

# The Hazard Ranking System (HRS)

## *The SESSI Pathway – Soil Exposure Component*

*October 26, 2023*

*Tanya Amme*



*The soil exposure component evaluates people and sensitive environments in contact with hazardous substances within 2 feet of the surface.*



# Soil Exposure Scoresheet



## Likelihood of Exposure

## Area of Observed Contamination (AOC)



## Waste Characteristics

## Toxicity

## Hazardous waste quantity



## Targets

### Residential Threat

Resident individuals  
Resident populations  
Workers  
Resources  
Terrestrial sensitive environments

### Nearby Threat

Nearby individuals  
Nearby populations

TABLE 5-1—SOIL EXPOSURE COMPONENT SCORESHEET

Factor categories and factors	Maximum value	Value assigned
<b>Resident Population Threat</b>		
Likelihood of Exposure:		
1. Likelihood of Exposure .....	550	
Waste Characteristics:		
2. Toxicity .....	( <sup>a</sup> )	
3. Hazardous Waste Quantity .....	( <sup>a</sup> )	
4. Waste Characteristics .....	100	
Targets:		
5. Resident Individual .....	50	
6. Resident Population:		
6a. Level I Concentrations .....	( <sup>b</sup> )	
6b. Level II Concentrations .....	( <sup>b</sup> )	
6c. Resident Population (lines 6a + 6b) .....	( <sup>b</sup> )	
7. Workers .....	15	
8. Resources .....	5	
9. Terrestrial Sensitive Environments .....	( <sup>c</sup> )	
10. Targets (lines 5 + 6c + 7 + 8 + 9) .....	( <sup>b</sup> )	
Resident Population Threat Score:		
11. Resident Population Threat (lines 1 × 4 × 10) .....	( <sup>b</sup> )	
<b>Nearby Population Threat</b>		
Likelihood of Exposure:		
12. Attractiveness/Accessibility .....	100	
13. Area of Contamination .....	100	
14. Likelihood of Exposure .....	500	
Waste Characteristics:		
15. Toxicity .....	( <sup>a</sup> )	
16. Hazardous Waste Quantity .....	( <sup>a</sup> )	
17. Waste Characteristics .....	100	
Targets:		
18. Nearby Individual .....	1	
19. Population Within 1 Mile .....	( <sup>b</sup> )	
20. Targets (lines 18 + 19) .....	( <sup>b</sup> )	
Nearby Population Threat Score:		
21. Nearby Population Threat (lines 14 × 17 × 20) .....	( <sup>b</sup> )	
Soil Exposure Component Score:		
22. Soil Exposure Component Score <sup>d</sup> (S <sub>so</sub> ), (lines [11 + 21]/82,500, subject to a maximum of 100) .....	100	

<sup>a</sup> Maximum value applies to waste characteristics category.

<sup>b</sup> Maximum value not applicable.

<sup>c</sup> No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to maximum of 60.

