



***Installation Management Command
U.S. Army Garrison Picatinny Arsenal***

US Army Garrison



Picatinny Arsenal

Vapor Intrusion

Introduction and Overview

Presented by Nadine Weinberg

Our Mission: To provide standardized, effective & efficient services, facilities and infrastructure to Soldiers, Families and Civilians for an Army and Nation engaged in persistent conflict.

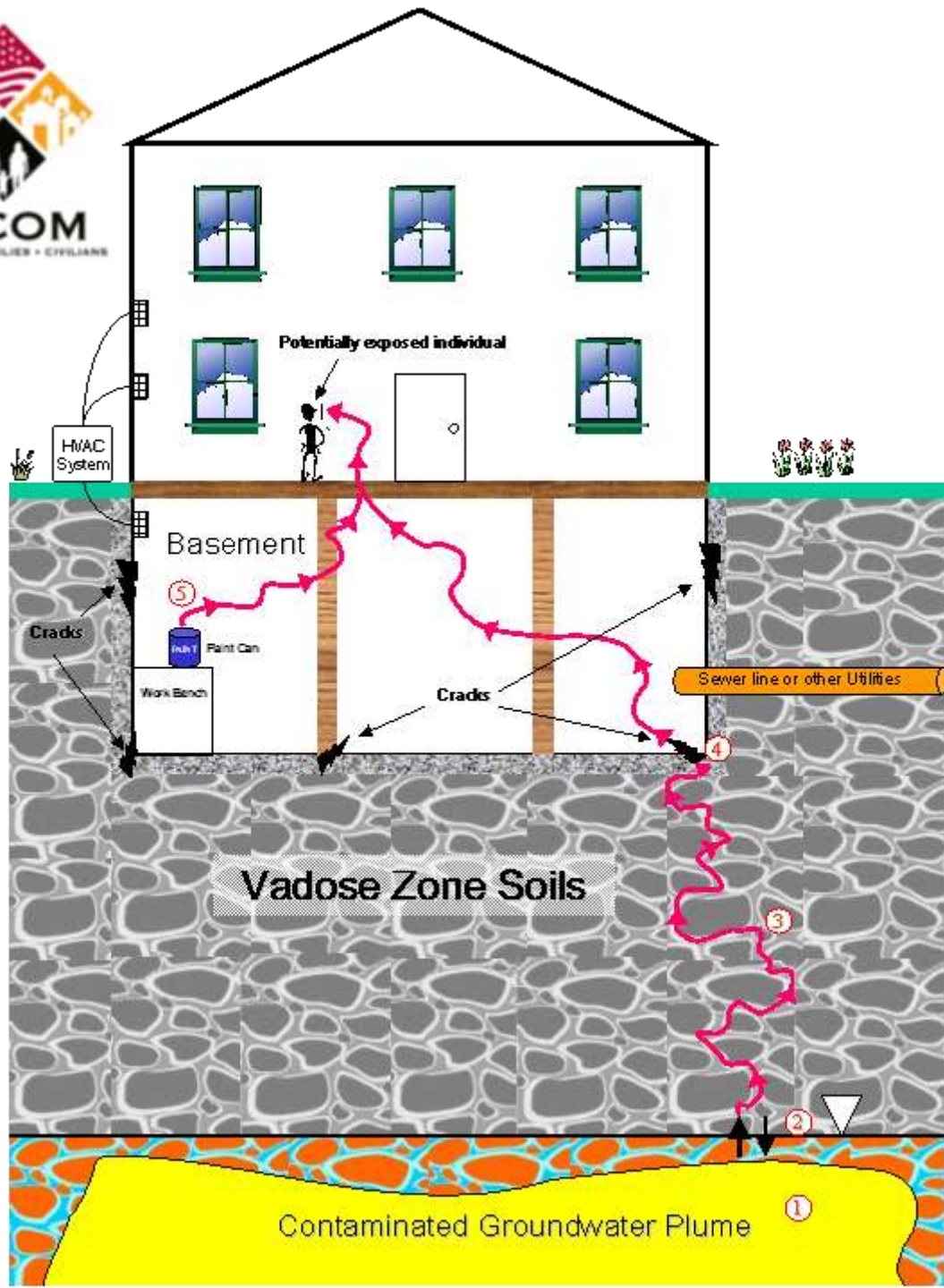
We are THE ARMY'S HOME



Overview of Presentation

- What is Vapor Intrusion (VI)
- USEPA and NJDEP VI Guidance
- Sampling methods
- Mitigation
- Picatinny VI evaluations





Vapor Intrusion Pathway

What is it?

