Remediation and Redevelopment Program

Issues & Trends 2017

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Dial: 1-855-947-8255
Passcode: 6612 745#

Vapor Intrusion: Action Criteria, Mitigation, and Long-term Monitoring

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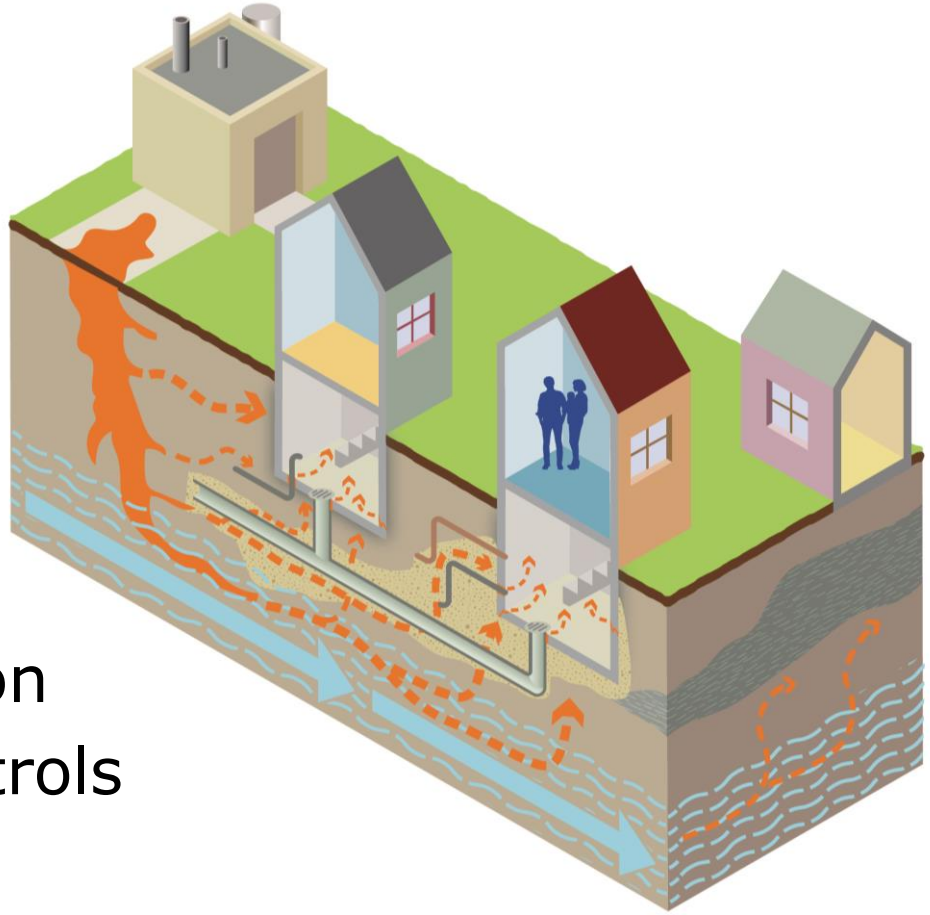
Questions will be taken during the presentation.
You may also submit questions to DNRRRComments@wisconsin.gov

WISCONSIN
DEPT. OF NATURAL RESOURCES

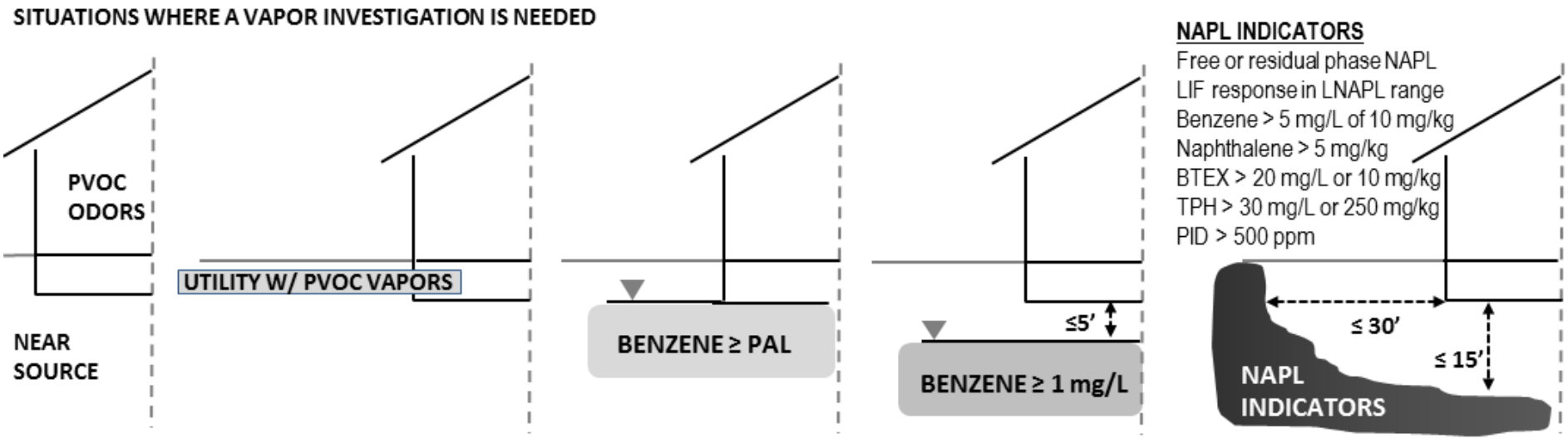
OVERVIEW

- ✓ Action Criteria
  - Screening Criteria
  - Response Actions
    - Immediate
    - Mitigation
    - Remediation
- ✓ Mitigation Options
  - Active Depressurization
  - Active Indoor Air Controls
  - Passive Controls
- ✓ Long-term Monitoring



