



Bioreactor Research Needs and Challenges

Presentation

- Past Challenges
- Regulatory Challenges
- Operational Challenges
- Long-term Challenges





EPA Identified Challenges - 1999

- ✱ Long-term fate of metals
- ✱ Lack of data
- ✱ Increased operational requirements
- ✱ Landfill gas capture
- ✱ Leachate treatment and storage
- ✱ Landfill space and capacity reuse
- ✱ Greenhouse gas abatement
- ✱ Bioreactor design
- ✱ Solid waste density considerations
- ✱ Settlement
- ✱ Waste pretreatment
- ✱ Cover
- ✱ Management of amendments

Regulatory Challenges

- ✦ Infiltrating cover
- ✦ Alternative liner
- ✦ Non-indigenous liquids
- ✦ Airspace recovery

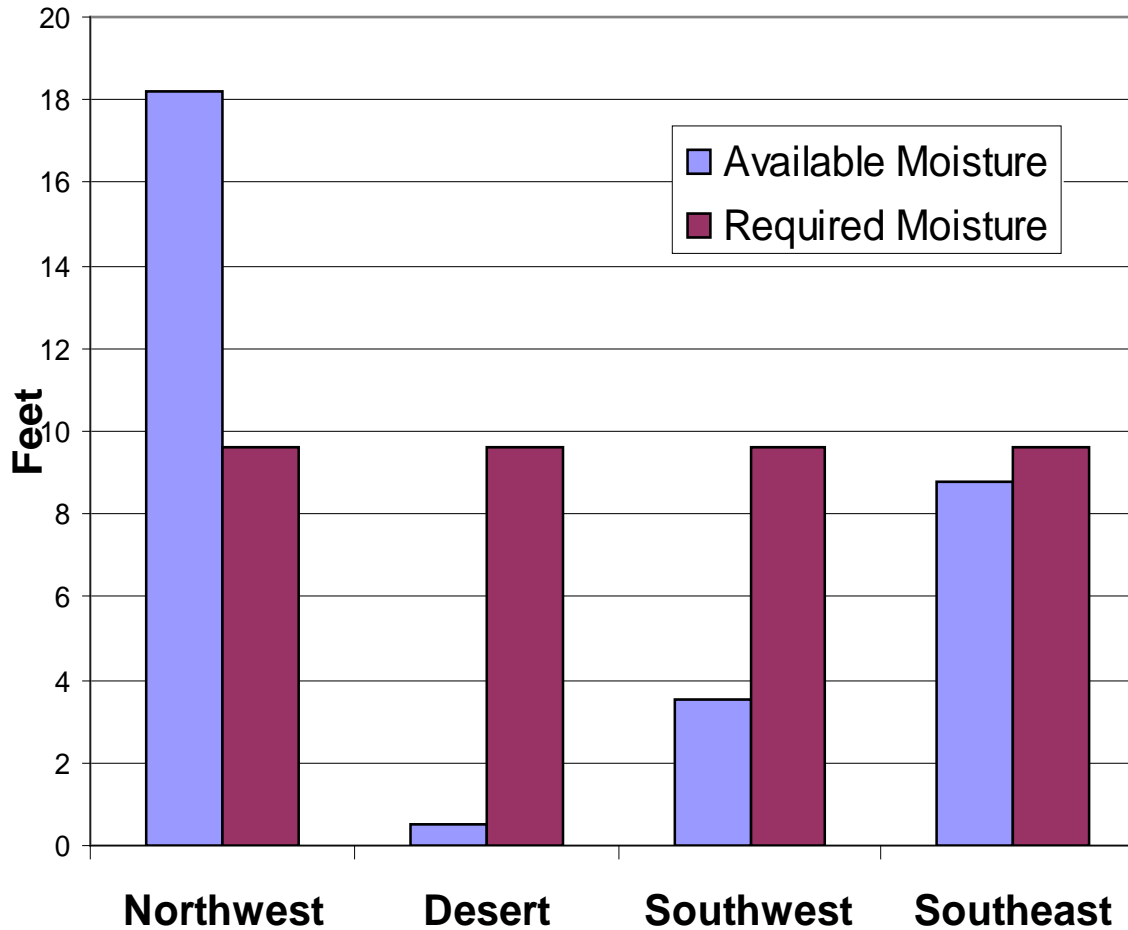


Operational Challenges

- Source of moisture
- Monitoring
- Gas collection
- Geotechnical stability
- Moisture distribution