1. Source (GW & Soil)
2. Volatilization
3. Movement through soil pore spaces (soil gas)
4. Infiltration through building cracks/sumps
5. Indoor background sources



Key steps in dealing with a potential vapor intrusion issue.



- Understand the regulations
- Develop a conceptual site model
- Develop a VI approach/strategy
 - Additional investigation
 - Groundwater and soil screening
 - Soil gas/near slab soil gas
 - Subslab soil gas
 - Indoor air
 - Modeling and risk assessment
 - Mitigation

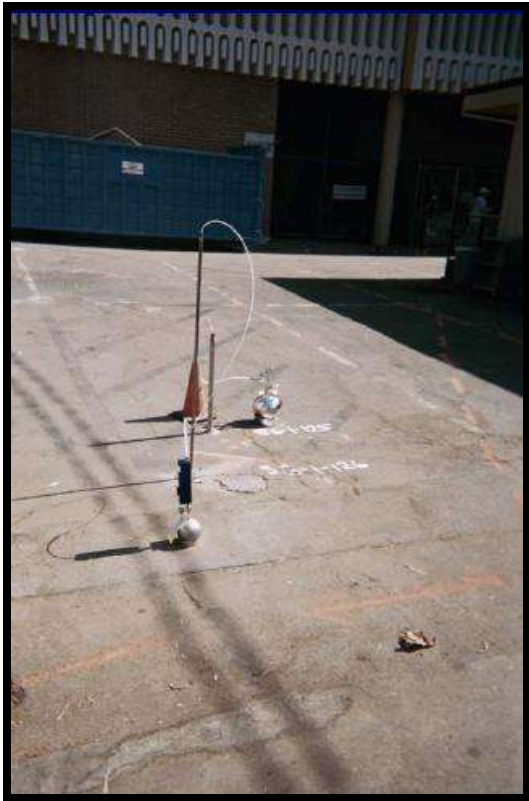


USEPA VI Guidance

- USEPA 2002 to be updated in 2012
- White papers (Technical Bulletin)
 - Attenuation factors
 - Background concentrations
 - Conceptual Site Model
- Empirical data key
 - Longer term (passive sampling)
 - Multiple sub-slab samples
 - Multiple temporal samples
- Petroleum VI Information Paper released June 2010



NJDEP VI Guidance and Regulations



- NJDEP VI Guidance released in 2005
 - Screening values for gw, soil gas, and indoor air updated in 2007
- VI Guidance under review; no due date identified
- VI part of receptor evaluations for every site
 - VI sampling results may trigger an IEC or VC which requires follow up actions with regulatory timeframes.

