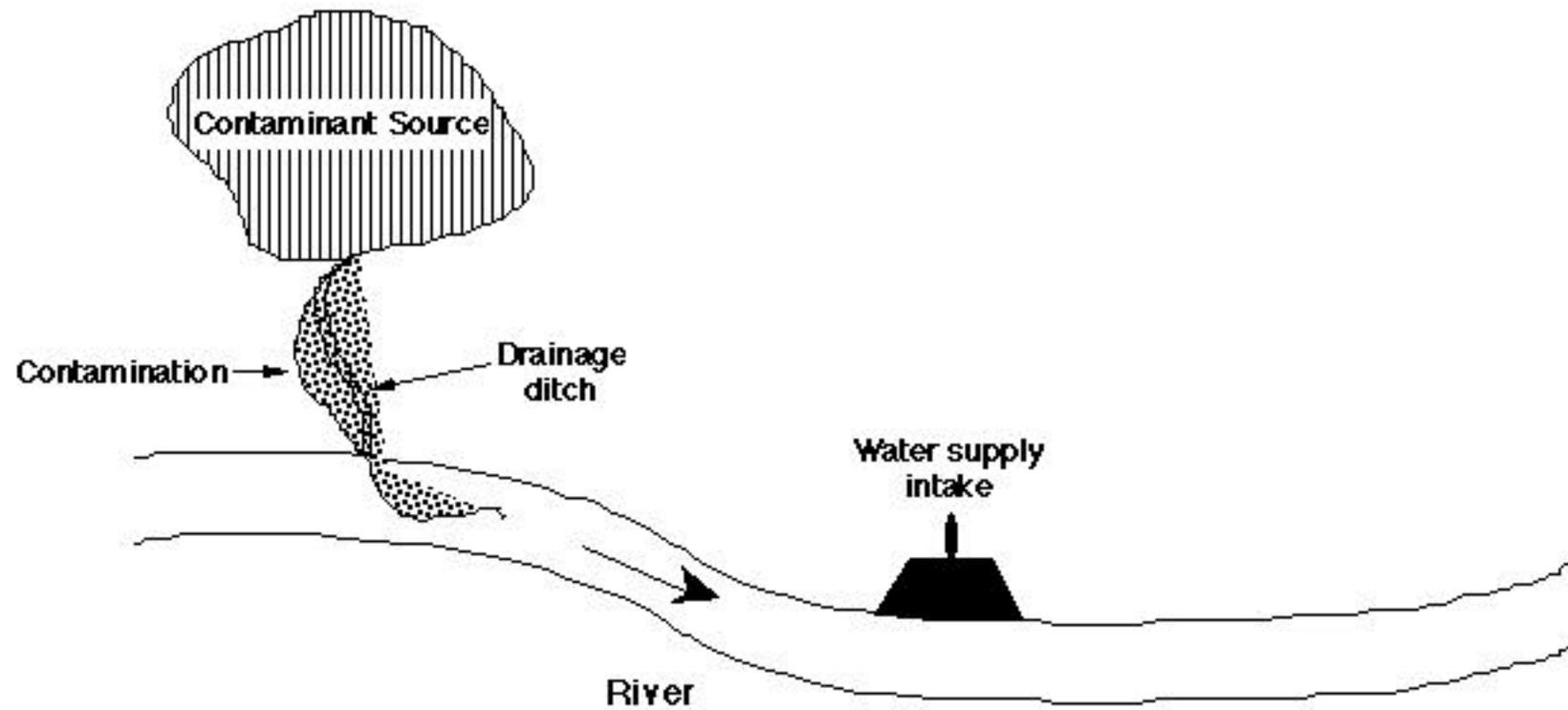
## Low Relative Risk—Groundwater



# Relative Risk Site Evaluation Scenarios

## High Relative