

Figure 1. Index Map showing Location of Study Area

**Figure 2: Outline of the 3M Model Grid Compared to
a Township and Range Grid**

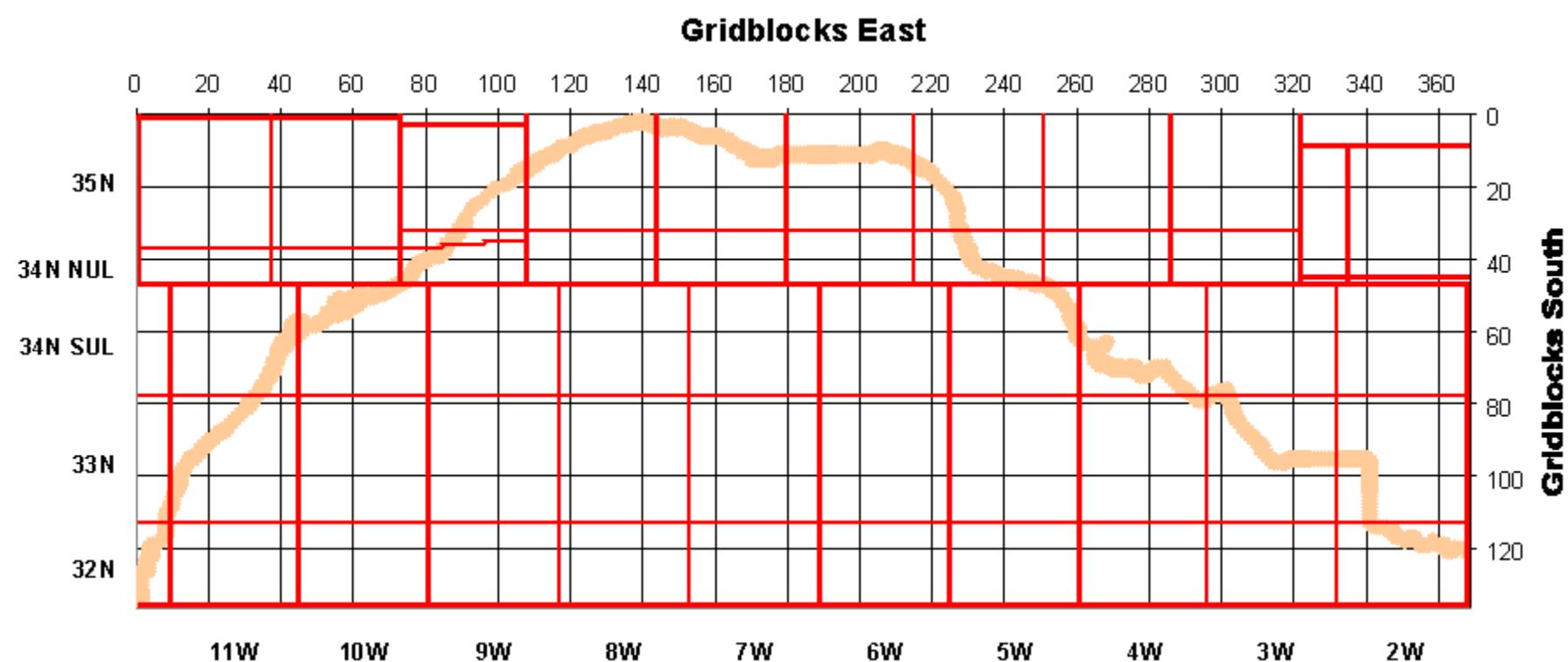


Figure 3: Typical Fruitland Coal Isotherms

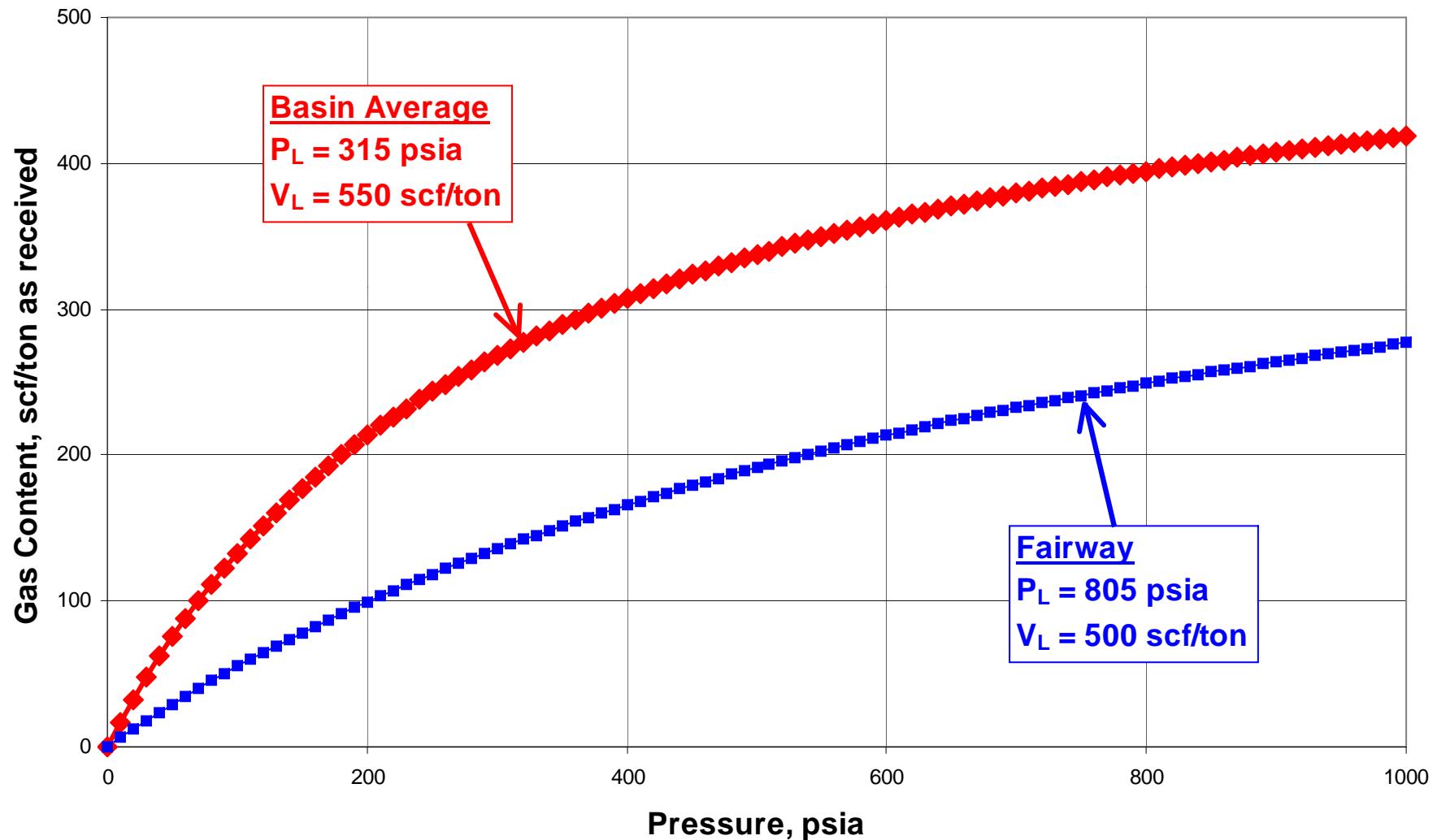
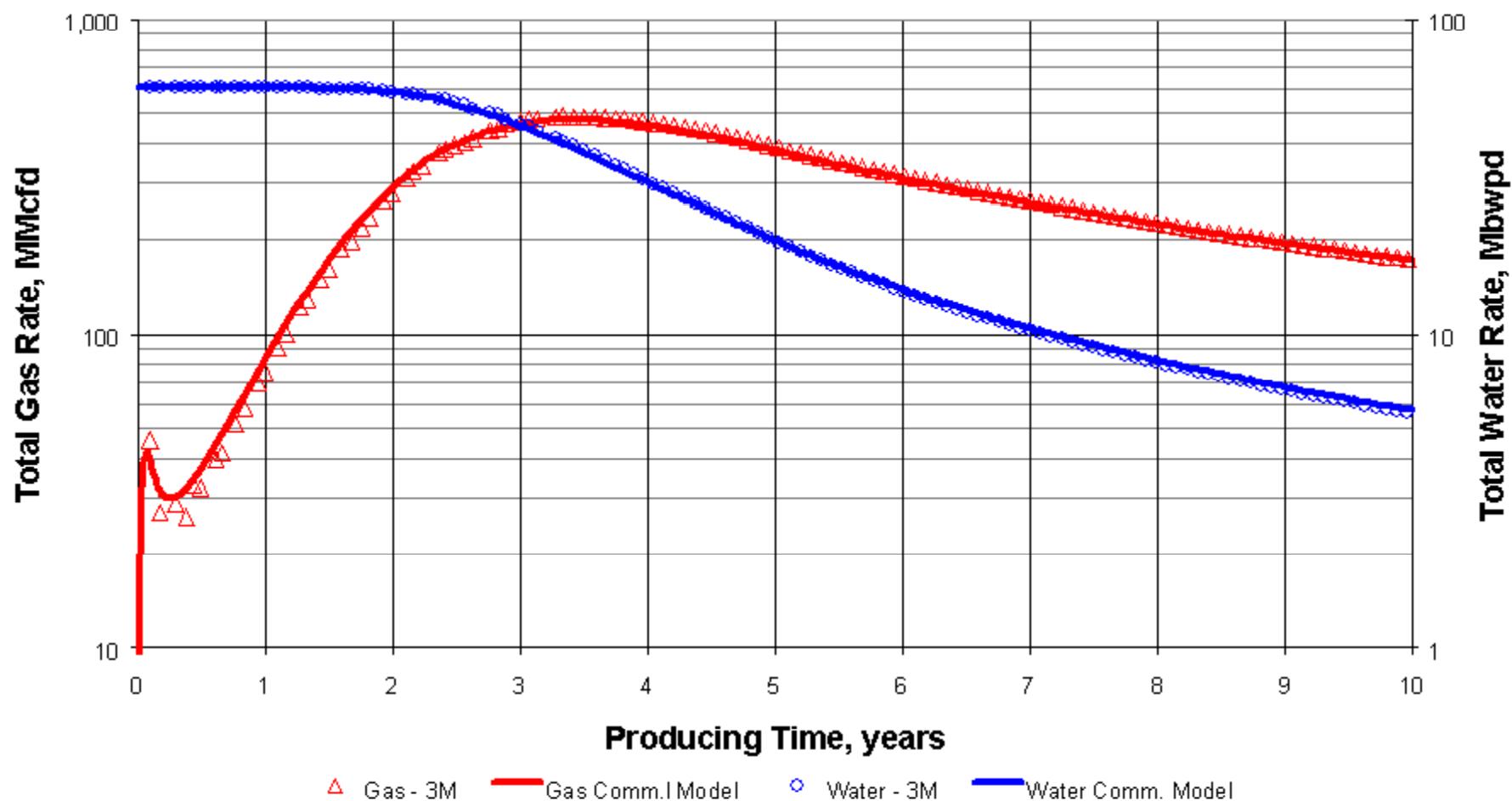


Figure 4: Benchmark Comparison between the 3M CBM MODEL and a Commercial CBM Model
100 Wells, 50 by 50 grid, Dip = 3 Degrees



**Figure 5: River Nodes, Recharge and Seep Nodes
in the 3M CBM Model**

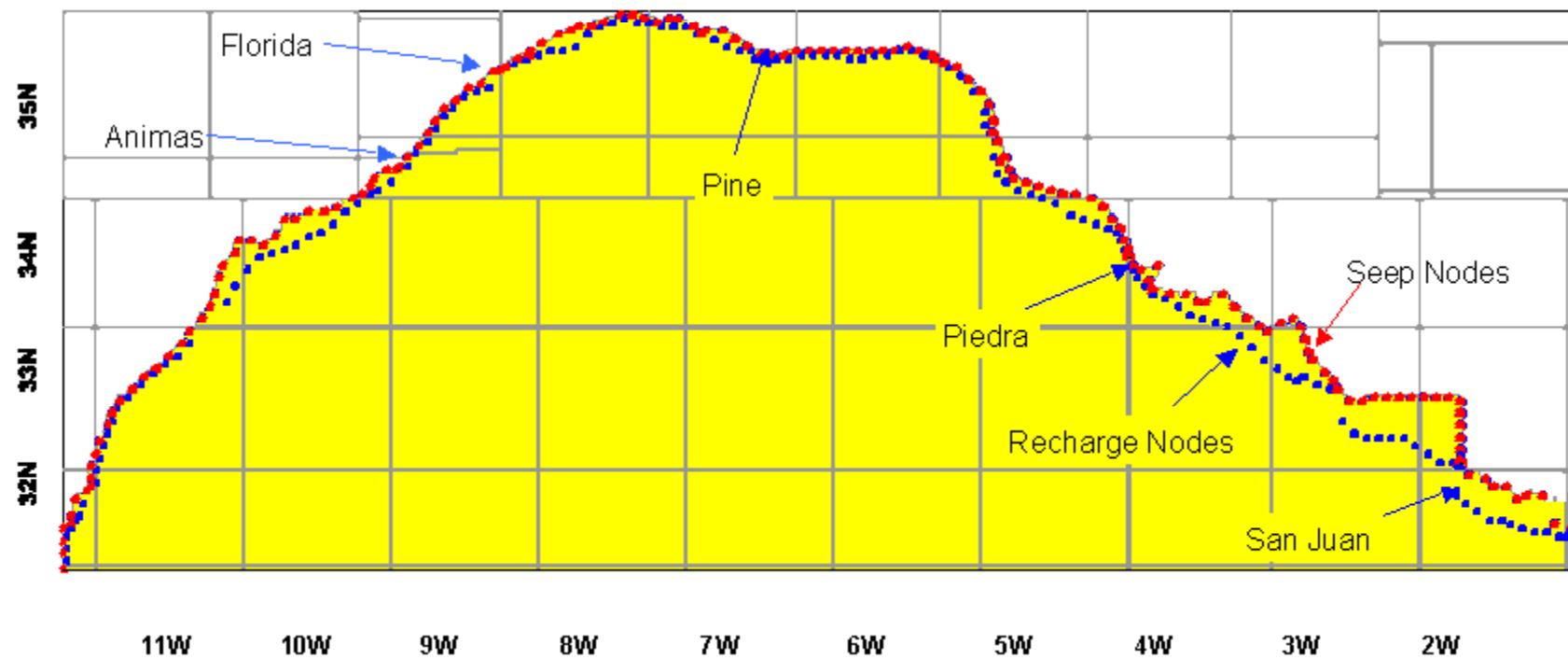


Figure 6: Existing Well Locations in the 3M CBM Model

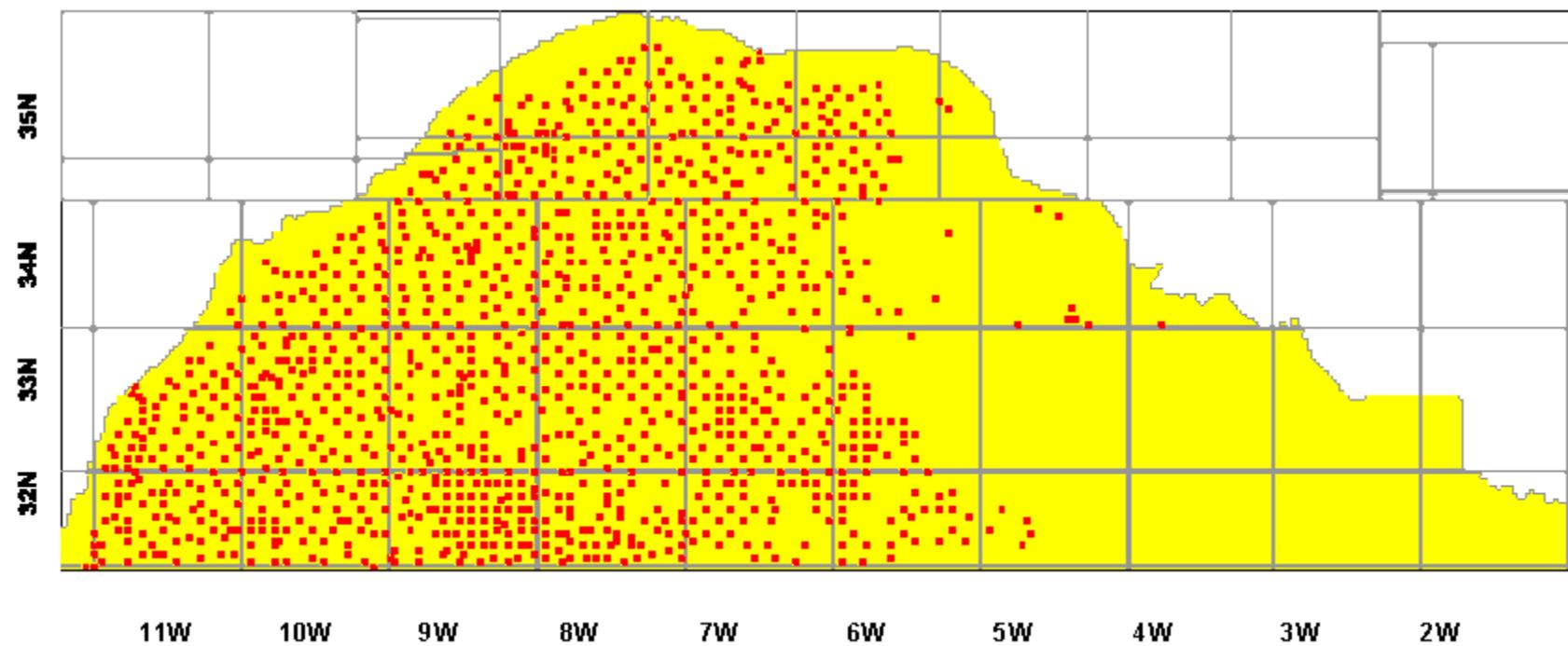


Figure 7: Infill Well Locations in the 3M CBM Model

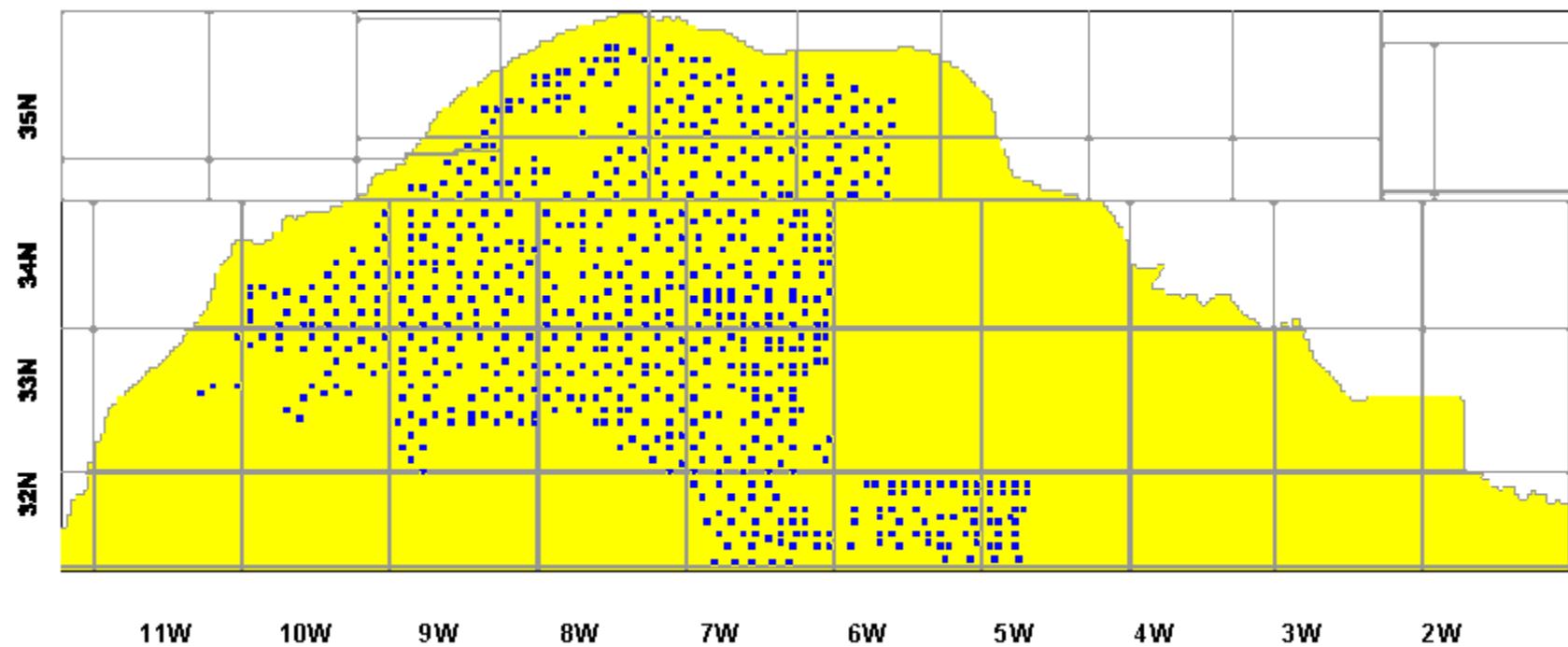


Figure 8: Subdivision of the Model into Areas A, B, C, D and E

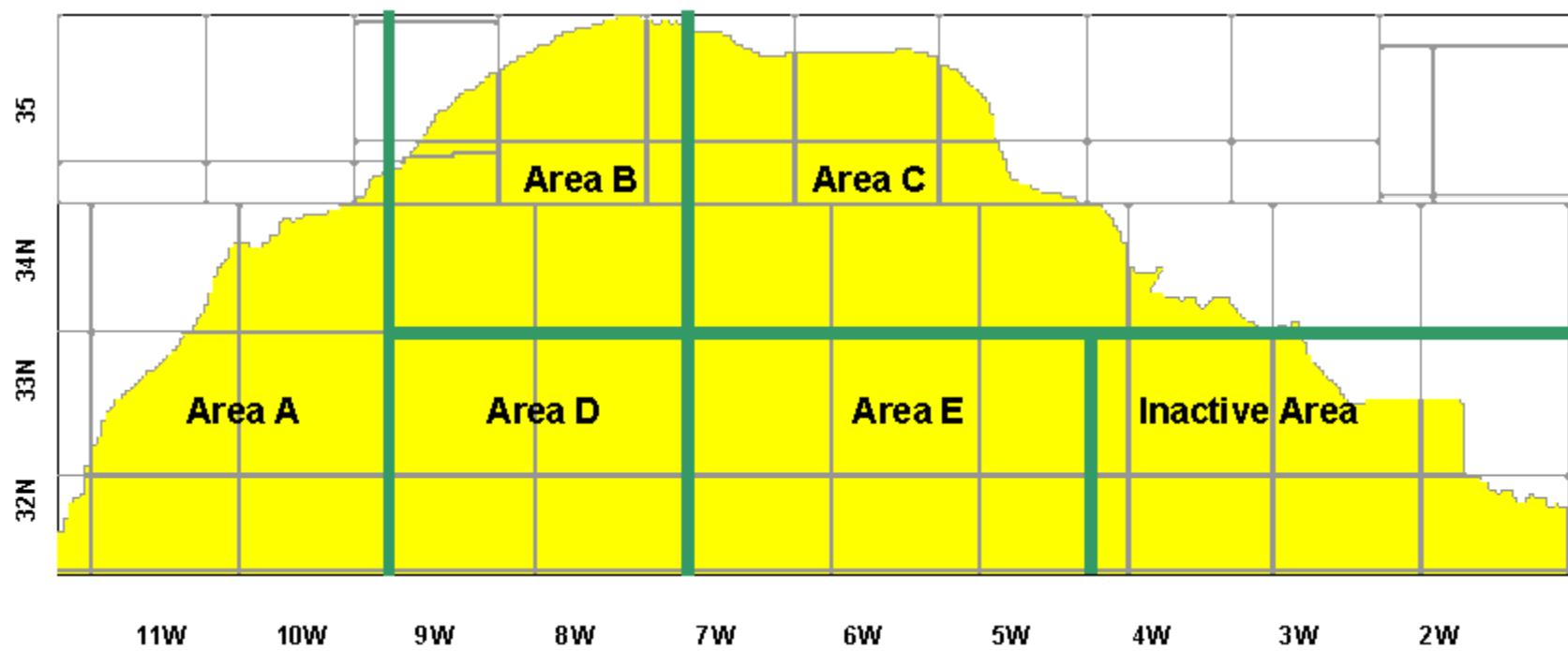


Figure 9: Structural Elevation at Midpoint of Fruitland Coal (MSL)

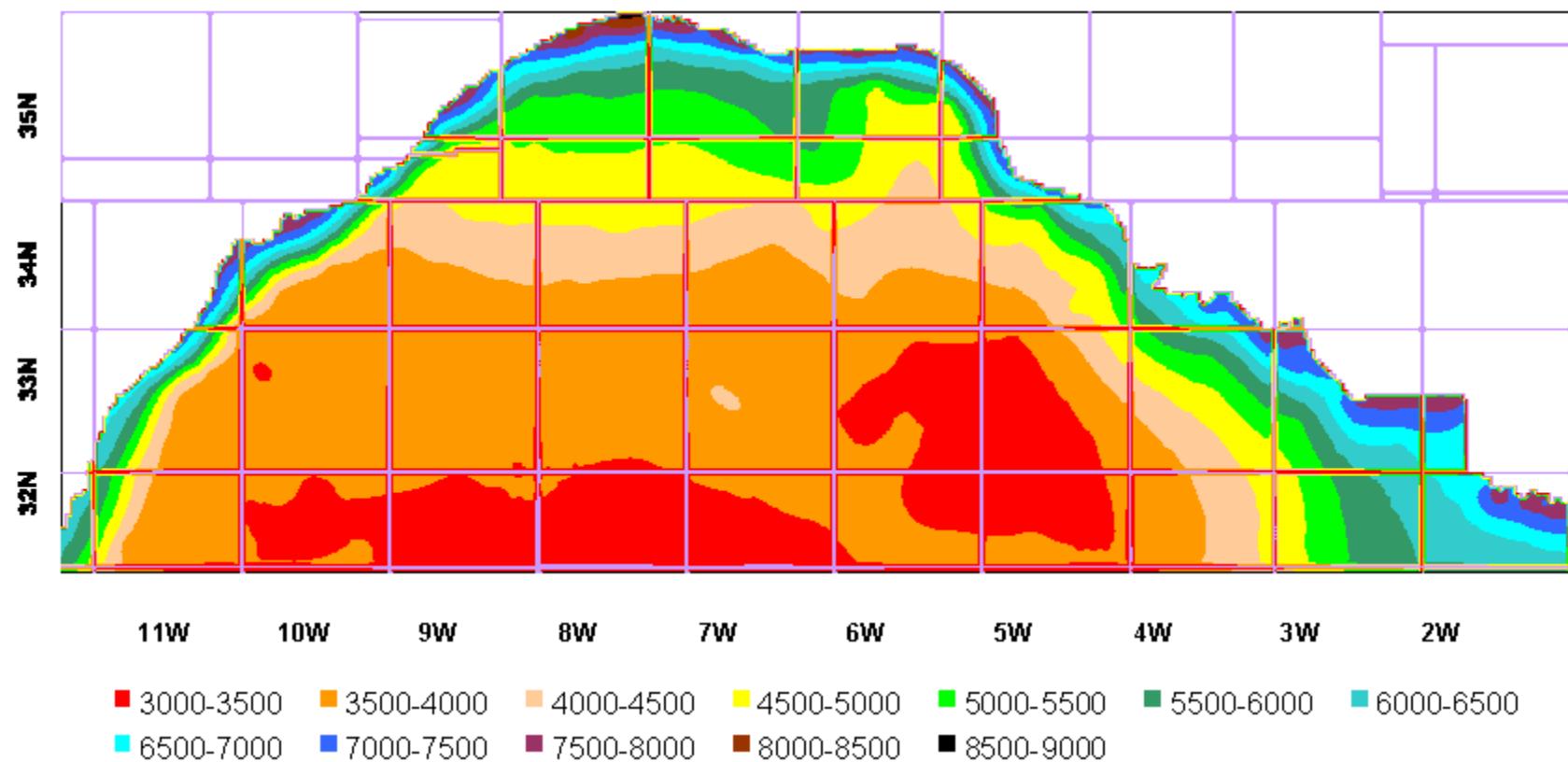


Figure 10: Net Coal Thickness (ft)

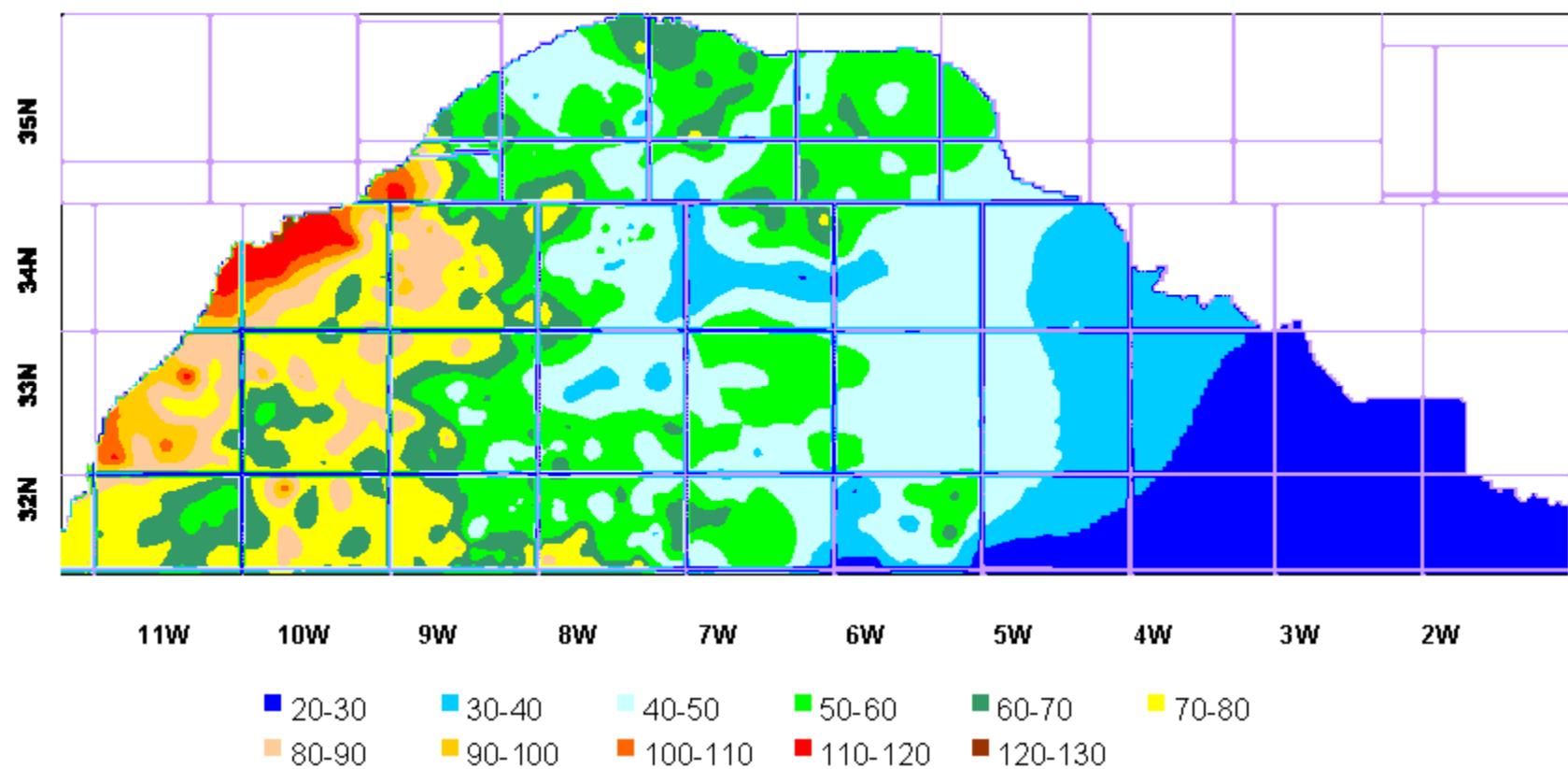


Figure 11: Initial Potentiometric Surface Elevation (MSL)

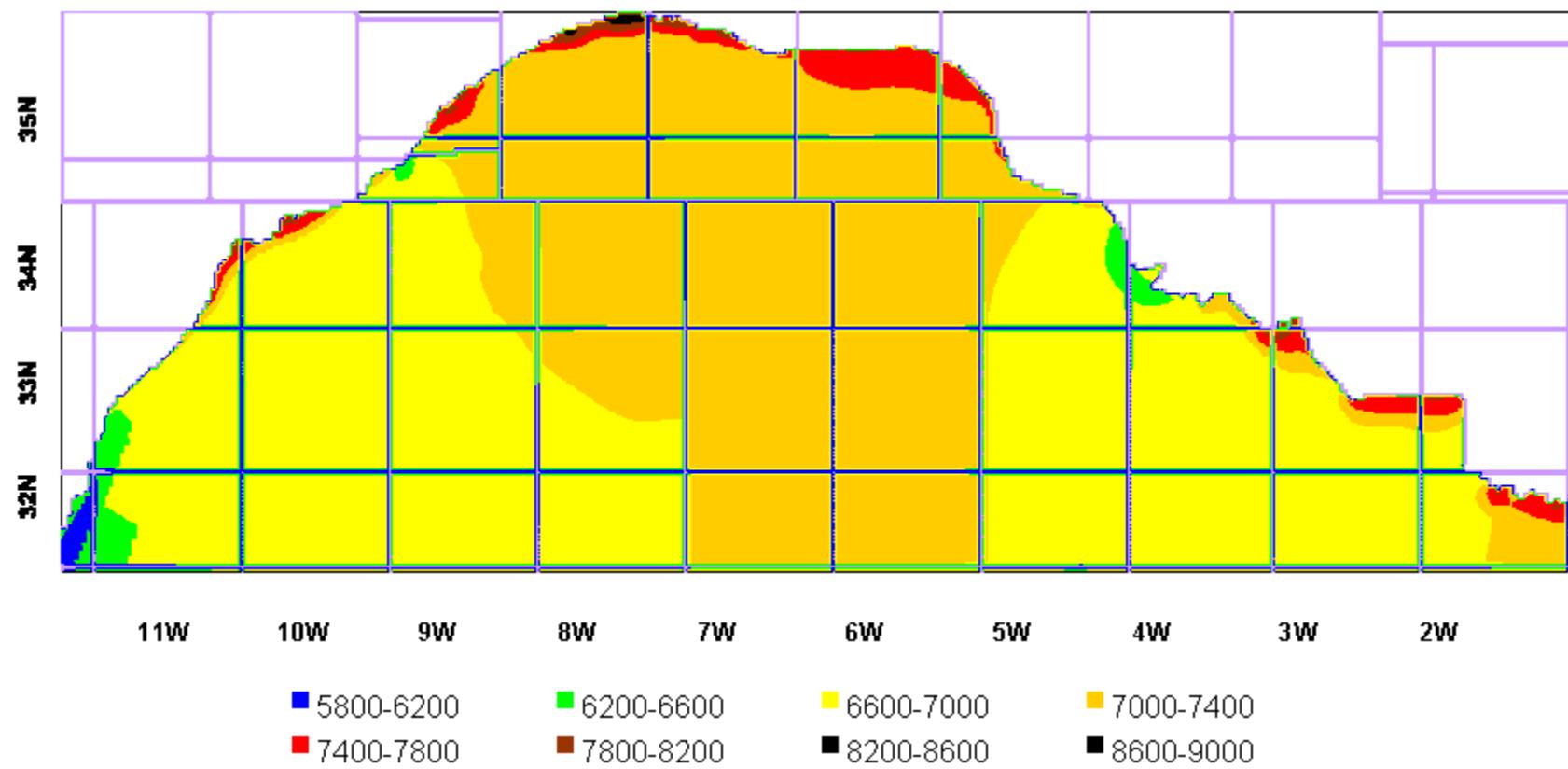
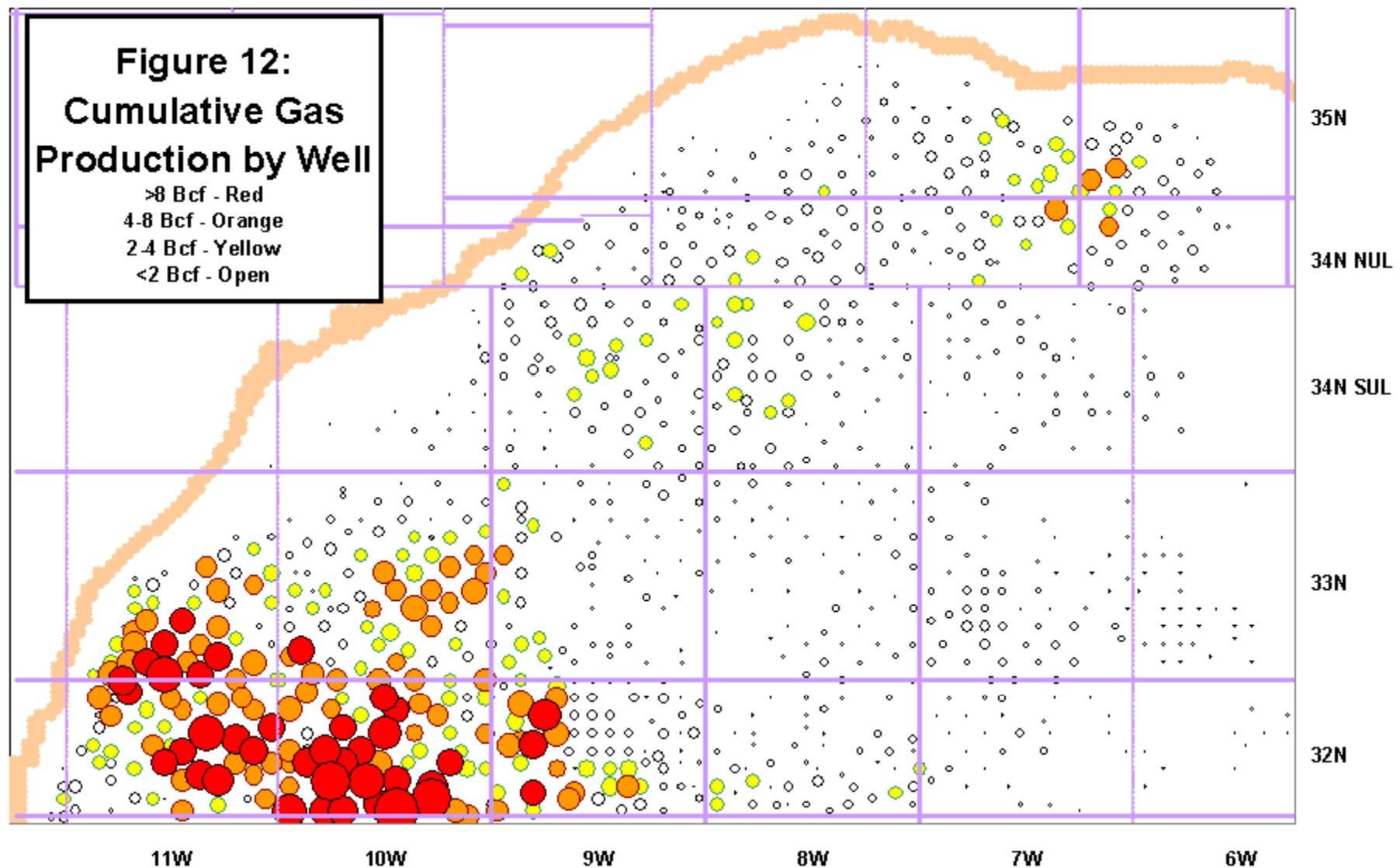


