The Hazard Ranking System (HRS)

The SESSI Pathway – Subsurface Intrusion (SsI) Component

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EPA

The subsurface intrusion component evaluates the migration of hazardous substances from the subsurface environment—or more specifically, the unsaturated zone or shallow, unconfined groundwater—into overlying structures

Subsurface Intrusion Component Scoresheet

Likelihood of Exposure

Observed exposure
Potential for exposure

Waste Characteristics

Toxicity
Degradation
Hazardous waste quantity

Targets

Residents
Students
Day care attendees
Workers
Resources

TABLE 5–11—SUBSURFACE INTRUSION COMPONENT SCORESHEET

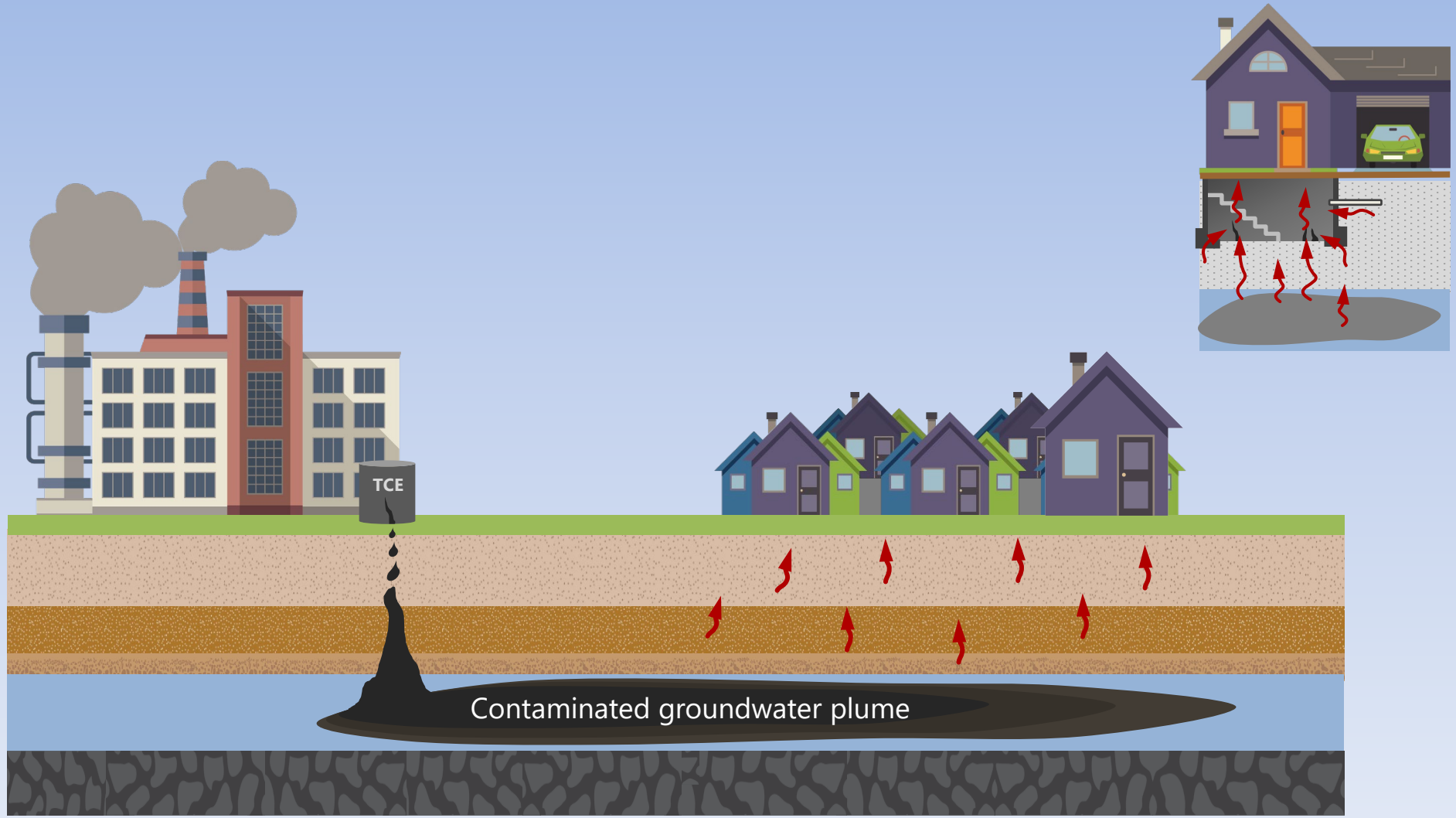
Factor categories and factors	Maximum value	Value assigned
Subsurface Intrusion Component		
Likelihood of Exposure:		
1. Observed Exposure	550	
2. Potential for Exposure:		
2a. Structure Containment	10	
2b. Depth to contamination	10	
2c. Vertical Migration	15	
2d. Vapor Migration Potential	25	
3. Potential for Exposure (lines 2a * (2b + 2c + 2d), subject to a maximum of 500)	500	
4. Likelihood of Exposure (higher of lines 1 or 3)	550	
Waste Characteristics:		
5. Toxicity/Degradation	(a)	
6. Hazardous Waste Quantity	(a)	
7. Waste Characteristics (subject to a maximum of 100)	100	
Targets:		
8. Exposed Individual	50	
9. Population:.		
9a. Level I Concentrations	(b)	
9b. Level II Concentrations	(b)	
9c. Population within an Area of Subsurface Contamination	(b)	
9d. Total Population (lines 9a + 9b + 9c)	(b)	
10. Resources	5	
11. Targets (lines 8 + 9d + 10)	(b)	
Subsurface Intrusion Component Score:		
12. Subsurface Intrusion Component (lines 4 × 7 × 11)/82,500 [c] (subject to a maximum of 100)	100	
Soil Exposure and Subsurface Intrusion Pathway Score:		
13. Soil Exposure Component + Subsurface Intrusion Component (subject to a maximum of 100)	100	

[a] Maximum value applies to waste characteristics category.
[b] Maximum value not applicable.
[c] Do not round to the nearest integer.

