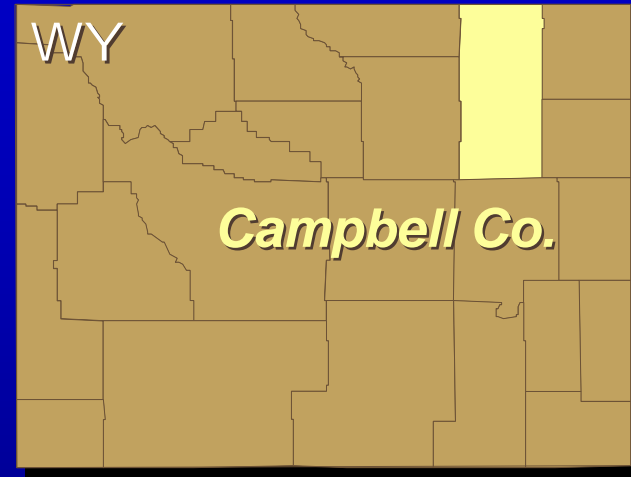
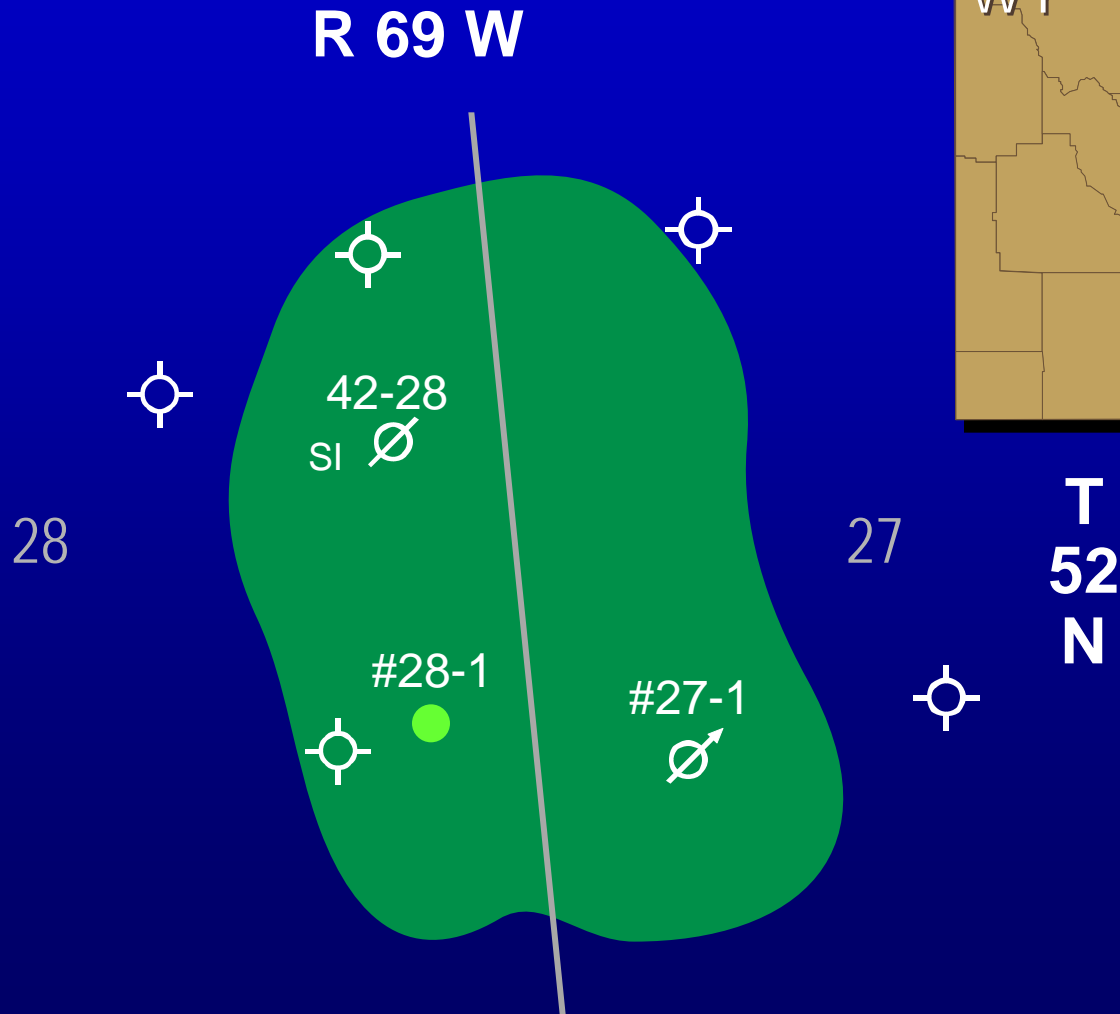


