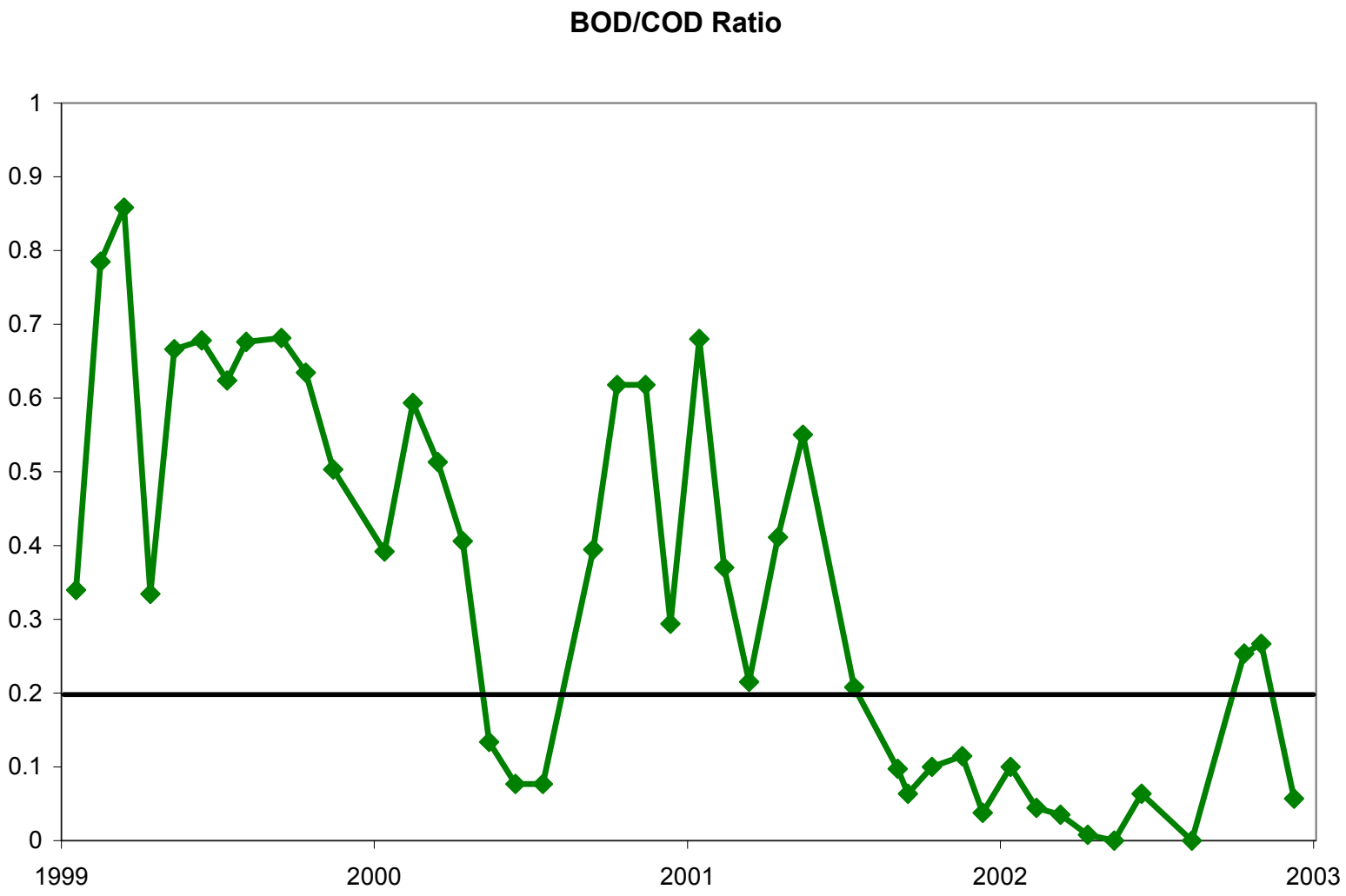
