



Course ID: VAQM - 401



CONTAMINANT VAPOR MIGRATION AND INTRUSION

An overview of assessment, modeling, remediation, and institutional controls

The Northwest Environmental Training Center presents:

Contaminant Vapor Migration and Intrusion - An overview of assessment, modeling, remediation, and institutional controls

Course ID: VAQM-401 (2 days)

December 3-4, 2008, 8:30 A.M. to 5 P.M.

NWETC - Headquarters

650 South Orcas Street, Suite 220

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Instructor: Henning Larsen

Description: This course provides an overview of the vapor intrusion exposure pathway including its scientific foundation, regulatory framework, and the technical aspects of investigating and remediating contaminated vapor sites. The class will cover topics such as: screening sites for potential vapor intrusion concerns, conducting field investigations, sampling techniques, data analyses, exposure point calculations, the Johnson and Ettinger predictive model, vapor intrusion risk assessment, vapor intrusion mitigation, and remediation. Participants will work through practical problems and typical site scenarios based on case studies of established vapor intrusion sites. This course provides a comprehensive introduction for those new to the field, and will also provide insights, data analysis techniques, and the latest research for more advanced participants.

About the Instructor: Mr. Larsen received his bachelors degree in Geology from Humboldt State University and masters degree in Water Resource and Environmental Engineering from Oregon State University. He currently works for the Oregon Department of Environmental Quality (ODEQ) as a Senior Hydrogeologist for the Environmental Cleanup Program. Mr. Larsen has been researching, training professionals, and developing guidance on the vapor intrusion pathway since 1995 and is a co-author of ODEQ's Risk-Based Decision Making for the Remediation of Petroleum Contaminated Sites.

Course Topics:

Introduction

Overview and Definitions

- Context of hazardous substance cleanup sites
- Defining "Volatile Chemicals"
- Migration pathways

Vapor Migration Issues

- Human health risks
- Universal nature of pathway
- Mitigation/Remediation
- Future property development/brownfields redevelopment

Vapor Chemistry

- 3 and 4 phase chemical partitioning
- Partitioning as predicted by: Henry's law, vapor pressure, and Raoult's law

Vapor Physics

- Diffusion
- Fick's Law

Vapor Intrusion Investigations

- Sampling techniques for groundwater, soil, slab, and indoor air
- Depth discrete
- Temporary vs. permanent monitoring points
- Analytical methods
- Spatial temporal variability
- Limitations
- Correlation to indoor levels
- Antecedent conditions
- Creating cross section profiles
- Second lines of evidence

Data Analysis and Interpretation

- 90/95% UCLs
- Sample sets
- Data distributions
- ProUCL
- Biased vs. non biased data sets
- Thiessen Polygon Method
- Using Means

- Advection

Hydrogeology

- Soils
- Vapor permeability
- Heterogeneities
- Porosity (total, air-filled/water-filled)
- Perched water
- Preferential vapor migration
- Distinction between vapor flux and concentration
- Groundwater (depth to contamination, diving plumes)

Biodegradation

- Chlorinated VOCs
- Petroleum hydrocarbons

Building Design Issues

- Foundation types
- Space partitioning
- HVAC systems

Regulatory Framework:

- Identification of chemicals of interest
- Delineation of extent and magnitude
- Groundwater
- Soil
- Soil gas
- Indoor ambient air
- Determination of exposure point concentrations
- Consideration of background contaminant levels
- Calculation of risk
- Engineered and institutional controls
- Demonstrating compliance
- Forms

- Partitioned buildings
- Separation of ventilation systems

Johnson and Ettinger Model

- Types
- Data needs
- Parameter sensitivities
- Accuracy
- Value
- Problems and limitations
- Guidance

Case Studies

Vapor Mitigation Systems and Engineered Controls

- Modified HVAC systems
- Air treatment
- Sub-slab depressurization (types, performance/reliability)
- Vapor barriers (types, specifications)
- Combination systems

Vapor Remediation

- Source-zone treatment
- SVE systems
- Dual-phase (liquid ring pumps)
- Demonstrating compliance
- Off-gas treatment

Institutional Controls

- Use restrictions (documentation, long term compliance)
- Current and future uses
- Zoning
- Influence on property redevelopment

New Developments in Vapor Intrusion

- Future of Johnson and Ettinger Model
- EPA databases
- Correlation levels
- Empirical vs. theoretical results
- HVOCs vs. petroleum
- EPA guidance and use of generic attenuation factors
- Other vapor guidance

Intended Audience: Environmental professionals seeking an improved understanding of vapor migration and intrusion with an emphasis on vapor assessment and modeling. The material is intended for practitioners working on remediation of hazardous substance release sites and brownfields redevelopment.

Prerequisites: Basic math skills and a general understanding of contaminated sites.

Level: Introductory/refresher

Course Materials: Attendees will receive a binder containing workshop proceedings and reference material.

Continuing Education Units: 1.3

What to Bring: Pen or pencil, coffee mug, and a water bottle (to reduce waste). Please wear comfortable clothes appropriate for the prevailing weather. Drinks and snacks will be provided each day.

Registration: \$495 (*\$395)

** Reduced*

tuition is available for Native American tribes; government employees; nonprofits; students; and [NAEP](#), [NEBC](#), [NWAEP](#) members). You may register via the link below or by calling the Northwest Environmental Training Center at 206-762-1976.

Cancellation Policy: Registration fees are fully refundable up to 30 days prior to the event and 50 percent refundable (or

100% credit) thereafter up to the day prior to the event. Registration may occur up to the day prior to the event provided that space is available.

Northwest Environmental Training Center

A nonprofit 501(c)(3) program of the Northwest Environmental Education Council
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