



Technical Session Agenda 2016 SPEE Annual Meeting

Tuesday, June 7, 2016 2016 SPEE Technical Session 2 Salon I/II

9:25 AM Mitigating the Impacts of Cognitive Bias in E&P Decision-Making Creties Jenkins

Why is it that E&P companies routinely over-promise and under-deliver on so many of their ventures? At least part of the blame can be traced to cognitive biases, which are errors in thinking and judgment that contribute to inflated expectations. This talk, richly-illustrated with examples, examines how and why we've stumbled and provides some recommendations for doing a better job of identifying risks, quantifying uncertainties, and creating realistic expectations for our projects.

BIOGRAPHY

Creties Jenkins, Partner, Rose and Associates

Creties Jenkins (P.E., P.G.) is a Partner with Rose and Associates specializing in the characterization of unconventional reservoirs. Over the past decade he has conducted integrated studies, project reviews, and resource evaluations for 50+ companies and taught 100+ industry courses and workshops. He has served as a technical editor, distinguished lecturer, and distinguished author for SPE and is a past president of the Energy Minerals Division of AAPG. Creties is also one of the SPEE Monograph 4 authors. He holds an MS in Geology and a BS in Geological Engineering from the South Dakota School of Mines.

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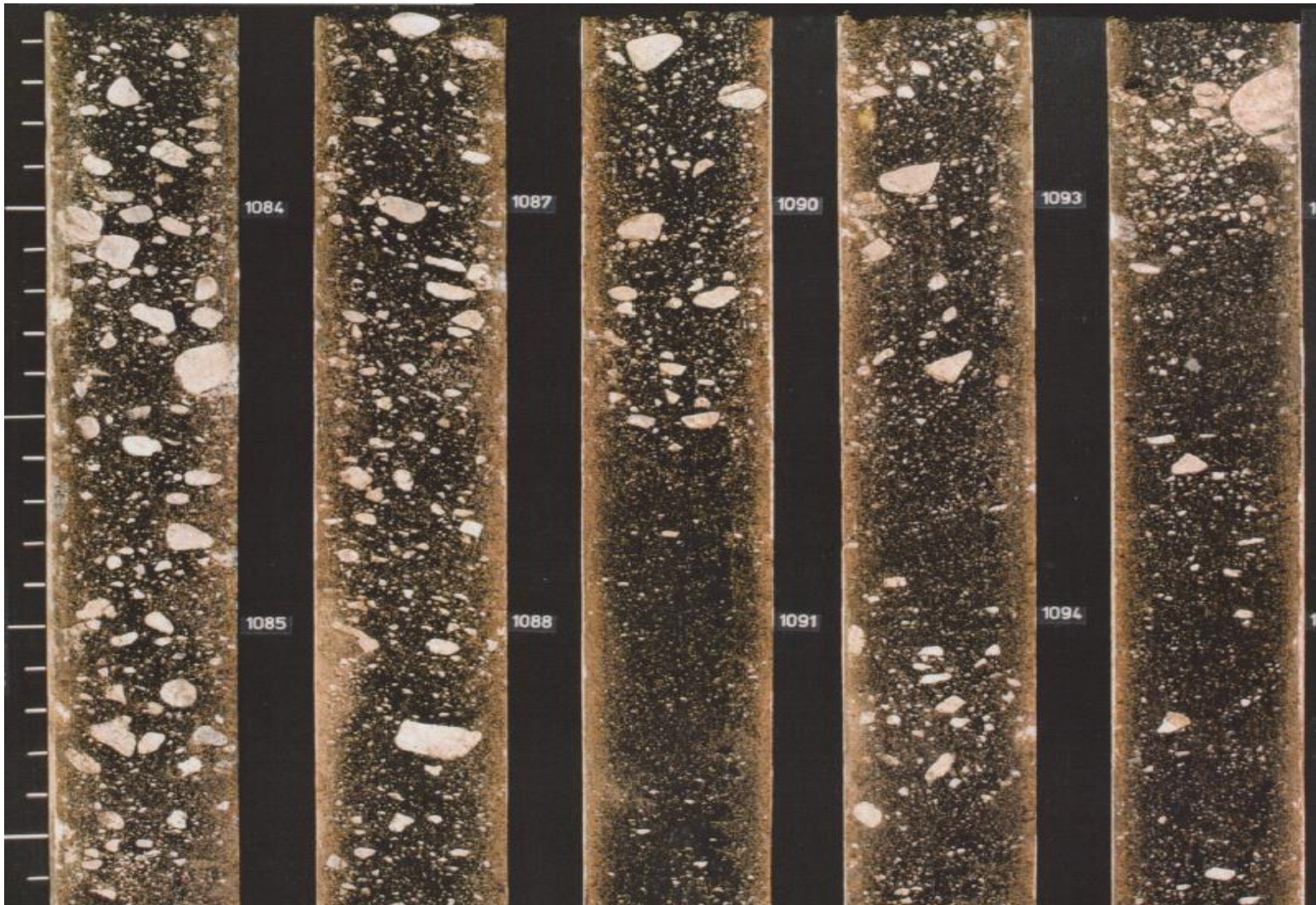
Mitigating the Impacts of Cognitive Bias in E&P Decision Making