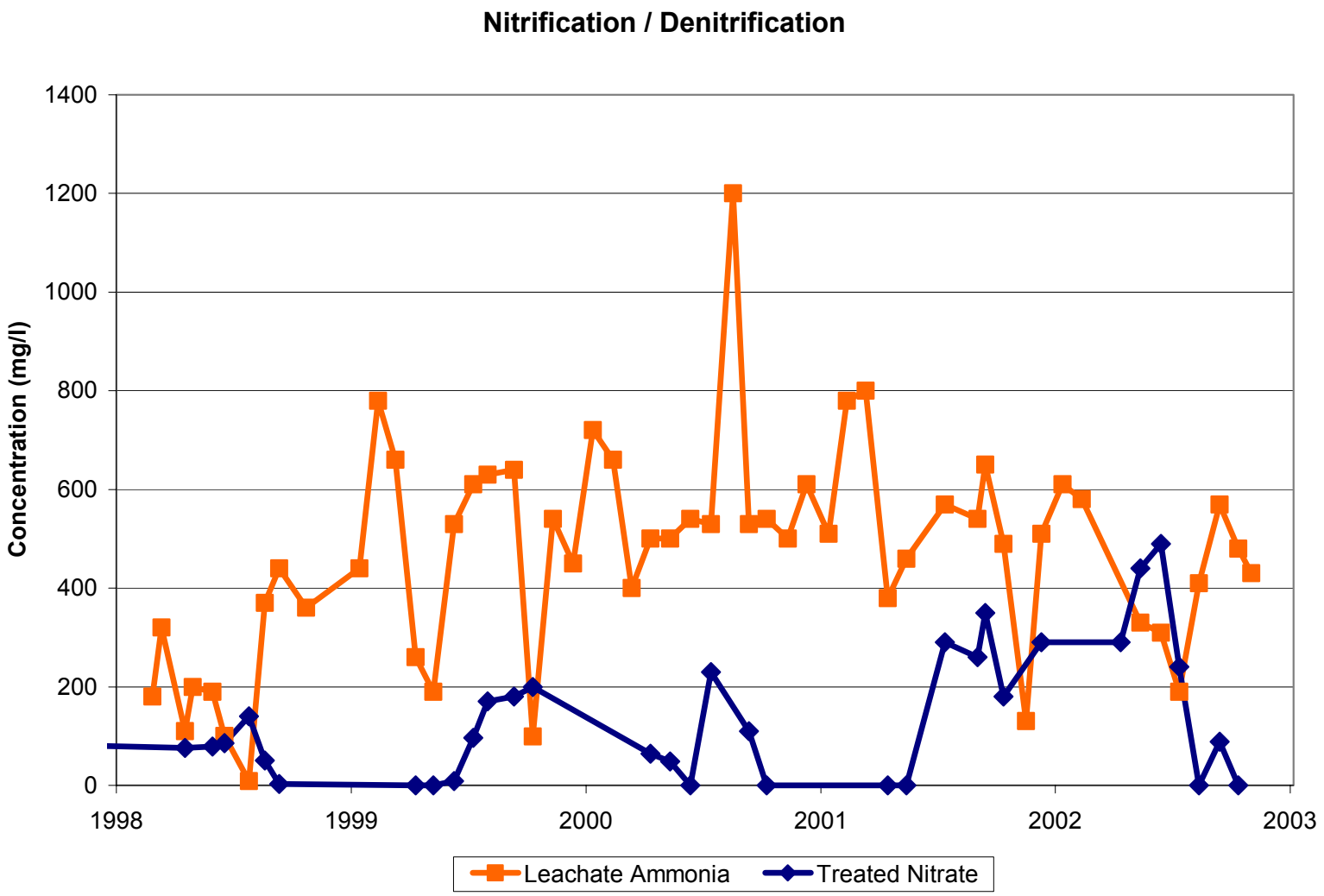