Ash Minnelusa Unit Sweep Improvement

Case Study

Jim Mack
MTech Ventures LLC
Denver, Colorado

Ash Minnelusa Sand Unit

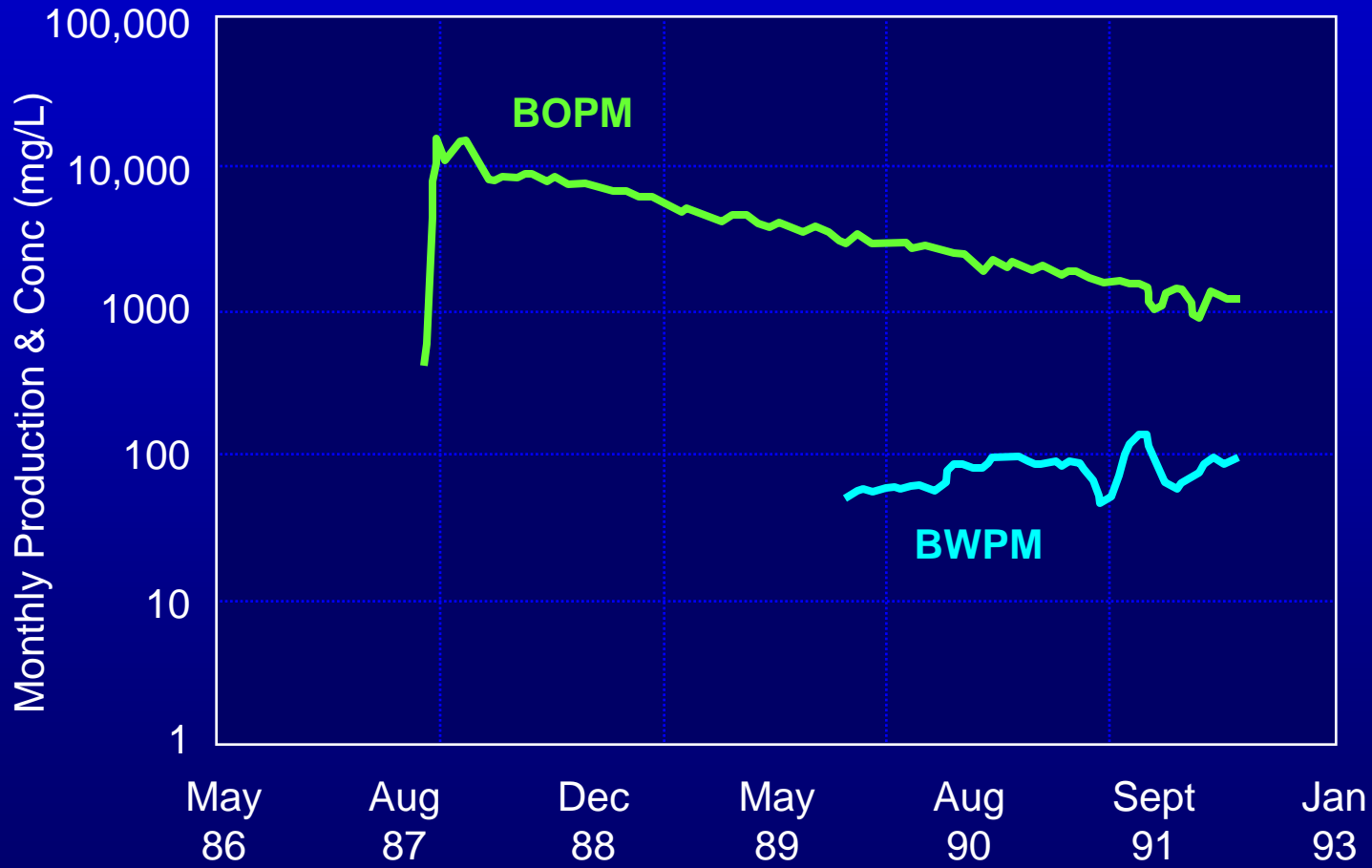


Ash Minnelusa Sand Unit Reservoir Data

General:	Discovery Formation Type Average Depth Primary Producing Mech Well Spacing	July 3, 1987 Minnelusa "B" Sandstone Stratigraphic 7775 Rock and Fluid Expansion 40 Acre
Rock Properties:	Permeability Range Average Permeability Permeability Variation Average Porosity Average Water Saturation Temperature	5 – 3000 md 300 md 0.746 16.3% 15.5% 140°F
Fluid Properties:	Formation Volume Factor Oil Viscosity Oil Gravity	1.01 30 cps 20°API
Injection Data:	Cumulative Polymer Cumulative Water Cumulative Total	33.6% PV 138.4% PV 172.0%PV
Recovery Data:	OOIP Primary Recovery Current Oil Recovery	2,170 MSTBO 14.1% OOIP 45.4% OOIP

Total Field Production

Ash Minnelusa Sand Unit



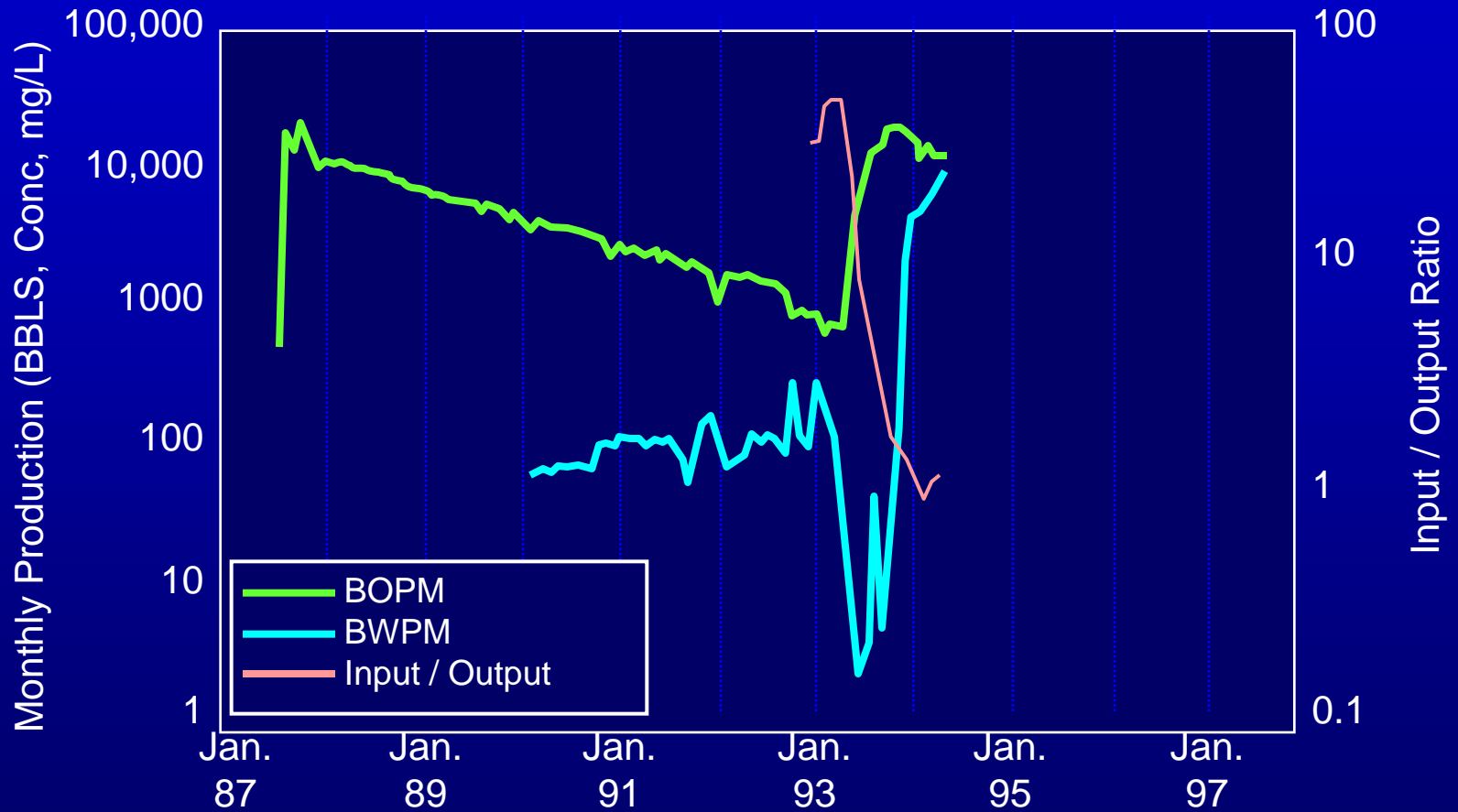
Ash Minnelusa Sand Unit

Polymer-Augmented Processes

Process	BBLS	% Pore Volume	Avg. Polymer Conc, mg/L
Mobility Control	424,598	16.3	705

