Lockhart Crossing: Economically Efficient Reservoir Operations

Nik Wood
Denbury Resources Inc.

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Corporate Information

Corporate Headquarters

Denbury Resources Inc.
5100 Tennyson Pkwy., Ste. 1200
Plano, Texas 75024
Ph: (972) 673-2000 Fax: (972) 673-2150
Web Site: www.denbury.com

Contact Us

Phil Rykhoek
Chief Executive Officer
(972) 673-2050
phil.rykhoek@denbury.com

Mark Allen
Senior VP & CFO
(972) 673-2007
mark.allen@denbury.com

Laurie Burkes
Investor Relations Manager
(972) 673-2166
laurie.burkes@denbury.com

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The data contained in this presentation that are not historical facts are forward-looking statements that involve a number of risks and uncertainties. Such statements may relate to, among other things, capital expenditures, drilling activity, development activities, production efforts and volumes, net asset values, proved reserves, potential reserves and anticipated production growth rates in our CO_2 models, 2009 and 2010 production and expenditure estimates, availability and cost of equipment and services, and other enumerated reserve potential. These forward-looking statements are generally accompanied by words such as "estimated", "projected", "potential", "anticipated", "forecasted" or other words that convey the uncertainty of future events or outcomes. These statements are based on management's current plans and assumptions and are subject to a number of risks and uncertainties as further outlined in our most recent 10-K and 10-Q. Therefore, the actual results may differ materially from the expectations, estimates or assumptions expressed in or implied by any forward-looking statement made by or on behalf of the Company.

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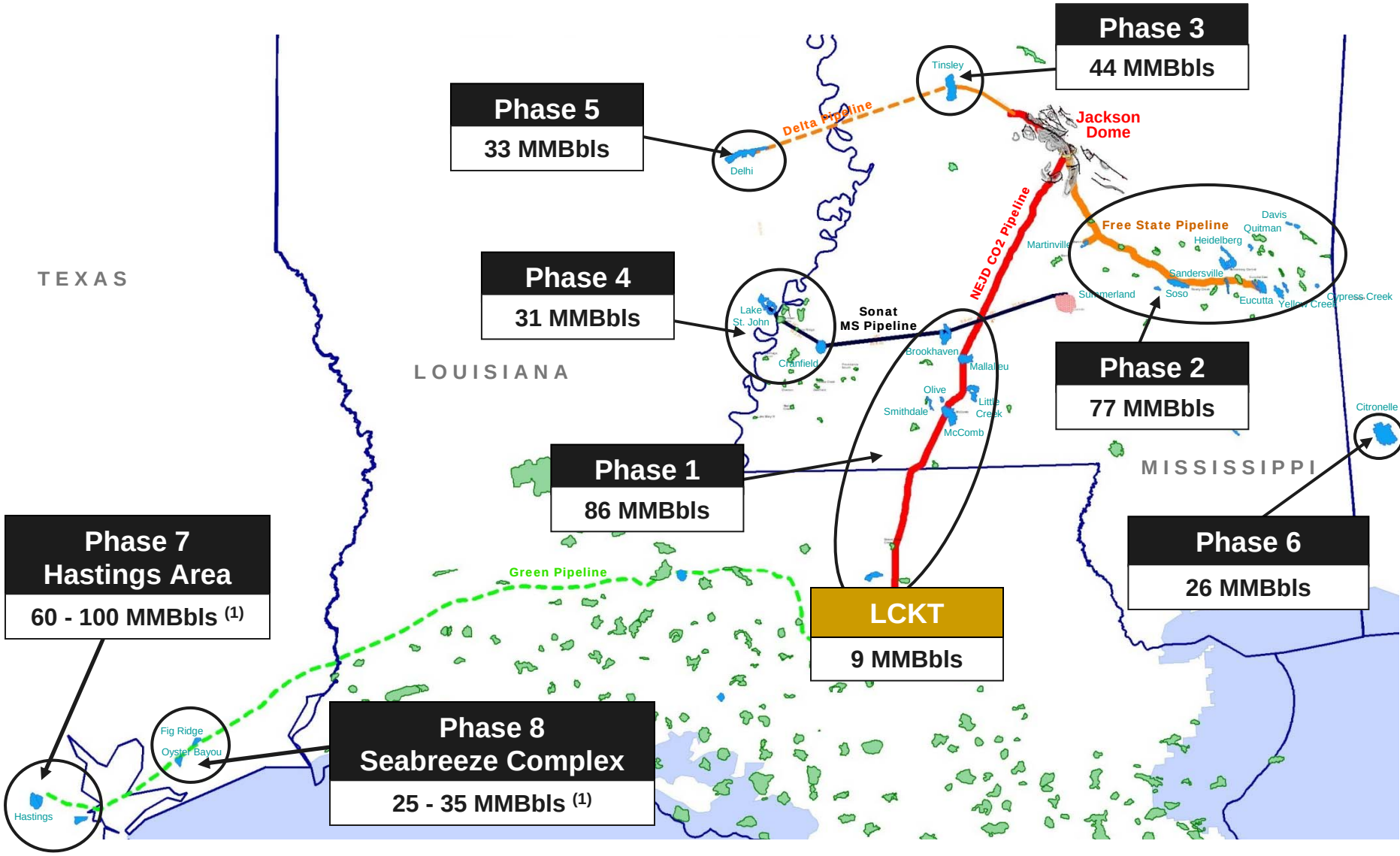
Economically Efficient Reservoir Operations Agenda

- Lockhart Crossing Introduction and Background
- Asset Development Principles / Business Plan
- Reservoir Surveillance Metric Creation and Comparison
- Economically Efficient Process Evolution
  - Asset Observations
  - Optimization Process Design and Management Plan
  - Implementation
  - Results

Lockhart's Geographic Location

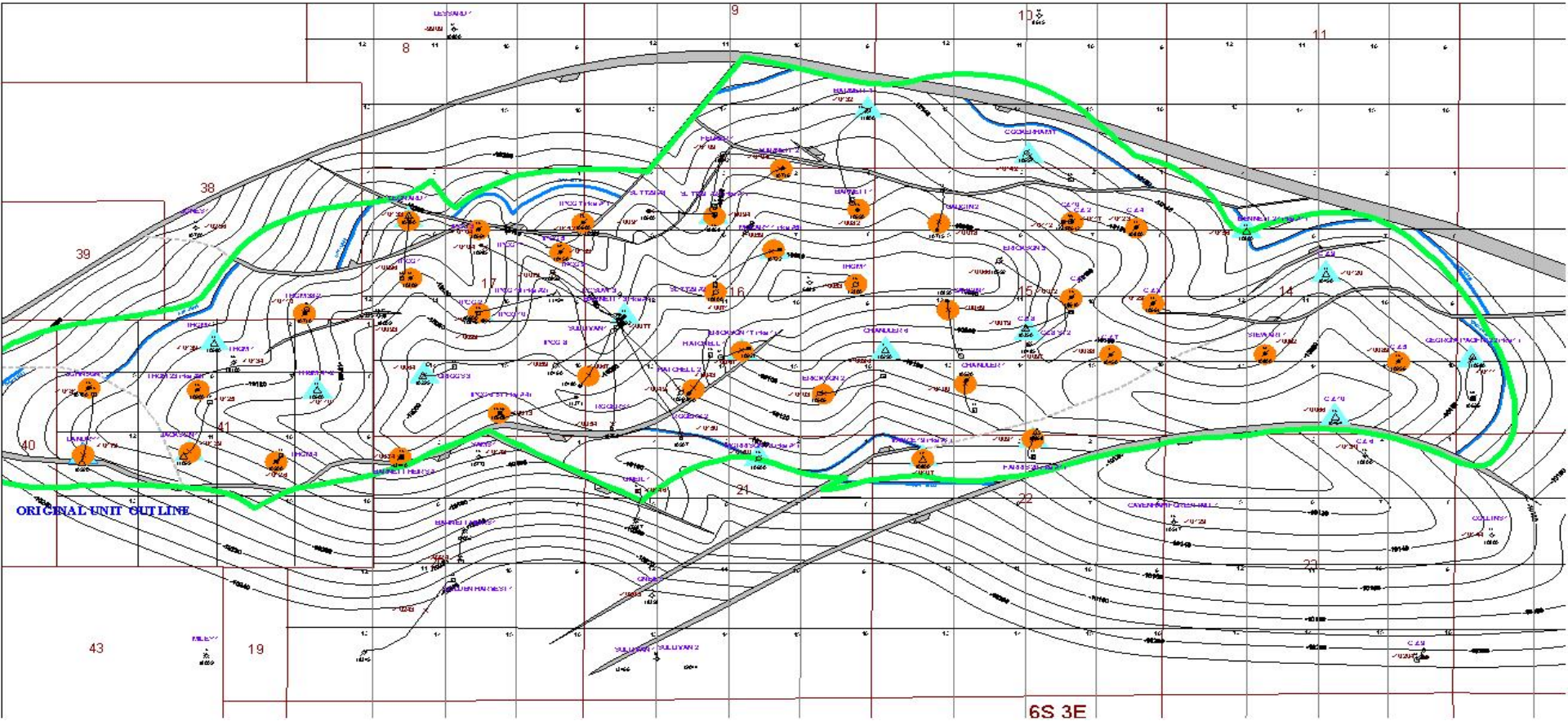


(1) Proved plus probable tertiary oil reserves as of 12/31/08, including past production, based on a range of recovery factors. Hastings Field was purchased 2/2/09.

Lockhart Crossing 1st Wilcox Structure

OOIP: 56.1 MMBBLS
Production: 18.2 MMBBLS (32%)

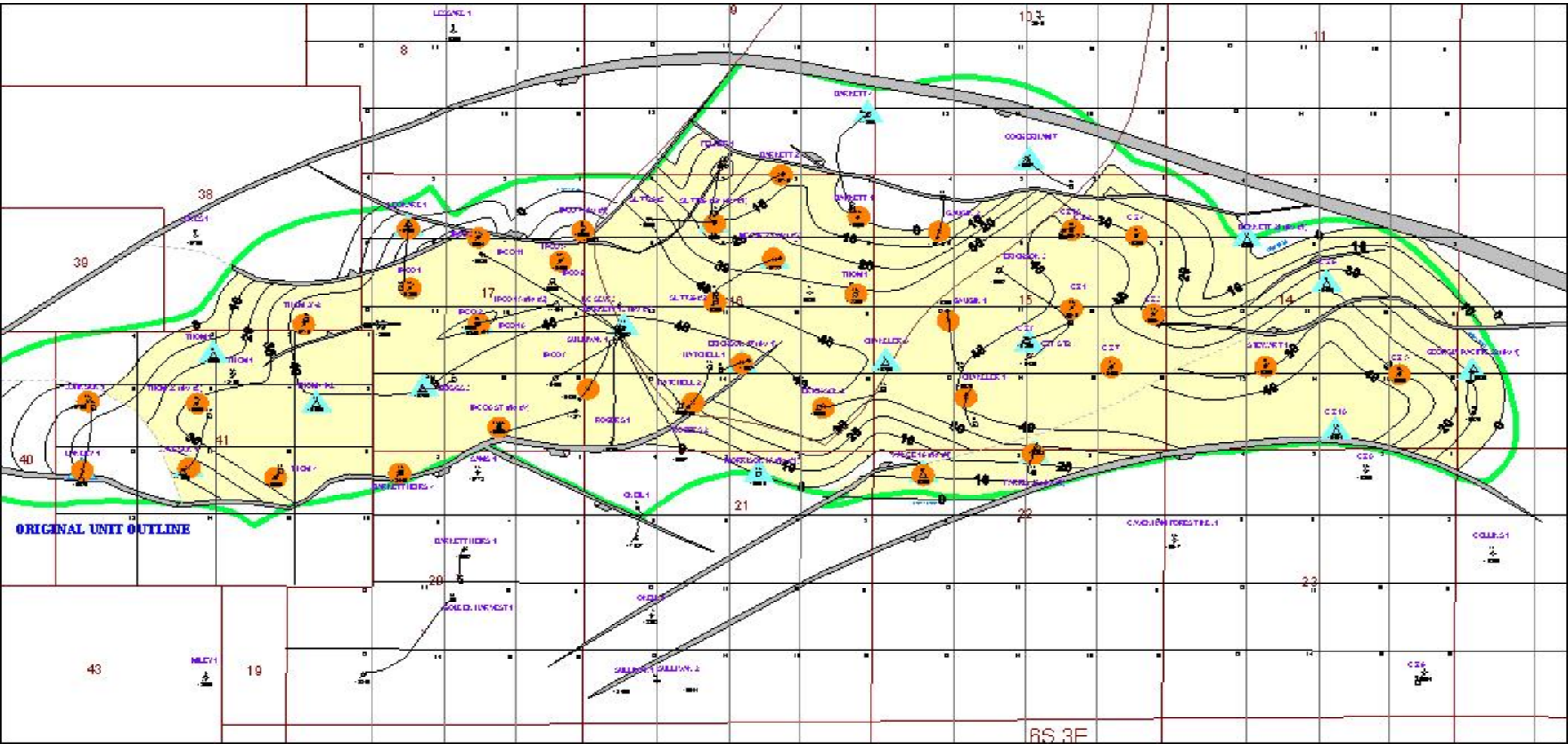
Discovery July 1982 Callon Petroleum
3,500 Acres
Unitized 1985



