The Bluestem Bioreactor

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Introduction

- Background
- Construction
- Features
- Operational Experience
- Data Collection
- Results
- Future

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Background

- Intergovernmental Agency (City of Cedar Rapids and Linn County).
- Formed in 1994
- Expanded composting in 1995
- Developed an ISWM Plan in 1996
- Began landfill siting in 1996
- Applied for and received Iowa DNR grant for bioreactor pilot project in 1997

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Background

- Construct a series of bioreactor cells, each capable of holding one year's waste.
- Fill a cell each year with mixed MSW (and potentially wastewater biosolids)
- After a number of years (six to eight?) excavate a cell, screen the degraded organics from the non- organic materials
- Organics to be used for beneficial use, non-organics to be landfilled in conventional landfill
- SUSTAINABLE LANDFILLING

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Background

- Constructed bioreactor in 1998
- Filled bioreactor in 1999
- Capped bioreactor in 2000
- First full year of operation in 2001

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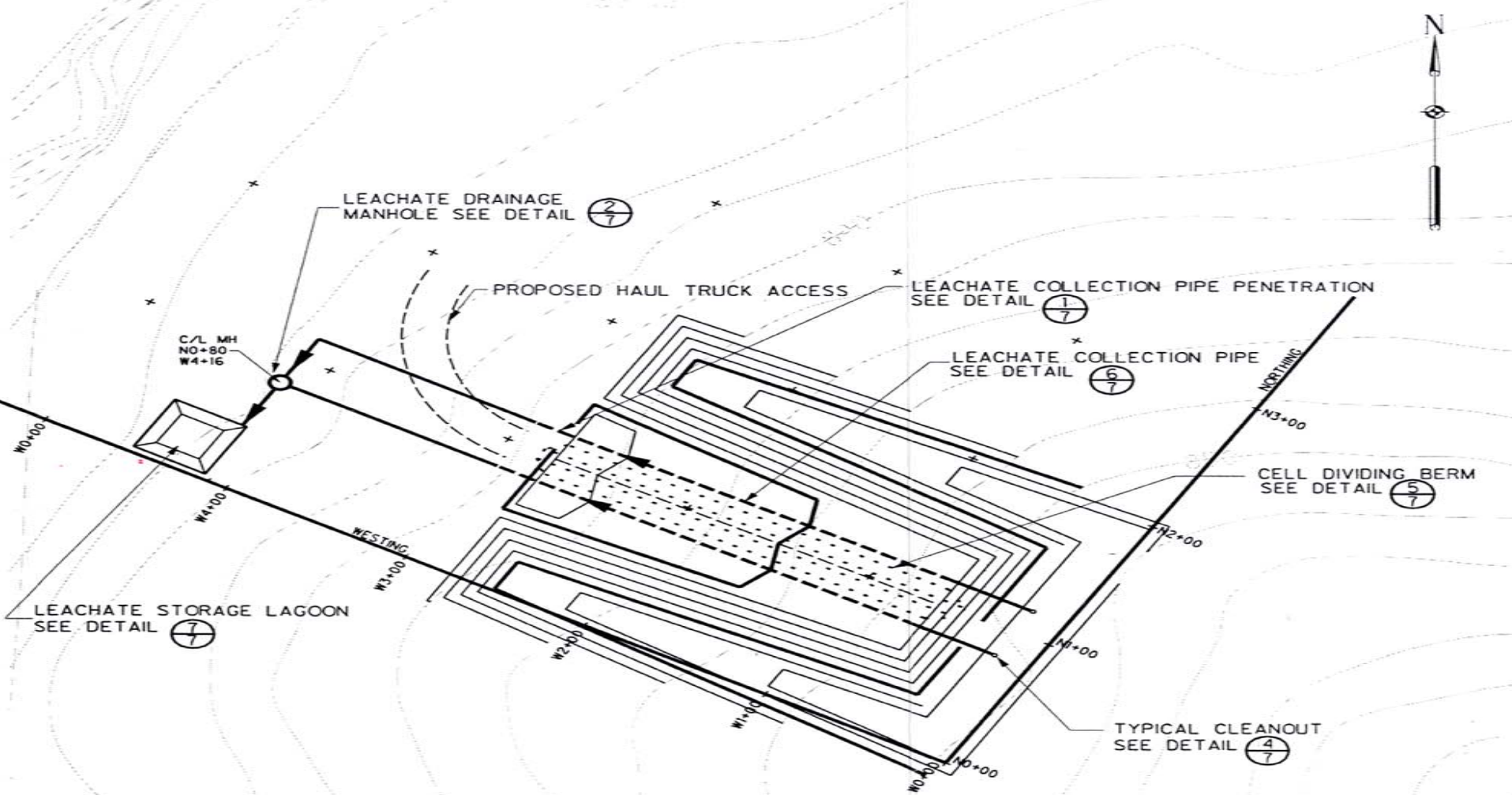