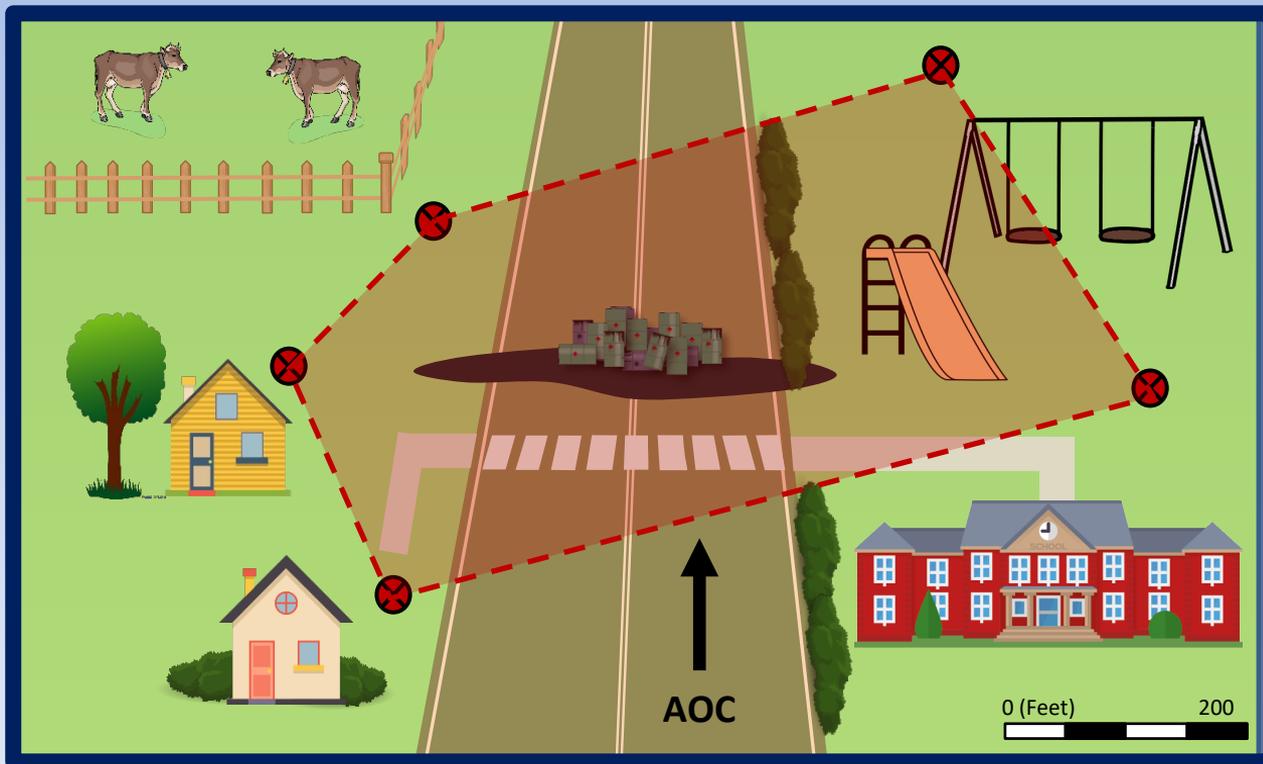
<sup>d</sup> Do not round to nearest integer.

SESSI Pathway – Soil Exposure 

**WHAT IS YOUR SITE?**

# What is Your Site?

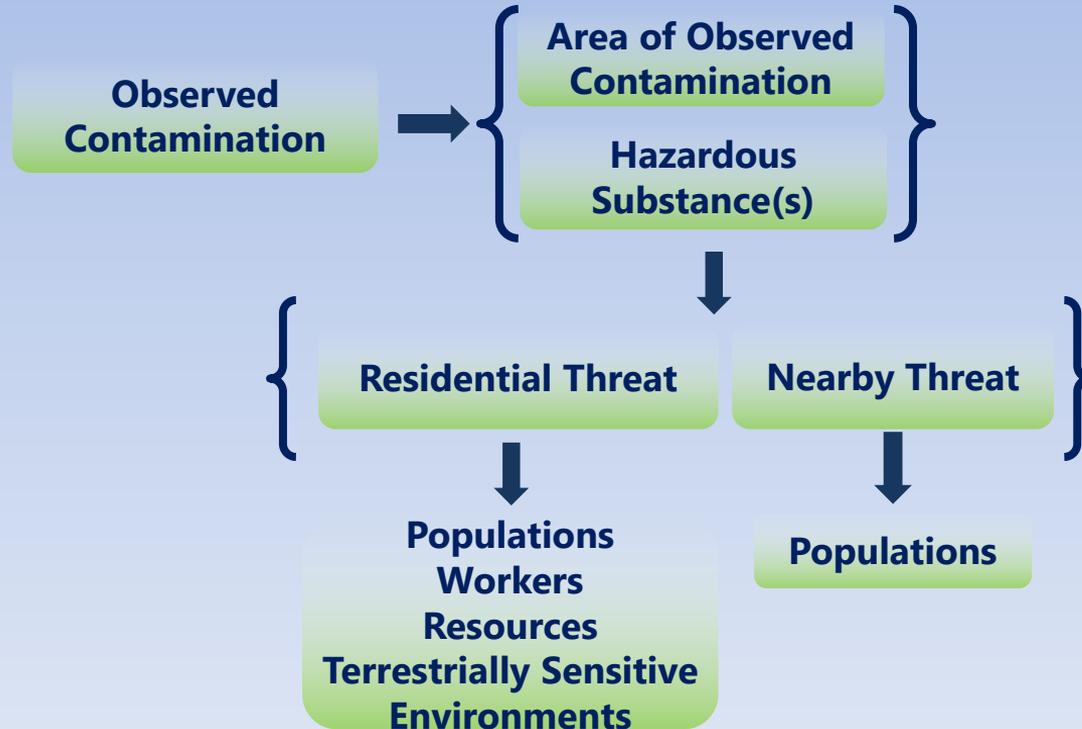
## *Soil Exposure – Conceptual Site Model*





