

Updated: 11 December 2019 [Print version](#)

# CEE 370 Environmental Engineering Principles

Lecture #39  
Hazardous Waste II:  
Site Remediation

[Reading: Davis & Cornwall, Chapt 9](#)  
[Reading: Davis & Masten, Chapter 14](#)

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## Site Remediation Procedures

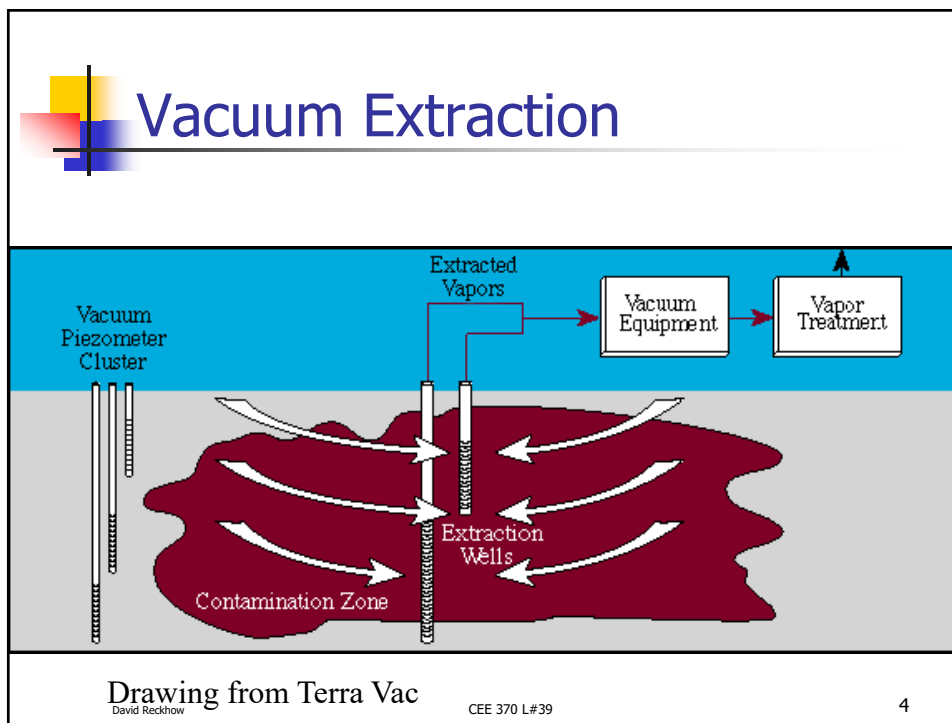
- Containment “buying time”
  - Pumped Containment: groundwater must be pumped and treated
  - Capping: minimizes surface water intrusion
  - Slurry Walls: trench filled with clay, down to aquiclude
- Conventional Cleanup Methods
- In Situ Cleanup Methods
  - Vacuum Extraction
  - Air Stripping
  - In Situ Biological Treatment

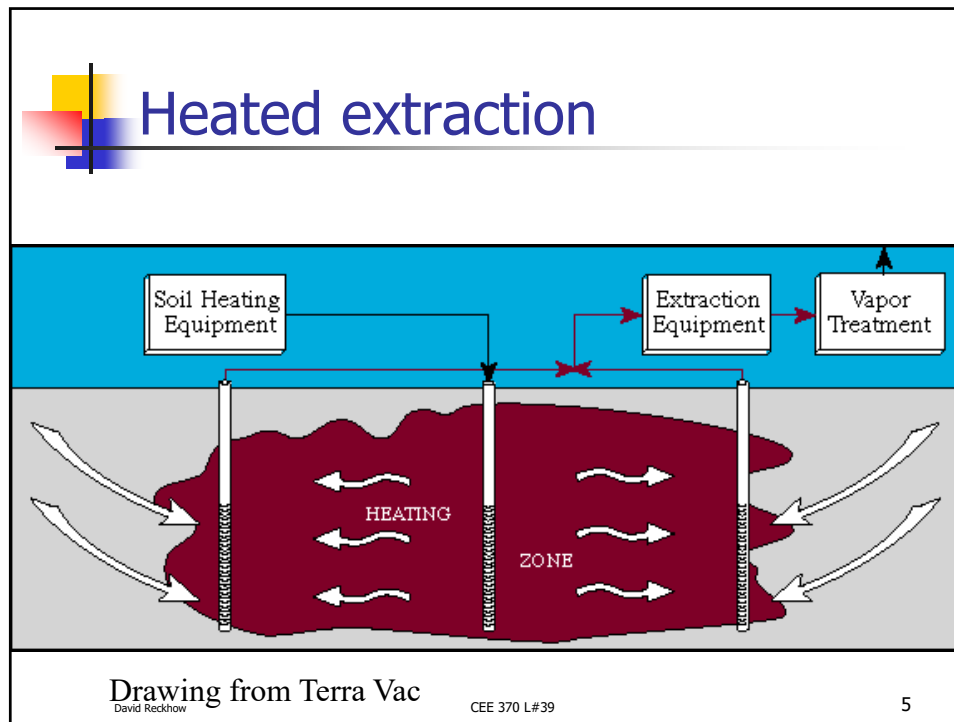
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## Vacuum Extraction

- Application of a vacuum
- resulting air flow induces volatilization
- only applicable for volatile and semi-volatile contaminants
  - chlorinated solvents
  - petroleum hydrocarbons
  - mercury
- Many site demonstrations