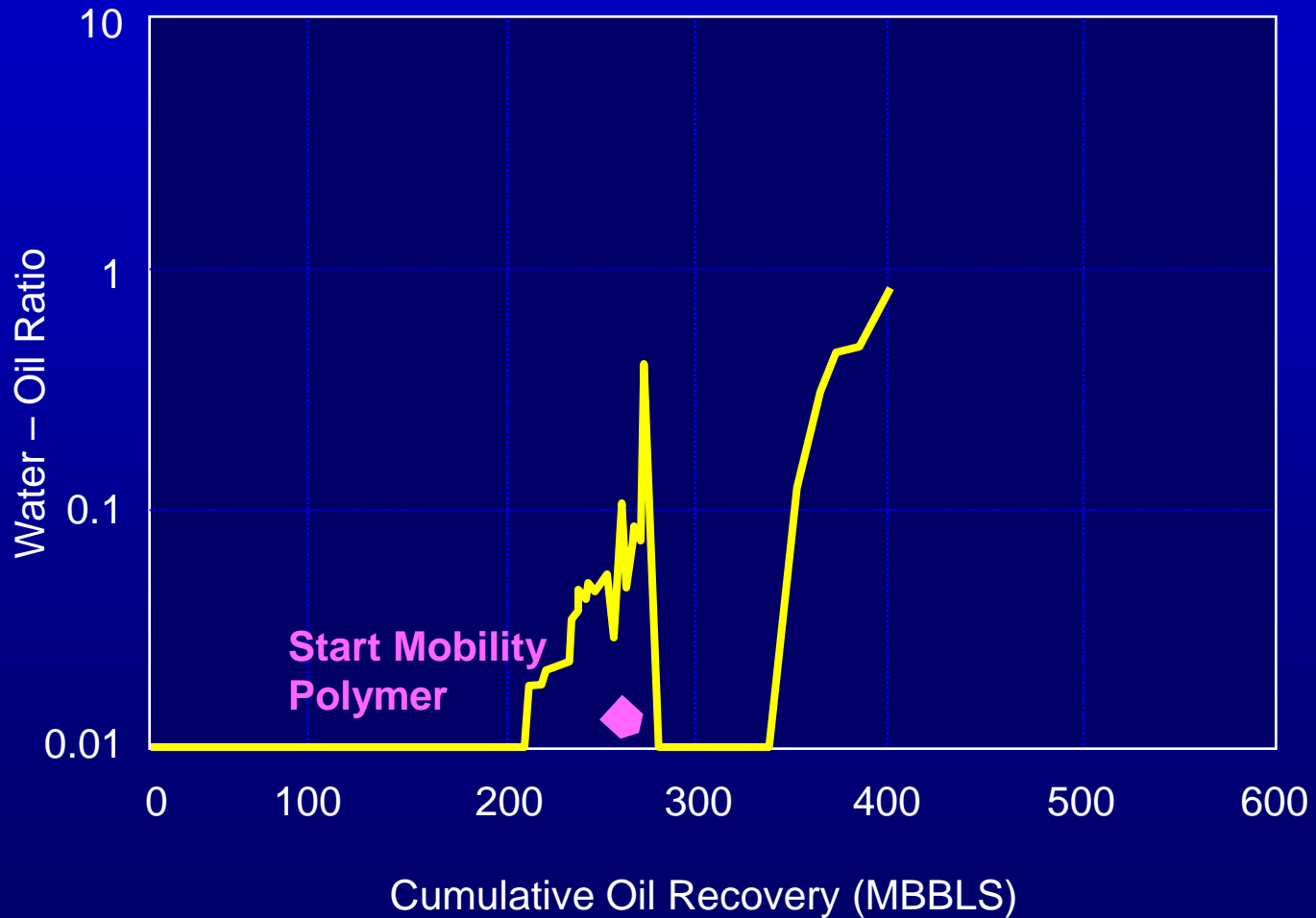
Total Field Production

Ash Minnelusa Sand Unit



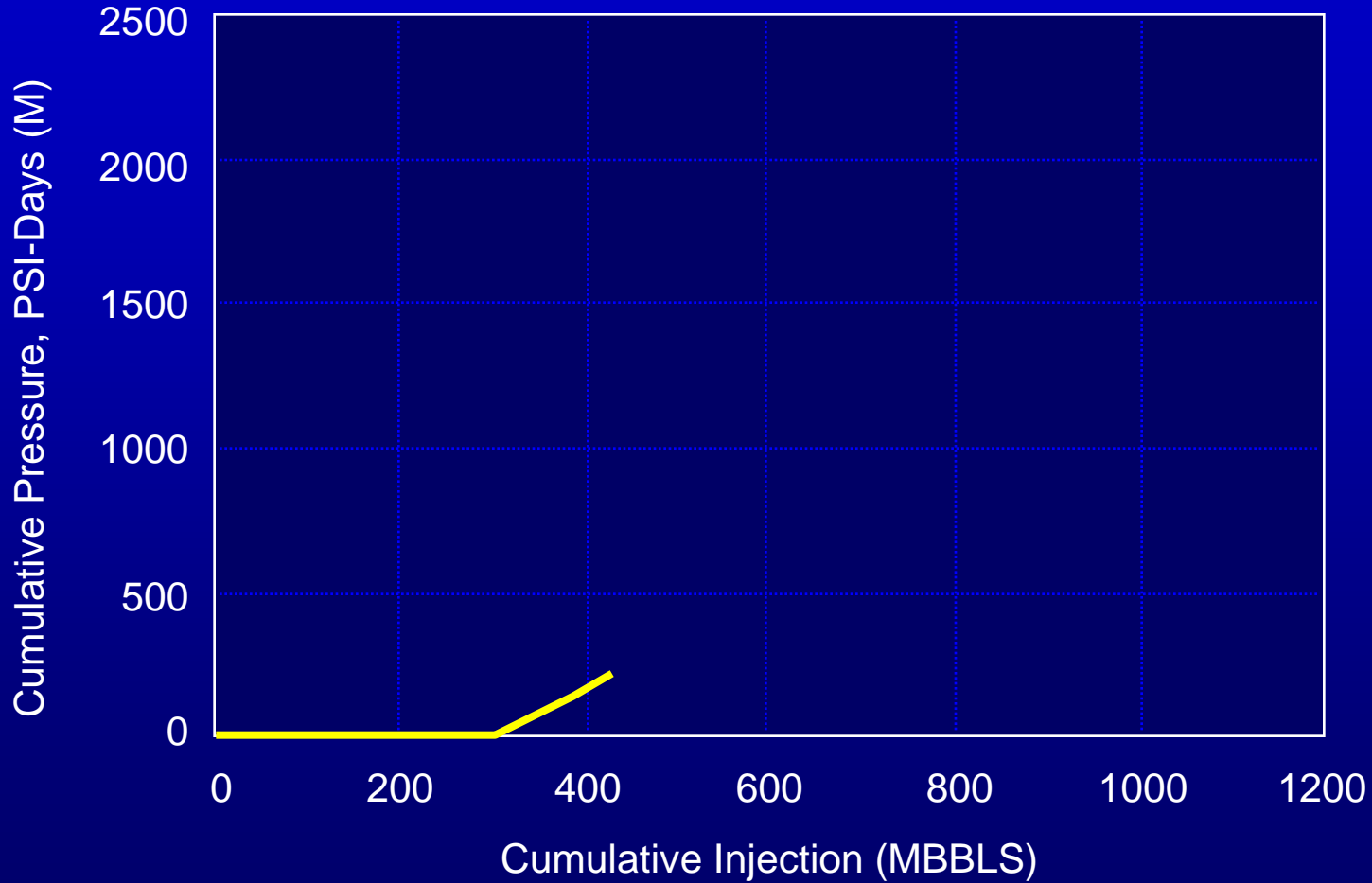
Production Efficiency

Ash Minnelusa Sand Unit



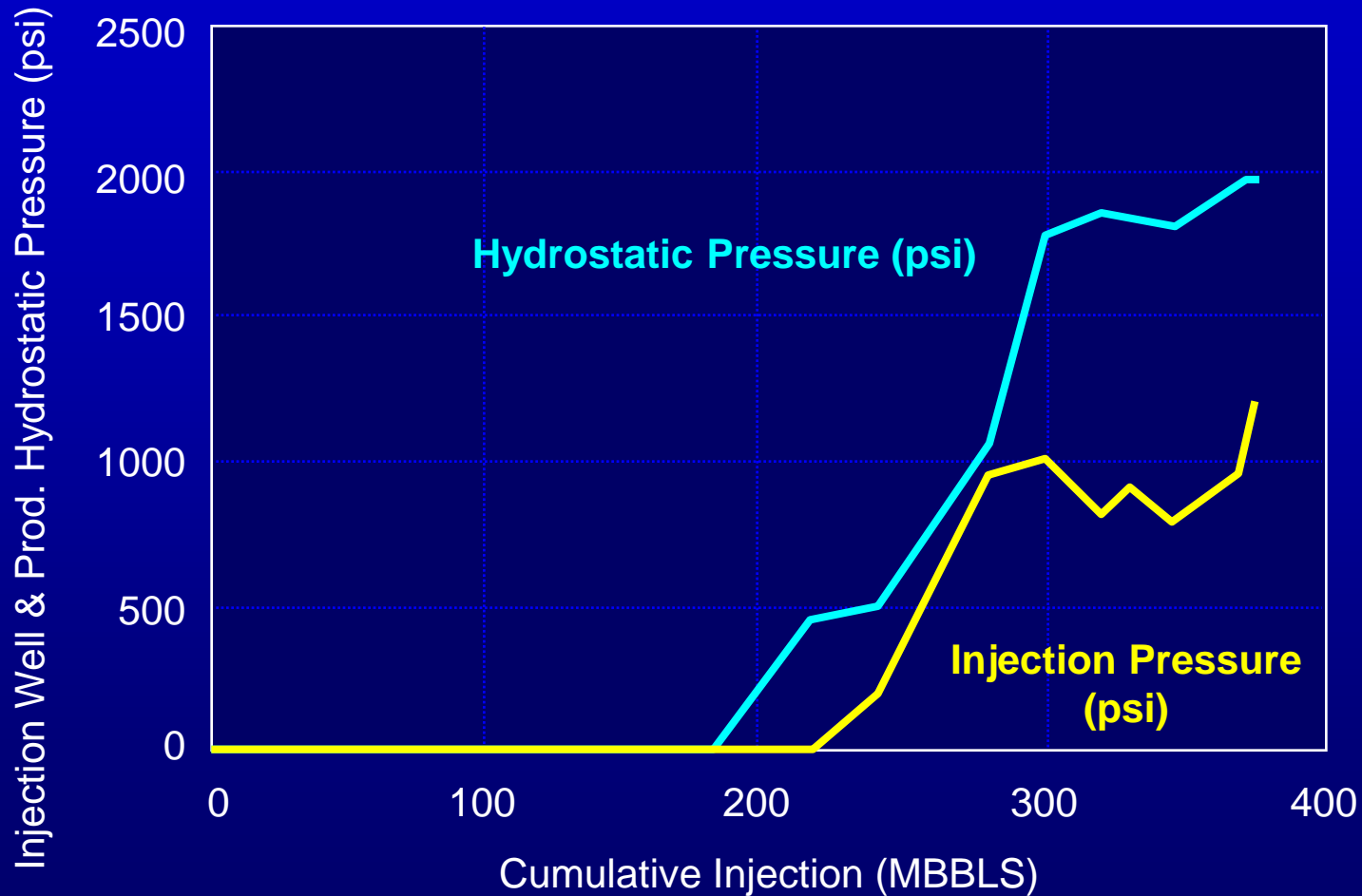
Ash Minnelusa Sand Unit

Ash #1-27 Hall Plot