SESSI Pathway – Subsurface Intrusion (SsI) Component

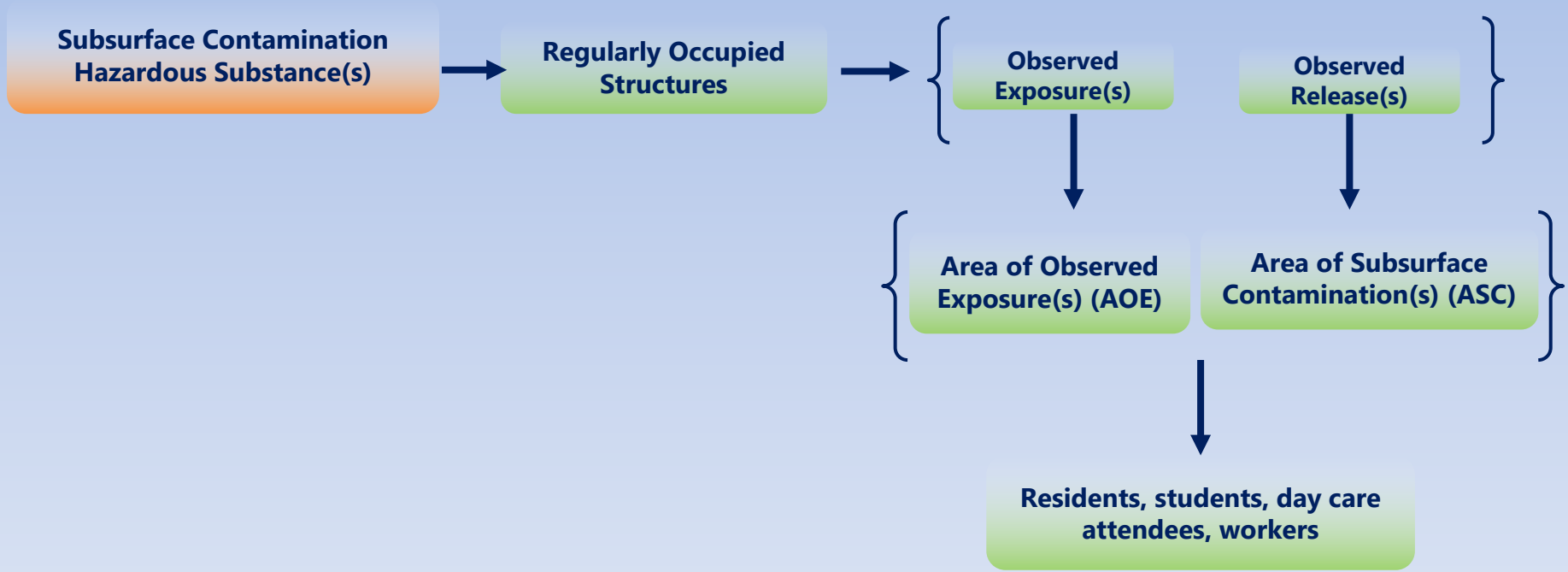
WHAT IS YOUR SITE?

SsI Component Conceptual Site Model



ELEMENTS OF THE SUBSURFACE INTRUSION COMPONENT EVALUATION

Elements of the SsI Component

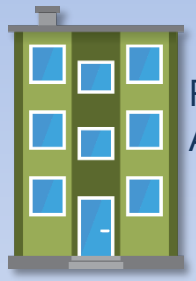



Soft Energy Gas
Tall Chicken Meditation Center
Torque Storage Enterprise
Sub-Zero Snail Manufacturing
Complicated Badger Manufacturing, Inc.
SupraGood Elementary School
Iron Dog Elder Care
Observed Exposure Indoor Air
Observed Release Groundwater
Observed Release Soil Gas
Observed Release Subslab Soil Gas

