NAVFAC Vapor Intrusion Activities

November 10, 2009

Kim Parker Brown, M.S., PE

NAVFAC HQ

Overview

- **Navy Vapor Intrusion (VI) Policy**
- **Summary of Navy VI Sites**
- **Navy VI Focus Group**
- **Tools and Technical Efforts**

Navy/Marine Corps Policy on Vapor Intrusion

- **Navy/Marine Corps Policy on Vapor Intrusion (VI) - April 2008**
  - **Describes how to consider VI pathway in the Environmental Restoration Program**
    - **When to evaluate the VI Pathway**
    - **Considerations for planning and implementing a VI pathway evaluation**
    - **Considerations of background chemical issues**
    - **Considerations of human exposure and potential risk**
    - **Considerations for evaluating remedial alternatives**
    - **Considerations for previously transferred property**
  - **Policy is applicable to site investigations and response actions funded under ER,N and BRAC**

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

5090
Ser N453/8U158104
29 April 2008

From: Chief of Naval Operations
To: Commander, Naval Facilities Engineering Command

Subj: NAVY/MARINE CORPS POLICY ON VAPOR INTRUSION

Encl: (1) Navy/Marine Corps Policy on Vapor Intrusion

1. Enclosure (1) is provided in response to concerns received from the field to clarify Navy policy on the evaluation and remediation of the Vapor Intrusion (VI) pathway in the Environmental Restoration program. Enclosure (1) describes how to consider VI in the program by 1) determining whether to evaluate the VI pathway for a site; 2) planning and implementing a VI pathway evaluation; 3) addressing background chemical issues; 4) evaluating risk for human health exposures associated with the VI pathway; 5) evaluating remedial alternatives; and 6) considering previously transferred property.

2. My staff point of contact is Ms. Kendra D. Holmes, N453 at (703) 602-2571 or DSN 332-2571 or email kenda.holmes@navy.mil.

L. BICE
Rear Admiral, U.S. Navy
Director, Environmental Readiness Division (OPNAV N45)

Copy to:
BRAC PMO
NAVFAC ATLANTIC (Code 18)
NAVFAC MIDATLANTIC (Code 18)
NAVFAC MIDWEST (Code 18)
NAVFAC NORTHWEST (Code 18)
NAVFAC SOUTHEAST (Code 18)
NAVFAC SOUTHWEST (Code 18)
NAVFAC WASHINGTON (Code 18)
NAVFAC PACIFIC (Code 18)
NAVFAC HAWAII (Code 18)
NAVFAC MARIANAS (Code 18)
NAVFAC ESC (Code EV40)

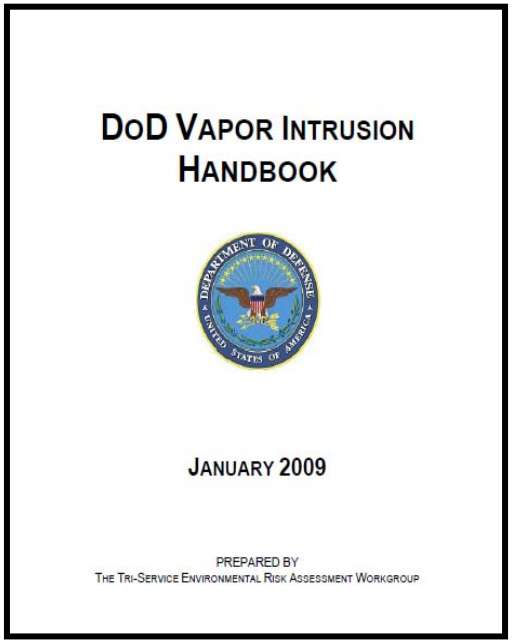
Navy VI Sites

- **Estimated 75 potential VI sites across NAVFAC**
- **VI Source:**
  - **59 Sites (79%) chlorinated VOCs in groundwater / soil**
  - **8 Sites (11%) petroleum and VOCs**
- **Soil gas and / or indoor-outdoor air sampled at 20 sites**
- **VI Remedial Actions:**
  - **VI Investigations planned or underway at 57 sites**
  - **VI Remedial Actions anticipated at 16 sites**
    - High concentrations in subsurface beneath buildings
  - **VI Remedial Actions implemented**
    - Land use/building controls
    - Sub-slab depressurization system

Facilities Engeering Command	# VI Potential Sites	VI Source			# Sites Soil Gas / Air Sampled	SI / RI: Remedial Action TBD	SI / RI: Remedial Action Anticipated	Remedial Action Implemented
		Petroleum	cVOCs	cVOCs & Petroleum				
	75	5	59	8	20	57	16	4

