

CEE 370

Environmental Engineering Principles



Lecture #39

Hazardous Waste II: Site Remediation

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

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



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

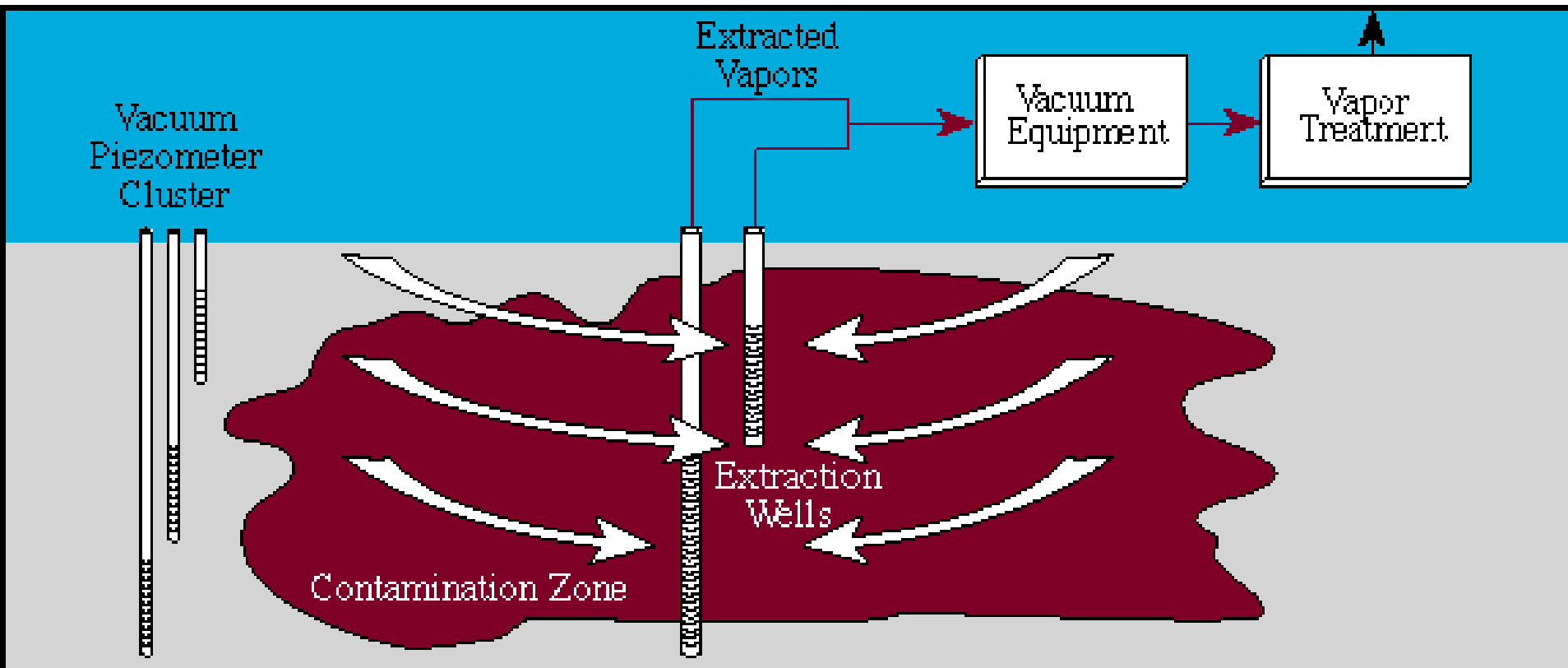
- Vacuum Extraction
- Air Stripping
- In Situ Biological Treatment