Figure 12:
Cumulative Gas
Production by Well

>8 Bcf - Red
4-8 Bcf - Orange
2-4 Bcf - Yellow
<2 Bcf - Open



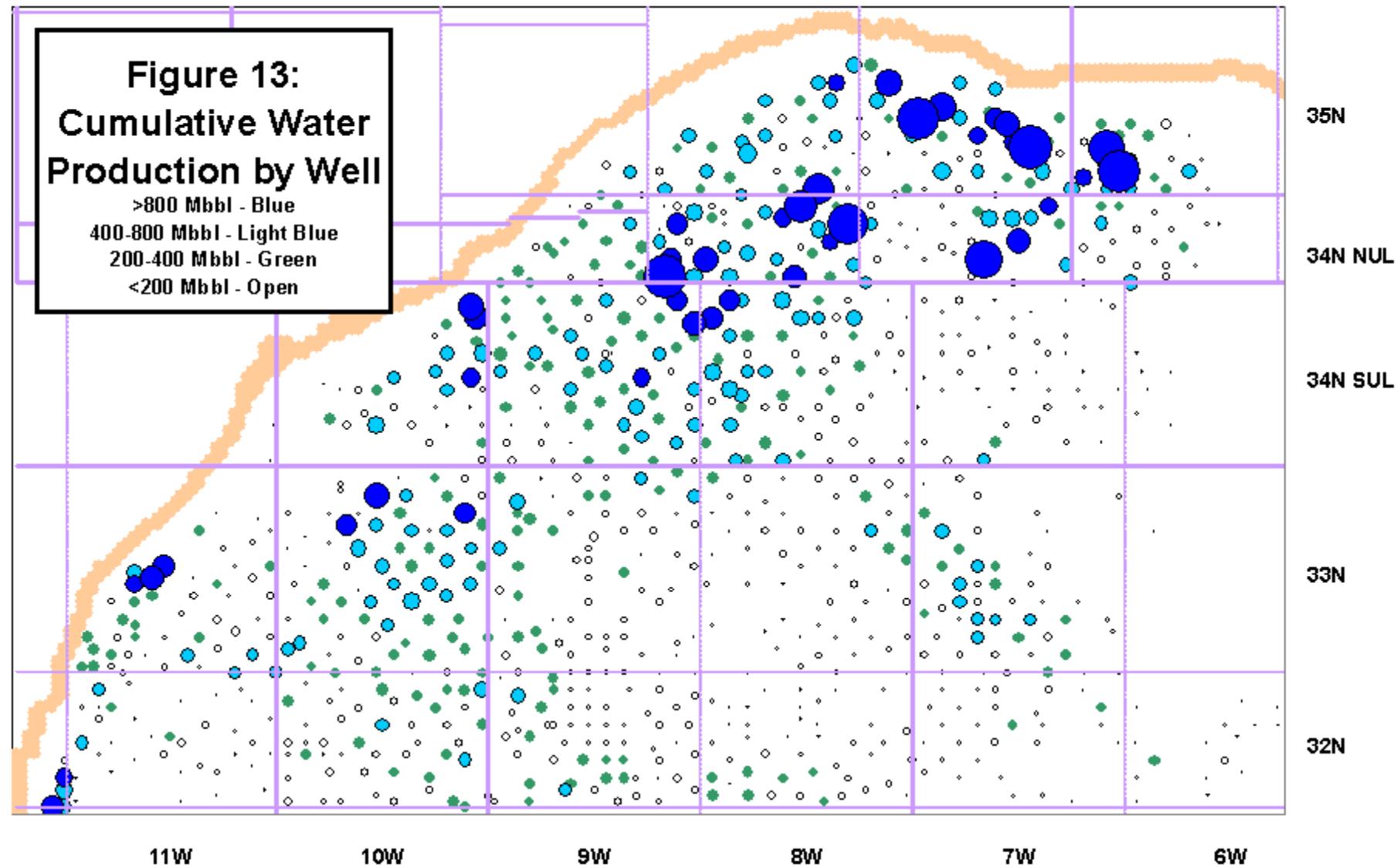


Figure 14: Computed Permeability Ranges in 3M CBM Model

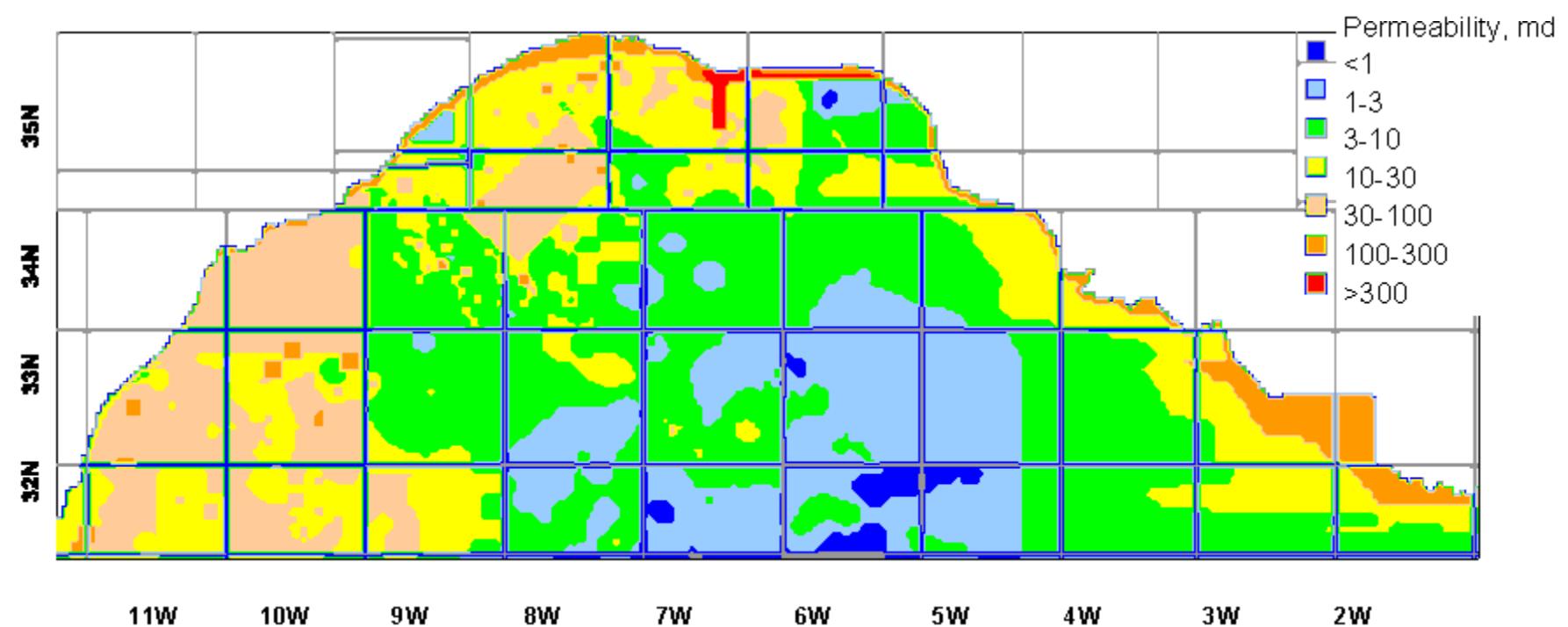
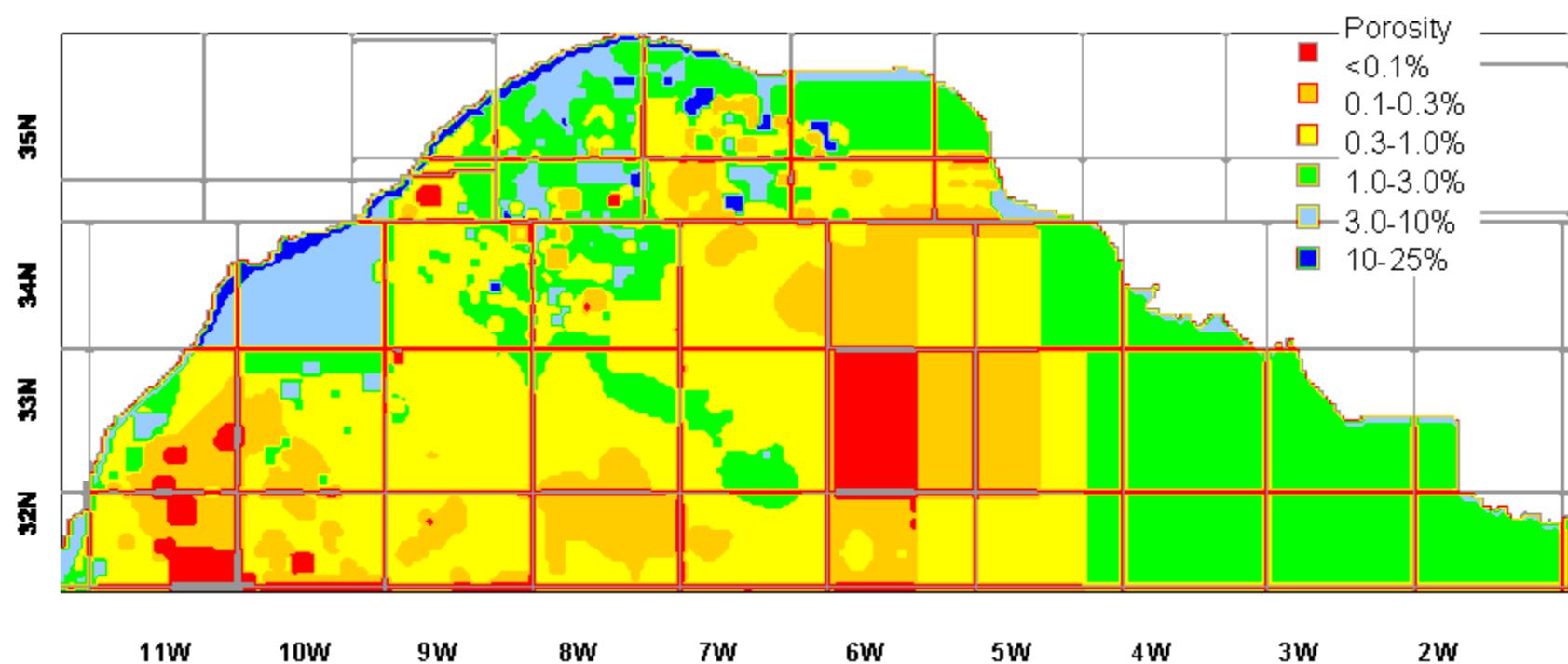


Figure 15: Computed Porosity Ranges in 3M CBM Model



**Figure 16: Basin Average Fruitland Coal
Relative Permeability Curves**

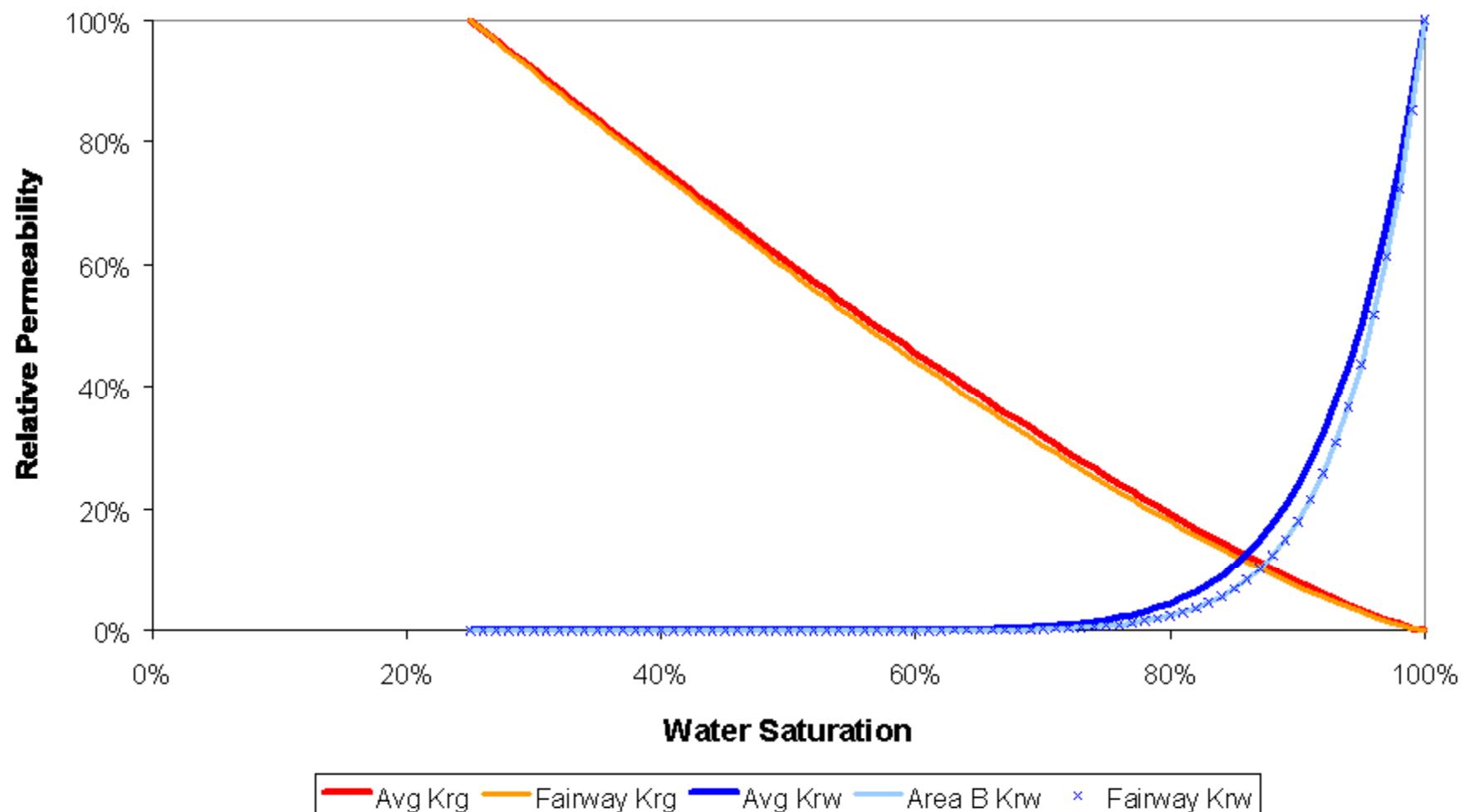


Figure 17: 3M "Wet" Relative Permeability Curves

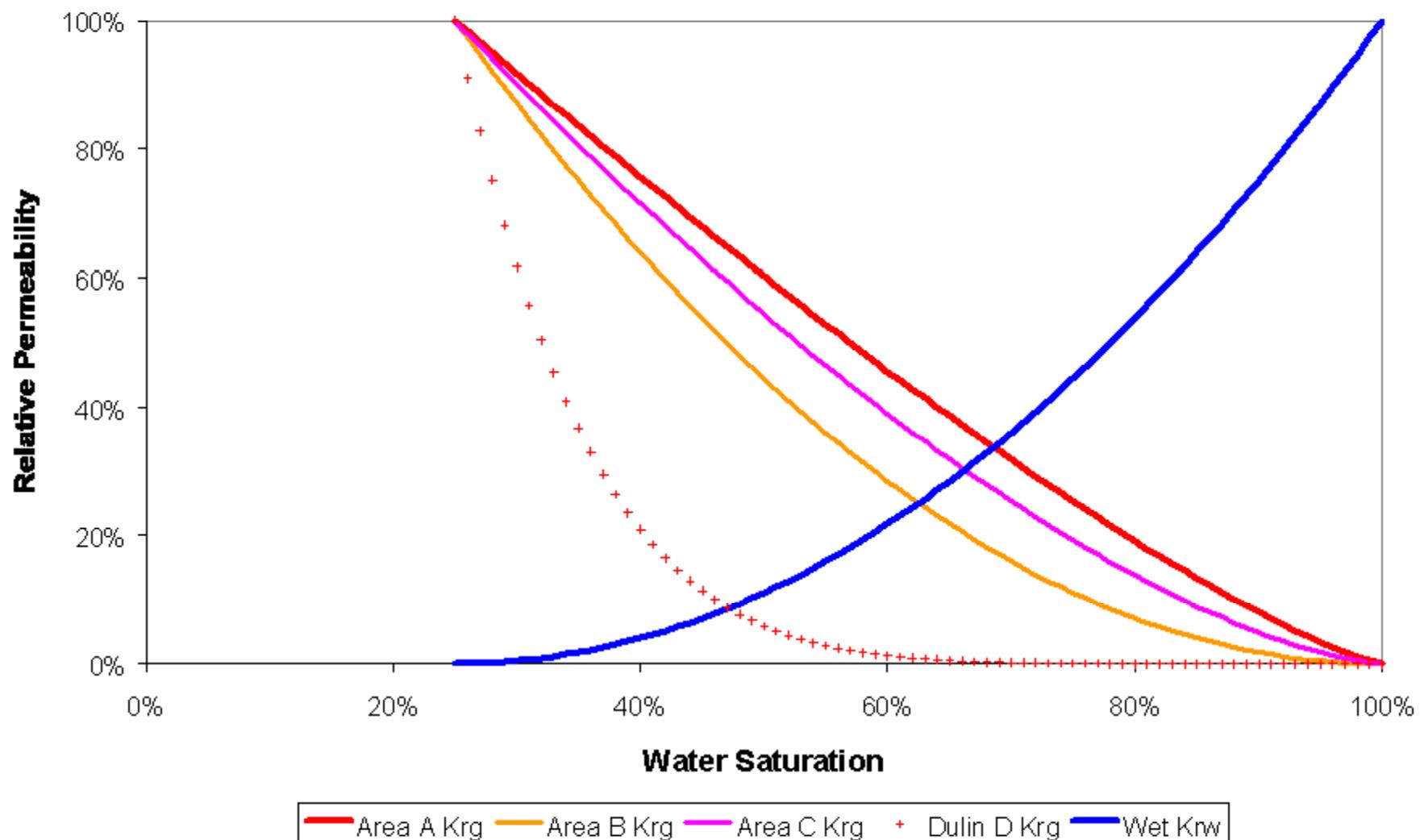


Figure 18: 3M Outcrop Relative Permeability Curves

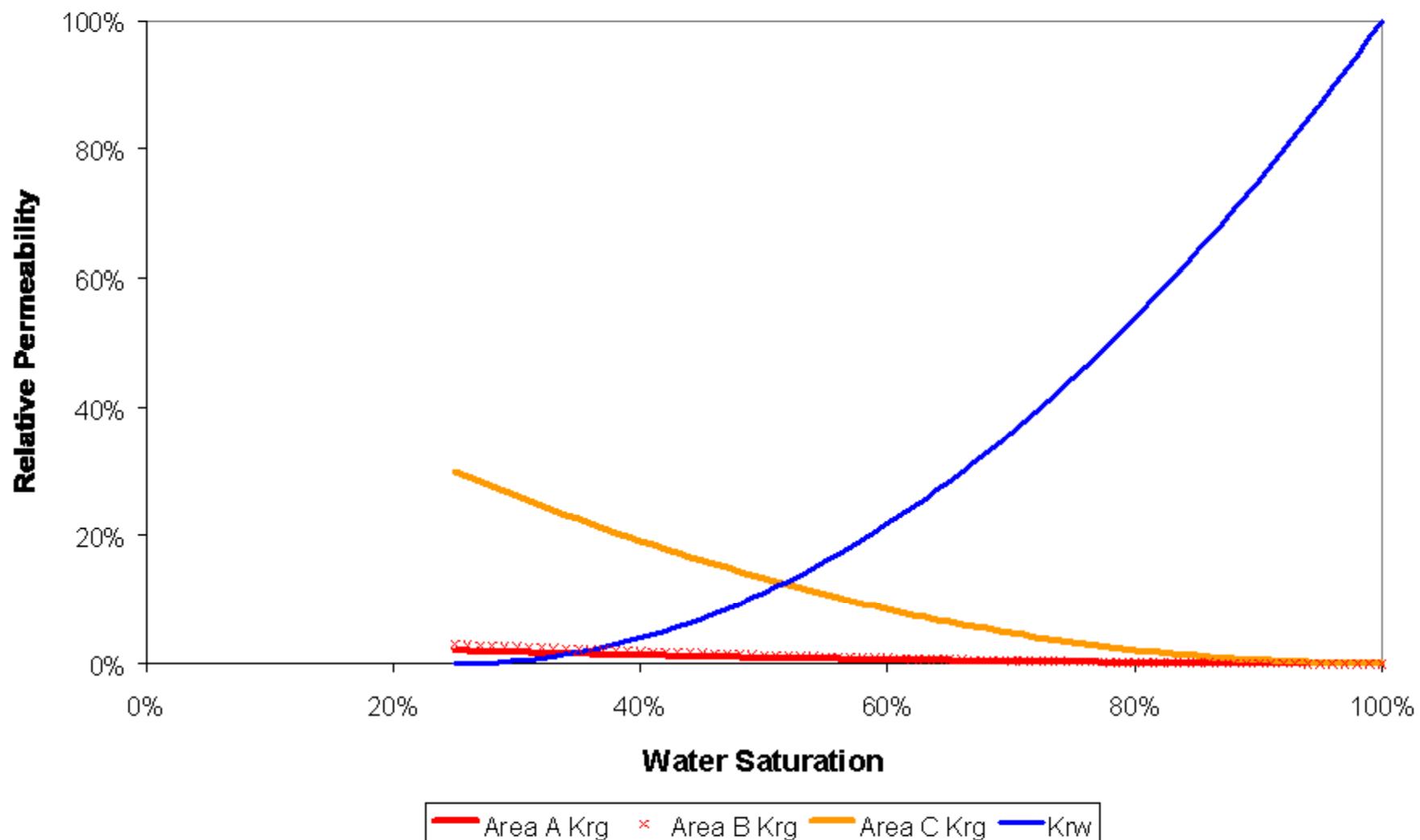


Figure 19: San Juan Basin Fruitland Coal Temperatures

BHT $\approx 60 + 2 \text{ deg}/100 \text{ ft}$ Based on Recorded BHT from Pressure Surveys

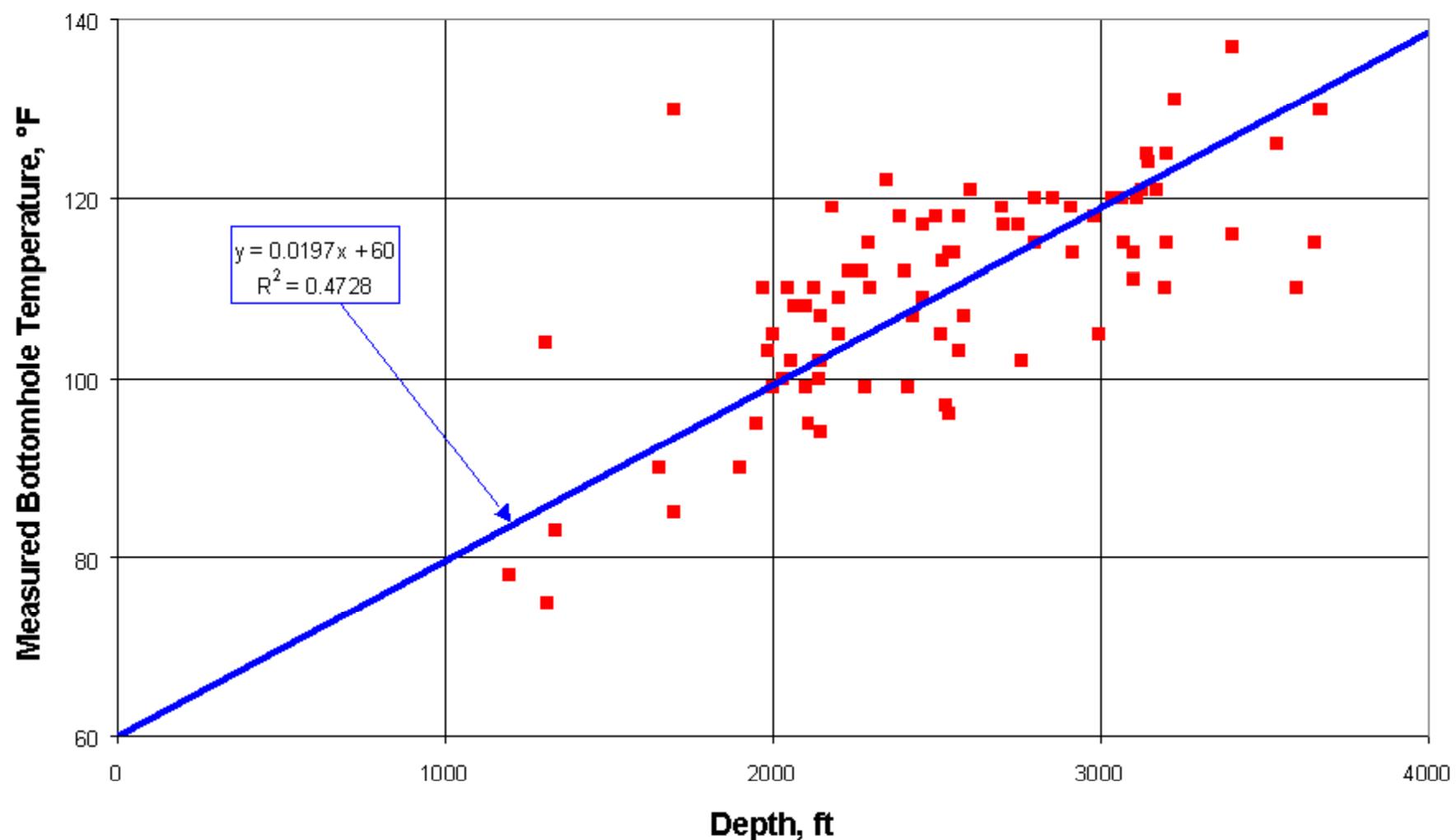


Figure 20: Barriers and Baffles in the 3M CBM Model

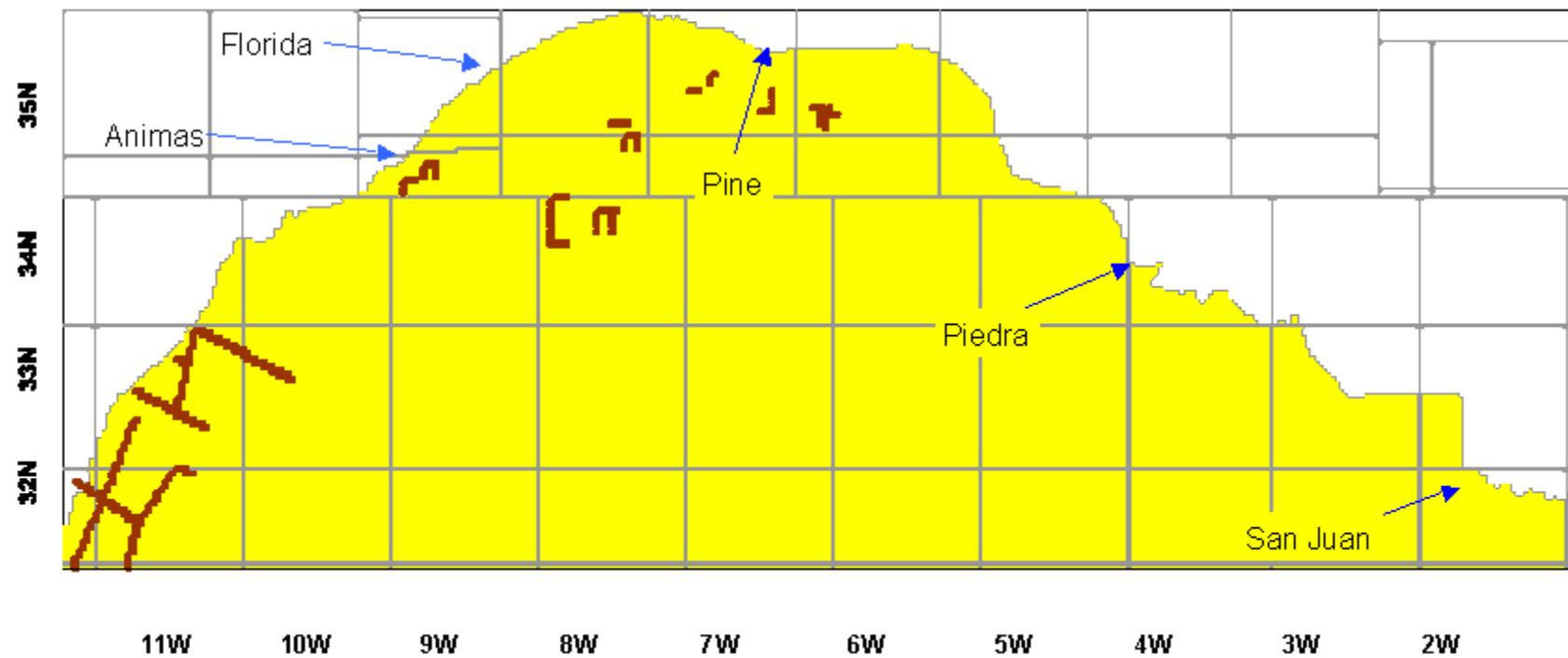
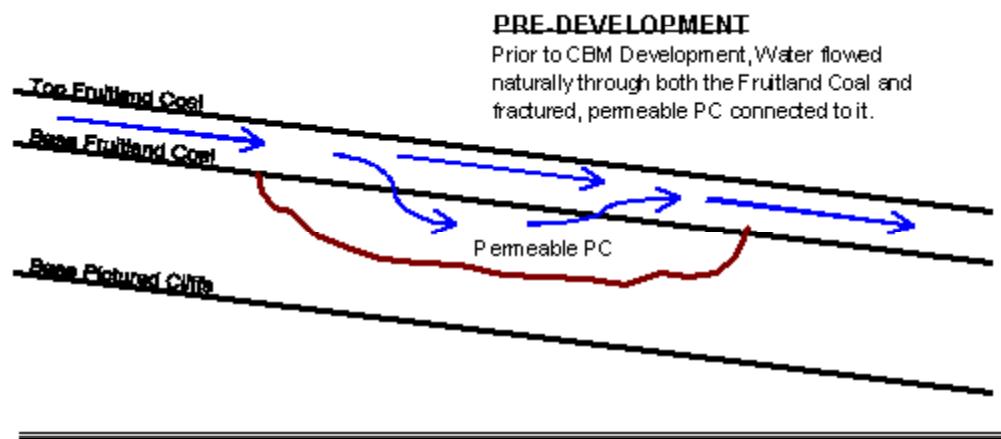


Figure 21: Conceptual Model of Pictured Cliffs Connection



CONDITIONS DURING CBM PRODUCTION

Where permeable PC is in hydraulic connection with the coal, the PC can partially drain due to gas movement from the coal into the PC during production.

