

BP Alaska Heavy Oil Production from the Ugnu Fluvial-Deltaic Reservoir*

Josef Chmielowski¹

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Posted May 27, 2013

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Abstract

The Alaska North Slope is a prolific hydrocarbon basin that has produced billions of barrels of light oil. As the basin matures and production declines, it is necessary to investigate other means by which to extend field life. As a result, BP Alaska has appraised the fluvial-deltaic Ugnu reservoir and associated heavy oil fluids in order to demonstrate the technical viability of producing heavy oil on the North Slope. In 2011 and 2012, the large heavy oil resource (approximately 18Bn bbls) has been tested via a four-well-production pilot. Due to limited surface locations and permafrost issues, two horizontal wells with surface-drive progressive cavity pump were selected for appraisal of the Ugnu Formation. Acquisition of quality data and a proactive approach to well management allowed up to 20% sand production to be sustained over the test period. Data is shown to demonstrate the improvement in performance relative to conventional horizontal predictions and how the sand production is enhancing oil rates through wormhole extension. An update on continued production results is shared herein. Note: the heavy oil resources face significant technological and investment challenges in the current Alaska fiscal system. As such, in late 2012, BP announced it is scaling back its heavy oil efforts and will stop the pilot program in 2013.



Topics:

- Introduction
- Pilot Objectives
- Pilot Results
- Forward Plan

BP Alaska Heavy Oil Pilot

▶ Josef Chmielowski

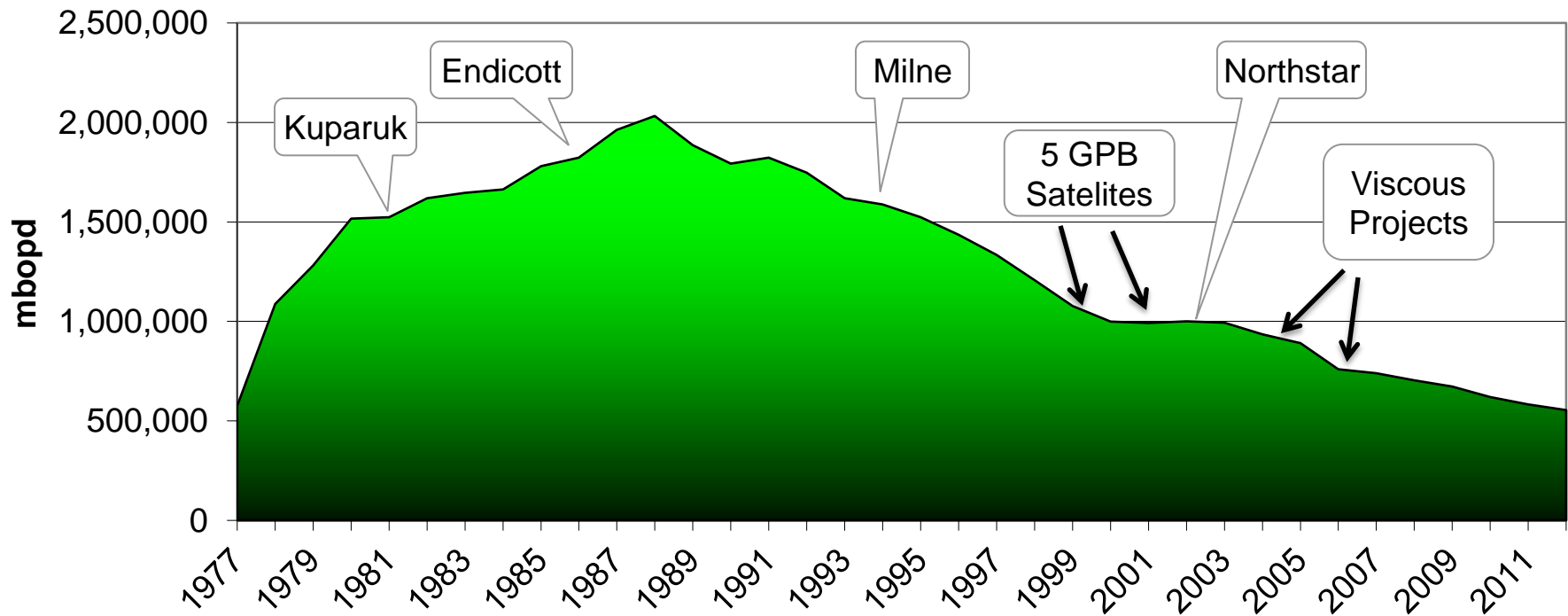
April 22, 2013

SPE-AAPG Joint Conference, Monterey CA

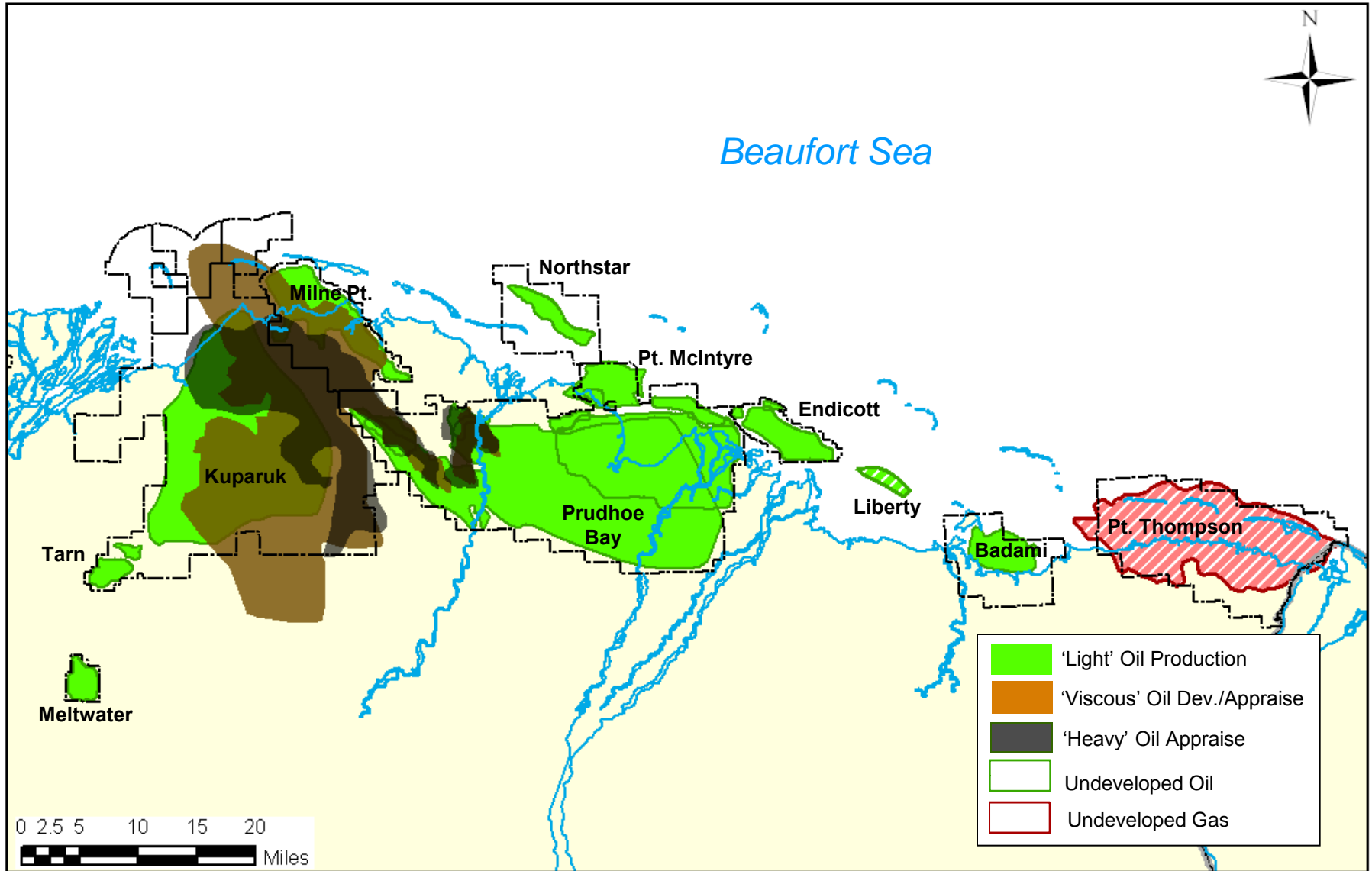
Alaska Heavy Oil - Why Now?