LEACHATE COLLECTION PLAN

0 50' 100'

SCALE: 1" = 50'

Construction

Construction

Construction

Features

- Two distinct cells. Cell A and Cell B
- Cell B received cake and liquid sludges
- Temperature probes each side
- Horizontal gas collection system
- Targeted leachate recirculation system
- Exposed R-PP cap
- 6 Time capsules to monitor progress

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Construction

- Bioreactor Filling
  - Cell A
    - MSW 6092 tons
    - Woodchips 360 tons
    - Paper sludge 40 tons
  - Cell B
    - Same as Cell A
    - Also 26 tons of WWTP liquid sludge
    - Also 71 tons WWTP cake sludge

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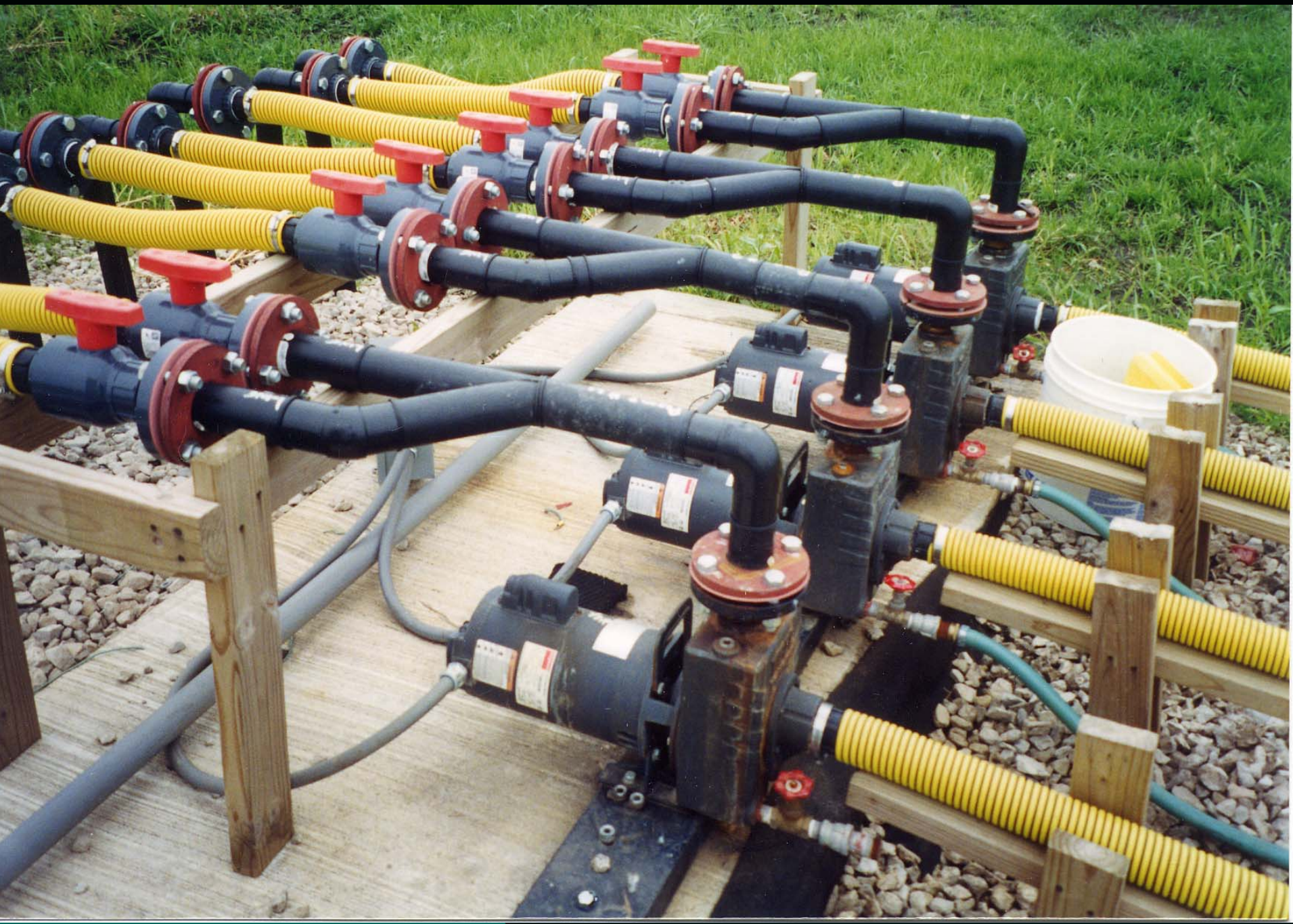
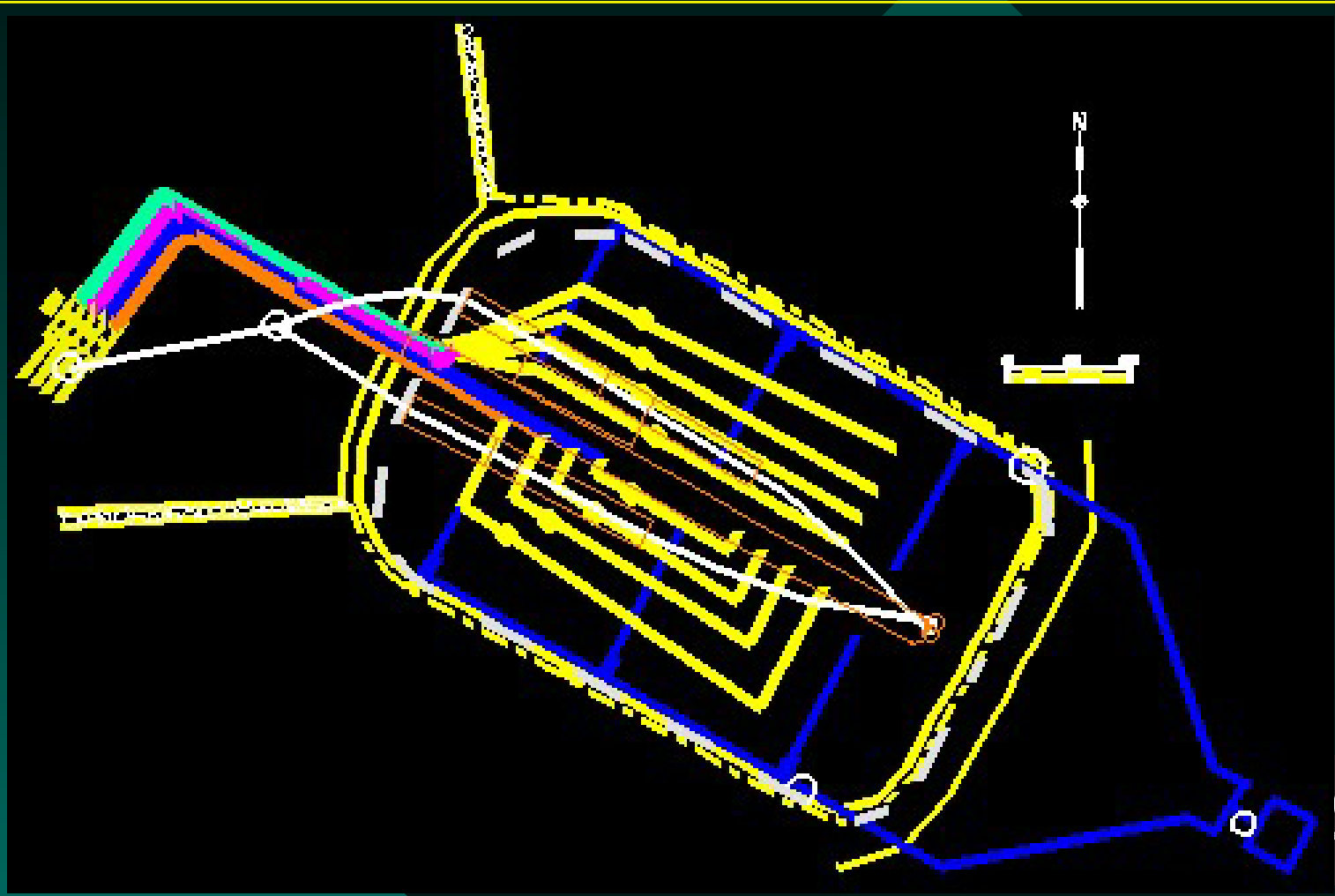
11
98 12 15