## ELEMENTS OF THE SOIL EXPOSURE EVALUATION

# Elements of the SESSI Pathway – Soil Exposure



# Likelihood of Exposure



Likelihood of Exposure

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**Area of Observed Contamination**

# Observed Contamination

## *General Considerations*



- Consider only hazardous substances present at the surface or covered by 2 feet or less of cover material (e.g., soil)
- Can only be established by chemical analysis
- Must meet the observed release criteria in HRS Table 2-3
- Any area covered by maintained, essentially impenetrable surfaces (e.g., asphalt) are **not** eligible for inclusion in the AOC

# Observed Contamination

## *Areas of Observed Contamination*

- Areas of Observed Contamination (AOCs) can include:
  - Contaminated Soil
  - Tanks/Drums
  - Landfills
  - Piles
  - Surface Impoundments
  - Other Source Types
- Contaminated Soil AOCs – Delineate the AOC boundary based on observed contamination samples
- Other AOCs – Any sample taken from the source indicates observed contamination, consider entire source to be an AOC





# Observed Contamination

## *Sample Similarity*

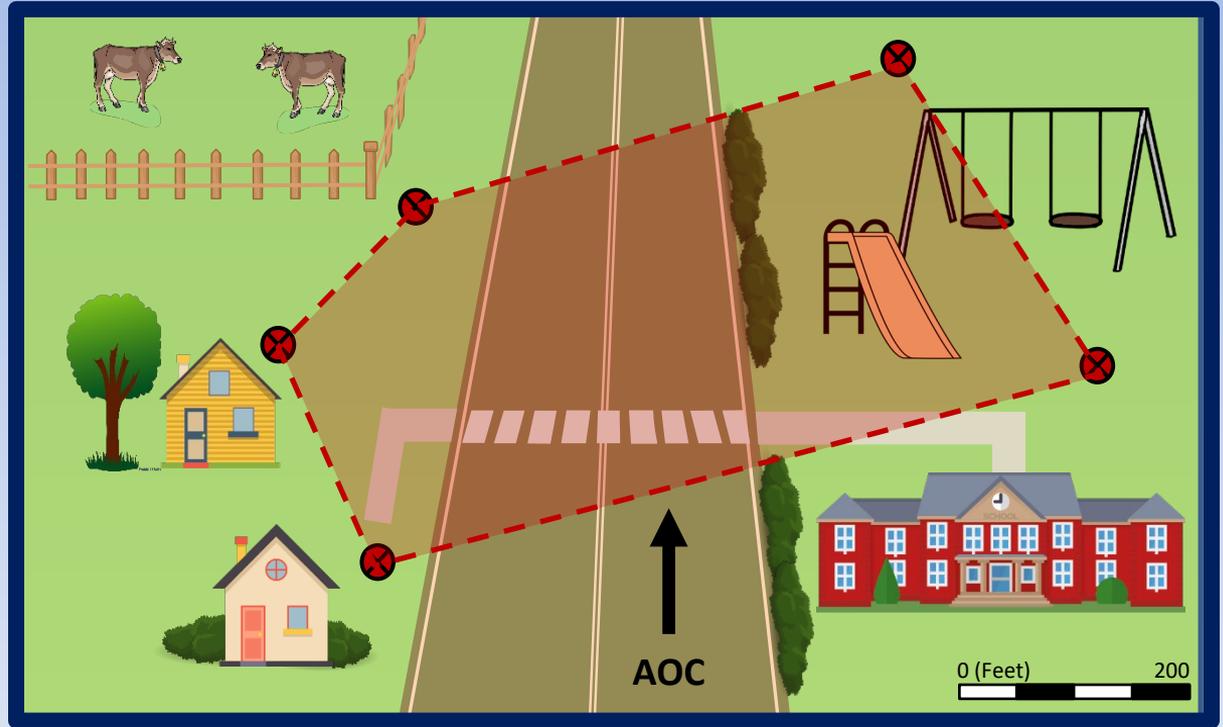
- Use the same sample collection procedures and analytical methods for both background and AOC samples
- Consider mode of deposition
  - If by fill, then background should be outside areas where fill was likely placed
  - If by runoff, look at topography and choose an upgradient location
  - If by air, look at predominant wind direction and consider using air modeling
- If areas along road right of way must be used as sample locations for the AOC, make sure to collect comparable background samples (e.g., same right of way conditions, similar traffic)

# Quiz: Establishing Observed Contamination

You witnessed a hazardous substance being deposited on the ground. Can observed contamination be established based on this observation?