SCREENING CRITERIA: WHEN TO SAMPLE

PVOCS

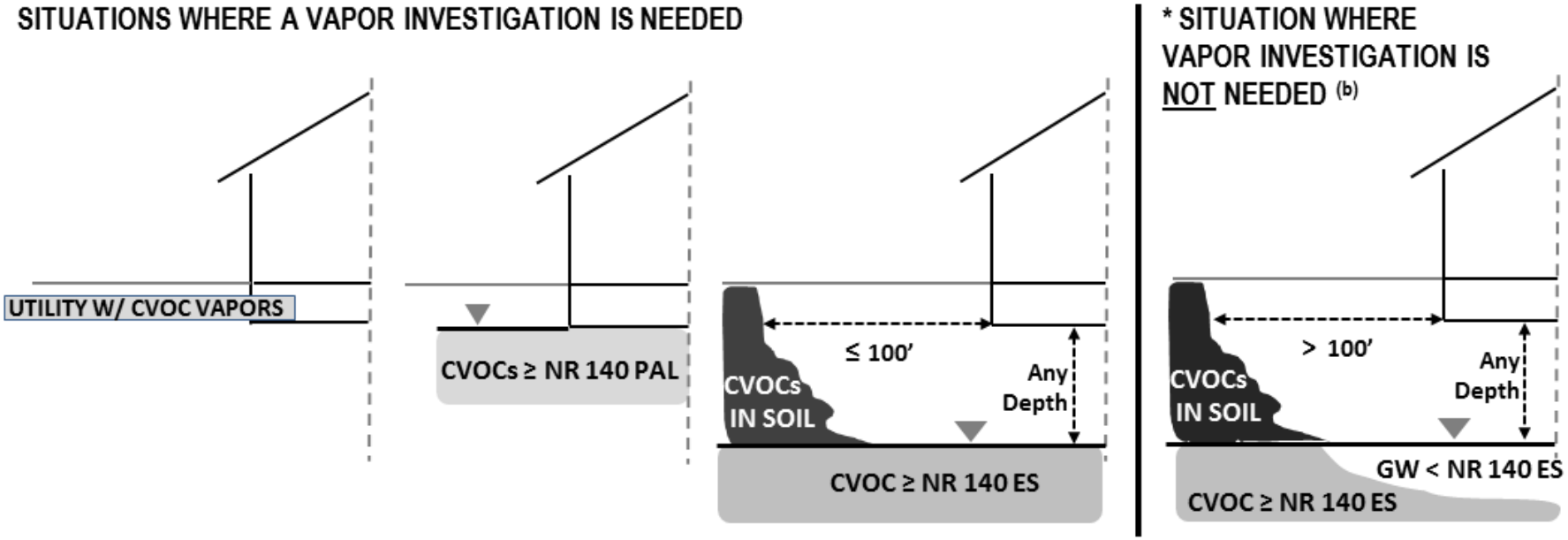


For soil impacts check for :*Aerated Soil Indicators* within 5-ft of building

- O_2 > 5%,
- CH_4 < 1%,
- LEL < 10%

SCREENING CRITERIA: WHEN TO SAMPLE

CVOCS



VAPOR ACTION LEVELS (VALs)
VAPOR RISK SCREENING LEVELS (VRSLs)

- ✓ Common Contaminants
  - DNR Quick Look-up Table
    http://dnr.wi.gov/topic/Brownfields/documents/vapor/vapor-quick.pdf
- ✓ Others
  - See Quick Look-up Table for directions
  - Use U.S.EPA RSL Tables
    https://www.epa.gov/risk/regional-screening-levels-rsls
    - Target Cancer Risk = 10^{-5}
    - Non-cancer Hazard Index = 1 *(i.e. Target Hazard Quotient)*

SCREENING CRITERIA: WHEN TO SAMPLE

OTHERS?