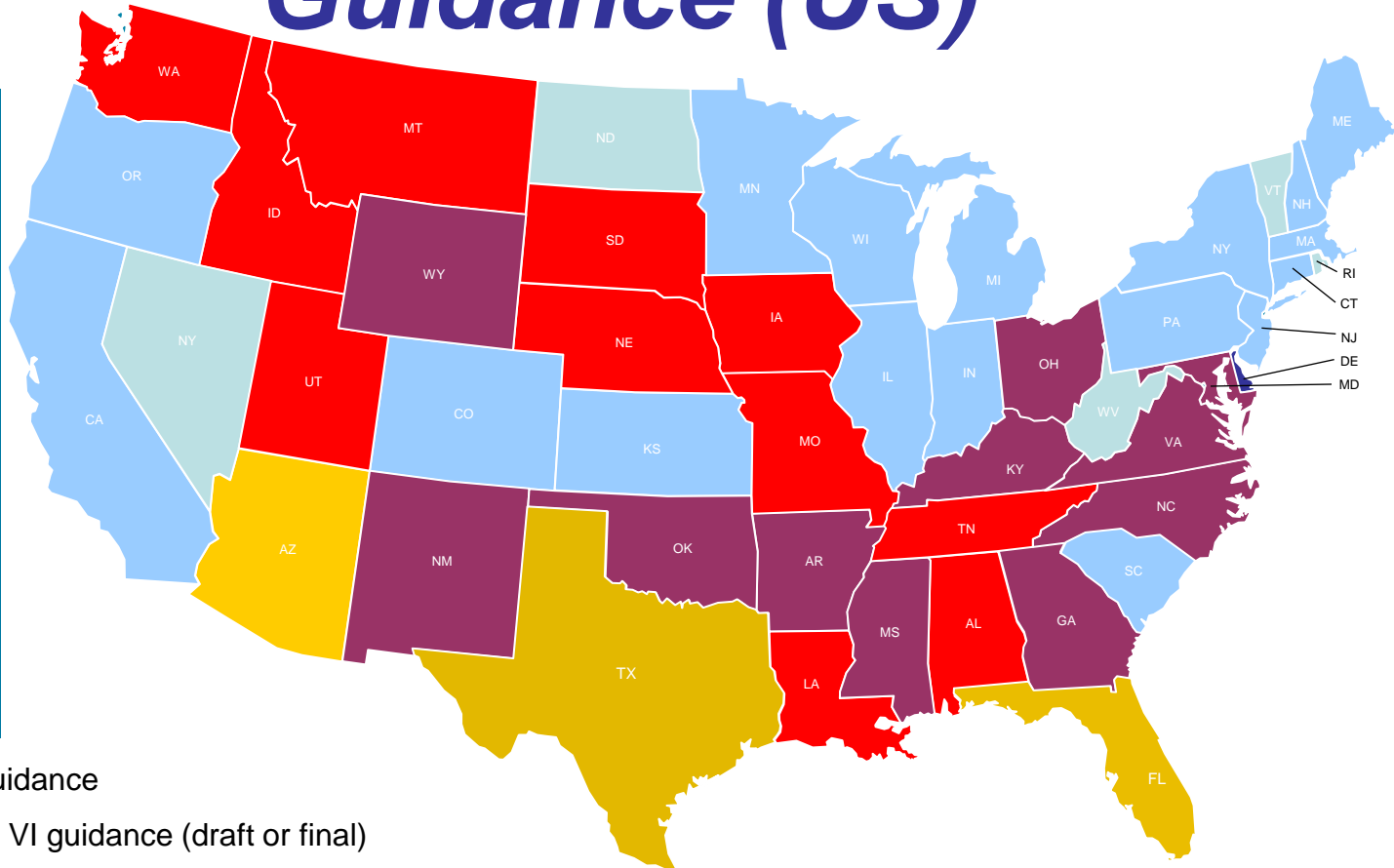
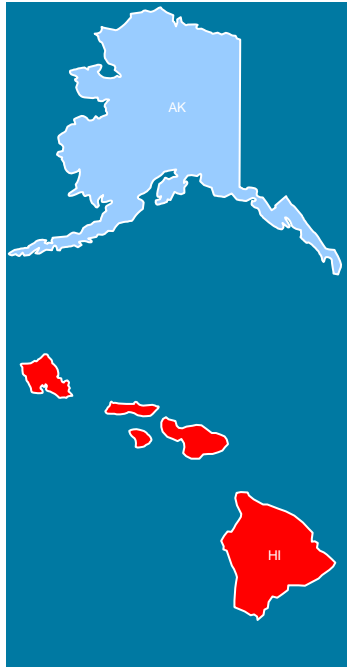


Status of Regulatory Guidance (US)¹

US Army Garrison



Picatinny Arsenal



- States developing VI guidance
- States with stand alone VI guidance (draft or final)
- States with guidance as part of another program (limited guidance)
- States that rely on USEPA guidance
- No State guidance developed (likely to rely on USEPA)

¹ While we believe the information presented in this slide to be accurate as of July 2010, the information is not intended as advice. You should always formally discuss vapor intrusion issues with the appropriate state regulatory agency before taking action on matters associated with the vapor intrusion pathway at your sites.