- A. Yes
- B. No

# Delineating Contaminated Soil AOCs



# Area of Observed Contamination (AOC)

## *Inference*

- Contamination is inferred between sample points unless evidence suggests otherwise
- Observed contamination generally inferred only at Level II concentrations
- Inference is determined on a case-by-case basis
- There is no set distance for how far apart samples can be
- The decision to infer must be reasonable and defensible



# Waste Characteristics



# Targets



## Targets

<b>Residential Threat</b>	<b>Nearby Threat</b>
<b>Resident individuals</b> <b>Resident populations</b> <b>Workers</b> <b>Resources</b> <b>Terrestrial sensitive environments</b>	<b>Nearby individuals</b> <b>Nearby populations</b>

# Resident Population Threat

Evaluated based on whether an AOC is present:

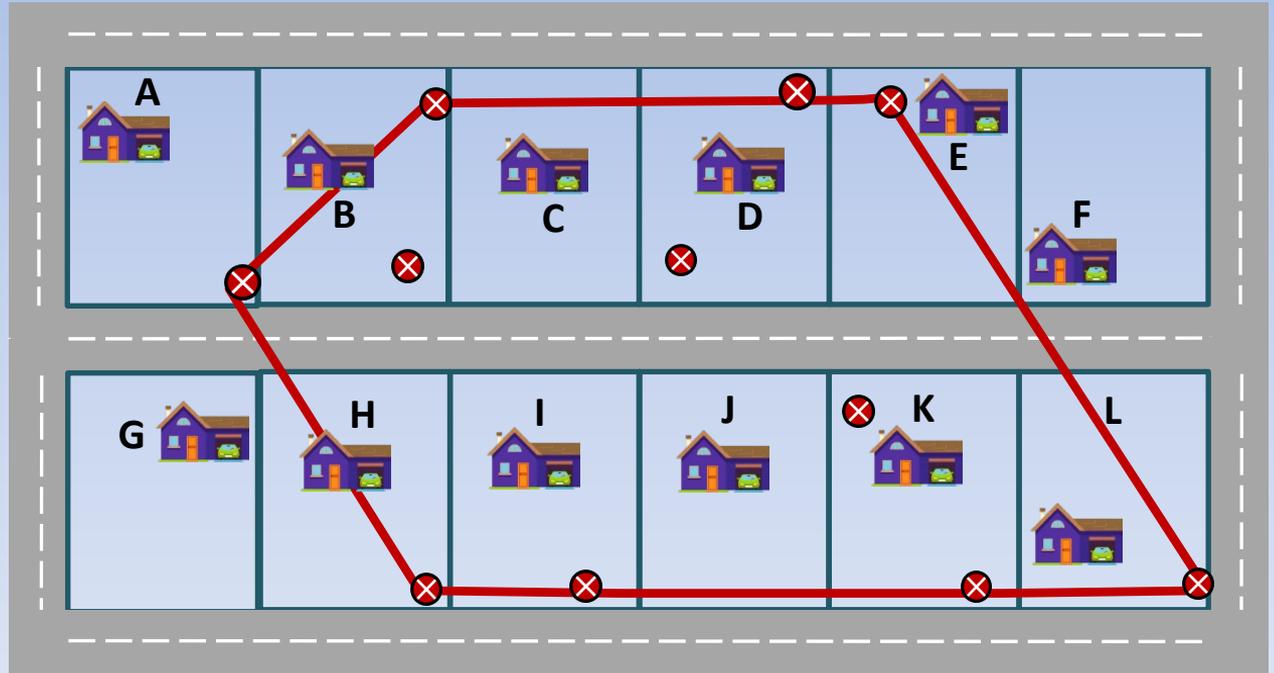
- On the property of a residence, school, or day care center and within 200 feet of the respective residence, school, or day care center, **or**
- Within a workplace property boundary and within 200 feet of a workplace area, **and**
- People are living, working or going to school on the properties
- Within the boundaries of a resource or terrestrial sensitive environment



# Quiz: Identifying Resident Individuals

Are residents of Home A eligible for consideration?