Moisture Balance





Monitoring Challenges

- ✚ Waste heterogeneity
- ✚ Need for sensor contact with waste
- ✚ Corrosive conditions
- ✚ Cables
- ✚ Data Management
- ✚ Leachate/waste changes with respect to time



Monitoring Challenges – Cont'd

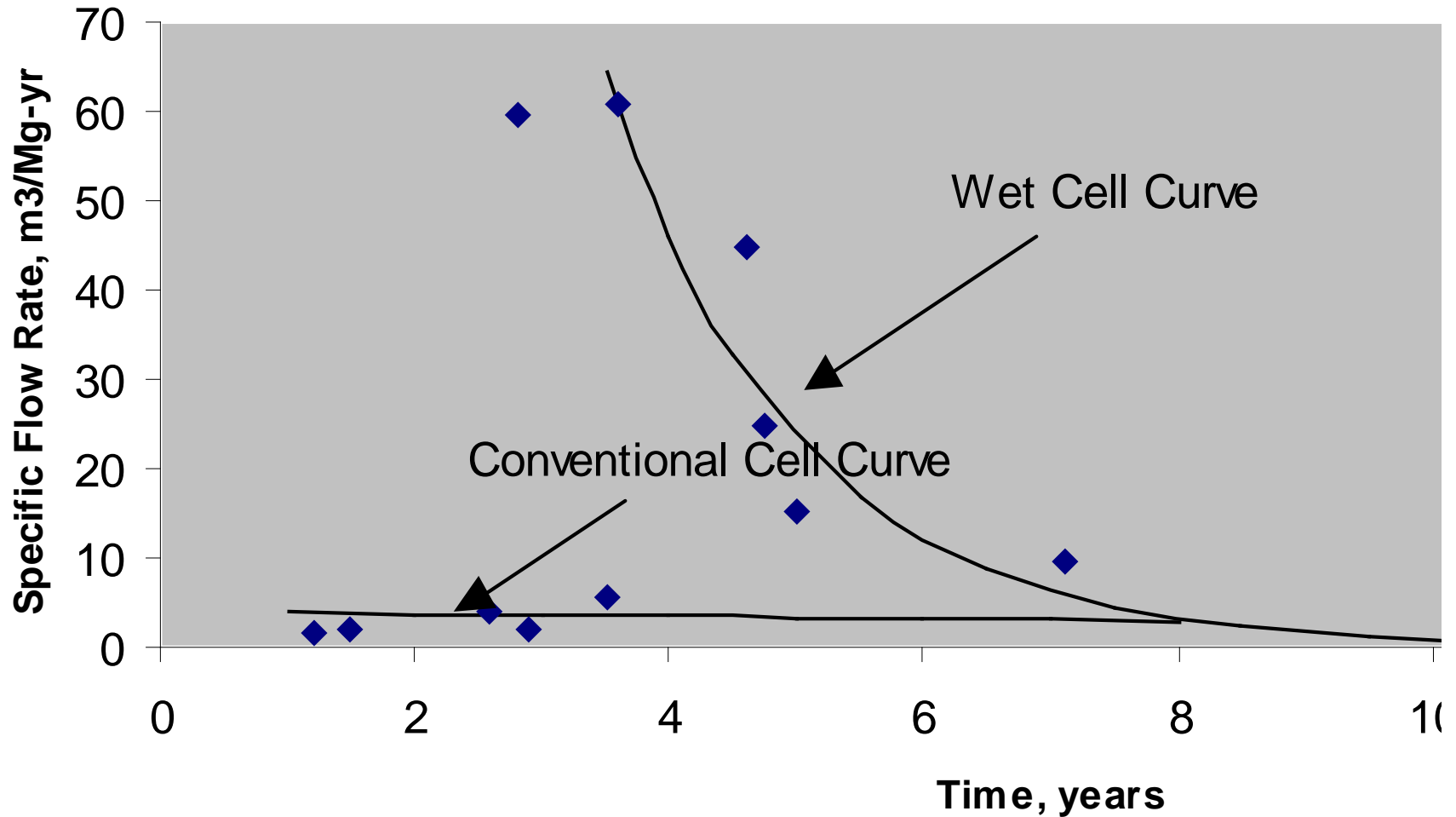
- How can we use leachate data to control the process?
- What parameters really need to be monitored and how often?
- How can we measure density and airspace utilization from location to location?
- How do geotechnical parameters change with depth?