- Low hanging fruit (light oil) is becoming more challenged
- Heavy oil technology has been utilized globally for decades
- Oil price has stabilized in recent years around \$60 - \$100
- Diluent is running out (North Slope decline is 6-8% per year)

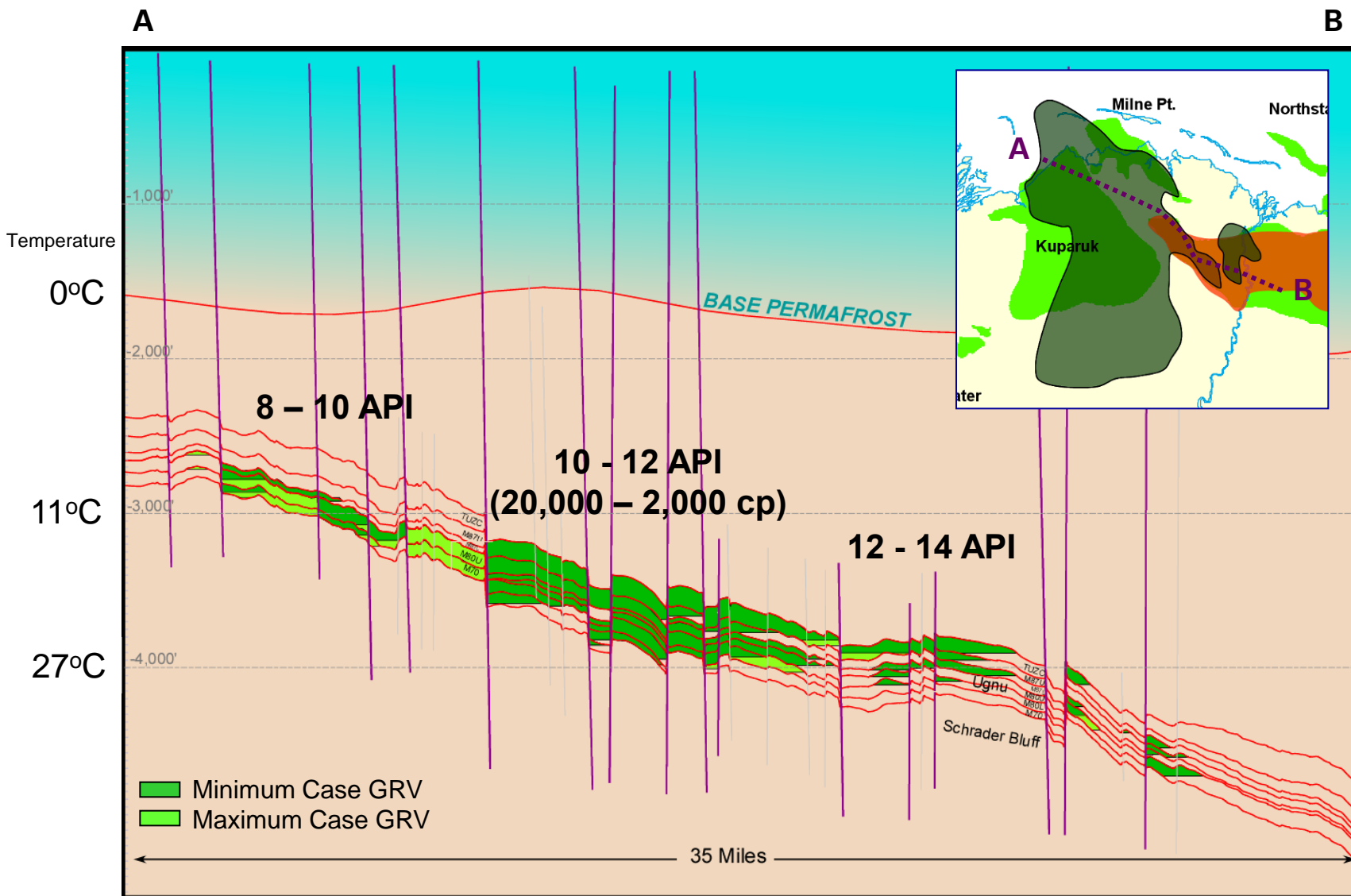
Trans-Alaska Pipeline Throughput



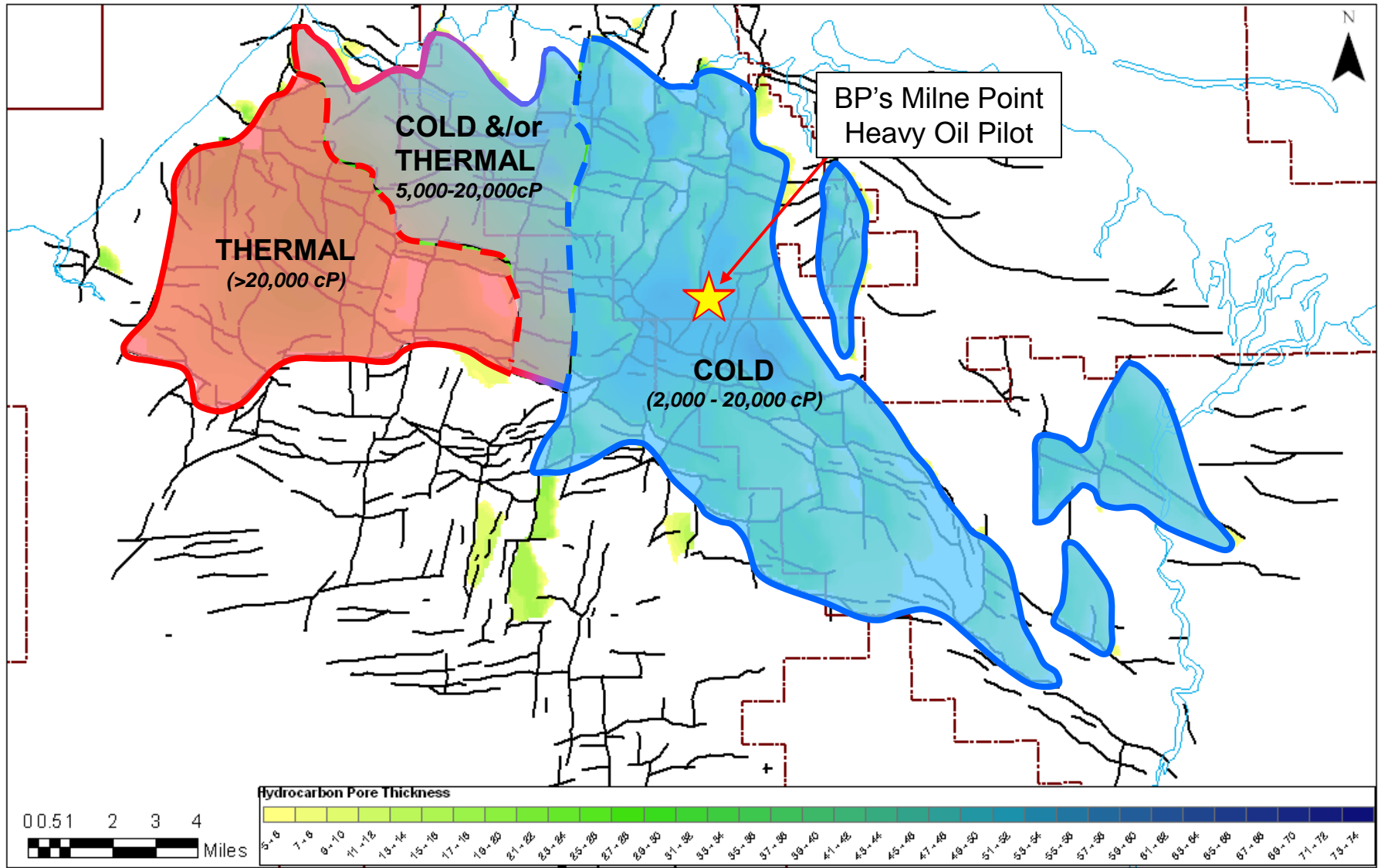
Alaska Light, Viscous and Heavy Oil



Ugnu Structure & Fluid Quality



Heavy Oil Depletion Mechanisms



Alaska Heavy Oil Production Begins!



APRIL 29, 2011

Alaska Dispatch

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Energy

Heavy oil production begins on North Slope

Patti Epler | Apr 28, 2011

A new project that could herald the future for Alaska's maturing oil industry has begun pumping oil from one of the North Slope's most difficult reservoirs.

BP Alaska's "heavy oil" pilot project is now under way, says the company's director of operations. He calls it an "awesome project" that will produce billions of barrels of oil.

Eric West, the heavy oil pilot project's director, says the first of four wells in a pilot test is now producing. The Ugnu formation has been thought to contain as much as 23 billion barrels of oil-in-place, he says.

The project captivated lawmakers in Washington that dangled the possibility of drilling for oil trapped in an oozy sand formation that has long figured out how to tap.

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West's power point presentation says the pilot test will encourage more development in the area. He says the company has been looking for ways to get more heavy oil into the trans-Alaska pipeline, which carries oil from the North Slope to the coast.