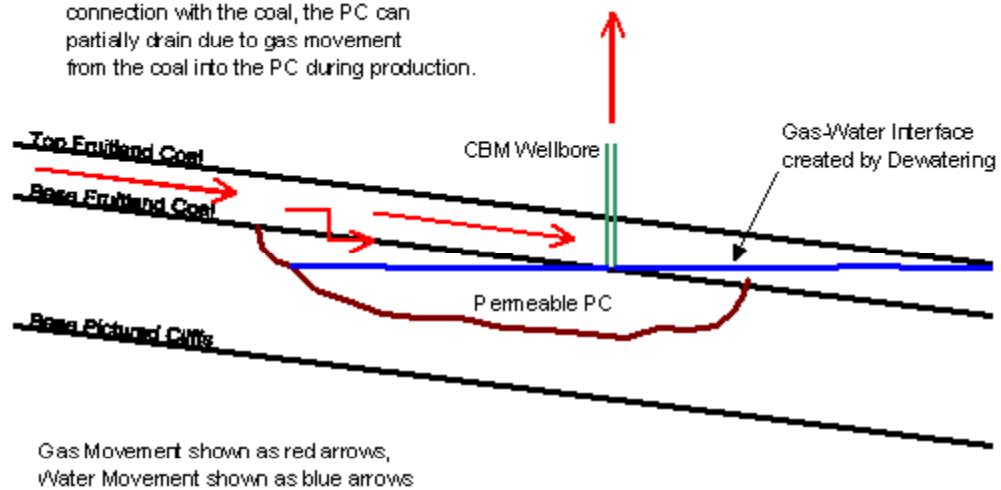
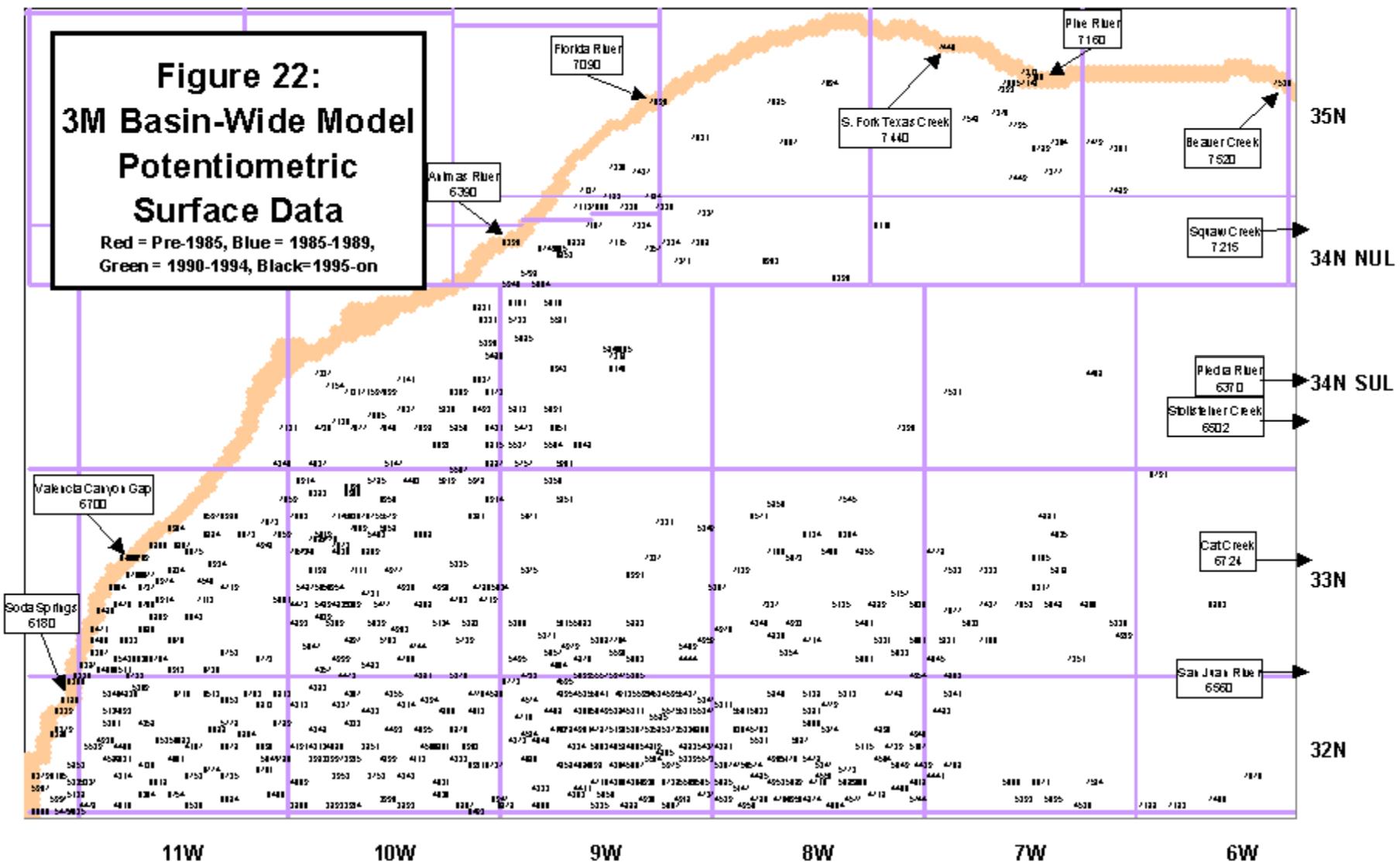


Figure 22:
3M Basin-Wide Model
Potentiometric Surface Data

Red = Pre-1985, Blue = 1985-1989,
 Green = 1990-1994, Black = 1995-on



11W

10W

9W

8W

7W

6W

Figure 23:
Difference between Observed
and Initial Model P-Heads,
Run 26-33

Red = Pre-1985, Blue = 1985-1989, Green = 1990-1994

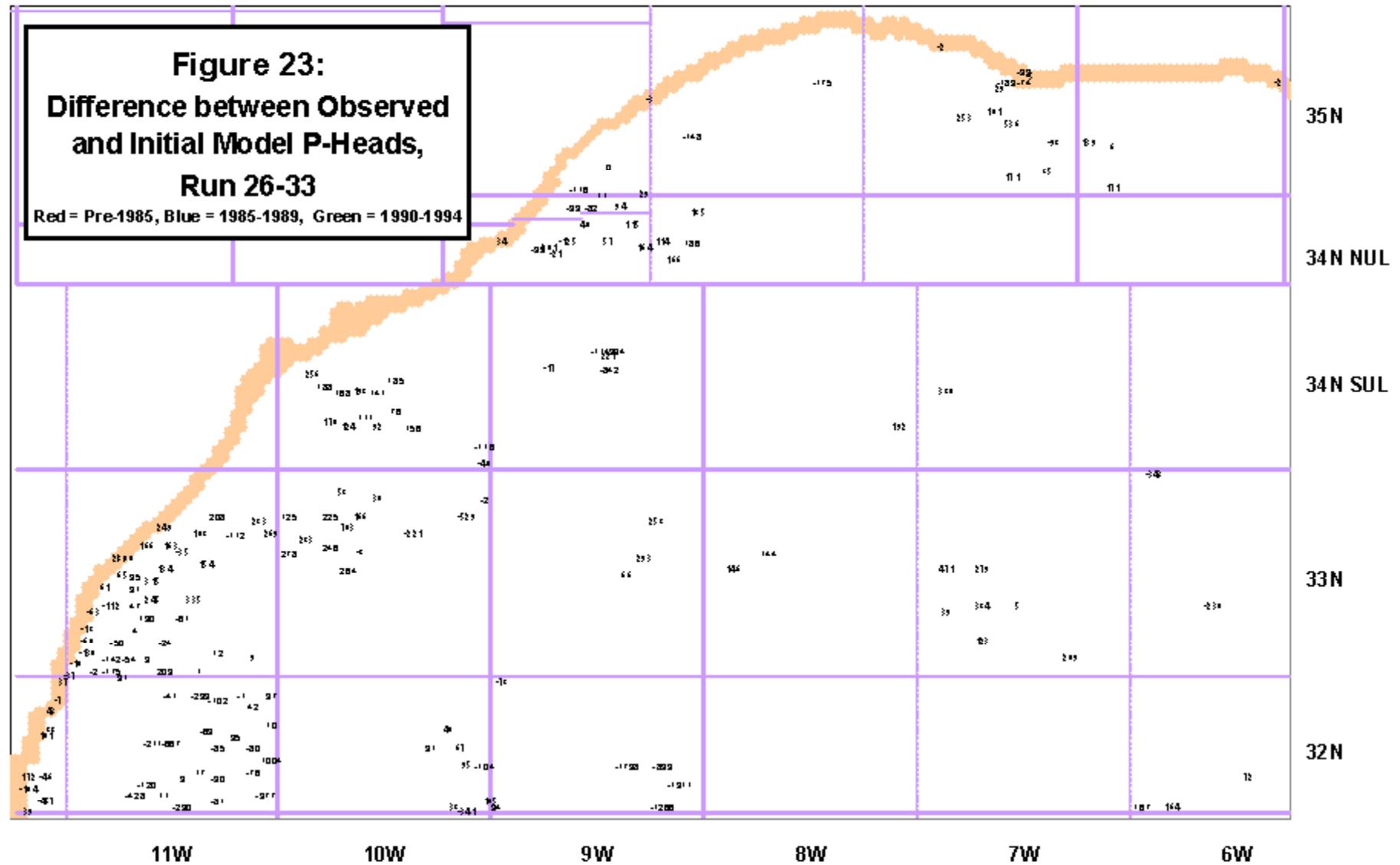


Figure 24: Comparison between Simulated Initial Heads and Measured Heads, Run 26-33

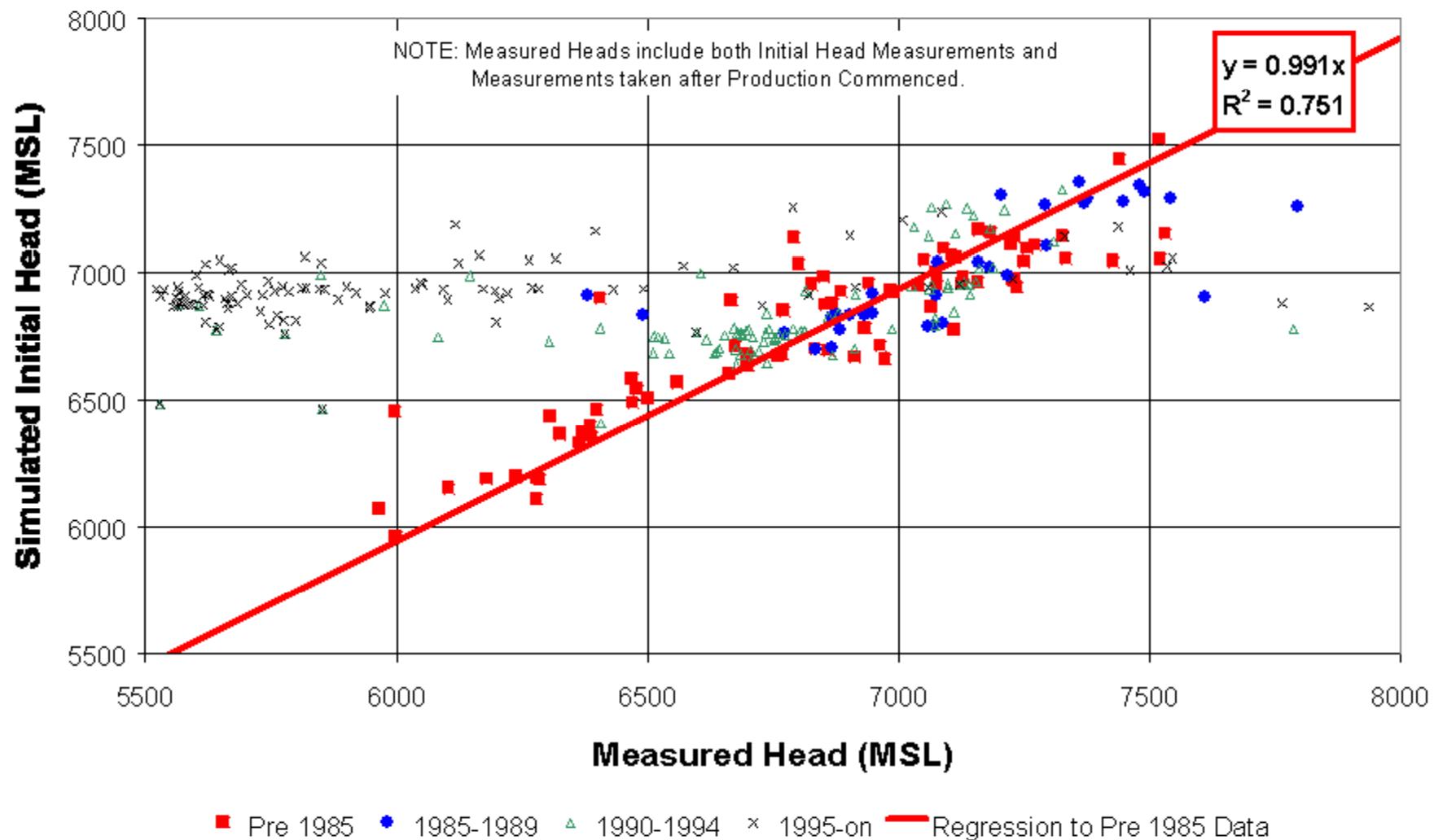
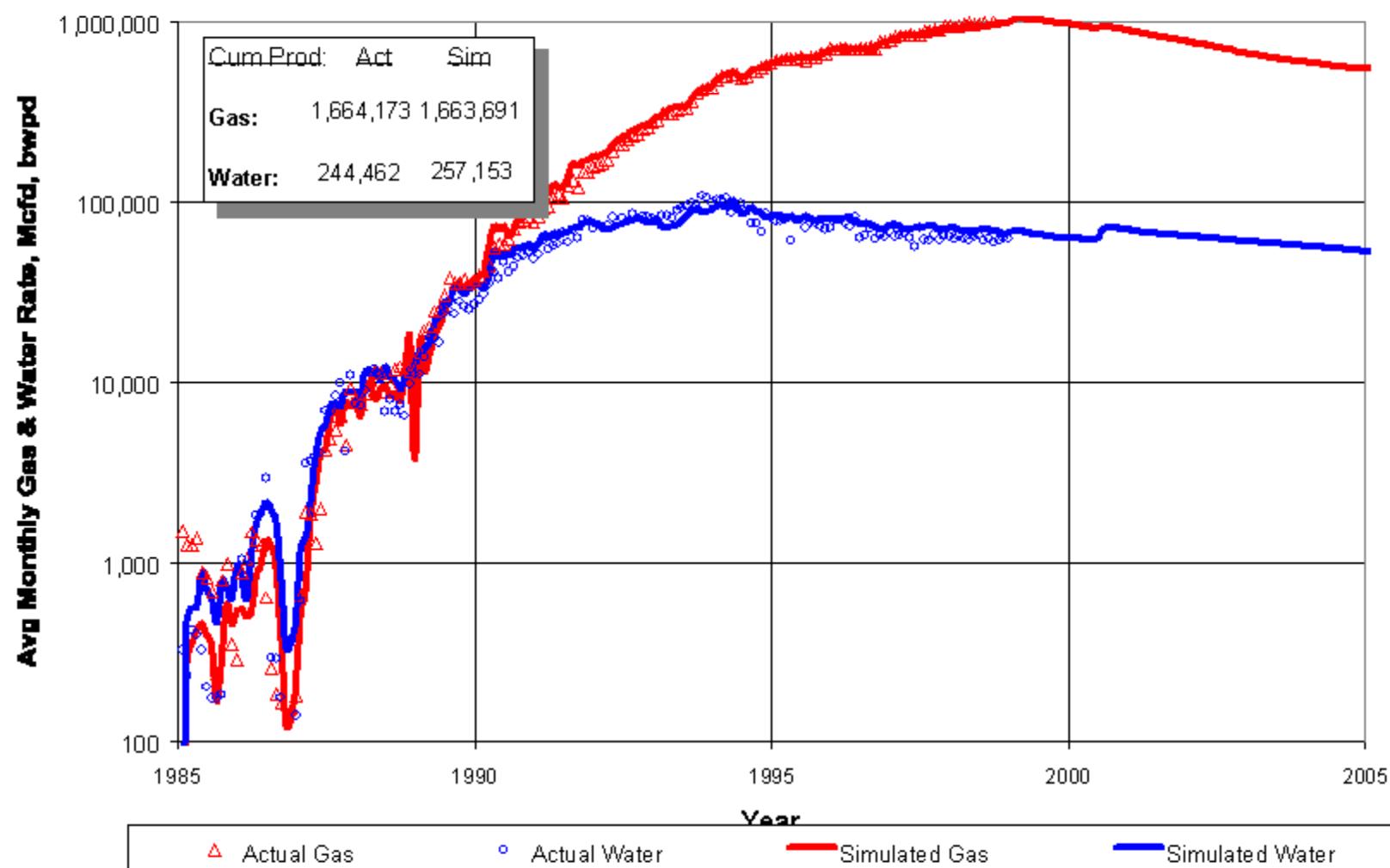
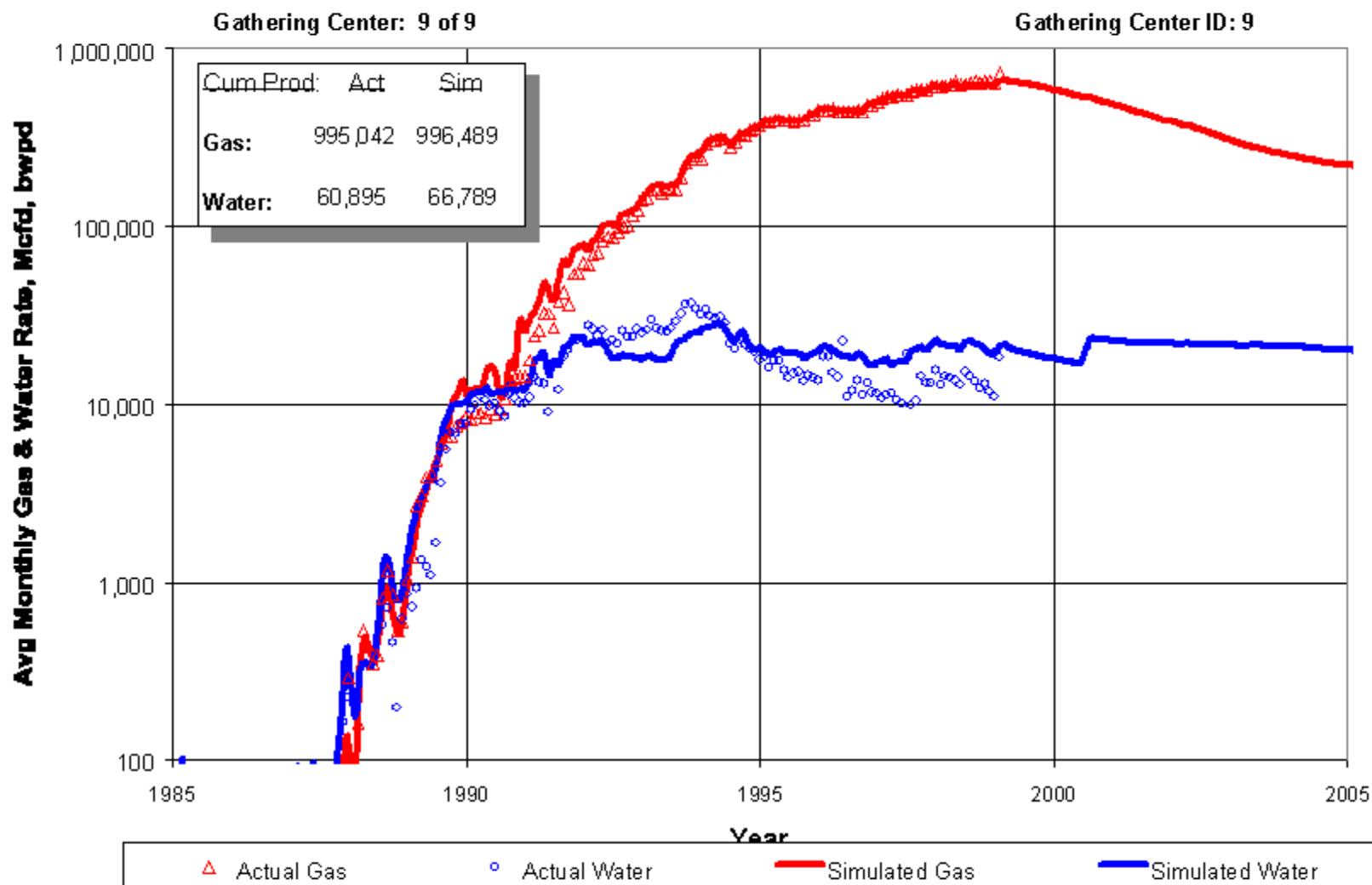


Figure 25: Overall History Match, All Areas Combined



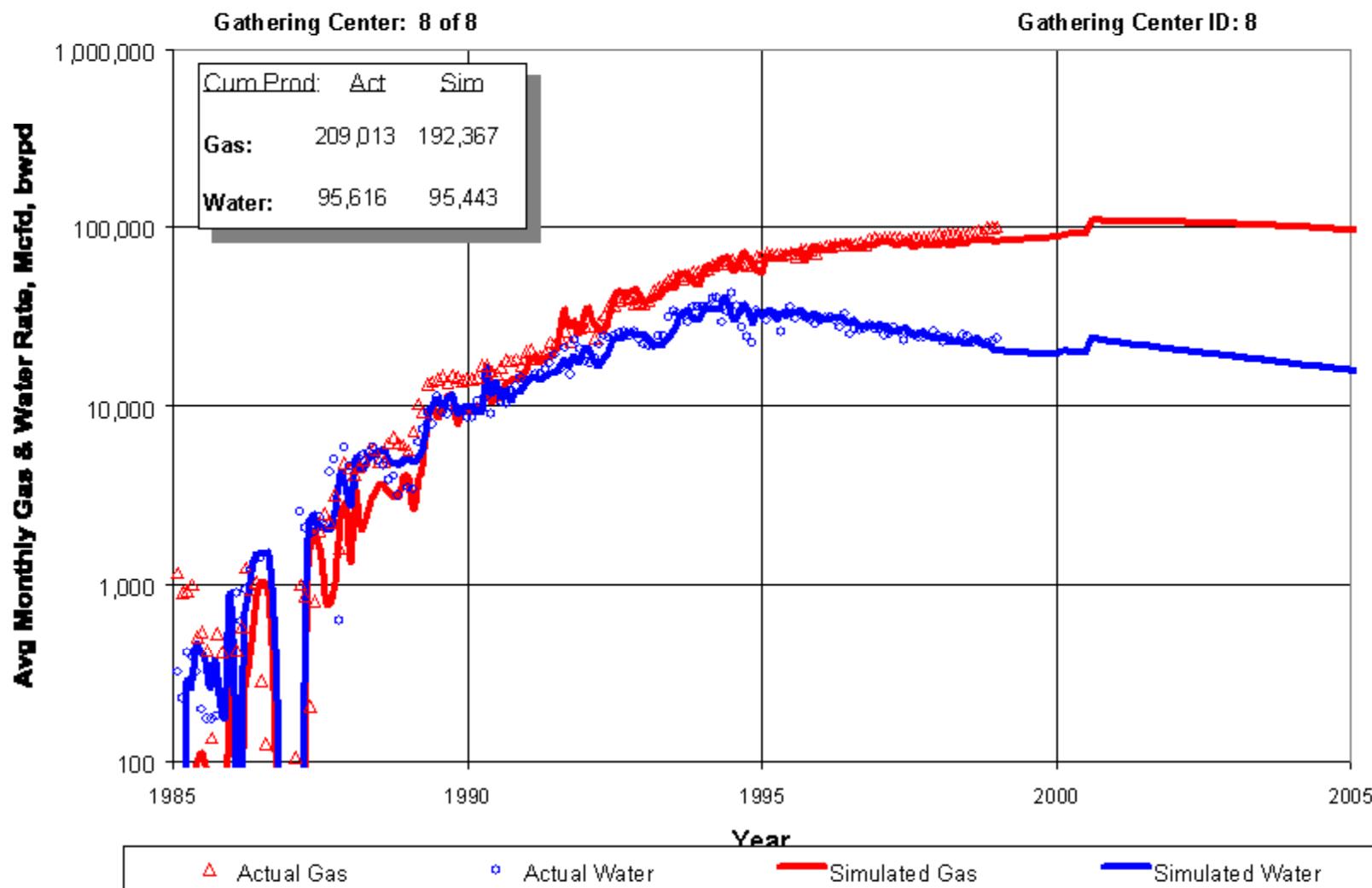
3M Model History Matches

Figure 26: Area A Existing Wells (308 Wells)



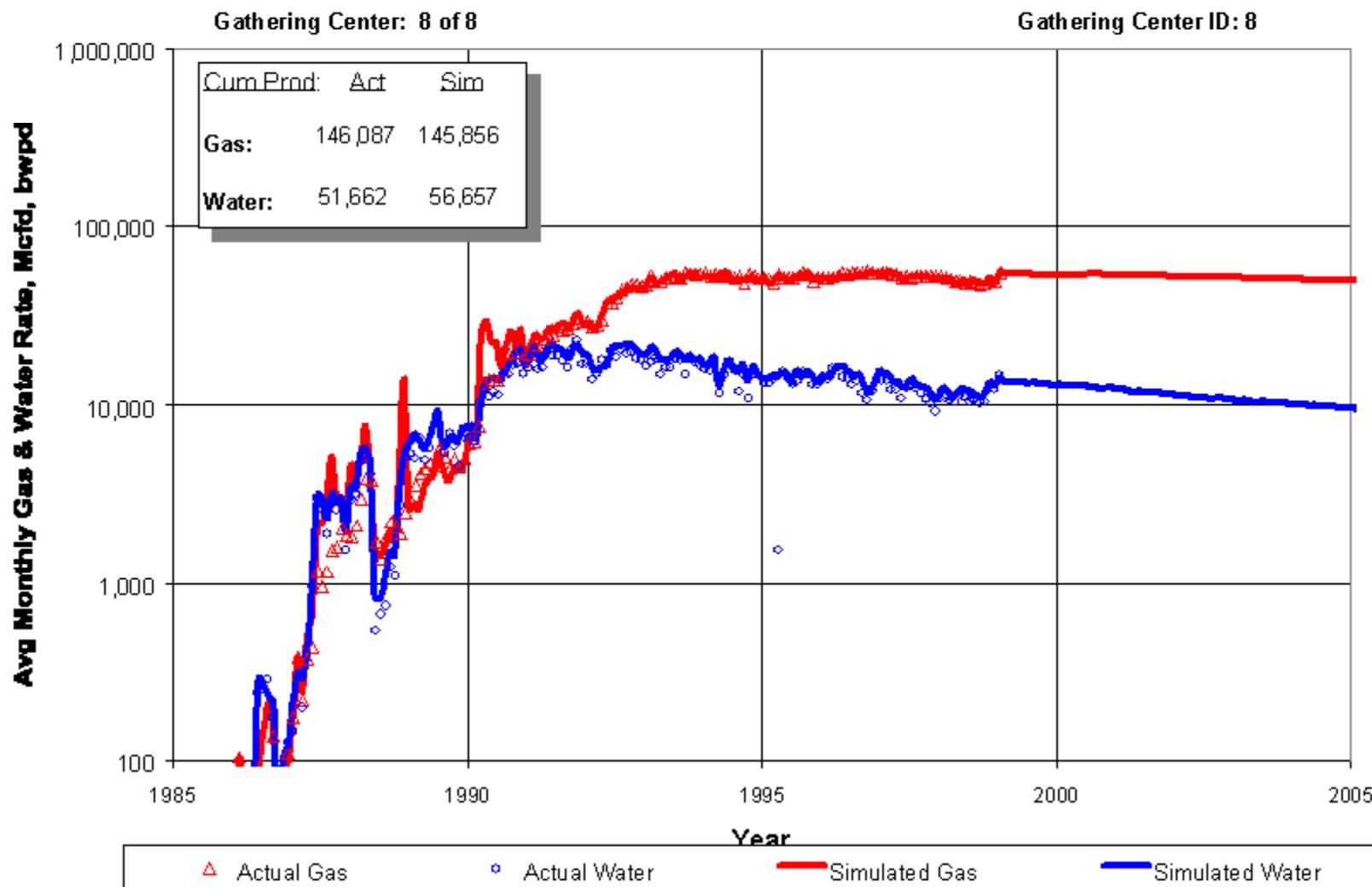
3M Model History Matches

Figure 27: Area B Existing Wells (244)



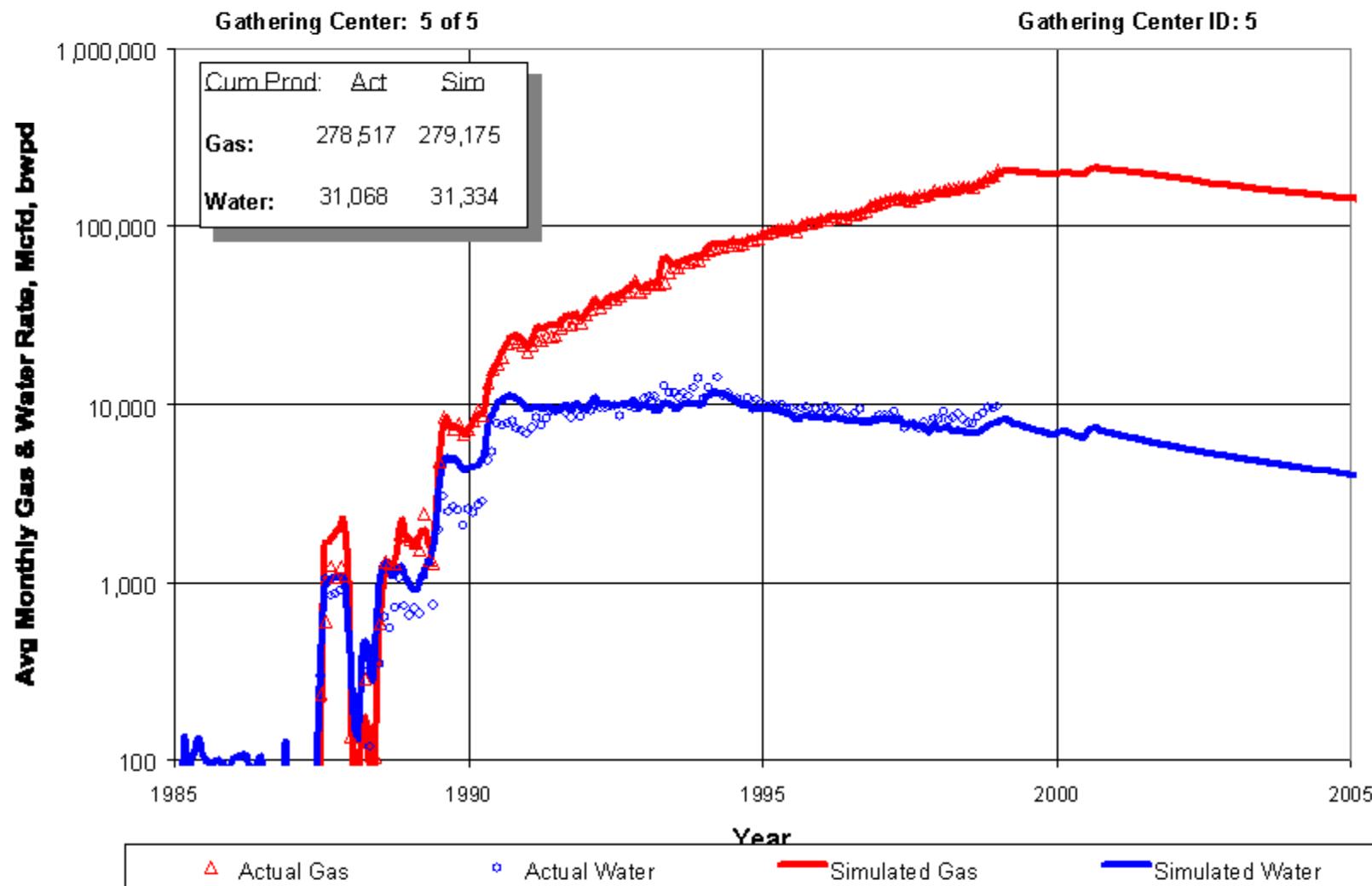
3M Model History Matches

Figure 28: Area C Existing Wells (160 Wells)

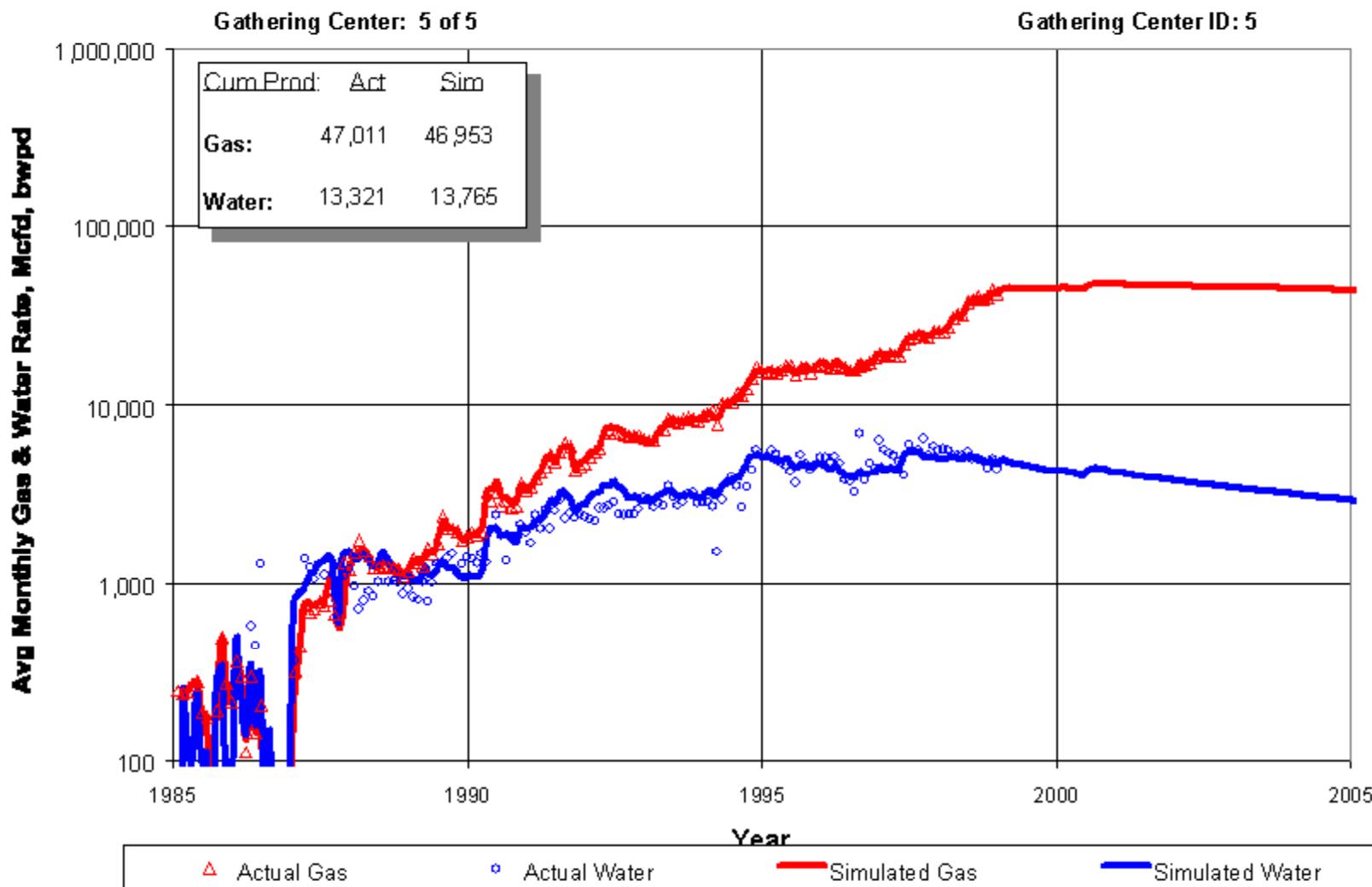


3M Model History Matches

Figure 29: Area D: Existing (349 Wells)

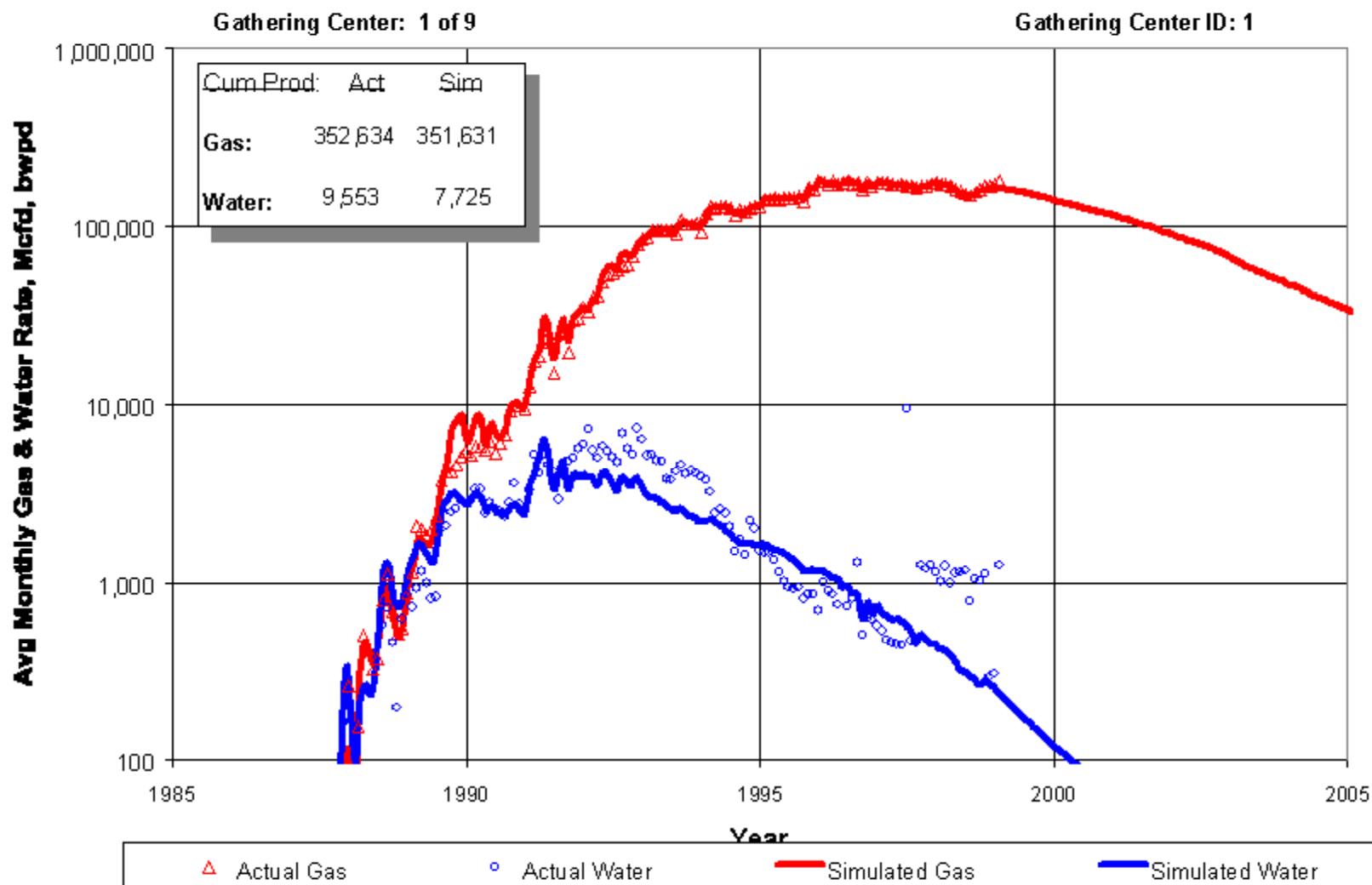


3M Model History Matches
Figure 30: Area E (187 Wells)