ConCover®
THE COVER ALTERNATIVE FOR WASTE DISPOSAL
BLUESTEM


93 8 2



Bioreactor Layout



Operational Experience

- Leachate seep
- Exposed cap damage
- Recirculation frequency
- Winter operations
- Biofilter odor control
- Pump efficacy

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Data Collection

- Data collected and frequency
  - Temperature (daily)
  - Subsidence (quarterly)
  - Recirculation pump data (daily)
  - Liquids addition (as added)
  - Leachate data
  - LFG data

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Data Collection

- Data collected and frequency (con't)
  - Leachate head
  - 2003 Flowmeters installed
  - Time capsules (1-2 per year)
  - Leachate discharge flow rate in 2003

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Results

- Temperature data
- Subsidence
- Leachate data
- LFG data
- Time capsule

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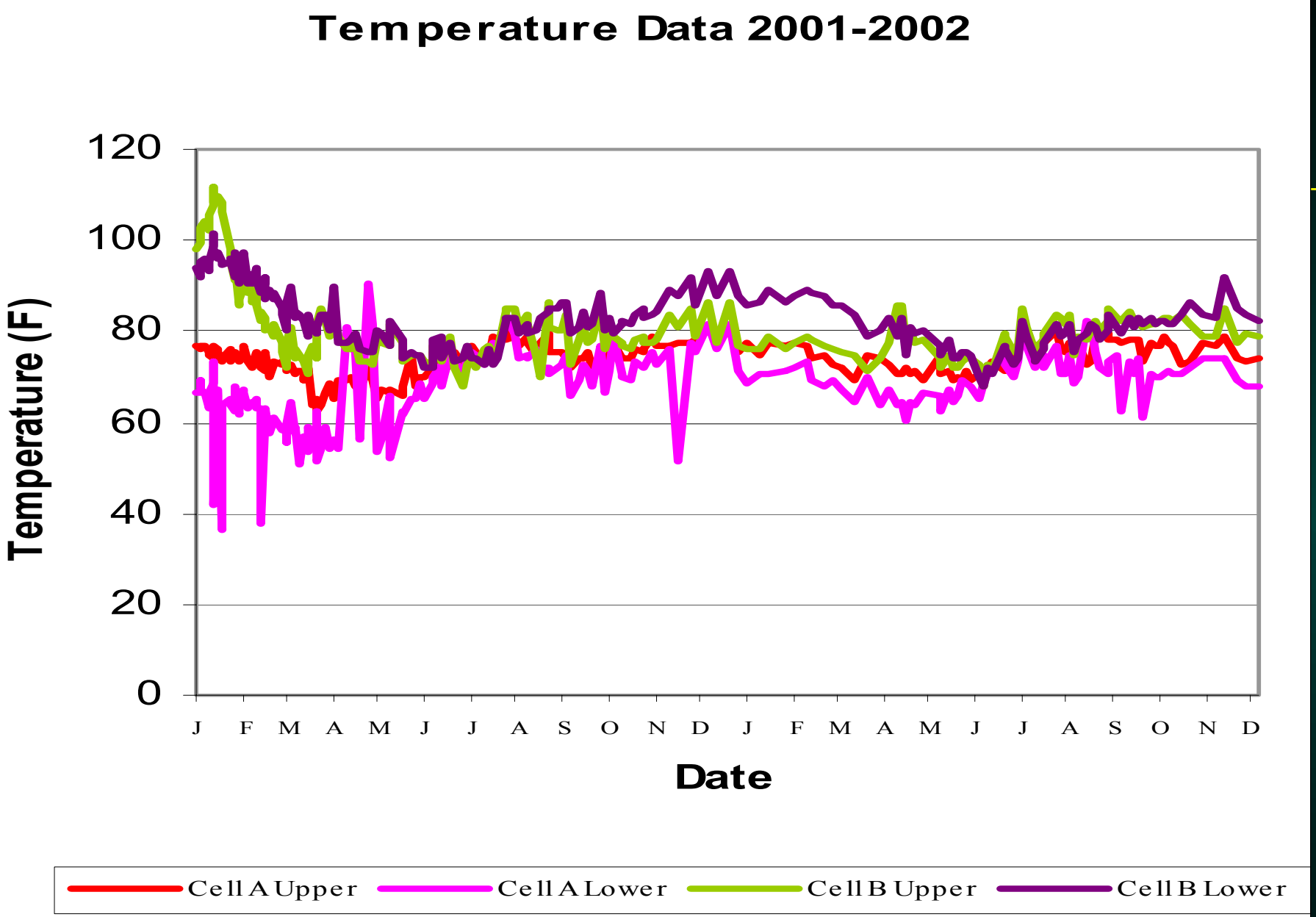
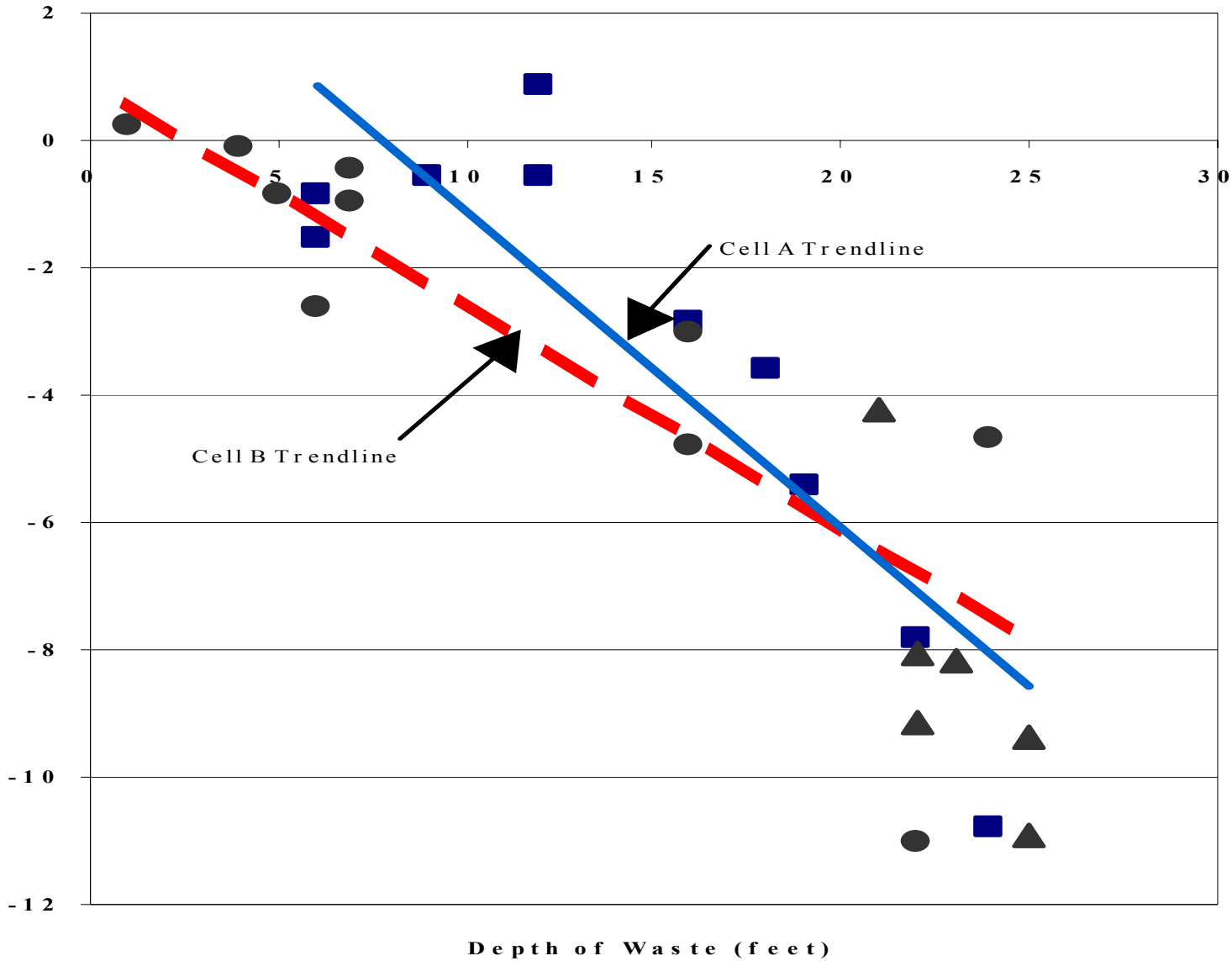