[BP ready to launch new 'heavy oil' project on North Slope](#)

[Oil taxes: The \\$2-billion \(a year\) question](#)

[Bypassing Juneau, oil industry appeals to public for tax breaks](#)

[ConocoPhillips: Oil tax cut could spur mothballed Alaska oil projects](#)

The McGraw-Hill Companies

platts

Overview Oil Natural Gas Electric Power Coal Shipping

BP starts up first heavy oil test production well on North Slope

Anchorage (Platts)--28Apr2011/211 pm EDT

BP has started up the first of four test wells in a pilot test of the Ugnu formation, a complex reservoir that has long been considered one of the most difficult to produce. The Ugnu is a complex reservoir that has long been considered one of the most difficult to produce. The Ugnu is a complex reservoir that has long been considered one of the most difficult to produce.

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BP heavy-oil pilot well starts production

By DAN JOLING Associated Press
Published: April 29th, 2011 11:37 AM
Last Modified: April 29th, 2011 11:38 AM

A trickle of new oil into the trans-Alaska pipeline has BP Alaska officials optimistic about a \$100 million investment.

For more than a week, the company has produced about 350 barrels per day of new heavy crude oil -- petroleum that flows like molasses or cold honey -- from a test well in the Ugnu Formation in the Milne Point lease area on Alaska's North Slope.

The output from the first of four test wells in the company's Milne Point S-Pad Pilot project is less important than what the company is learning, said Eric West, its heavy-oil project director.