Creties Jenkins
Annual SPEE Conference
June 7, 2016

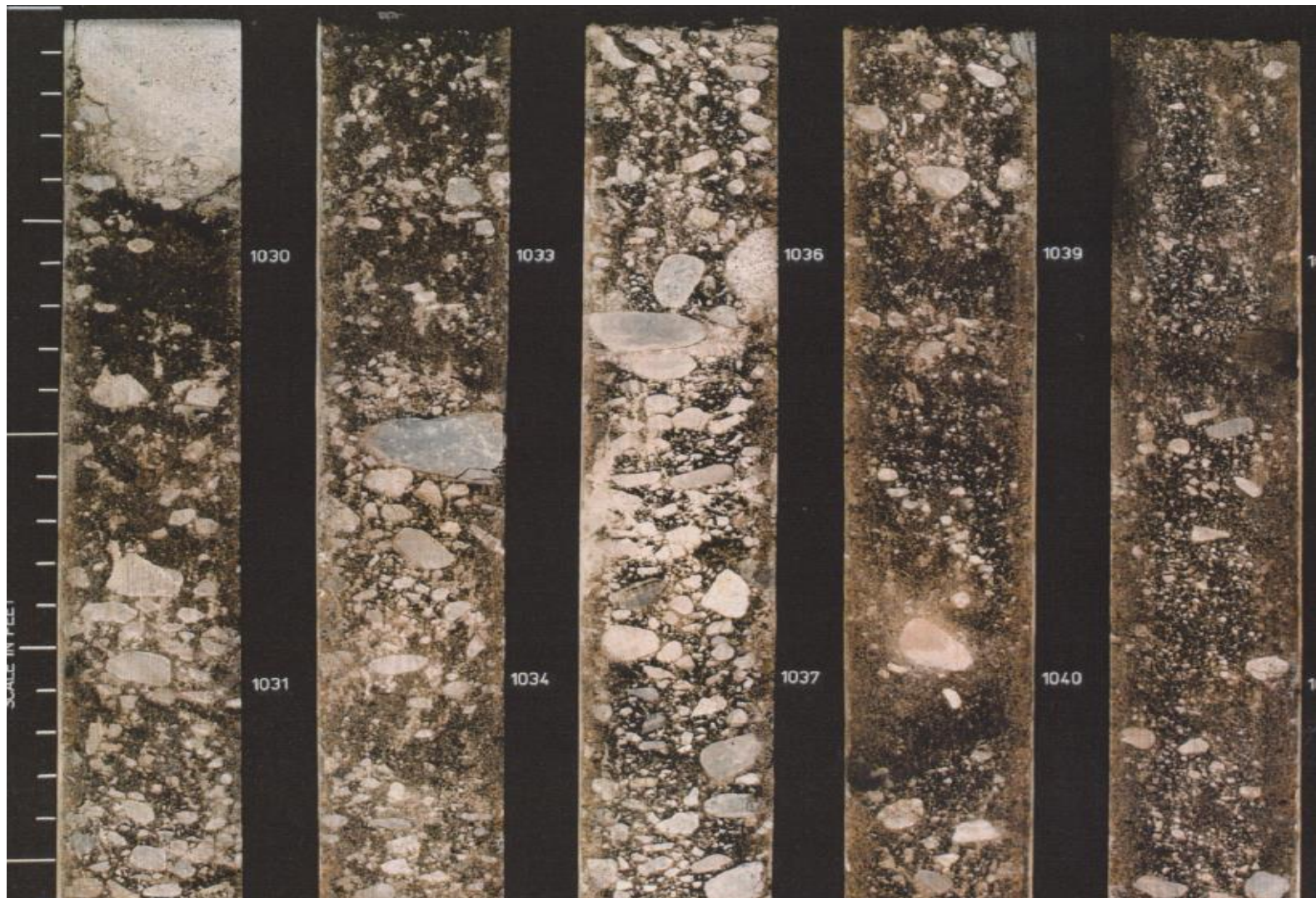
Fable 1

The Heavy Oil Lease and Its Updip Cousin

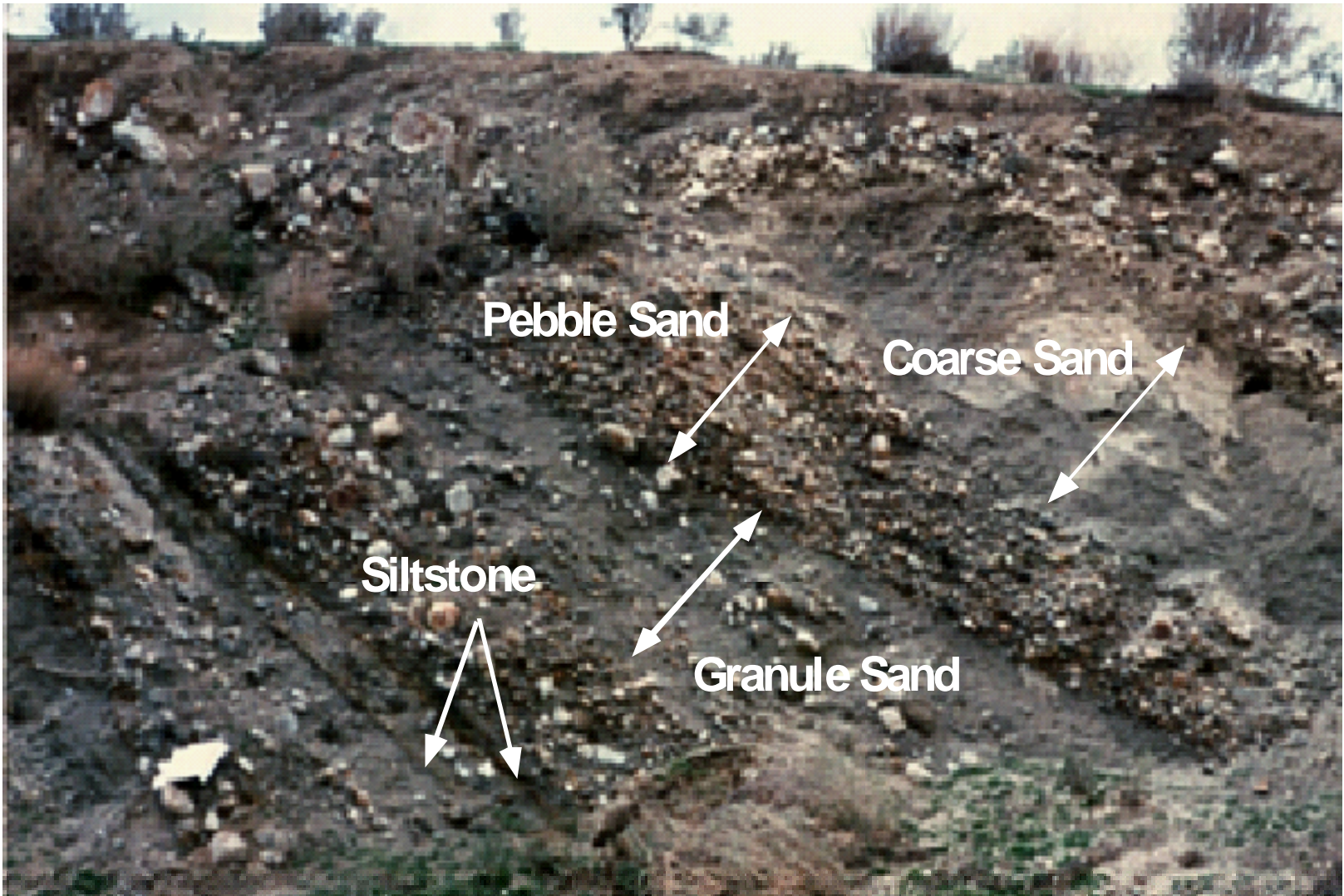
The Heavy Oil Lease



The Updip Cousin



