

IMPACT OF PETROLEUM VAPOR INTRUSION ON OBTAINING SITE CLOSURE

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Terracon

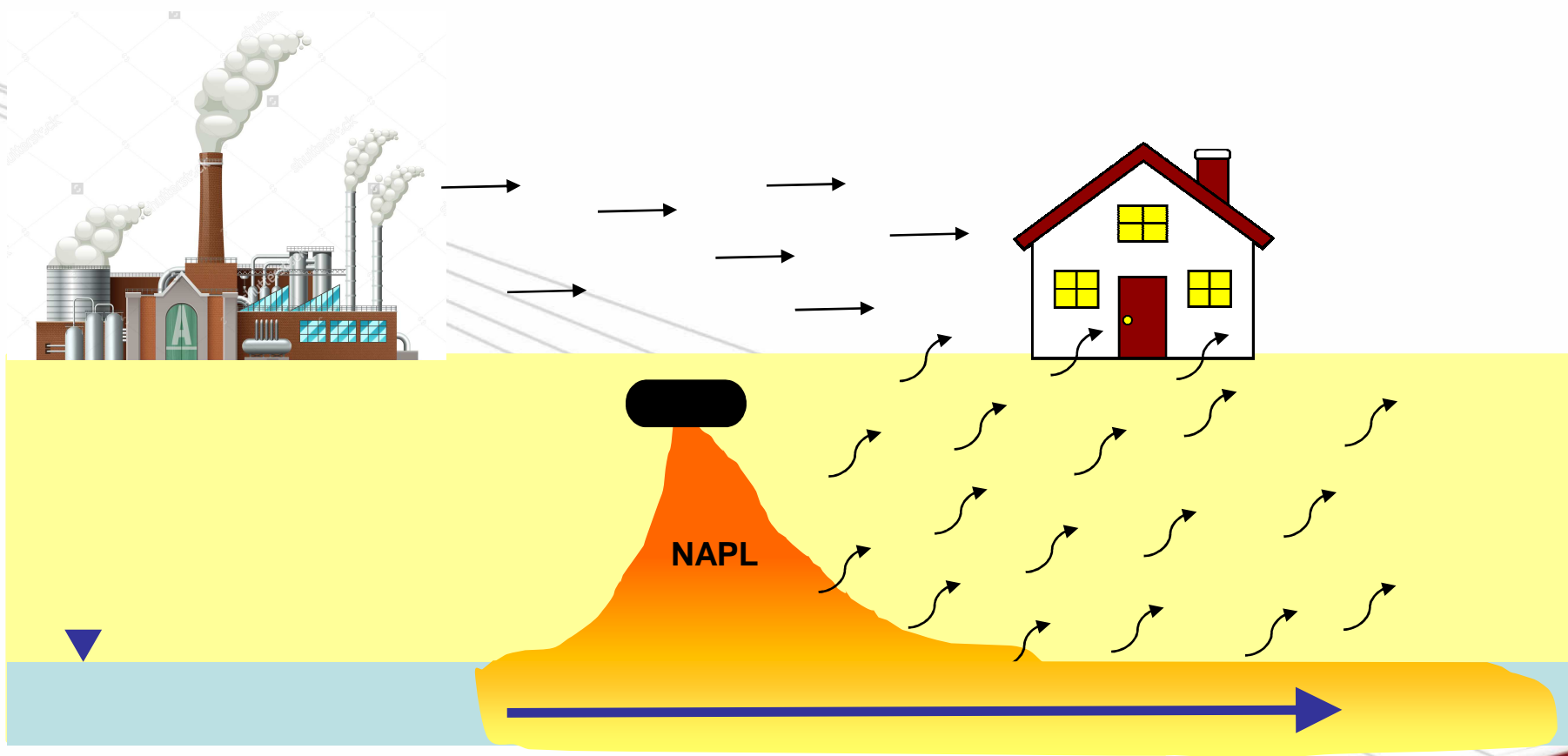
Discussion Topics

- What is Petroleum Vapor Intrusion?
- Significance of PVI?
- How to Investigate PVI?
- Case Studies (3 sites)



What is Petroleum Vapor Intrusion (PVI)?

process by which volatile petroleum hydrocarbons released as vapors from NAPL, petroleum-contaminated soils, or petroleum-contaminated groundwater migrate through the vadose zone and into overlying buildings (ITRC, 2014)



Significance of PVI?