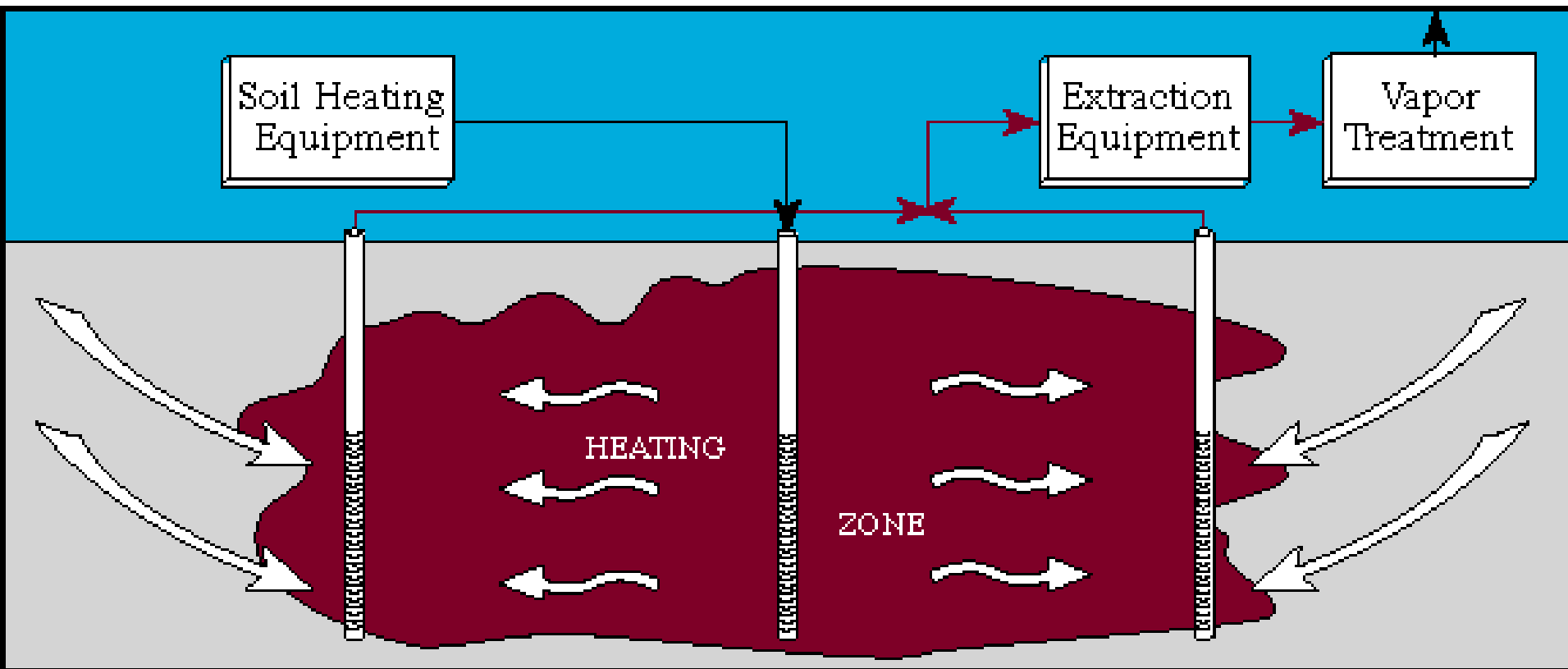
Vacuum Extraction

- 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

Vacuum Extraction



Heated extraction

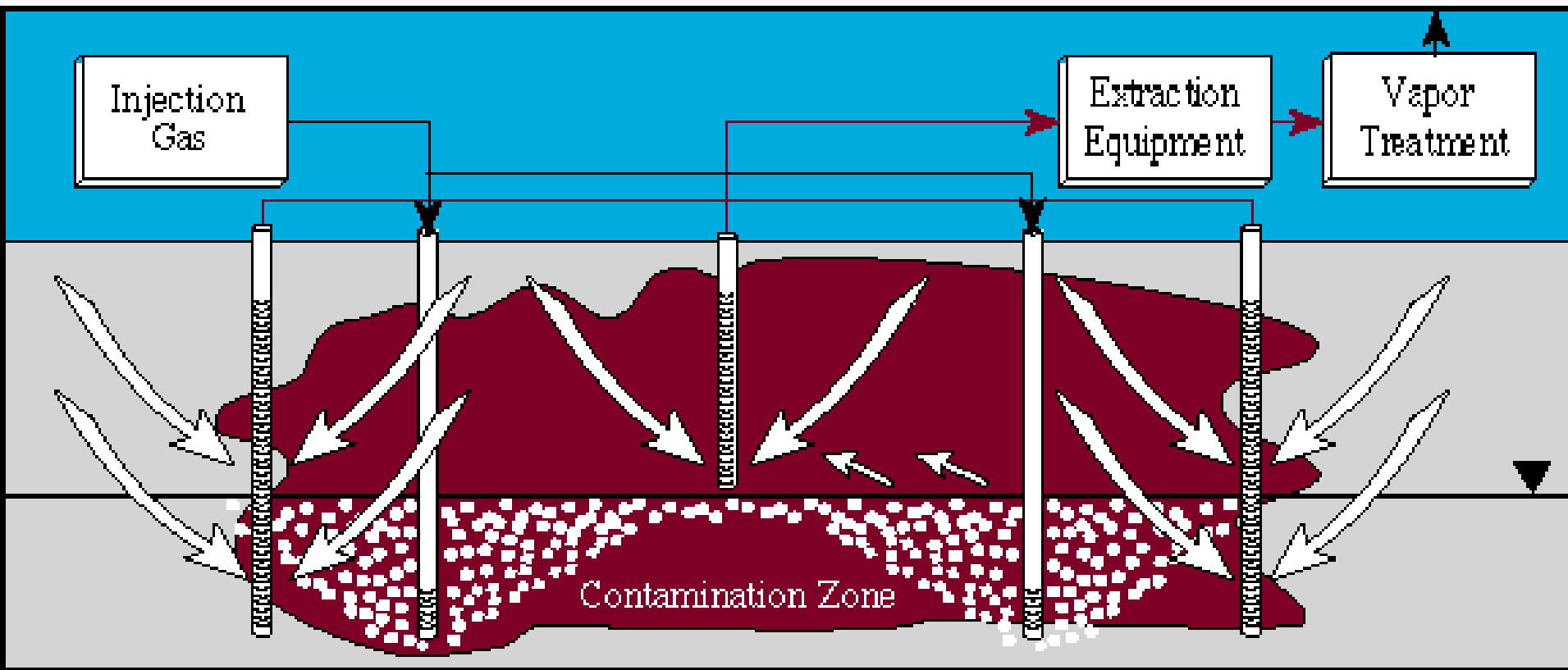




Air Stripping/Sparging

- 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

Air Sparging

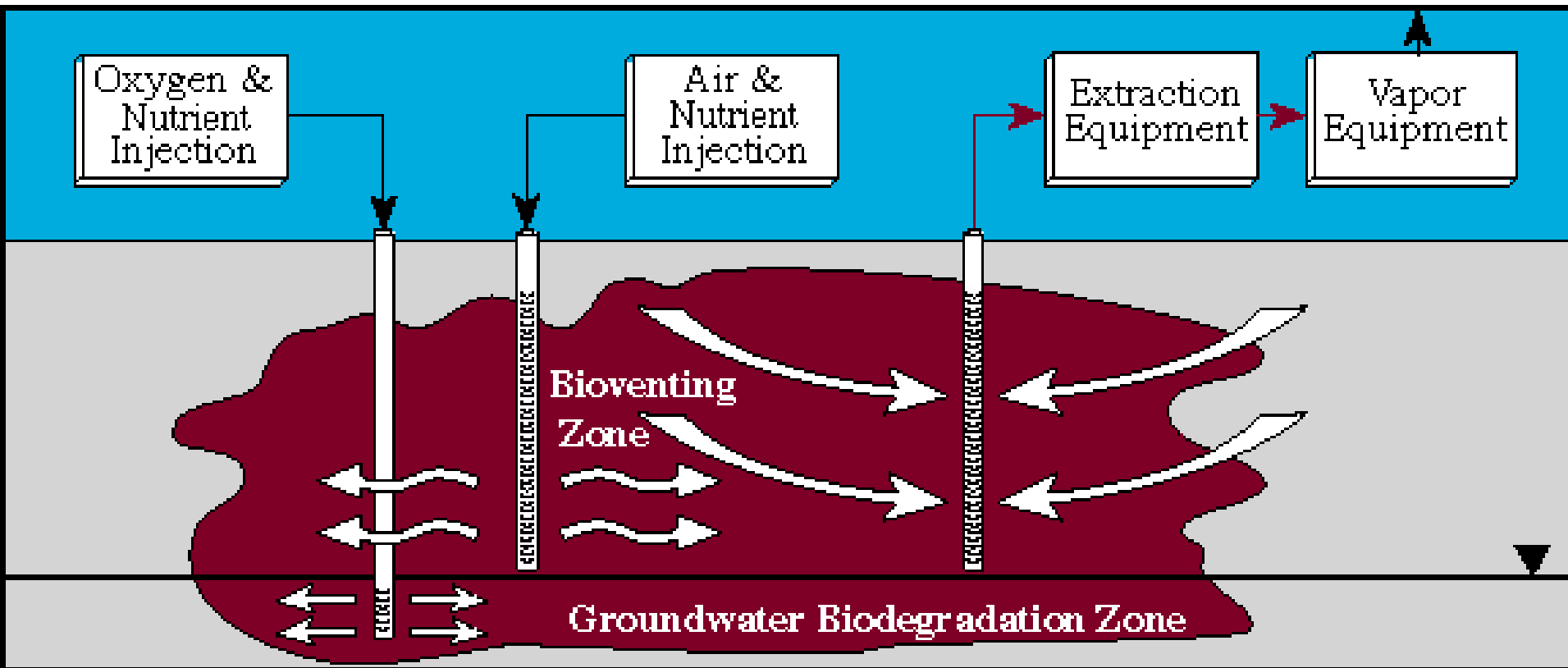




Bioventing

- 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

Bioventing





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



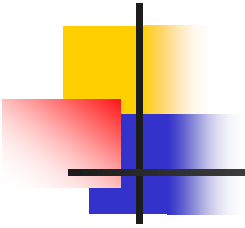
End of Course

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



General Study guide

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



- The End