Injection Wellhead Pressure and Producing Well Hydrostatic Pressure

Ash Minnelusa Sand Unit



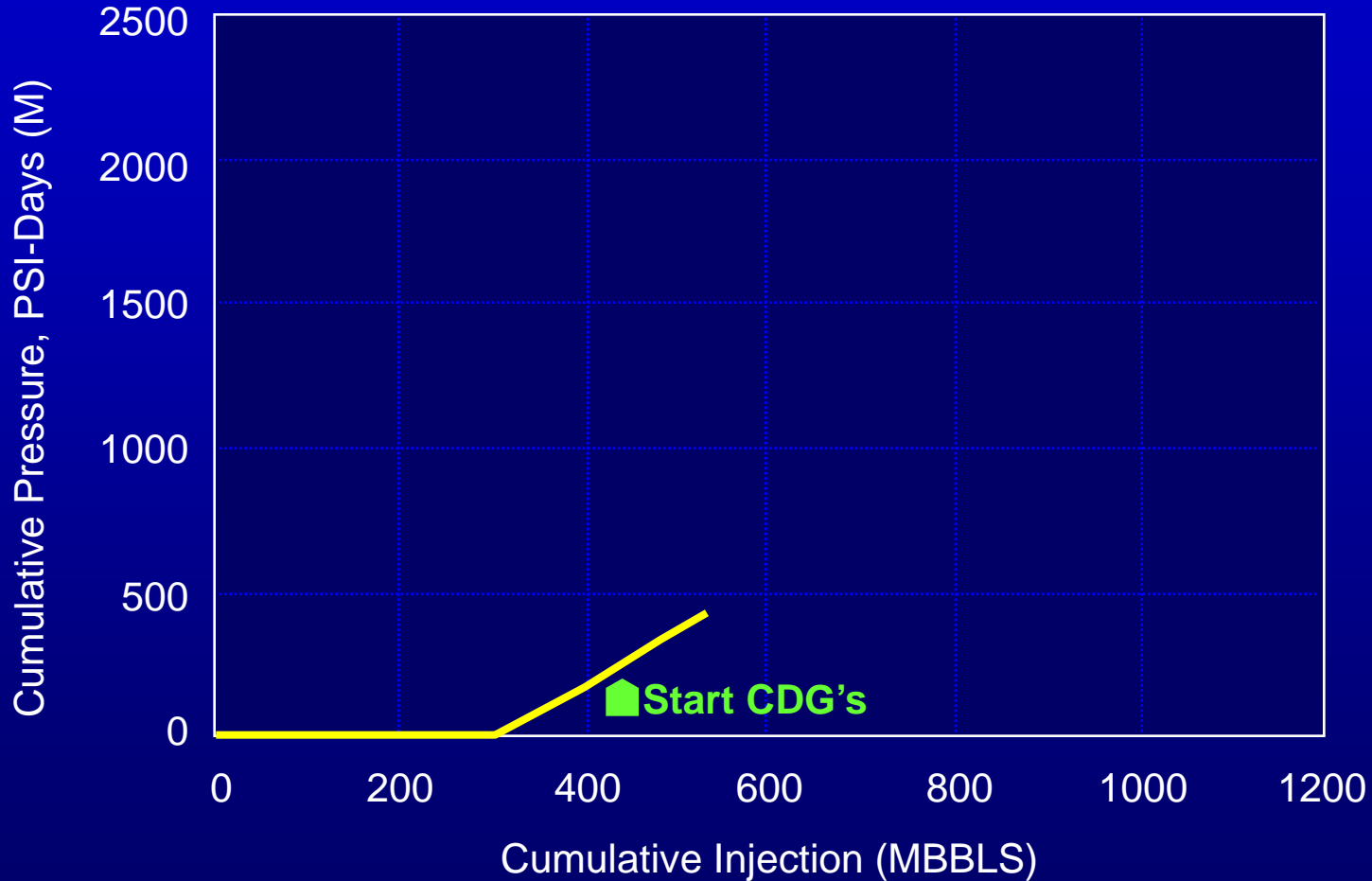
Ash Minnelusa Sand Unit

Polymer-Augmented Processes

Process	BBLS	% Pore Volume	Avg. Polymer Conc, mg/L
Mobility Control	424,598	16.3	705
CDG	180,000	6.9	431