Liability Risk to Responsible Party

Health Risk to Receptors

Driver for Site Closure

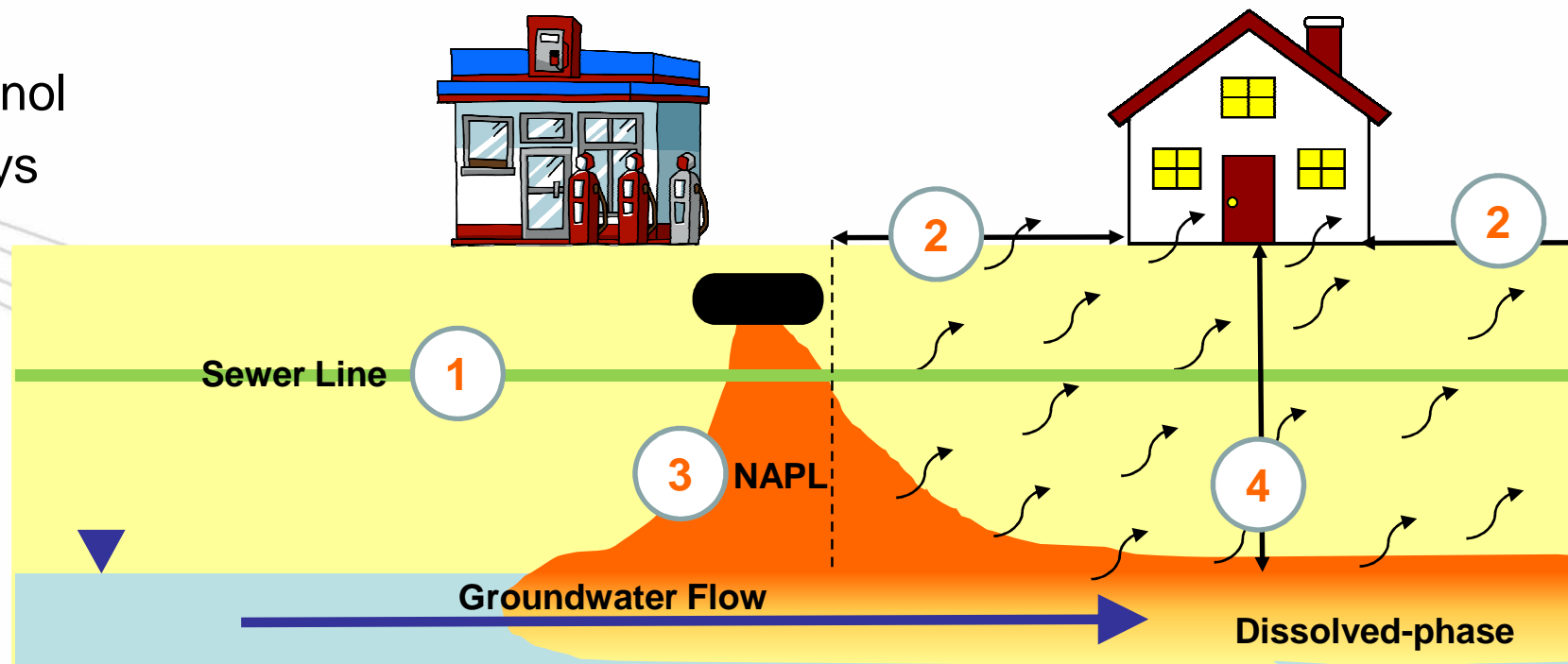
Re-open Closed Sites



How to Investigate PVI?



- including Factors
- 2-DCA, EDB, ethanol
- Preferential Pathways
- Travel Distance
- Presence of NAPL
- Vertical Distance
- Investigation

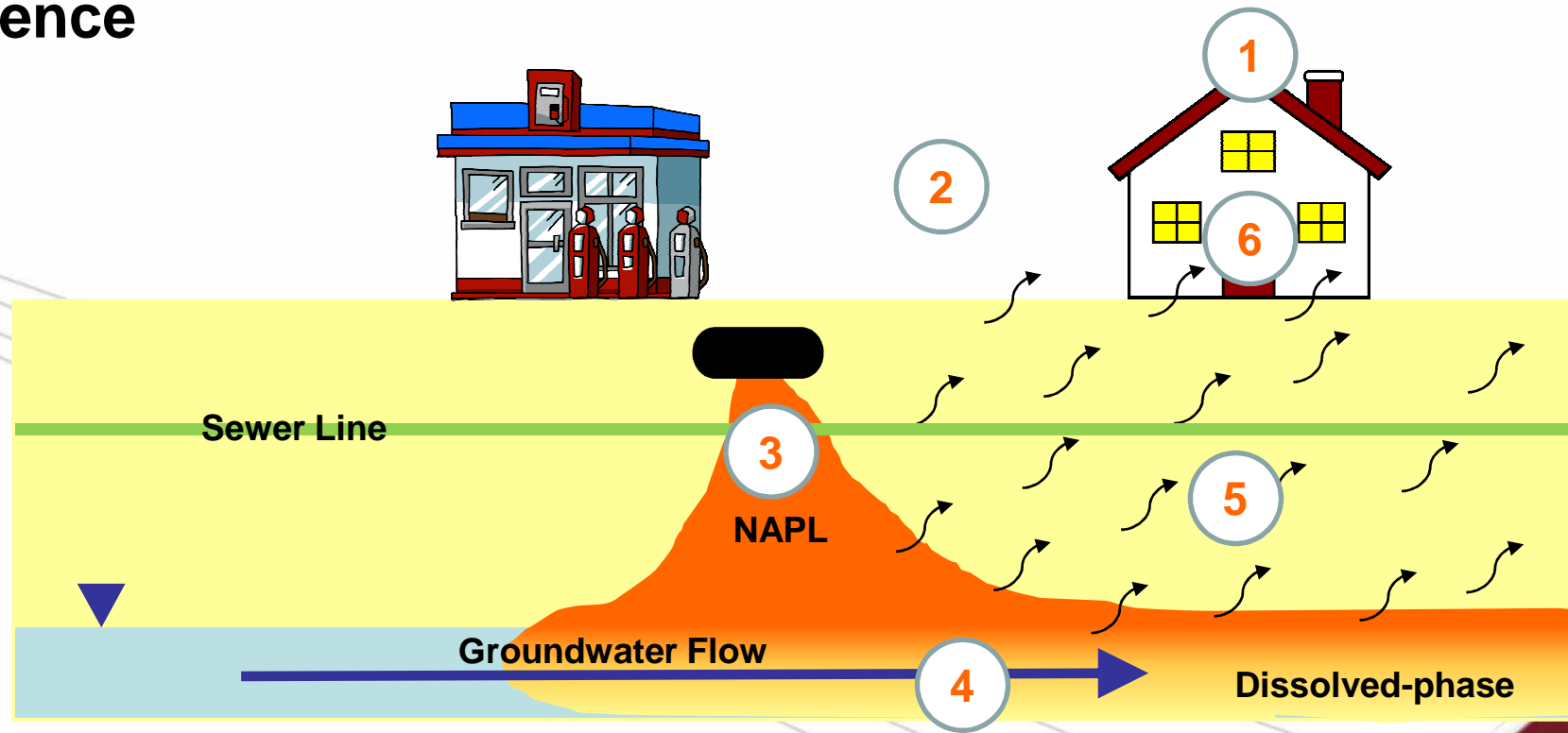


to Investigate PVI?

Key Lines of Evidence

Geophysical Survey
Indoor Air

Groundwater
Vapor
Indoor Air



to Investigate PVI?