- ✓ Is chemical sufficiently volatile and toxic?
- ✓ Look up on U.S. EPA VISL Table
  https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-levels-visls

EPA-OLEM VAPOR INTRUSION ASSESSMENT

Vapor Intrusion Screening Level (VISL) Calculator Version 3.5.1 (May 2016 RSLs)

The primary objective of risk-based screening is to identify sites or buildings unlikely to pose a health concern through the vapor intrusion pathway. Generally, at properties where subsurface concentrations of vapor-forming chemicals (e.g., groundwater or "near source" soil gas concentrations) fall below screening levels (i.e., VISLs), no further action or stu warranted, so long as the exposure assumptions match those taken into account by the calculations and the site fulfills the conditions and assumptions of the generic conceptual underlying the screening levels. In a similar fashion, the results of risk-based screening can help the data review team identify areas, buildings, and/or chemicals that can be eliminate from further assessment. The generic conceptual model underlying these screening levels is described in OSWER Publication 9200.2-154 (OSWER Technical Guide for Assessing Mitigating the Vapor Intrusion Pathway From Subsurface Vapor Sources to Indoor Air) (EPA 2015; Section 6.5)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or c
Target Risk for Carcinogens	TCR	1.00E-05	Enter target risk for c
Target Hazard Quotient for Non-Carcinogens	THQ	1	Enter target hazard qu
Average Groundwater Temperature (°C)	Tgw	25	Enter average of the

View All Chemicals

View Checked Chemicals

CAS		Does the chemical meet the definition for volatility?	Does chemical have inhalation toxicity data?	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from	Target Indoor Air Conc. @ TCR = 10E-06 or THQ = 1	To B
		(HLC>1E-5 or VP>1)	(IUR and/or RfC)	Cvp > Cia,target?	Chc > Cia,target?	MIN(Cia,c;Cia,i	
56-55-3	Benz[a]anthracene	Yes	Yes	Yes	Yes	9.2E-02	
50-32-8	Benzo[a]pyrene	No	Yes	No (not volatile)	No (not volatile)		
207-08-9	Benzo[k]fluoranthene	No	Yes	No (not volatile)	No (not volatile)		

ATTENUATION FACTOR: WHICH TO USE

- ✓ Residential:
  - ✓ Use default (almost *always*)
- ✓ Non-residential:
  - ✓ Use default
  - ✓ Site-specific (okay in most situations)
  - ✓ Site-specific = Tracer (Radon) Test

Continuous Radon Monitor

$$\text{VRSL} = \frac{\text{VAL}}{\text{ATTENUATION FACTOR}}$$

DEFAULT VALUES
OR
SITE-SPECIFIC MEASUREMENT

RESPONSE ACTIONS: WHEN TO MITIGATE

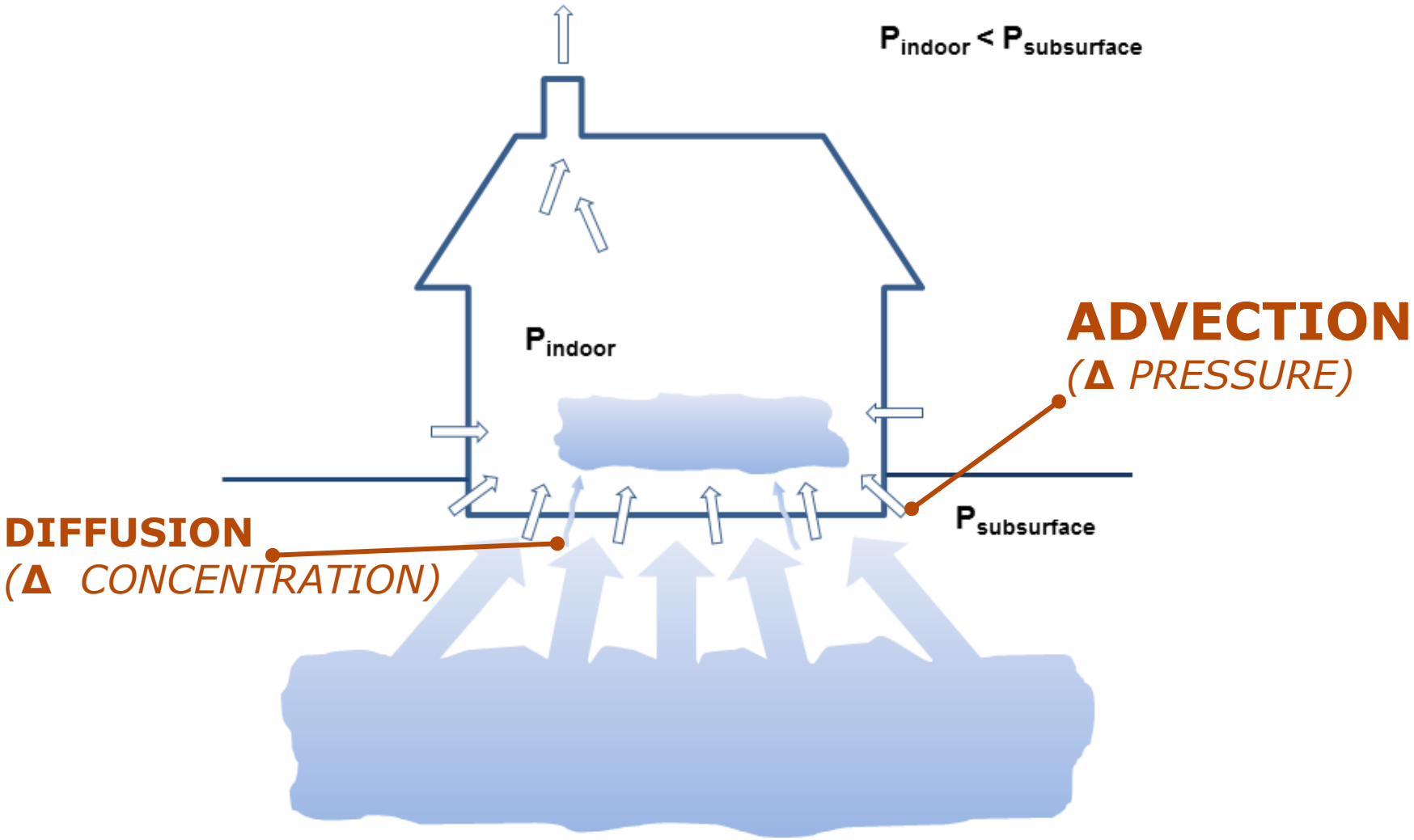
VI CONDITION		RESPONSE ACTION
1. Sub-slab > VRSL	→	**Remediate and Mitigate**
+ Indoor Air > VAL	→	Immediate (more urgent)
2. Groundwater or Soil gas > VRSL	→	Likely Remediate & Potential to Mitigate
3. Soil gas < VRSL	→	Likely No Action for VI
4. Sub-slab < VRSL	→	**No Action for VI**