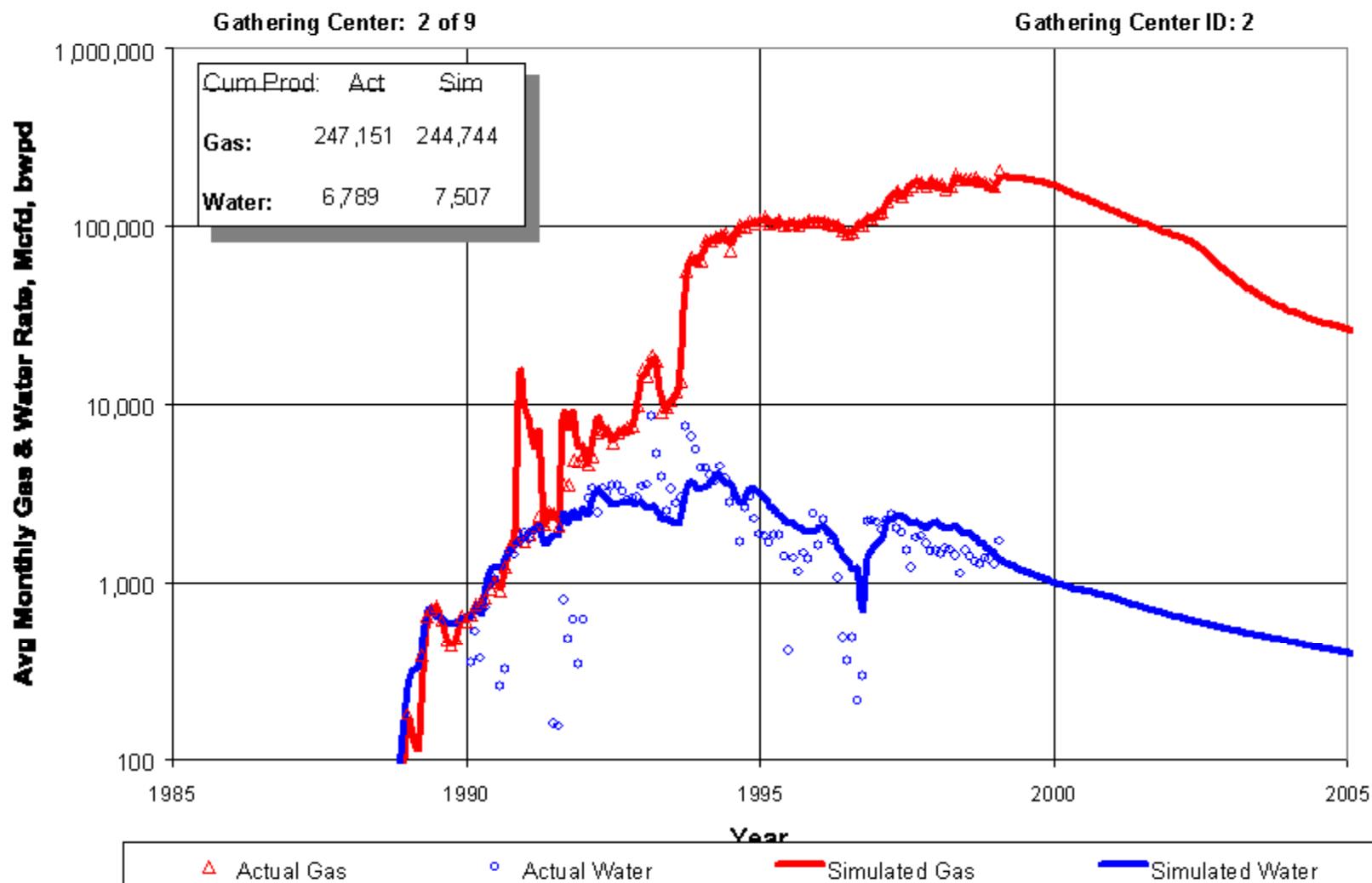
3M Model History Matches

Figure 31: Area A1: 32N-10W (51 Wells)



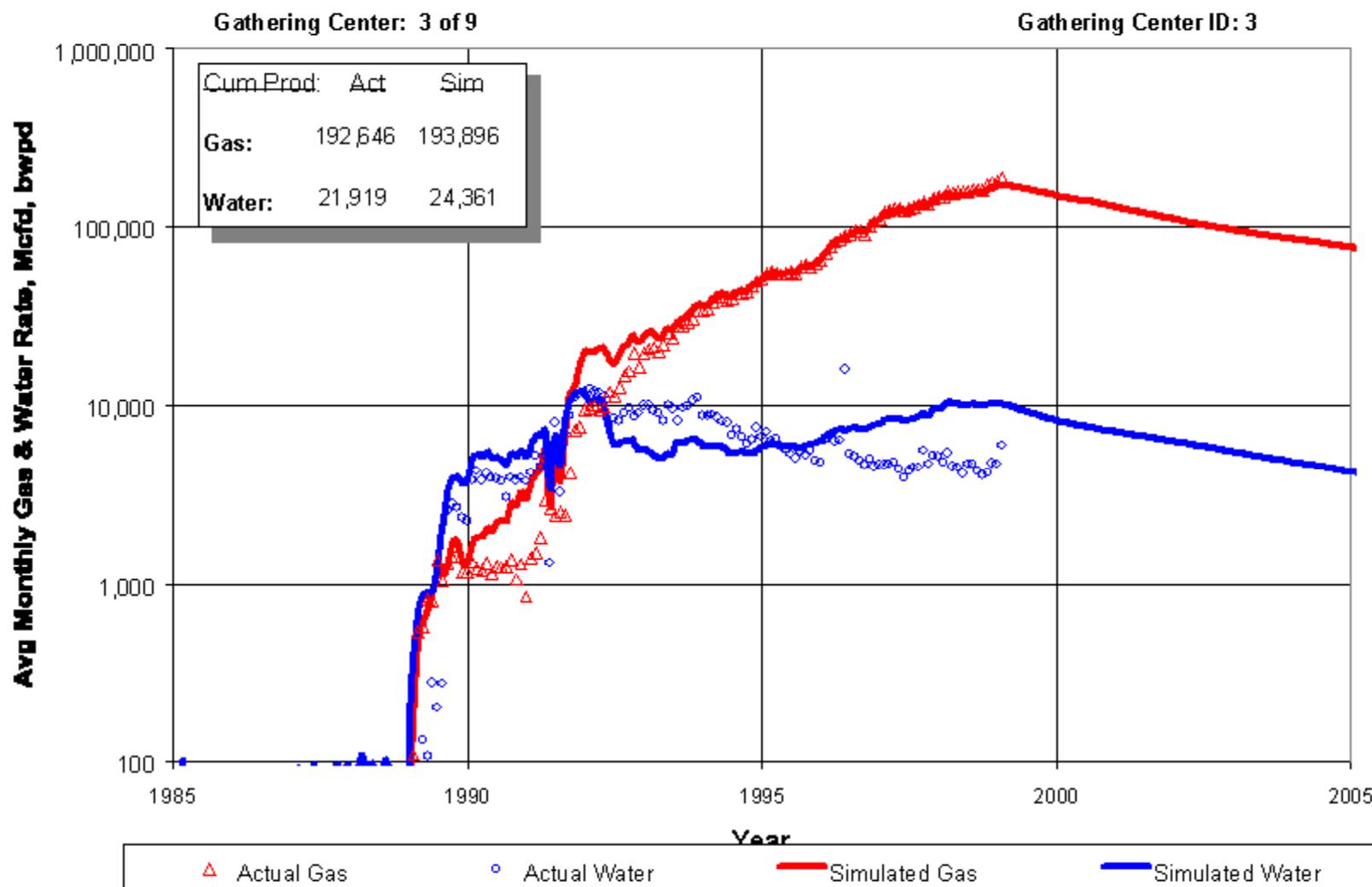
3M Model History Matches

Figure 32: Area A2: 32N-11 & 12 W (59 Wells)



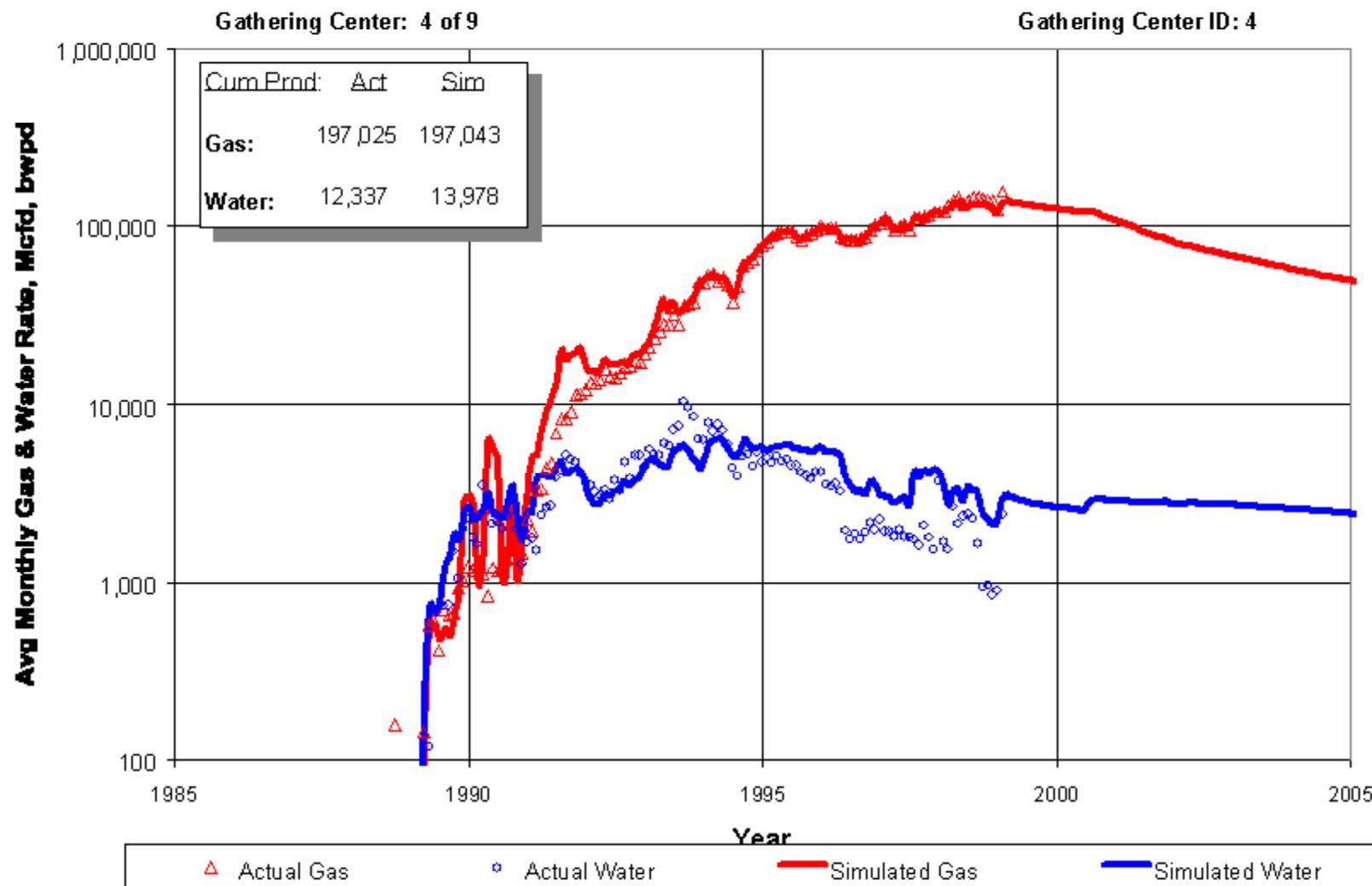
3M Model History Matches

Figure 33: Area A3: 33N-10W (90 Wells)



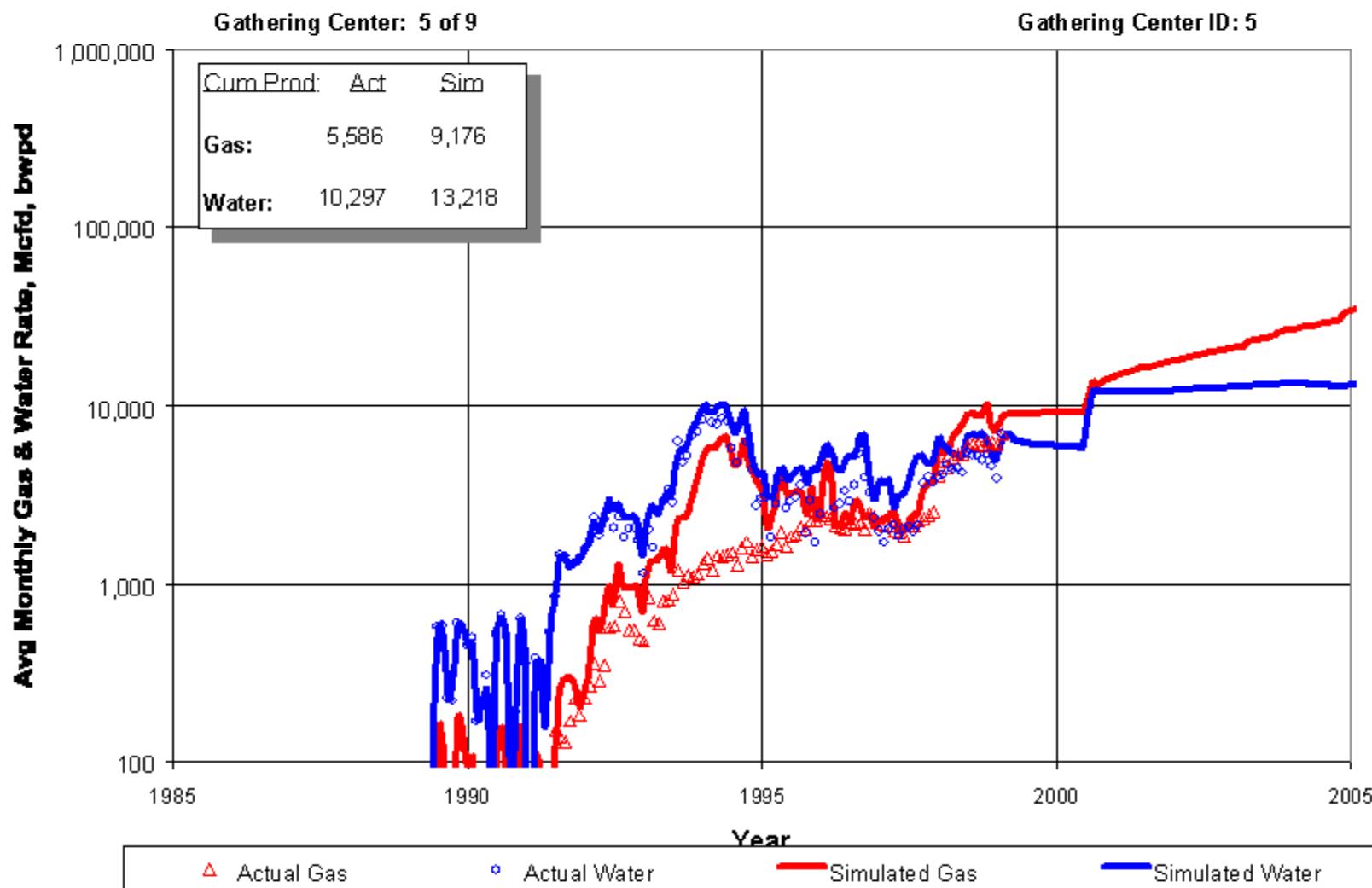
3M Model History Matches

Figure 34: Area A4: 33N-11W (63 Wells)



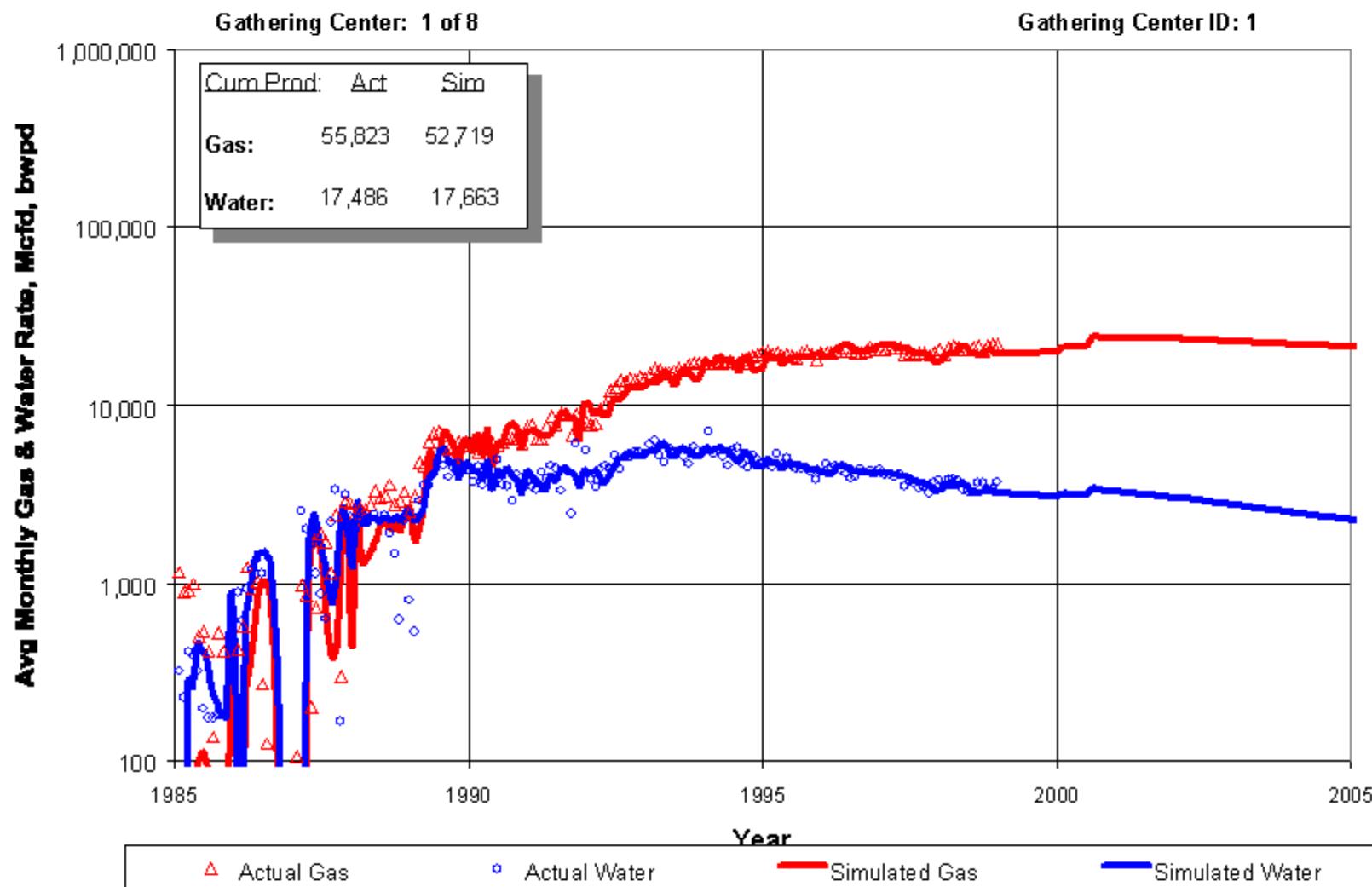
3M Model History Matches

Figure 35: Area A5: 34N-10 & 11W SUL (45 Wells)



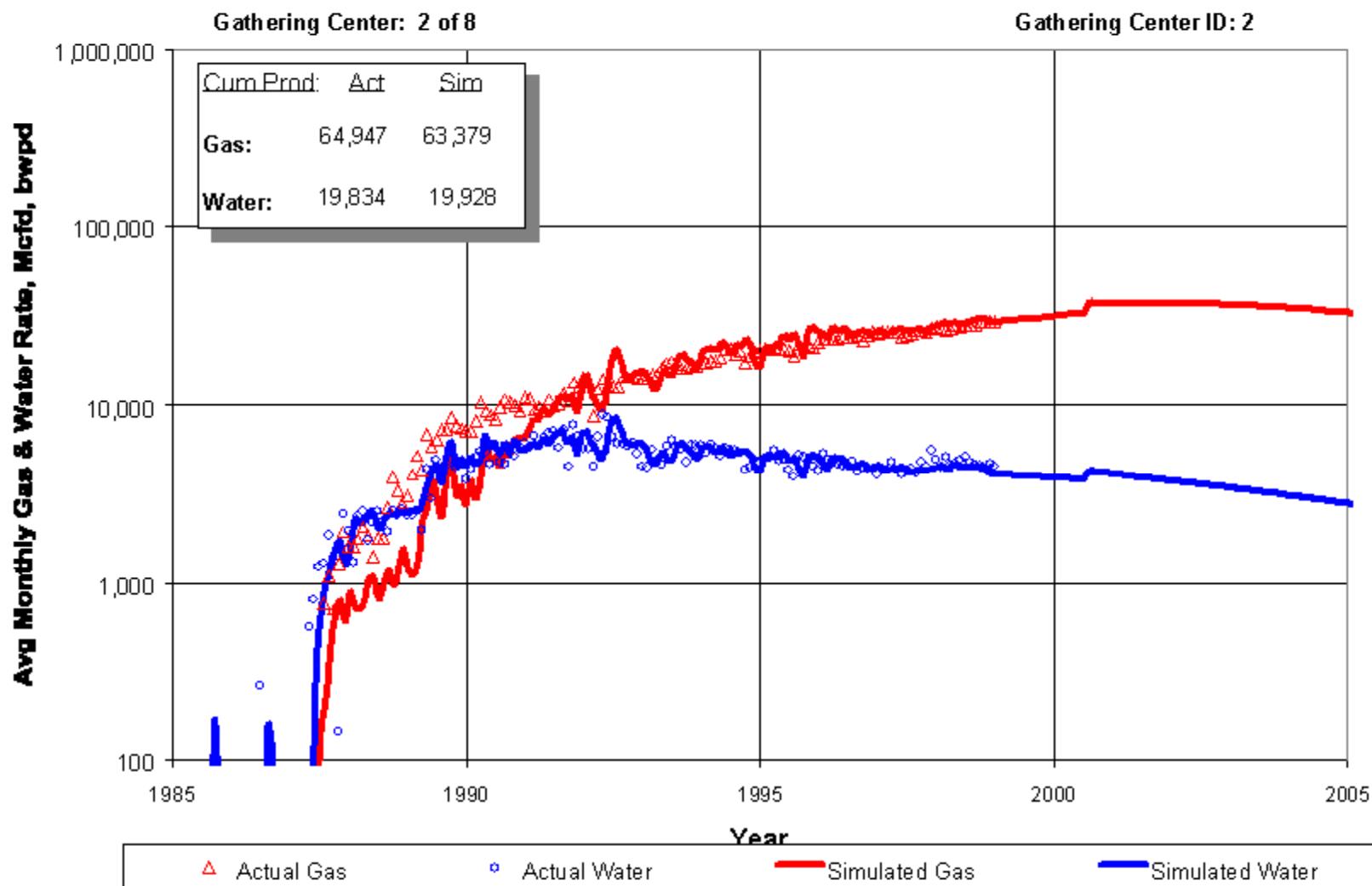
3M Model History Matches

Figure 36: Area B1: 34N-8W SUL (63 Wells)



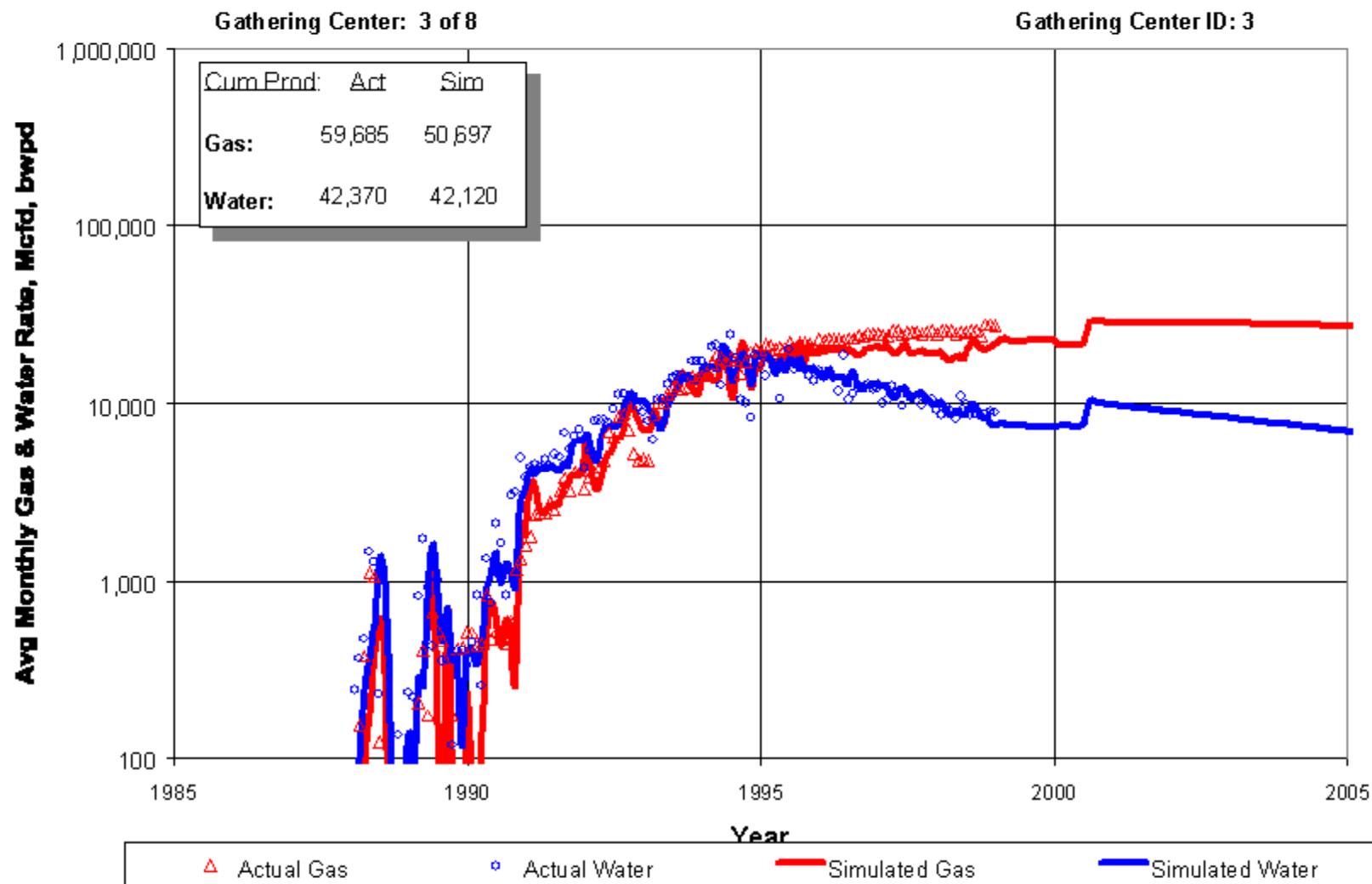
3M Model History Matches

Figure 37: Area B2: 34N-9W SUL (63 Wells)



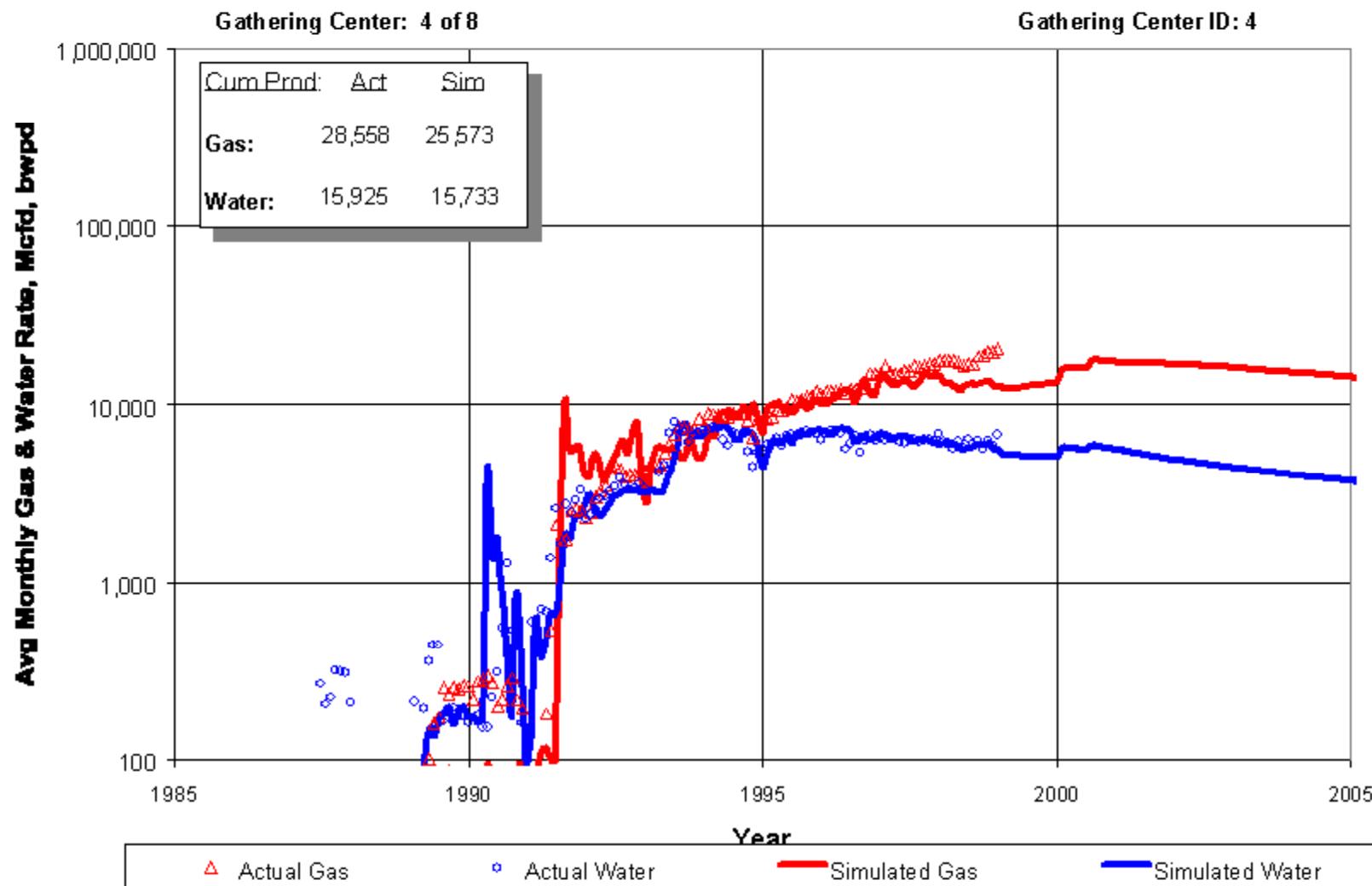
3M Model History Matches

Figure 38: Area B3: 34 & 35N- 7& 8W NUL (74 Wells)



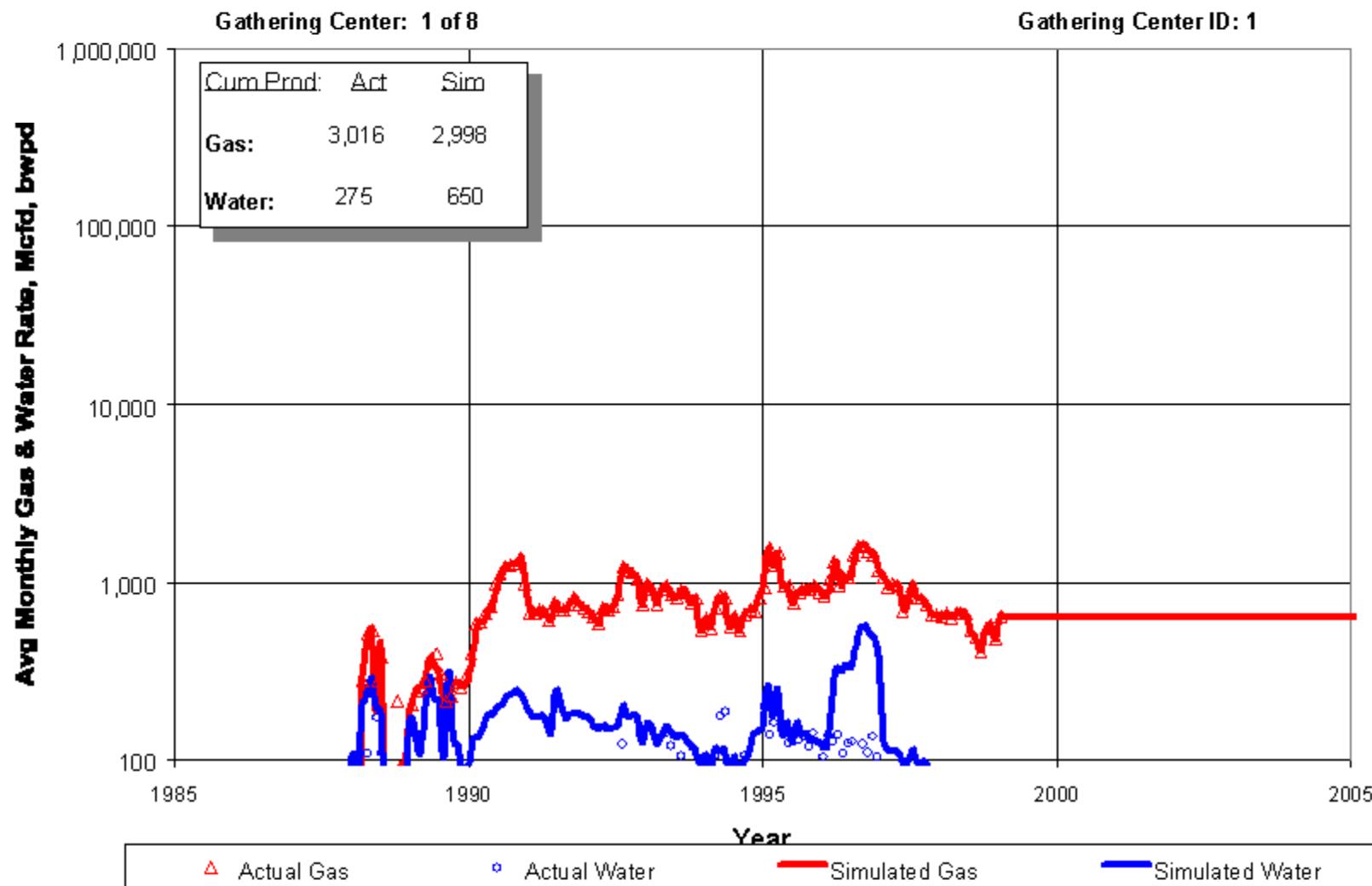
3M Model History Matches

Figure 39: Area B4: 34 & 35N-9W NUL (44 Wells)



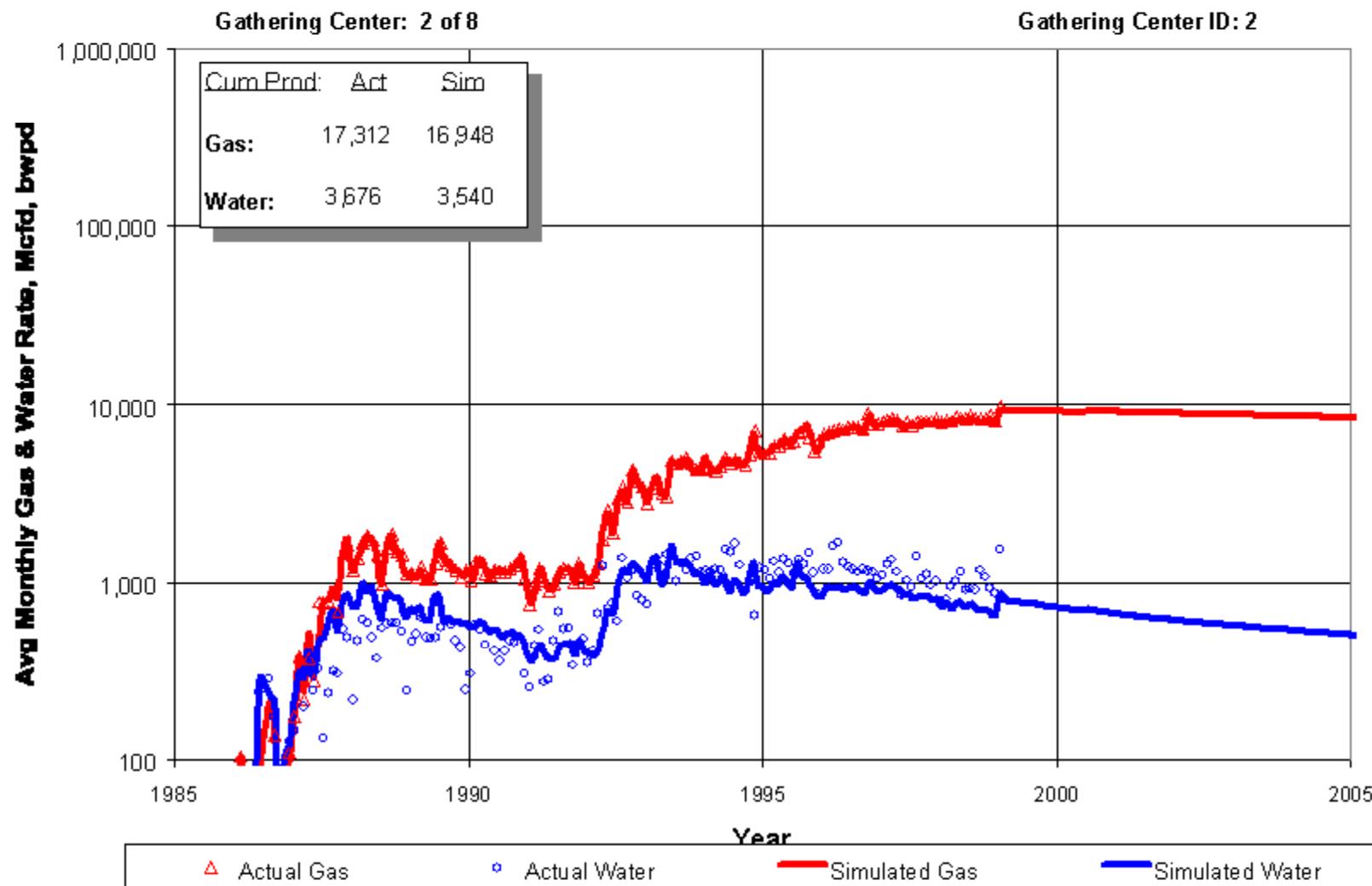
3M Model History Matches

Figure 40: Area C1: 34N-5 & 6W SUL (19 Wells)