Navy Vapor Intrusion Focus Group

- **Develop decision tools to supplement DoD Vapor Intrusion Handbook**
- **Understand variability in regulatory approaches**
- **Support and apply VI research and new & innovative technologies**
  - **ESTCP, NESDI, SPAWAR Best Practices**
- **Access to industry technical expertise**
  - **Robbie Ettinger (Geosyntec, Inc.)**
  - **Tom McHugh (GSI Environmental)**



Navy Vapor Intrusion Focus Group

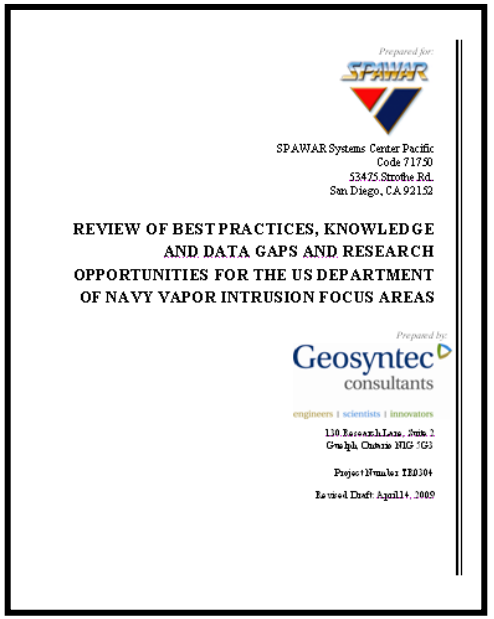
- **Supported by**
  - **NAVFAC**
  - **NFESC**
  - **NMCPHC**
  - **Contractor technical leads**

- **Provide RPMs technical support for VI investigations**
  - **Planning VI investigations**
  - **Data review and interpretation (multiple lines of evidence)**
  - **Regulatory negotiations**
  - **Mitigation assessment and planning**

- **Track VI site investigation progress**

Tools and Technical Efforts

- **BEST PRACTICES for US Department of Navy Vapor Intrusion Focus Areas (NESDI funded)**
  - **Subsurface samples to assess VI and minimize the need for intrusive sub-slab samples**
  - **Sampling methods for indoor air to improve exposure estimates**
  - **Indoor air source separation methods to tease out background**
- **End Products:**
  - **Best Practices Review Document**
  - **Identify technologies for improved VI assessment**
  - **Technology Demonstration & Validation Reports**
- **Technologies for demonstration at Navy sites**
  - **Passive adsorptive samplers**
  - **Pressure cycling (induced depressurization)**


Prepared for:
SPAWAR

SPAWAR Systems Center Pacific
Code 71750
53475 Strothe Rd.
San Diego, CA 92152

REVIEW OF BEST PRACTICES, KNOWLEDGE AND DATA GAPS AND RESEARCH OPPORTUNITIES FOR THE US DEPARTMENT OF NAVY VAPOR INTRUSION FOCUS AREAS

Prepared by:
Geosyntec consultants
engineers | scientists | innovators

Project Number TR0304

Revised Draft: April 14, 2009

Tools and Technical Efforts

- **VI Conceptual Site Model Checklist**
  - **Guide RPMs**
  - **Basis of interactive tool being developed by Focus Group**
- **VI Web Tool**
  - **Environmental Restoration Technology Transfer (ERT2) Web Page**
  - **NFESC collaboration with VI Focus Group**