Risk (Human)—Surface Water or Sediment

---



Significant  
Contaminant  
Levels

Evident  
Migration

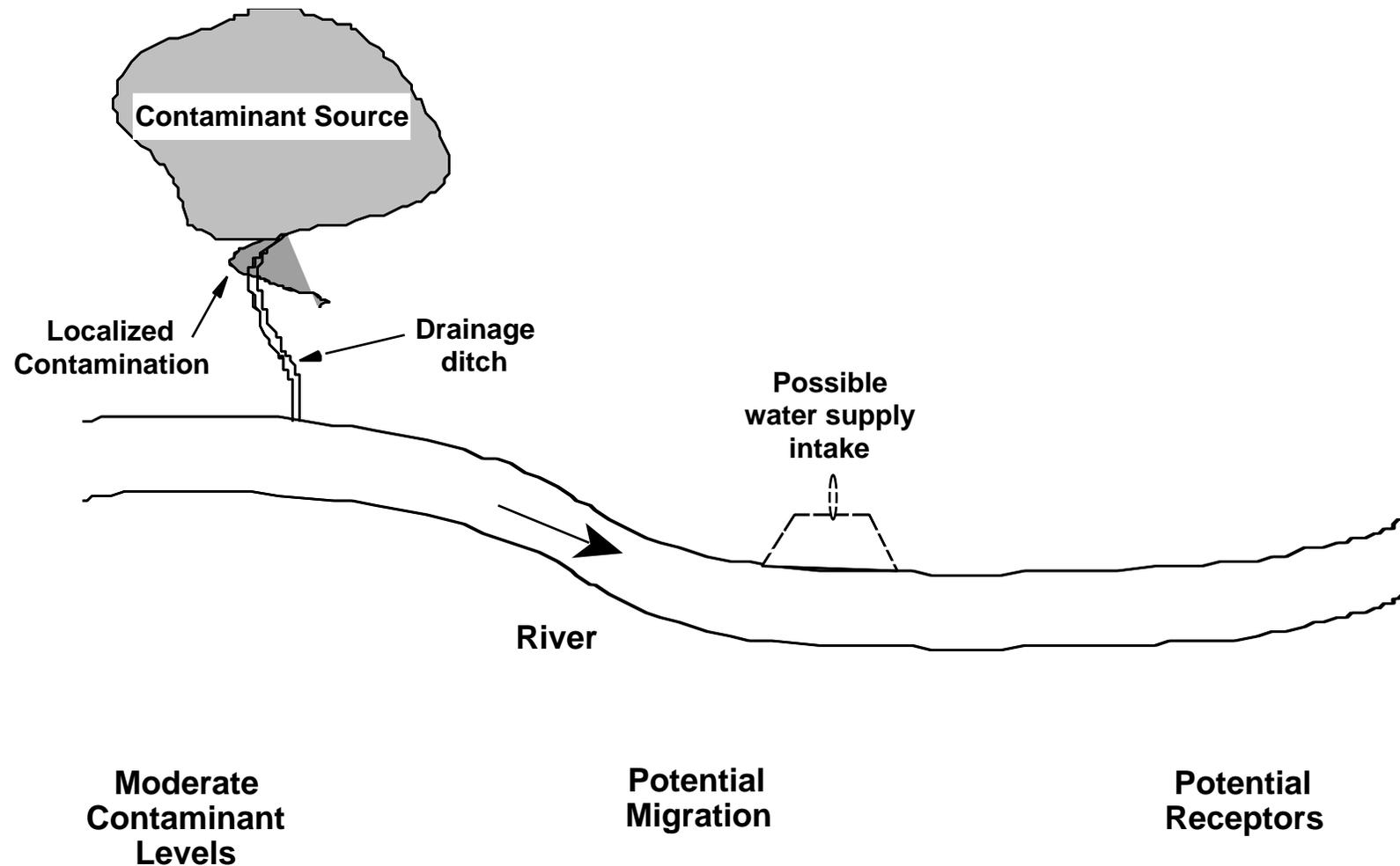