1st Wilcox Bar Isopach

OOIP: 41.8 MMBBLS

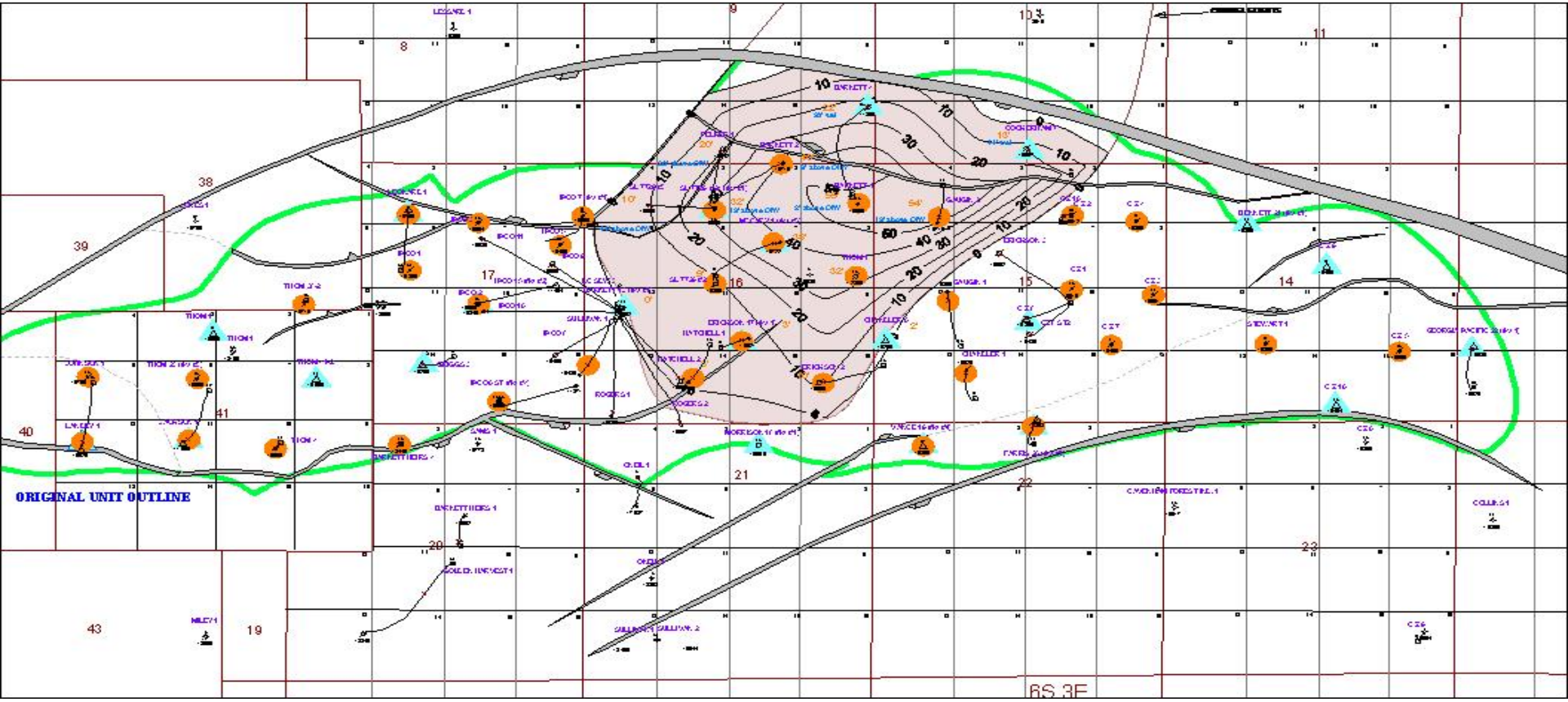
Phi: 15 - 24%, avg. 20%
K: 1 - 100 md, avg. 80 md



1st Wilcox Channel Isopach

OOIP: 14.3 MMBBLS

Phi: 10 - 27%, avg. 21%
K: 0.1 – 4,400 md, avg. 500 md



Lockhart 1st Wilcox Review (Pre CO2)

Lockhart Field Wilcox 1	
Field Found	1982
Initial Operator	Callon
Formation	Wilcox
Depth	~10,100'
OWC	-10,159'
DRIVE	Solution Gas - Moderate Water
TTL Field Area (acre)	3,500
Production History	
Black Oil produced (stb)	18,200,000
Solution Gas Produced (stb)	17,300,000,000
Water Produced (stb)	21,200,000
Water Injected (stb)	38,988,000
Recovery Primary (stb)	6,808,038
Recovery Secondary (stb)	11,391,962
Rf Primary	12%
Rf Secondary	20%
Reservoir Description	
Original Pressure (psi)	4,600
Lowest Pressure (psi)	2,500
Original Bubble Point (psi)	3,550
Porosity	20%
Permeability (bar / channel) (md)	80 / 500
Sw Original (bar / channel) (%)	43 / 28
Avg H Koil (ft)	42
Bo Original (rb/stb)	1.53
Gravity (API)	42
Temp (f)	212
OOIP (stb)	56,000,000
OGIP (Solution) (scf)	53,000,000,000
Solution GOR (scf/stb)	951
Well Count during Primary and Secondary	
Primary Total	37
Secondary Total	49
Secondary Producers	27
Secondary Injection	22

DRI Asset Development Philosophies

- Develop assets without utilizing full array of industry tools. This is in efforts to attain relatively higher value through accelerated cash flows that would otherwise be delayed (and slightly more costly)
  - Associated with fields that have:
    - Similar analogue reservoirs in DRI's asset base
    - Lower relative reservoir complexity
    - Smaller size (economies of scale)

- Integrate the full array of industry's technical tools as resources for optimal field development
  - Associated with fields that have:
    - Generally unique features relative to DRI's tertiary asset base
    - Higher relative reservoir complexity
    - Larger in size (the bigger the difference a X% change in recovery makes)

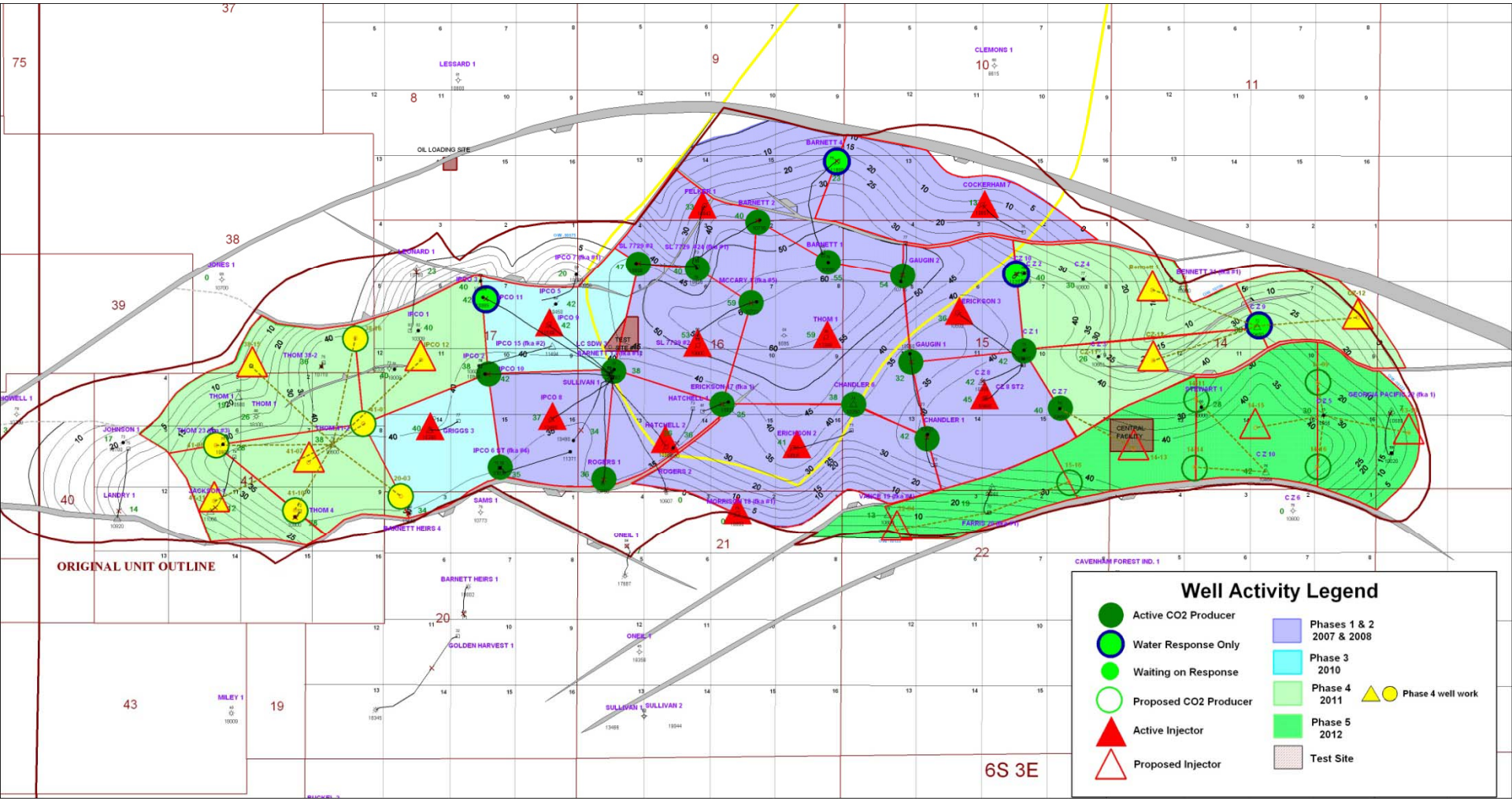
Lockhart's Business Plan / Development Principles

- Lockhart provides a relatively small tertiary target that requires efficiencies in design, development, and operation to be strong economically
- Utilize known analogues for technical guidance to reduce cost and accelerate timing
- Utilize old wellbores to develop asset at low cost
- Small facilities in design and footprint to minimize CAPEX and LOE
  - Asset Design Capacities
    - 3,500 BOPD
    - 11,000 BWPD
    - 60 MMSCFPD recycle
    - 60 MMSCFPD purchase

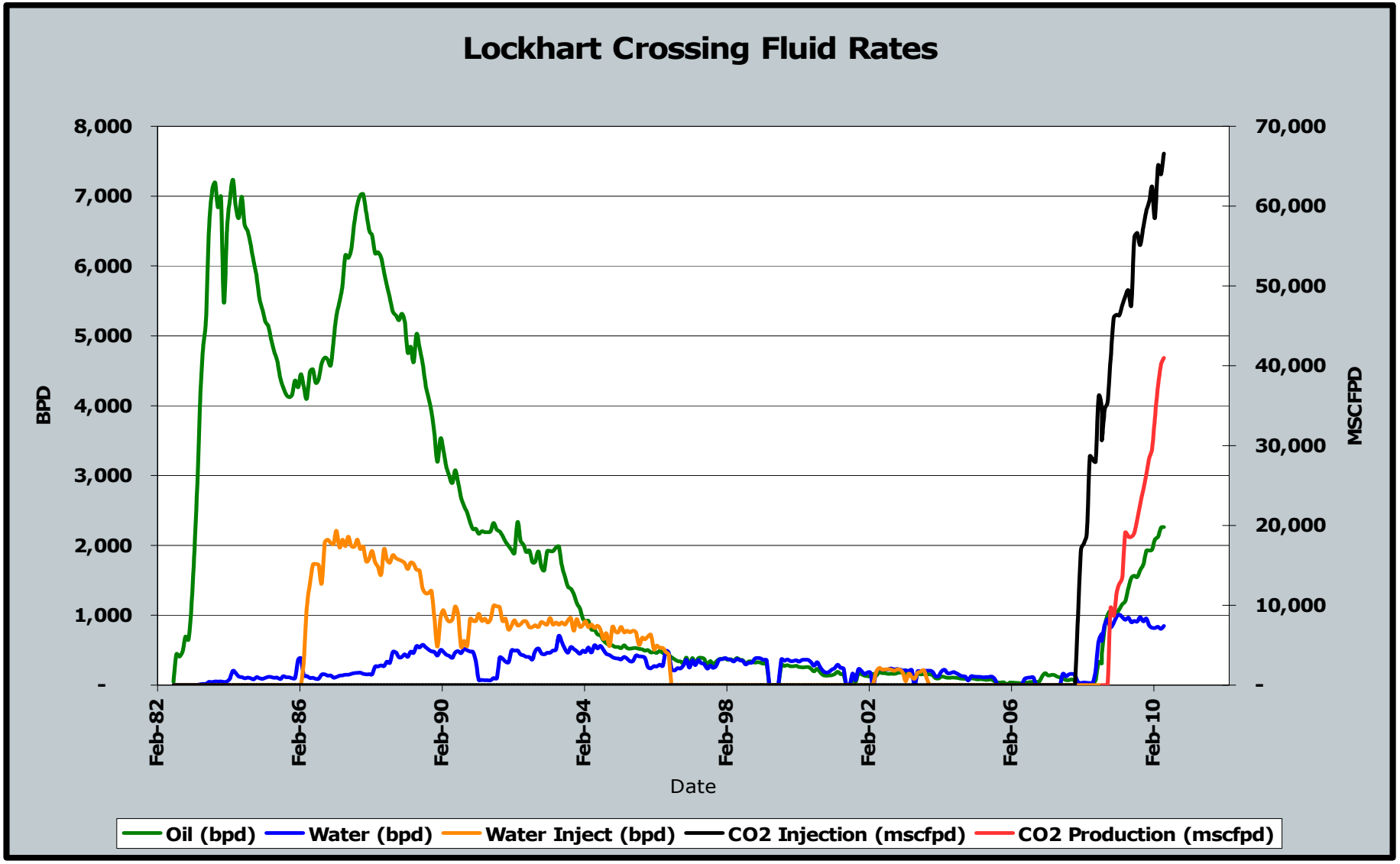
Lockhart Crossing Field CO_2 Flood - Milestones

- Well work commenced in January 2007
- Drilling commenced April 2007
- Denbury commenced construction of CO_2 Recycling Facility in May 2007
- After receiving COE permit, pipeline construction commenced September 2007
- Construction of six-mile 8” CO_2 supply pipeline completed 3rd quarter 2007
- Injection of CO_2 began in December 2007
- First CO_2 production occurred in June 2008 – first sales July 2008
- Test Site 1 operational June 2008, Test Site 2 operational January 2009
- Lockhart produced it’s 1,000,000th BBL of CO2 Oil in June 2010!