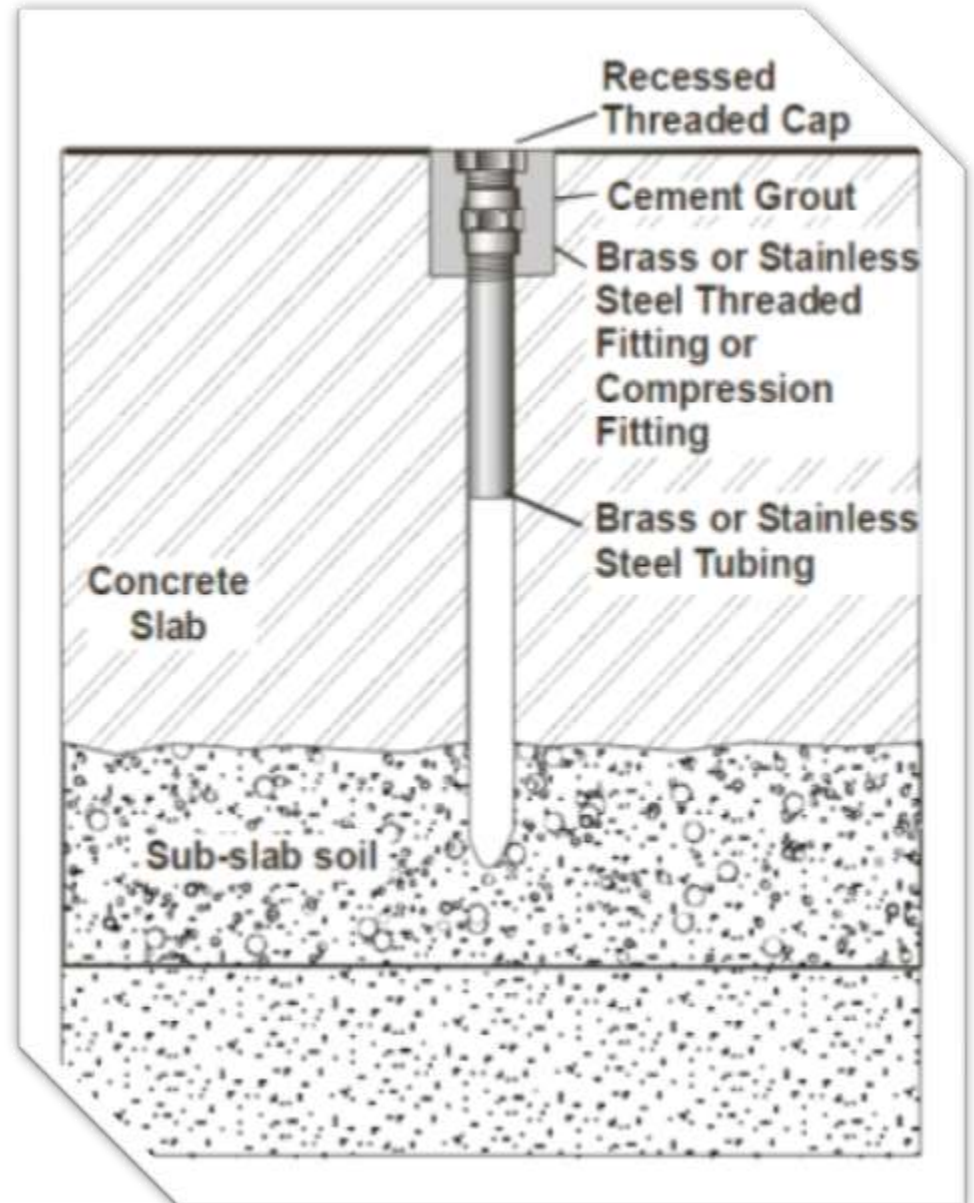


Developing a VI Conceptual Site Model

Understand site conditions	Identify preferential migration of vapors	Evaluate driving forces that move soil gas into buildings
<ul style="list-style-type: none">• Geology• Hydrogeology• Source areas and concentrations• Media of concern• COPC• Soil gas, sub-slab, indoor air data	<ul style="list-style-type: none">• Plumbing, gas and electrical utility corridors• Elevator shafts• Sumps and drains• Floor and basement wall cracks	<ul style="list-style-type: none">• Stack effects (warm air rises!)• Exhaust ventilation• Gas generating processes (i.e., metabolism, oxidation)• Wind effects• Weather changes (pressure)