Identified  
Receptors

# Relative Risk Site Evaluation Scenarios

## Medium Relative Risk (Human)—Surface Water or Sediment

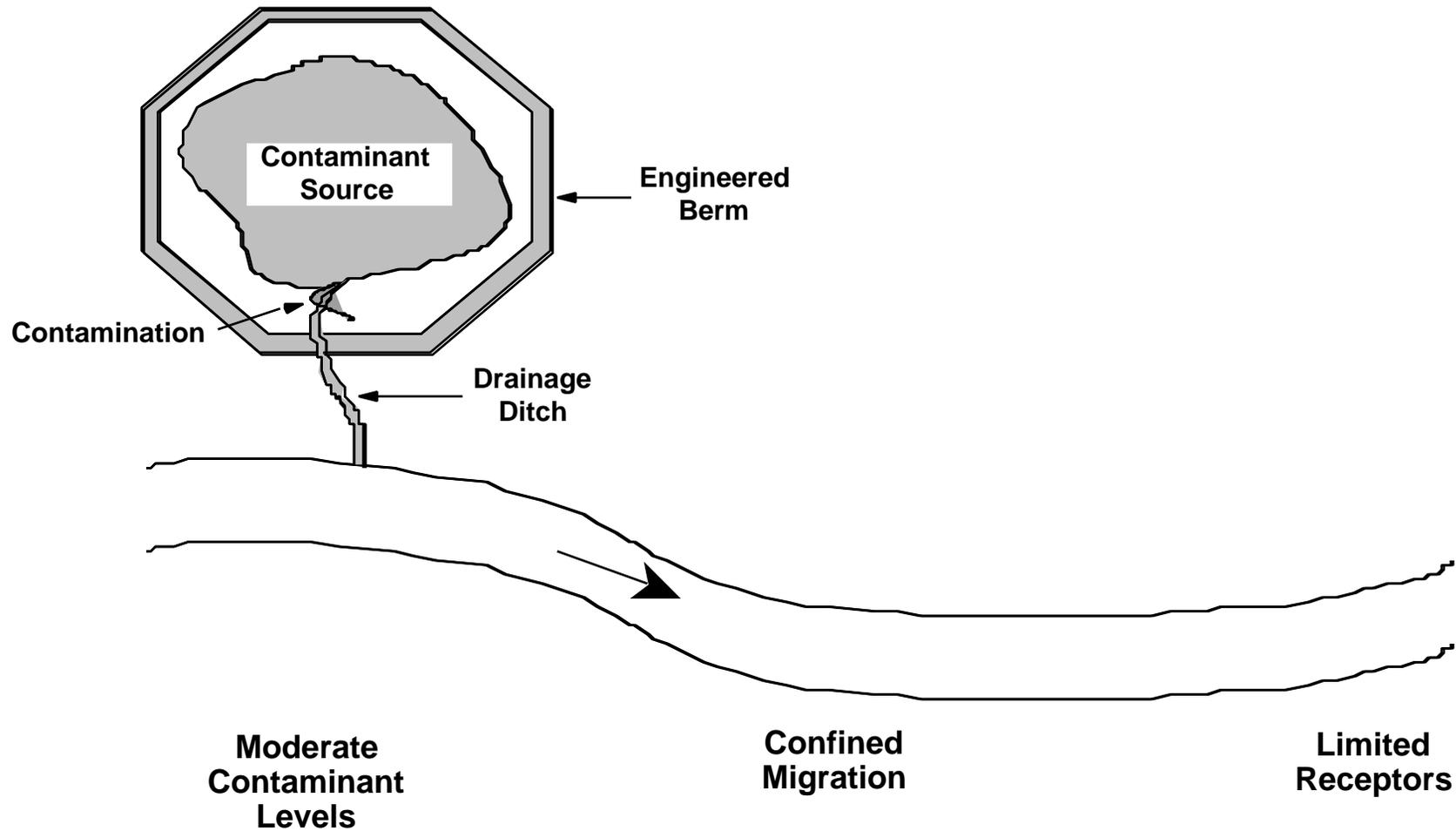
---

---



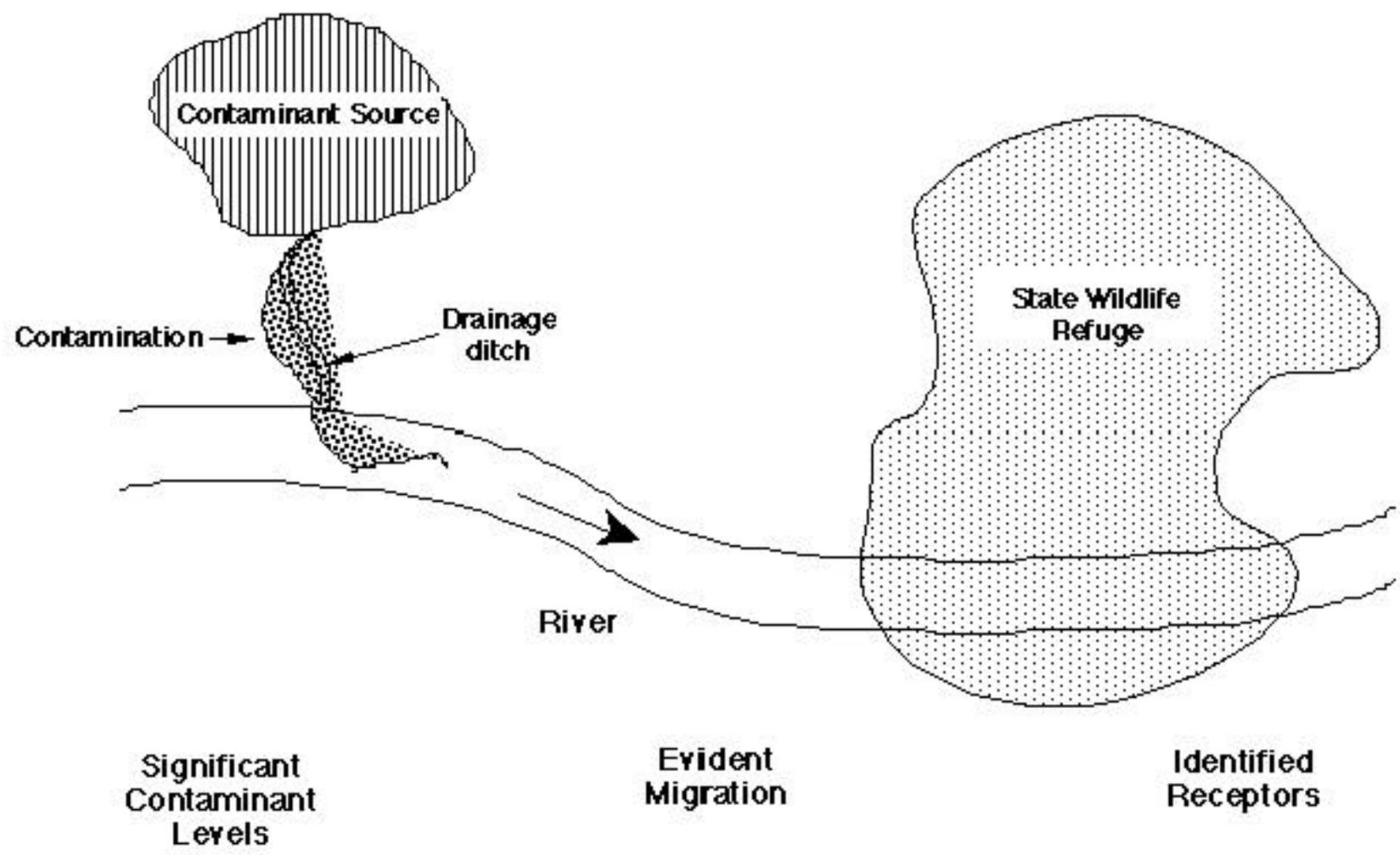
# Relative Risk Site Evaluation Scenarios