Lockhart Original Pattern Design



Lockhart Crossing Field Life



Lockhart 1st Wilcox Review

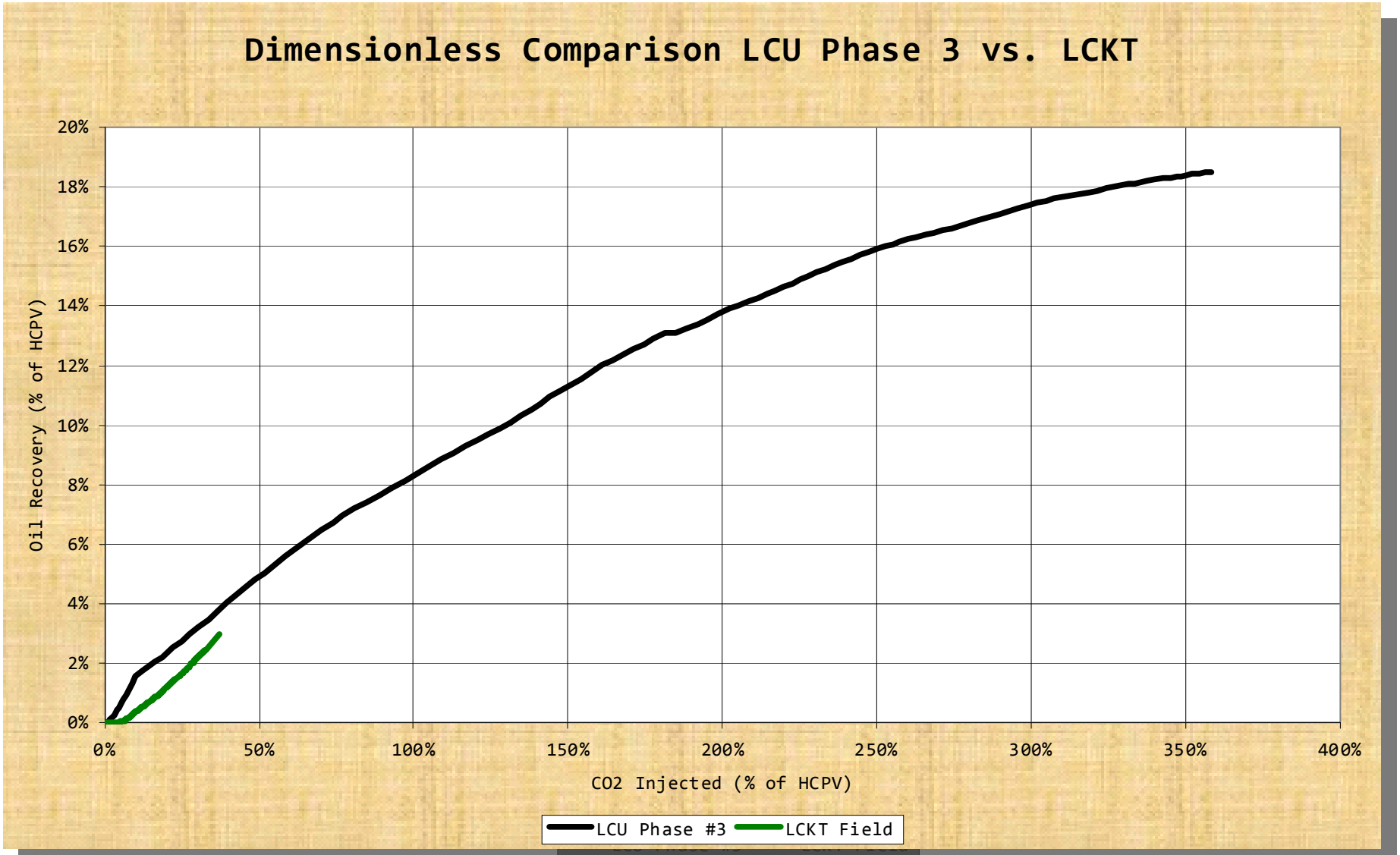
Lockhart Crossing Reservoir Surveillance

Life Metrics		units
Start Date	6/1/2008	
Current date	11/30/2010	
Life to date	2.50	years
Life to date	7.1%	
Expected Life	35	years

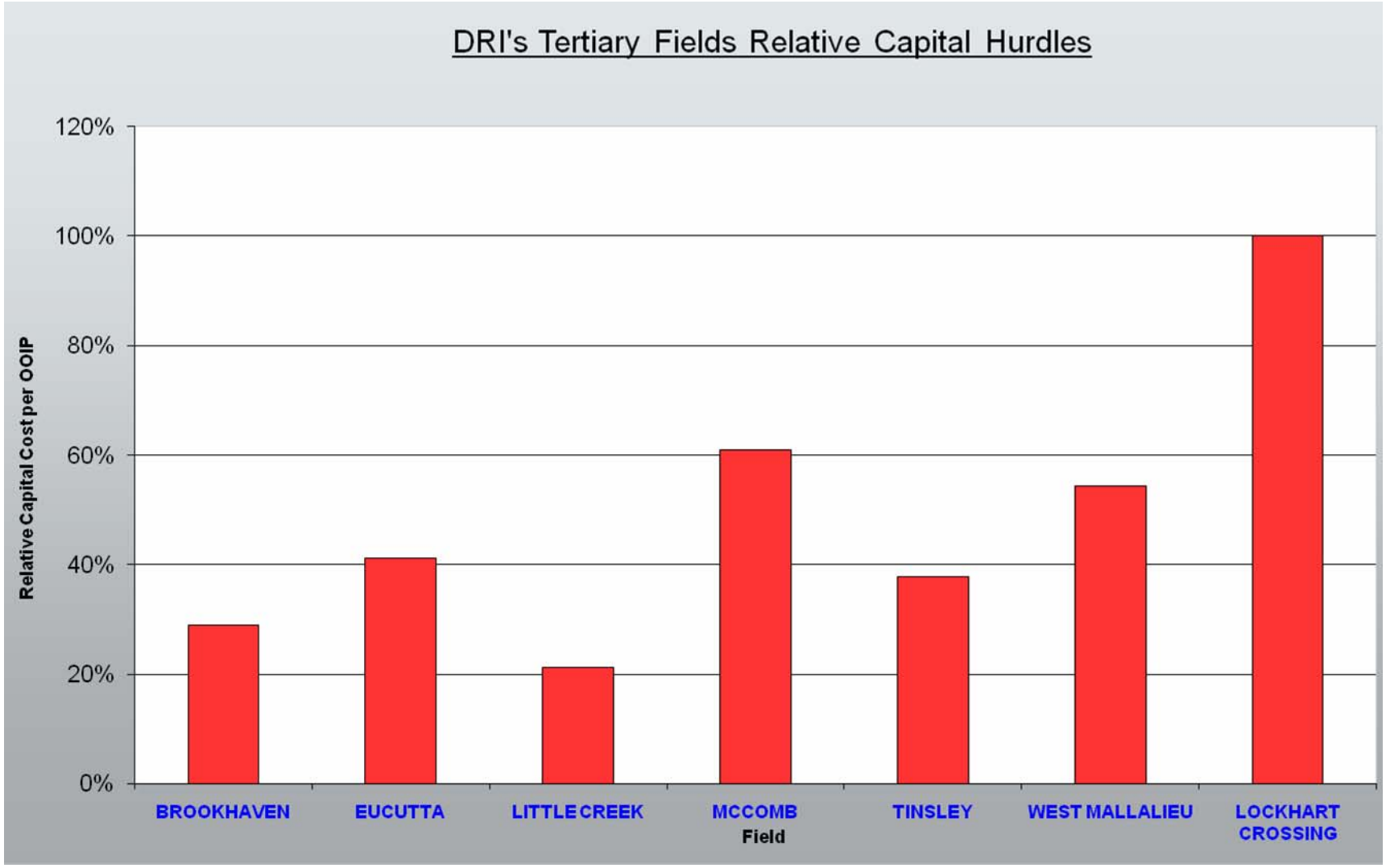
Cumulative Metrics			
Cum CO2 injected	51,042,000	MCF	
Cum Recycle	19,928,234	MCF	
Cum Purchase	31,113,766	MCF	
Cum Water	6,540,421	BBLS	
Cum Oil	1,411,753	STB	LCU phase 3
Current Pattern Total HCPVI	44.00%		42.5%
Current Pattern Oil Rec	3.96%		4.3%
Oil Rec to HCPVI	0.090	<	0.10
Field Total HCPVI	28%		
Field Oil Rec	2.5%		
Total HCPVI to Oil Rec	0.09	dmsless	
Gross Utilization	36	mcf/stb	
Net Utilization	22	mcf/stb	

Rate Metrics			
Daily Oil Rate	2,866	STBPD	
Daily Purchase	28.3	mmscfpd	
Daily Recycle	48.1	mmscfpd	
Current Pattern HCPVI/day	0.07%		
HCPV oil recovered/day	0.008%		LCU phase 3
HCPV rec/inj/day	0.12	>	0.086

Dimensionless Top Performer



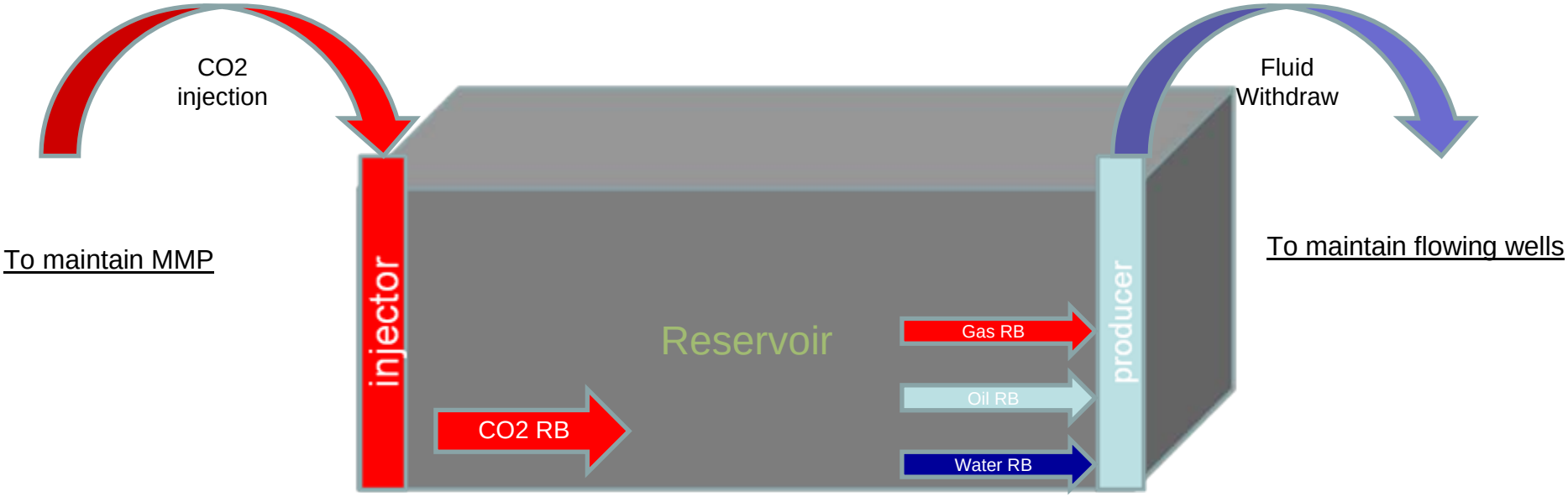
Challenge Comes with Smaller Scale



Presentation Preface

- The communication objective and technical content of this presentation are basic reservoir and economic concepts
- Though the concepts demonstrated are elementary these concepts provide a high magnitude of economic impact
- The focus of this presentation is to highlight simple methods of evaluation to ensure maximization of asset value
- Hindsight is 20/20, when looking back operation modifications may seem implicit, but it might not have been so clear during the implementation

Reservoir Pressure Surveillance



IWR

•IWR = CO2 (RB) ÷ (Gas (RB) + Oil (RB) + Water (RB))

•IWR (instantaneous) delivers direction your reservoir pressure is going at a given instant.

•IWR (cumulative) delivers the relative reservoir pressure from the point in time the accumulation began.

Net Cum Fluid

•Net Cum Fluid = Cum CO2 RB – Cum (Gas (RB) + Oil (RB) + Water (RB))

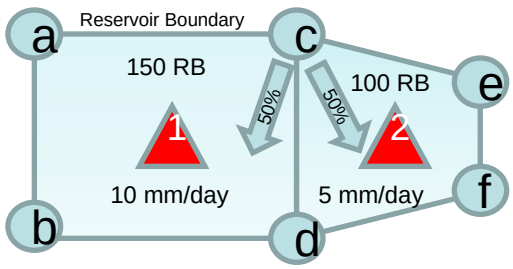
•Delivers direction the reservoir pressure is going at a given instant by the slope of the curve.

•Delivers the relative reservoir pressure from the point in time the accumulation began.

•Delivers magnitude of fluid thus the magnitude of relative pressure change based on reservoir size.