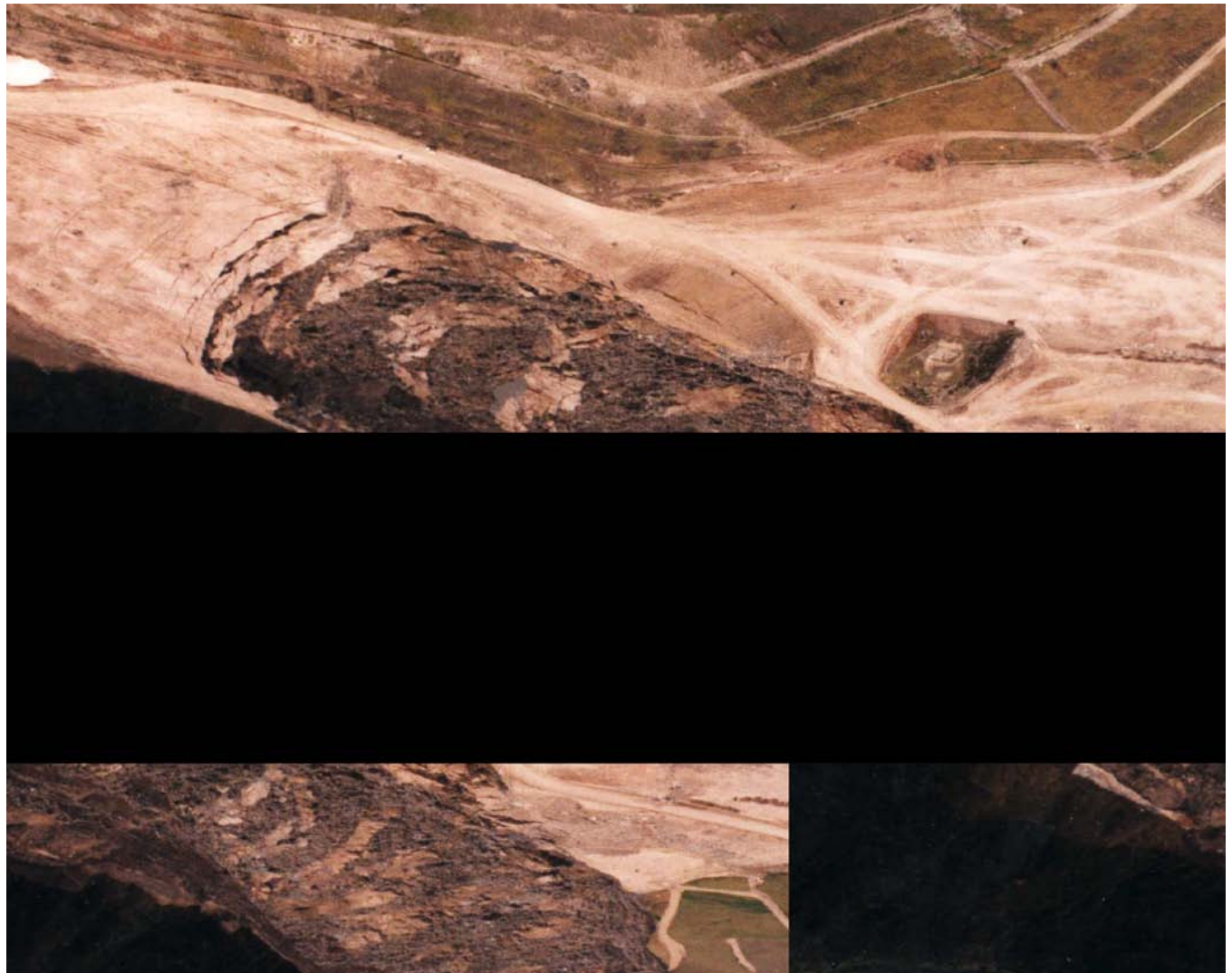
Monitoring Challenges – Cont'd

- ✦ Can we standardize monitoring requirements?
- ✦ How do we balance economics with our need to understand the process?
- ✦ Can we develop instruments that do not require cables (wireless)?

Gas Production



Geotechnical Stability



Moisture Distribution

- Alternative daily cover
- Liquid injection techniques
- Wicking
- Waste pretreatment
- Compaction



Long-Term Challenges

- How far does the bioreactor need to be pushed?
- How far can the bioreactor be pushed?