BP heavy-oil pilot well starts production

- BP heavy-oil pilot well starts production
- Conoco sees 43% earnings increase for quarter
- Feds' worst-case Arctic spill far greater than planning estimate
- Conoco Phillips 1Q earnings short of expectations
- Special session forces delay in legislators' trip to Norway

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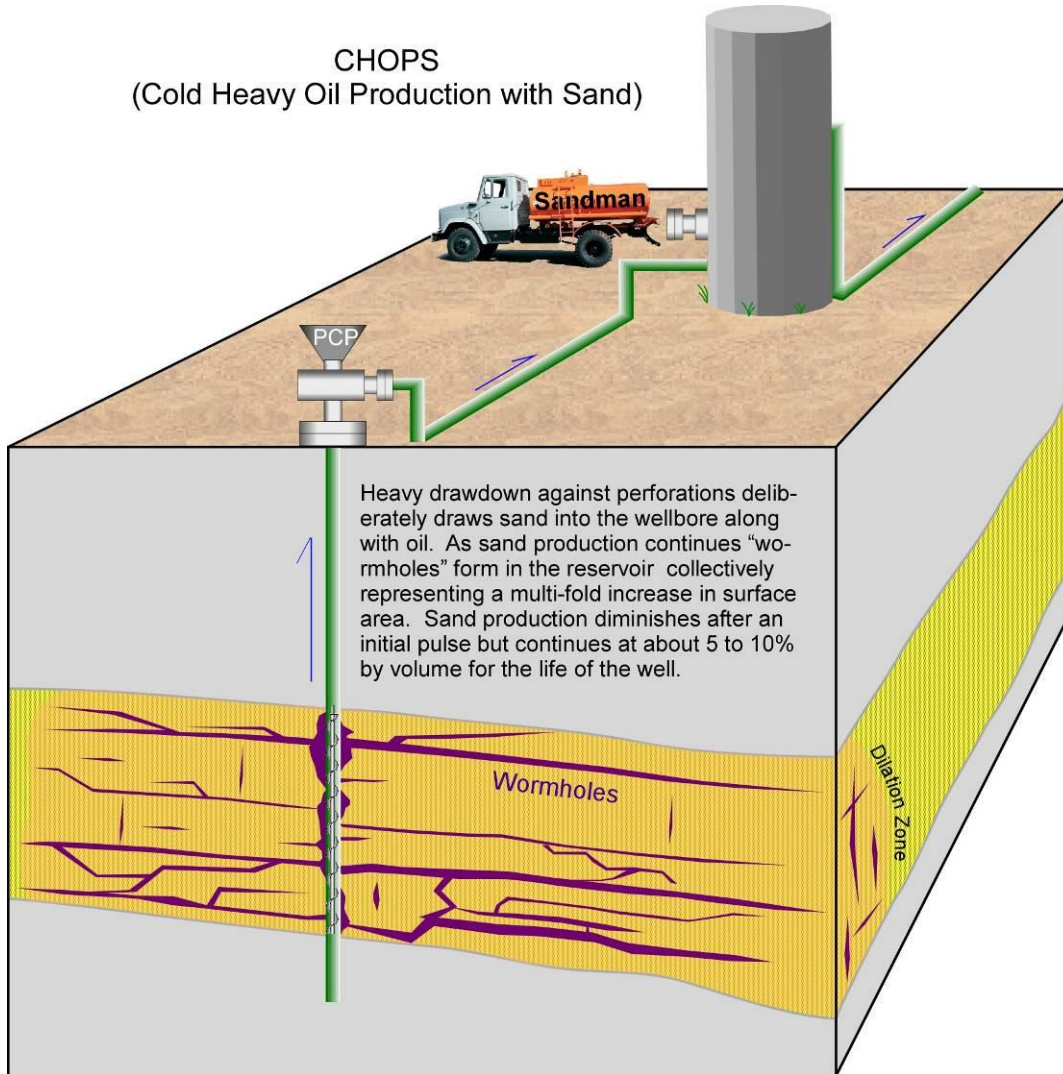
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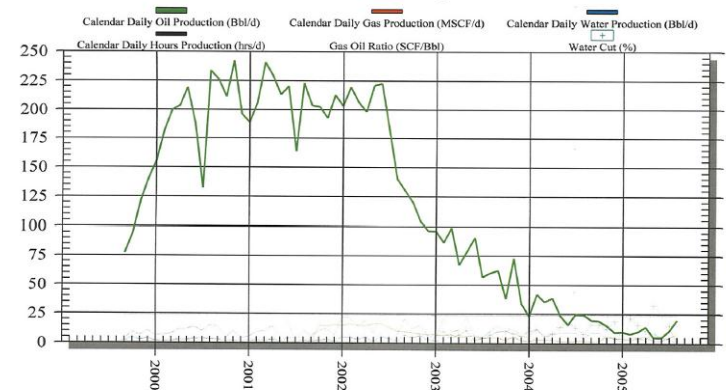
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CHOPS
(Cold Heavy Oil Production with Sand)



- Foamy oil
- Sand production
- PCP pump
- Surface drive
- Heated separation tank
- Sand disposal

CHOPS: CHARACTERISTIC PRODUCTION PROFILE
scatter is intrinsic to process



Objective #1: Producibility

- Foamy Oil – demonstrate solution gas drive present in the reservoir ✓
- Sand Production – demonstrate significant and sustained sand production ✓

Objective #2: Repeatability

- Other wells, reservoir zones, other hydraulic units

Objective #3: Sustainability

- Longterm Trends - oil rate, GOR, sand cut, water, well integrity

Objective #4: Commerciality

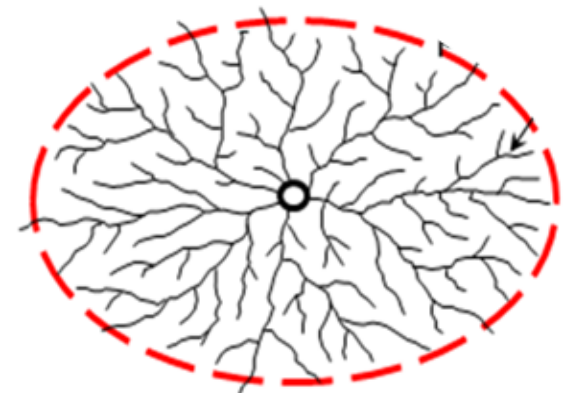
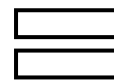
- Production profiles, peak rate, capex/opex profiles, well spacing & design, recovery factor