MITIGATION OPTIONS: WILL IT WORK?

SETTING	MITIGATION CATEGORY		
	ACTIVE DEPRESSURIZATION	ACTIVE INDOOR AIR CONTROLS	PASSIVE CONTROLS
EXISTING BUILDING			
Residential	Yes	No	No
Lg /Mixed Use	Yes	Depends	No to Depends
Non-Residential	Yes	Depends	No to Depends
NEW CONSTRUCTION			
Residential	Yes	Depends	Depends
Lg /Mixed Use	Yes	Depends to Yes	Depends
Non-Residential	Yes	Yes	Depends to Yes

EFFECTIVENESS LIKELIHOOD

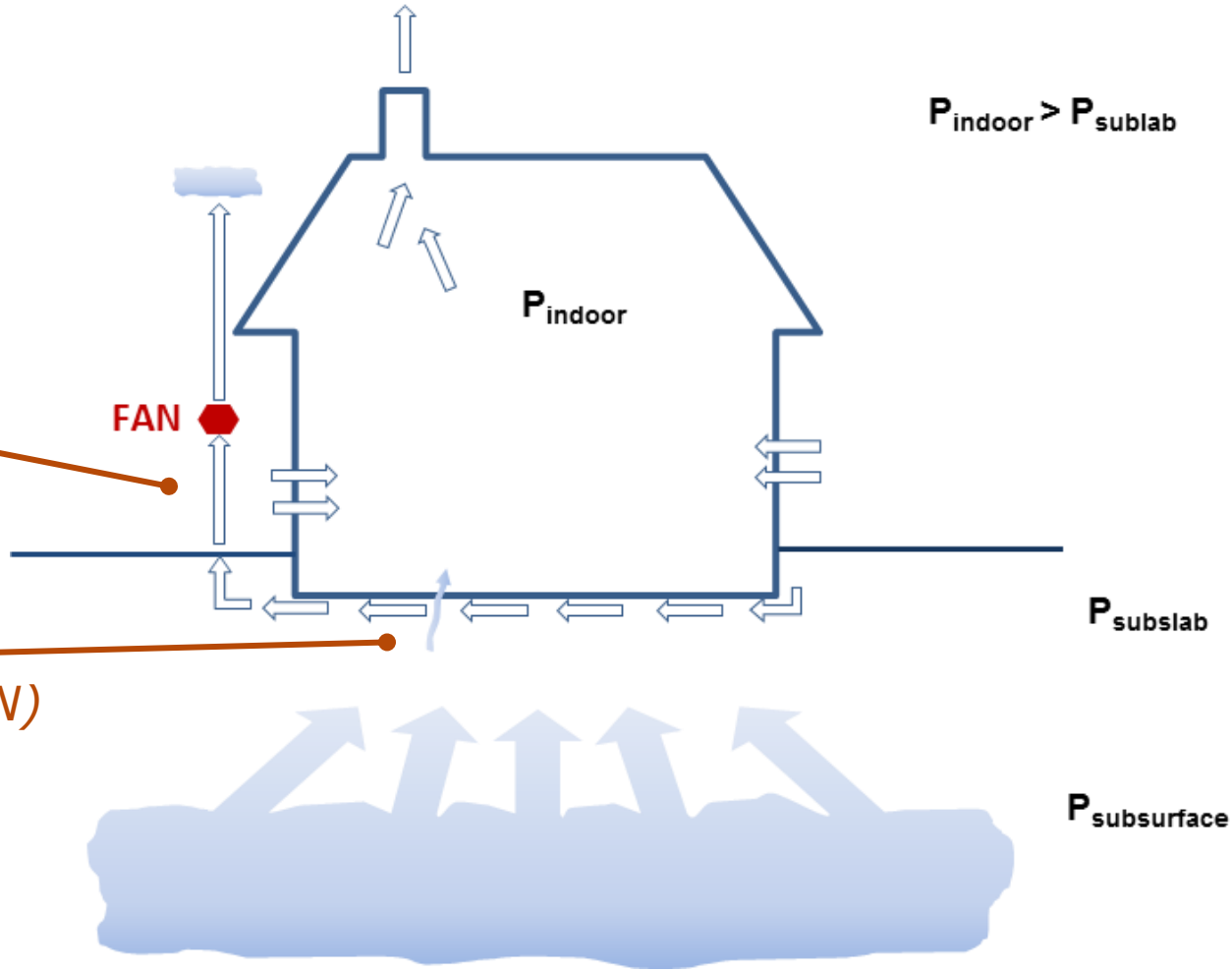
MITIGATION: DESIGN BASIS



MITIGATION: SUBSLAB DEPRESSURIZATION

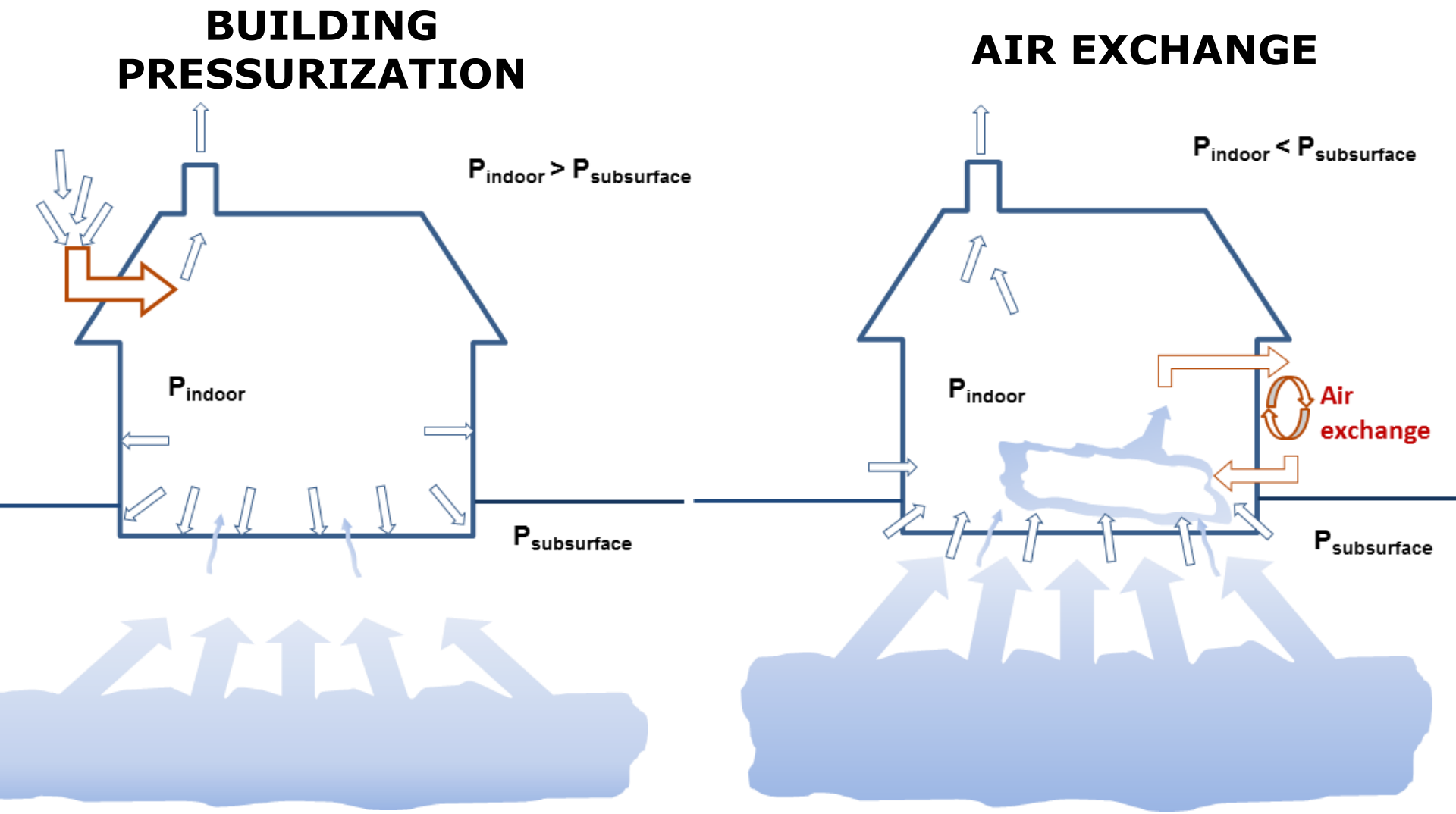
ADVECTION
(Δ PRESSURE)

DIFFUSION
(Δ CONCENTRATION)



Controlled and effective?