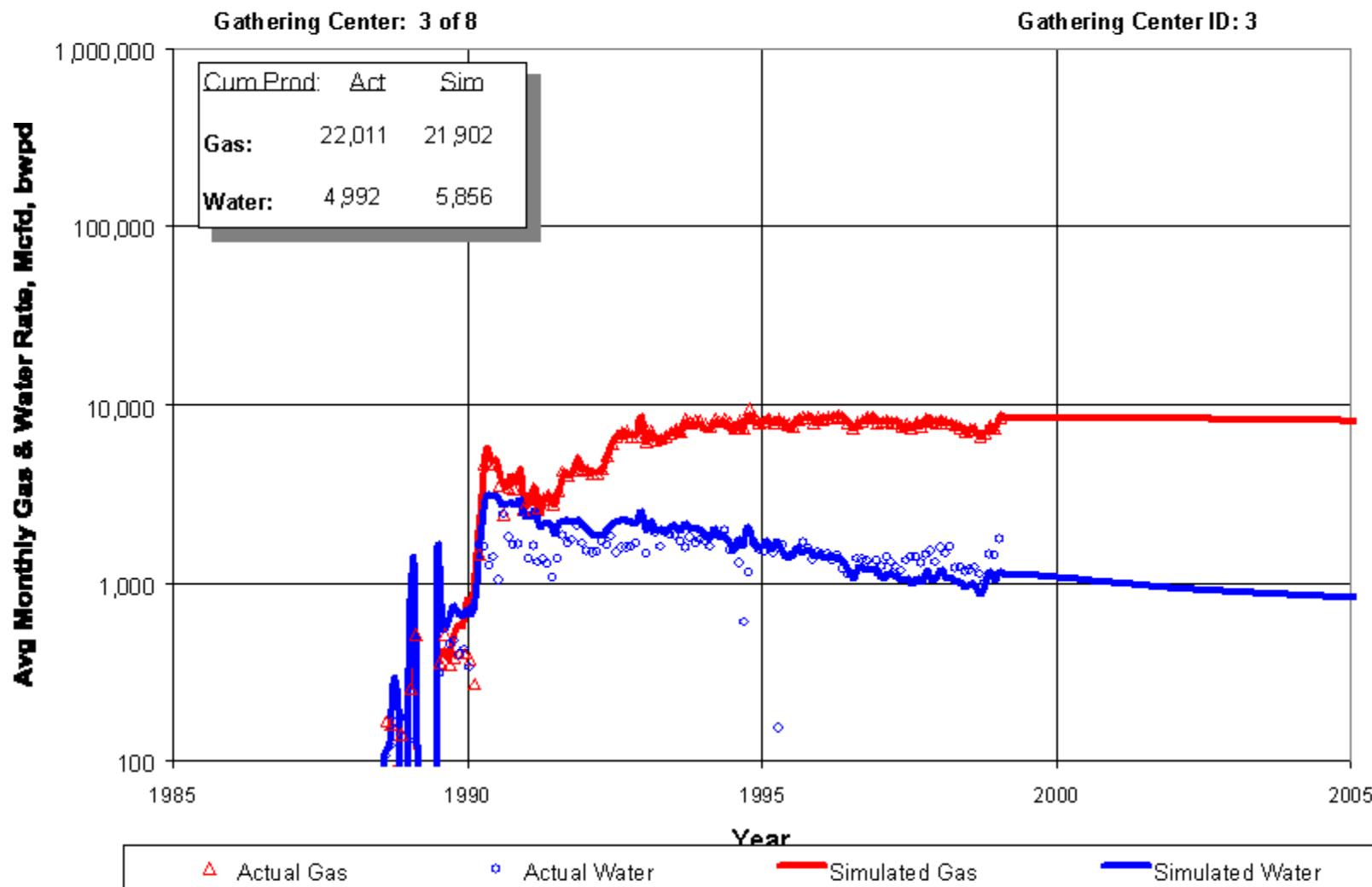
3M Model History Matches

Figure 41: Area C2: 34N-7W SUL (47 Wells)



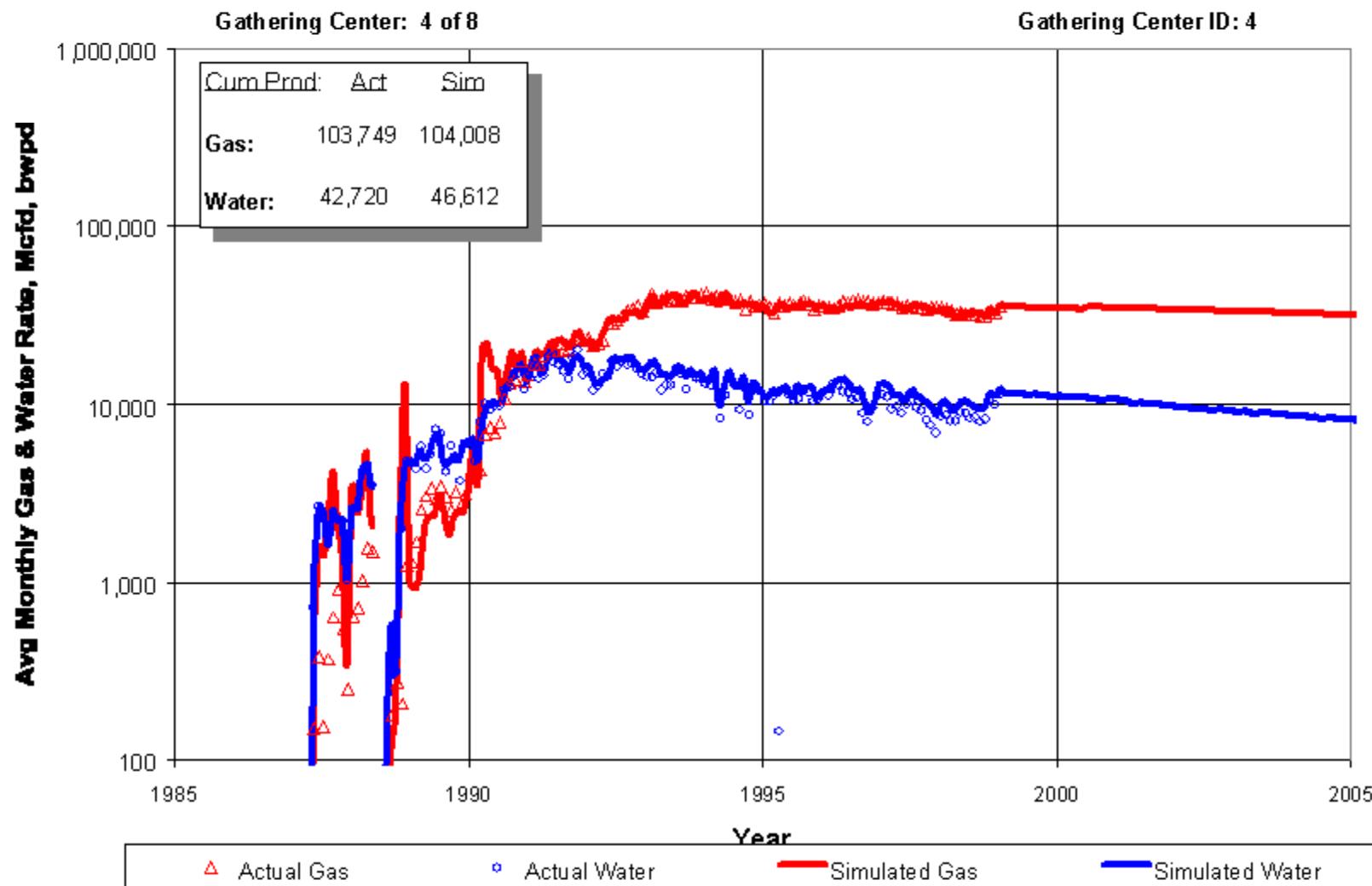
3M Model History Matches

Figure 42: Area C3: 34 & 35N- 5 & 6W NUL (30 Wells)



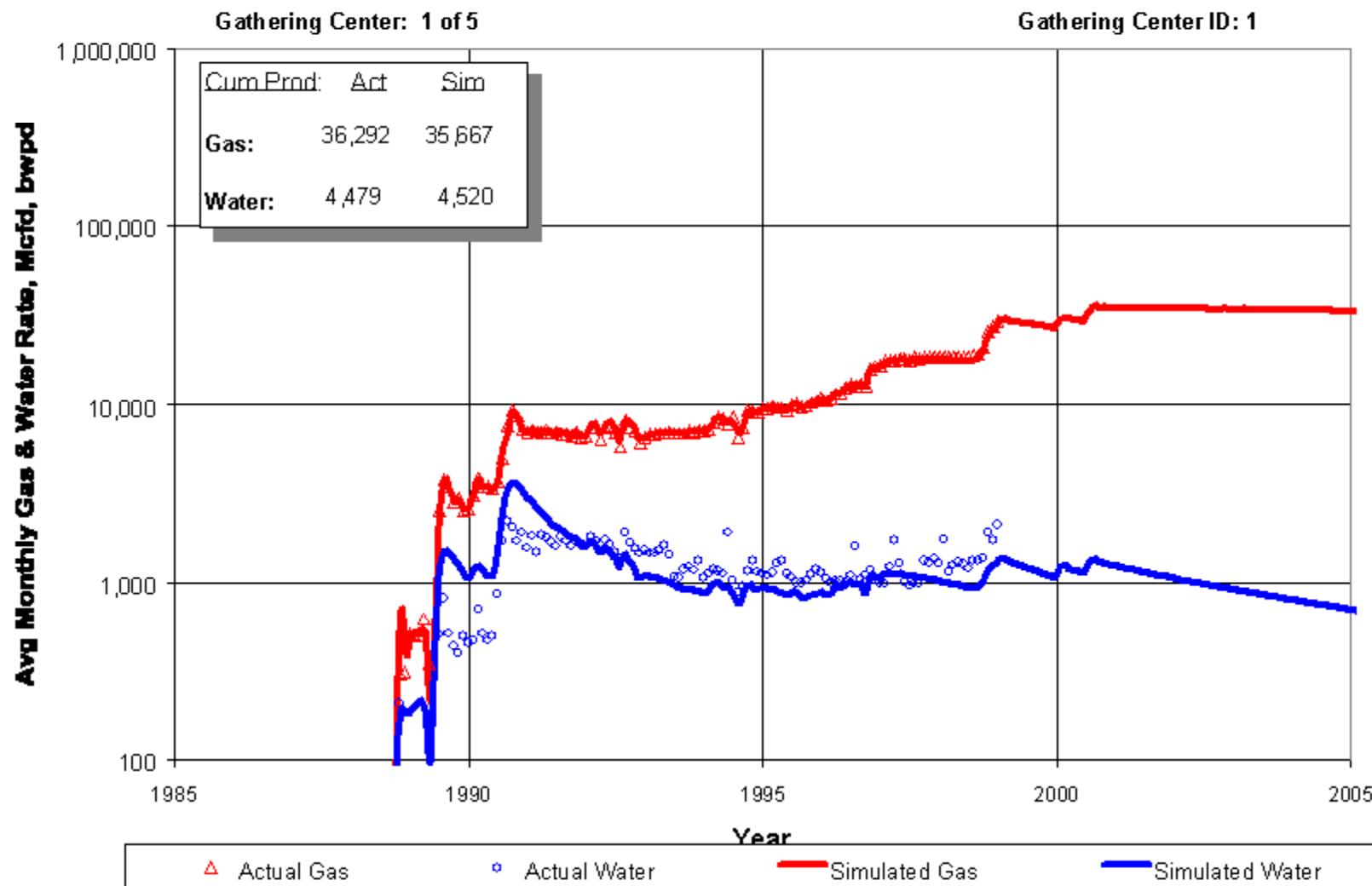
3M Model History Matches

Figure 43: Area C4: 34 & 35N-7W NUL (64 Wells)



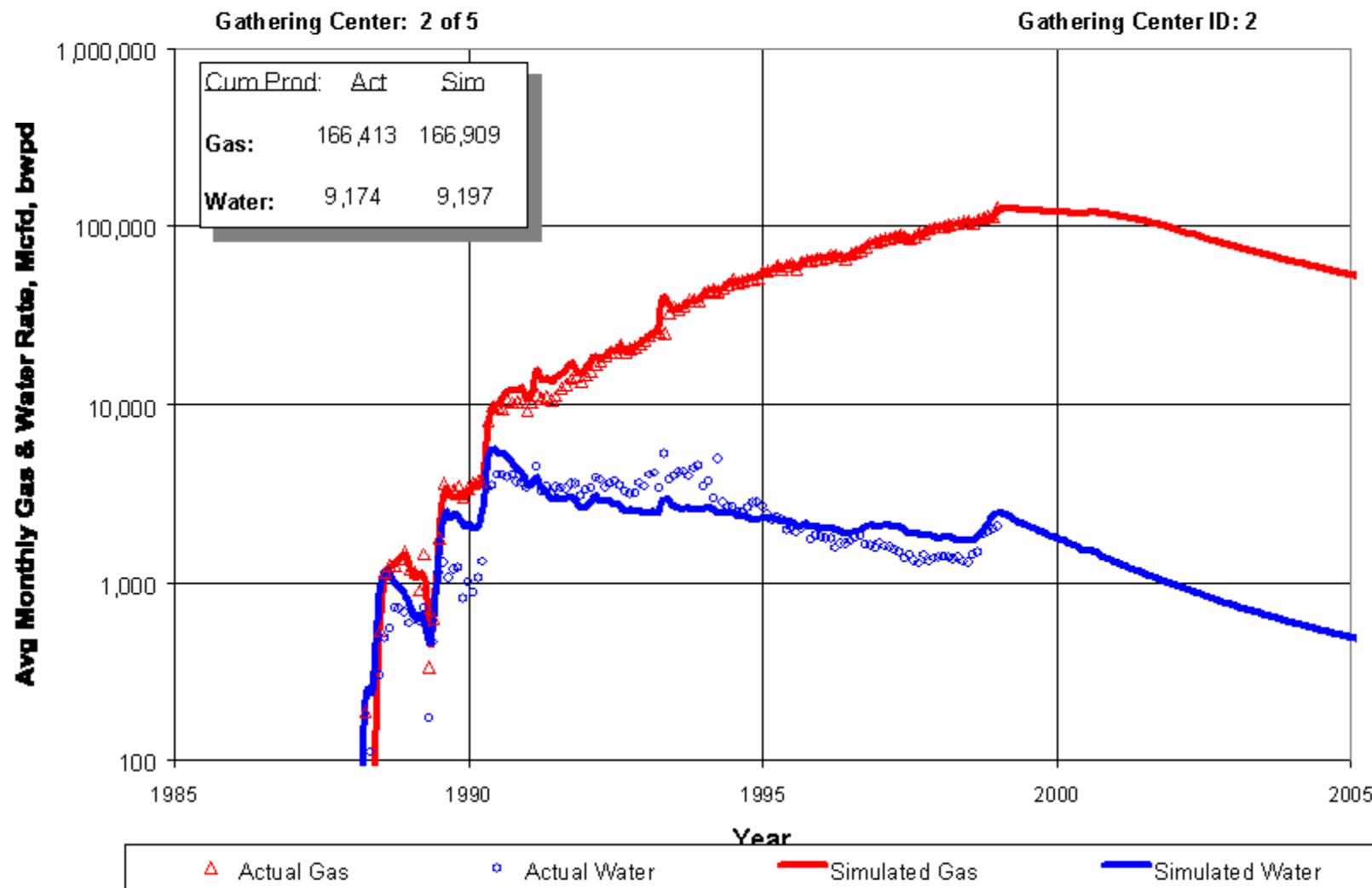
3M Model History Matches

Figure 44: Area D1: 32N-8W (54 Wells)



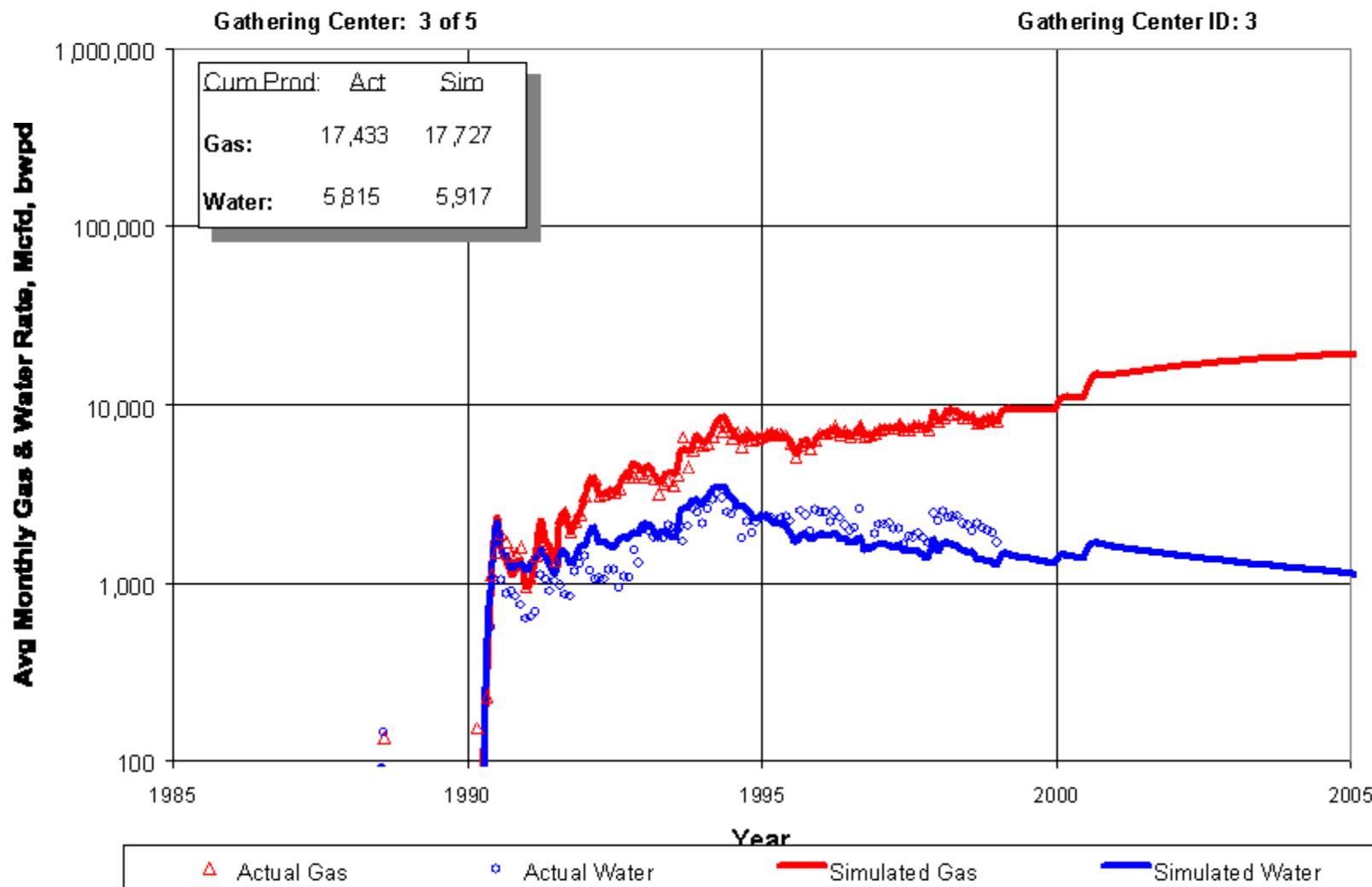
3M Model History Matches

Figure 45: Area D2: 32N-9W (71 Wells)



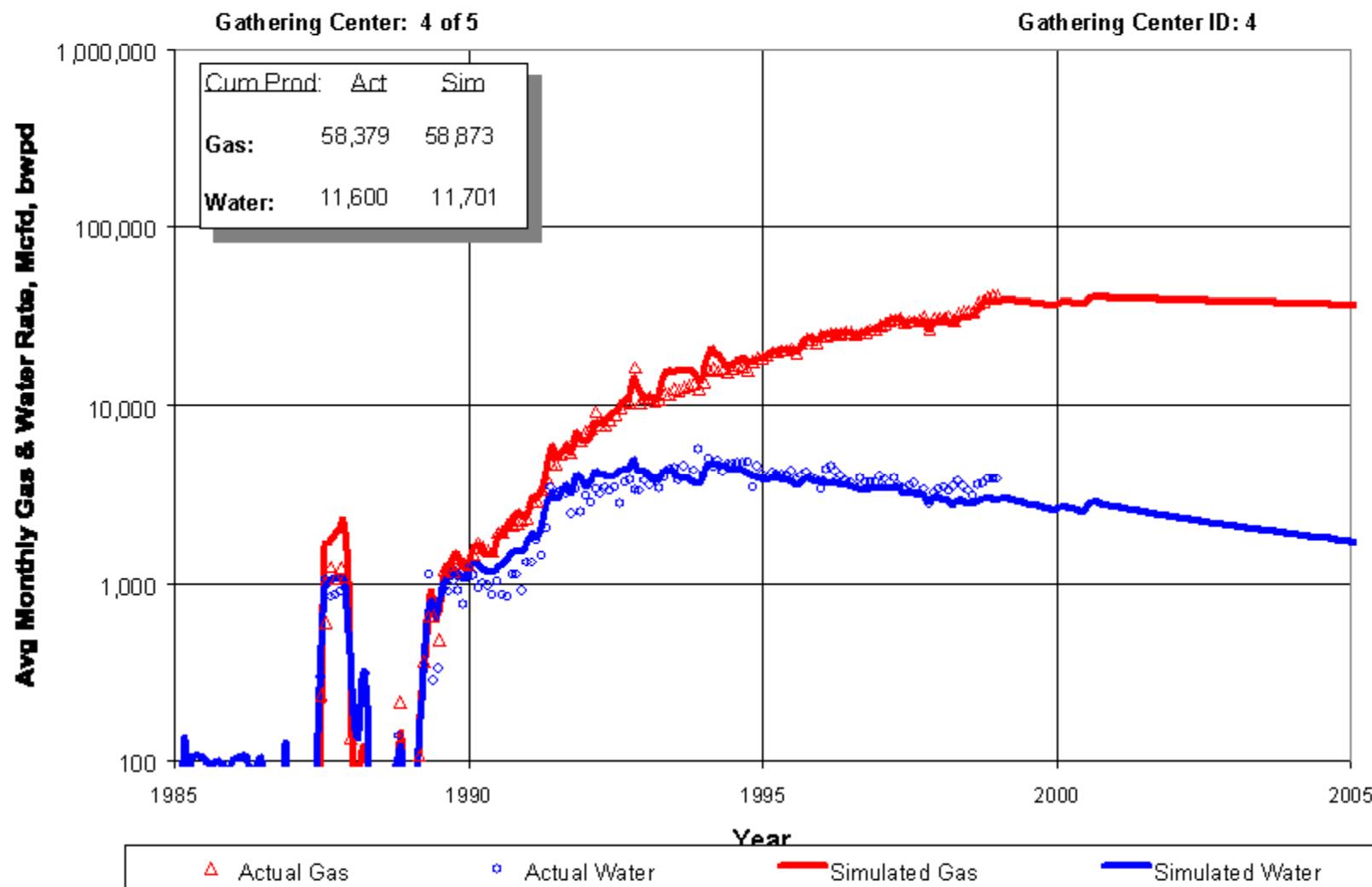
3M Model History Matches

Figure 46: Area D3: 33N-8W (70 Wells)



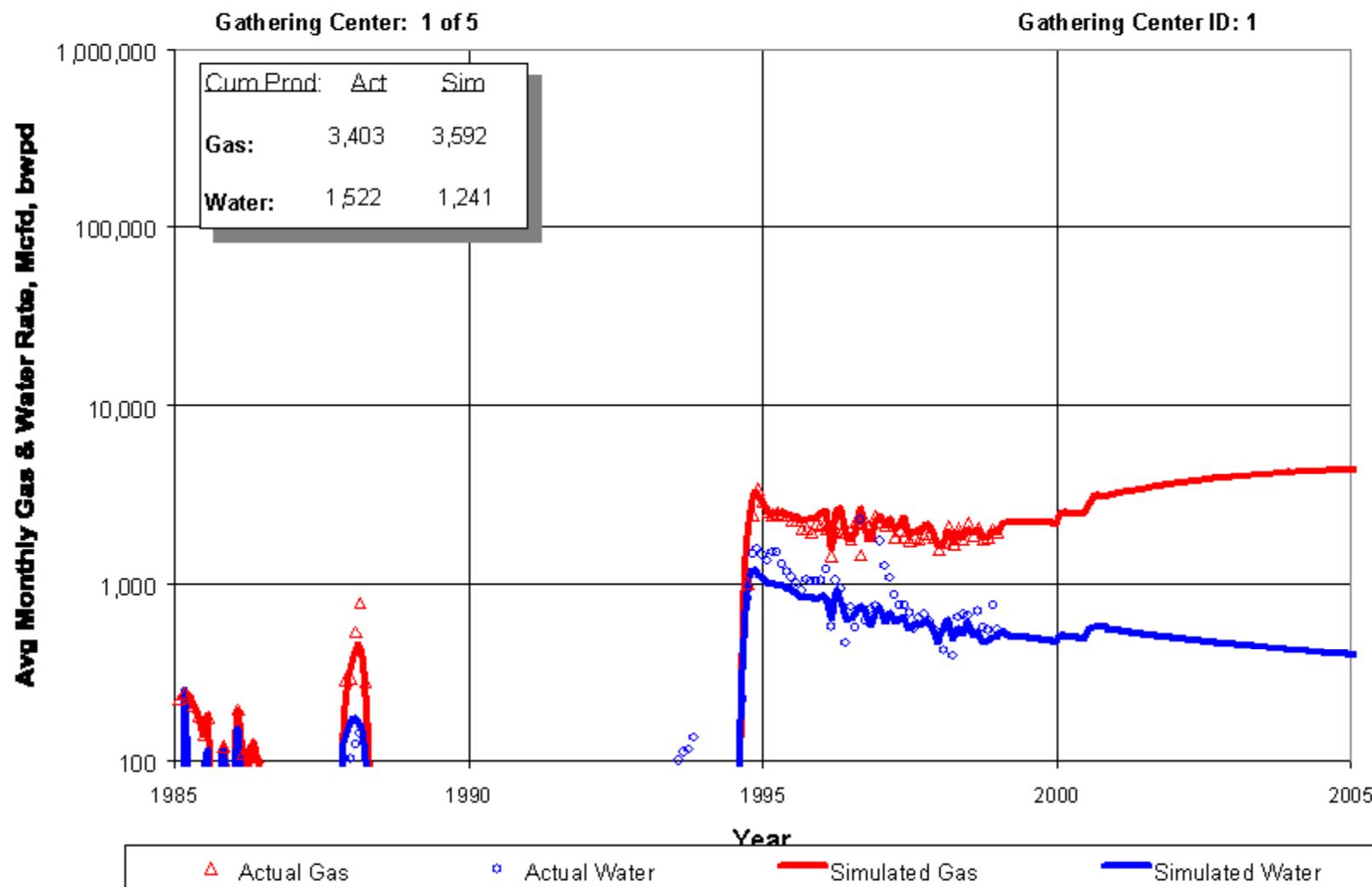
3M Model History Matches

Figure 47: Area D4: 33N-9W (77 Wells)



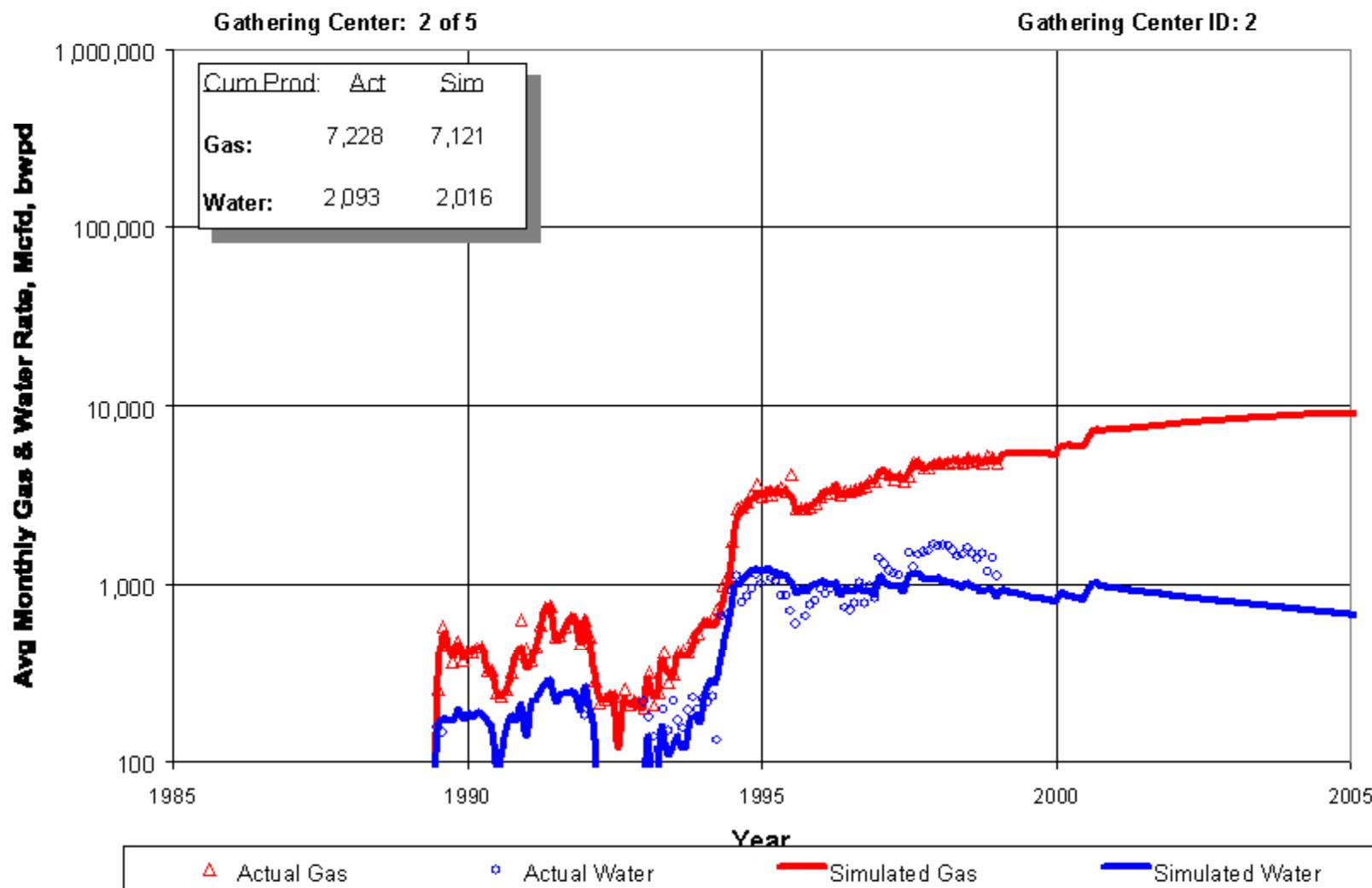
3M Model History Matches

Figure 48: Area E1: 32N-5&6W (38 Wells)



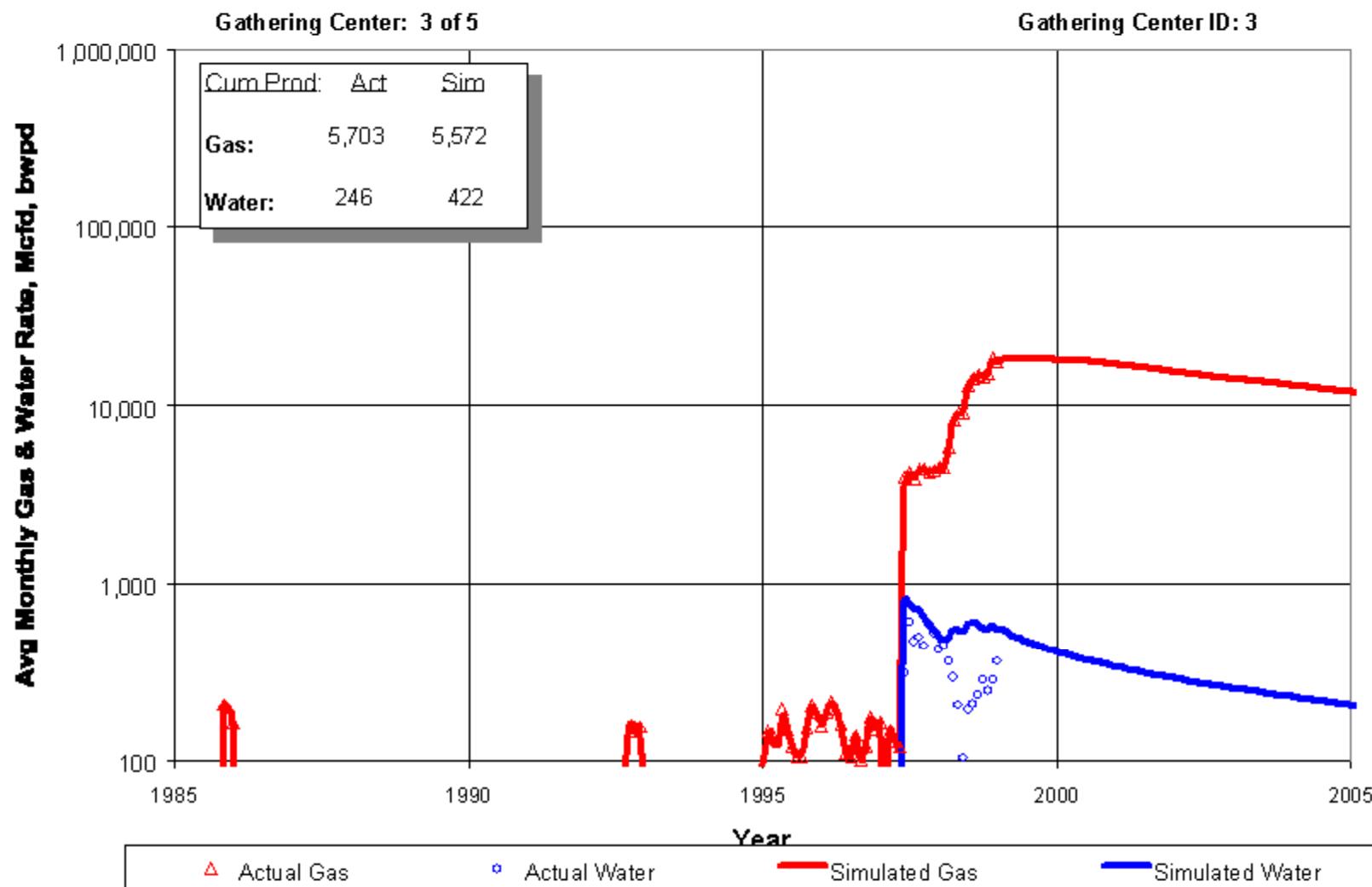
3M Model History Matches

Figure 49: Area E2: 32N-7W (46 Wells)



3M Model History Matches

Figure 50: Area E3: 33N-5&6W (33 Wells)



3M Model History Matches

Figure 51: Area E4: 33N-7W (70 Wells)