Lines of Evidence

Compounds Detected

Location of Detections

Soil

SW

Soil Vapor

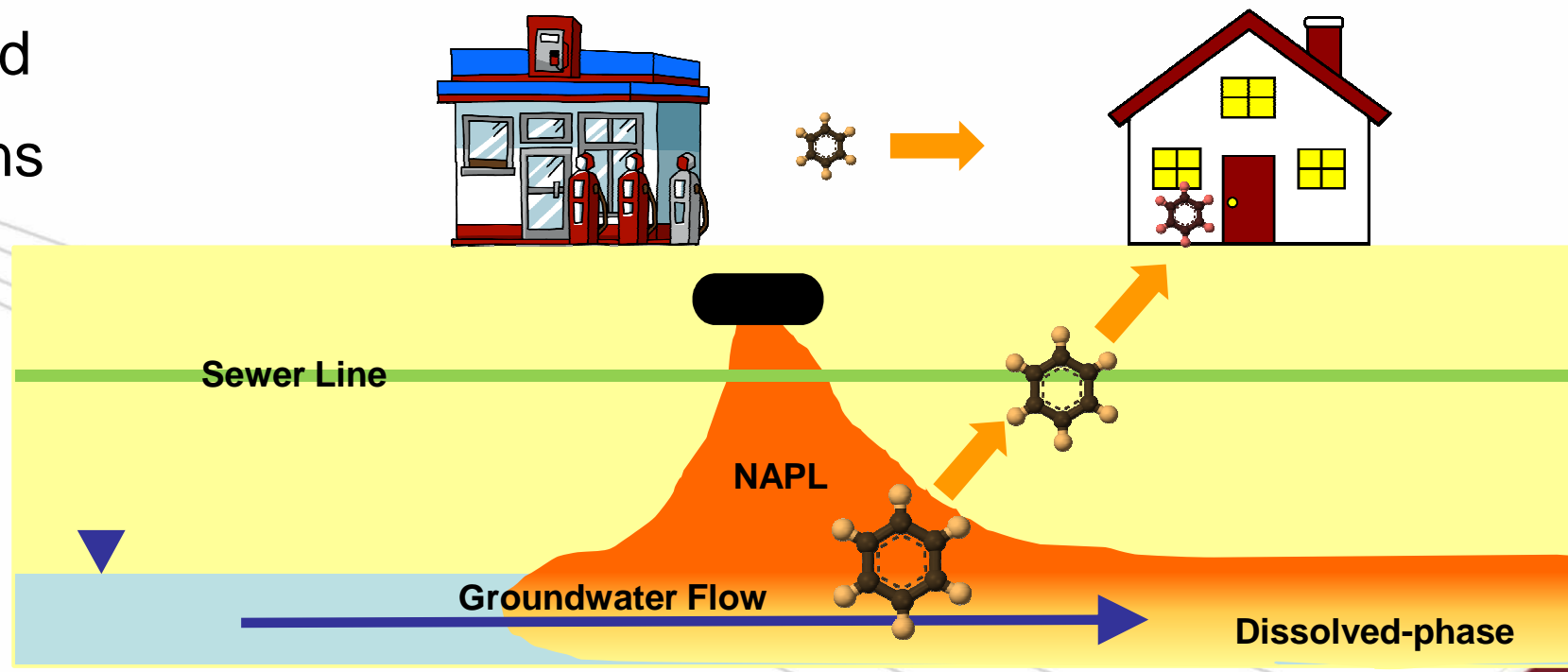
Indoor Air

Outdoor Air

Concentrations

Decreasing away from source

Attenuation Factor



Case Studies

Former retail gas stations

located in North Carolina

remediated using ITRC Guidance

developed as:

Car Dealership

Residence

Retail Store



Study #1 – Car Dealership

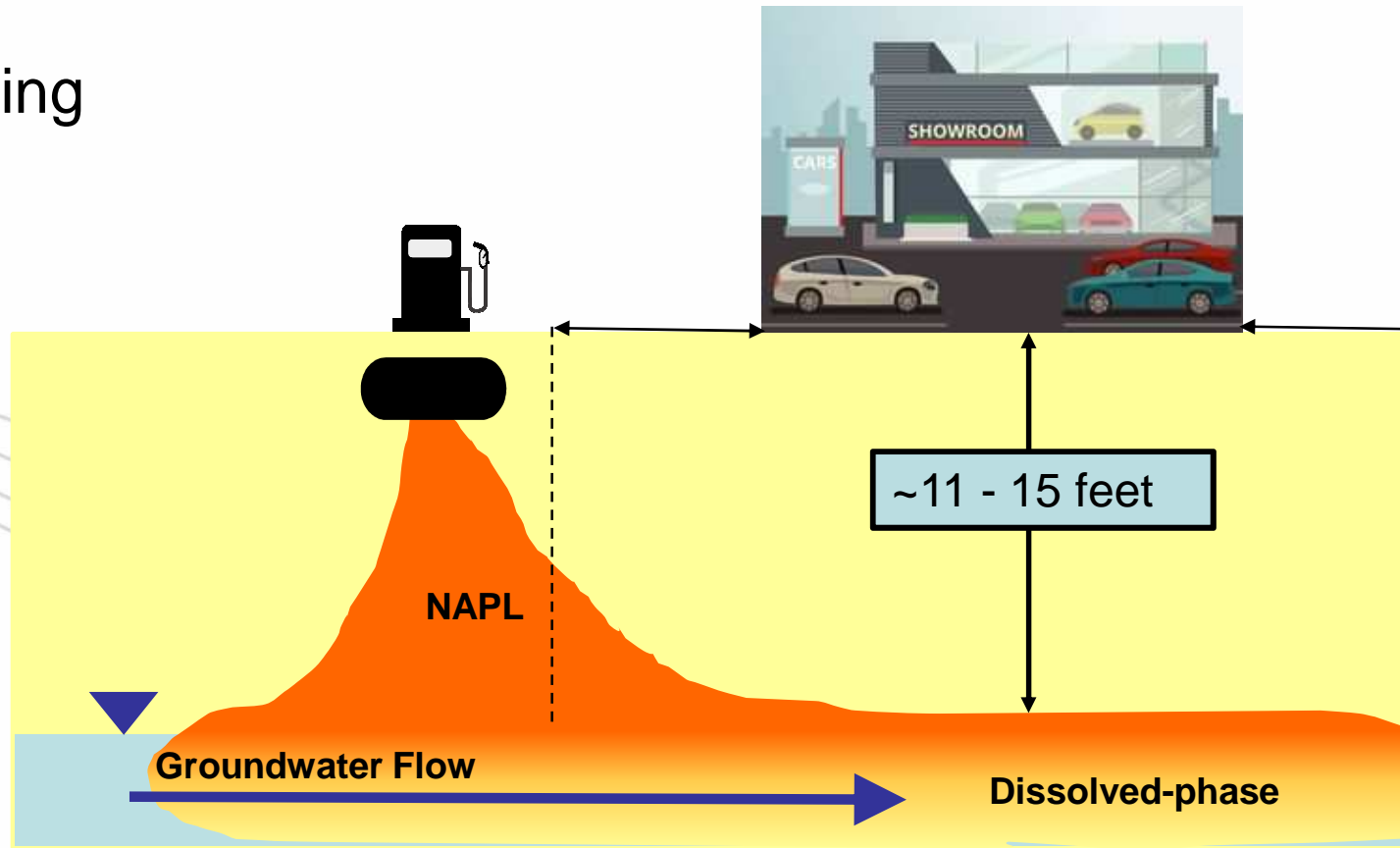
plume beneath building

including factors present:

2-DCA & EDB

Non-aqueous phase liquid (NAPL) (GW conc.)