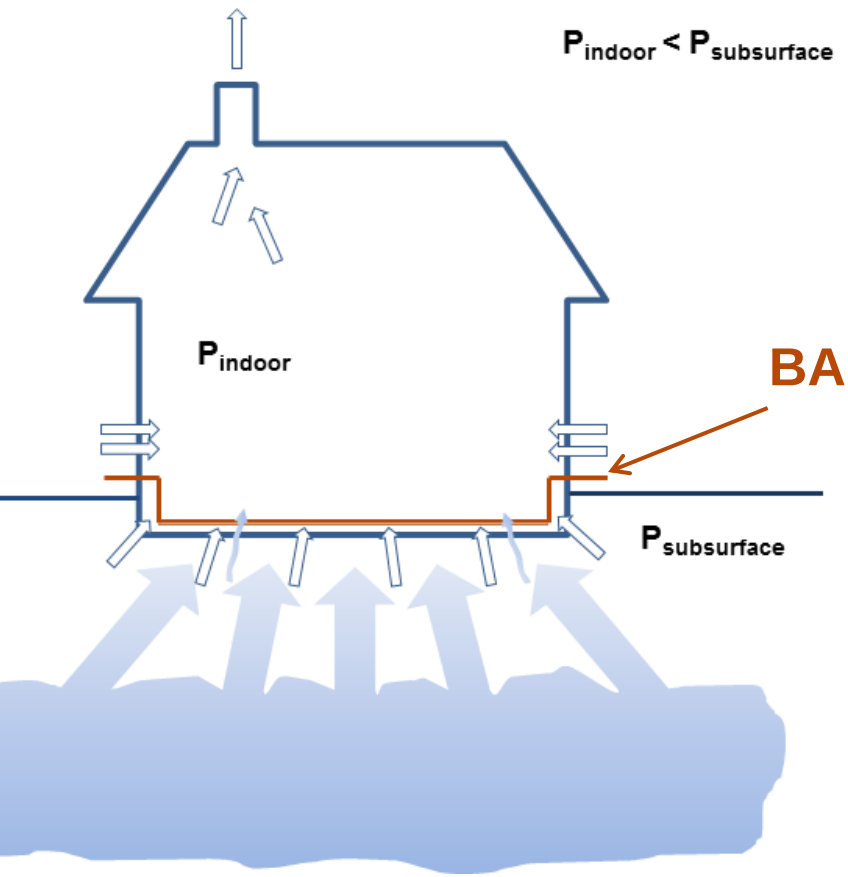
MITIGATION: ACTIVE INDOOR CONTROLS



Controlled and effective?