Temperature Data 2001-2002
Temperature (F)
120
100
80
60
40
20
0
J F M A M J J A S O N D J F M A M J J A S O N D
Date
Cell A Upper
Cell A Lower
Cell B Upper
Cell B Lower


Subsidence Data
2
0
-2
-4
-6
-8
-10
-12
0
5
10
15
20
25
30
Cell A Trendline
Cell B Trendline
Depth of Waste (feet)

Leachate Data

- COD
  - 2001 560 to 2,500 mg/l
  - 2002 2,600 to 2,900 mg/l
- Volatile Acids
  - 2001 1,000 to 1,600 mg/l
  - 2002 175 to 380 mg/l

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Leachate Data

- Total Volatile Solids
  - 2001 1,200 to 4,300 mg/l
  - 2002 1,700 to 2,000 mg/l
- Chloride
  - 2001 1,600 to 1,800 mg/l
  - 2002 2,100 to 2,900 mg/l

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LFG Data

- NMOCs
  - 2001 1,700 ppmv as carbon
  - 2002 925 ppmv as carbon
- Methane/Carbon Dioxide
  - 2001 56%/43%
  - 2002 58%/41%

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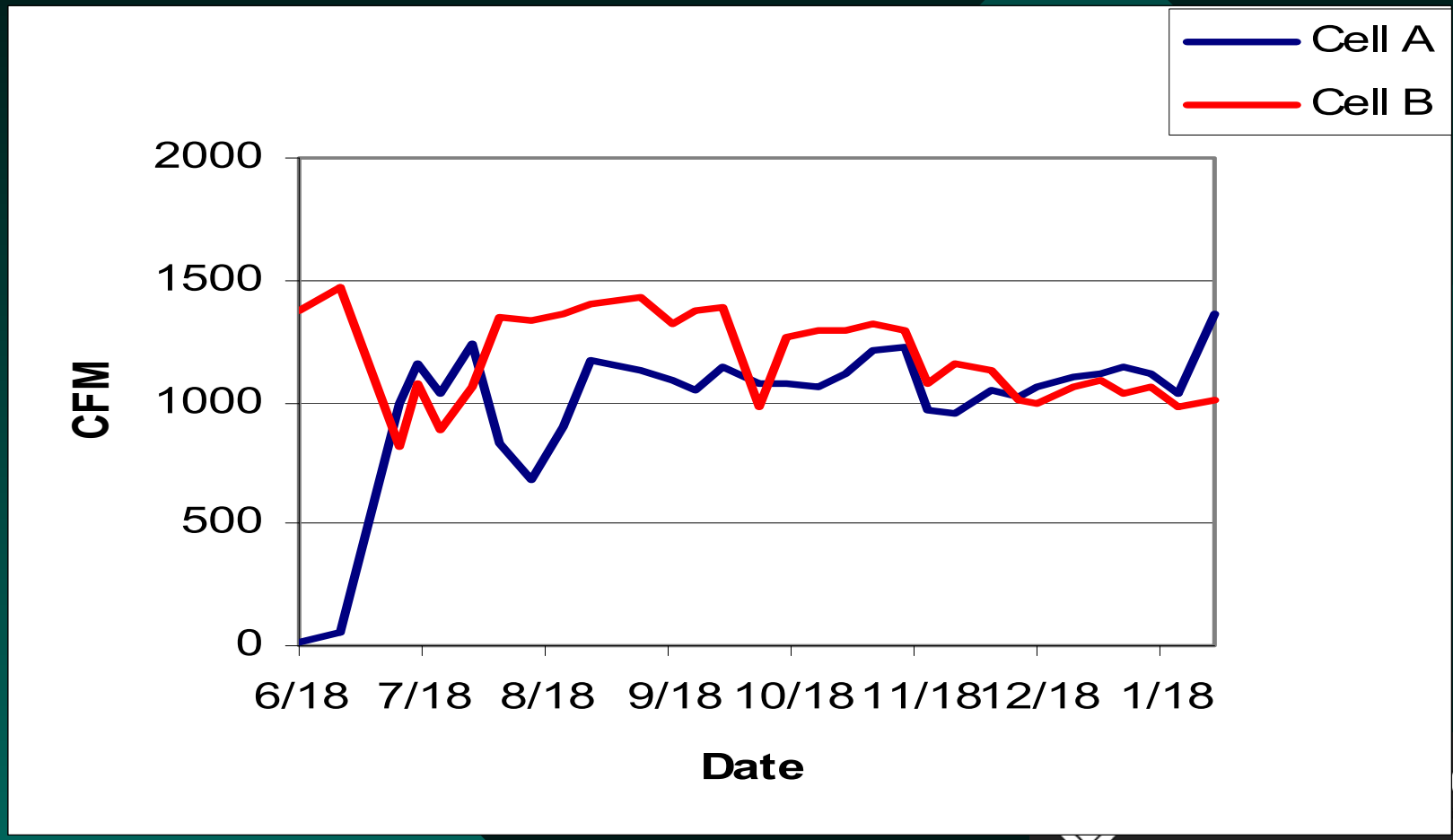
LFG Data - Flowrate



Time Capsules

- Six time capsules
  - 2002 1 was removed (Cell A)
  - 2003 1 to be removed (Cell B)
  - 2004 2 to be removed (Cells A&B)
  - 2005 2 to be removed (Cells A&B)
  - 2006 Cell excavation and screening

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Time Capsules - 2002

Time Capsules - 2002

Time Capsules - 2002

Time Capsules - 2002

Time Capsules - 2002

2003 Tasks

- Continue monitoring
- Continue with liquid sludge addition
- Install flow meters
- Consider dye test
- Remove Time Capsule in sludge side

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Questions?

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