BOD/COD Ratio
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1999
2000
2001
2002
2003

Leachate Quality vs. Groundwater Standards (ug/l)

Parameter	Value [a]	MCL
Arsenic	95	10 [b]
Barium	410	2,000
Chromium	52	100
P-Dichlorobenzene	25	75
Ethylbenzene	66	700
Toluene	40	1,000
Total Xylenes	184	10,000

[a] October 2002

[b] Proposed 2006


Nitrification / Denitrification
Concentration (mg/l)
1400
1200
1000
800
600
400
200
0
1998
1999
2000
2001
2002
2003
Leachate Ammonia
Treated Nitrate

Recirculation to Energy (RTE)

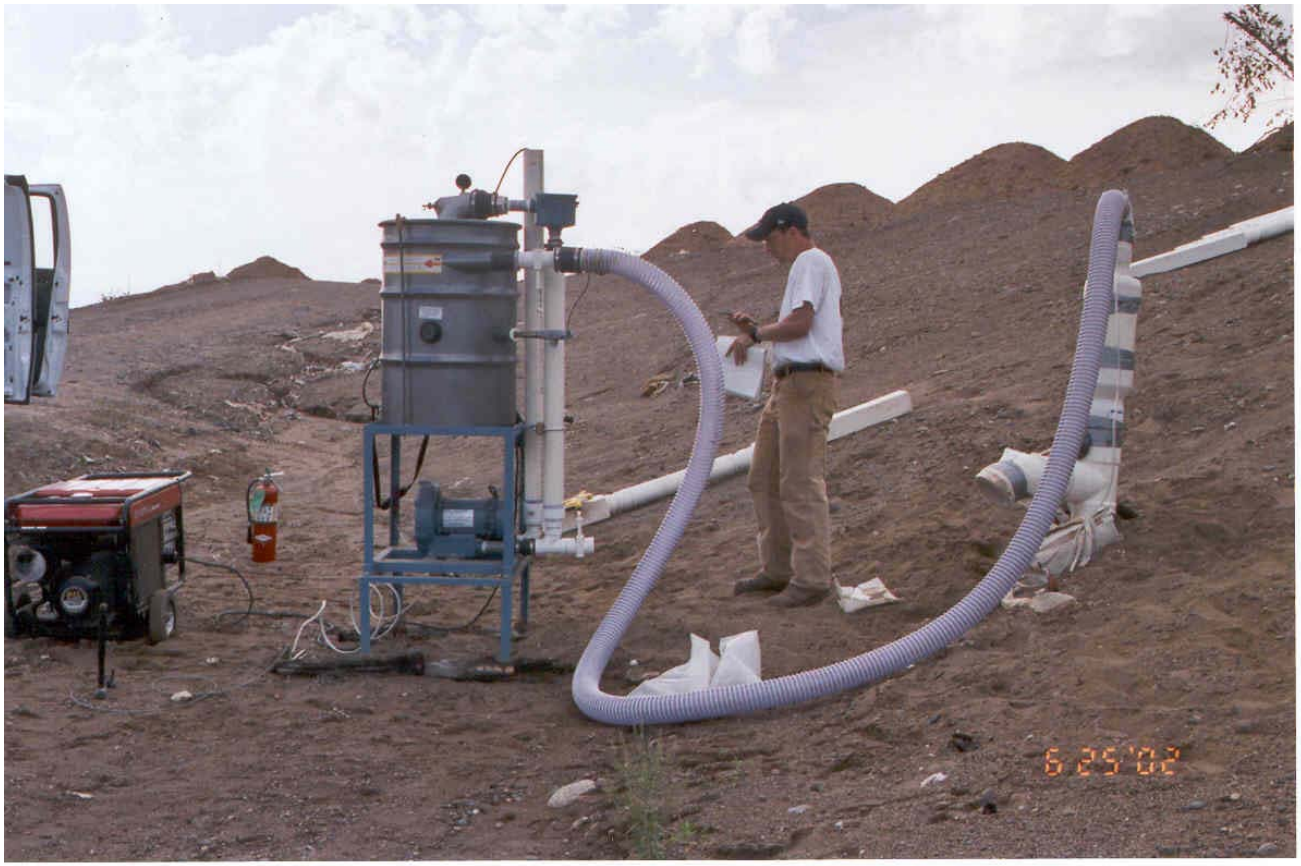
At a small Landfill where active control is <u>not</u> required:

- Converts methane to a productive reuse for energy generation and heat recovery;
- Reduces greenhouse and organic emissions; also reduces organics in leachate;
- Provides a reliable source of renewable power, at a reasonable price; and
- MN utilities are required to include renewable energy in their portfolio.

Recirculation to Energy Steps

- Feasibility Verification
  - Modeling
  - Field Pump Tests
  - Evaluation
- Utility Negotiation
- Air Permitting
- Construction
- Start-Up