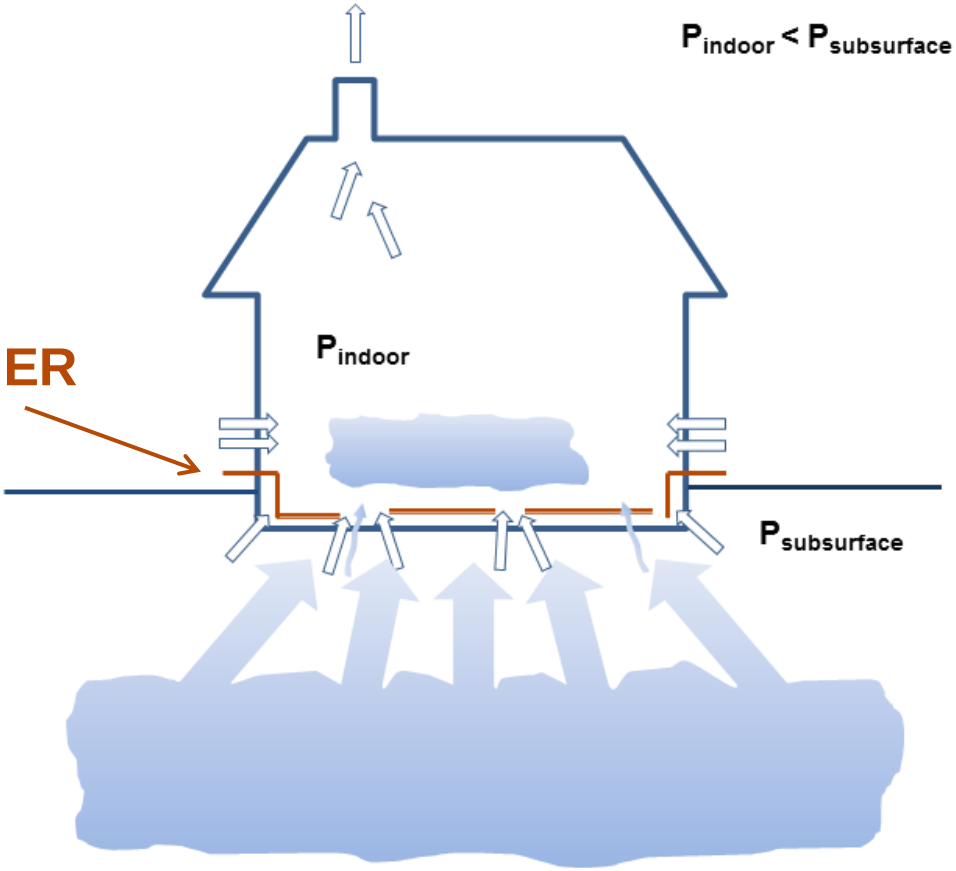
MITIGATION: PASSIVE CONTROLS

THEORY



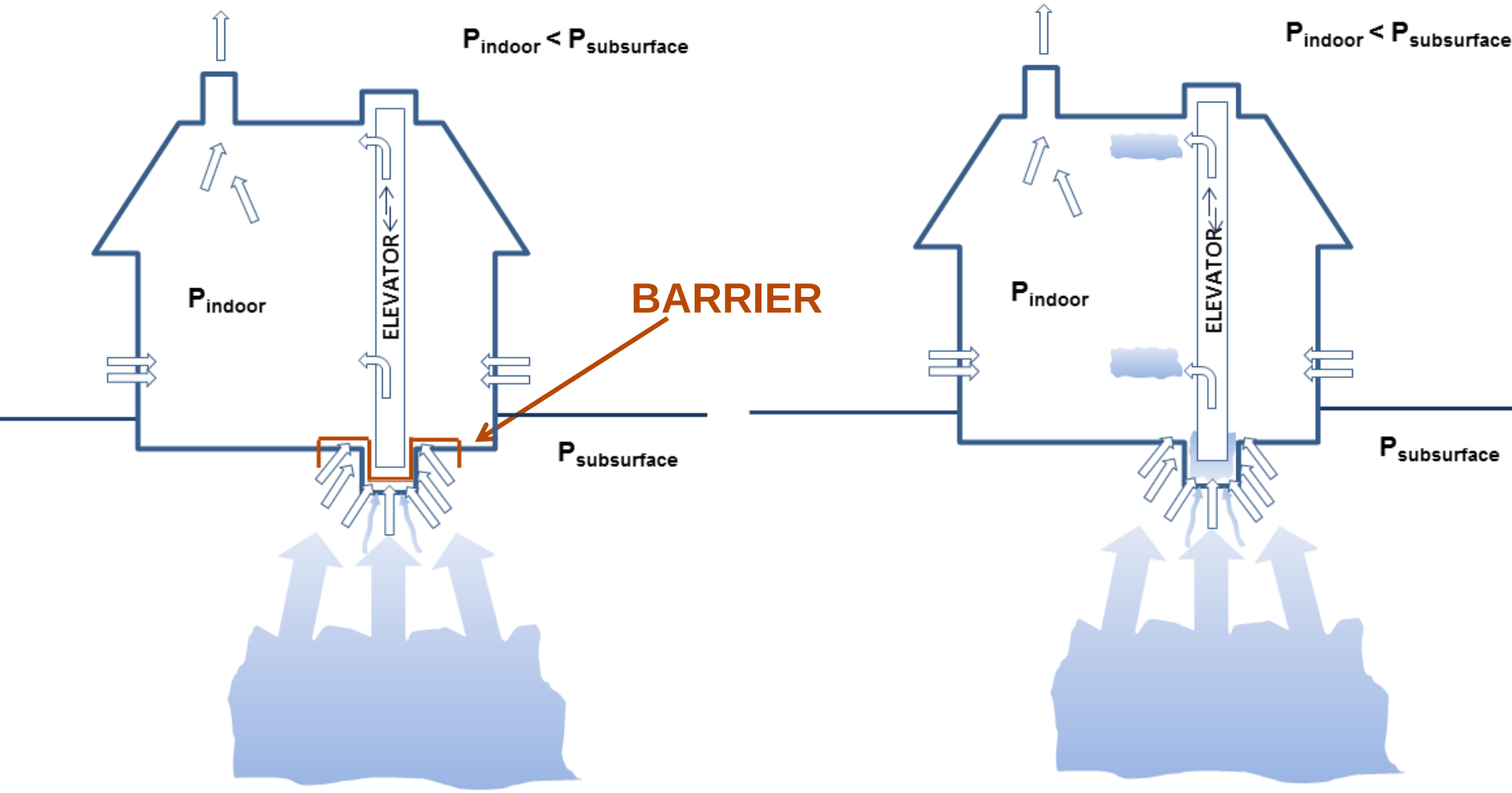