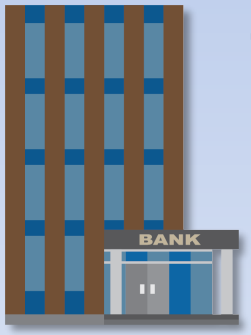
Regularly Occupied Structures

Single Family Residence

School



Residential Apartments/Condos



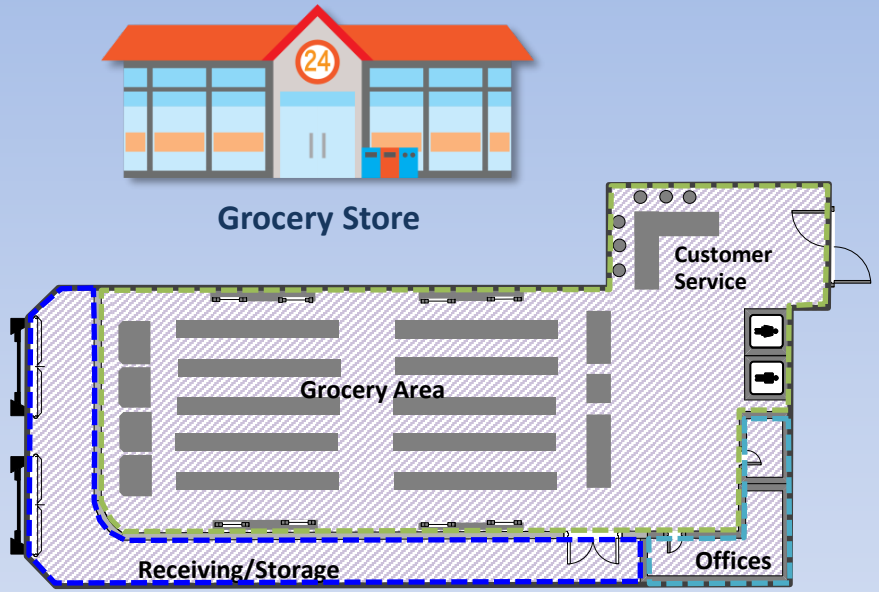
Office Building

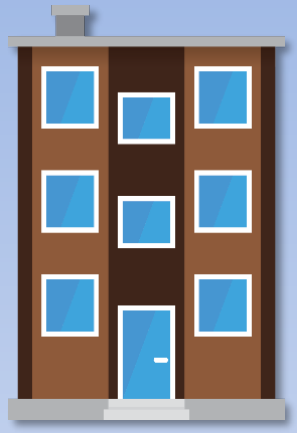
Commercial

Commercial

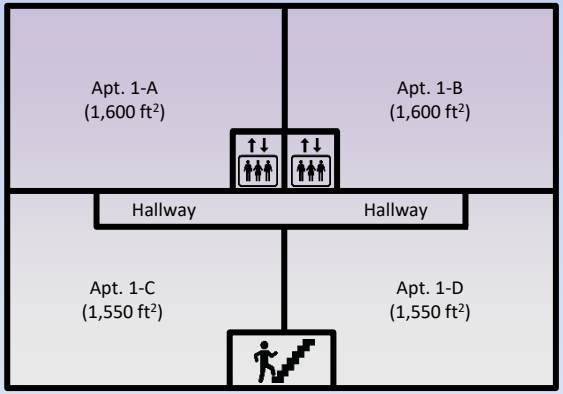
Industrial Facilities

Subunits



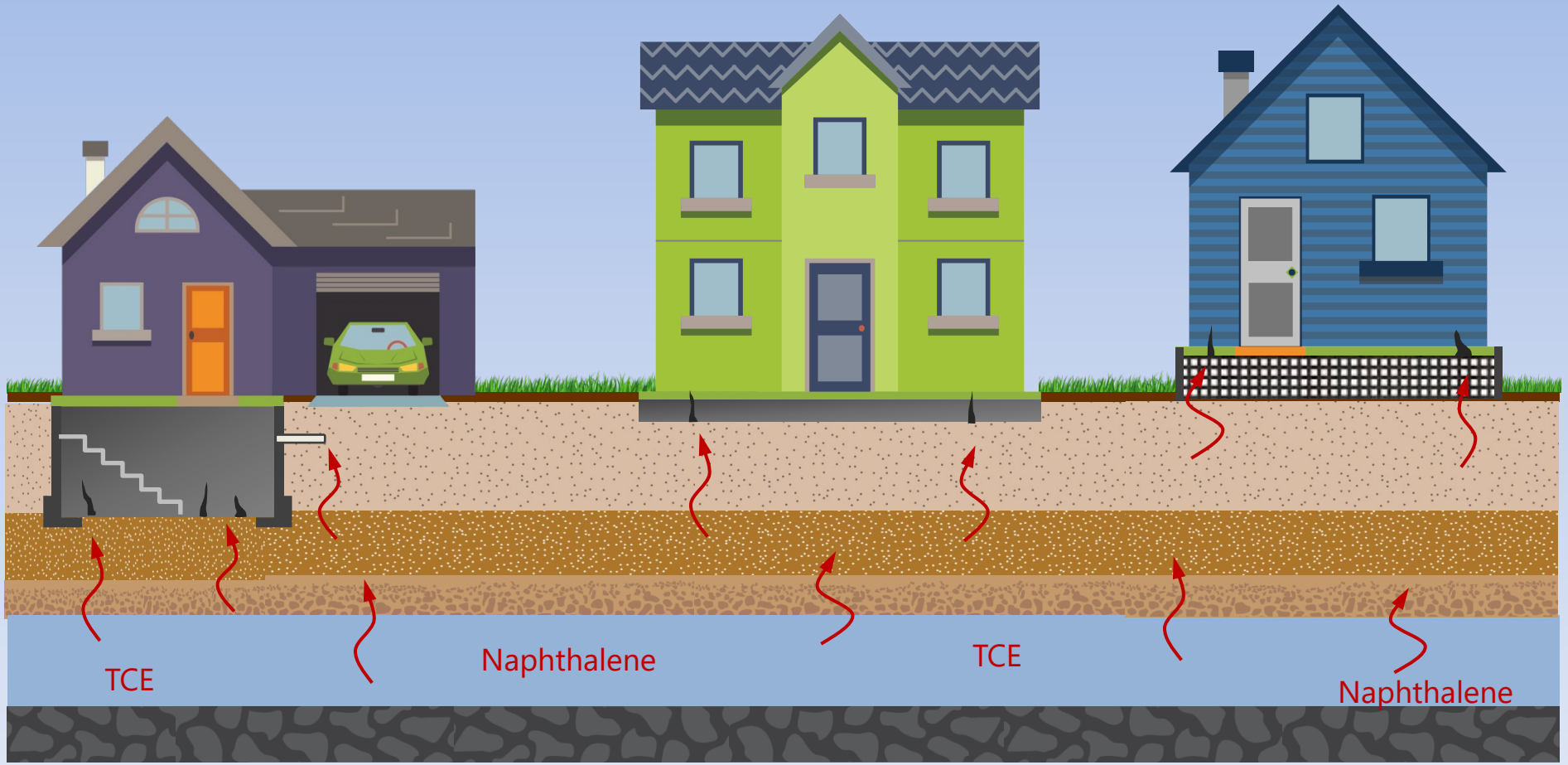


Condos



The HRS defines subunits as: "Partitioned areas within a structure with separate heating, ventilating, and air conditioning (HVAC) systems or distinctly different air exchange rates…."

Structure Containment



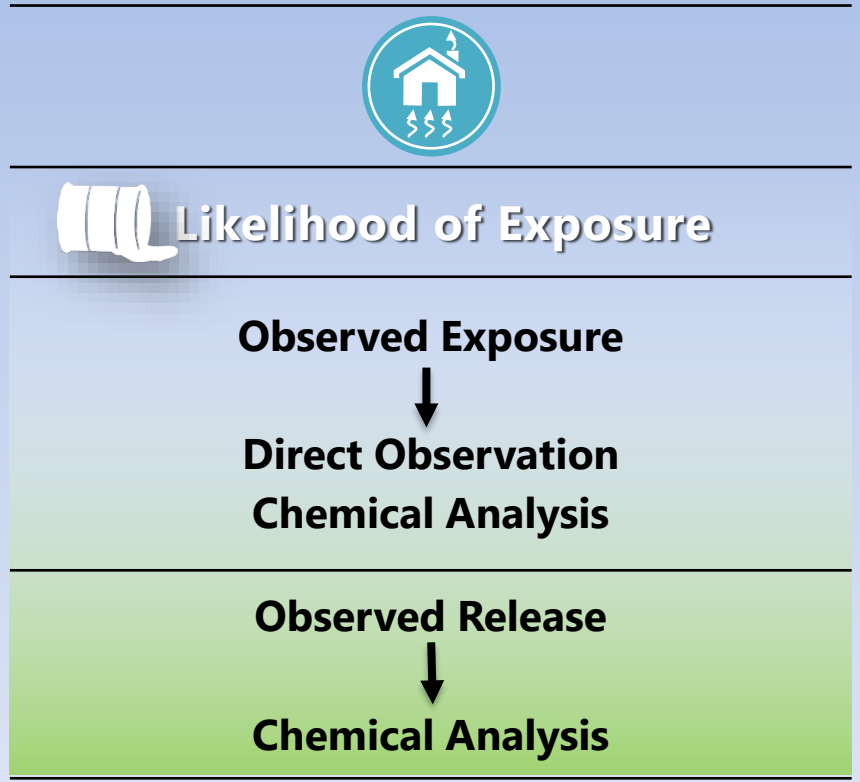
HRS Containment Factor Value Table

Subsurface Intrusion Component (HRS Table 5-12)