Sub-slab Soil Gas Sampling

- Sample from directly below slab or concrete surface
- Temporary or permanent
- Co-locate with indoor air
- Preferred by many regulatory agencies



Ambient and Indoor Air Sampling



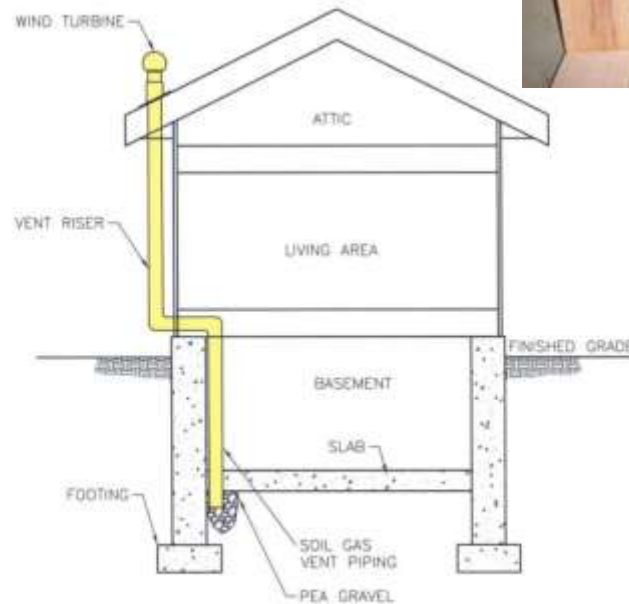
- Obtain data on current exposures
- Identify background sources of VOC
 - Indoor air – cleaning projects, paint, nail polish, etc.
 - Ambient air (outside) – roadways, airport, factory, etc.
- Collected at breathing height (3-5')
- Consider exposure durations (worker vs. residential)





Mitigation Options

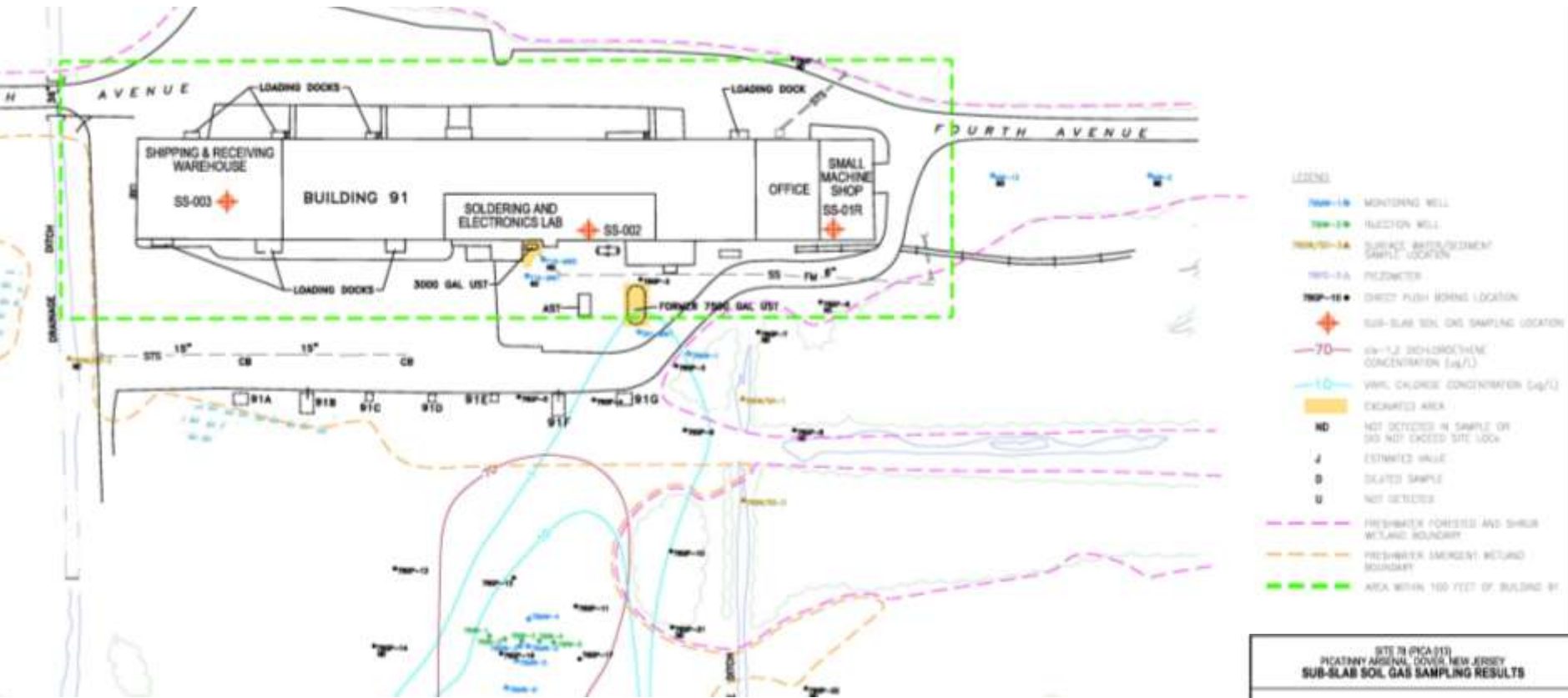
- Sealing
 - Cracks/Seams
 - Block Walls
 - Sumps
 - Utility openings
- Sub-slab Depressurization
 - Active
 - Passive