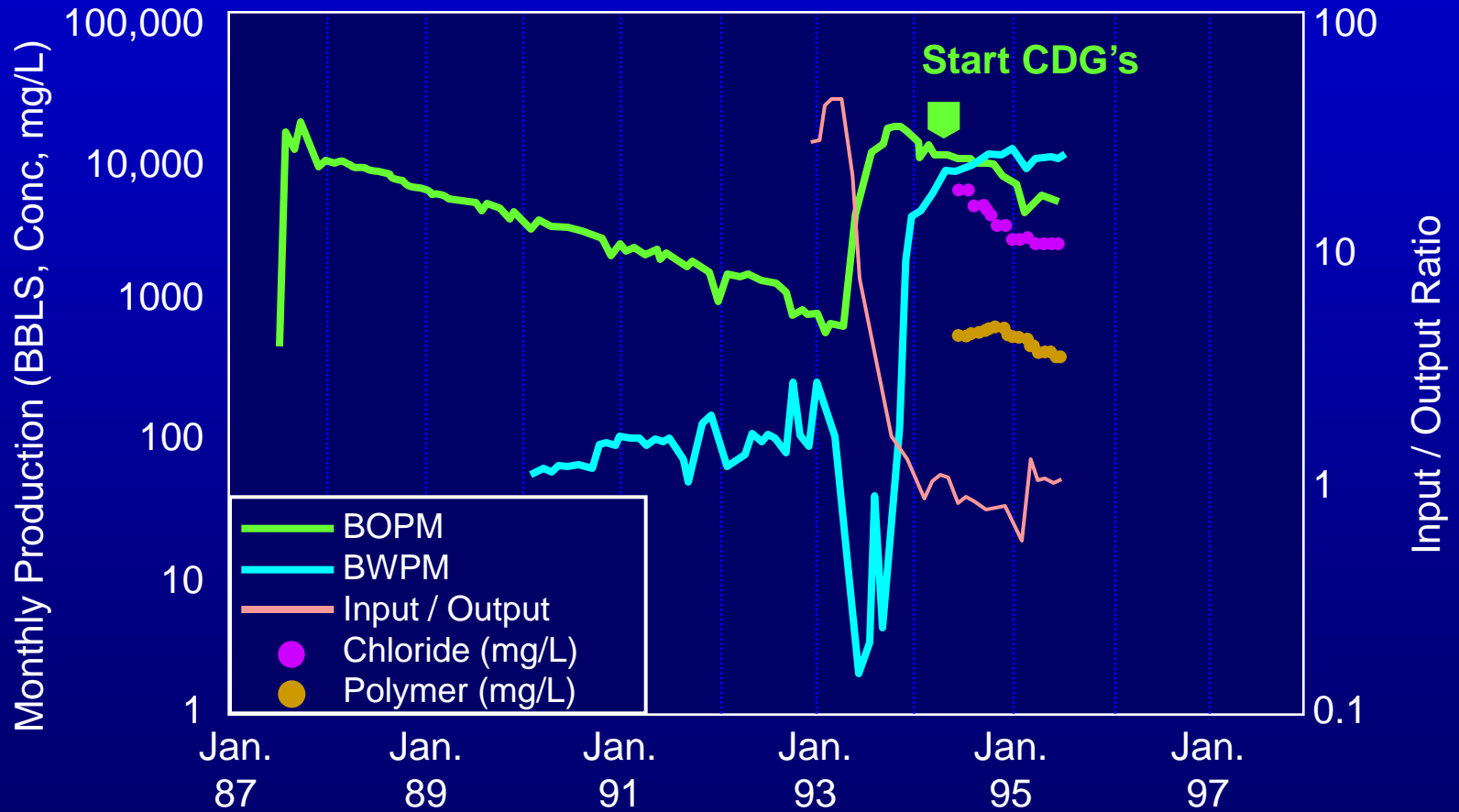
Ash Minnelusa Sand Unit

Ash #1-27 Hall Plot



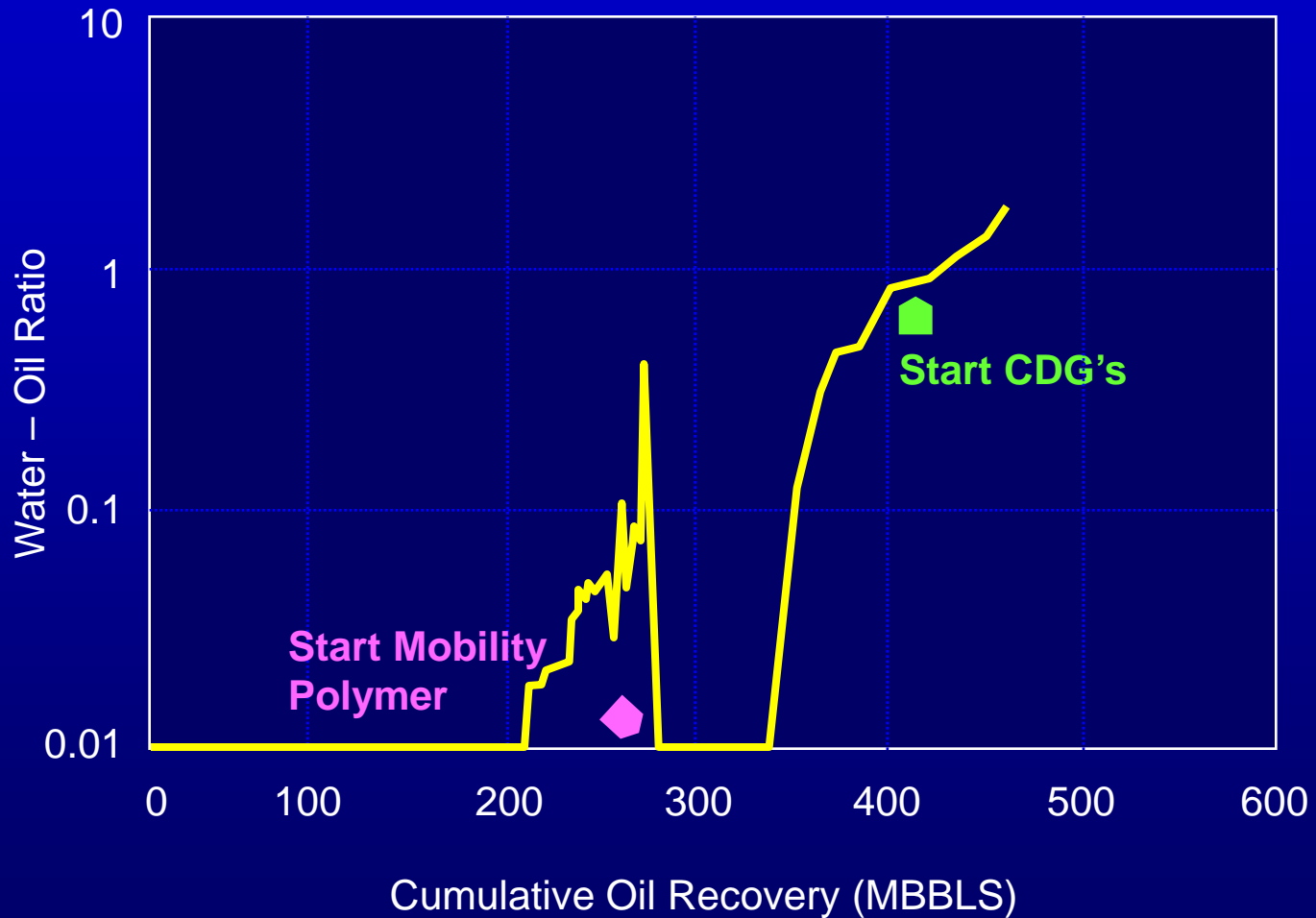
Total Field Production

Ash Minnelusa Sand Unit



Production Efficiency

Ash Minnelusa Sand Unit



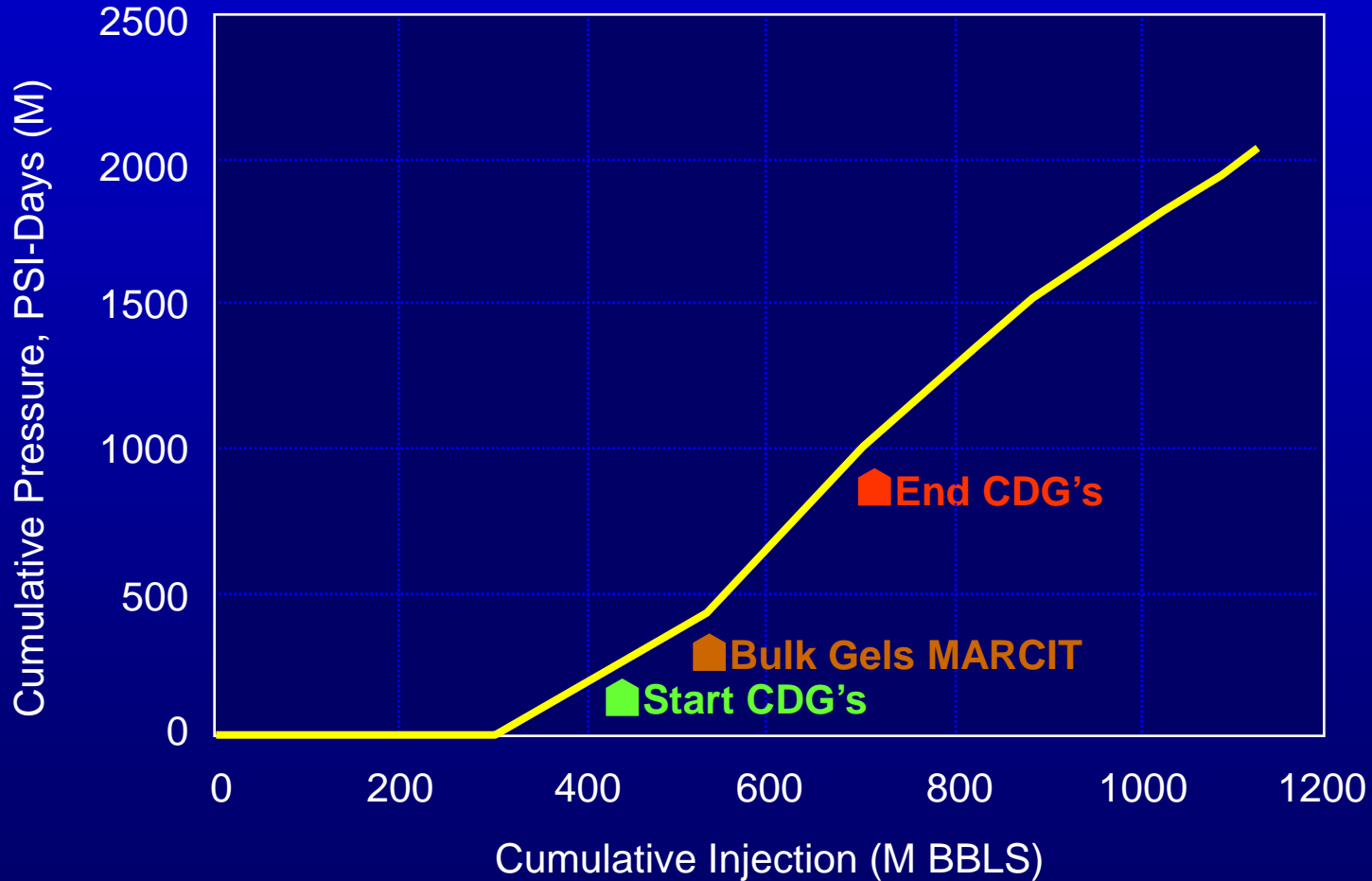
Ash Minnelusa Sand Unit

Polymer Augmented Processes

Process	BBLS	% Pore Volume	Avg Polymer Conc, mg/L
Mobility Control	424,598	16.3	705
CDG	180,000	6.9	431
Bulk Gel (MARCIT)	10,192	0.4	1,500 2,250 3,000 4,000