## Low Relative Risk (Human)—Surface Water or Sediment



# Relative Risk Site Evaluation Scenarios

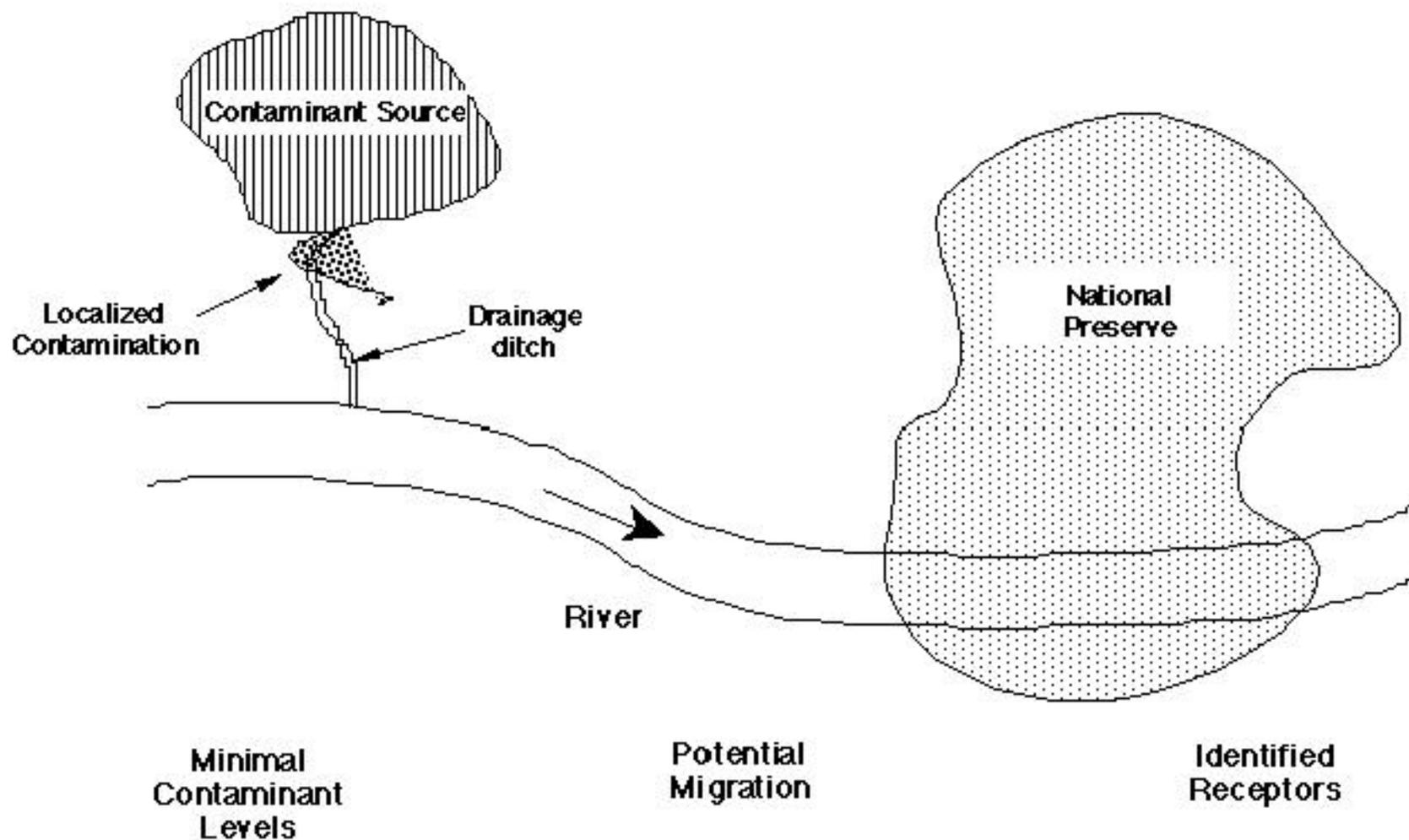
## High Relative Risk (Ecological)—Surface Water or Sediment