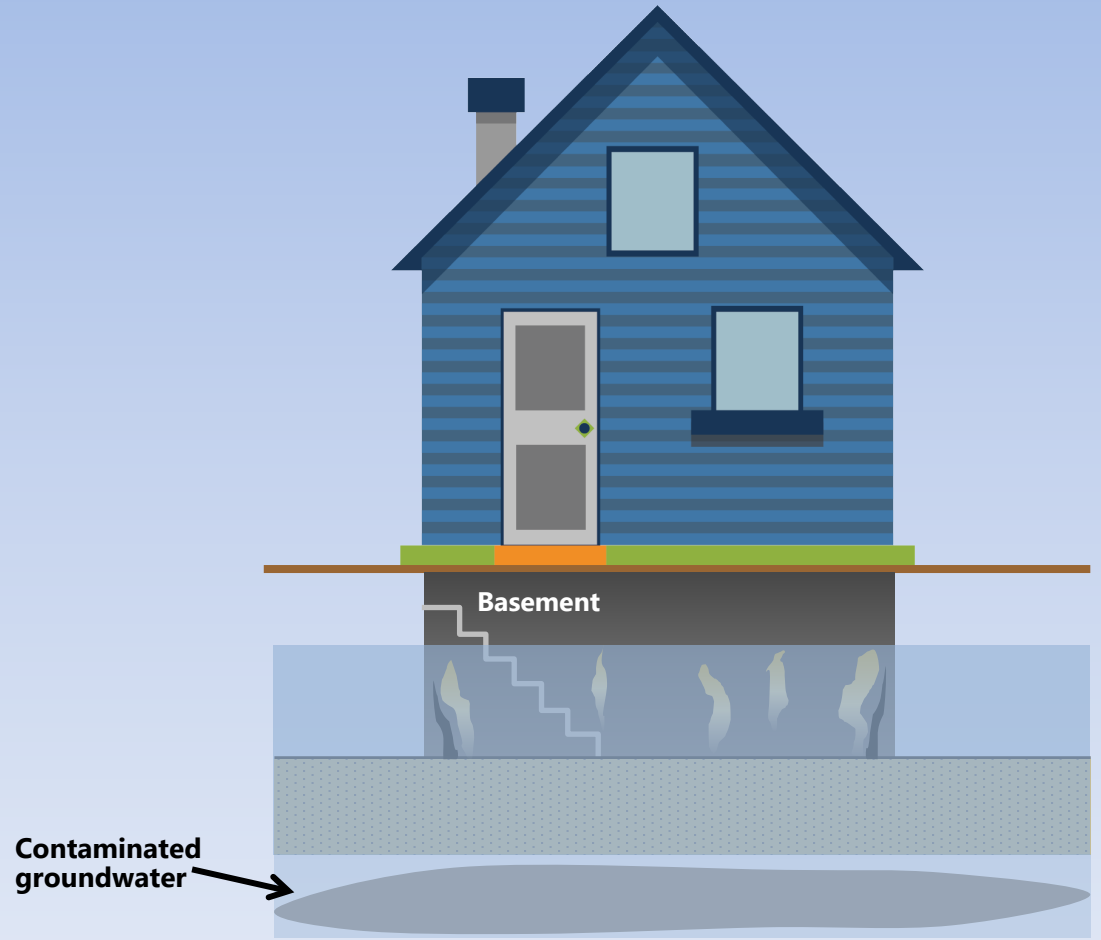
TABLE 5–12—STRUCTURE CONTAINMENT

No.	Evidence of structure containment	Assigned value
1.	Regularly occupied structure with evidence of subsurface intrusion, including documented observed exposure or sampling of bio or inert gases, such as methane and radon.	10
2.	Regularly occupied structure with open preferential subsurface intrusion pathways (*e.g.,* sumps, foundation cracks, unsealed utility lines).	10
3.	Regularly occupied structure with an engineered vapor migration barrier system that does not address all preferential subsurface intrusion pathways.	7
4.	Regularly occupied structure with an engineered passive vapor mitigation system *without* documented institutional controls (*e.g.,* deed restrictions) or evidence of regular maintenance and inspection.	6
5.	Regularly occupied structure with no visible open preferential subsurface intrusion pathways from the subsurface (*e.g.,* sumps, foundation cracks, unsealed utility lines).	4
6.	Regularly occupied structure with an engineered passive vapor mitigation system (*e.g.,* passive venting) *with* documented institutional controls (*e.g.,* deed restrictions) or evidence of regular maintenance and inspection.	3
7.	Regularly occupied structure with an engineered, active vapor mitigation system (*e.g.,* active venting) *without* documented institutional controls (*e.g.,* deed restrictions) and funding in place for on-going operation, inspection and maintenance.	2
8.	Regularly occupied structure with a permanent engineered, active vapor mitigation system (*e.g.,* active venting) *with* documented institutional controls (*e.g.,* deed restrictions) and funding in place for on-going operation, inspection and maintenance.	1
9.	Regularly occupied structure with a foundation raised greater than 6 feet above ground surface (*e.g.,* structure on stilts) or structure that has been built, and maintained, in a manner to prevent subsurface intrusion.	0