Depth = ~11 to ~15 feet



Study #1 – Car Dealership

Screening

1. Precluding Factors

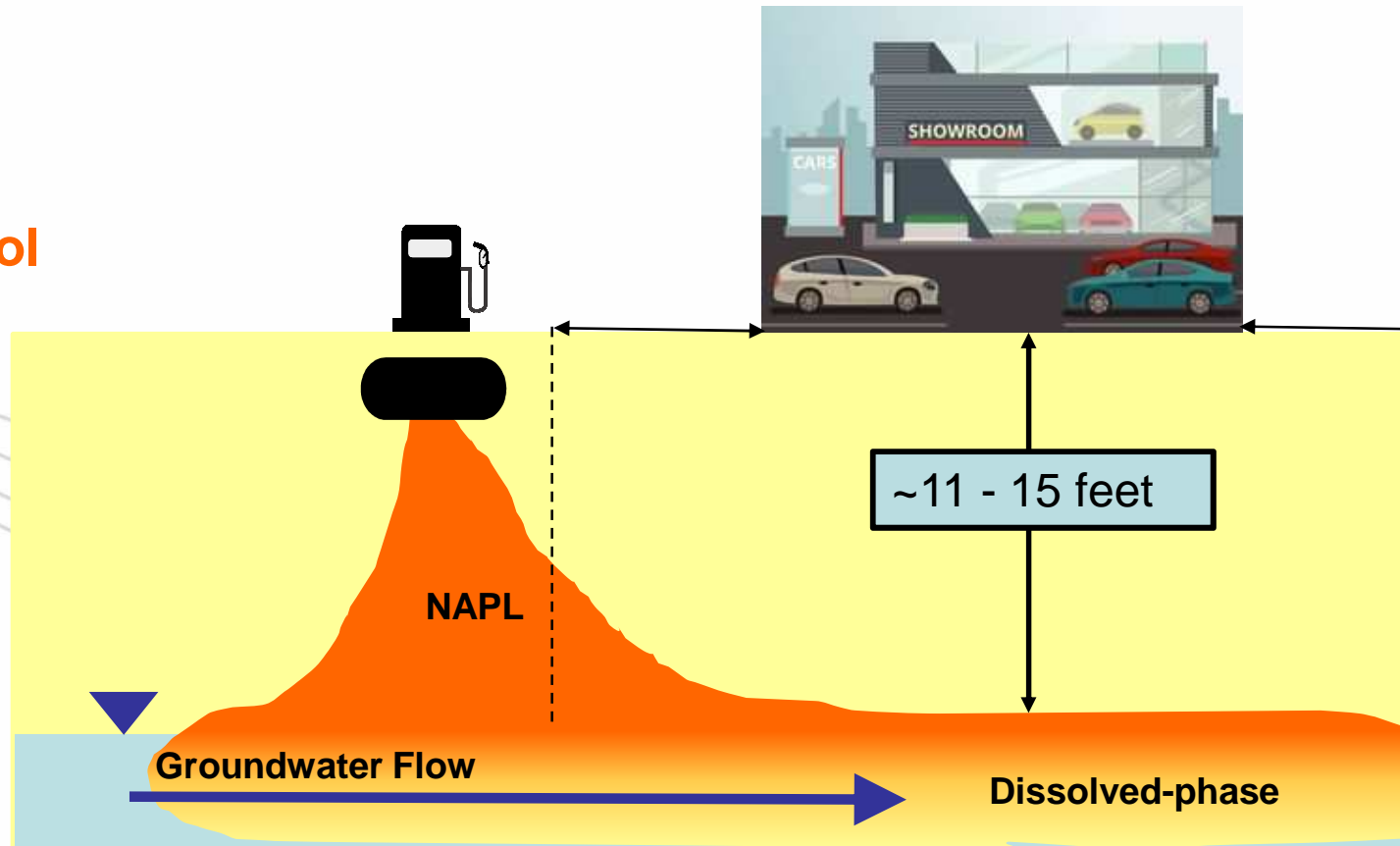
- A. 1,2-DCA, EDB, ethanol
- B. Preferential Pathways

2. Lateral Distance

3. Presence of NAPL

4. Vertical Distance

5. Investigation



Study #1 – Car Dealership

Multiple Lines of Evidence

Toluene detected in:

Groundwater

Soil Vapor

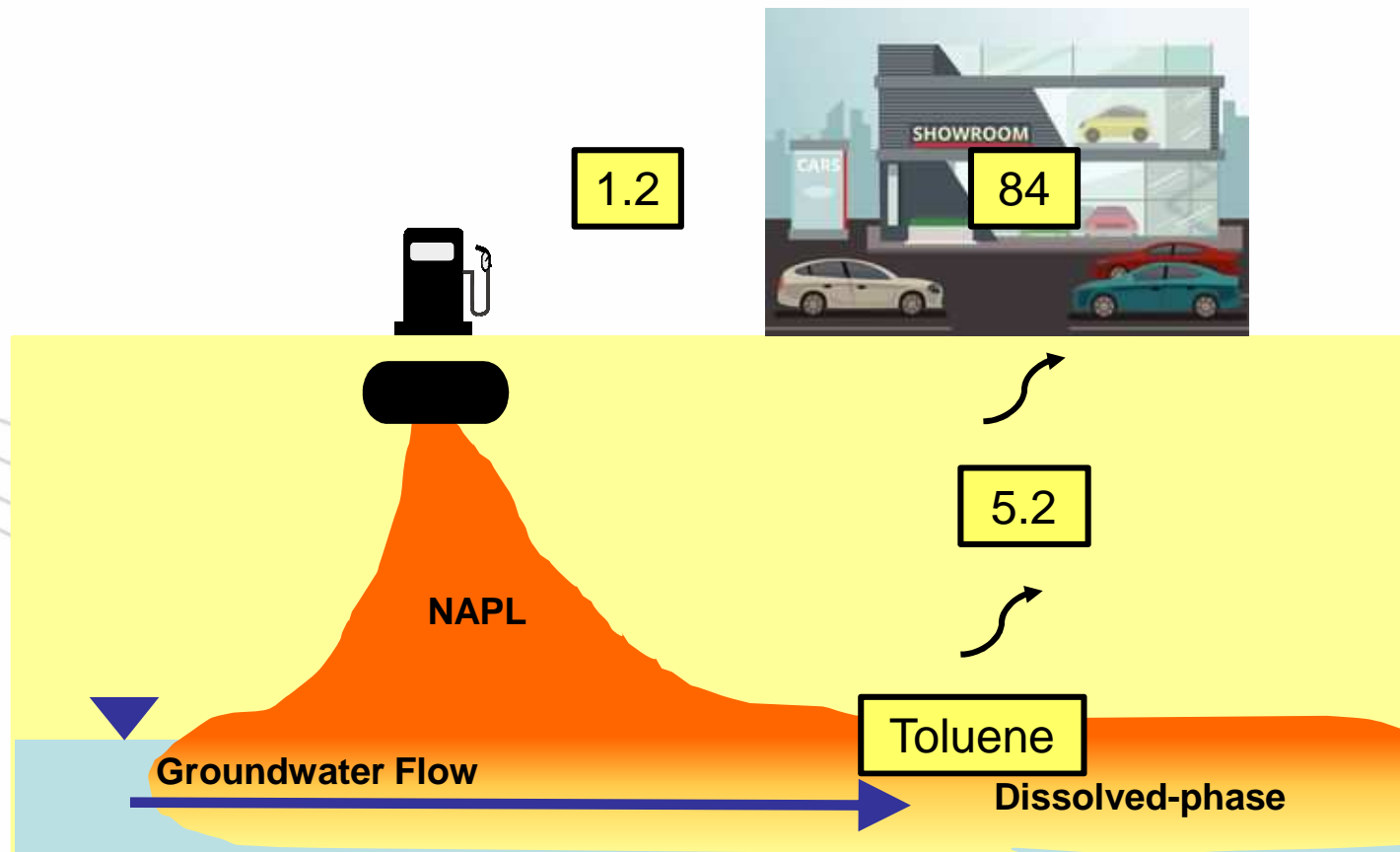
Indoor Air

Outdoor Air

Indoor Air > Soil Vapor

PVI prevent closure?