- A. Yes
- B. No



Observed Contamination Sample Location

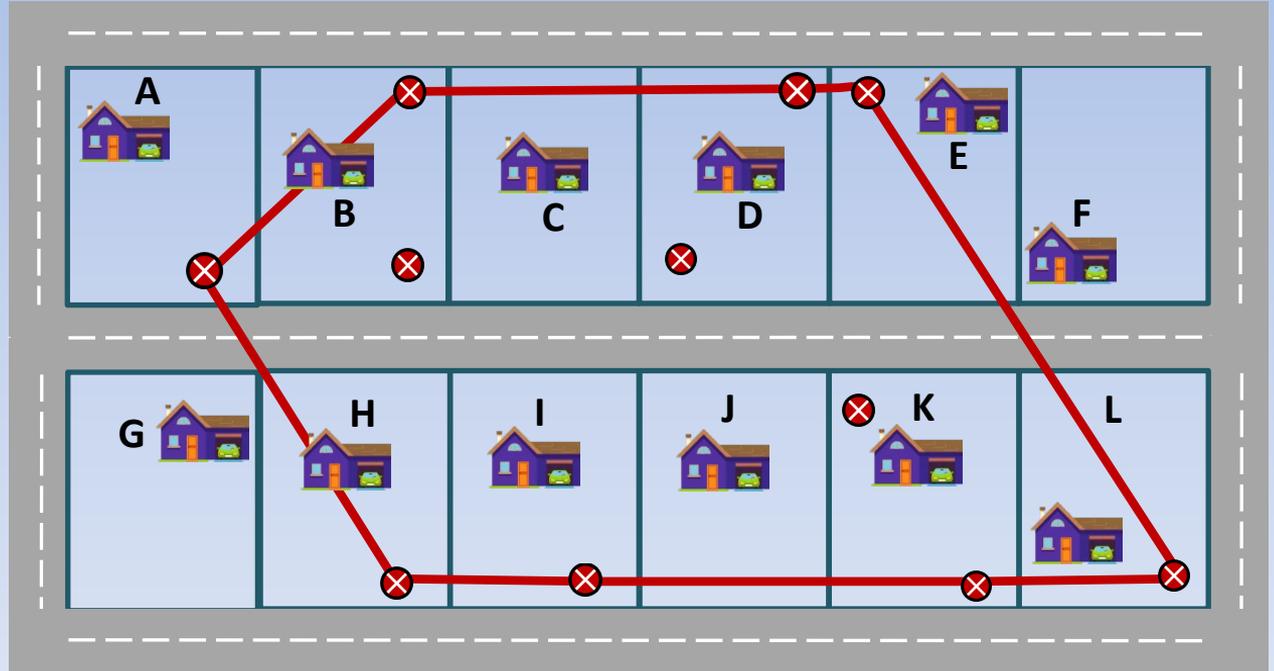
Area of Observed Contamination (AOC) Boundary

0 — 200 ft.

# Quiz: Identifying Resident Individuals

Are residents of Home F eligible for consideration?