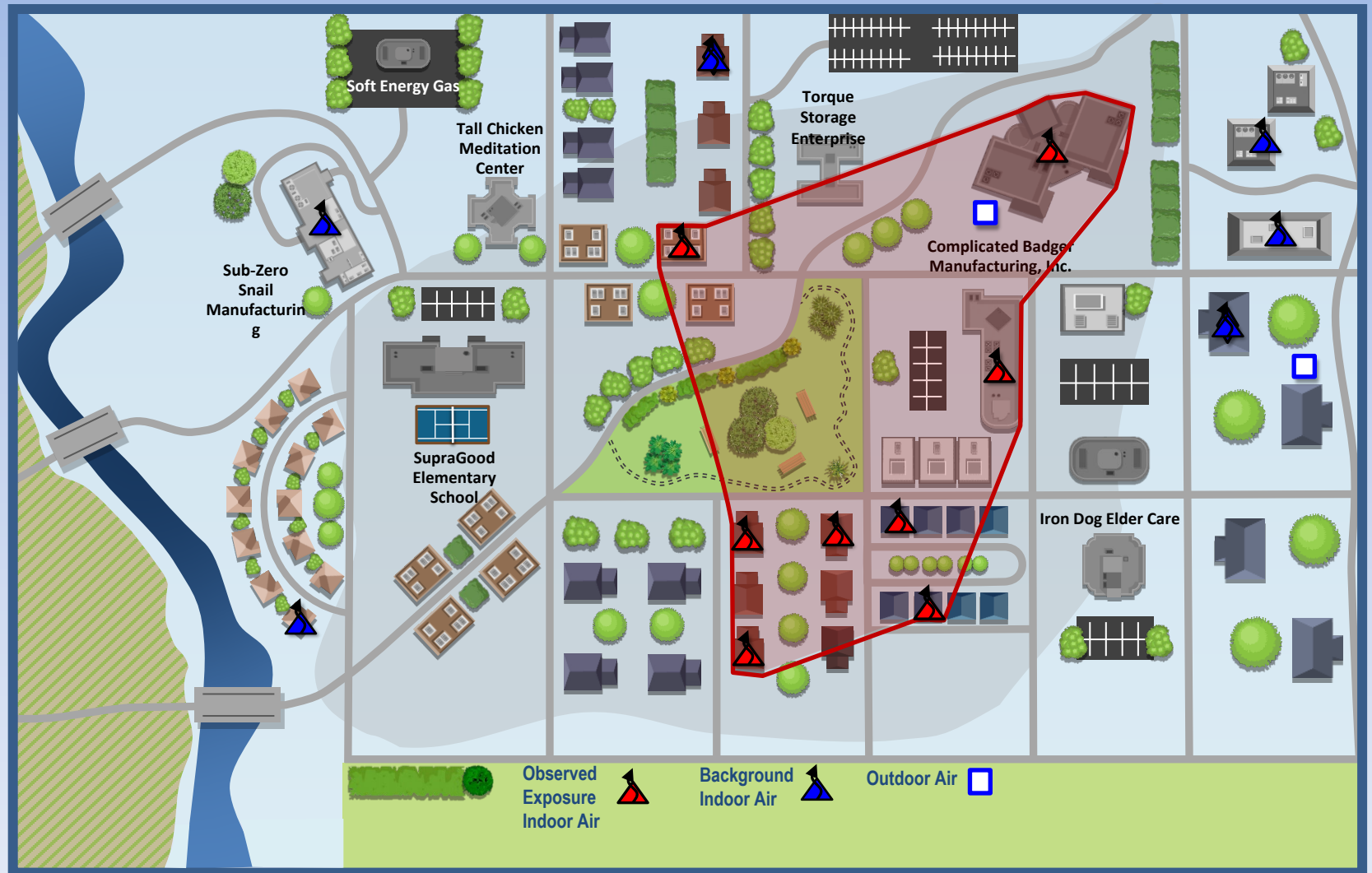
Likelihood of Exposure



Establishing Observed Exposure *by Direct Observation*



Observed Exposure by Chemical Analysis



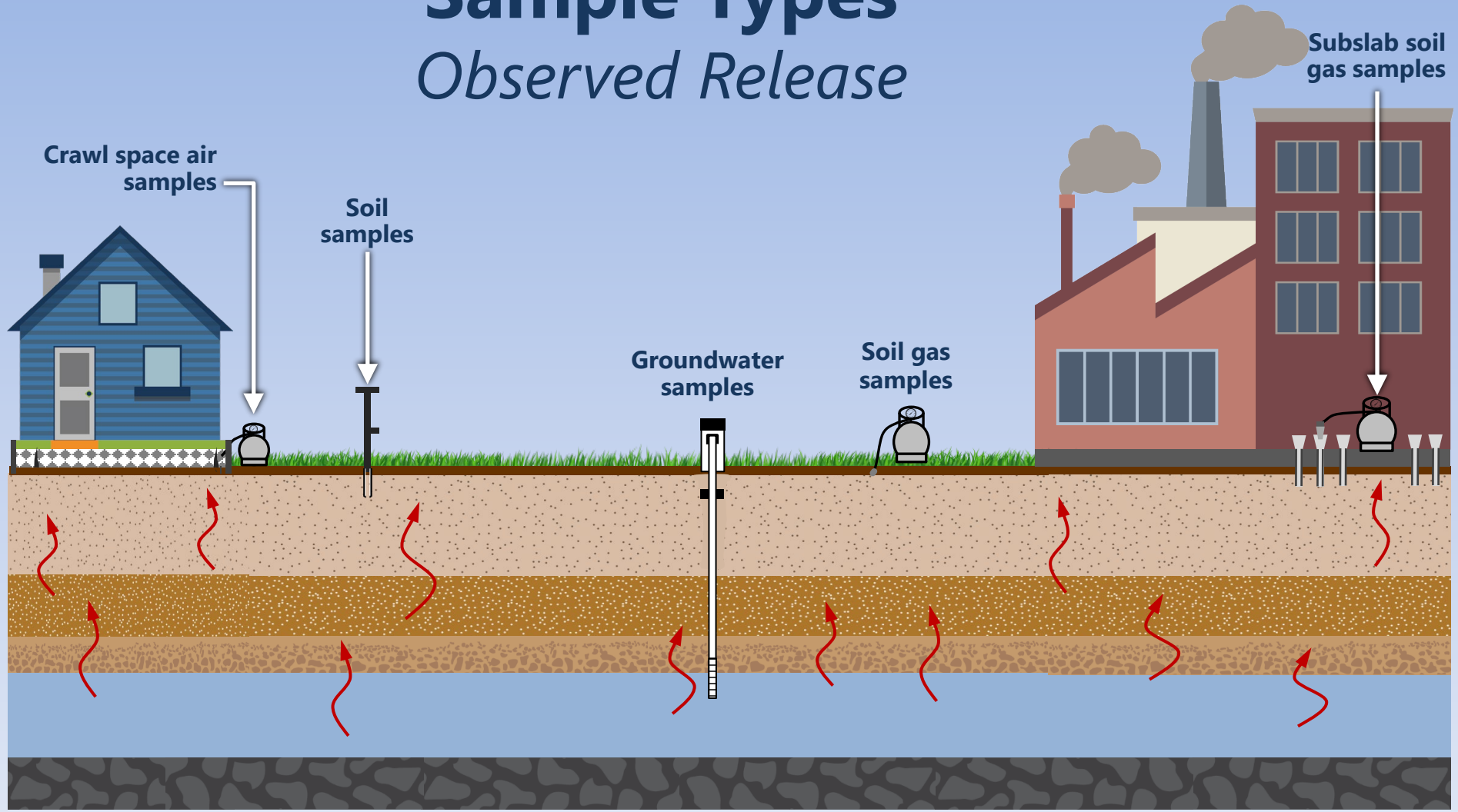
Observed Release by Chemical Analysis

Sample Types

Observed Exposure

Sample Types

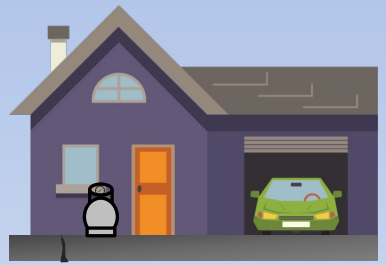
Observed Release



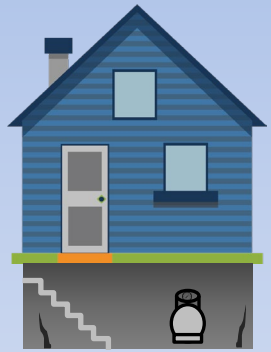
Sample Similarity

Background and Exposure/Release Samples

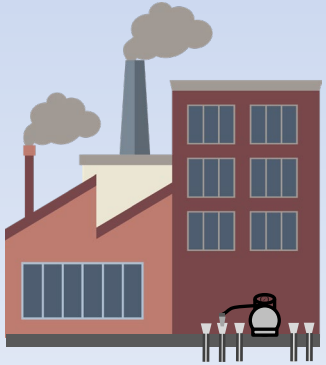
Similar Structure Construction



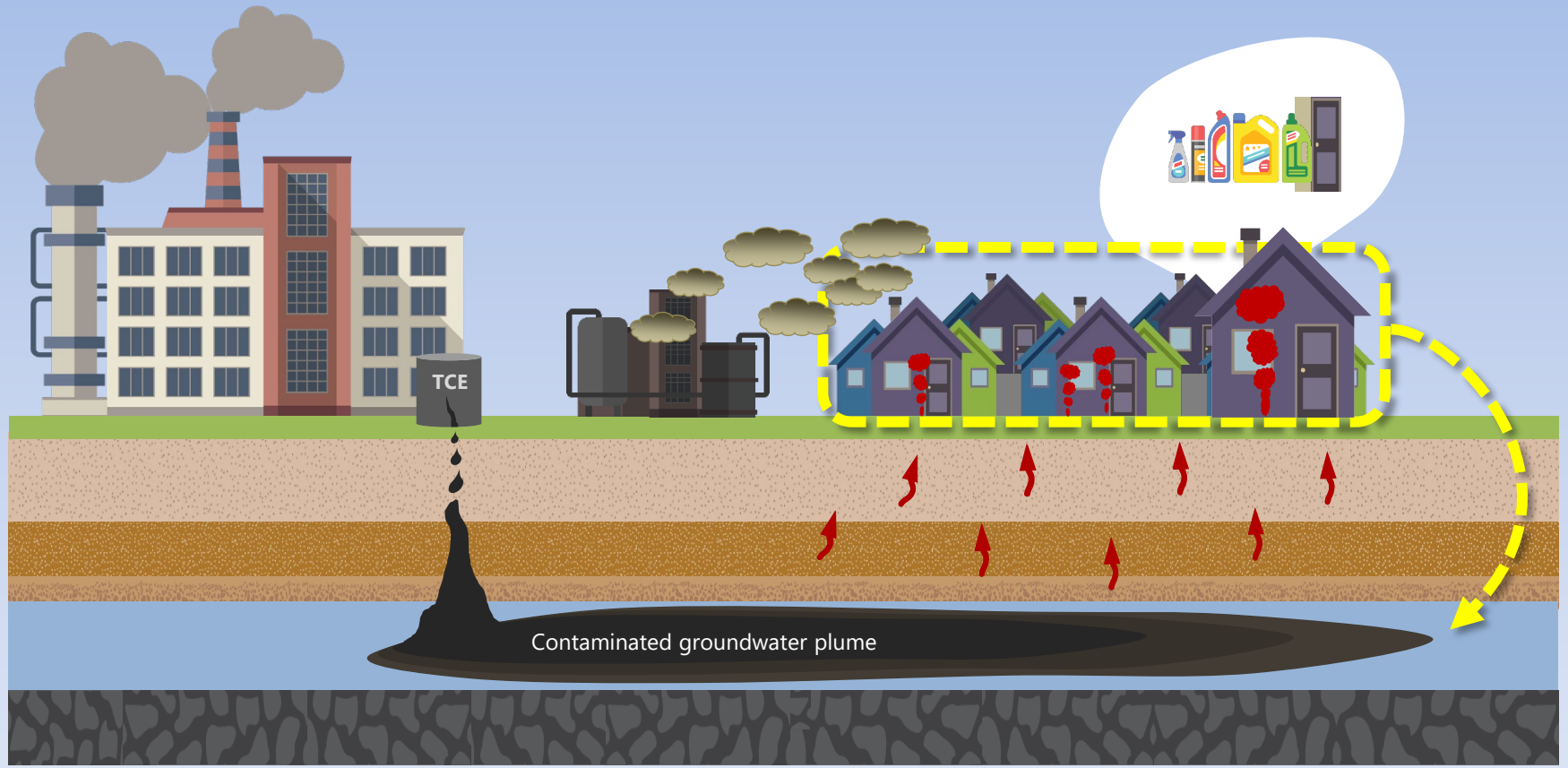
Similar Sample Locations



Similar Sample Type



Establishing Attribution



Quiz Question #1

A site cannot have both an AOE and an ASC delineated.

A. True
B. False

Waste Characteristics

Toxicity – Evaluates the toxicity of a substance to humans

Degradation - represents the potential for an eligible substance to degrade prior to intruding into a structure

Targets

Targets

Residents
Students
Day care attendees
Workers
Resources

Area of Observed Exposure

Actually Contaminated Targets

Indoor air sample meeting observed exposure criteria and subject to Level I concentrations

Indoor air sample meeting observed exposure criteria and subject to Level II concentrations