BARRIER

CONCERN

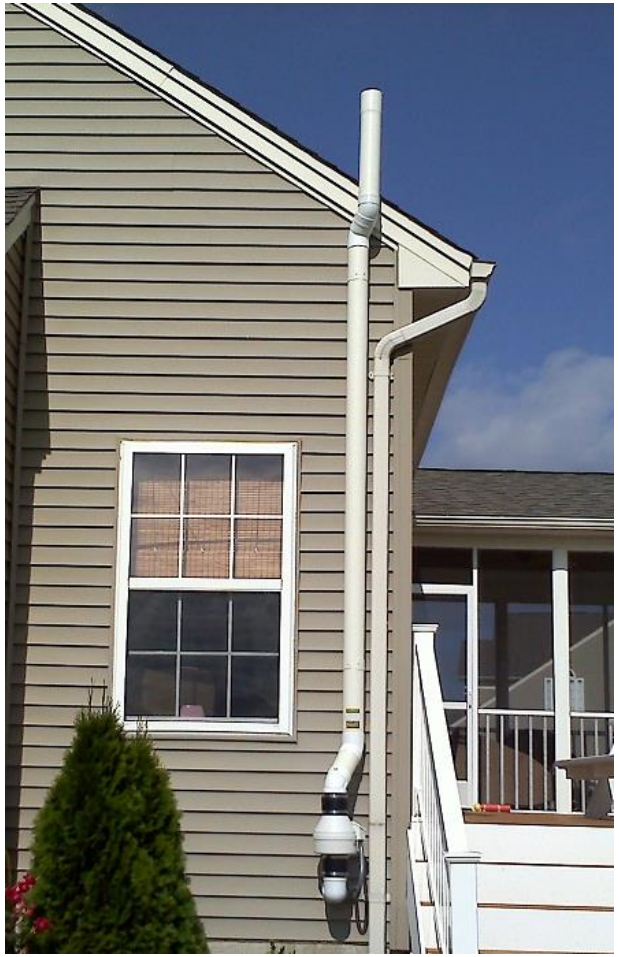


Can you demonstrate this will <u>not</u> happen?