Foamy Oil



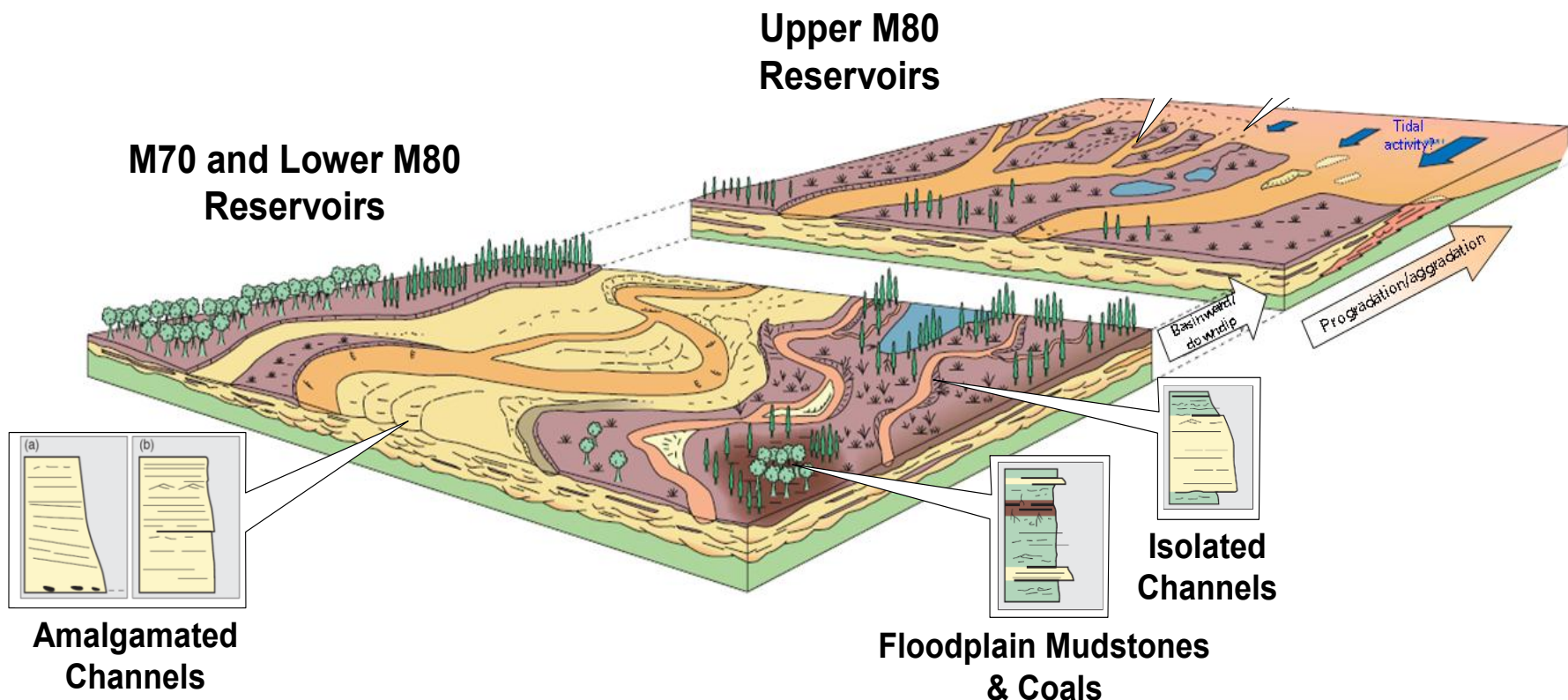
Sand Cut



Wormholes

Integrated Subsurface Description

- Characterization of the resource is a key part of our remit
- Ugnu consists of fluvial-deltaic sands deposited in large, meandering rivers
- Reservoir is laterally discontinuous

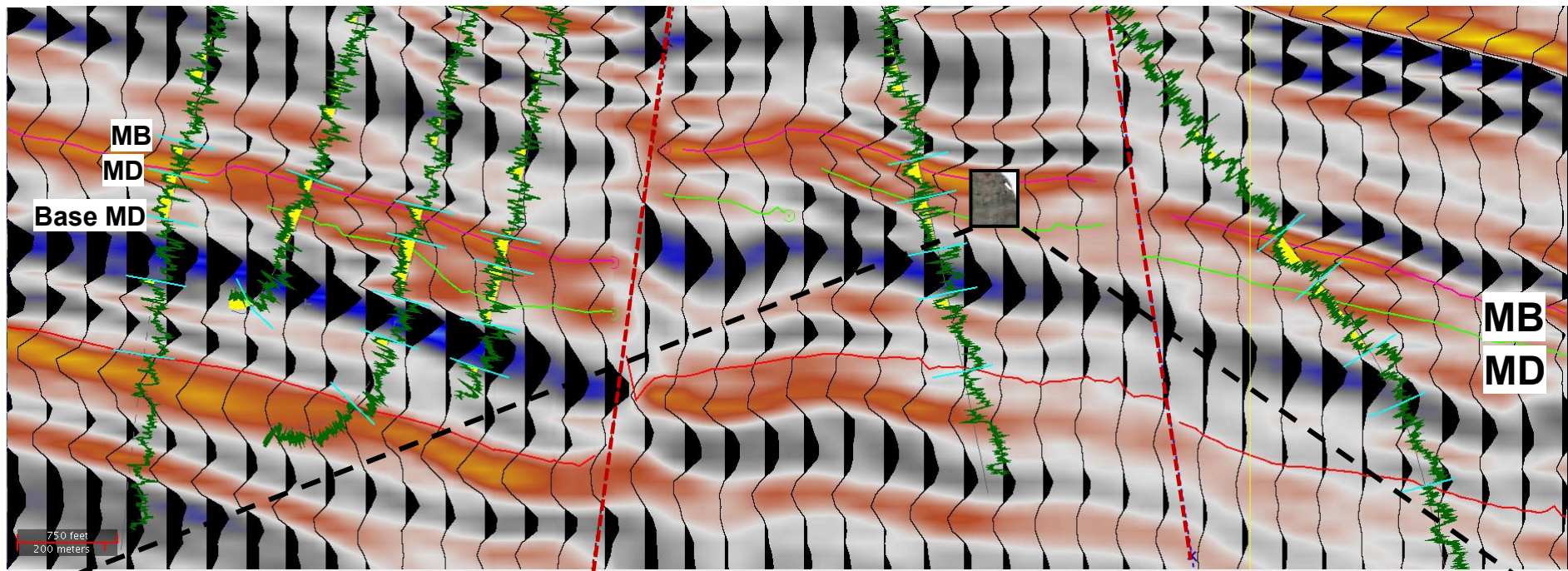


What Should We Expect From Seismic?