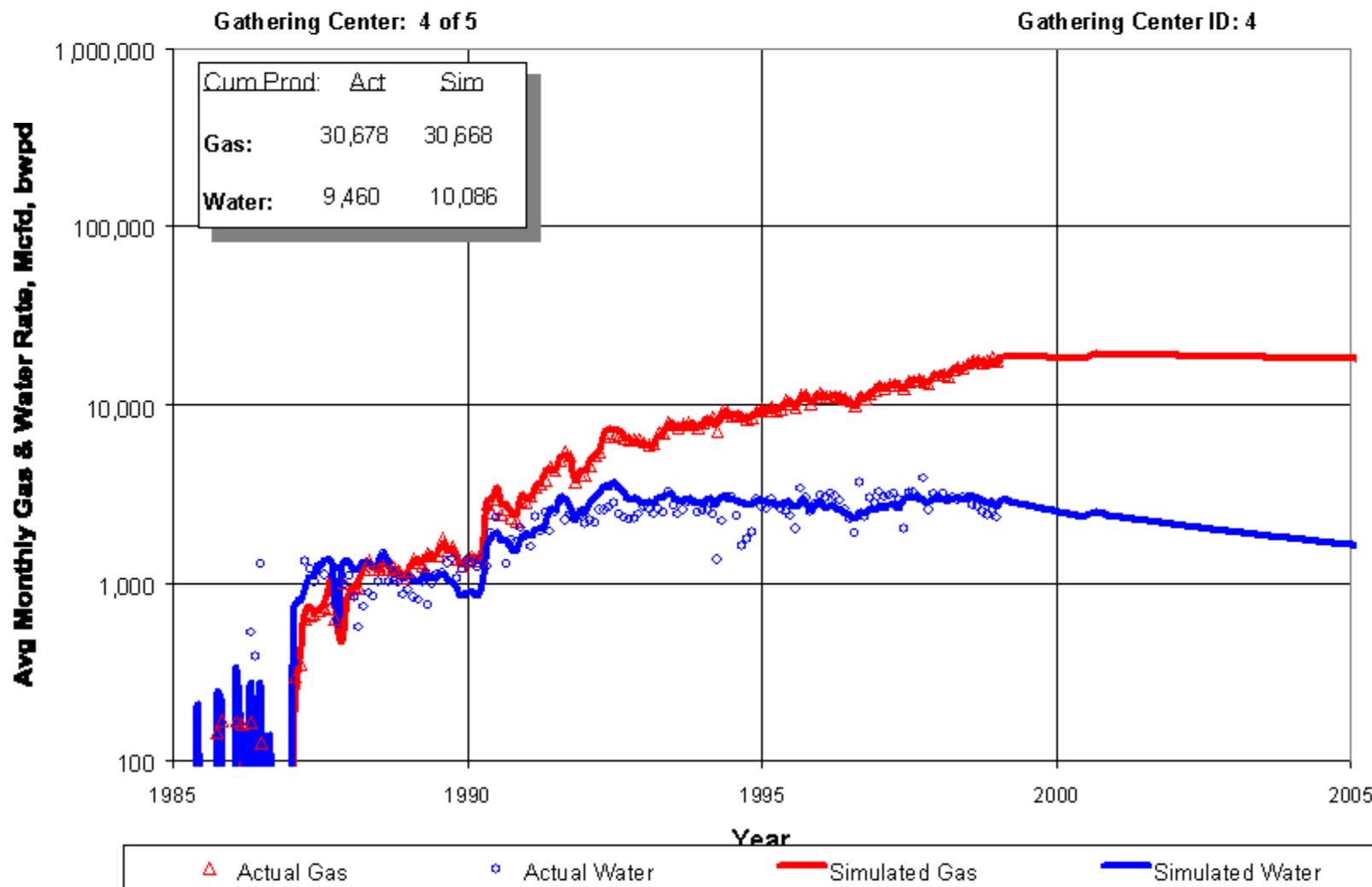


Figure 52: Pressure Match for UTE 32-1 POW 1

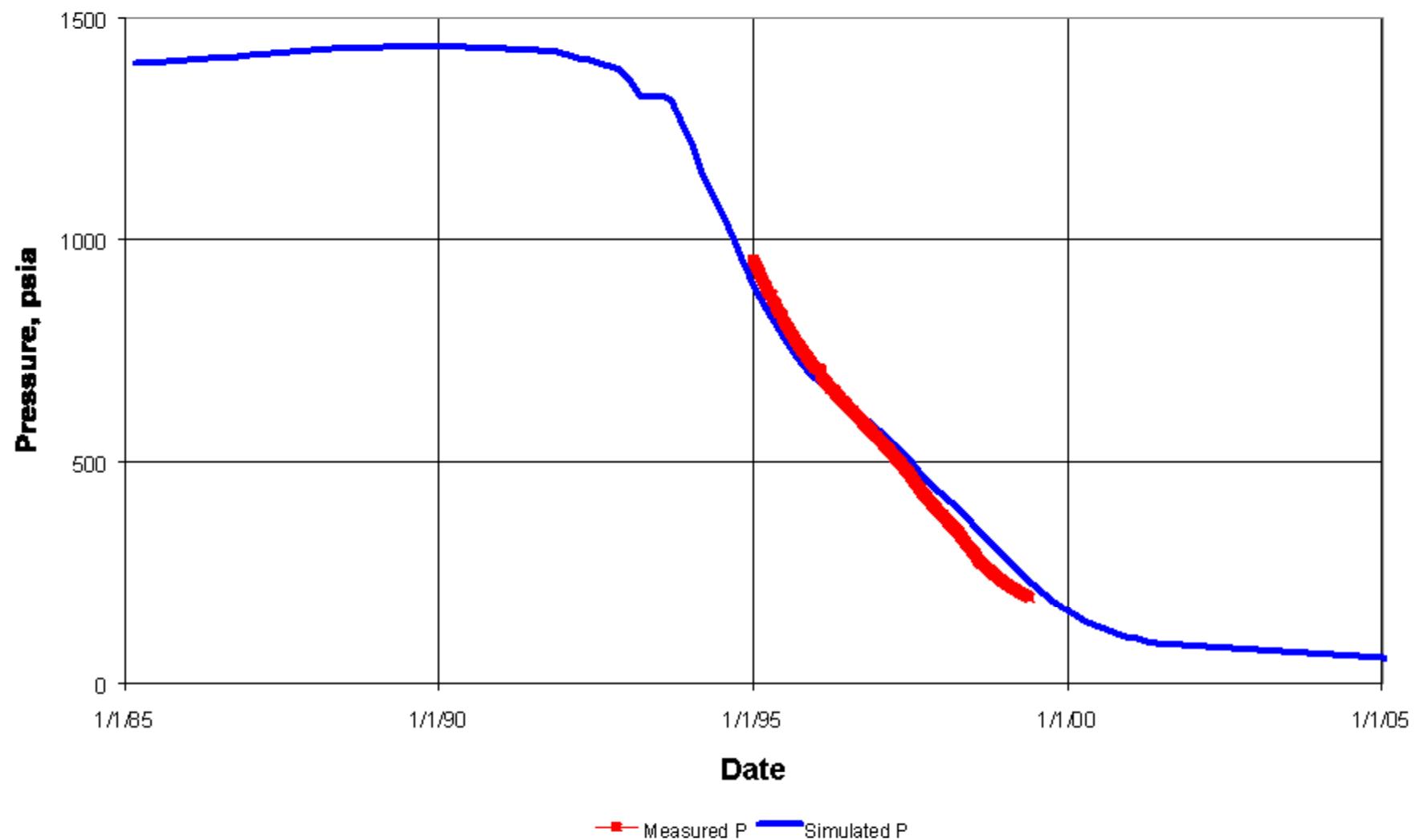


Figure 53: Pressure Match for UTE 32-11 POW 2

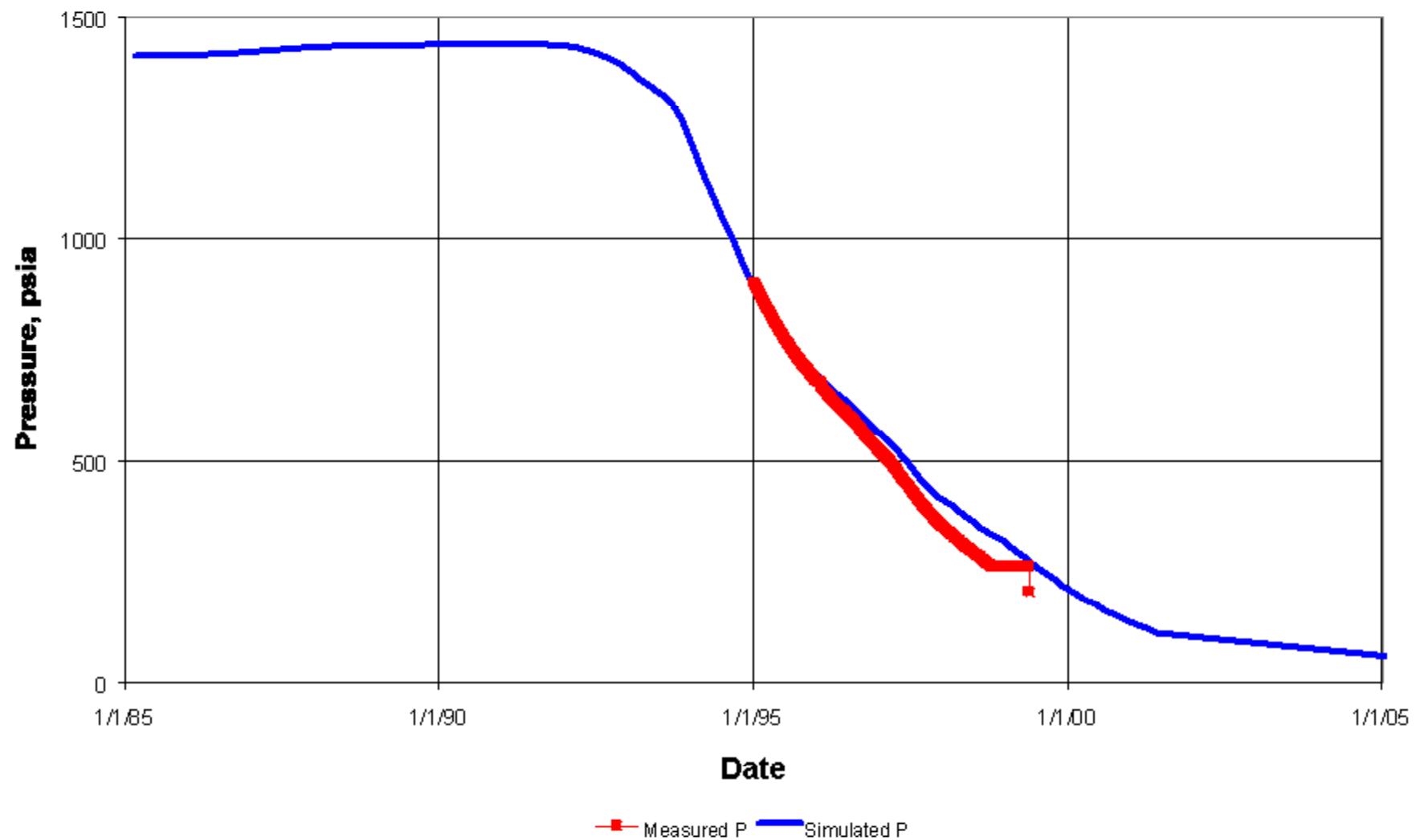


Figure 54: Pressure Match for UTE 17

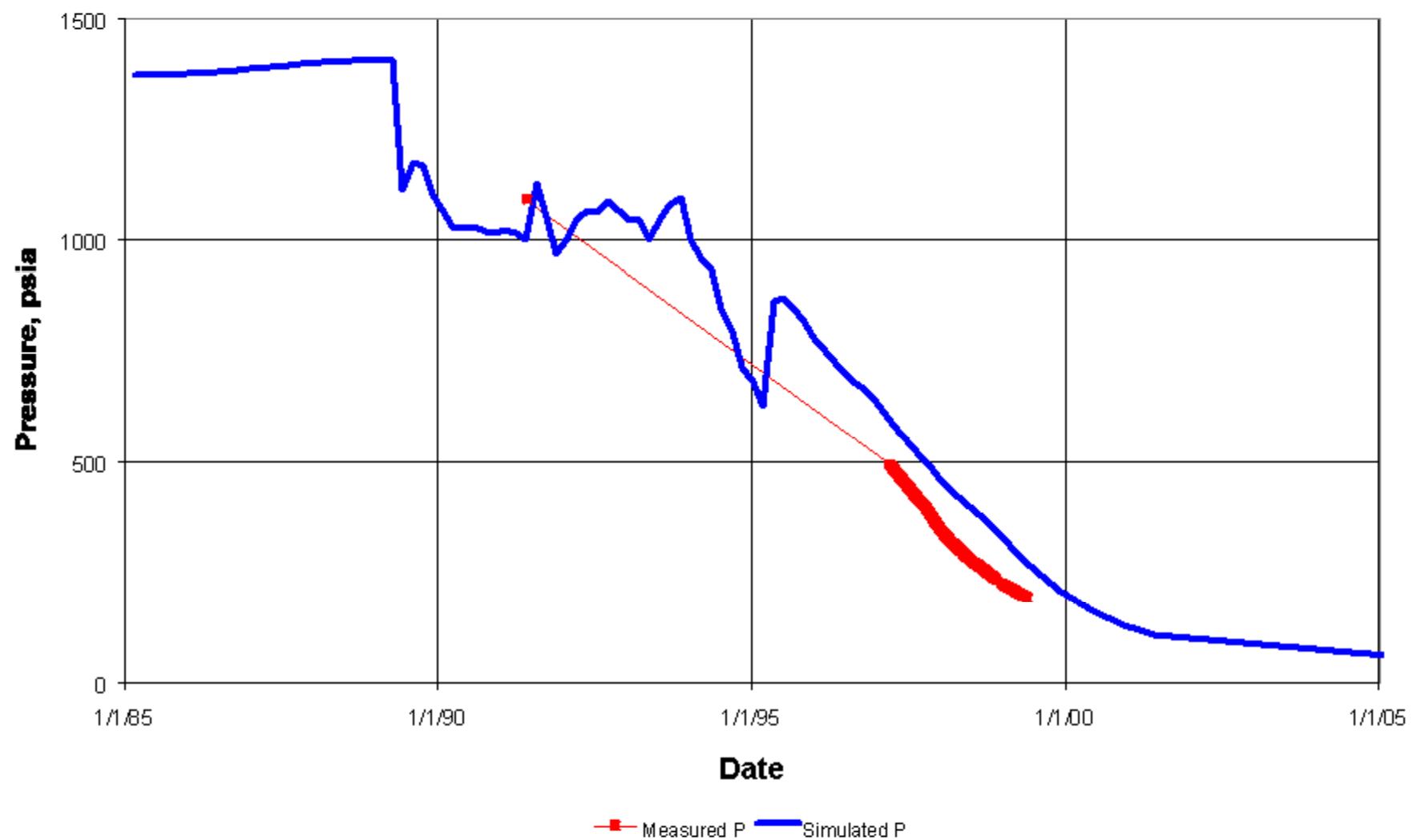


Figure 55: Pressure Match for SOUTHERN UTE 10-3

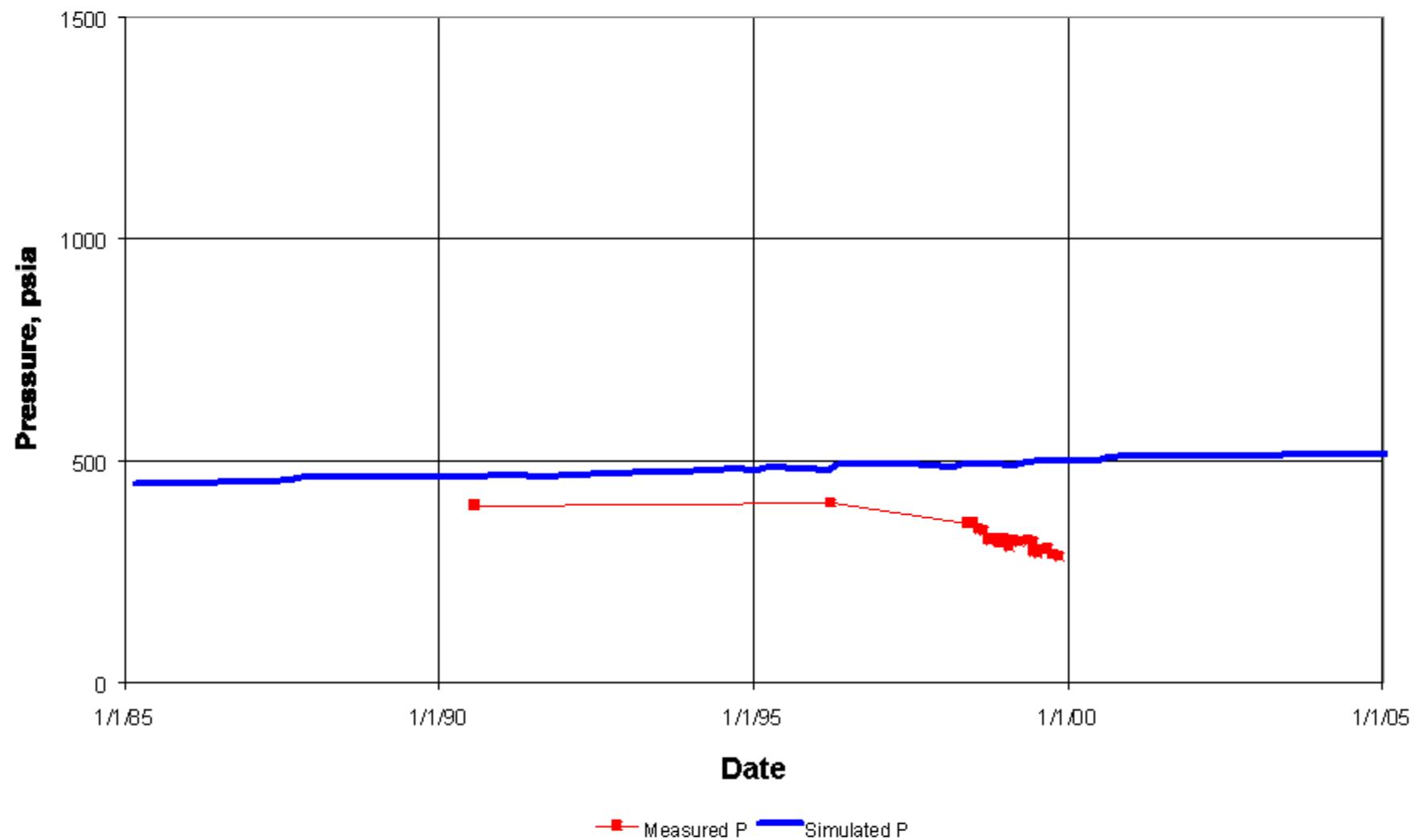


Figure 56: Pressure Match for HUBER-GARCIA 1-22

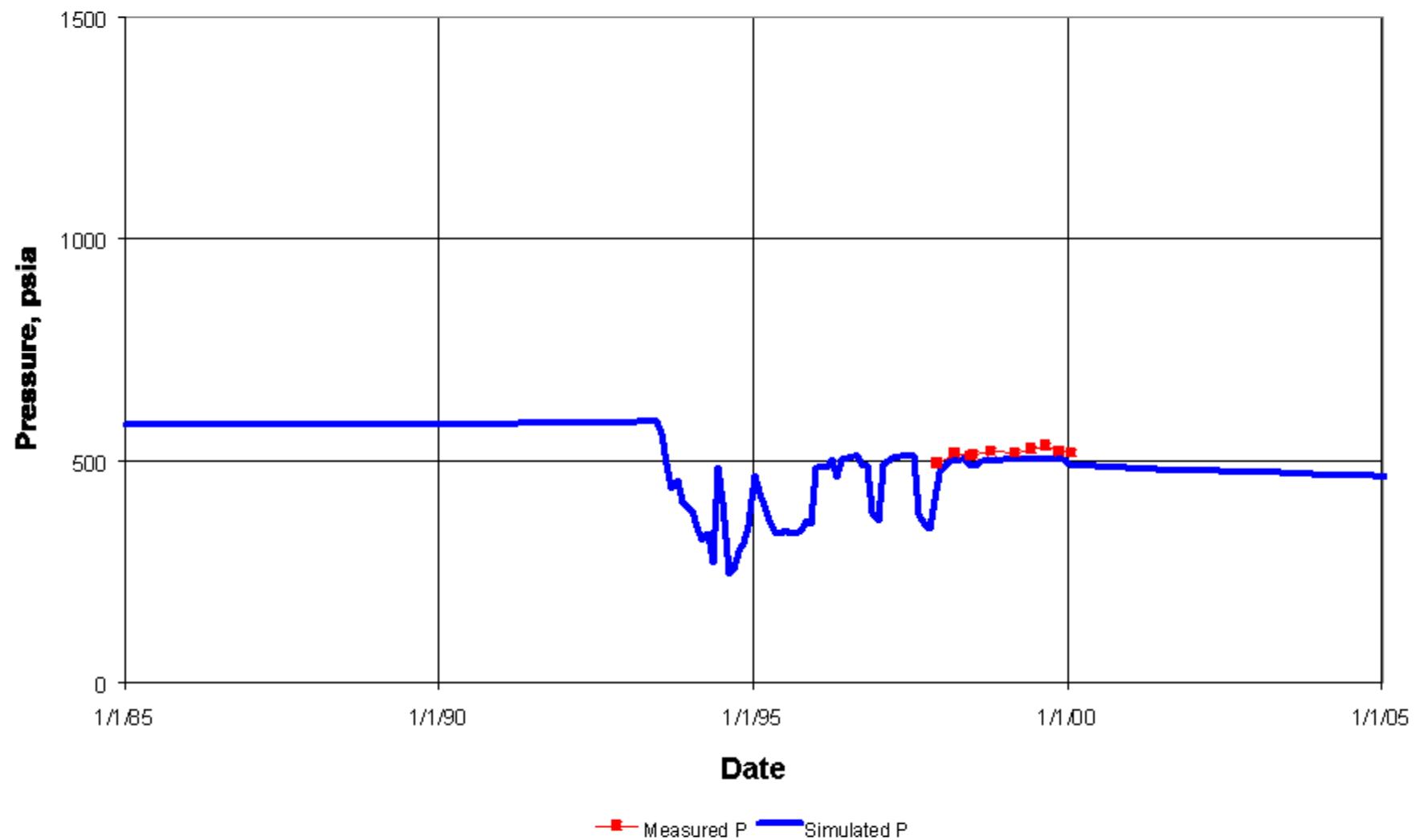


Figure 57: Pressure Match for MARIE SHIELDS GAS UNIT A 1

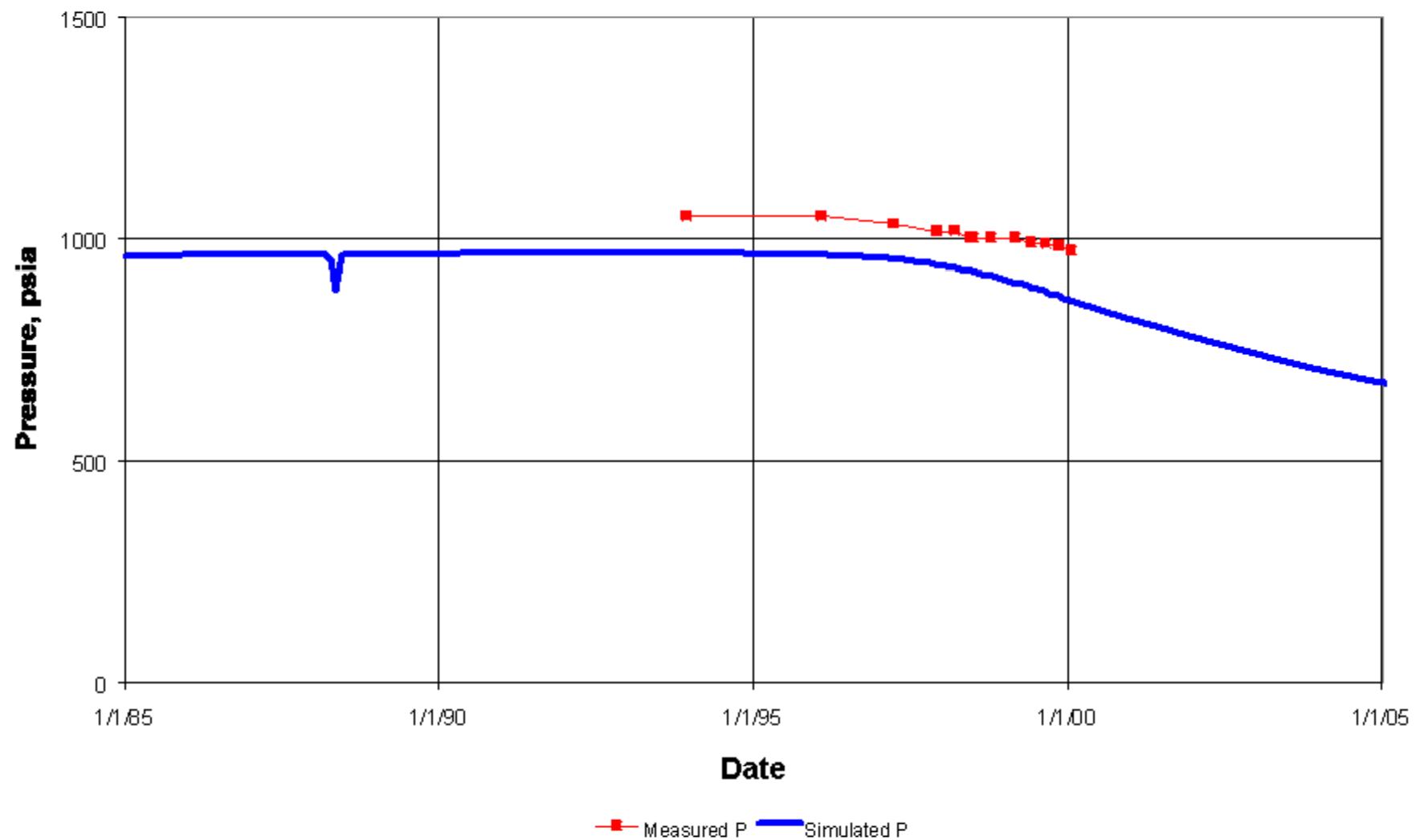


Figure 58: Pressure Match for DAY V RANCH 1-35

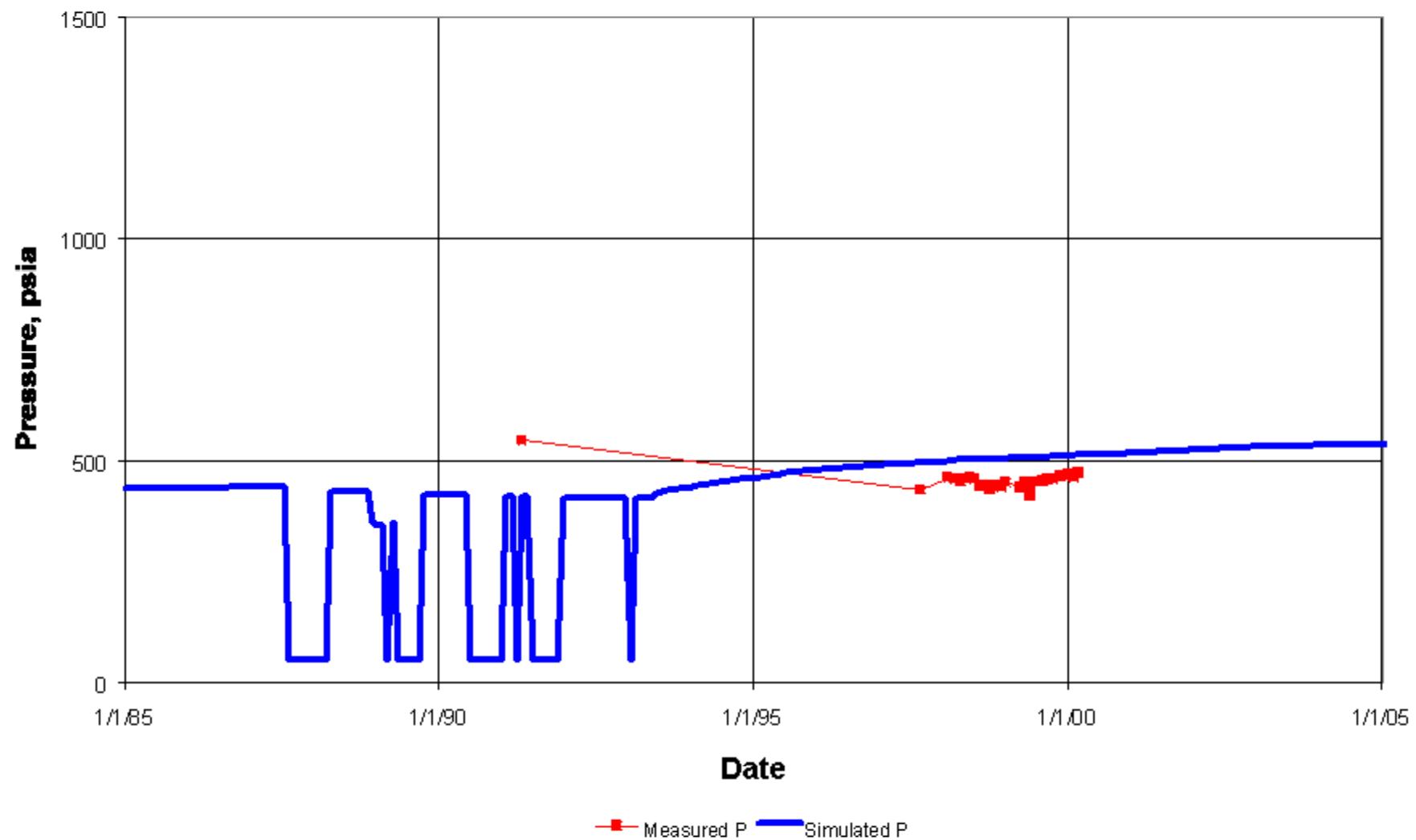


Figure 59: Pressure Match for GURR FEDERAL GAS UNIT 1

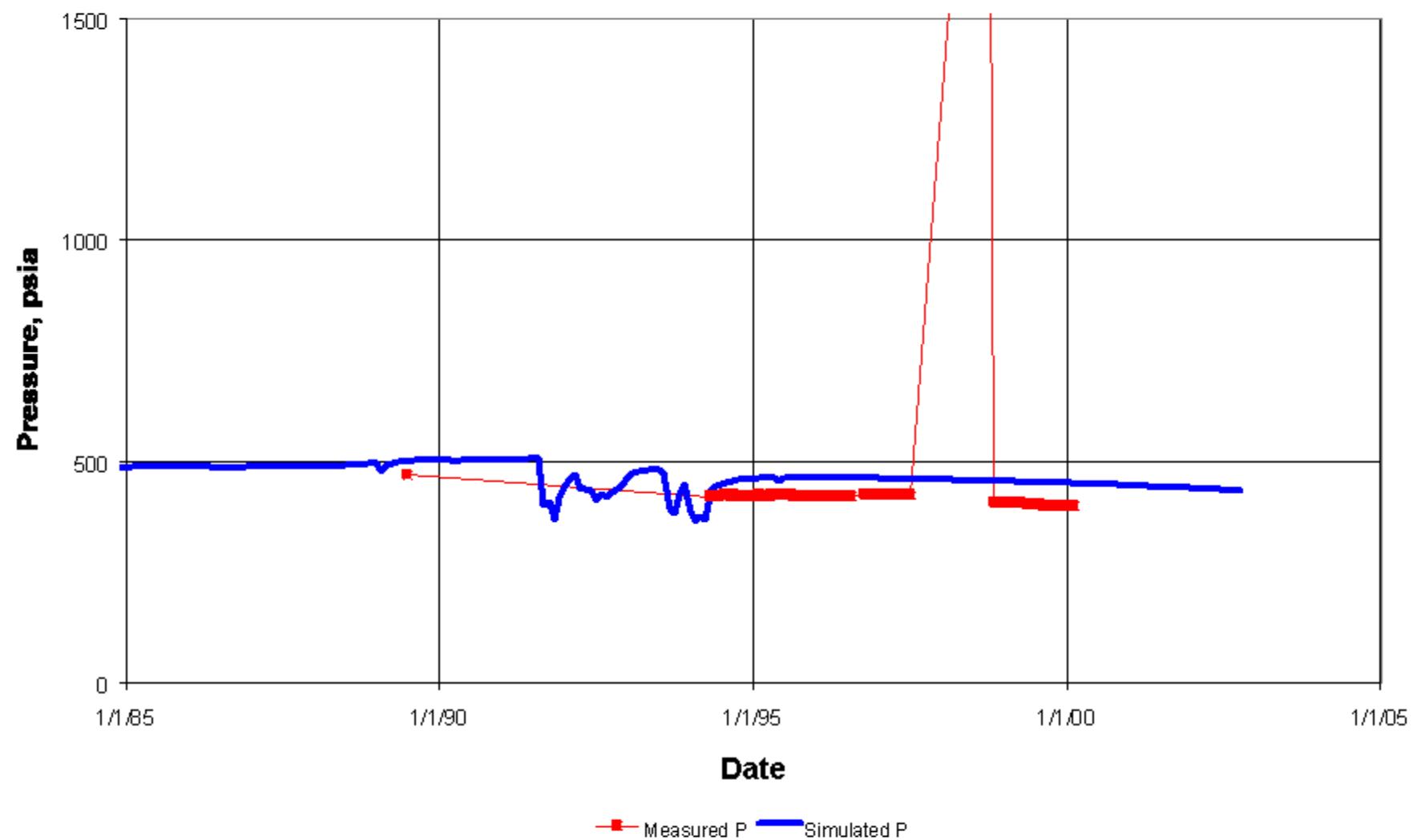


Figure 60: Pressure Match for POLE BARN MONITOR