TYP. VAPOR CONTROL SYSTEM - BASEMENT
SCALE: NOT TO SCALE



Building 91 VI Evaluation



SITE #1 (PCA#1)
 PICATINNY ARSENAL COVER, NEW JERSEY
SUB-SLAB SOIL GAS SAMPLING RESULTS

SUB-SLAB SOIL GAS SAMPLING LOCATIONS

 FIGURE
2



Building 91

Sub-slab Soil Gas Results

Table 1. Sub-slab Soil Gas Analytical Data
Building 91, Site 78 (PICA 013)

Volatile Organic Compounds	NJDEP Soil Gas Screening Level Non-Residential	Sample Location Sample ID Sample Type Sample Date	SS-01R		SS-002		SS-003	
			B-91-SS-01R-110210 Soil vapor 11/02/10		B-91-SS-002 (101910) Soil Vapor 10/19/10		B-91-SS-003 (101910) Soil Vapor 10/19/10	
Carbon disulfide	51,000	$\mu\text{g}/\text{m}^3$	190		16	U	16	U
1,2-Dichloroethene (trans)	5,100	$\mu\text{g}/\text{m}^3$	12		8	U	8	U
Tetrachloroethene	36	$\mu\text{g}/\text{m}^3$	14	U	14	U	26	
Toluene	360,000	$\mu\text{g}/\text{m}^3$	14		8	U	8	U

All units in ($\mu\text{g}/\text{m}^3$) microgram per cubic meter

BOLD: Indicates detection

- NJDEP and USEPA agreed that VI pathway was incomplete and no further action was needed.