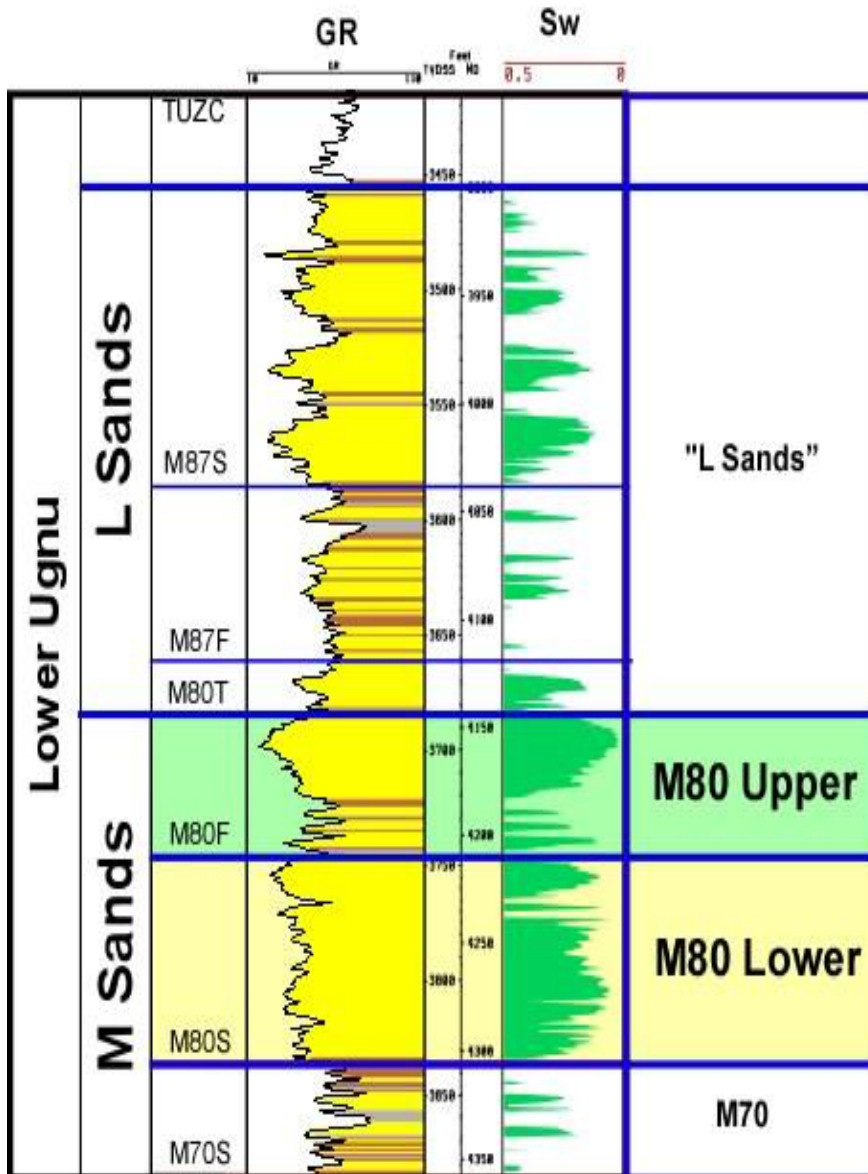


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Stratigraphic Column

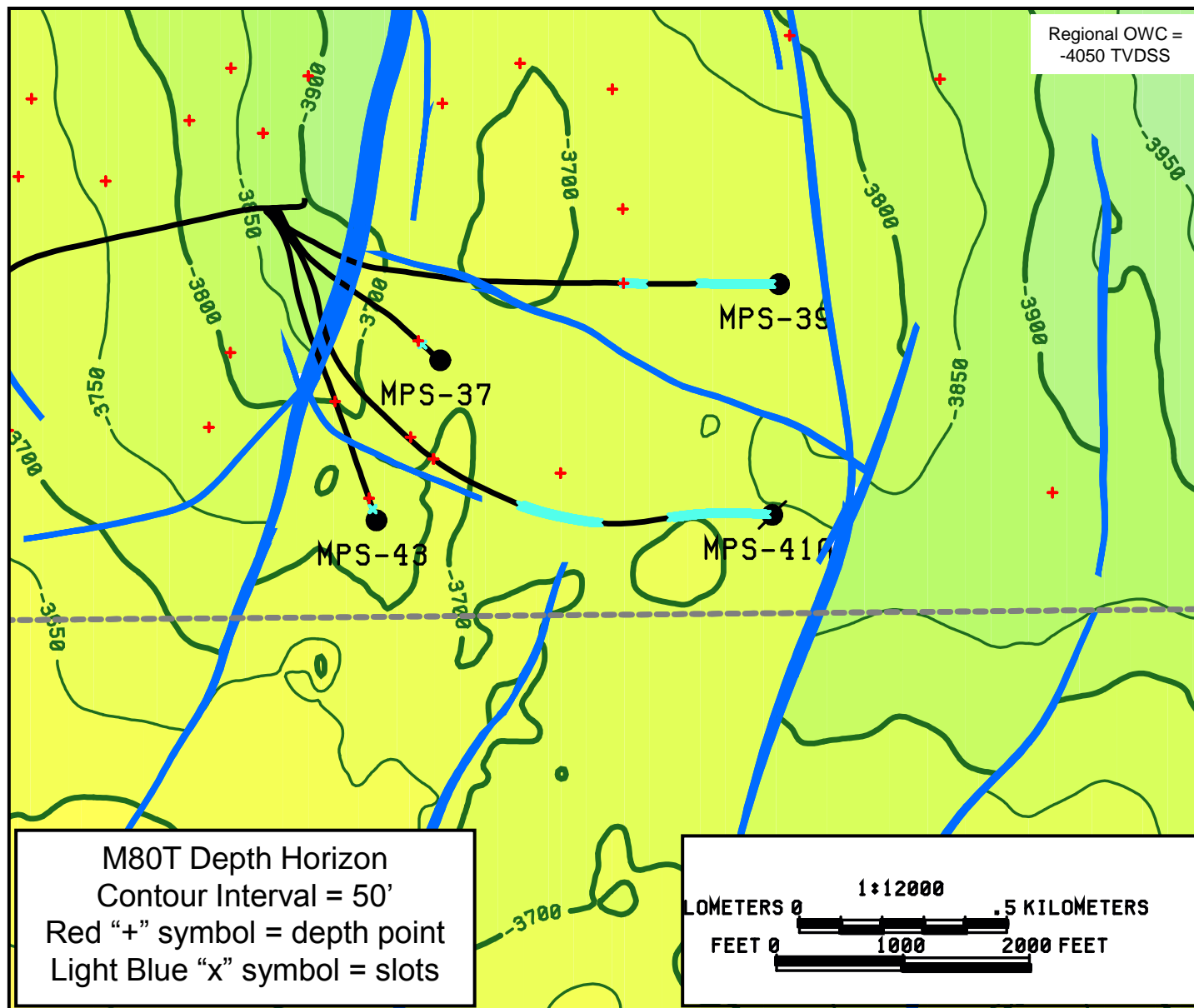


Under Evaluation: No Wells

Horizontal Wells: MPS-41A & MPS-39

Vertical Wells: MPS-43 & MPS-37

Milne Point S-pad Ugnu Depth Map



MPS-41A versus MPS-39 Horizontal Profiles

MPS-41A

Peak Rate: 550 bopd (not fully ramped up)