LFG Feasibility Test



Equilibrium Test Results

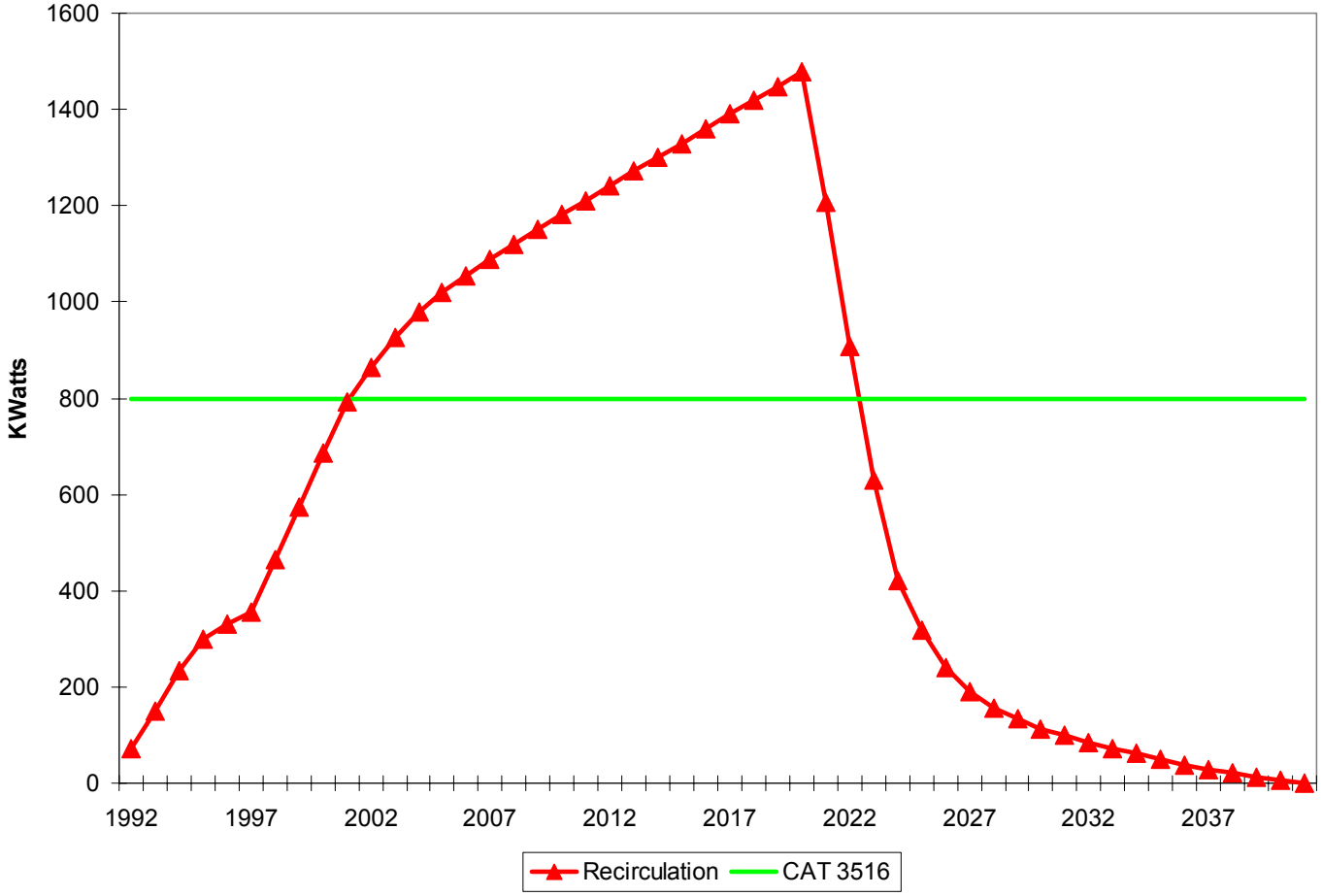
Location	Flow (cfm)	CH_4 (%)
GW-4	100	55
GW-4 (a)	140	55
GW-4 (b)	110	60
RL-6	0	<1
LC-3	130	45

24-hr tests except RL-6, GW-4 (b)

(a) Leachate pumped out before test

(b) 1-month test

Power Production



Operational/Design Hurdles

- Recirculation lateral layout/distribution;
- Recovery LFG from a recirculating landfill;
- Winter Operation;
- Settlement; and
- Seep Control.

Administrative Hurdles

- Long term purchase agreement with local power utility;
  - Utility is over capacity/downsizing
  - Transmission to market demand - wheeling cost
  - Utility currently meets renewable standards
  - Small project - 800 kW
- Long term commitment from waste haulers; and
- Long term regulatory acceptance.

The Future

- Continue to Recirculate
- Expand recirculation into Cell 3
- Spray Cell 3 Working Face
- Continue data collection
  - Leachate temperature (Cell 3)
  - Nitrification/Denitrification
- Develop RTE project