Fluid to Pattern Allocation

- Fluid dynamics within a reservoir are difficult to calculate
- Pattern allocation is a simple method used to account / estimate source of fluid flow
  - Used for Net Cum Fluid calculation
  - Serves as guides to remaining saturations within patterns
- There are many methods for allocation



Geometric allocation

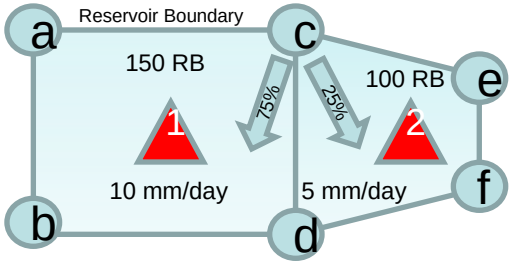
>Splits Pattern 1 and 2 production of fluid evenly

C allocation to Pattern 1 =

# of wells ÷ # of patterns sharing the well =

1 ÷ 2 =

50%



HCPV & I allocation

>splits Pattern 1 and 2 production based on injection rate and magnitude of HCPV

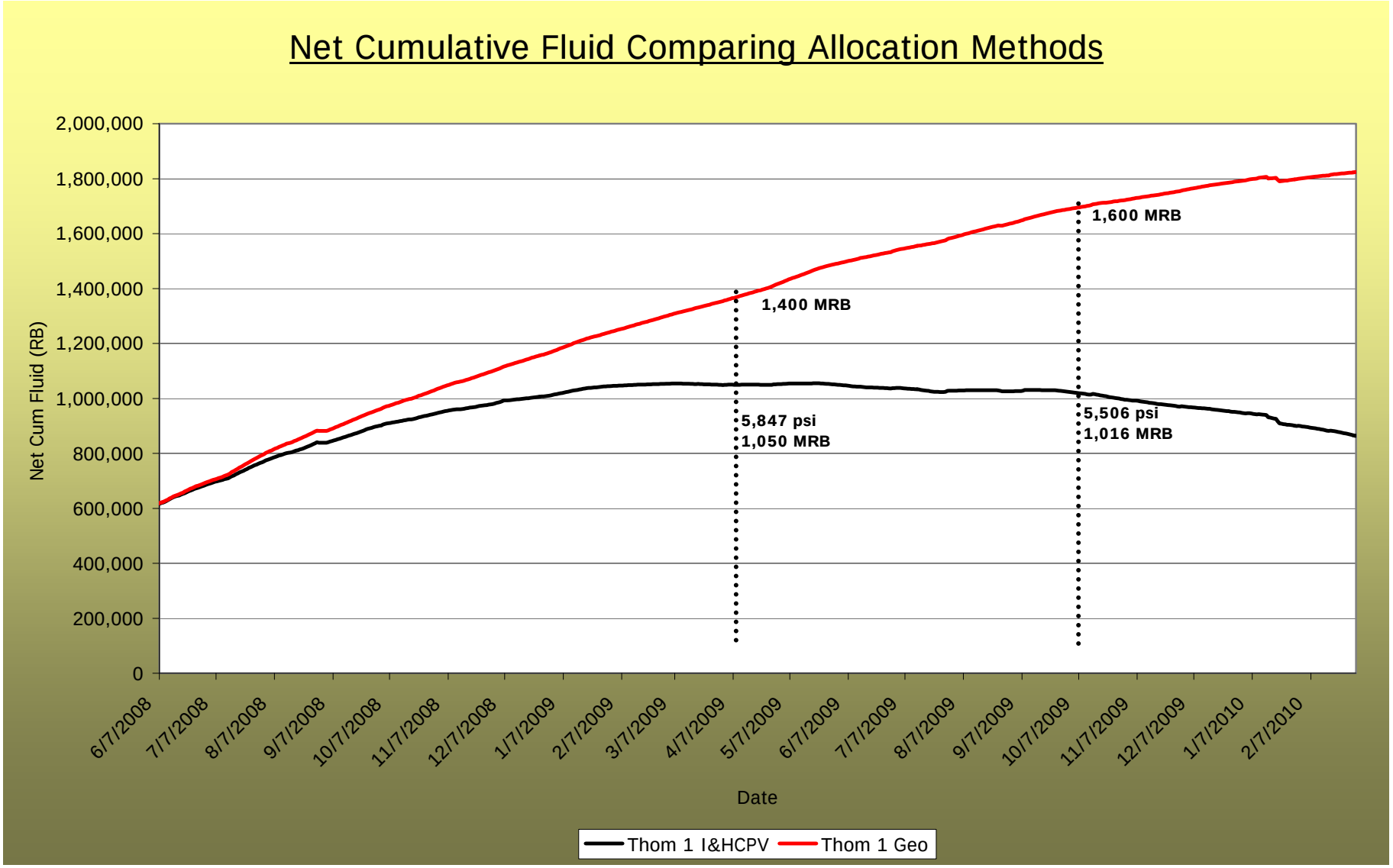
C allocation to pattern 1 =

*(HCPV1 * Injection rate1 / (HCPV1 * Injection rate1 + HCPV2 * Injection rate2)) =*

*10 * 150 / (10*150 + 5*100) =*

75%

Allocation Accuracy Evidence



Economically Efficient Asset Development

- Economically Efficient (Theoretical)
  - No additional output can be obtained without additional input
  - Production proceeds at the lowest per unit cost
  - The cost of producing a given output is as low as possible
  - …

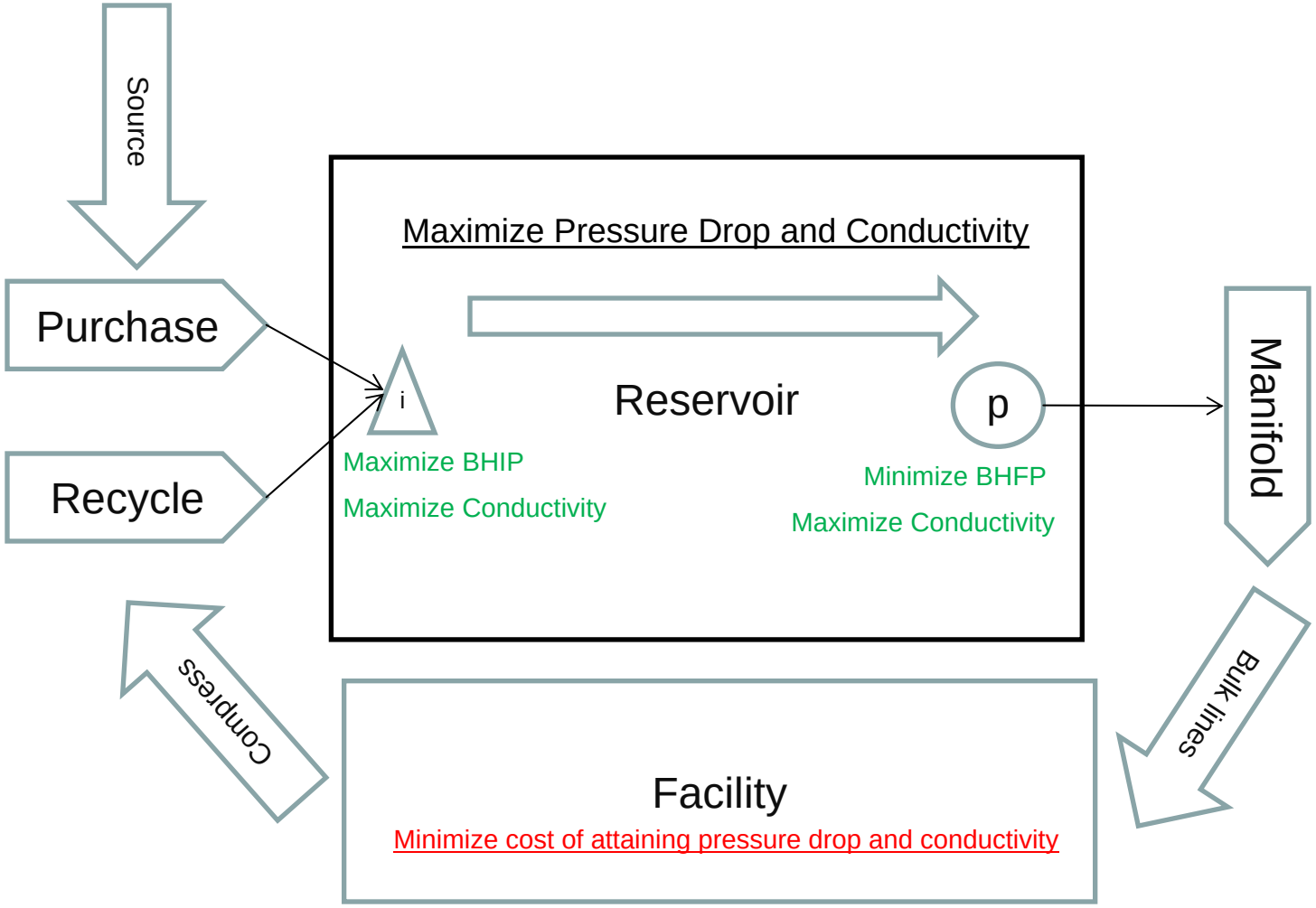
- Economically Efficient (Financial)
  - Max IRR
  - Max NPV
  - Abide within cash flow constraints

- Economically Efficient Ranking of Choice = Max NPV
  - Maximize
    - Revenue
    - Delay of negative cash flows
  - Minimize
    - Capital
    - Operating Expense
    - Delay of positive cash flows
    - Cost of Capital

Maximize Oil Reservoir NPV

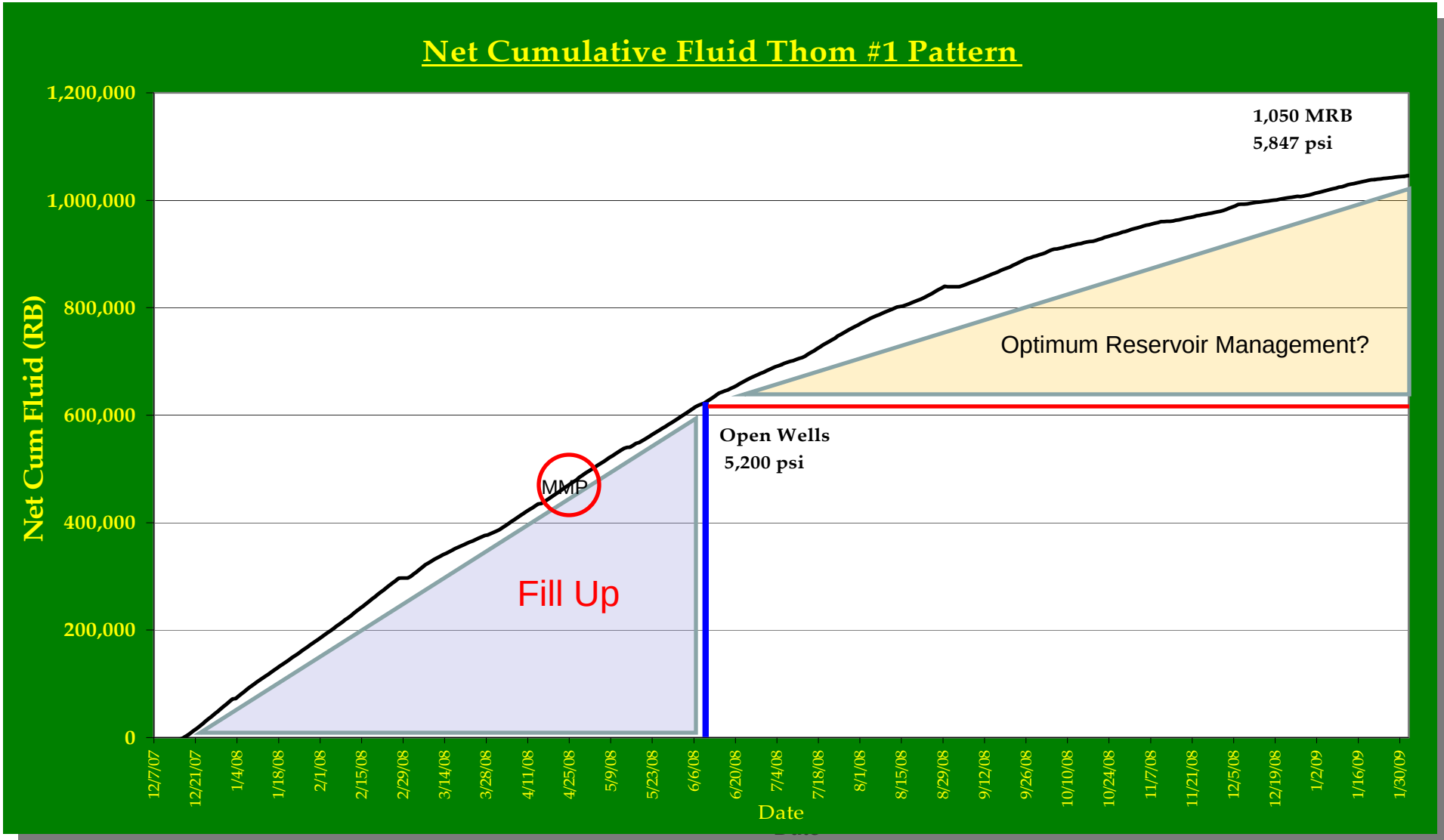
- Asset Optimization Problem
  - Maximize oil recovery magnitude
  - *Minimize recovery time (acceleration)*
  - *Minimize cost*
  - Maximize delay in capital outlays