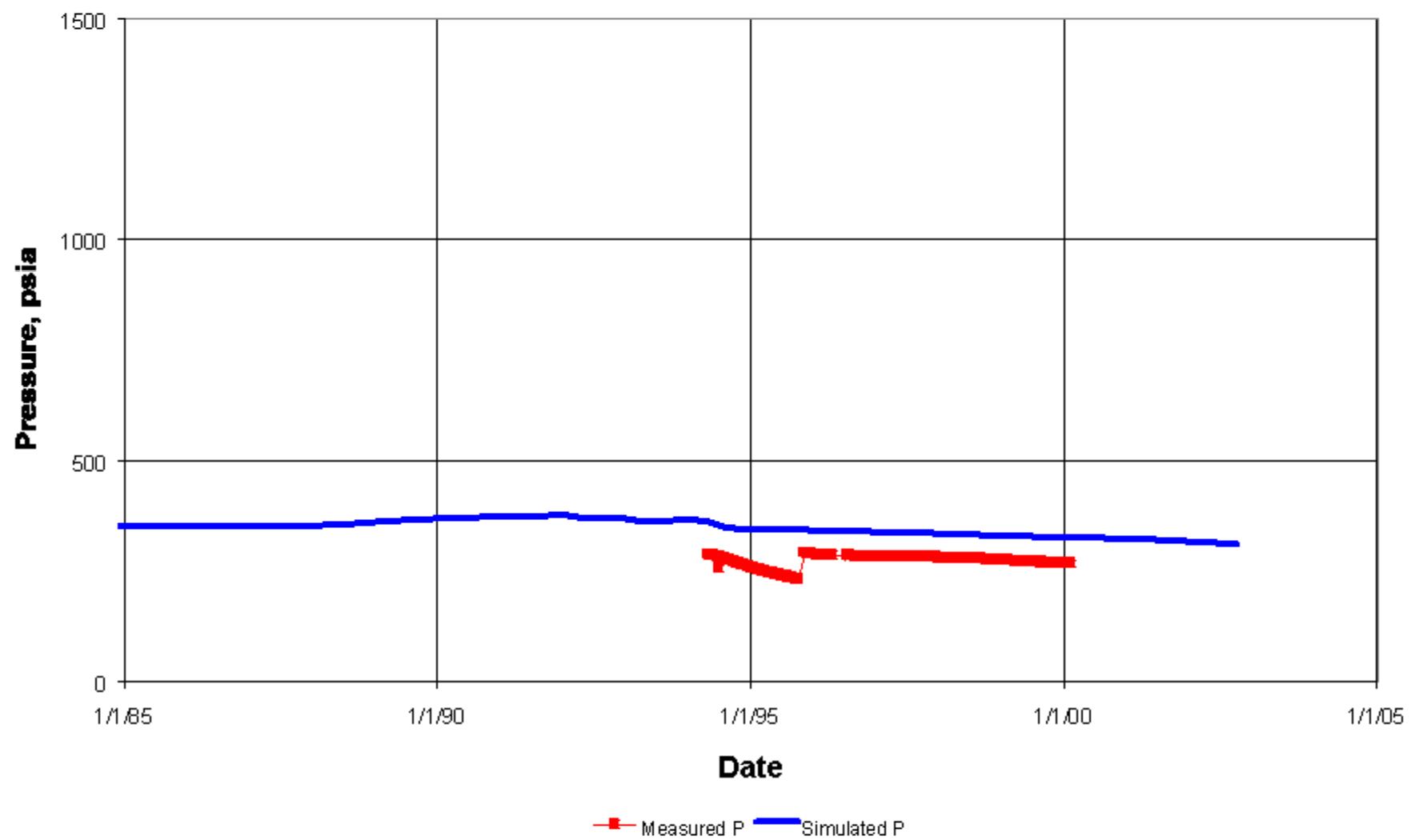


Figure 61: Projected Gas Seepage to 2030

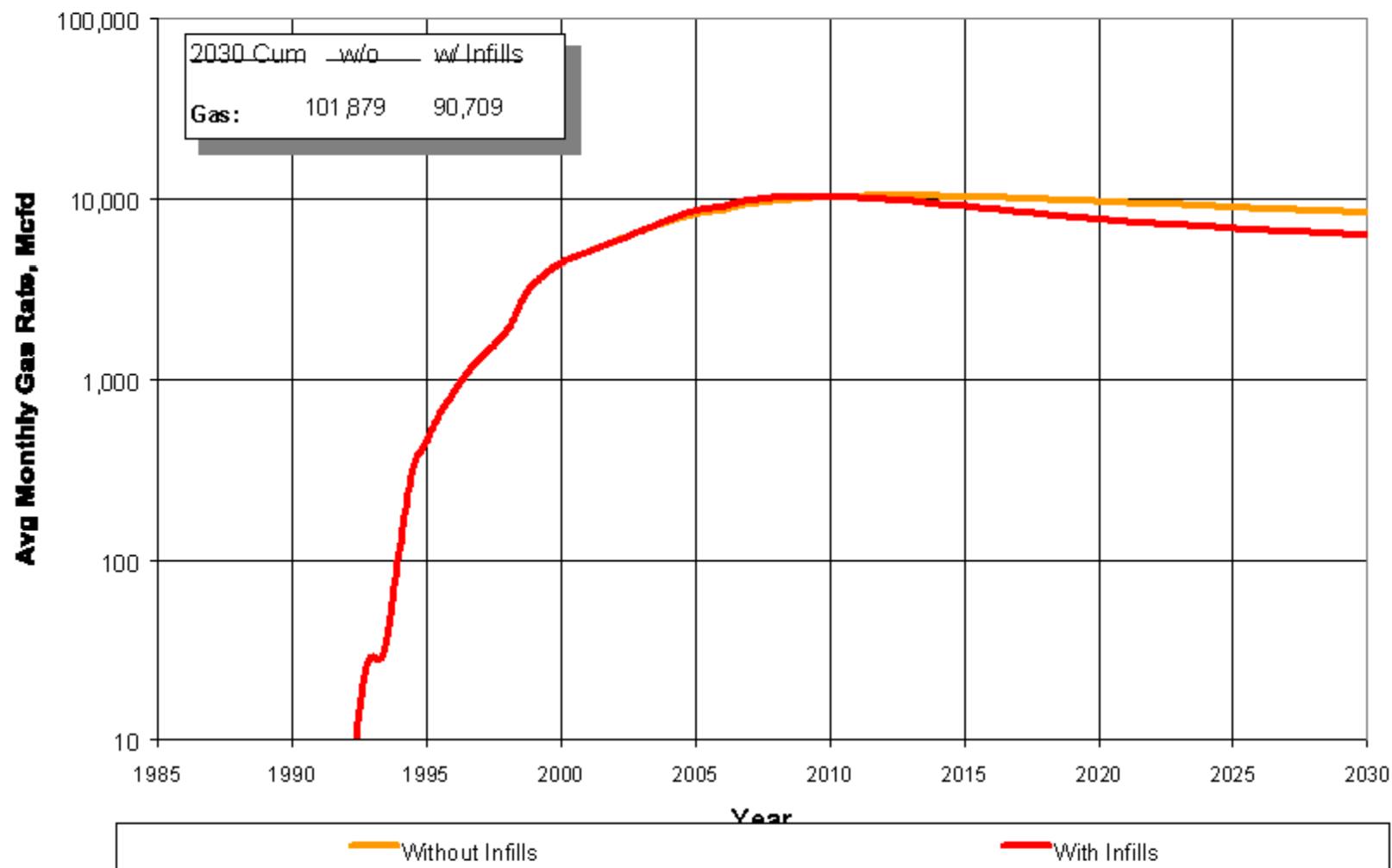


Figure 62: Projected Long-Term Gas Seepage

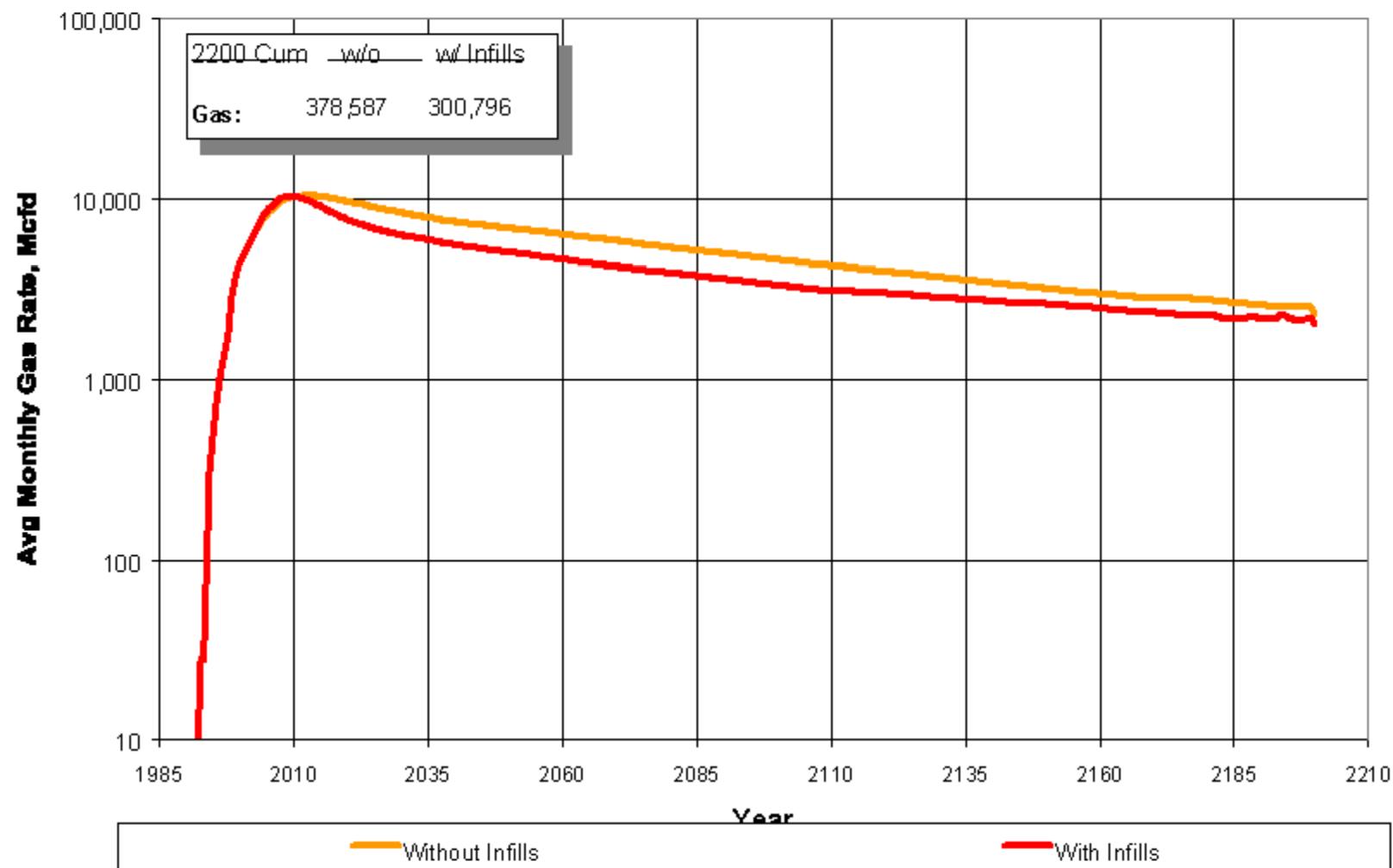


Figure 63: Projected Gas Seepage in Area A

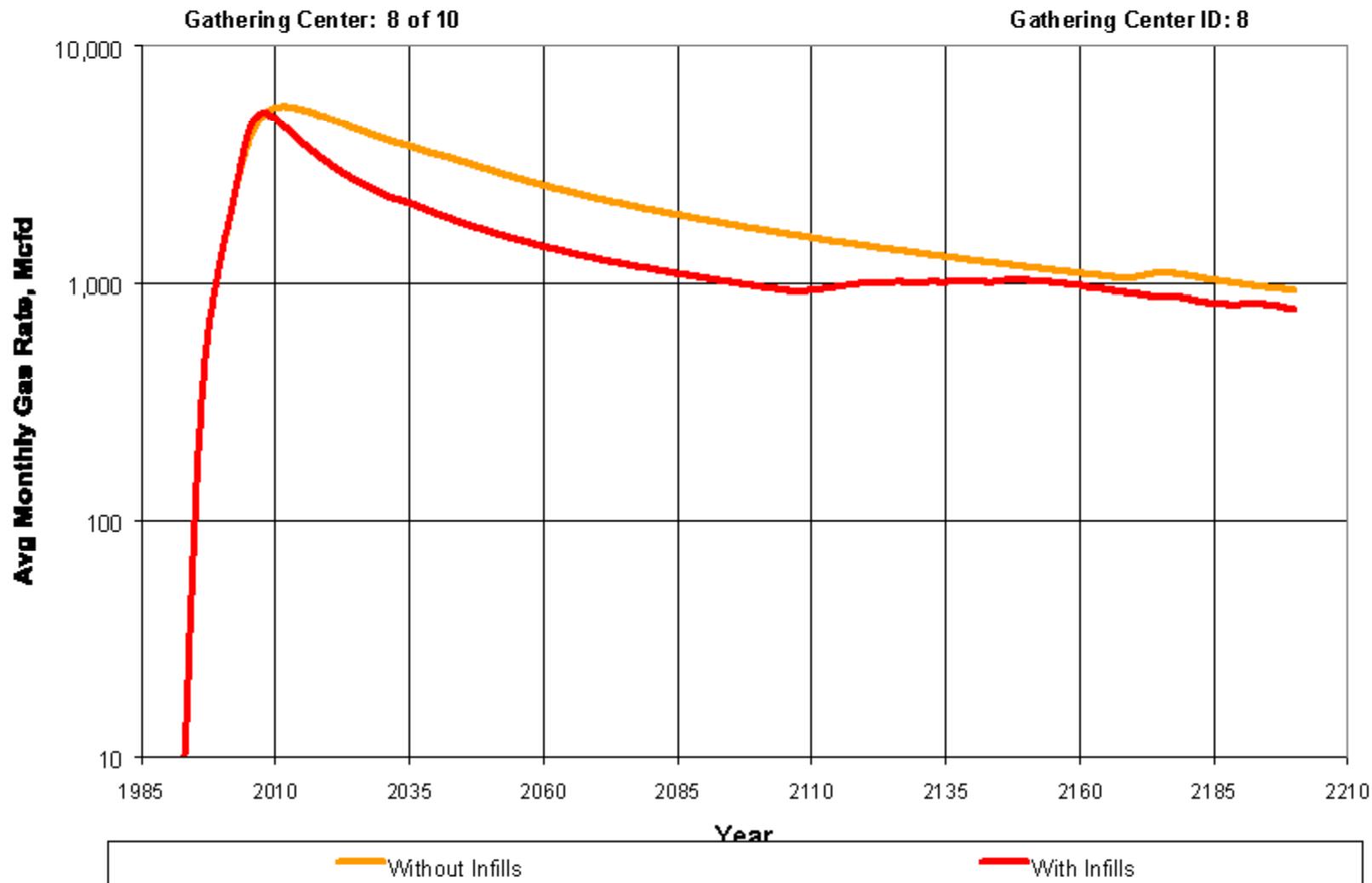


Figure 64: Projected Gas Seepage in Area B

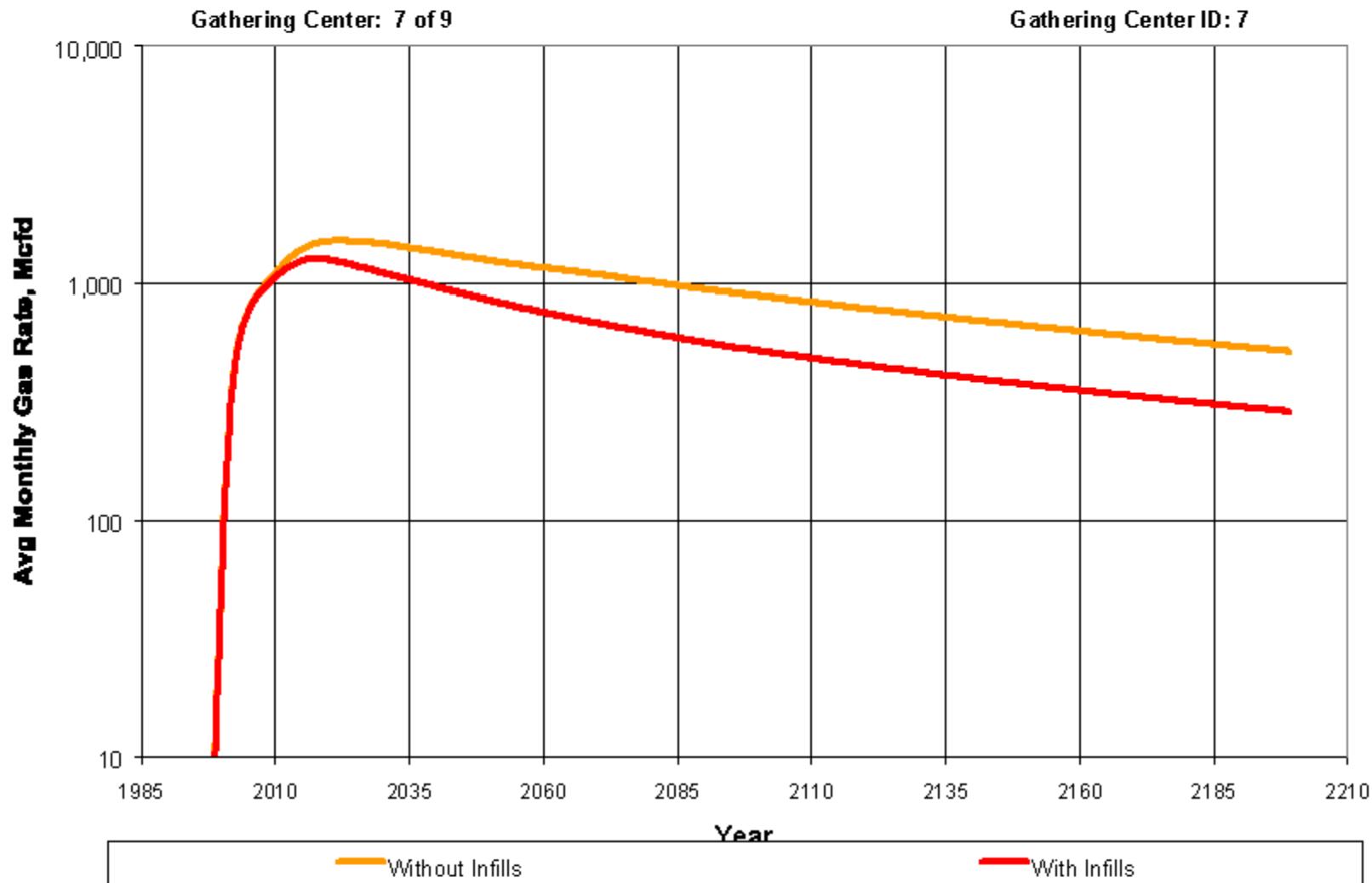


Figure 65: Projected Gas Seepage in Area C

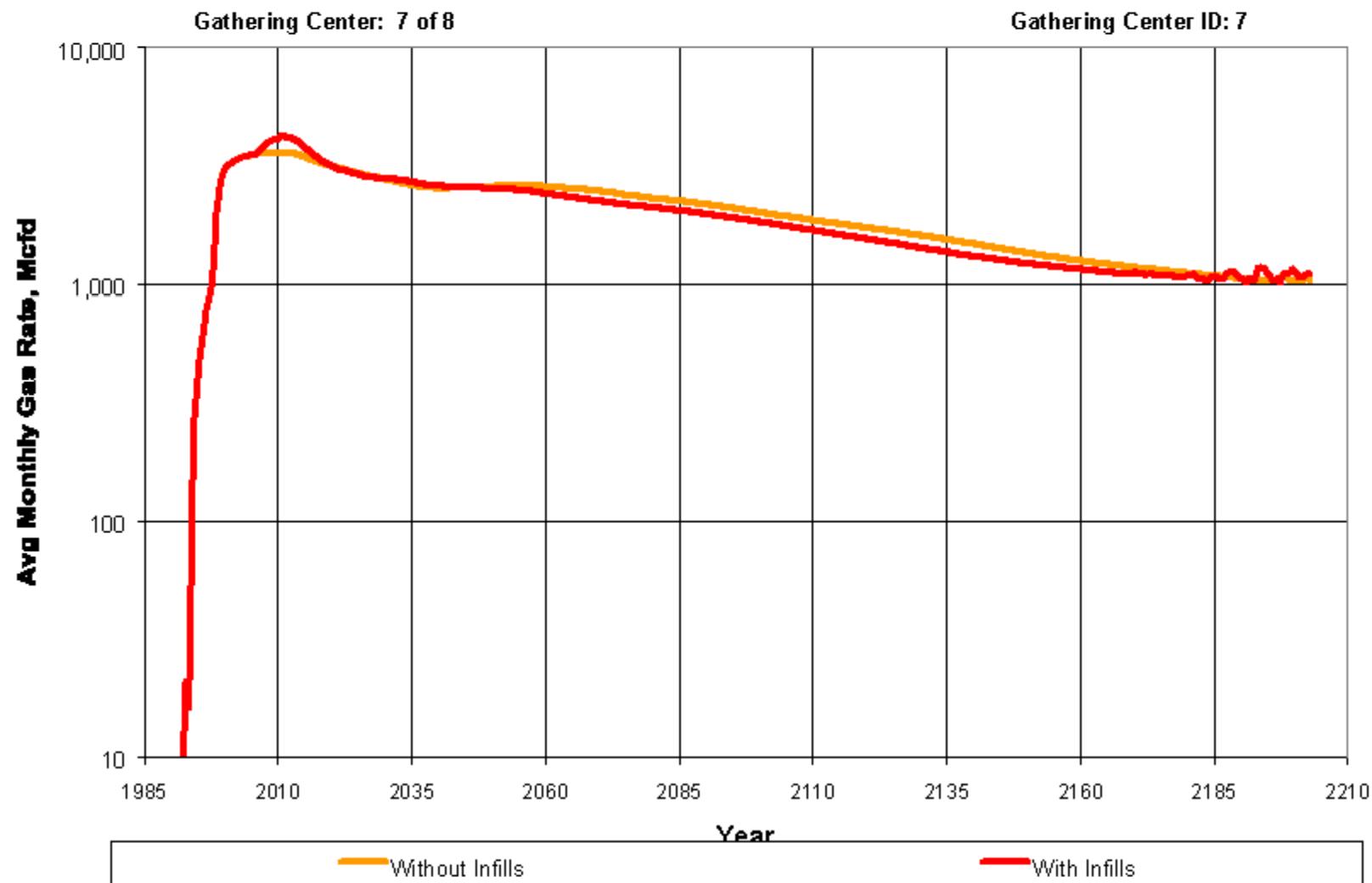


Figure 66: Simulated Initial Reservoir Pressure (psia)

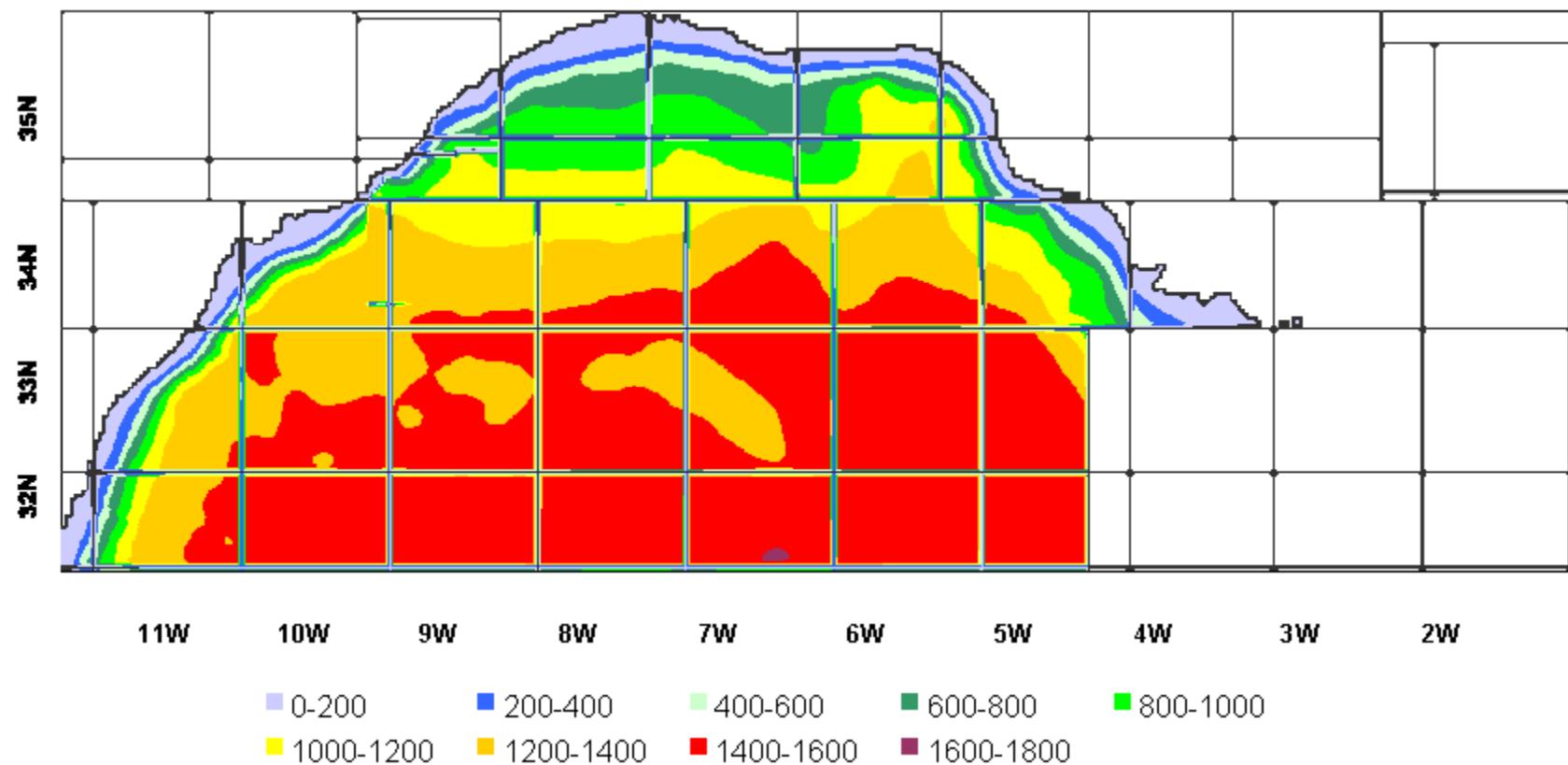


Figure 67: Simulated Pressure in Year 2000 (psia)

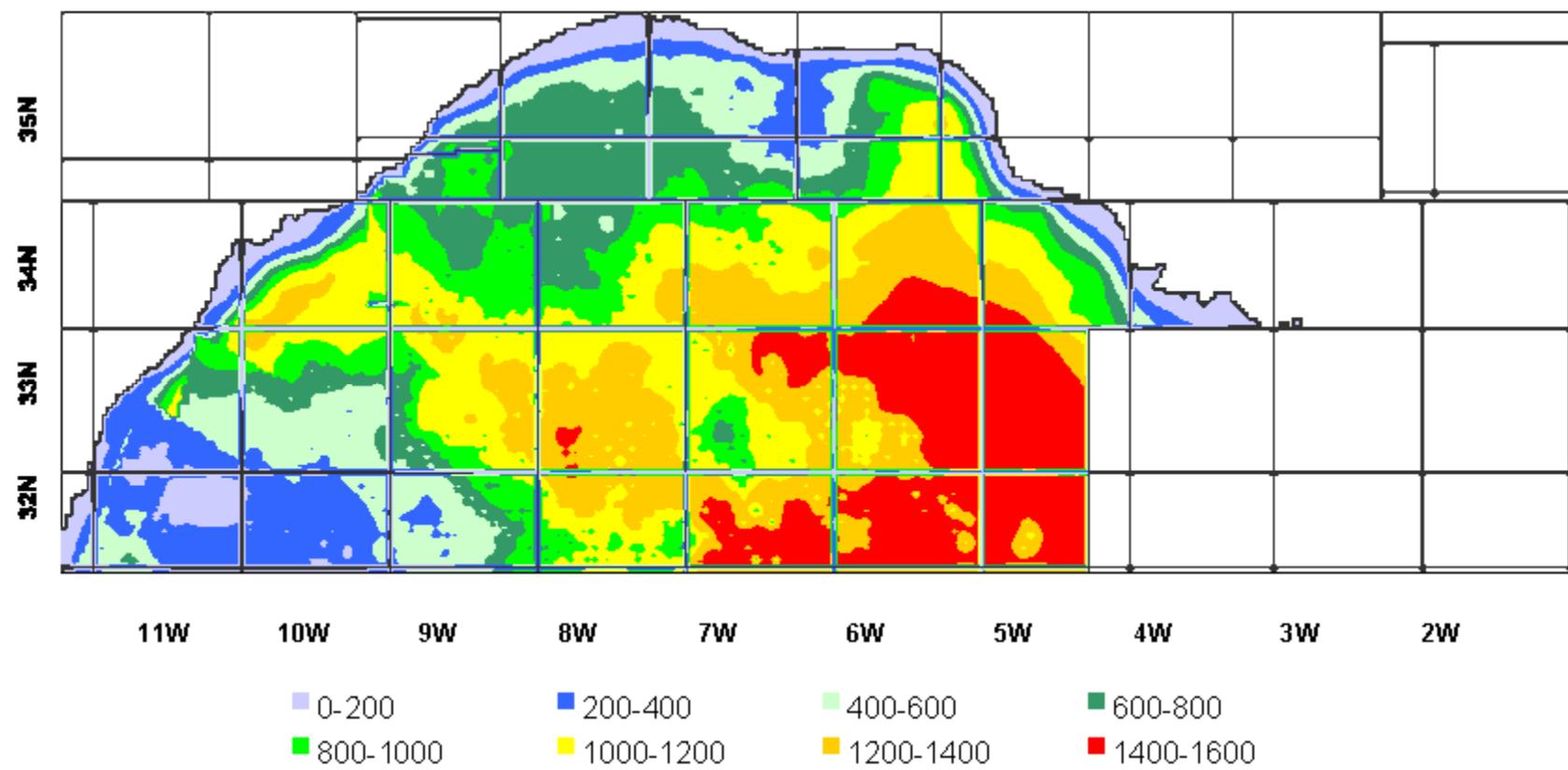


Figure 68: Simulated Pressure in Year 2030 (psia)

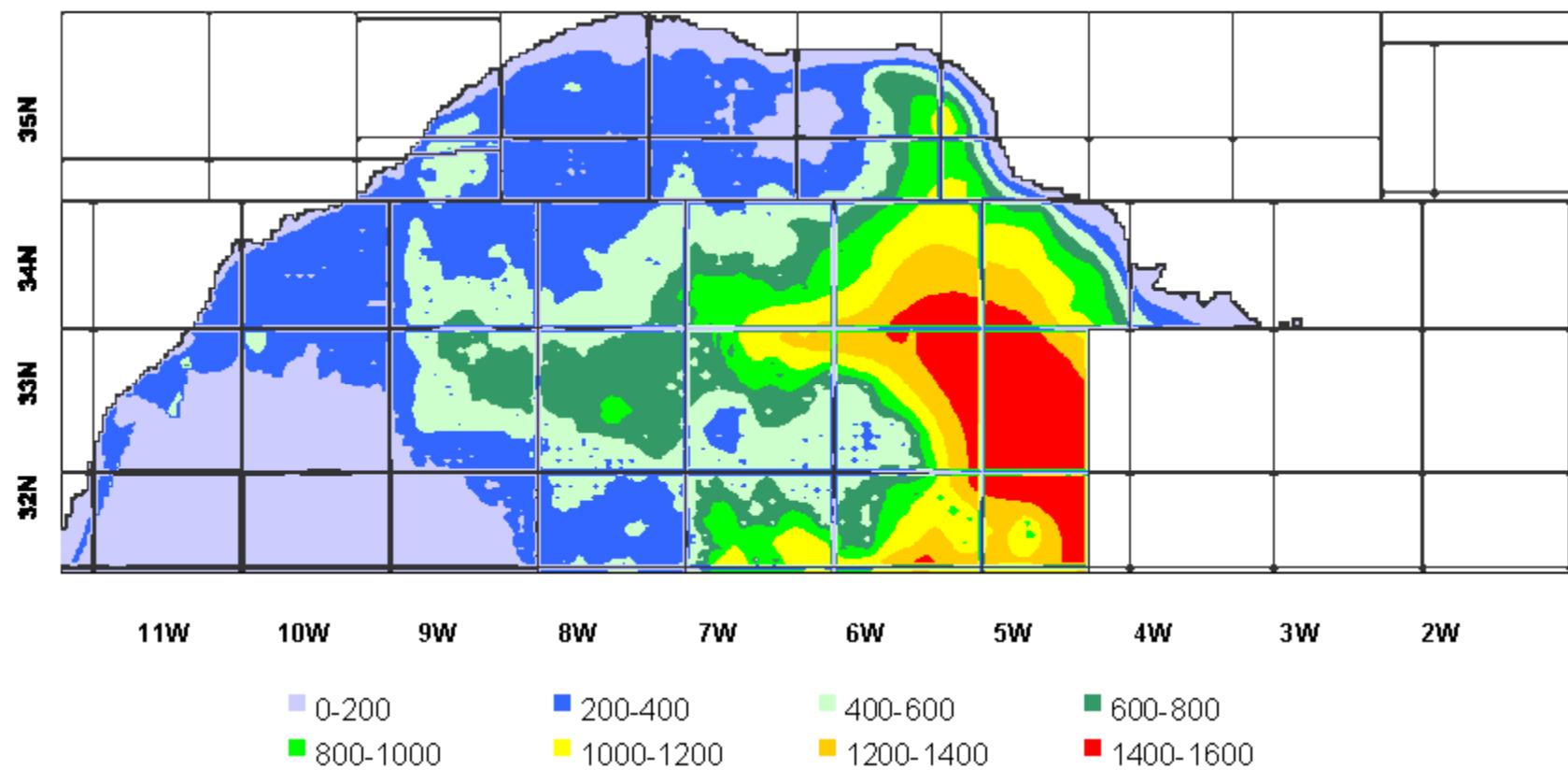


Figure 69: Simulated Pressure in Year 2030 with Infill Wells (psia)