# Relative Risk Site Evaluation Scenarios

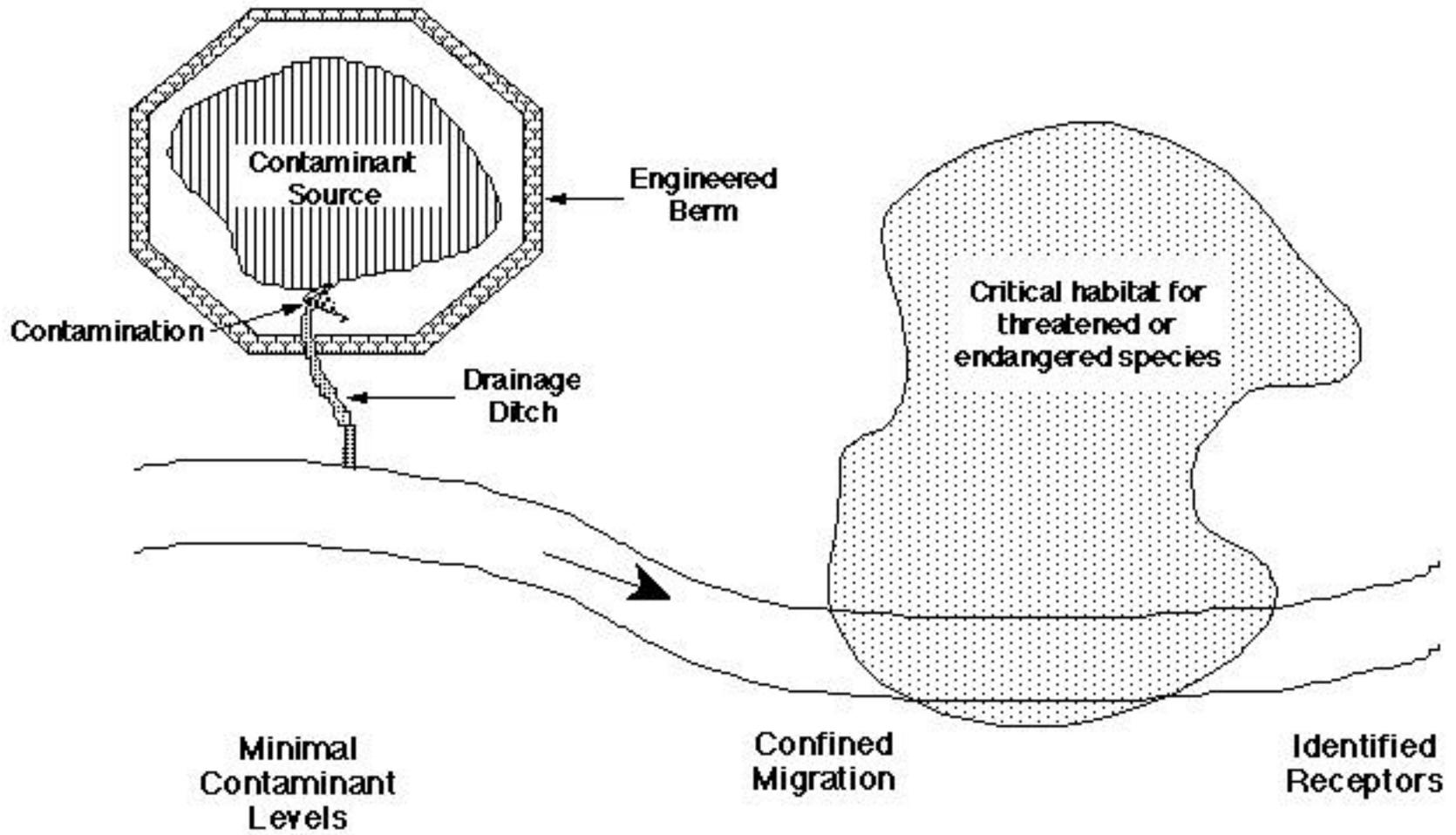
## Medium Relative Risk (Ecological)—Surface Water or Sediment