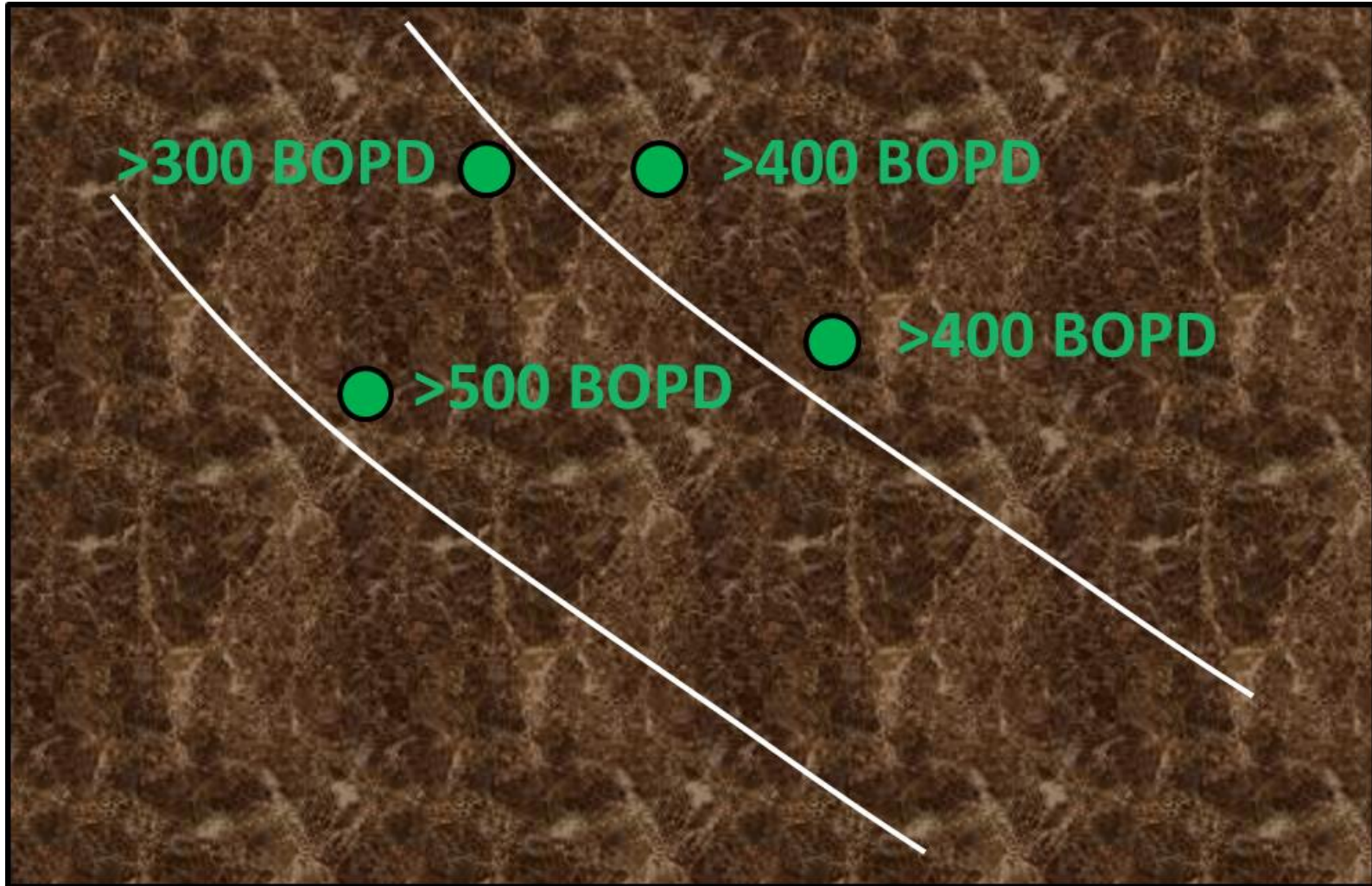
The Outcrop



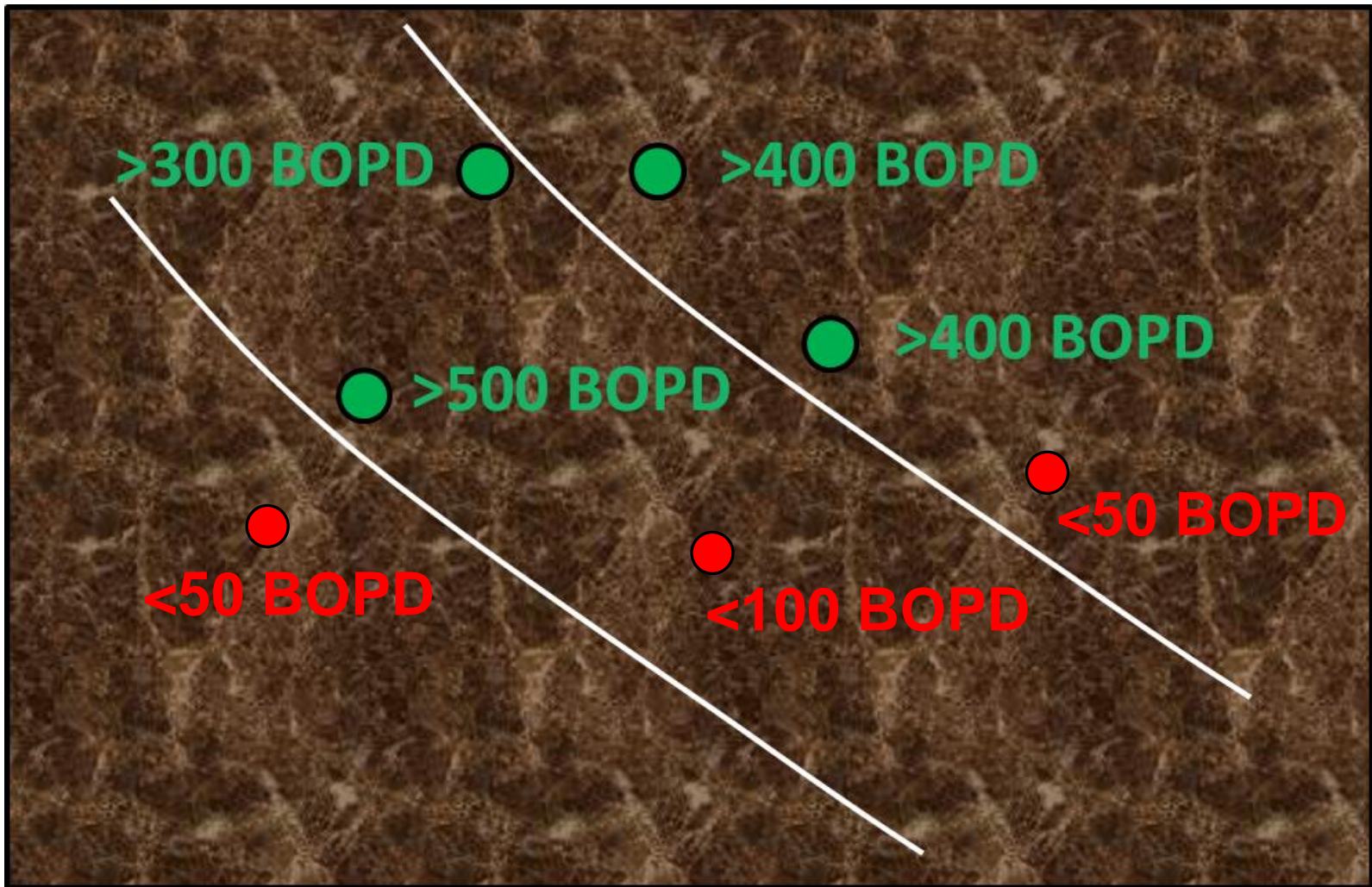
Fable 2

The Liquids Rich Shale and the Analysts

Early Wells



Later Wells



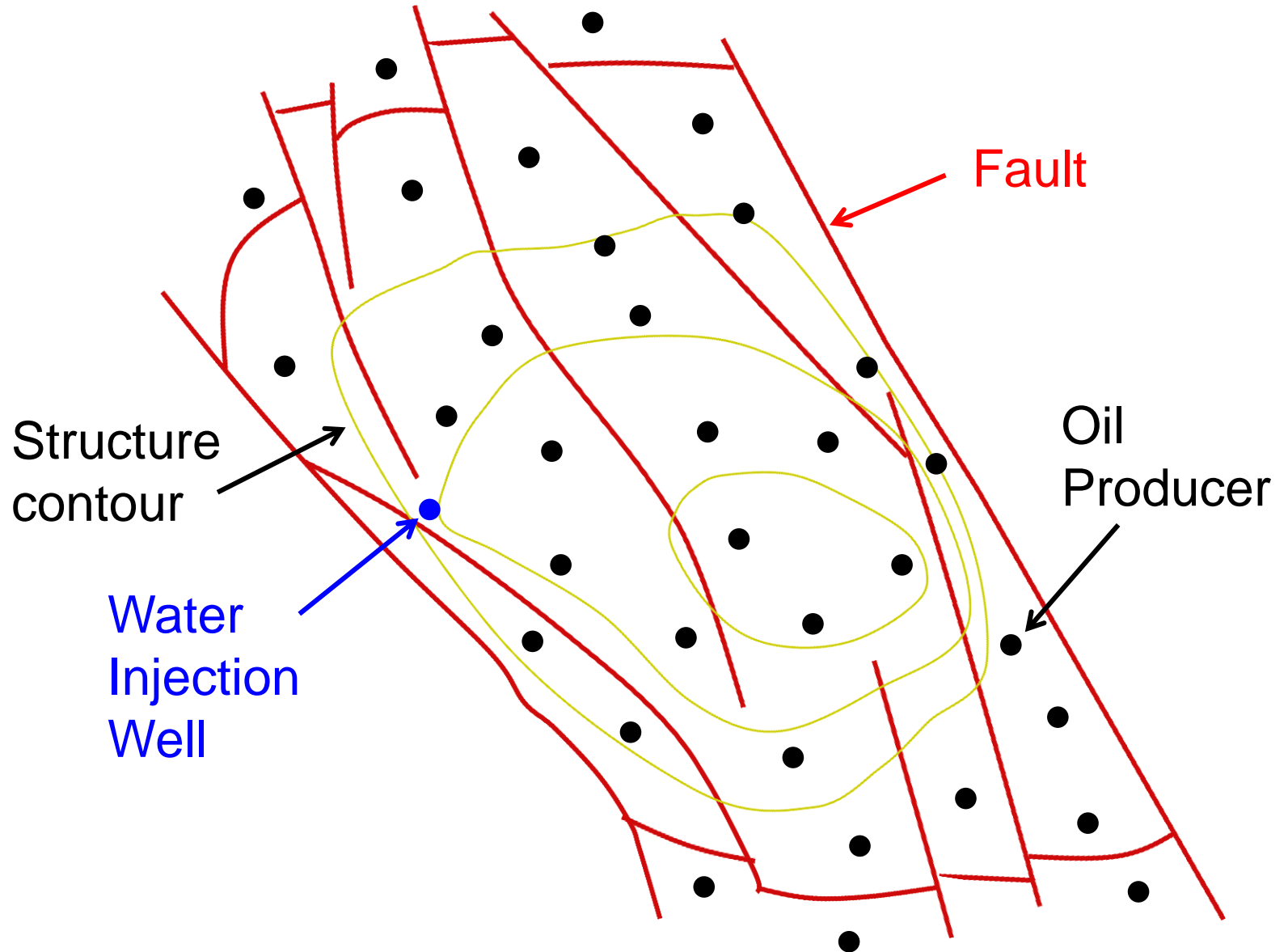
Project Review Comments

- We got involved in the play because we were desperate for a successful liquids-rich project
- We imposed our previous templates on the play without thinking enough about what might be different or what could go wrong
- Data collection was aimed at proving the model we had in mind
- We extrapolated the early well success to later wells without really understanding what controlled production
- The focus was more on getting the project approved than properly appraising it