- A. Yes
- B. No



Observed Contamination Sample Location

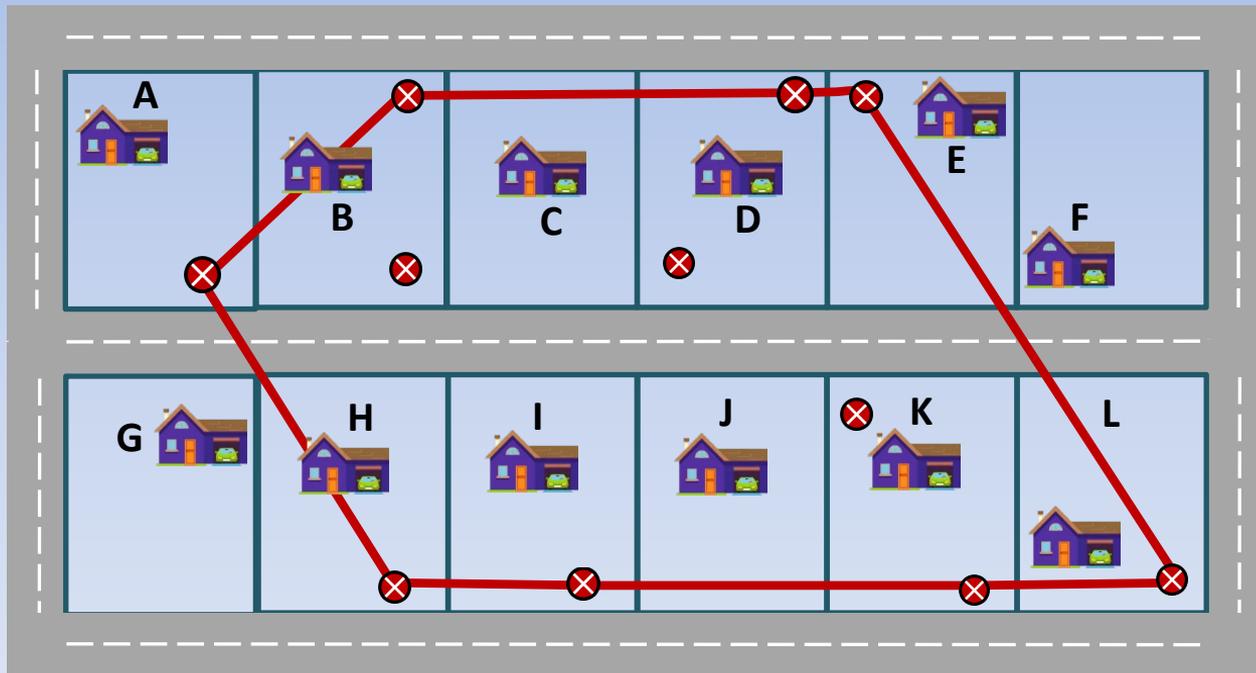
— Area of Observed Contamination (AOC) Boundary

0 — 200 ft.

# Quiz: Identifying Resident Individuals

Are residents of Home J eligible for consideration?

- A. Yes
- B. No



Observed Contamination Sample Location



Area of Observed Contamination (AOC) Boundary



0 — 200 ft.



## Nearby Population Threat

Evaluated based on:

- Total area and attractiveness/ accessibility of eligible AOCs
- AOC areas that are physically accessible to the public and have evidence of public recreation use
- Public or private lands but exclude residential properties
- Individuals who live or attend school within a 1-mile travel distance of an eligible AOC