Optimize recovery time and cost



Constrained by: coning, MMP, and sand production

Reservoir Management



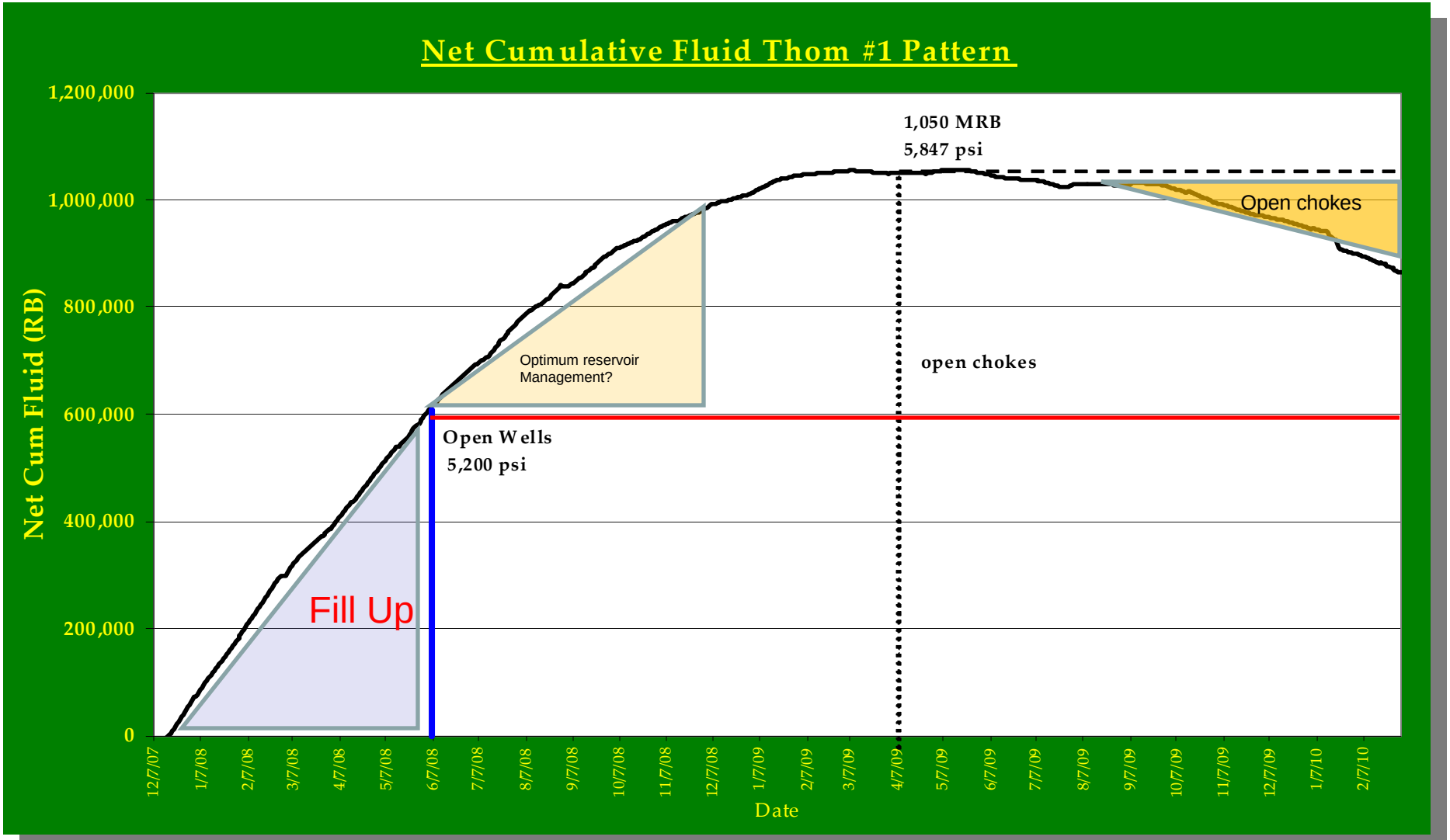
Team Objective Communication 06-09

- Objective
  1. Maximize injection through utilization of all equipment
  2. Accelerate production through accelerated injection
  3. Optimally produce reservoir

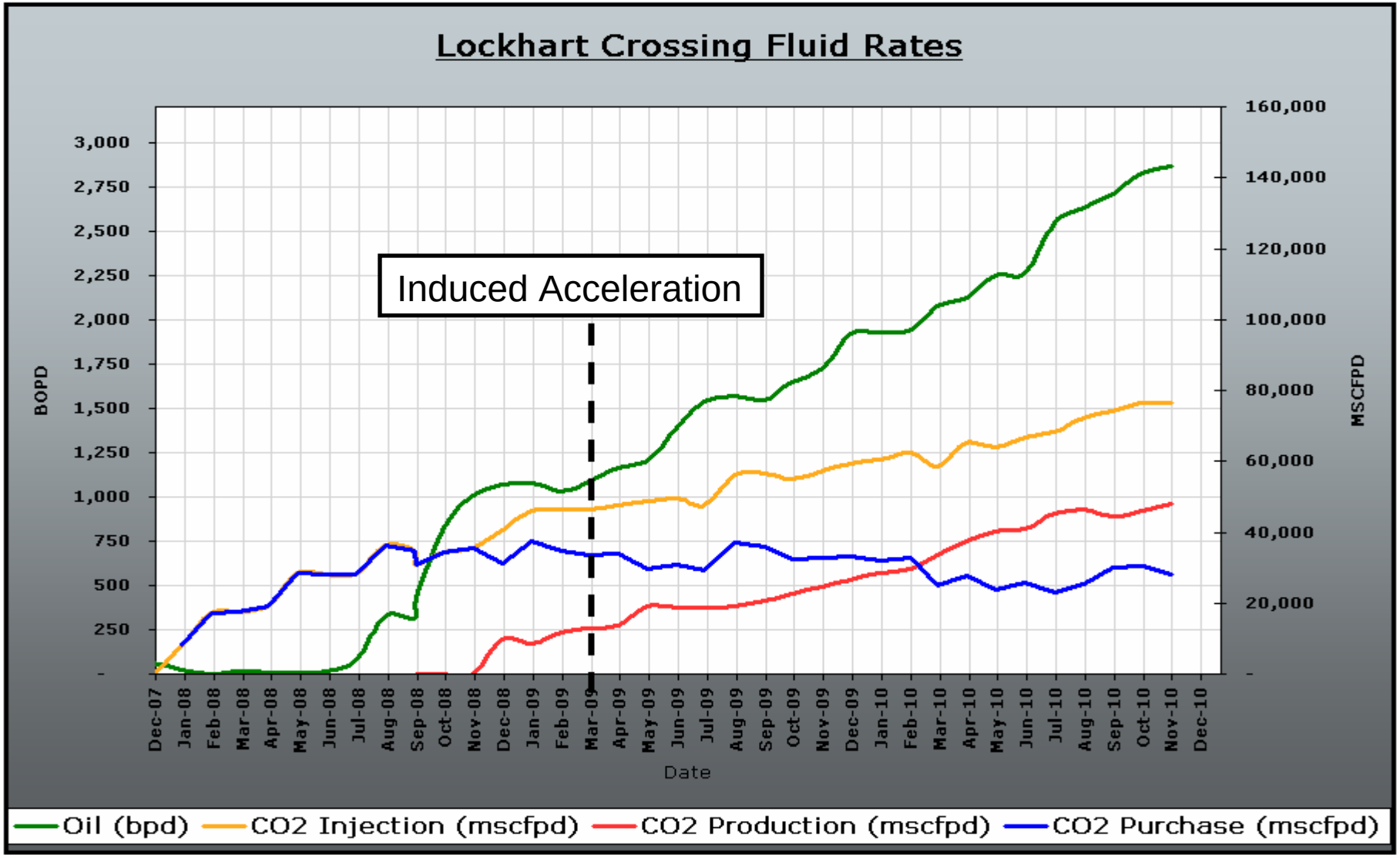
- Solution
  1. Open Chokes (increasing production rate)
  2. Reduce IWR <1
  3. Reduce Reservoir Operating Pressure (also helps utilization CO2 expansion)
  4. Increase injection (given 3,000 psi surface injection pressure)
  5. Accelerate production through optimal reservoir operating pressure

- Constraints
  - MMP
  - Surface operation constraints
    - Purchase
    - Recycle
    - Water Handling