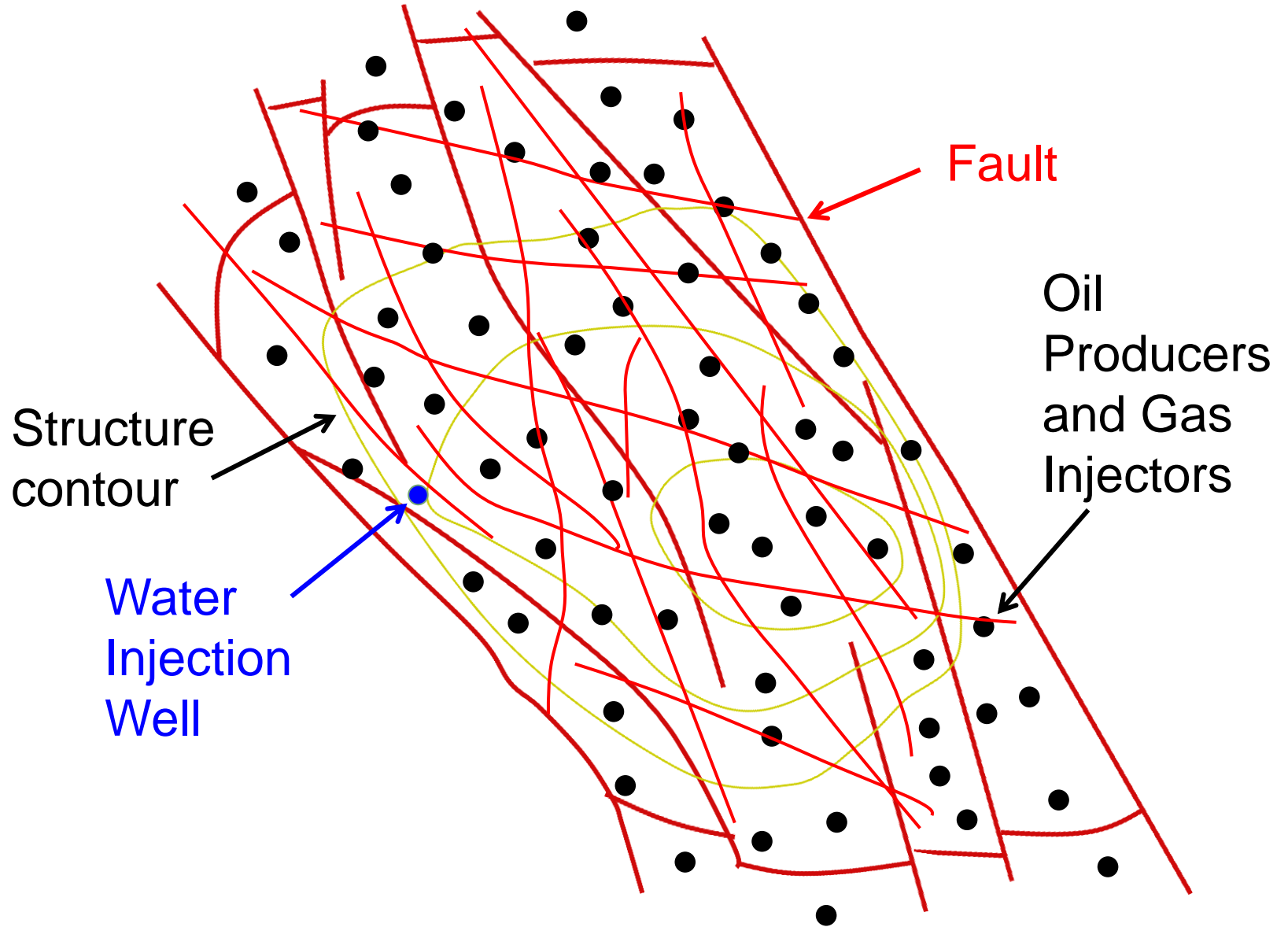
Fable 3

The Fractured Sandstone That Couldn't

Early Study Results



Post Audit Results



What Went Wrong?

- Fable 1: Heavy oil sands
 - Never thought updip lease would be very different
 - Relied too heavily on data from a single source
 - Short fuse encouraged disastrous shortcuts
- Fable 2: Liquids rich shale
 - Assumed the shale would be similar to last project
 - Believed that a few early wells were representative
 - Didn't collect enough data or objectively assess it
- Fable 3: Fractured sandstone
 - Didn't honor the limitations of the existing data
 - Never considered what failure could look like

What Was Really Behind These Missteps?

- Cognitive Bias
 - Is a set of errors in thinking and judgment that occur as we analyze information
 - It causes us to draw inferences and conclusions about situations from our own subjective reality
 - It often results from our attempt to simplify information processing

Types of Cognitive Bias

- Availability
 - Information at hand is given more weight than is deserved
- Framing
 - Characterizing a new problem through the prism of a dissimilar solved problem
- Anchoring
 - The tendency to anchor on those data that support your interpretation

Types of Cognitive Bias

- Confirmation
 - Seeking and interpreting data that confirms your hypothesis and ignores alternatives
- Motivational
 - A desire for a particular outcome motivated by your personal situation
- Information
 - Accepting and applying data at face value without understanding how it was obtained

Mitigating Bias: The Process (1/3)

- When conducting your analysis...
 - Recognize the limits of your knowledge and data
 - Focus attention on those uncertain elements that have the greatest impact