MITIGATION: ELEVATORS



LONG-TERM MONITORING: IS IT WORKING?



- ✓ Commissioning
  - ✓ Rigorous
  - ✓ High Frequency
  - ✓ Duration (~6 -12 mos.)
  - ✓ RP's responsibility
- ✓ Long-term
  - ✓ Simple
  - ✓ Low Frequency
  - ✓ Duration (indefinite)
  - ✓ Plan for property owner's responsibility

COMMISSIONING: VERIFY PERFORMANCE

EXAMPLE

- ✓ Frequency
  - 2 to 3 times
  - At least once during heating season
- ✓ Pressure Field Extension (PFE)
  - 1Pa or 0.004 inch-H_2O
  - Over entire area
- ✓ Indoor Air
  - Do if Indoor Air > VAL in the investigation
  - At same time as PFE

COMMISSIONING: RECORD BASELINE

EXAMPLE

- ✓ Fan Manometer
  - At same time as PFE
  - Permanently mounted
- ✓ Photos/Map
  - Barrier Conditions
  - Parts Inspection
- ✓ Optional
  - Air Flow in Pipe
  - Backdraft Testing for combustion appliances

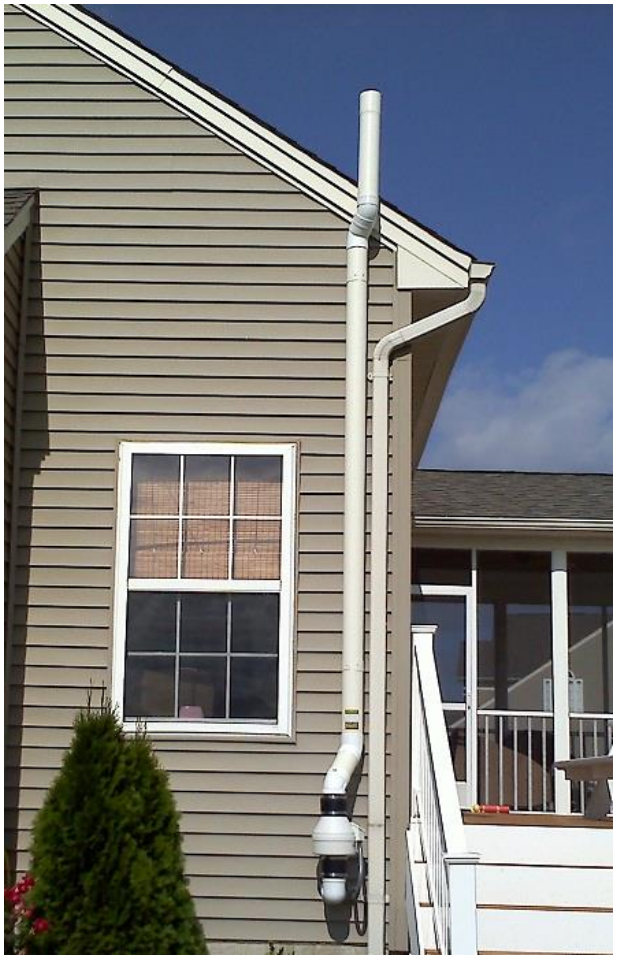
LONG-TERM MONITORING

EXAMPLE

- ✓ Frequency
  - At least once/yr
  - Heating season (preferred)
- ✓ Checklist
  - Manometer
  - Barrier Conditions
  - Parts Inspection
- ✓ Compare to baseline

SUMMARY

- ✓ Action Criteria
  - When to Sample
  - When to Mitigate
- ✓ Mitigation Options
  - Will it be effective
  - How does it work
- ✓ Long-term Monitoring
  - Is it working now
  - Is it continuing to work and match baseline conditions



QUESTIONS

CONTACT INFORMATION

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Issues & Trends 2017

October 4, 2017
12:00 p.m.

Look for information soon on the *NEW* RR Report web site:
rr-report.blogs.govdelivery.com

Audio and information from today's presentation and future *Issues & Trends Series* events can be found on the RR Program Training Webpage at:
Http://dnr.wi.gov/topic/Brownfields/Training.html

Questions/Comments/Suggestions regarding the Issues & Trends Series can be submitted to:
DNRRRComments@wisconsin.gov

WISCONSIN DEPT. OF NATURAL RESOURCES

Environment Cleanup Redevelopment Partnership
Remediation and Redevelopment