Lateral Length: 2700' (not constrained by faulting)

Drilling Operations: sidetracked twice to stay in high quality sand

Slotted Length: 1800'

Slot Size: .125"

MPS-39

Peak Rate: 500 bopd (not fully ramped up)

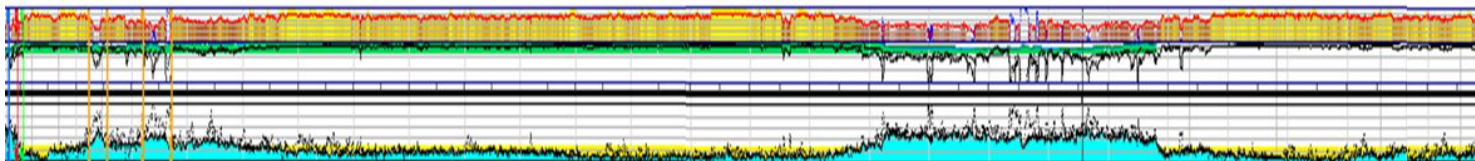
Lateral Length: 1400' (constrained by fault near heel & toe)

Drilling Operations: bit drilled out bottom of UM80, no sidetracks

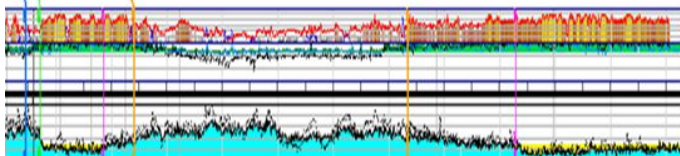
Slotted Length: 720'

Slot Size: .028"

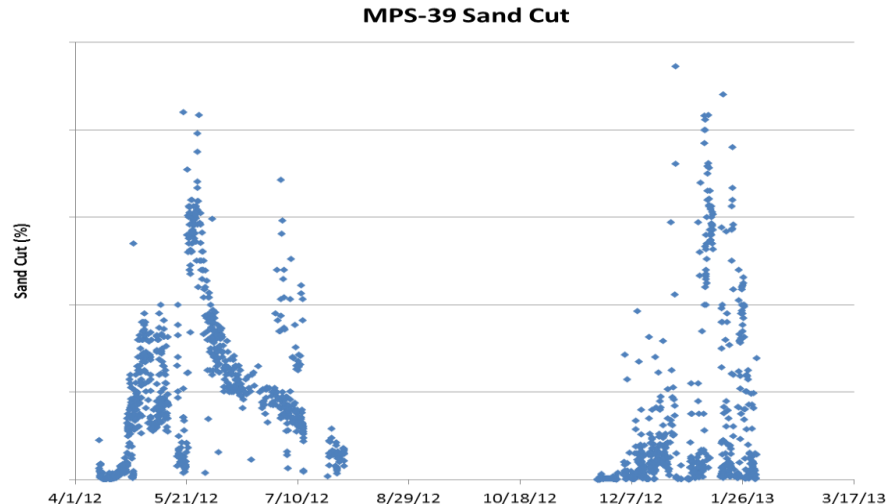
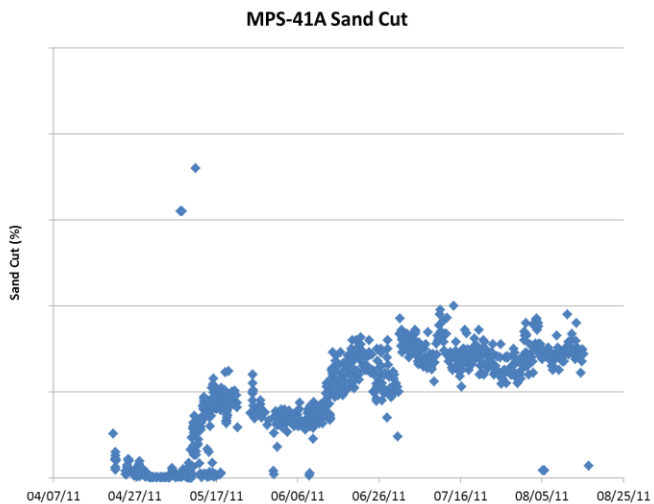
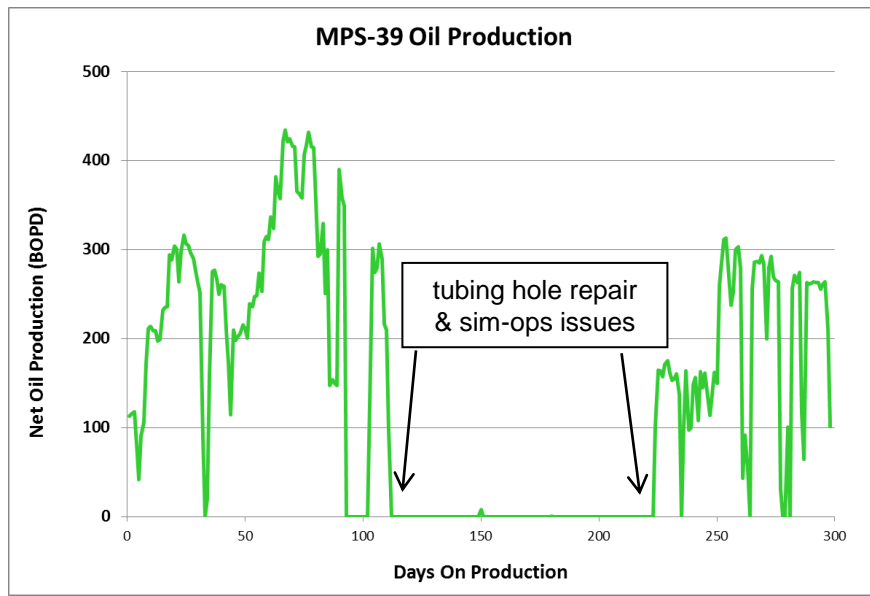
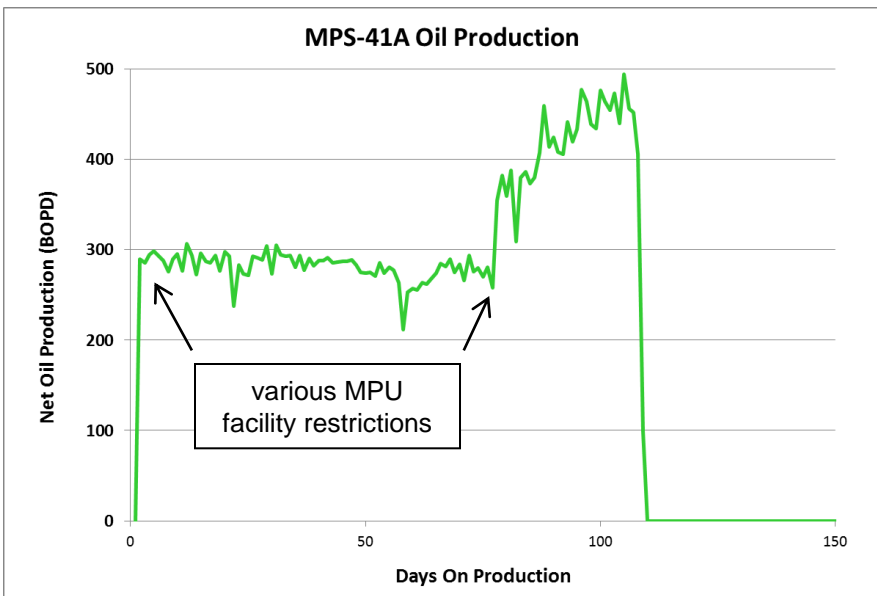
MPS-41A