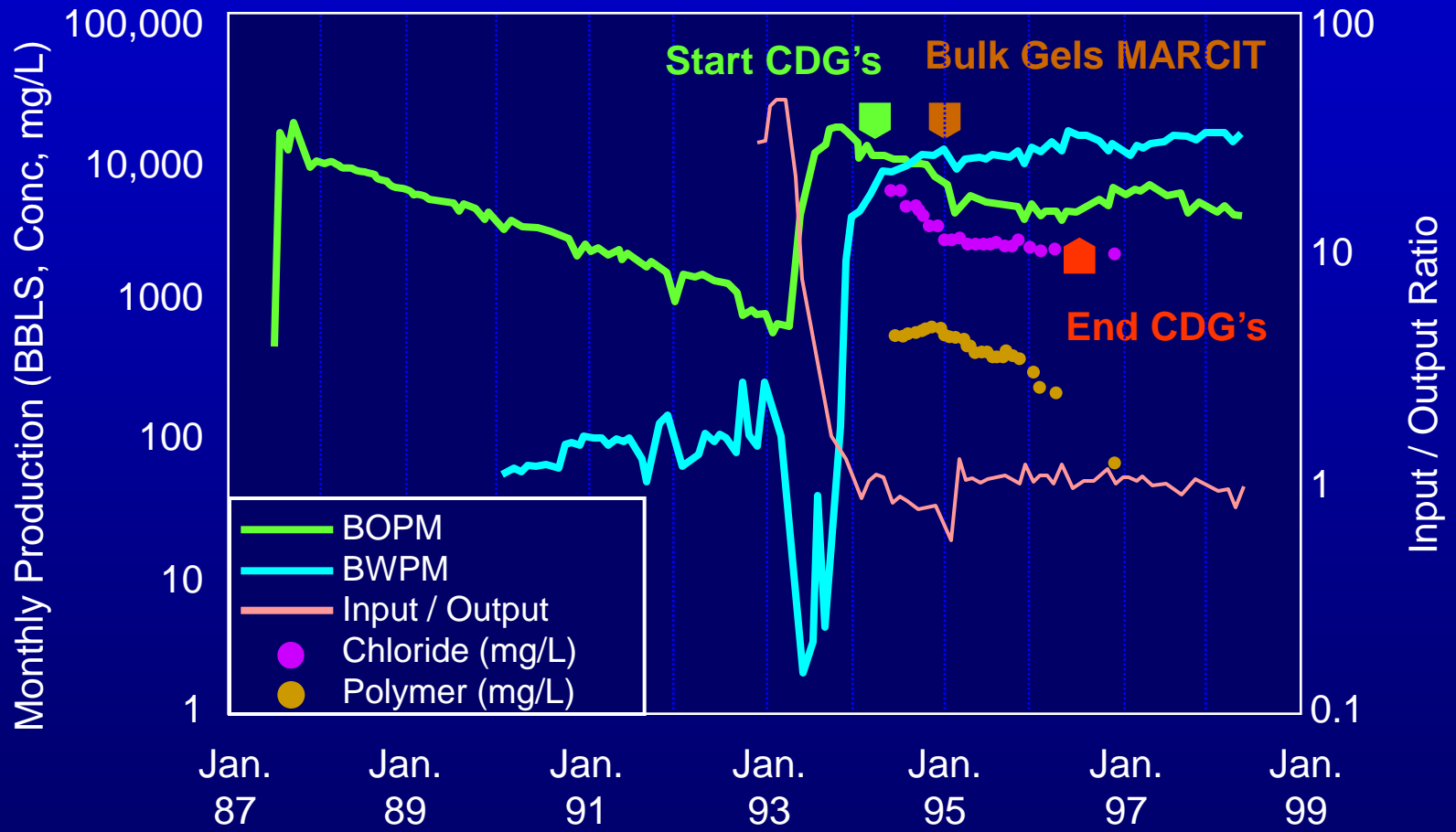
Ash Minnelusa Sand Unit

Ash #1-27 Hall Plot



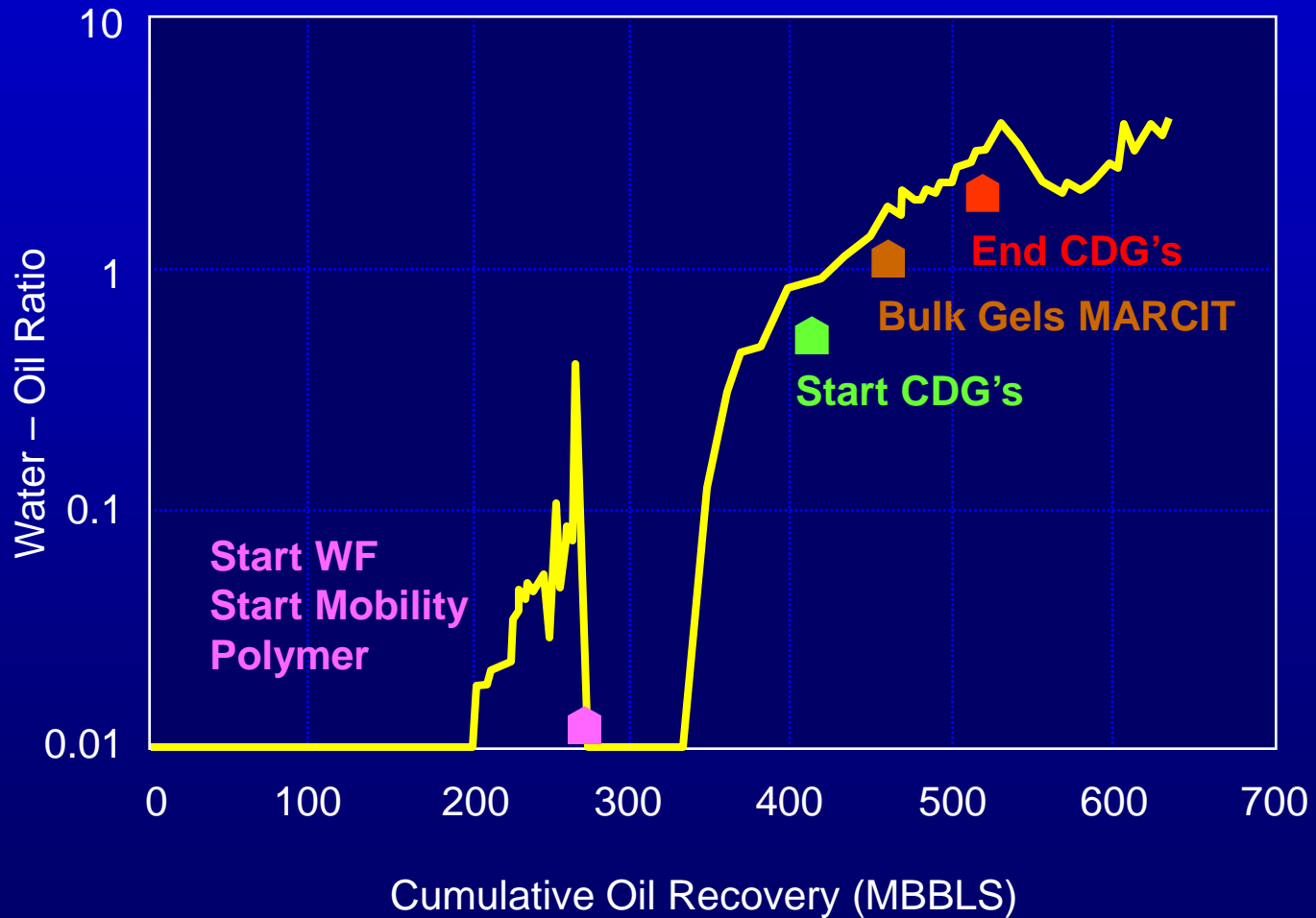
Total Field Production

Ash Minnelusa Sand Unit



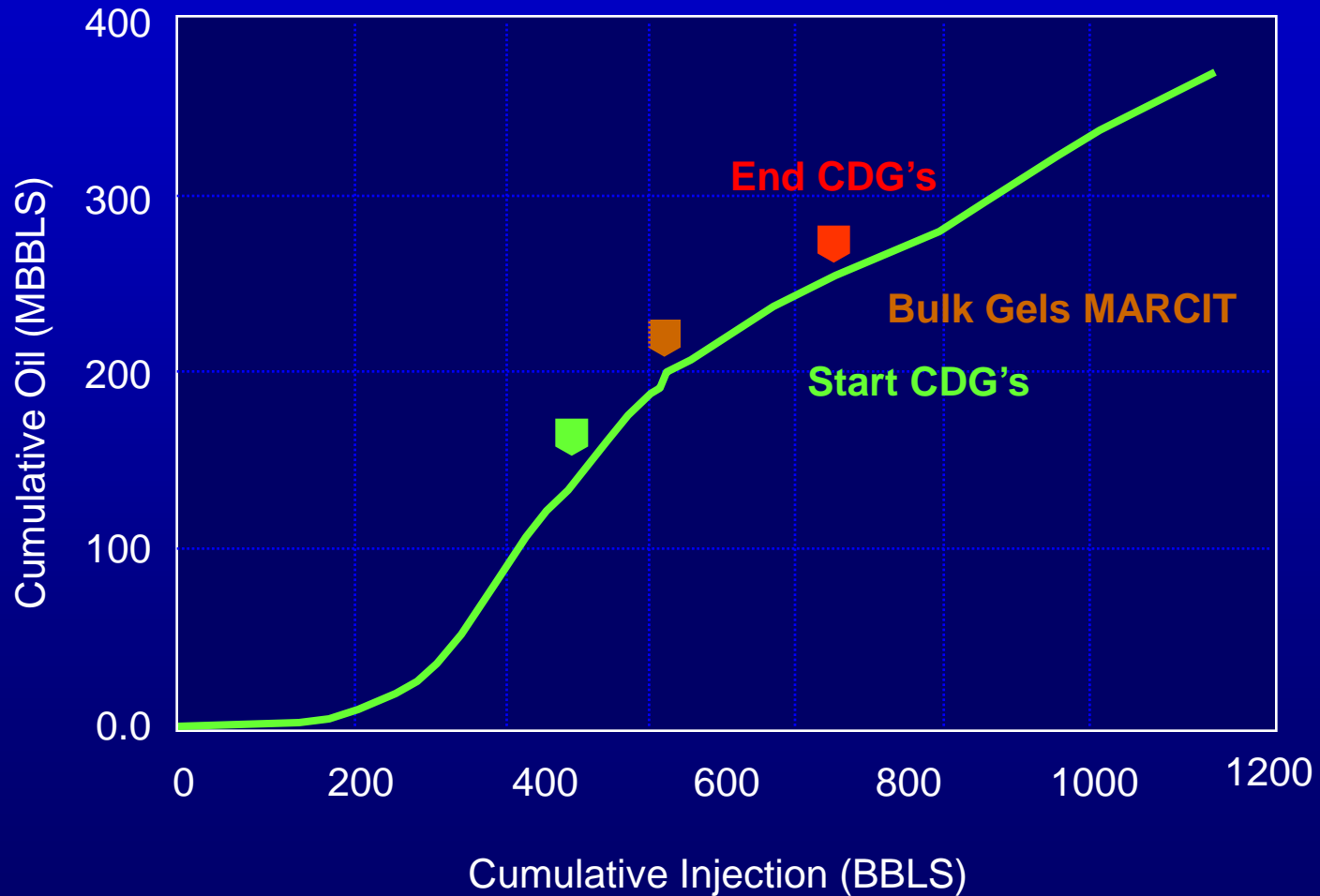
Production Efficiency

Ash Minnelusa Sand Unit



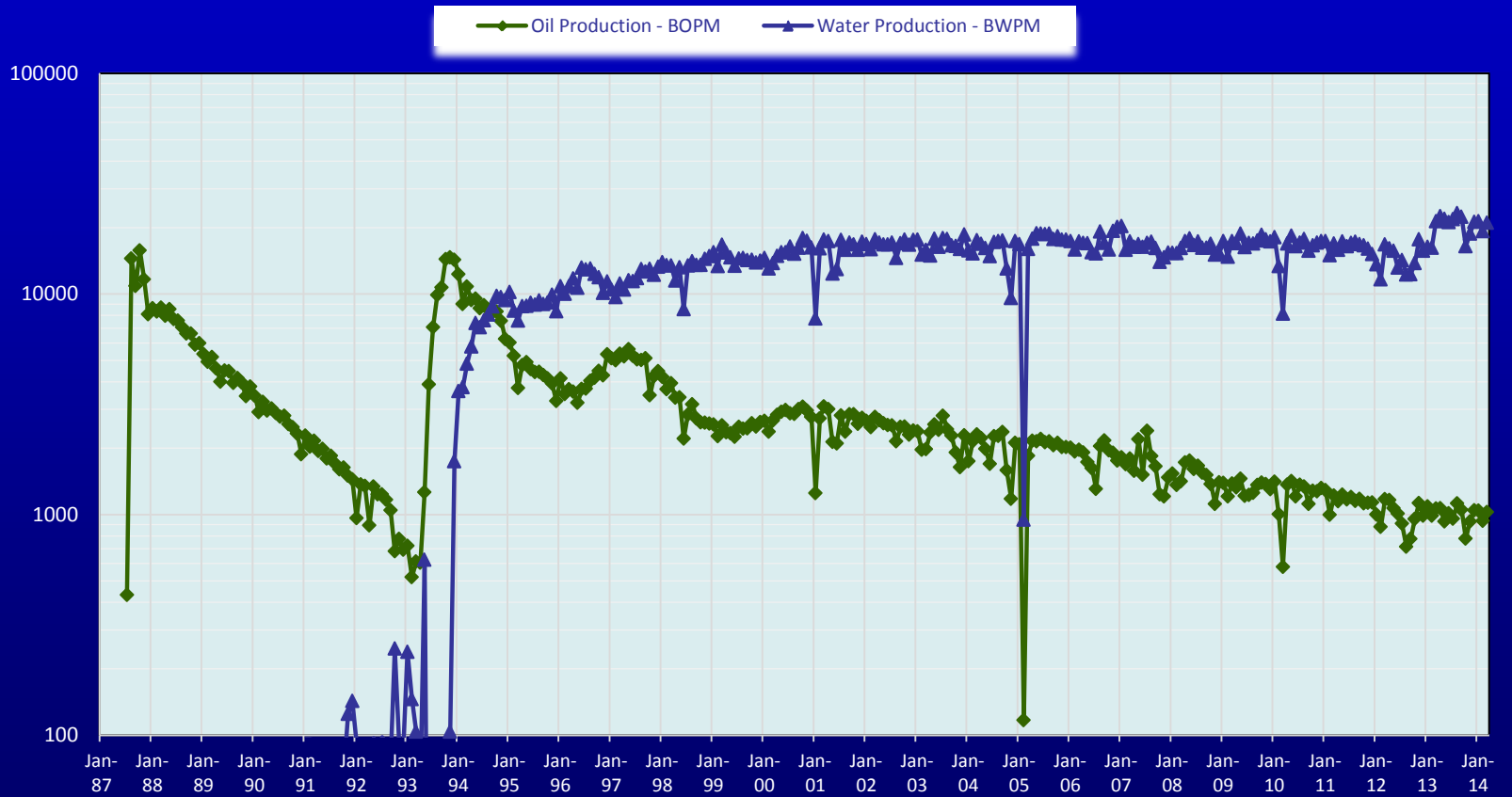
Injection Efficiency

