MOISTURE DISTRIBUTION

- The effectiveness of moisture distribution directly affects:
  - Air distribution
  - Water Availability for microorganisms

- Evidence of heterogeneous distribution of moisture, including saturated pockets and relatively dry areas

- For aerated systems, a tighter operating range of moisture content is needed
MOISTURE CONTENT DATA FROM OCTOBER 2002 SAMPLING EVENT

Moisture Content (Percent On Wet Weight Basis)

0.0%  20.0%  40.0%  60.0%

DEPTH (FEET)

Sample Boring B-2

"Nugget Effect" Adjacent Sample Boring B-2

Note: "Nugget" Samples Located 5 Feet From Adjacent B-2 Samples
NEEDED IMPROVEMENTS

- *In-situ* moisture content measurements are necessary for effective operation relative to concerns over maintaining FAS.

- For Retrofits - Improved methods and materials of construction in well and header system construction:
  - auguring or sonic drilling for wells
  - greater well diameter
  - angular granular materials used in annular space backfill
  - HDPE pipe and fittings for header system
SETTLEMENT
(AS OF 1/28/03)

<table>
<thead>
<tr>
<th>Percent of Measuring Locations</th>
<th>Settlement (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.3%</td>
<td>1.0</td>
</tr>
<tr>
<td>16.7%</td>
<td>1.7</td>
</tr>
<tr>
<td>16.7%</td>
<td>2.3</td>
</tr>
<tr>
<td>16.7%</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Average Settlement Across Site = 22 inches or 4.9% of original avg. depth
SETTLEMENT

Characteristic Drop In Surface Elevation Near Injection Wells
OPERATIONAL PROBLEMS AND TROUBLESHOOTING

- **PROBLEM:** Noise from blowers (neighbor complaints)

- **SOLUTION:** Vibration dampeners on outlet air header pipes; mufflers on blower intakes; carpeted structure around blowers
POSITIVE DISPLACEMENT BLOWERS WITH NOISE ABATEMENT MEASURES

MULCH BERMS

INTAKE MUFFLERS

DISCHARGE NOISE DAMPENERS
OPERATIONAL PROBLEMS AND TROUBLESHOOTING

- **PROBLEM:** Maintaining air header pressure due to pipe leaks at cracks and due to inadequate sealing at joints

- **SOLUTION:**
  - Replaced cracked pipe and all leaking joints
  - Use HDPE pipe with butt-fused joints
AIR HEADER LEAK

Separation At PVC Glued Joints

Crack Formation In PVC Pipe
OPERATIONAL PROBLEMS AND TROUBLESHOOTING

- **PROBLEM:**
  - Excessive air backpressures at air injection wells
  - Related to the variability in waste/soil density and porosity (limited free air-space), volume of intermediate soil cover used, moisture content
  - Related to the method of construction for the injection wells
OPERATIONAL PROBLEMS AND TROUBLESHOOTING

SOLUTION/RESPONSE:

- Construct waste cells in new bioreactor systems using methods to increase free air-space (waste processing, minimal compaction, shallow layering)

- Compare measured backpressures in the field using various delivery methods

- Internal examination of wells with down-hole camera
OPERATIONAL PROBLEMS AND TROUBLESHOOTING

- **PROBLEM:** Thermocouples
  - Sealing Connections
  - Shielded wire was not used
  - Accidental severing of Lines
  - Wires wrapped around piping

- **SOLUTION:**
  - Replacement of wire; use of shielded wire
  - Shrink-Wrap Connections or replace with outdoor connectors (watertight)
  - Remove wires from around piping