Yes or **No**



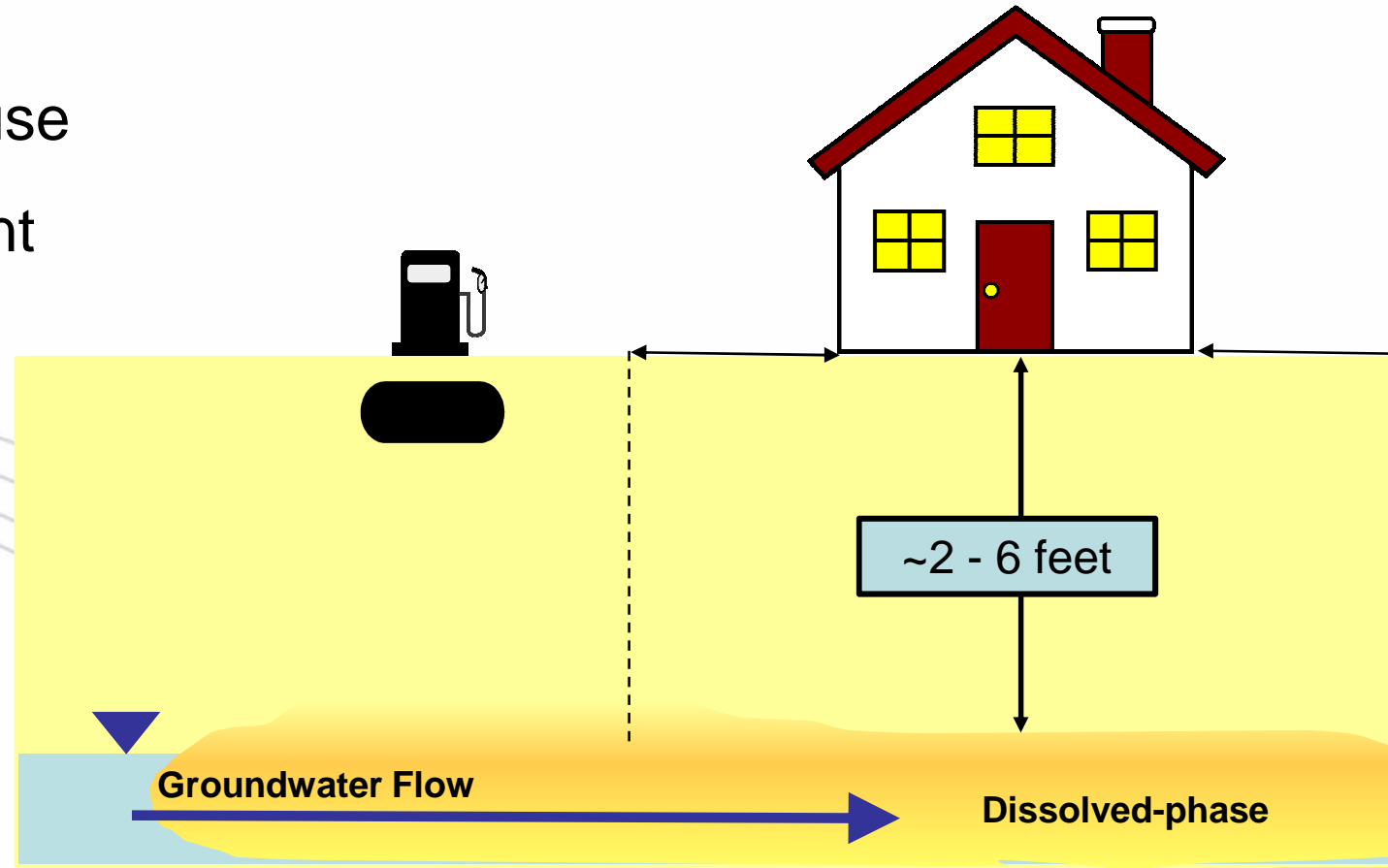
Study #2 – Residence

zene plume beneath house

cluding factors not present

L not present

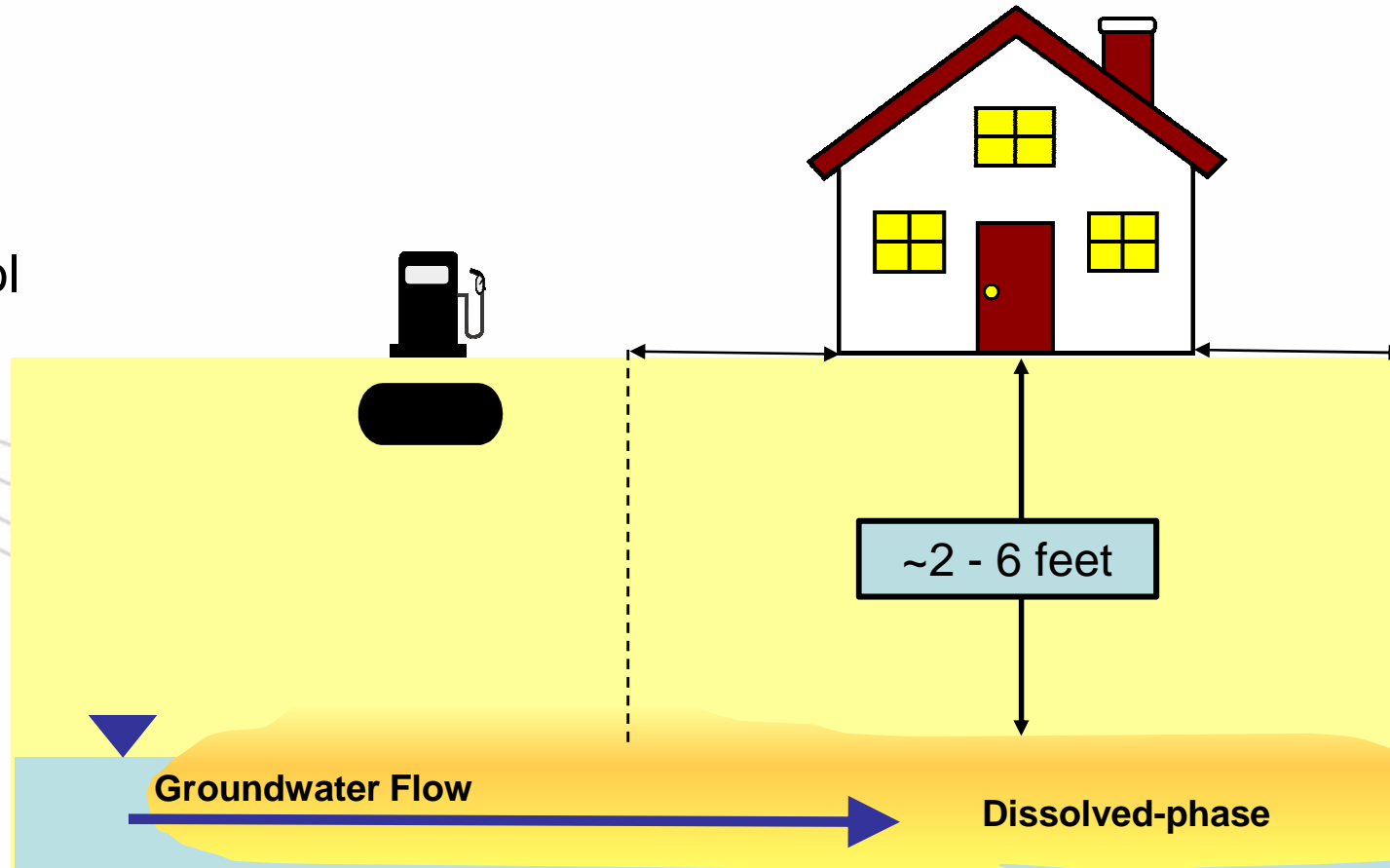
/ = ~2 to ~6 feet



Study #2 – Residence

Screening

- 1. Precluding Factors
 - A. 1,2-DCA, EDB, ethanol
 - B. Preferential Pathways
- 2. Lateral Distance
- 3. Presence of NAPL
- 4. Vertical Distance
- 5. Investigation



Study #2 – Residence

Multiple Lines of Evidence

Benzene detected in:

Groundwater

Soil Vapor

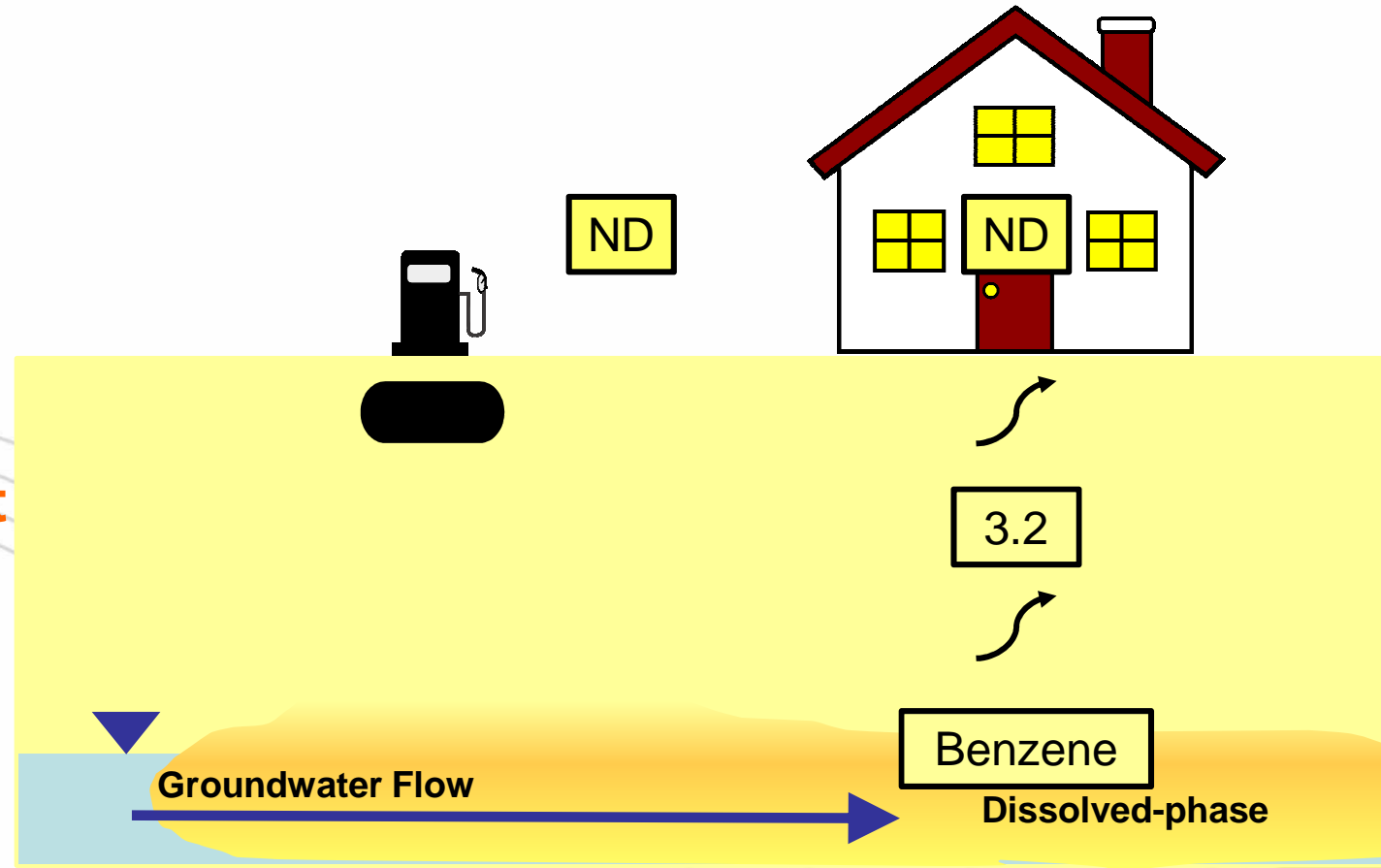
Indoor Air

Outdoor Air

Soil vapor detections, but
non-detect in ambient air

PVI prevent closure?