SESSI Pathway – Soil Exposure

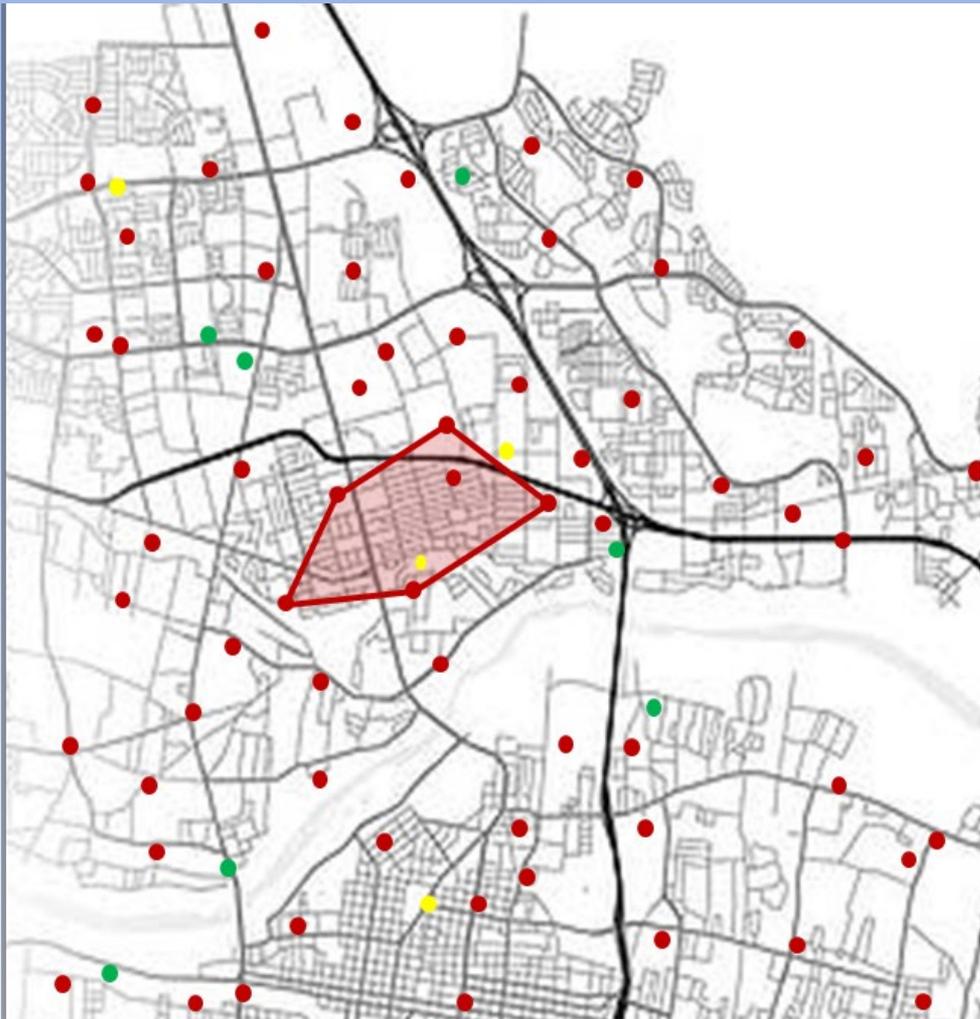


# **SPECIAL CASE: URBAN LEAD SITES**

# Urban Lead Sites

Scoring Difficulties can include:

- Differentiating between ubiquitous or anthropogenic sources of lead and lead attributable to your site
- Determining AOC/background levels for your site
- Identifying where your site starts and stops
- Ultimately, figuring out what your site is

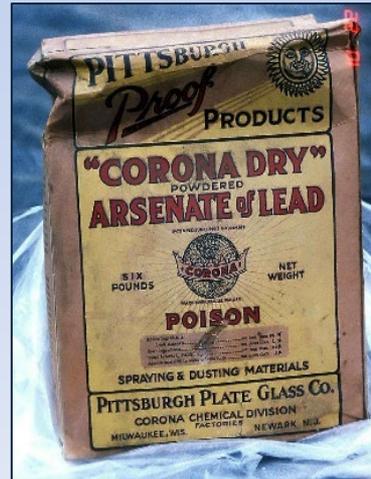
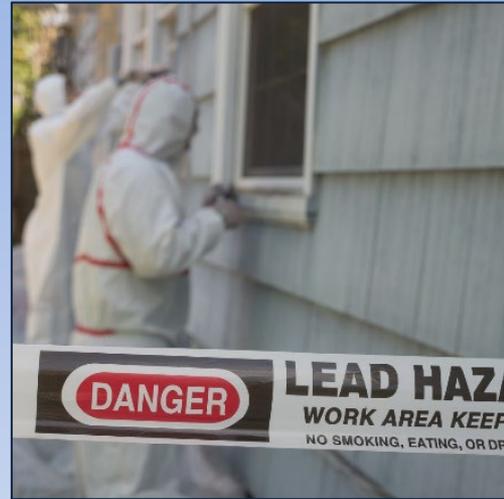


# Urban Lead Sites

Understand where lead contamination may come from:

- Lead may be ubiquitous in urban areas, especially older urban areas.
- Common anthropogenic sources include:
  - Leaded gasoline emissions
  - Lead-based paint
  - Lead-arsenate pesticides
  - Roofing materials

*Note:* elevated lead levels in urban soils are not necessarily an HRS source or site





## Urban Lead Sites

- Common industrial/historical sources that may be HRS-eligible include:
  - Battery recycling and other secondary smelting
  - Waste incineration
  - Use of lead-contaminated foundry sands or mine tailings as fill material
- Lead does not degrade; therefore, it can accumulate in soils from different sources over time