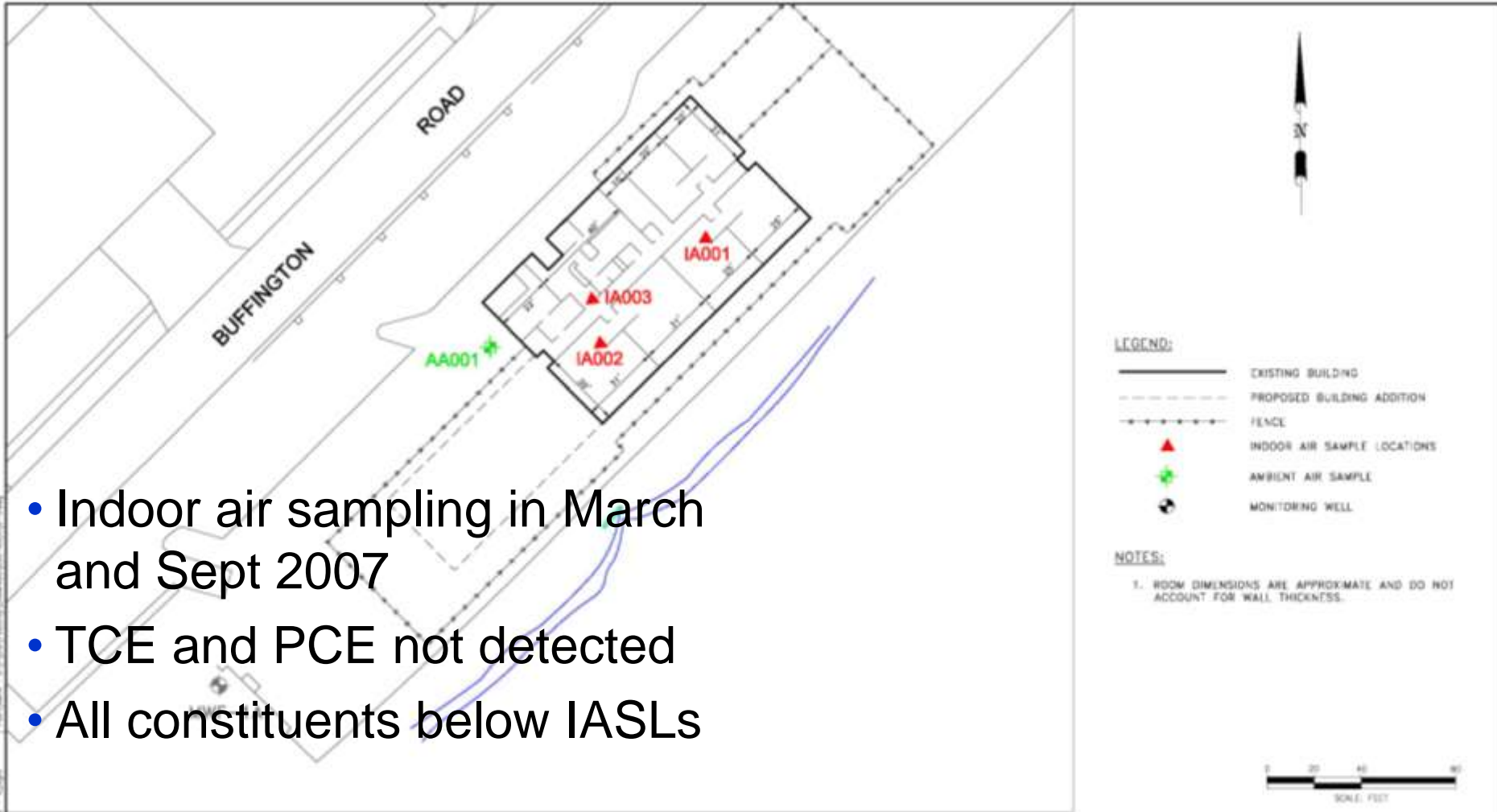


Child Development Center

US Army Garrison



Picatinny Arsenal



- Indoor air sampling in March and Sept 2007
- TCE and PCE not detected
- All constituents below IASLs



VAPOR INTRUSION SAMPLING - SEPTEMBER 2007
SAMPLING LOCATIONS
CHILD DEVELOPMENT CENTER

PICATINNY ARSENAL, NEW JERSEY

PROJECT SHEET	DATE
DRAWN	CHECKED
JUL	DEC
PROJECT ALIEN	DRAWN NUMBER
GP06PCA.P204	1



Area D VI Investigation

- Indoor air at 14 homes and offices sampled in 1997
- Indoor air sampled at 11 homes and offices in Oct 2007 and Jan 2008
- TCE identified just above NJDEP IASLs in Building 30
 - All concentrations below OSHA values
 - Estimated cancer risk = 3×10^{-6}
 - Estimated noncancer risk less than 1



INSTALLATION MANAGEMENT COMMAND



“Sustain, Support and Defend”