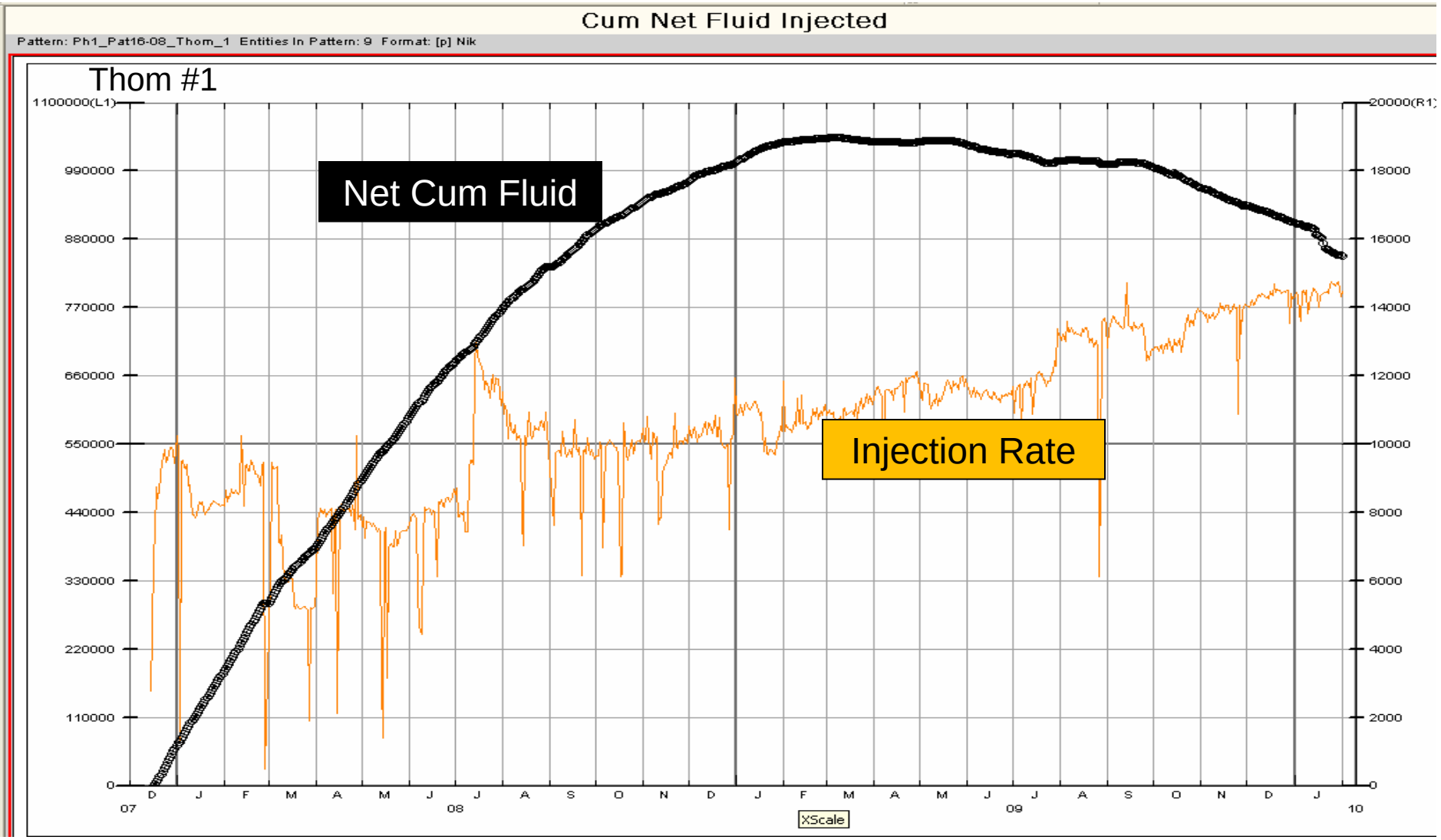
Process Management



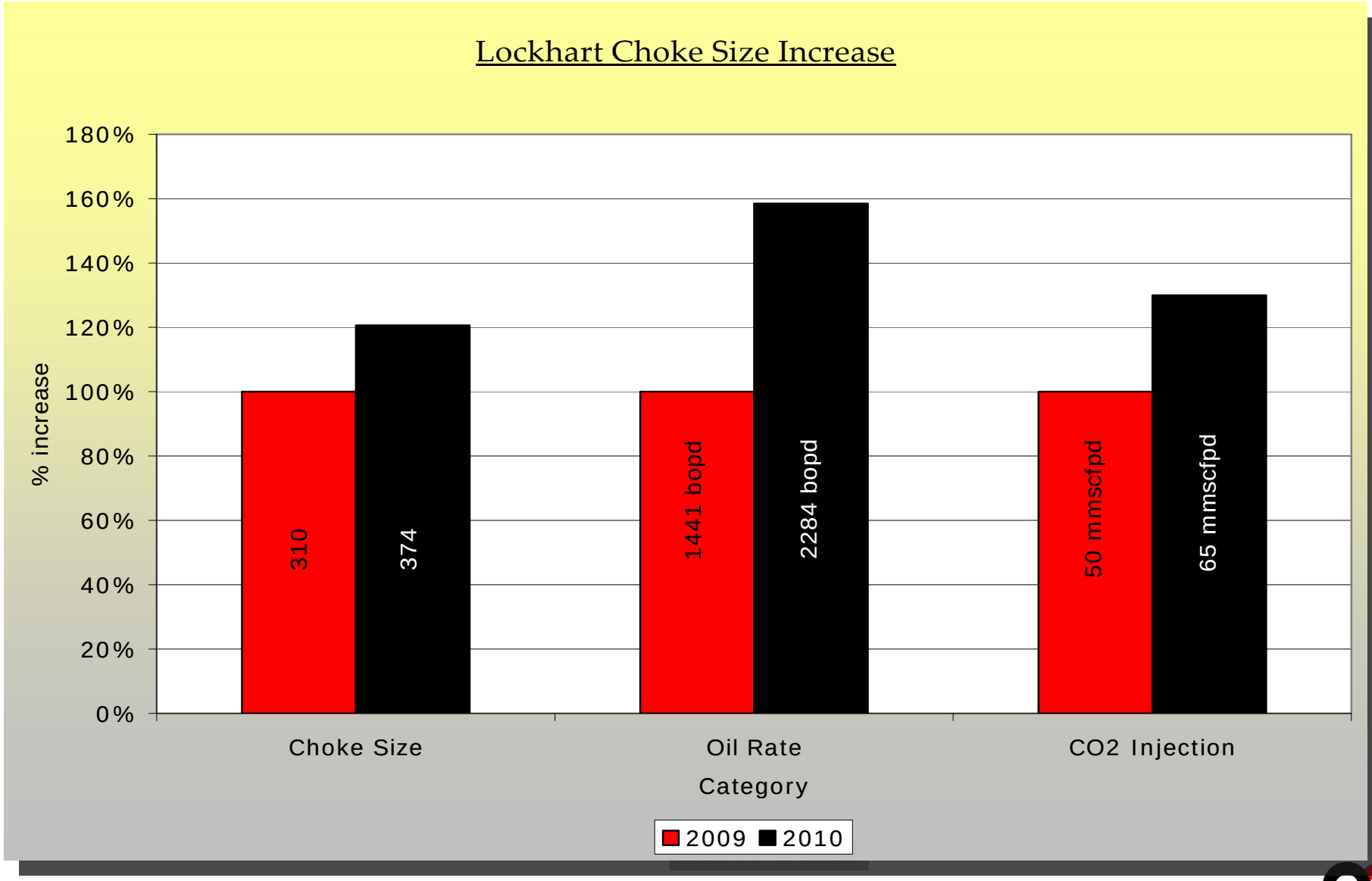
Lockhart Crossing CO2 EOR



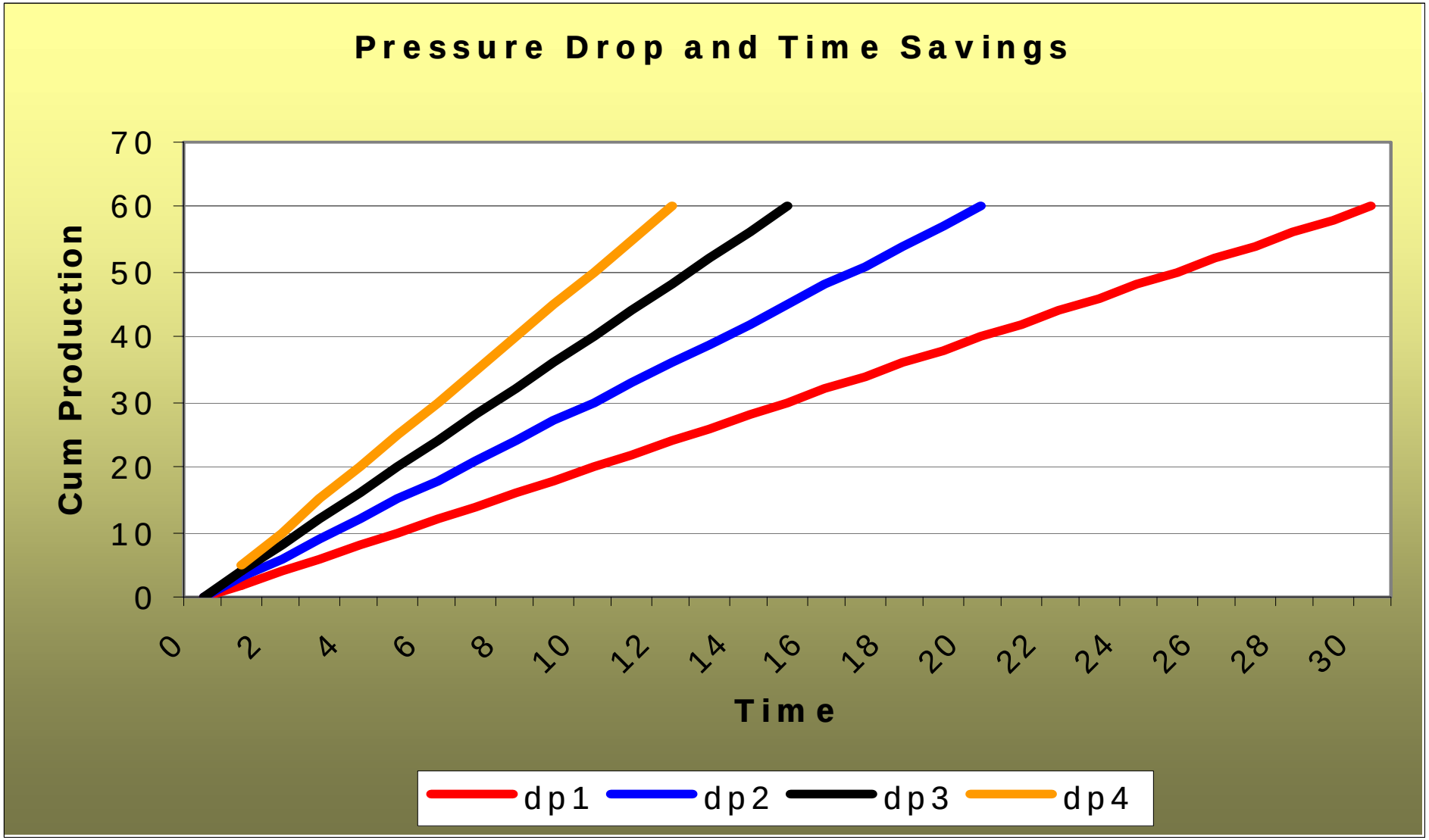
Opening of Chokes



Results of 2009 to 2010 choke changes

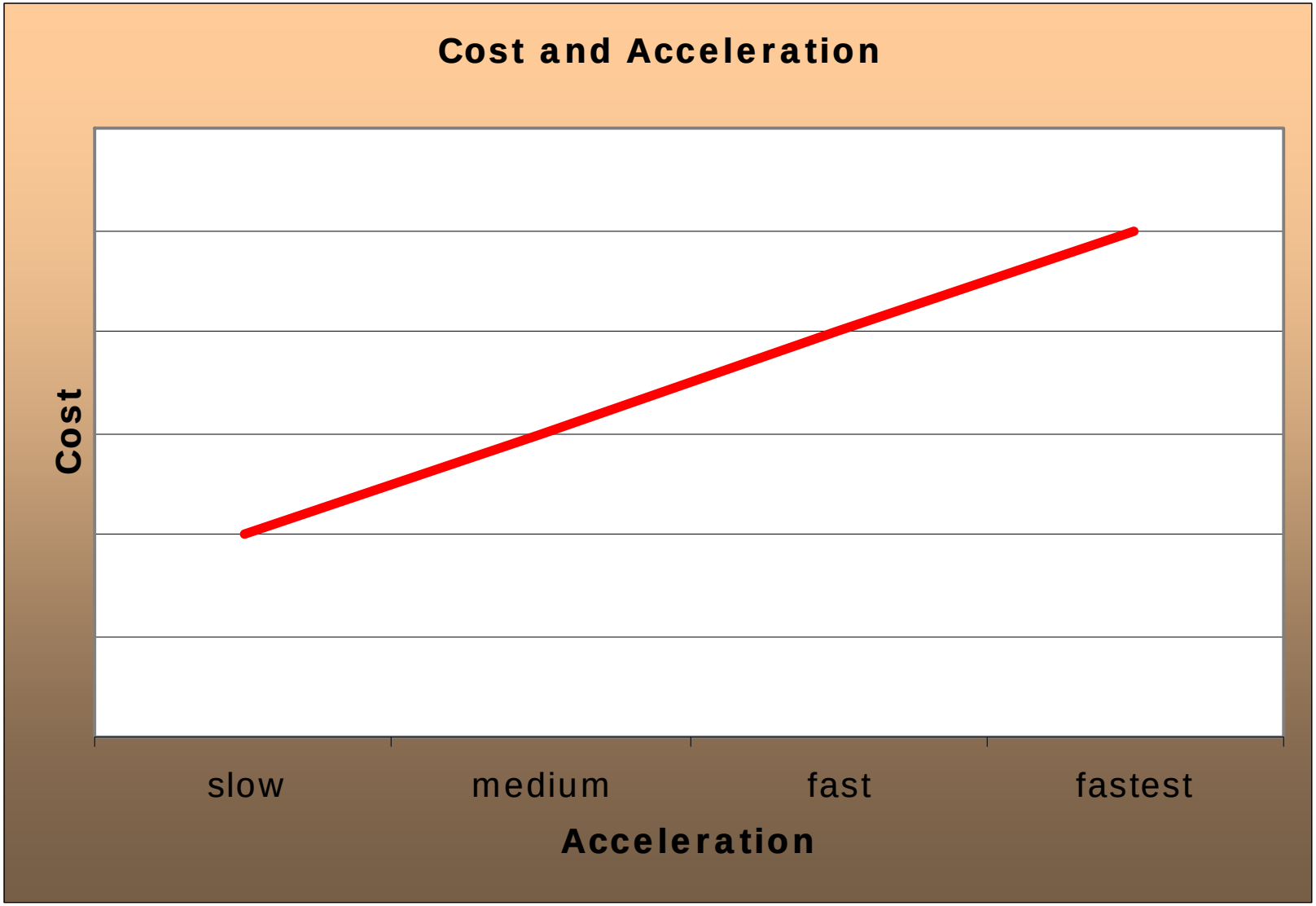


Optimize recovery time and cost

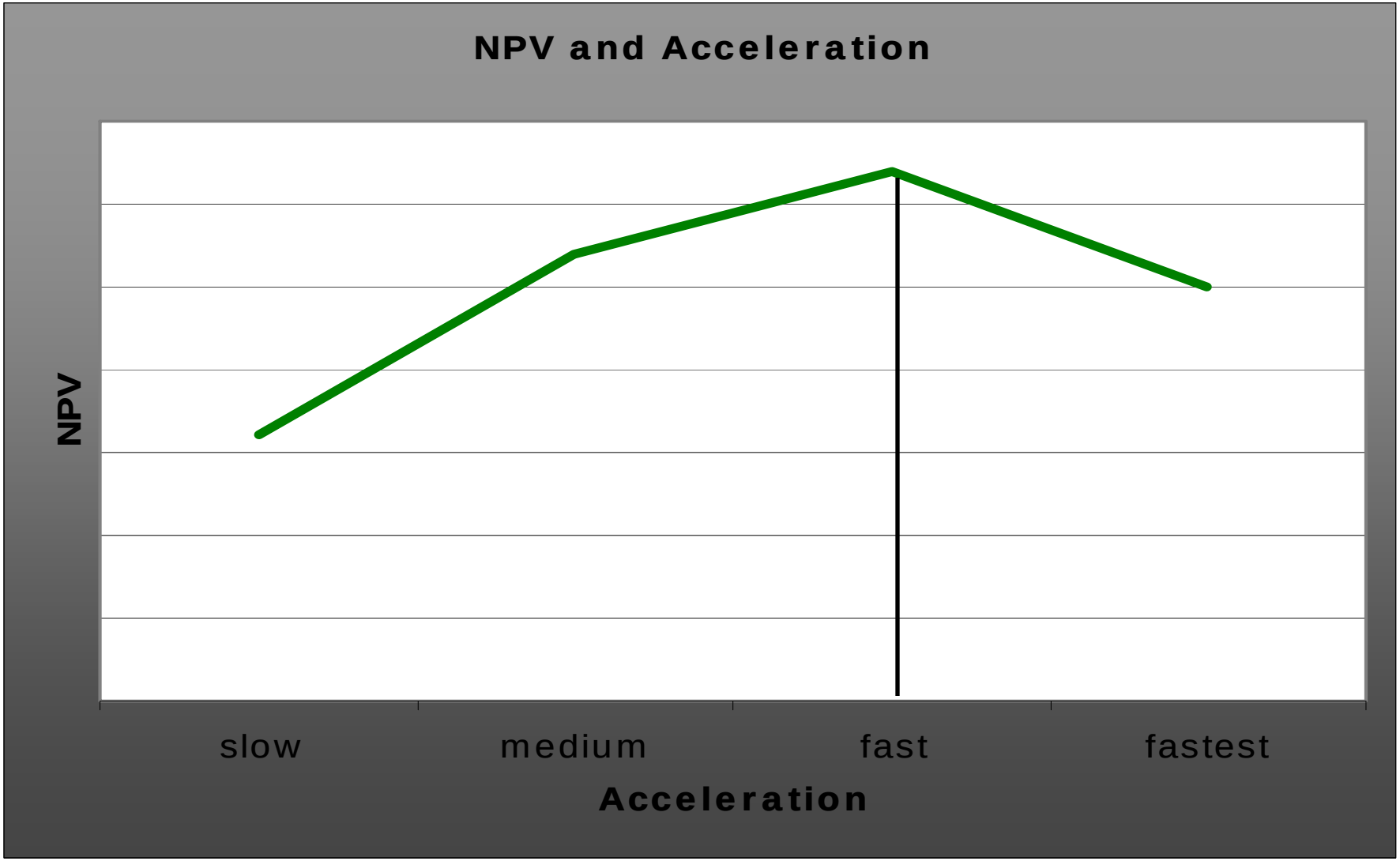


The larger the pressure drop the faster the oil is retrieved.