# Urban Lead Sites



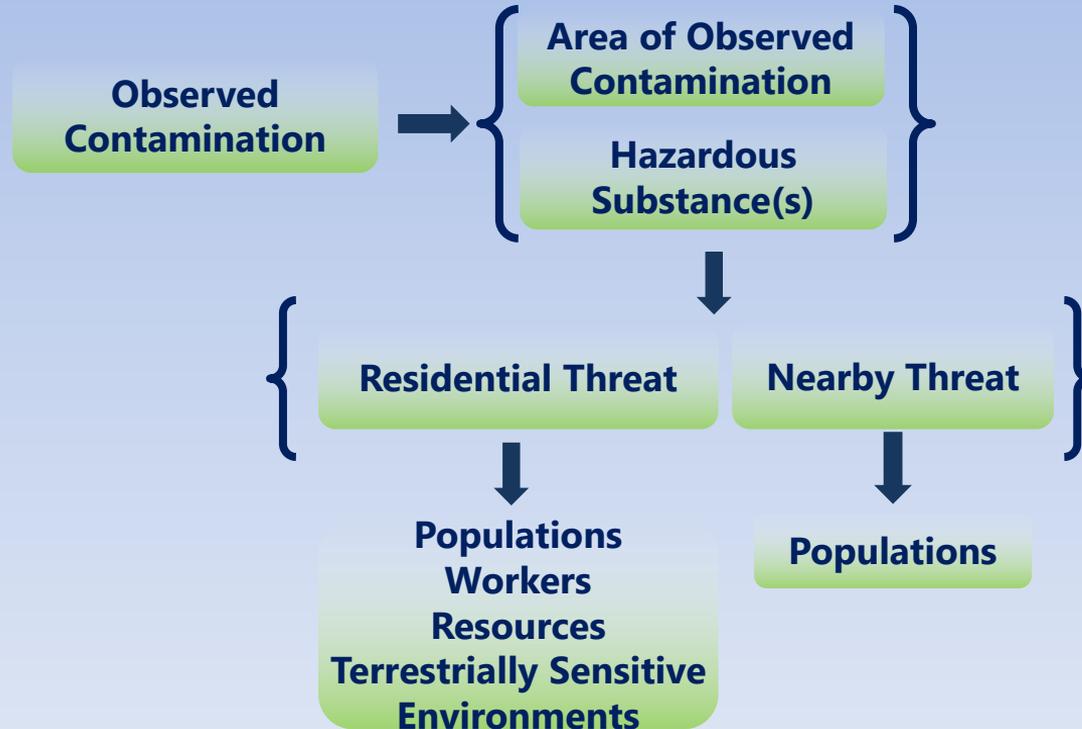
Helpful starting information might include:

- How was your site discovered?
- Is soil contamination suspected or has it been confirmed by sampling?
- Are there known possible sources (smelters, foundries, kilns)?
- What are/were the major industries in the area?
- Are/were there known smokestacks in the area?
- Are/were there other lead facilities in the area?

SESSI Pathway – Soil Exposure 

# FITTING THE PIECES TOGETHER FOR THE HRS EVALUATION

# Elements of the SESSI Pathway – Soil Exposure



# Elements of the SESSI Pathway – Soil Exposure

*Mapped to Factor Categories*



# Soil Exposure Elements within the HRS Structure

- When the contamination in/on the soil **has or may impacted**, residents, students, or worker
- When you have **enough contamination** that is also **toxic enough** to impact populations
- **People** are **coming in direct contact** with contamination



**Likelihood of Exposure**

**Area of Observed Contamination (AOC)**



**Waste Characteristics**

**Toxicity**

**Hazardous waste quantity**



**Targets**

**Residential Threat**

**Nearby Threat**

Resident individuals  
Resident populations  
Workers  
Resources  
Terrestrial sensitive environments

Nearby individuals  
Nearby populations

# Key Points for Information Gathering



## Likelihood of Exposure

- Sampling Data to establish observed contamination

# Key Points for Information Gathering



## Waste Characteristics

- Sampling Data to identify hazardous substances meeting observed contamination criteria
- Dimensions/capacities of AOCs
- Superfund Chemical Data Matrix (SCDM)

# Key Points for Information Gathering

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## Targets

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- Sampling Data to establish observed contamination
  - Concentrations to determine level of contamination weighting
- Location of samples
  - Property boundaries
- Populations present at structures within the AOC
- Workers present at structures within the AOC
- Presence of sensitive environments within the AOC
- Presence of resources within the AOC



Q & A