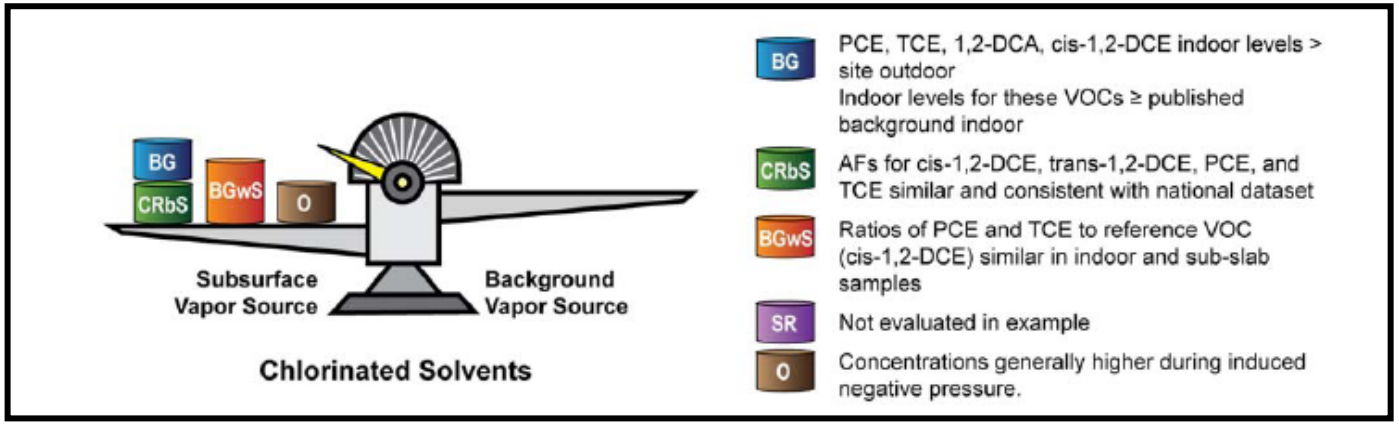
Conceptual Site Model Checklist – Vapor Intrusion	
Site Name	
	Do concentrations exceed generic screening criteria based on appropriate exposure scenarios/contaminated media? (For generic screening criteria refer to: 1) Appendix H of the ITRC [2007] guidance; 2) Use of USEPA Johnson & Ettinger model for Subsurface VI to Indoor Air; 3) State-specific screening levels/guidance)
Background Levels	Identify background contributions to indoor air ☐ Outdoor Sources: ☐ Indoor Sources: What are the background concentrations for each COC at the site?
Vapor Migration Mechanisms	What are the dominant migration mechanisms at the site? ☐ Diffusion of vapors from sources in the unsaturated zone ☐ Diffusion of vapors from sources in the shallow ground water ☐ Advective/convective transport of vapors ☐ Vapor migration through preferential pathways
Building Uses and Characteristics	Record relevant building information: ☐ Building use (e.g., residential, non-residential) ☐ Exposed population (e.g., adult, children) ☐ Foundation type/material (e.g., slab on grade, basement) Evaluate the enclosed inhabited space of the building, "Building Envelope" ☐ HVAC system ☐ Leaky or tight (sumps/open pits) ☐ Differential pressure monitoring
Factors Affecting Vapor Migration	Define the key vadose zone characteristics and vapor migration pathways: ☐ Depth to source ☐ Soil type ☐ Horizontal extent of contamination ☐ Distance of vapor source from buildings ☐ Sufficient delineation of the source area(s ☐ Identify locations and depths of major underground utilities
Risk Assessment Exposure Pathways and Receptors	
Current and Future Land Use	Current: ☐ residential ☐ industrial ☐ commercial ☐ agricultural ☐ recreational ☐ other Future: ☐ residential ☐ industrial ☐ commercial ☐ agricultural ☐ recreational ☐ other Surrounding: ☐ residential ☐ industrial ☐ commercial ☐ agricultural ☐ recreational ☐ other
Contaminant Release	Source # __: ☐ leaching ☐ volatilization ☐ fugitive dusts ☐ erosion/runoff ☐ plant uptake

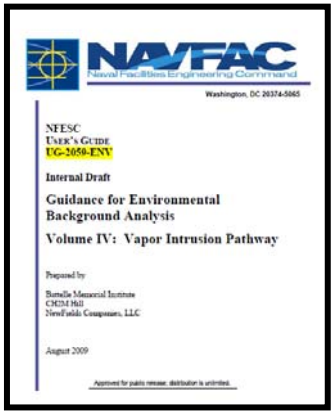
Tools and Technical Efforts

- **VI Guidance for Background Analysis**
  - **Exploratory data analysis methods**
  - **Forensic analysis methods**
  - **Statistical analysis methods**
- **Draft – currently in internal review**
- **Volume IV of Background Series**

BOX 3-3. Comparison of constituent ratios within samples

How does it work?	The chemical ratios (e.g., PCE to *cis*-1,2-DCE) within each medium are calculated and compared between media to see if they are similar. This is a simplified version of the forensics methods presented in Section 4.
How does this help ?	Similar ratios (i.e., chemical compositions) between indoor and outdoor air may suggest an outdoor source. Likewise, similar indoor and sub-slab ratios may indicate a subsurface source (i.e., vapor intrusion may be occurring).
Limitations and uncertainties	Concentrations close to the quantitation limits may be suspect and small differences can cause large changes in constituent ratios. Different consitutents may have different results. One comparison may indicate vapor intrusion and another may suggest outdoor sources. This could reflect reality (different sources) or could be the result of inherent variability.
How to improve the evaluation	Collect a sufficient number of representative samples. Avoid using results below the quantitation limit. Assess multiple ratios to assess trends and/or consistency of conclusions.





Questions

Points of Contact

- **Kim Parker Brown**
  - **(202) 685-0096**
  - **kim.brown@navy.mil**
- **Dan Waddill**
  - **(757) 322-4983**
  - **dan.waddill@navy.mil**
- **Donna Caldwell**
  - **(757) 322-4816**
  - **donna.caldwell@navy.mil**
- **Amy Hawkins**
  - **(805) 982-4890**
  - **amy.hawkins@navy.mil**