Ash Minnelusa Sand Unit

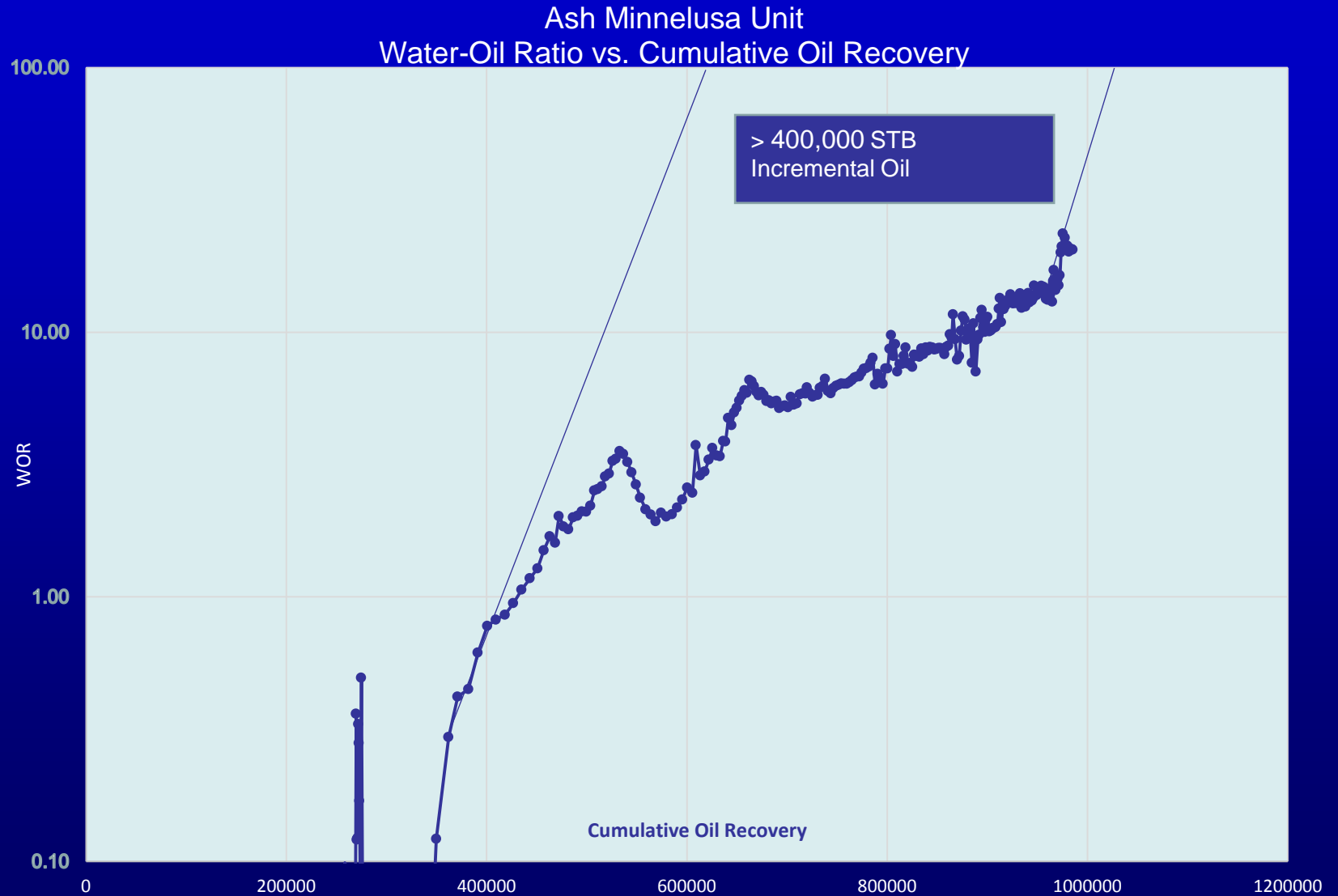


Total Field Production

Ash Minnelusa Unit - Field Production



Production Efficiency



Ash Minnelusa Unit Conclusions

- Monitor, monitor, monitor. Make changes based upon reservoir response
- Improved understanding of the problem improves process application and results
- Volumetric sweep (gels) should be applied before mobility control
- Implement gel processes early for maximum benefits
- Incremental oil expected to exceed 400,000 BBLS (18.4% OOIP) for \$0.88/BBL
- Field experience is critical with gel processes. Experience at Ash can be applied to other reservoirs.