---



# Relative Risk Site Evaluation Scenarios

## Low Relative Risk (Ecological)—Surface Water or Sediment

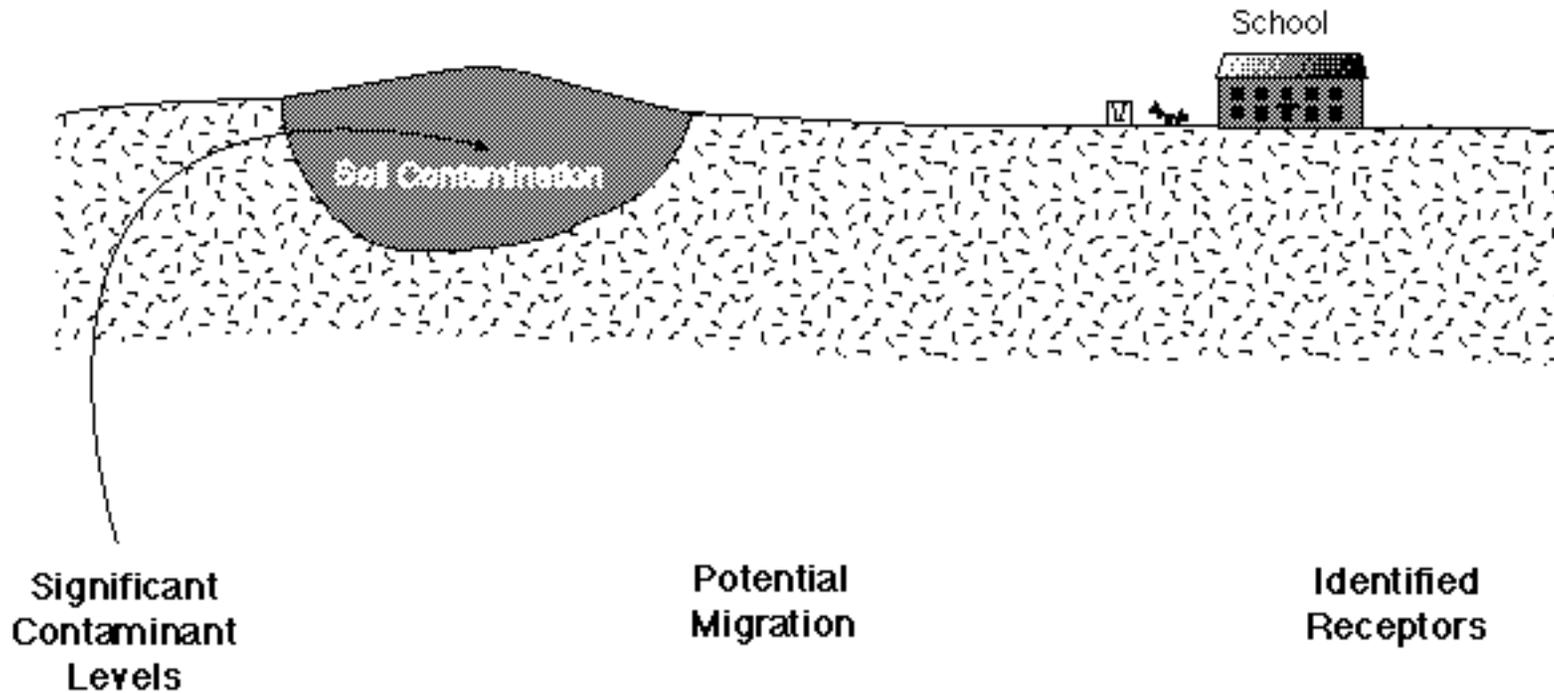


# Relative Risk Site Evaluation Scenarios

## High Relative