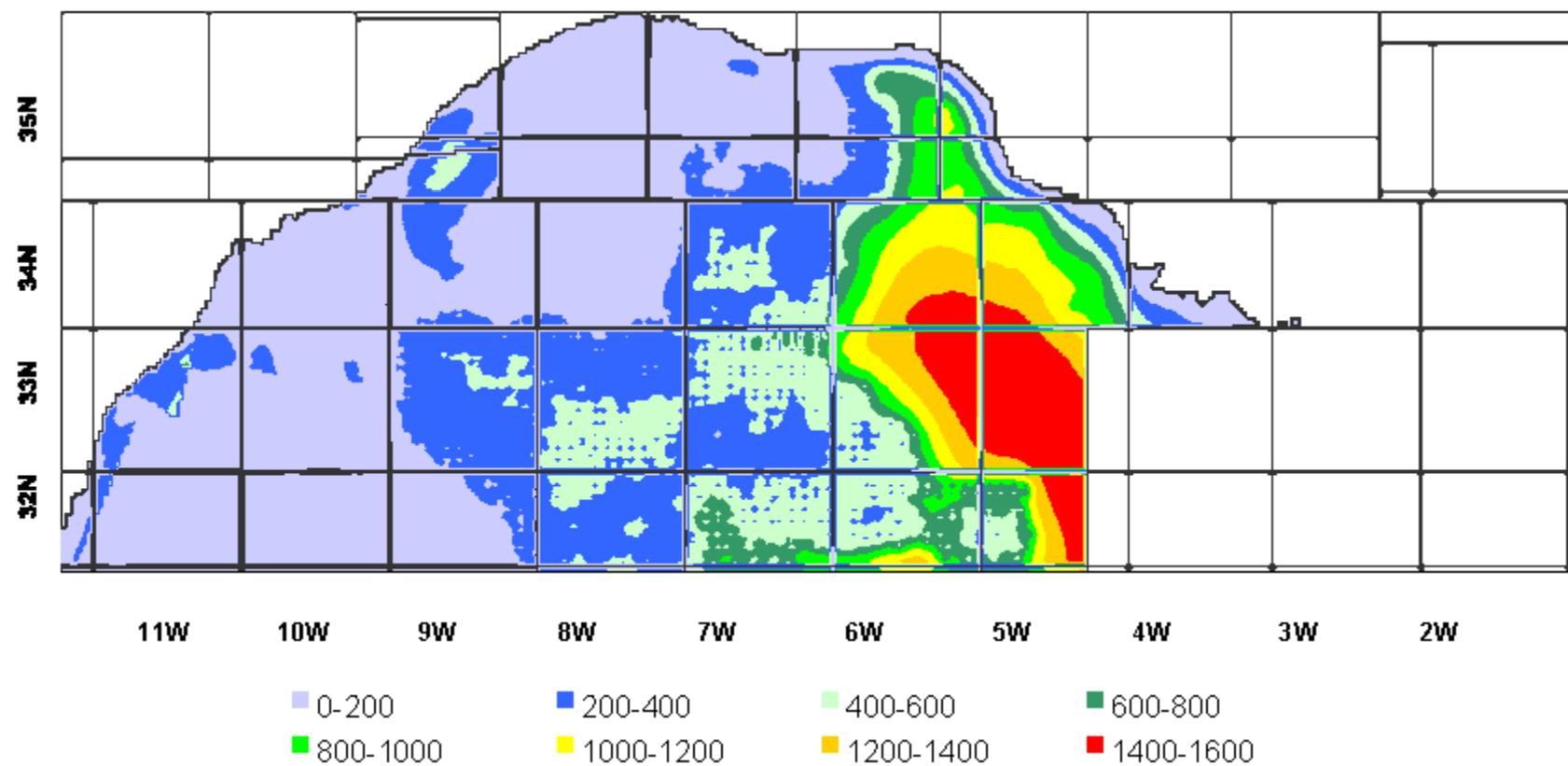


Figure 70: Simulated Initial Water Saturation

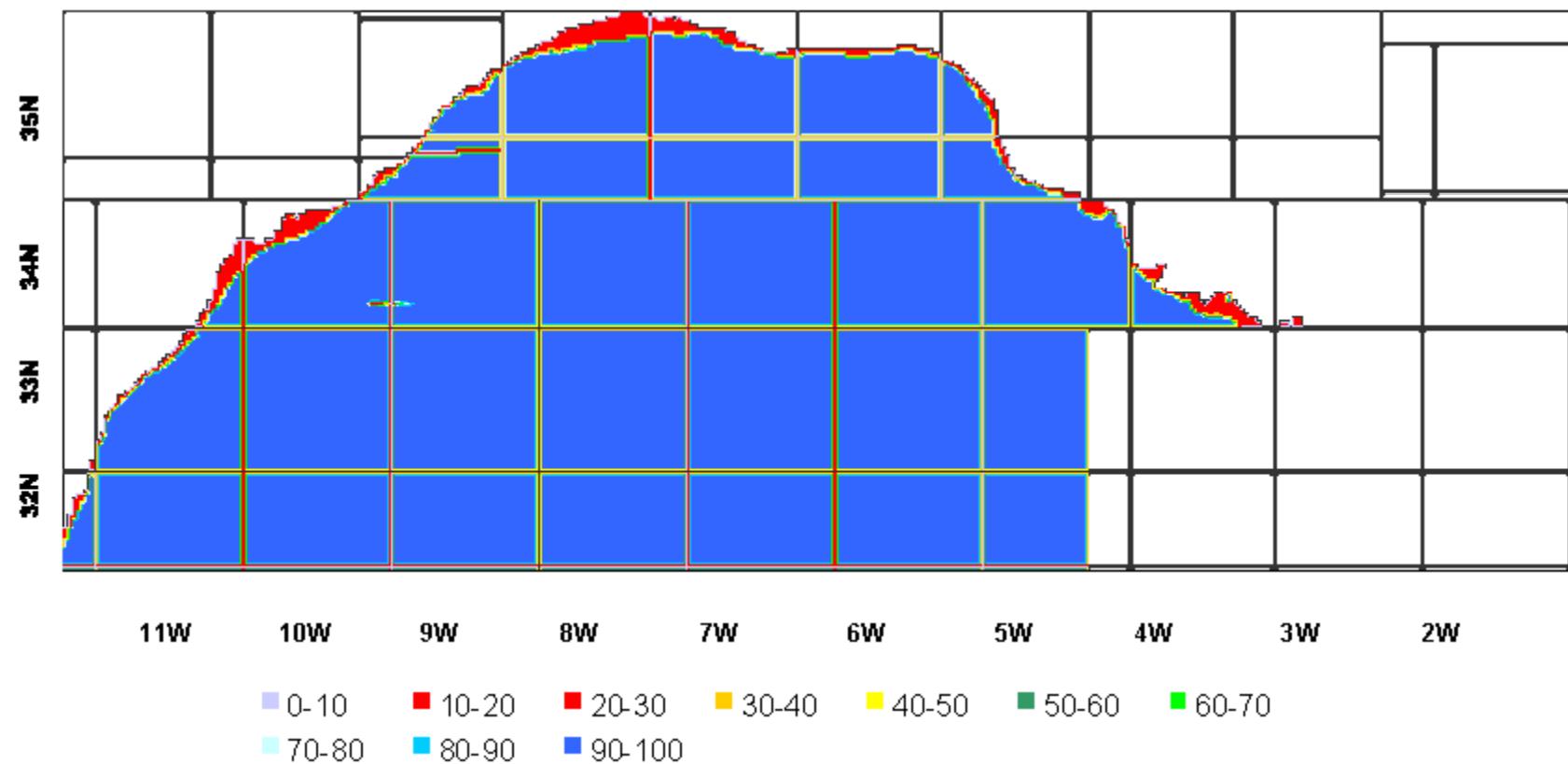


Figure 71: Simulated Water Saturation in Year 2000

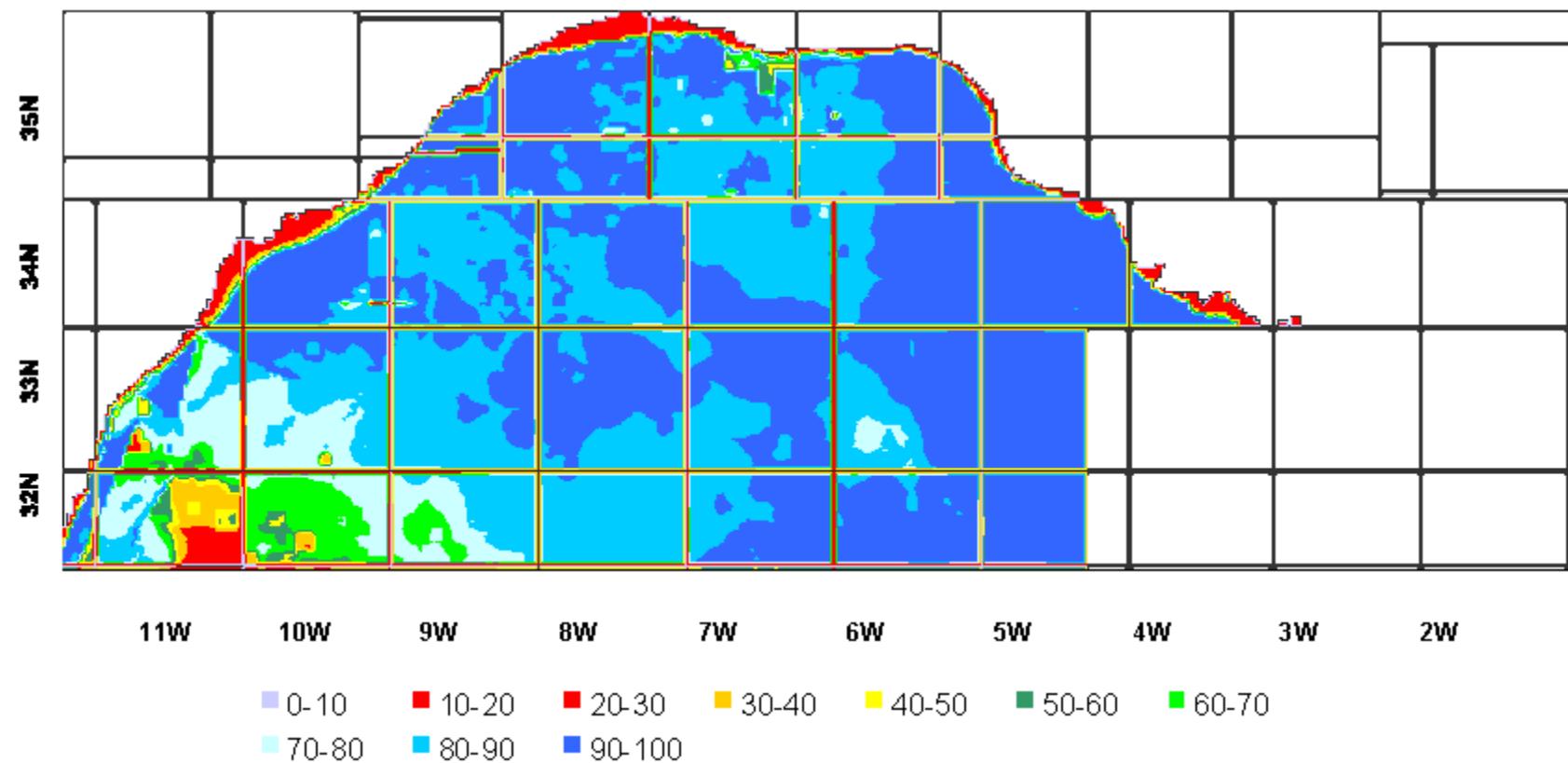


Figure 72: Simulated Water Saturation in Year 2030

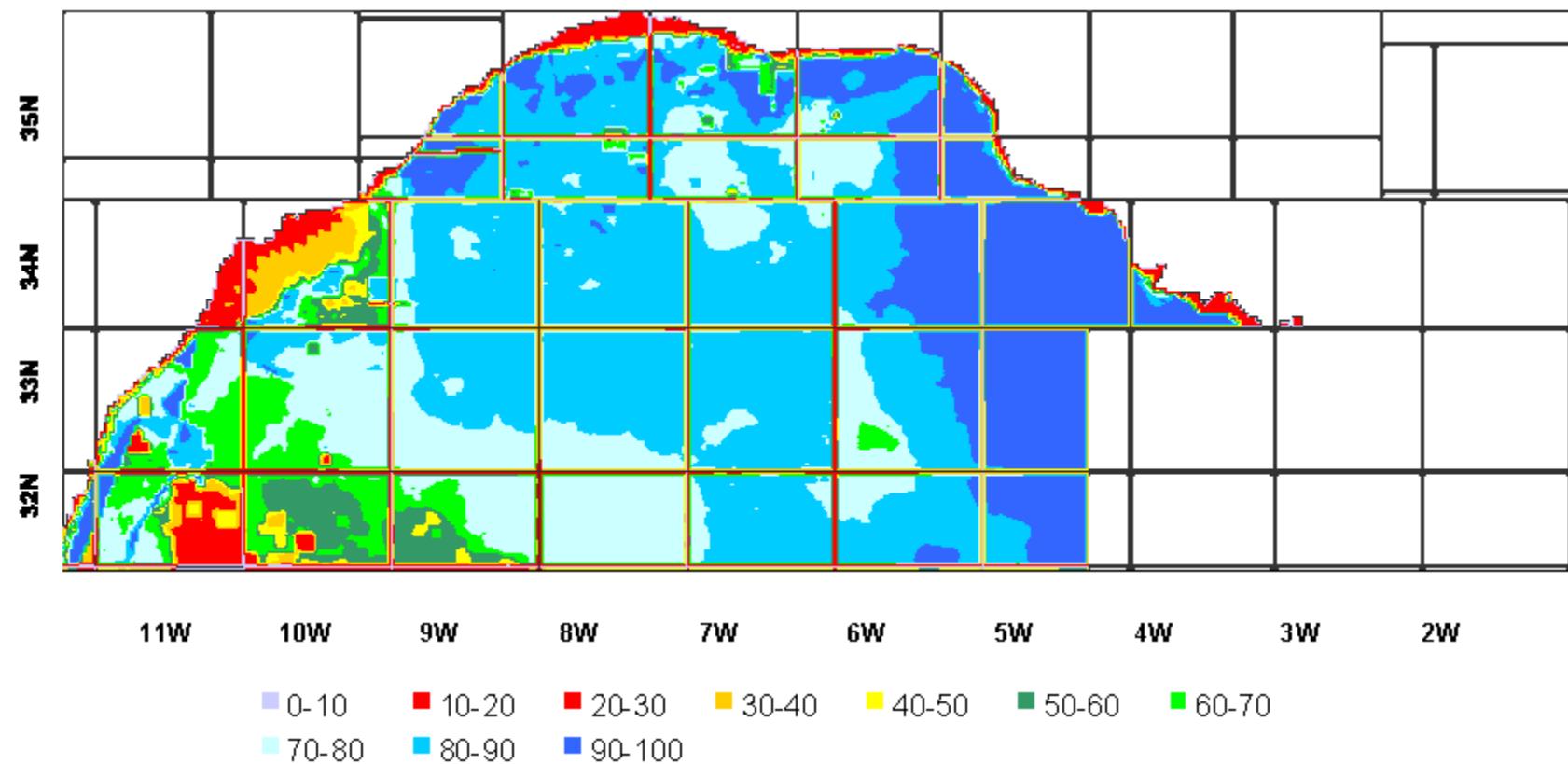


Figure 73: Simulated Water Saturation in Year 2030 with Infill Wells

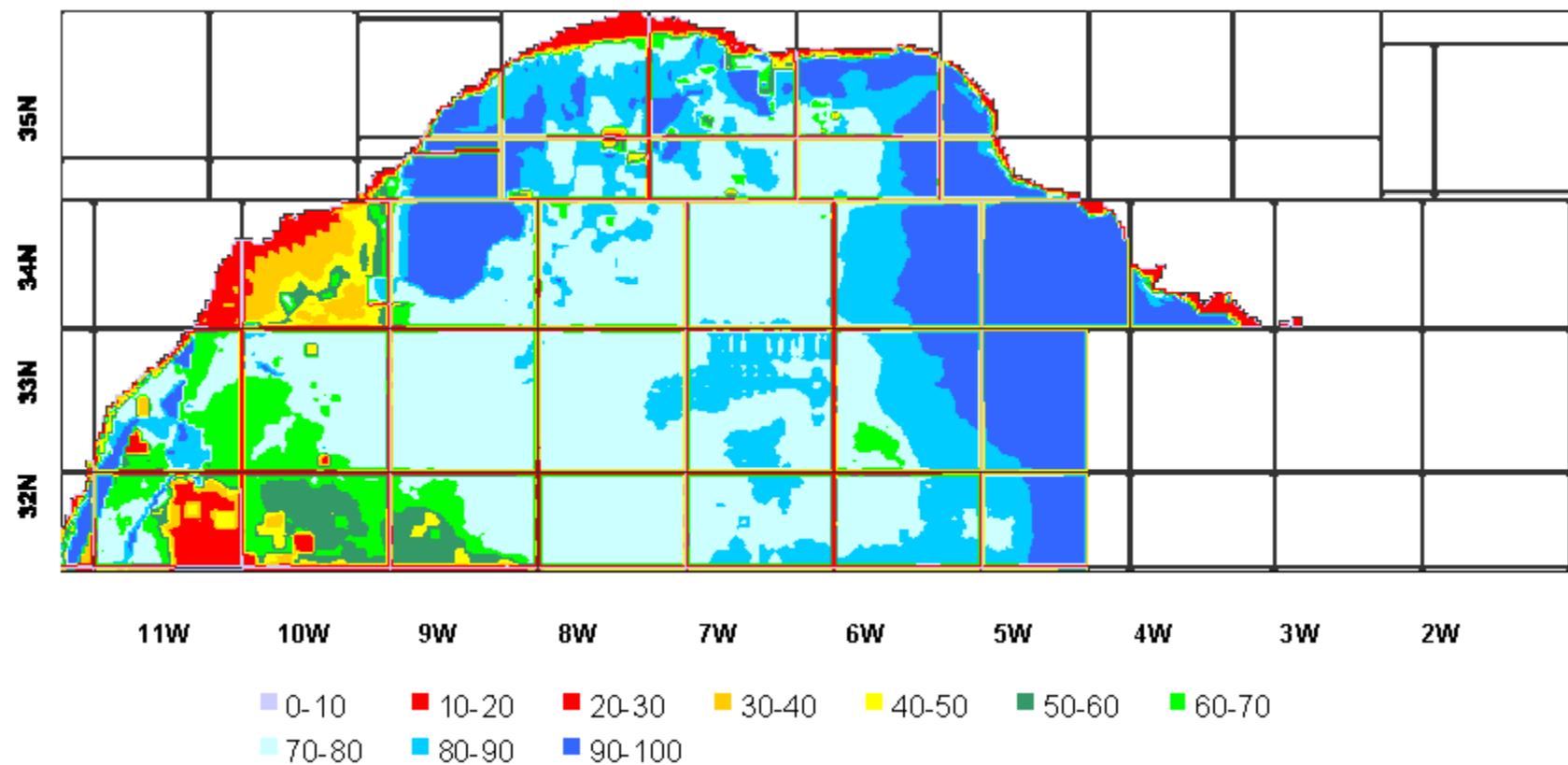


Figure 74: Simulated Gas Content in Year 1985 (scf/ton)

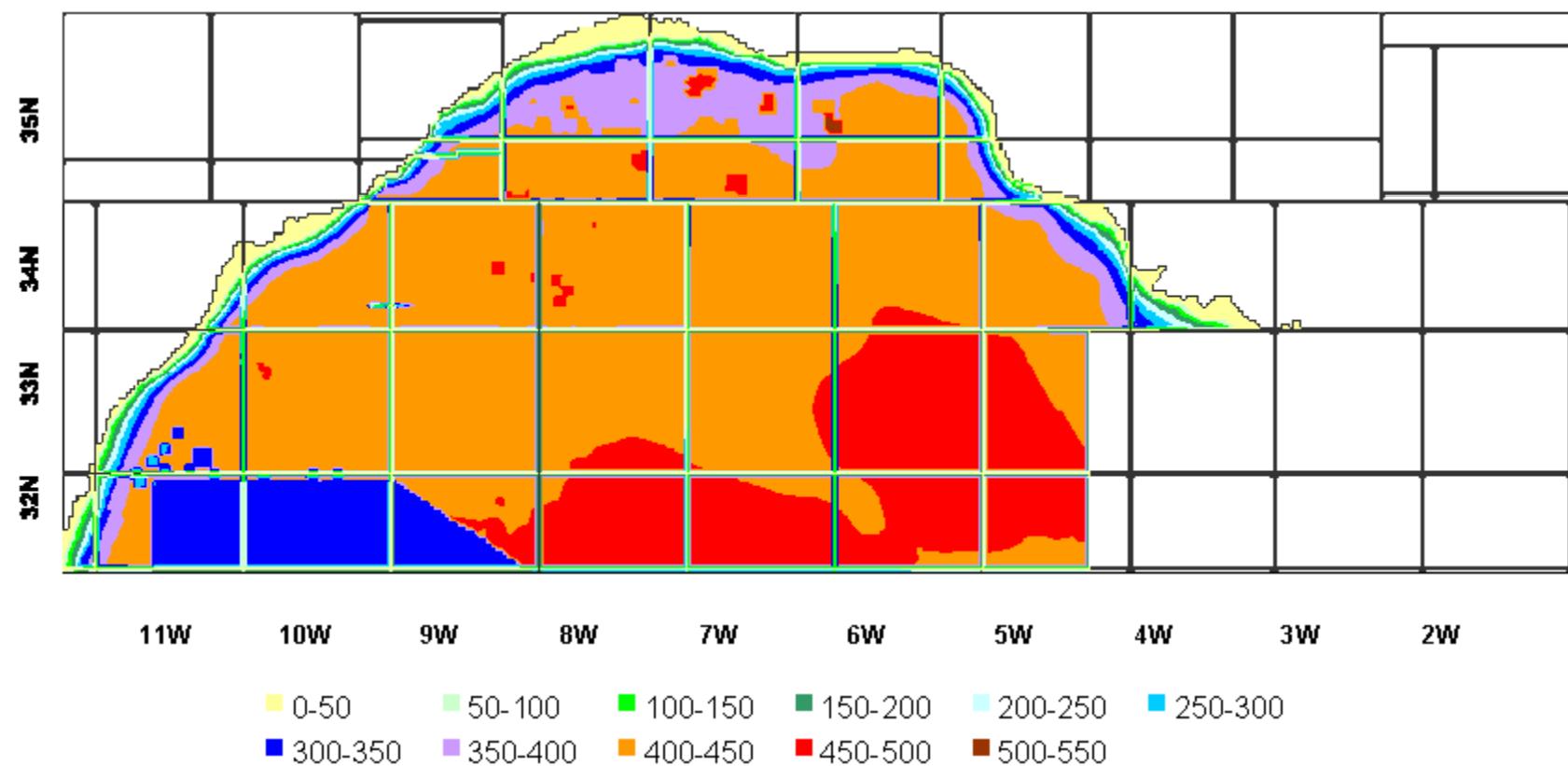


Figure 75: Simulated Gas Content in Year 2000 (scf/ton)

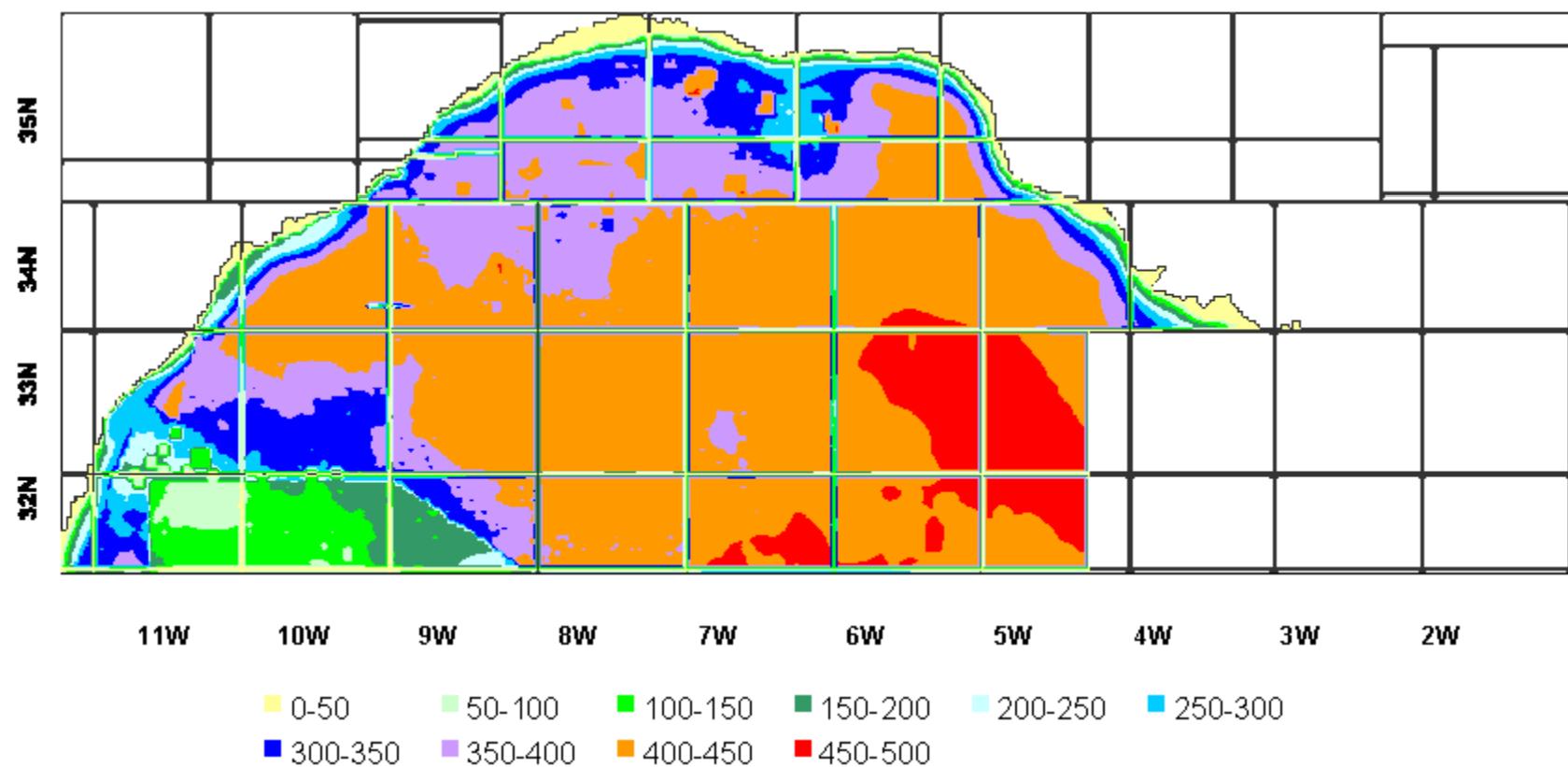
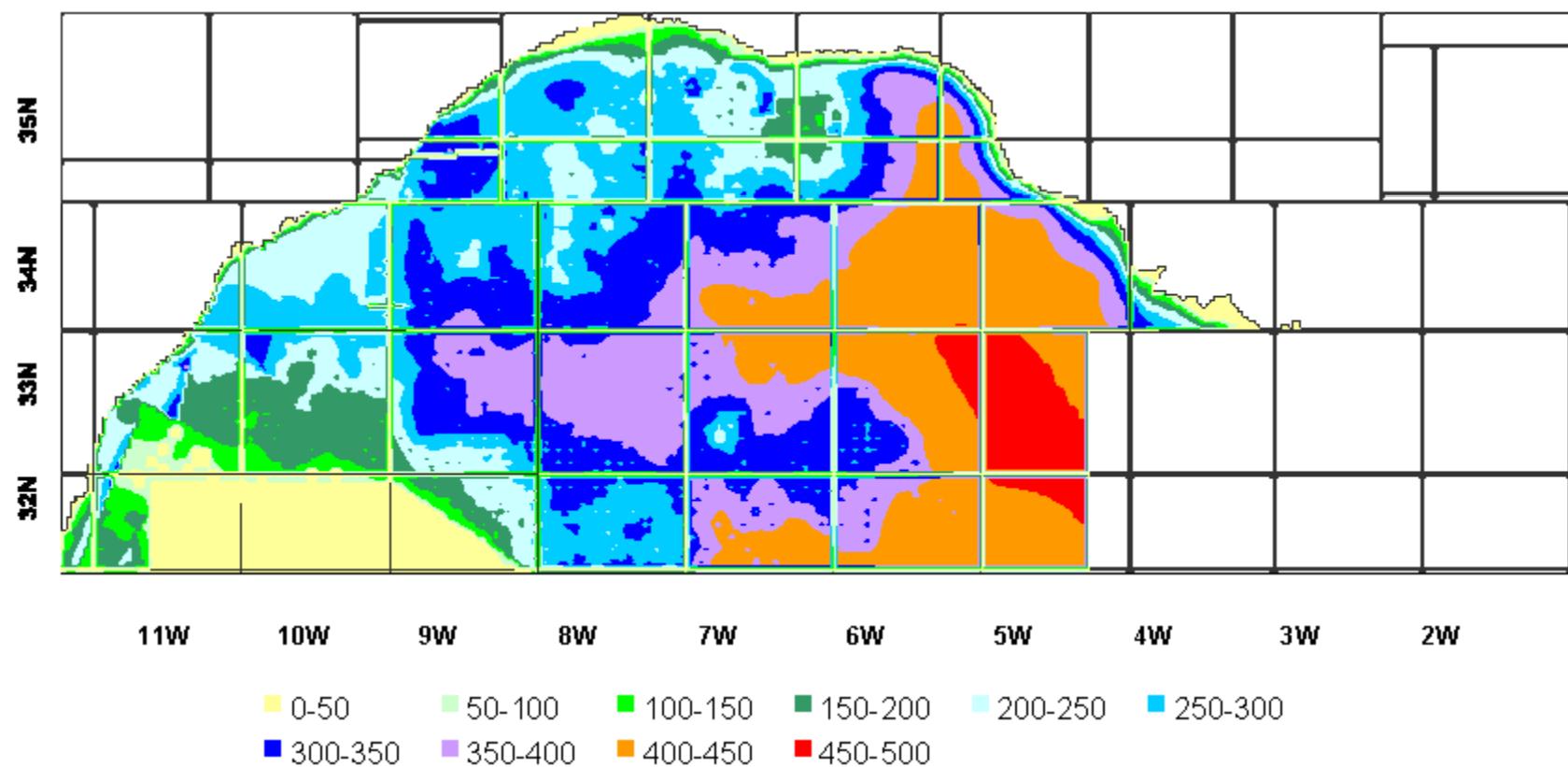


Figure 76: Simulated Gas Content in Year 2030 (scf/ton)



**Figure 77: Simulated Gas Content in Year 2030 with Infill Wells
(scf/ton)**

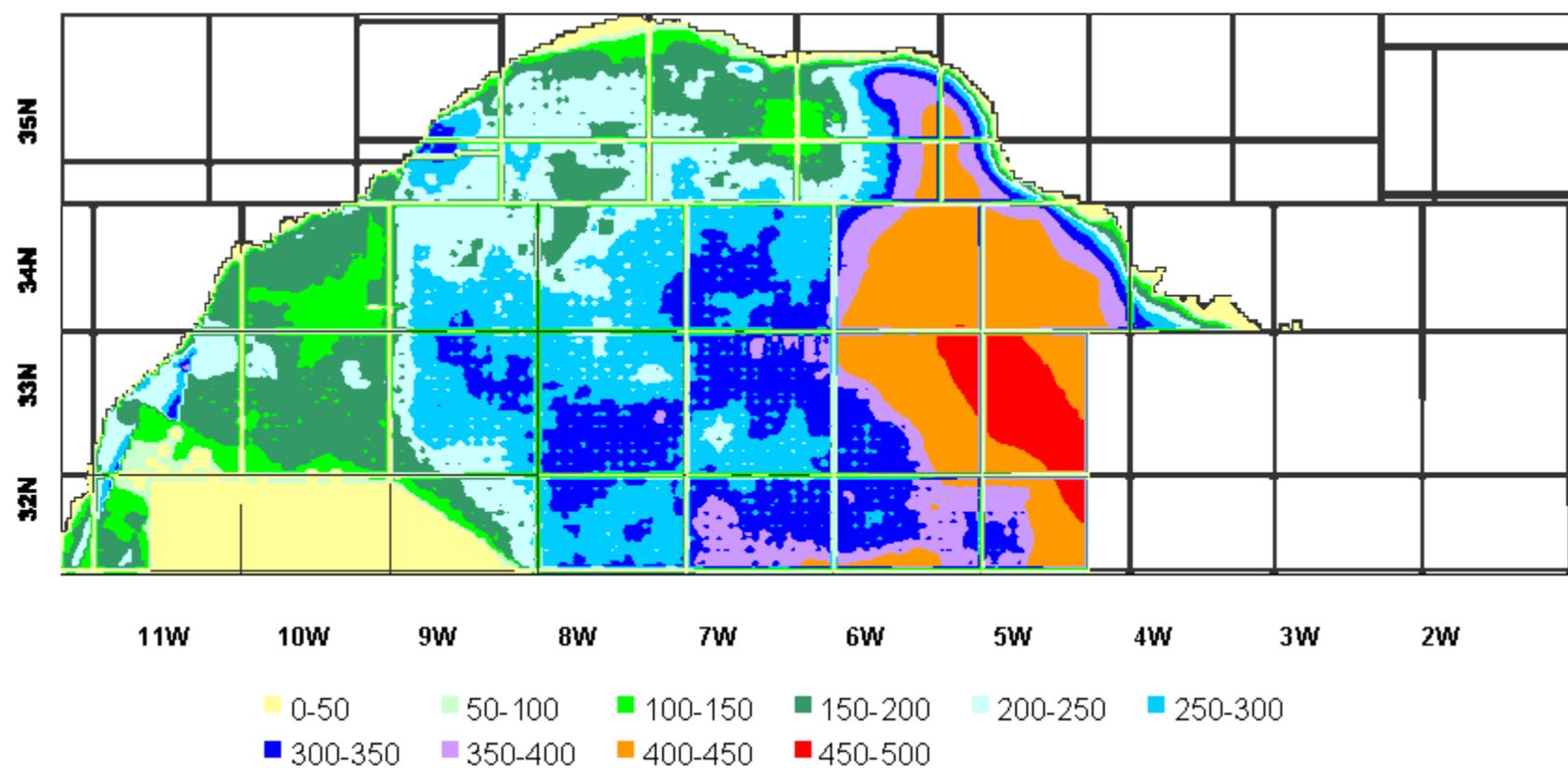


Figure 78:
Projected Seepage
as of 2000

(Red Dots Indicate Seeps,
Blue Dots Indicate Rivers and Gaps,
Green Indicates Outcrop)

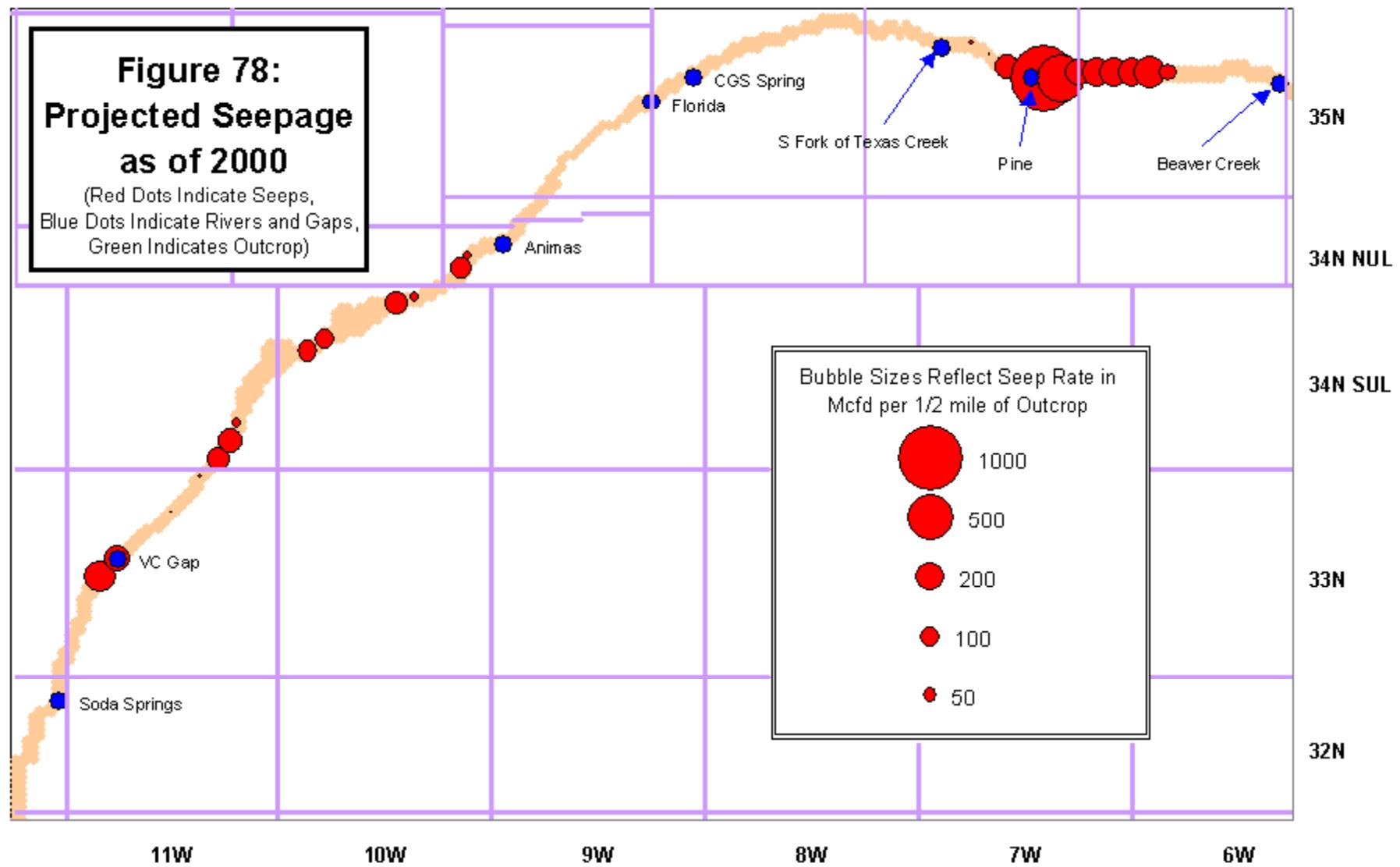


Figure 79:
Projected Seepage
as of 2030

(Red Dots Indicate Seeps,
Blue Dots Indicate Rivers and Gaps,
Green Indicates Outcrop)

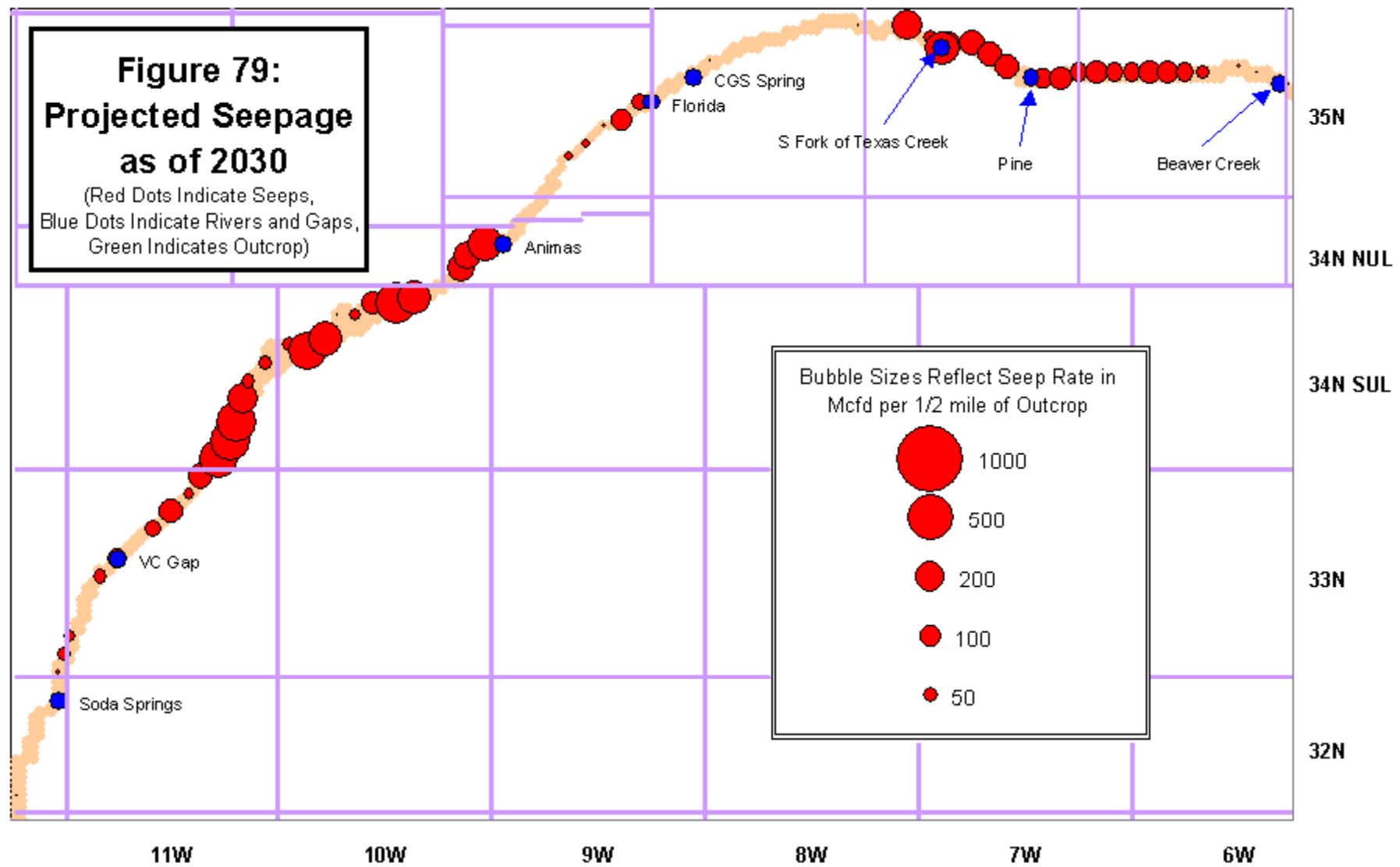


Figure 80: 3M Projections with and without Infill Wells