Optimize recovery time and cost

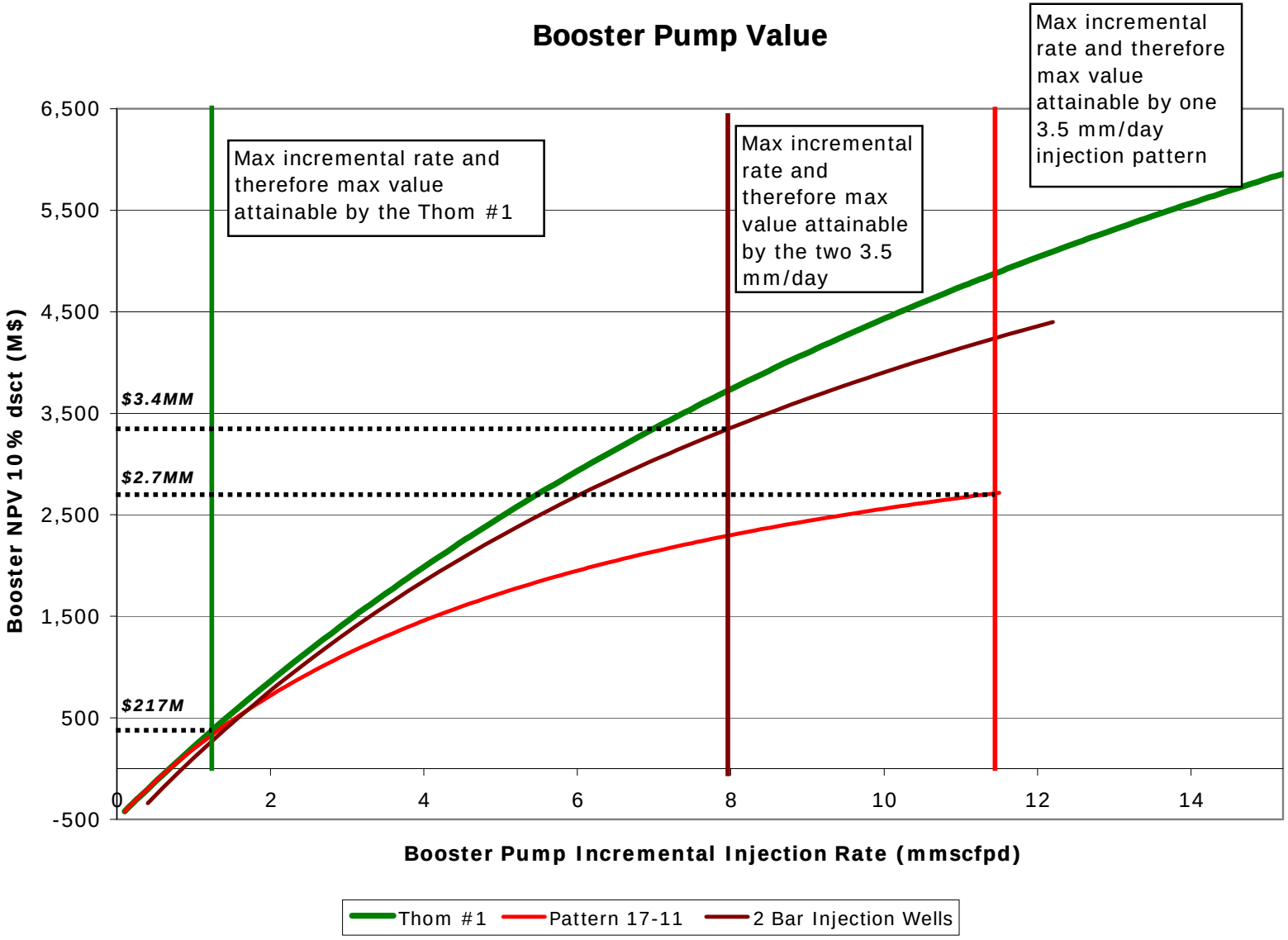


Optimize recovery time and cost



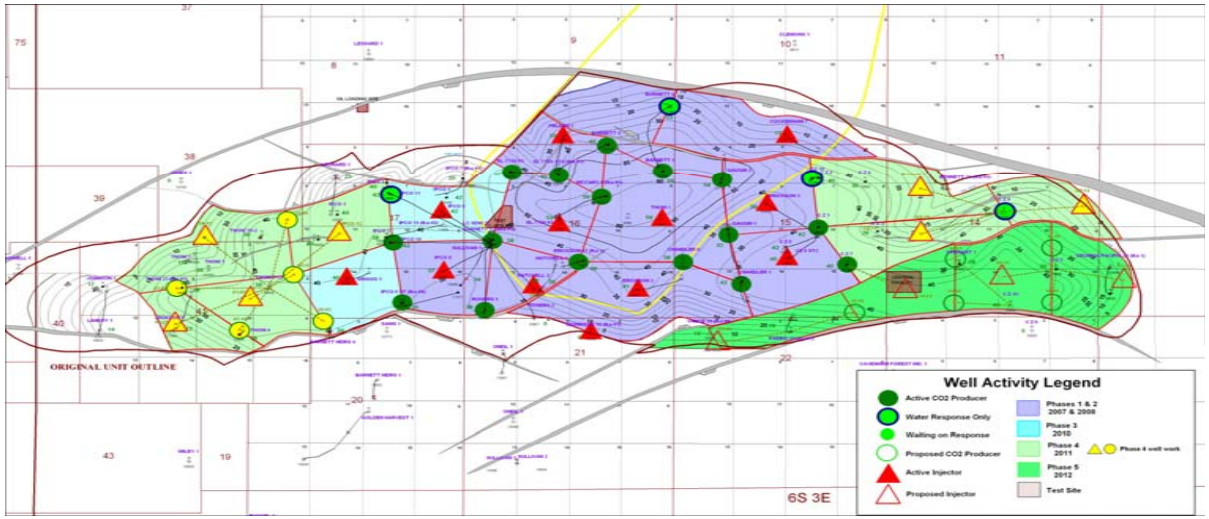
The second largest pressure drop provides maximum value

Booster Pump / Asset Optimization



Lockhart's Bar Injection Hurdle

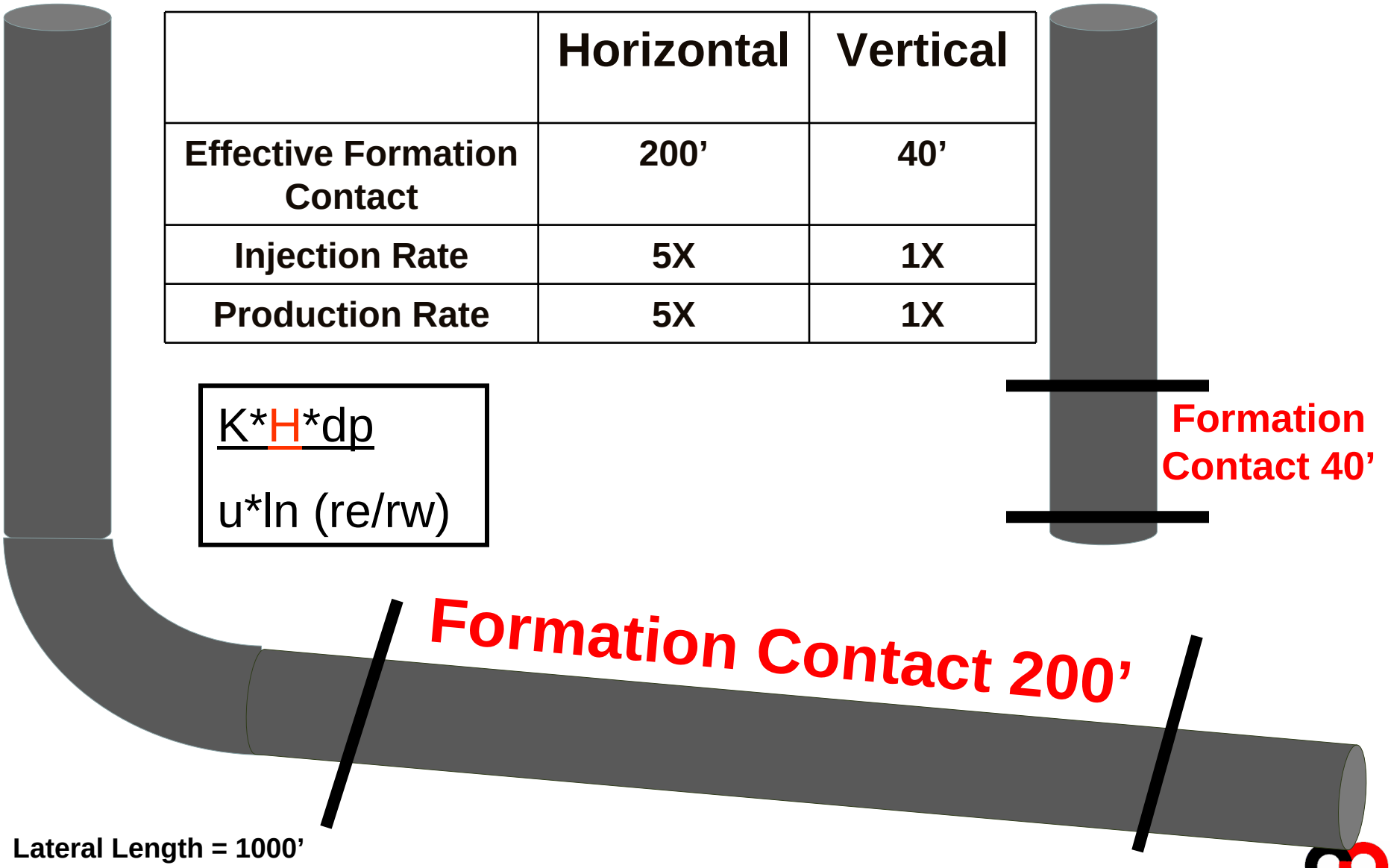
- Bar Injection wells injecting at ~5 mmscfpd
- Channel wells maximum injection rate ~17 mmscfpd down 2-7/8" tubing
- Transitively the bar formation is the bottle neck
  - (not the 2-7/8" tubing)
- Remaining Lockhart development is in the Bar Formation
- NPV is hindered due to a choke at the formation
  - Stimulation is not currently an option



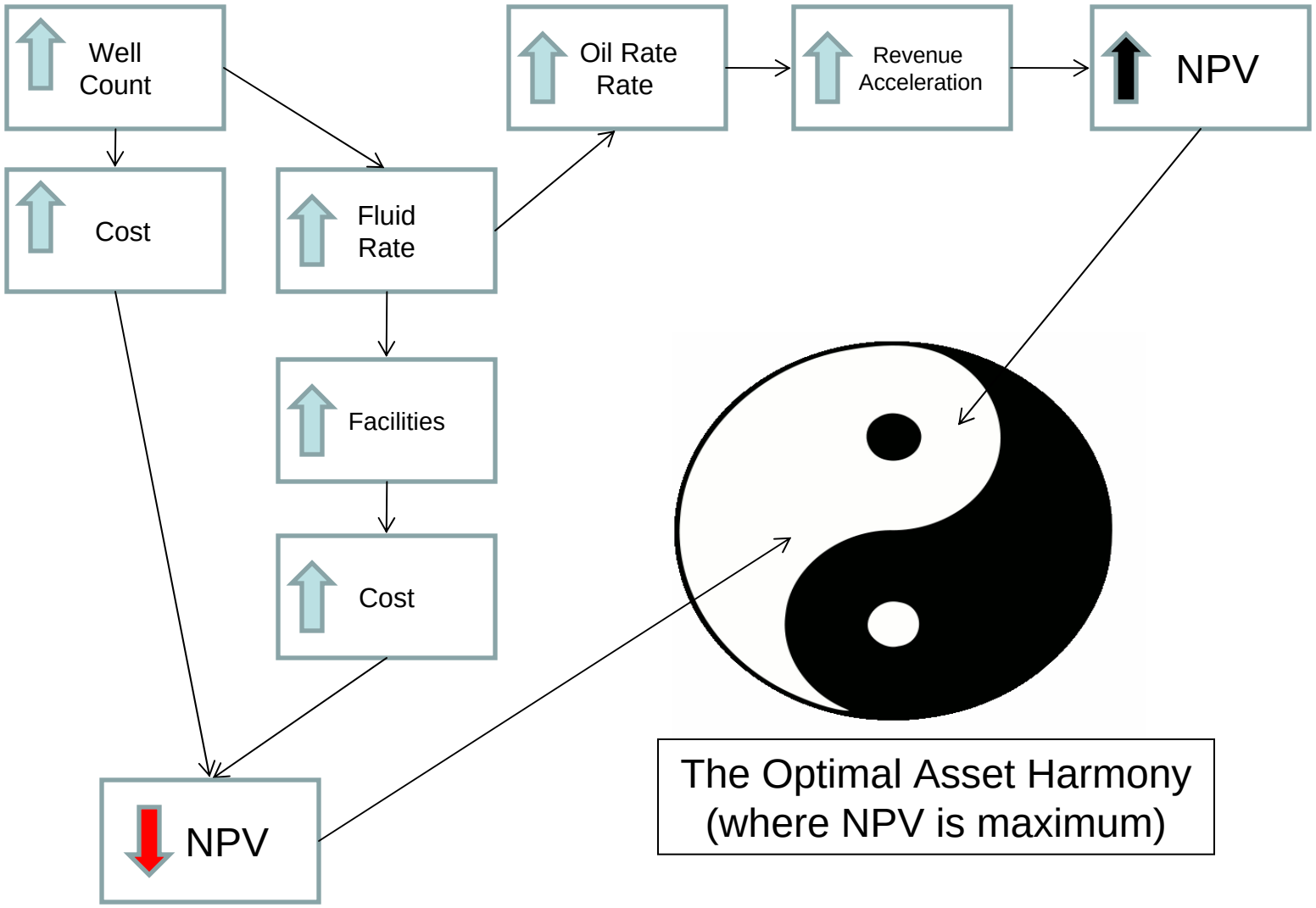
Horizontal vs. Vertical

	Horizontal	Vertical
Effective Formation Contact	200’	40’
Injection Rate	5X	1X
Production Rate	5X	1X