Area of Subsurface Contamination

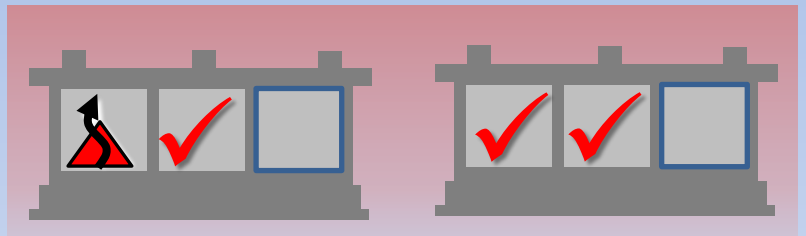
Potentially Contaminated Targets

SESSI Pathway – Subsurface Intusion (SsI) Component

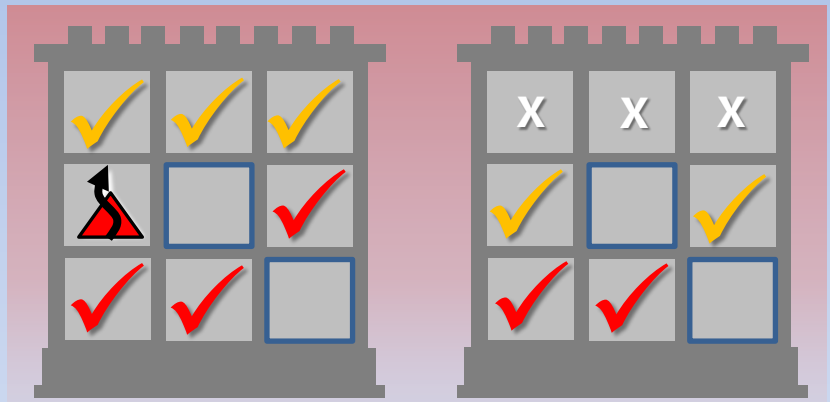
SUBUNITS

Multi-Subunit Structure Evaluation Options

AOE



Single Story
Multi-Subunit



Multi-Story
Multi-Subunit

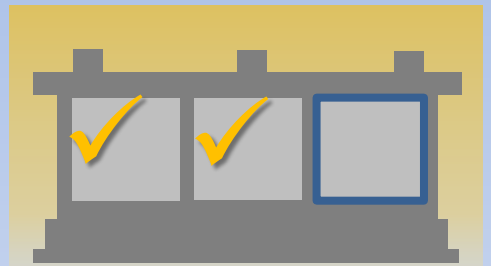
Observed Exposure Indoor Air

Inferred to be in an AOE

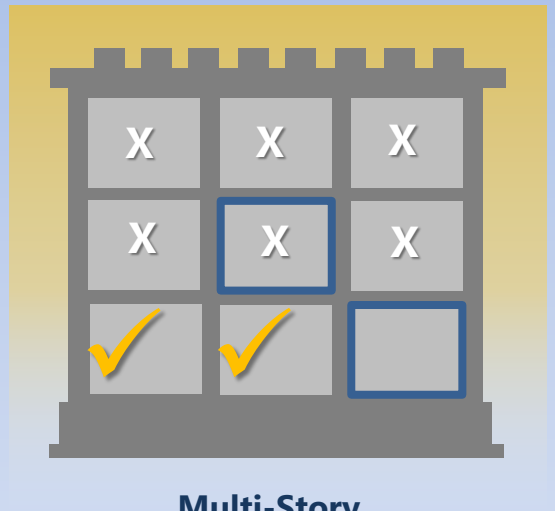
Not Regularly Occupied

Multi-Subunit Structure Evaluation Options

ASC



Single Story
Multi-Subunit



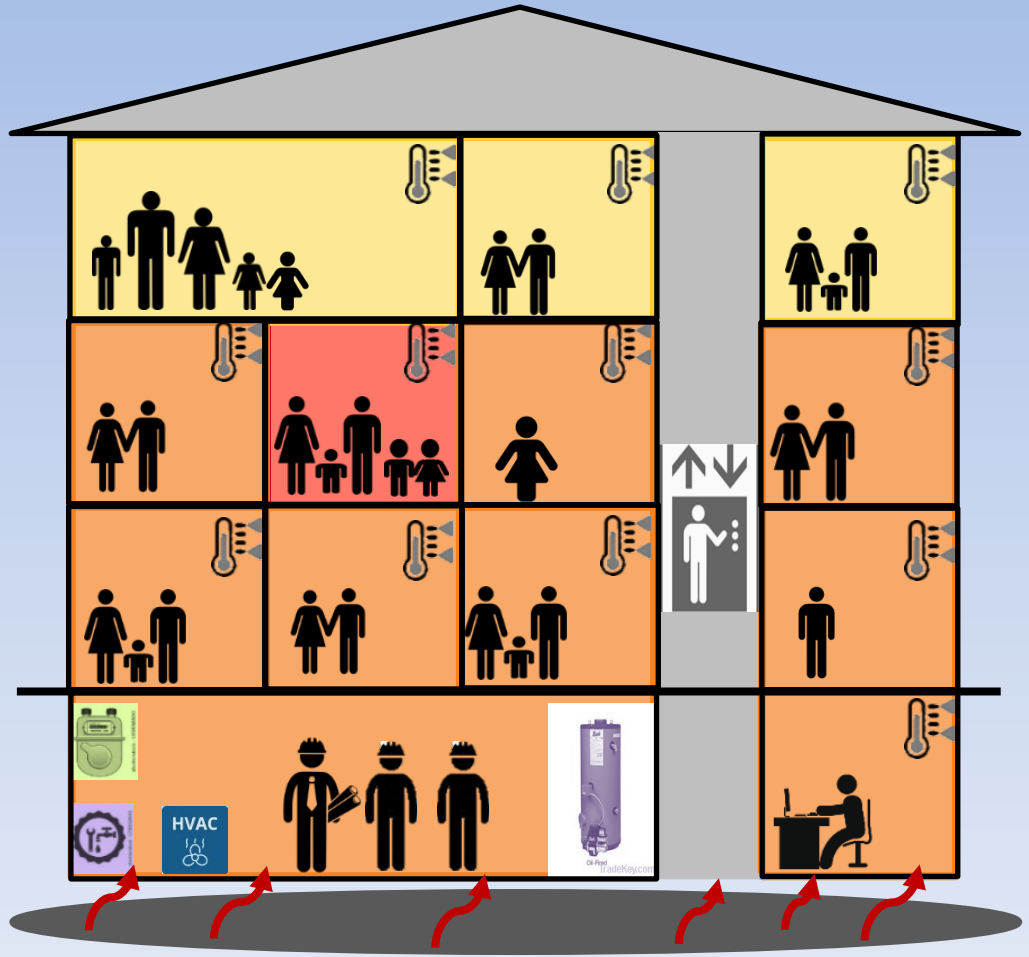
Multi-Story
Multi-Subunit

Inferred to be in an ASC

Not Regularly Occupied

Area of Observed Exposure

Actually Contaminated Targets in Subunits



ASC

AOE - Level I

AOE - Level II

Quiz Question #2

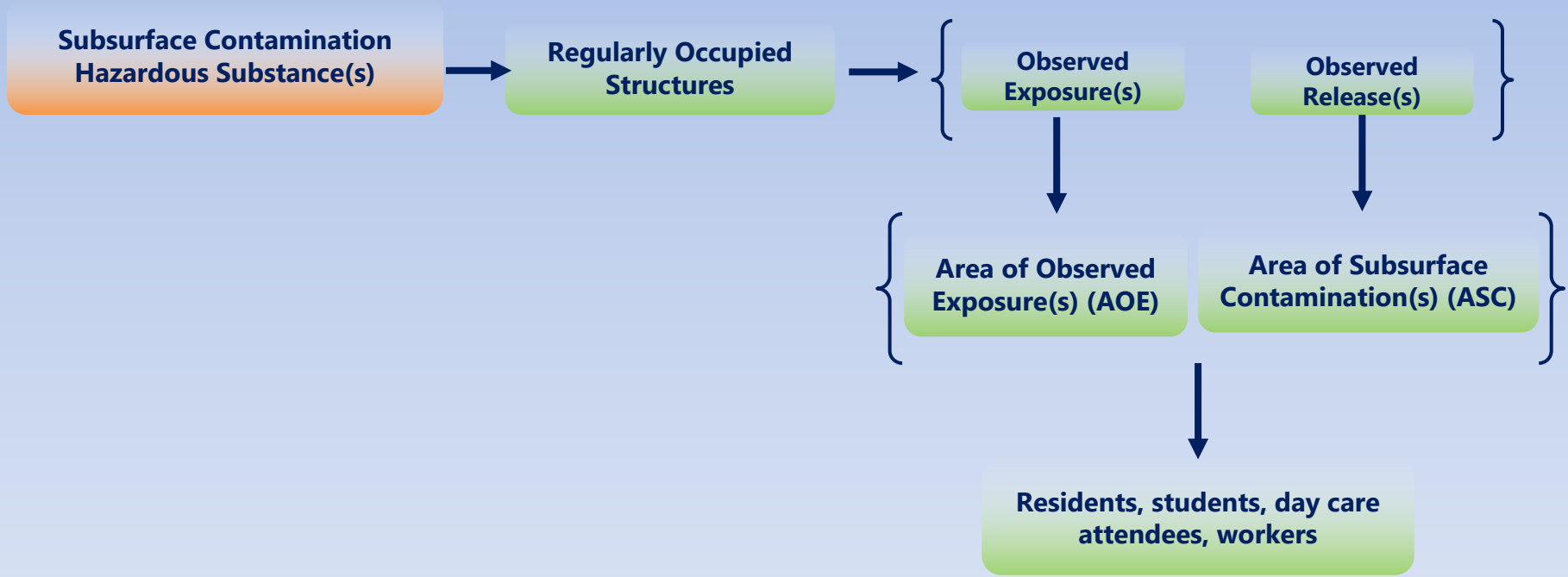
If a single regularly occupied structure contains multiple distinct areas, and the air in each area does not meaningfully mix with the other areas, how do you evaluate that structure?

A. Treat the structure as a single structure, no subunits
B. Treat each distinct area as a separate subunit
C. None of the above