Yes or **No**



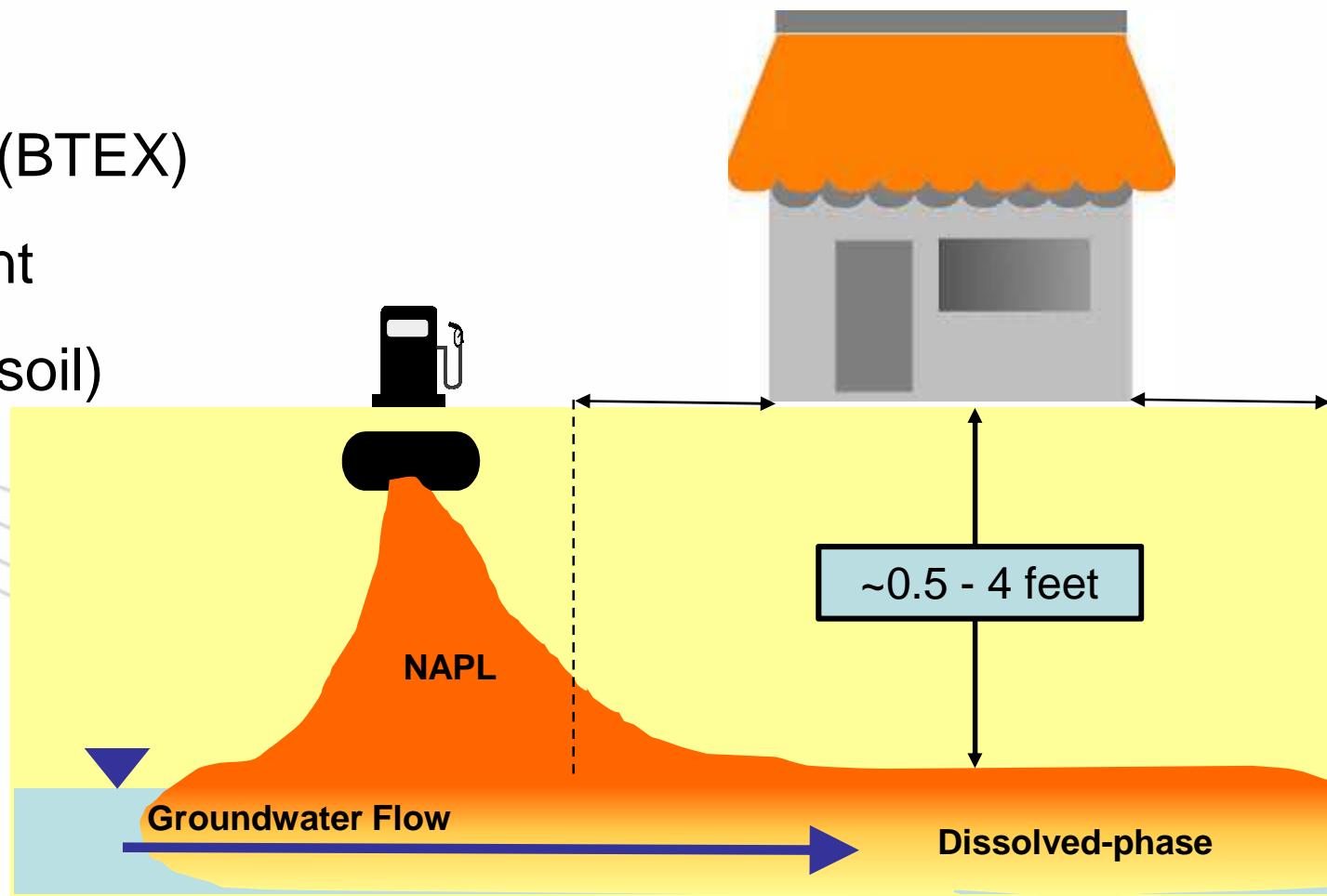
Study #3 – Retail Store

plume beneath building (BTEX)

cluding factors not present

ence of NAPL (GW and soil)