 - Work with multiple anchors and pay attention to outliers
 - Do not dismiss information and data that contradict your assumptions
 - Require estimates to include a range and level of confidence

Mitigating Bias: The Process (2/3)

- When formulating your interpretation...
 - Use heuristics (e.g., rules-of-thumb, intuition) with caution
 - Separate correlation from causation
 - Undertake reality and plausibility checks
 - Think about alternative hypotheses
 - Look for evidence that could falsify your interpretation

Mitigating Bias: The Process (3/3)

- When reviewing interpretations...
 - Use open-ended questions and LISTEN
 - Understand findings and supporting justifications
 - Consider assumptions and factors that were overlooked
 - List reasons for and against alternatives
 - Use performance tracking as a means to place the interpretations and results in context

Mitigating Bias: The Decision (1/2)

- Remove the ability to form and present a pre-conceived decision.
- Logically and systematically isolate the factors most important to a decision.
- Argue the other side's case. Understanding the opposition's arguments is a powerful learning tool.
- Quantify the failure case(s) and associated threshold(s).

Mitigating Bias: The Decision (2/2)

- Rank those key assumptions upon which project success depends and revisit them regularly to see if they are still valid.
- Keep track of your mistakes as carefully as your successes. We all tend to trumpet our successes and downplay our failures.
- Be honest about your failures. They're not always due to circumstances beyond your control.
- Remember that while failure may not be an "option" in your project, it can sure be an outcome!