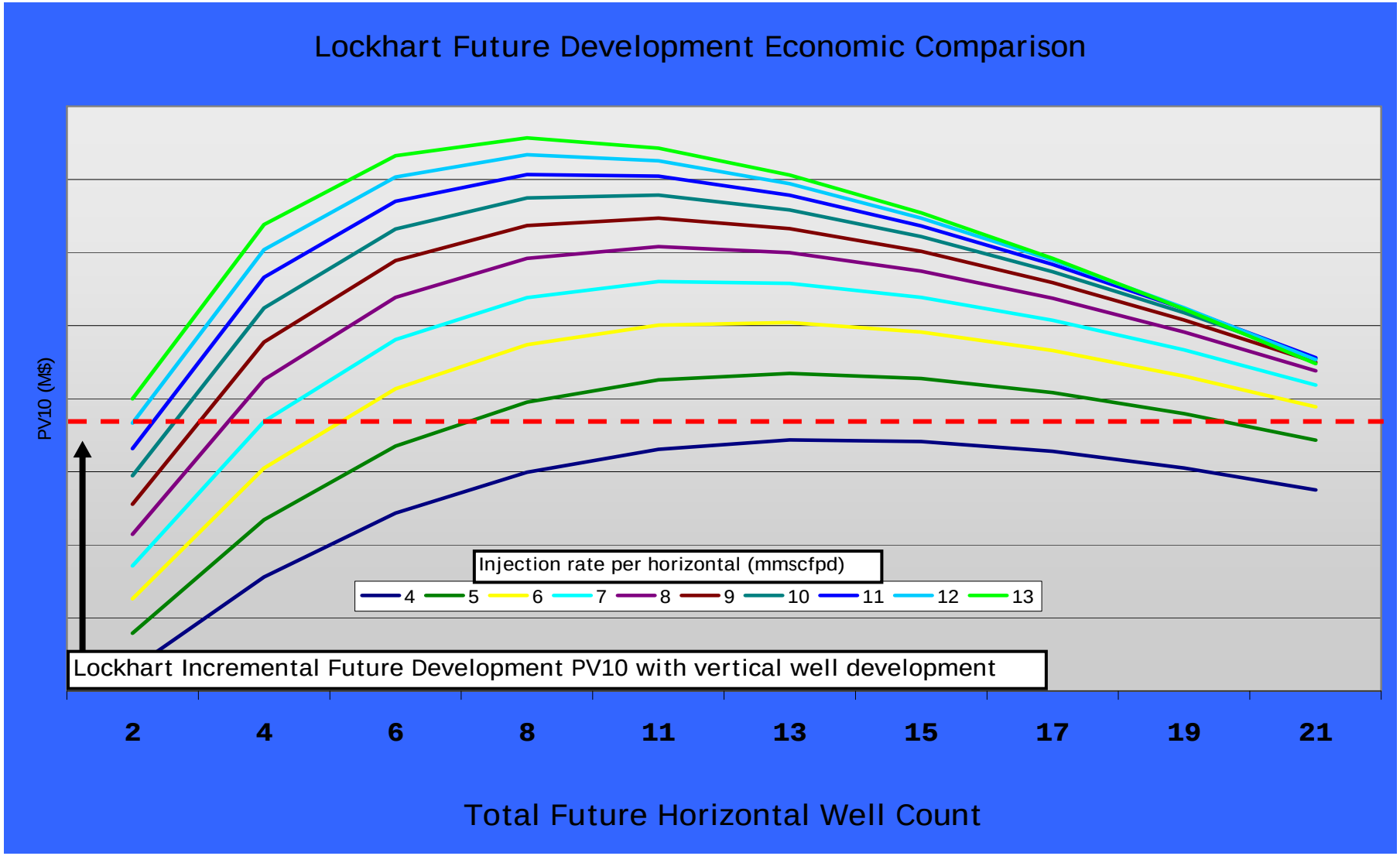
$$\frac{K*H*dp}{u*\ln(re/rw)}$$



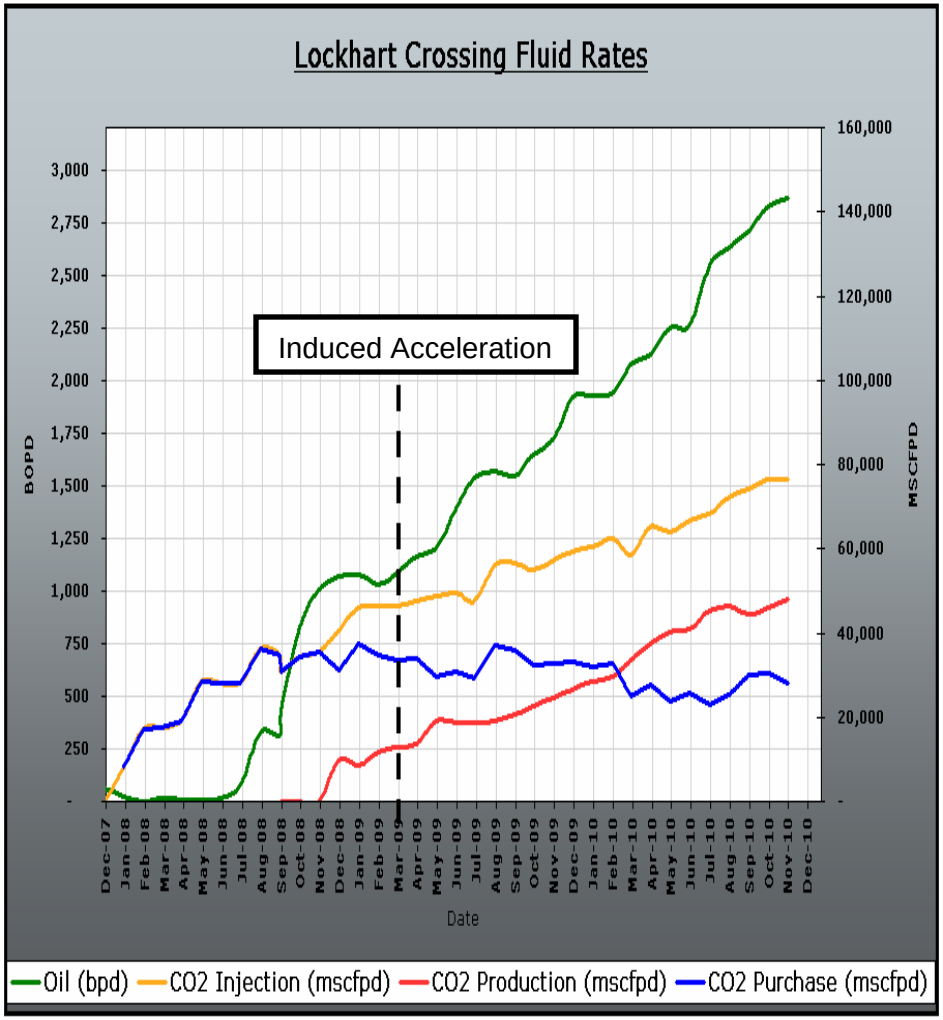
Horizontal Well / Asset Optimization

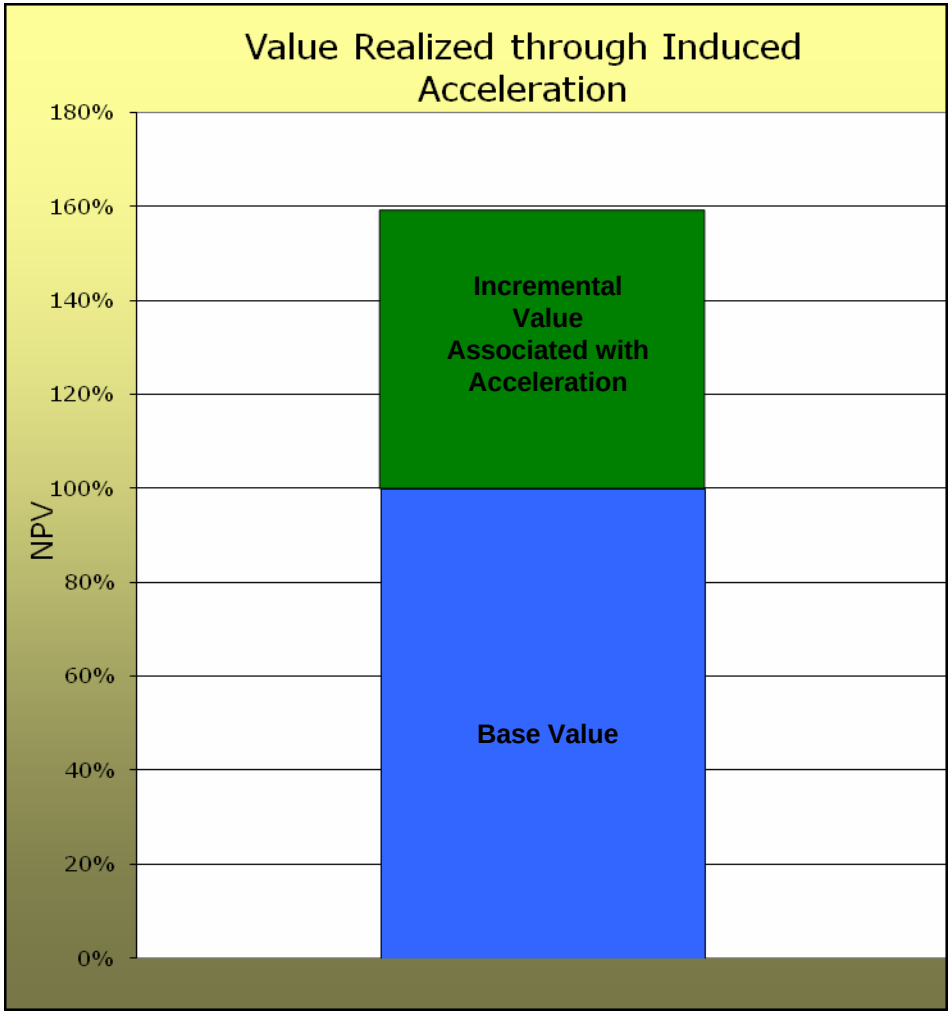


Horizontal Well Asset Optimization



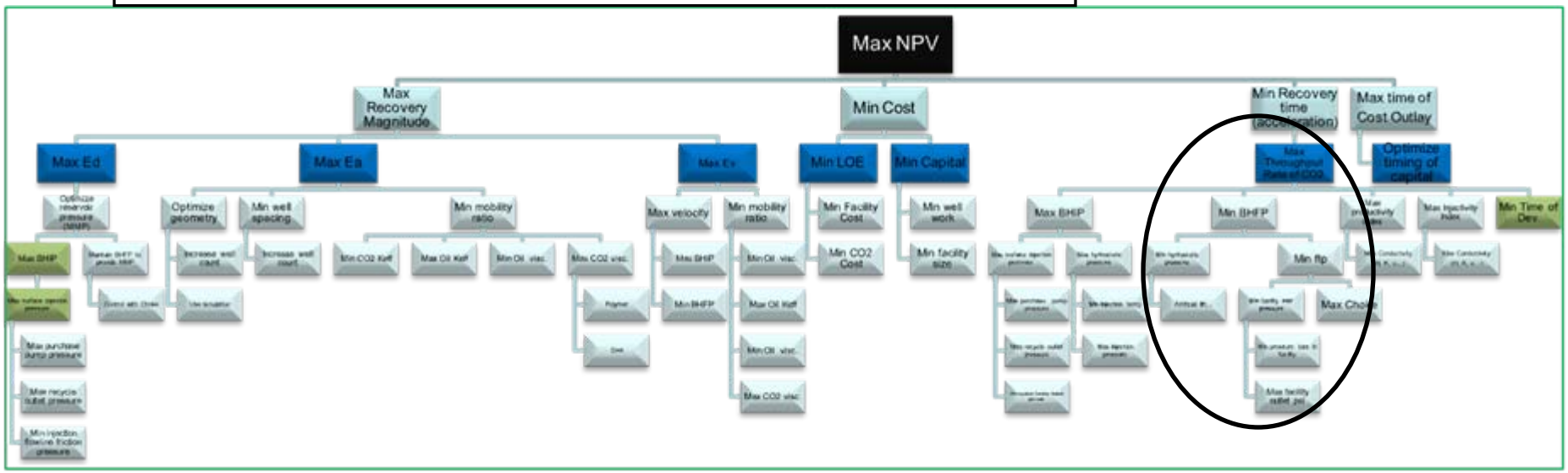
Economically Efficient Reservoir Operations Results





Economically Efficient Reservoir Operations

Includes optimization of all of this map plus more…



- Today's presentation covered some of the topics in the circled area
- There's significantly more value to be added to the asset outside (and inside) that circle
- I look forward to watching the DRI team further maximize the value of Lockhart Crossing by accomplishing their goals

Special Recognition

Management (names left to right)

Donnie Dubois - Field, Bob Sutherland - Reservoir, John McDaniel - Land, Joey Smith - Operations, James Fields - Land, Charlie Gibson - V.P. West, Don Butvin - Facilities, Bob Schellhorn - Geology, Mary Tombs - Production

Special Recognition

Plano Team (names left to right)

Dan Emmer, John McDaniel, James Fields, Sarah Dixon, Nik Wood, Misty Marko, Randy Charles, Randy McKenzie, Kyla Coker, Nic Bongiovanni, Jim Johnson

Special Recognition

Field Team (left to right)

Jason Shaffer, Todd Bergeron, Jimmy Naquin, Eroll Tisdale, Bobby McDougal, Mike Crawford, Henry Schultz, Chris Odom, Donnie Dubois, Dustin Swallow, Cecil Rushing, Dale Louviere, John Duplantis

Questions