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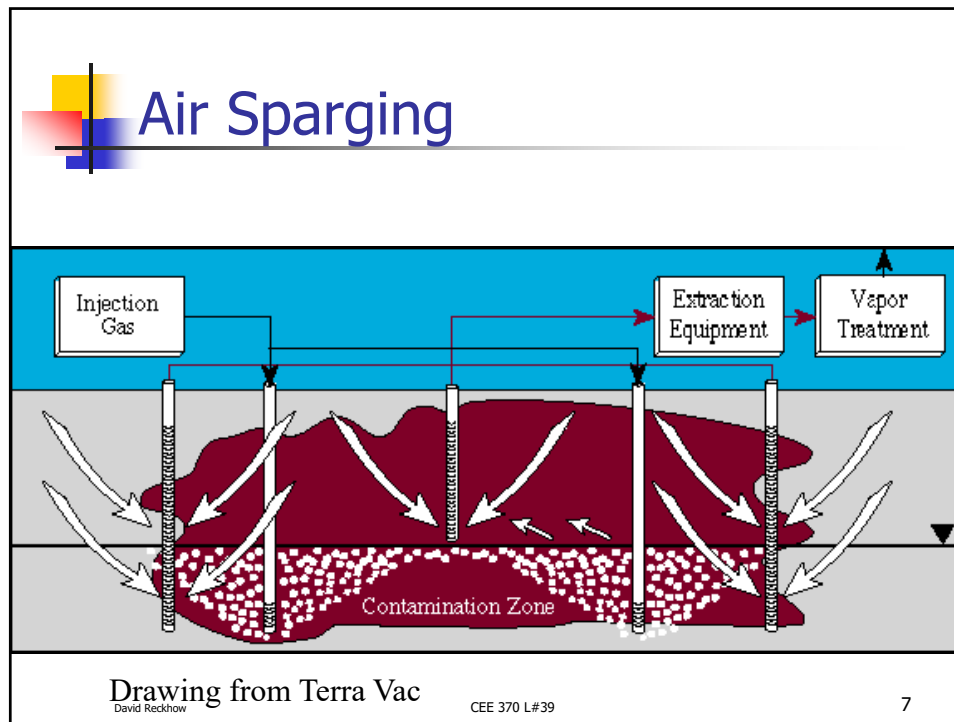
## Air Stripping/Sparging

- Injection of air under pressure into the saturated zone
- creation of subsurface bubbles
- generally combined with vacuum extraction
- applicable for soils with  $10^{-6}$  to  $10^{-1}$  cm/s hydraulic conductivity
- adds oxygen which can help with biodegradation

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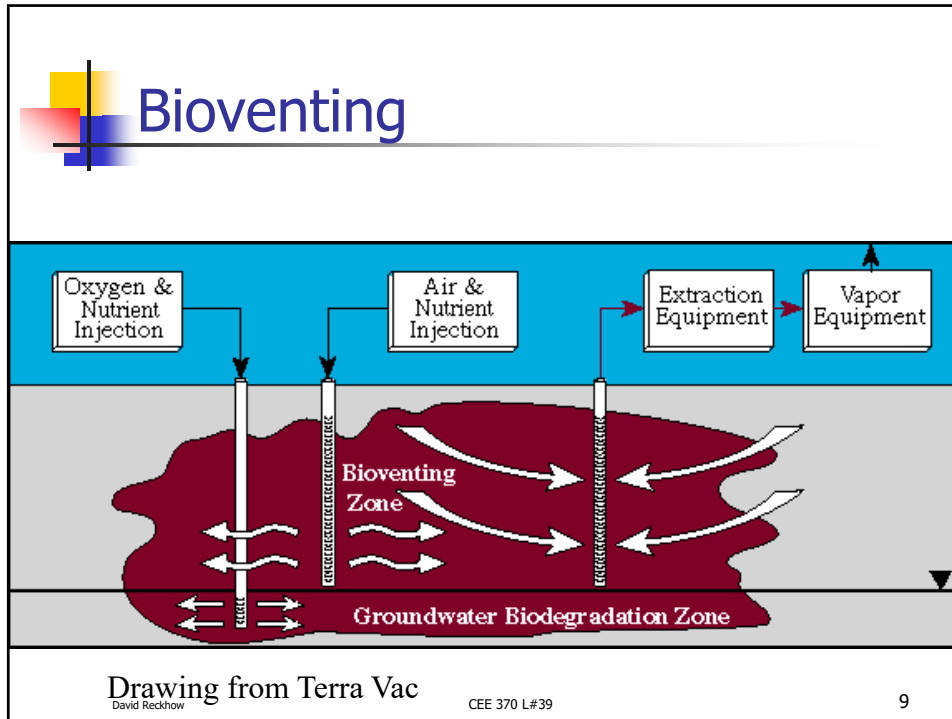
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## Bioventing

- A type of in situ biological treatment
- Injection of oxygen and possibly other nutrients into the saturated and/or unsaturated zone
- especially useful for biodegradable contaminants of low volatility
- often requires no vapor treatment
- low costs

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## Additional Sources of Information

- VISITT
  - Vendor Information System for Innovative Treatment Technologies
  - US EPA office of Solid Waste and Emergency Response; Technology Innovations Office
  - EPA-542-C-95-001 (ver 4.0; 5/95) and updates
- RREL Treatability Data Base
  - US EPA Risk Reduction Engineering Laboratory
  - EPA-600/C-93/003a (ver 5.0) and updates

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## End of Course

- Final Discussion on Hazardous Waste
- Lab Reports
- Final Exam

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## General Study guide

- Order of Importance
  - Homeworks
  - Lecture notes on the web
    - See next slides for more detailed guidance
  - Textbook

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- The End

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