Risk—Soil

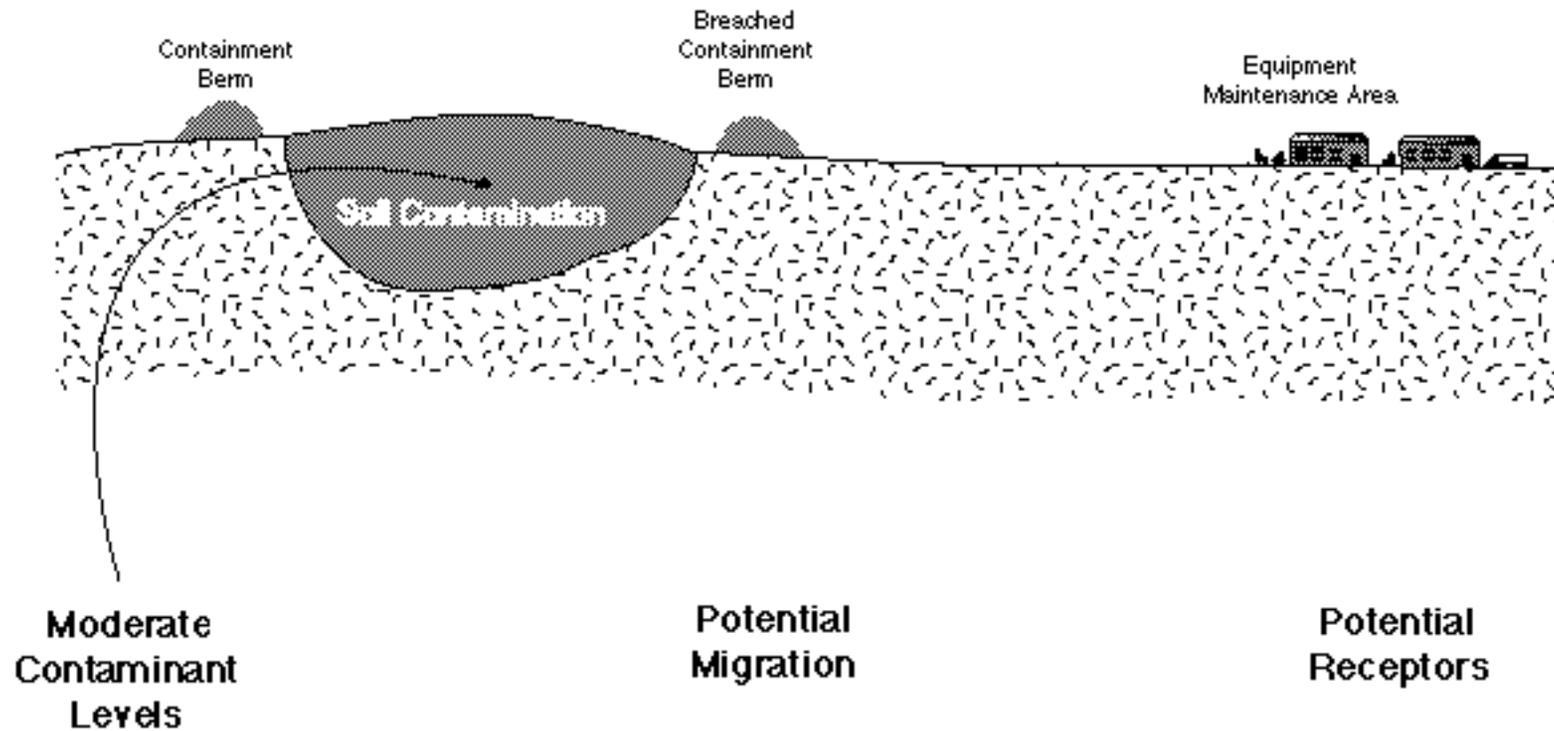
---

---



# Relative Risk Site Evaluation Scenarios

## Medium Relative Risk—Soil



# Relative Risk Site Evaluation Scenarios

## Low Relative Risk—Soil