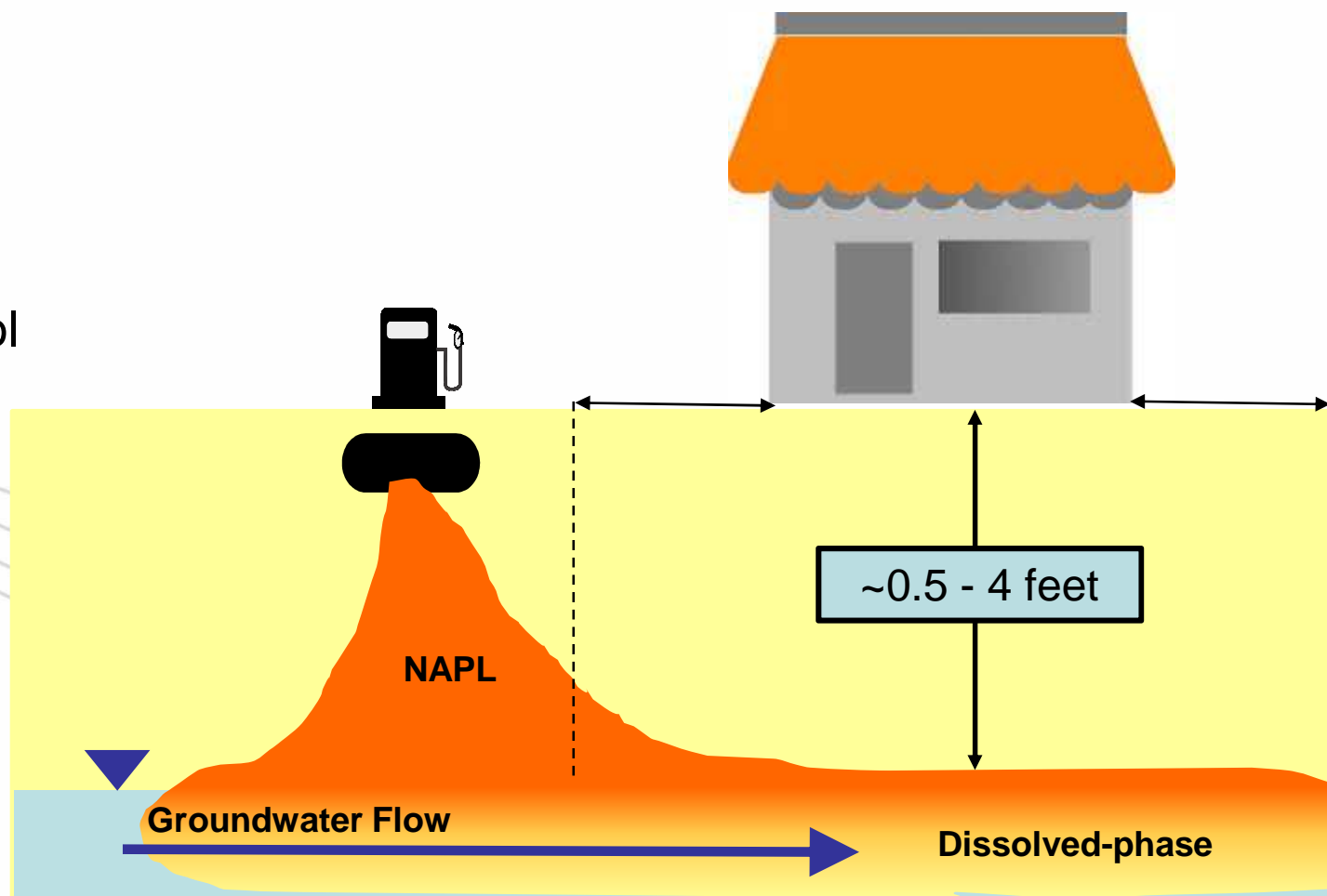
/ = ~0.5 to ~4 feet



Study #3 – Retail Store

Screening

1. Precluding Factors
 - A. 1,2-DCA, EDB, ethanol
 - B. Preferential Pathways
2. Lateral Distance
3. Presence of NAPL
4. Vertical Distance
5. Investigation



Study #3 – Retail Store

Multiple Lines of Evidence

BTEX detected in:

Groundwater

Soil Vapor

Indoor Air

Outdoor Air

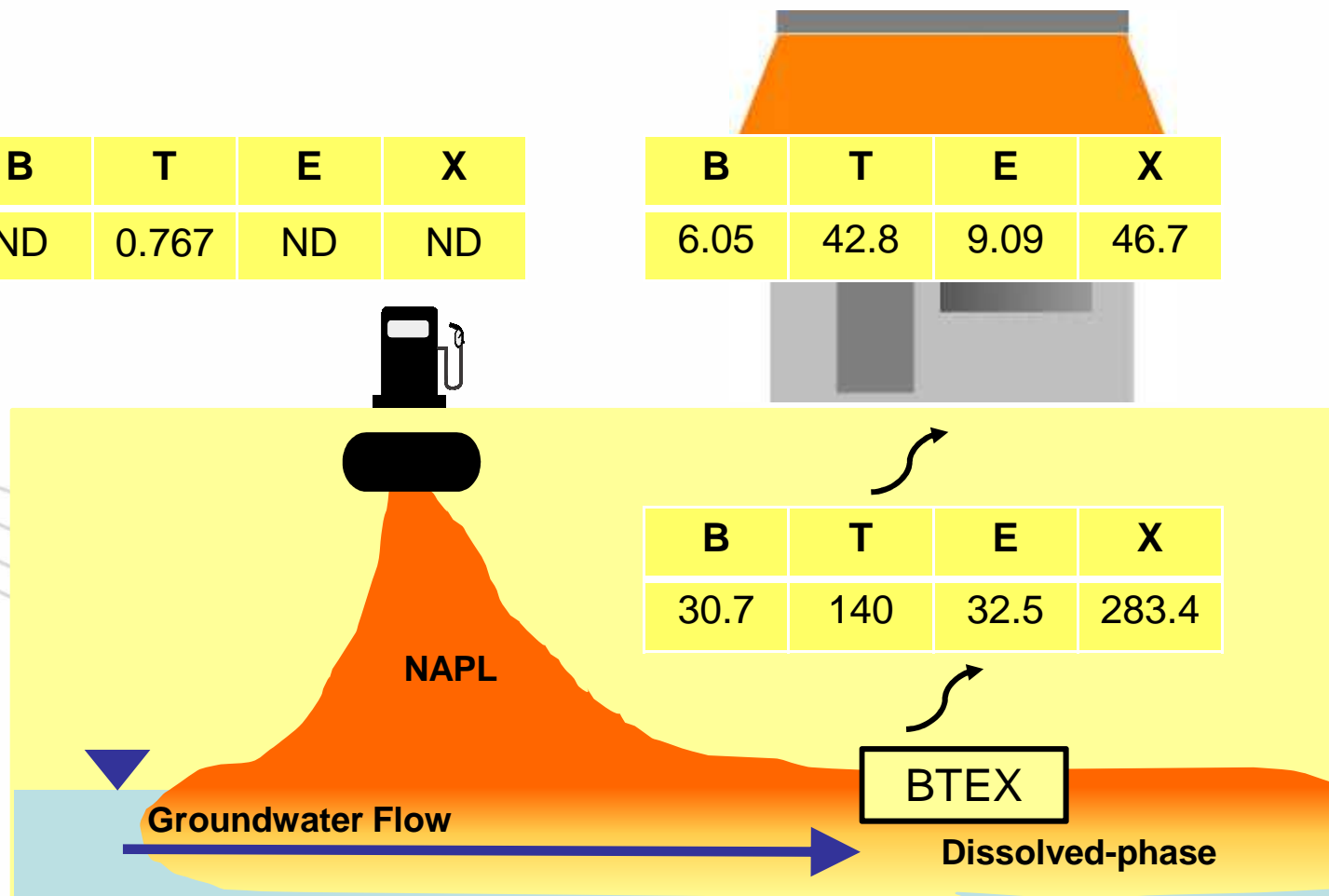
Soil Vapor > Indoor Air
 Consistent attenuation
 factors (0.16 to .30)

PVI prevent closure?

Yes or No

B	T	E	X
ND	0.767	ND	ND

B	T	E	X
6.05	42.8	9.09	46.7



Summary and Conclusions

Guidance provides **framework for screening**

Screening is dependent upon **conceptual site model**

Precluding factors often drive additional investigation

Evaluation should include **multiple lines of evidence**

PVI can be a driver and prevent closure

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