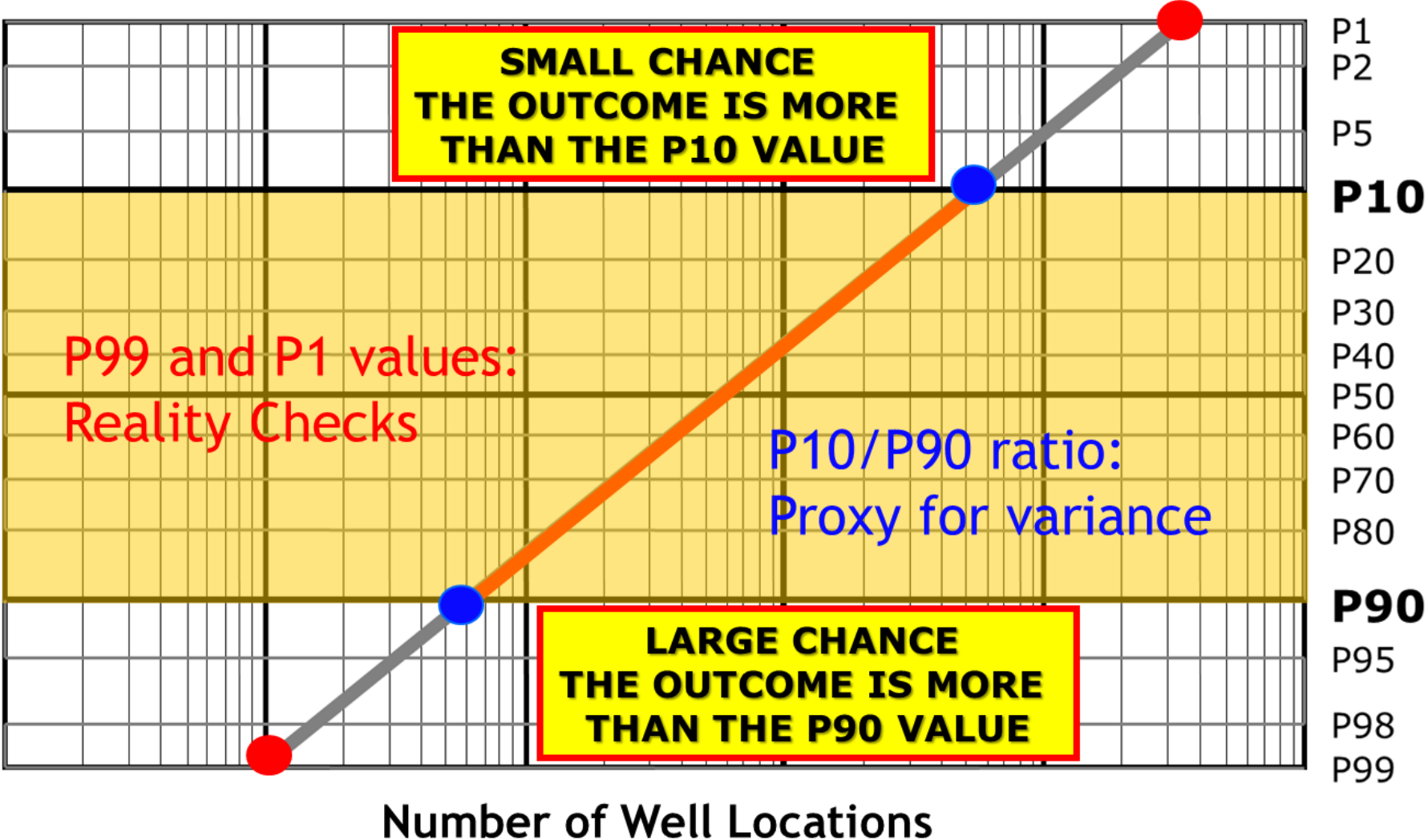
Practice!

- Now that you all have learned how to identify and mitigate bias, let's try a little exercise...
- I'm going to show you an aerial photo of an oilfield development project
- Please write down a range such that you are 80% confident that the number of well locations will fall into that range
 - Choose a low-side number such that there is only a 10% chance that there are *fewer* wells than this
 - Choose a high-side number such that there is only a 10% chance that there are *more* wells than this

Review

- Raise your hand if the number of wells fell within the range you provided
- What percentage got it right?
- What percentage got it wrong?
- What percentage should have gotten it right?
- Our inability to estimate under uncertainty is caused by the *Overconfidence Bias*
- This is perhaps the most important cognitive bias in our business—it often leads to outcomes that are poorer than expected

Use of Log-Probability Plots



Don't Despair... All is Not Lost...

- There are various tools you can use
- And a number of useful references...
 - *Thinking, Fast and Slow*, Daniel Kahneman (2011)
 - *The Flaw of Averages*, Sam Savage (2012)
 - *The Art of Thinking Clearly*, Rolf Dobelli (2013)
 - *Why Plans Fail*, Jim Benson (2014)
 - *Unconscious Marketing*, Sam Page (2015)
- And a short course that might help...
 - *Mitigating Blindness and Bias in E & P Decision Making*

Mitigating the Impacts of Cognitive Bias in E&P Decision Making

THANK YOU!

QUESTIONS?