MPS-39



Production Results: Net Oil & Sand Cut



Heavy Oil Pilot Performance

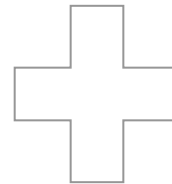


MPS-41A (P&A'd 2012)

- 117 day pilot production run
- Peak rate ~550 gross (500 net of sand)
- 35,000 bbls cumulative production
- Foamy oil drive established
- Sand production variable at 5 - 20%

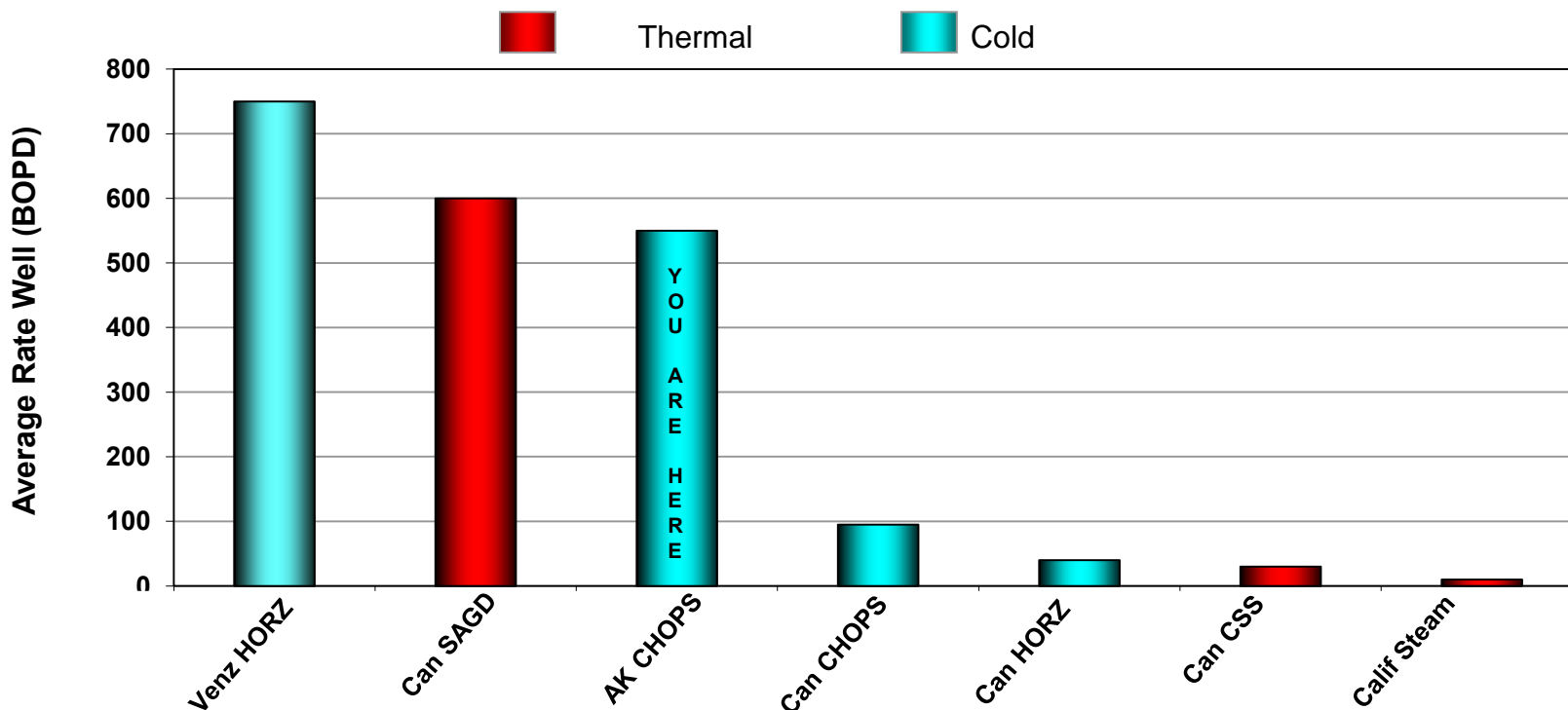
MPS-39 (currently shut-in)

- 177 day pilot production run
- Peak rate ~500 gross (430 net of sand)
- 40,000 bbls cumulative production
- Foamy oil drive repeated
- Sand production variable at 5 – 40%



How do Alaska Heavy Oil Wells Compare?

- **Pressure:** Ugnu reservoir pressure is much greater than Canadian analogs
- **GOR:** Ugnu gas oil ratio is optimum for solution gas drive
- **Fluids:** Ugnu viscosity is poorer than Venezuela, but typically better than Canada
- **Rocks:** thickness, porosity and permeability between Venezuela & Canada



1) BP Heavy Oil Pilot has exceeded expectations:

- CHOPS extraction technique is viable
- On-pad processing works
- Production rates for horizontal wells are >500bpd
- 75,000 barrels produced to date, shipped via TAPS, refined at Cherry Point and sold to market

2) Forward Plans:

- Produce deviated wells until mechanical failure
- Pilot project shutdown
- Document results

3) Heavy oil is technically and commercially challenged

Thank You



- BP Alaska for permission to share our progress and the vision to step into a challenging resource
- All past and current employees involved with the project
- Heavy Oil Advisory Board, AITF, Weatherford, C-FER, and many others in the Canadian & Venezuelan oil industry



Questions