SESSI Pathway – Subsurface Intusion (SsI) Component

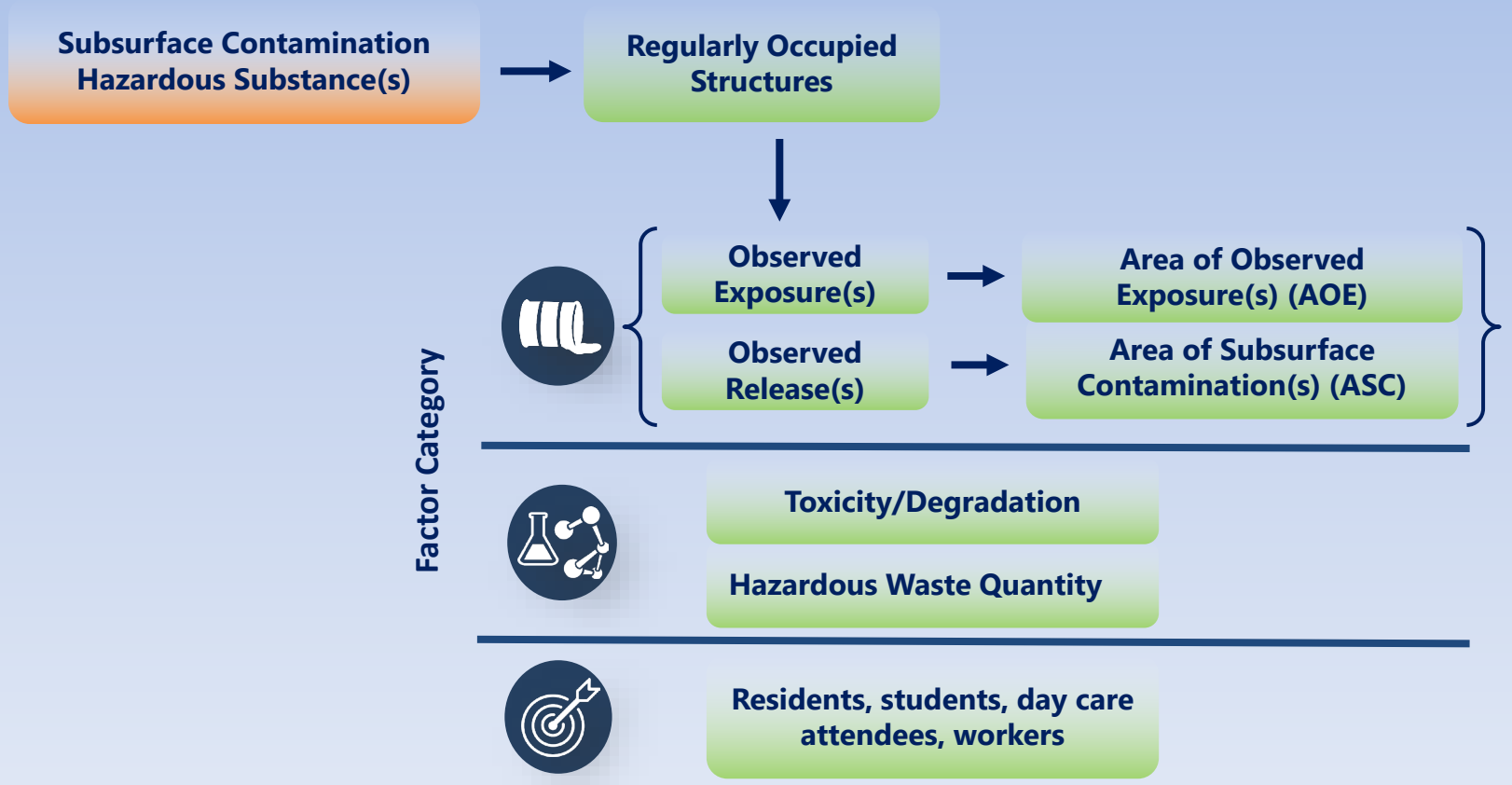
FITTING THE PIECES TOGETHER FOR THE HRS EVALUATION

Elements of the SsI Component



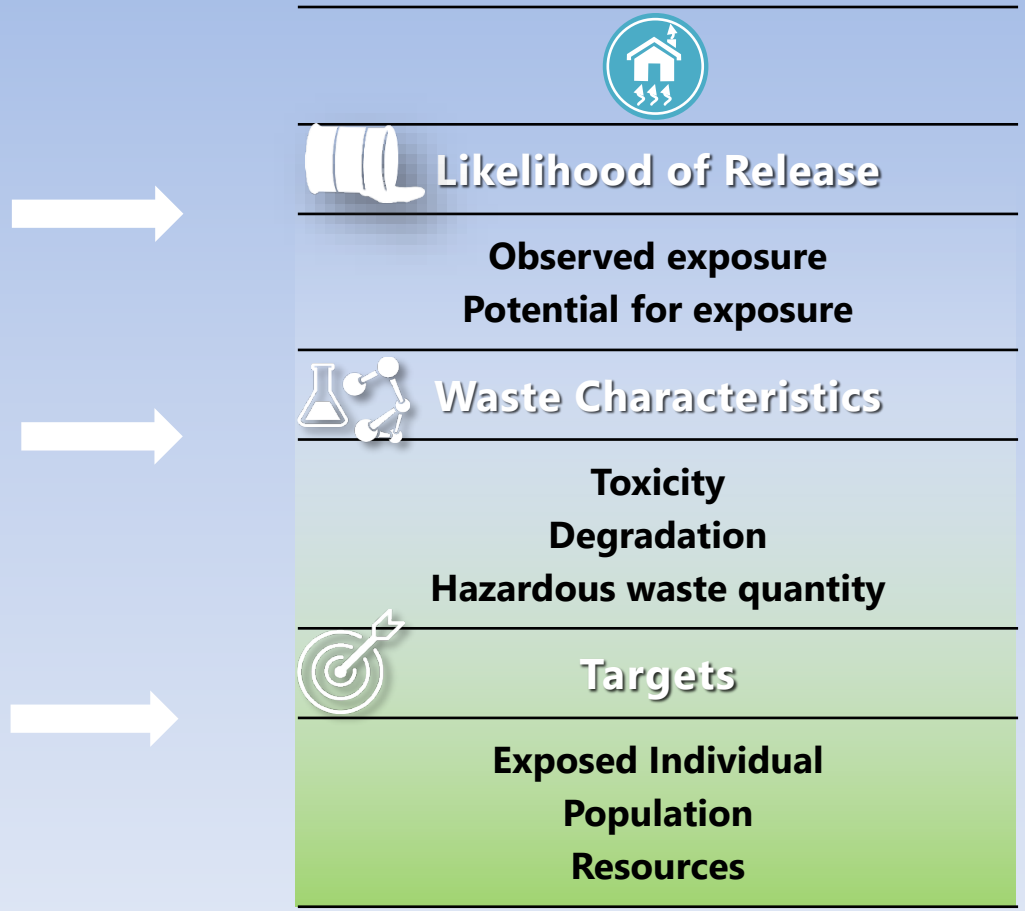
Elements of the SsI Component

Mapped to Factor Categories



Summary of SsI Component Threat

- When the contamination **has intruded**, or **threatens to intrude** into residential buildings, schools, commercial buildings
- When you have **enough contamination** that is also **toxic enough** to impact populations
- **People** are **actually exposed** to contamination due to subsurface intrusion or **could potentially be exposed** to contamination



Key Points for Information Gathering

Likelihood of Exposure

- Sampling data to establish observed exposure and/or observed release
- Structure construction details
- Shallow hydrogeology
- Other possible sources of contamination
- Indoor sources of hazardous substances
- Outdoor air samples

Key Points for Information Gathering

Waste Characteristics

- Sampling data
  - Identification of eligible hazardous substances
- Dimensions of structures/subunits
- Documentation of subunits
- Superfund Chemical Data Matrix (SCDM)

Key Points for Information Gathering

Targets

- Sampling data
  - Determining level of contamination
  - Weighting populations within an ASC
- Presence and location of subunits within individual structures
- Number of eligible individuals present in individual structures or subunits
- Number of workers (full-time or part-time) present in individual structures or subunits
- Presence of resources


Q & A