
Canadian Discovery Ltd.
Data | Intelligence | Expertise

Canadian Unconventionals: The Low(er) Hanging Fruit

October 22, 2015

Kaush Rakhit, President
M.Sc., P.Geol

Canadian Discovery Ltd.

Data | Intelligence | Expertise

Disclaimer

Disclaimers

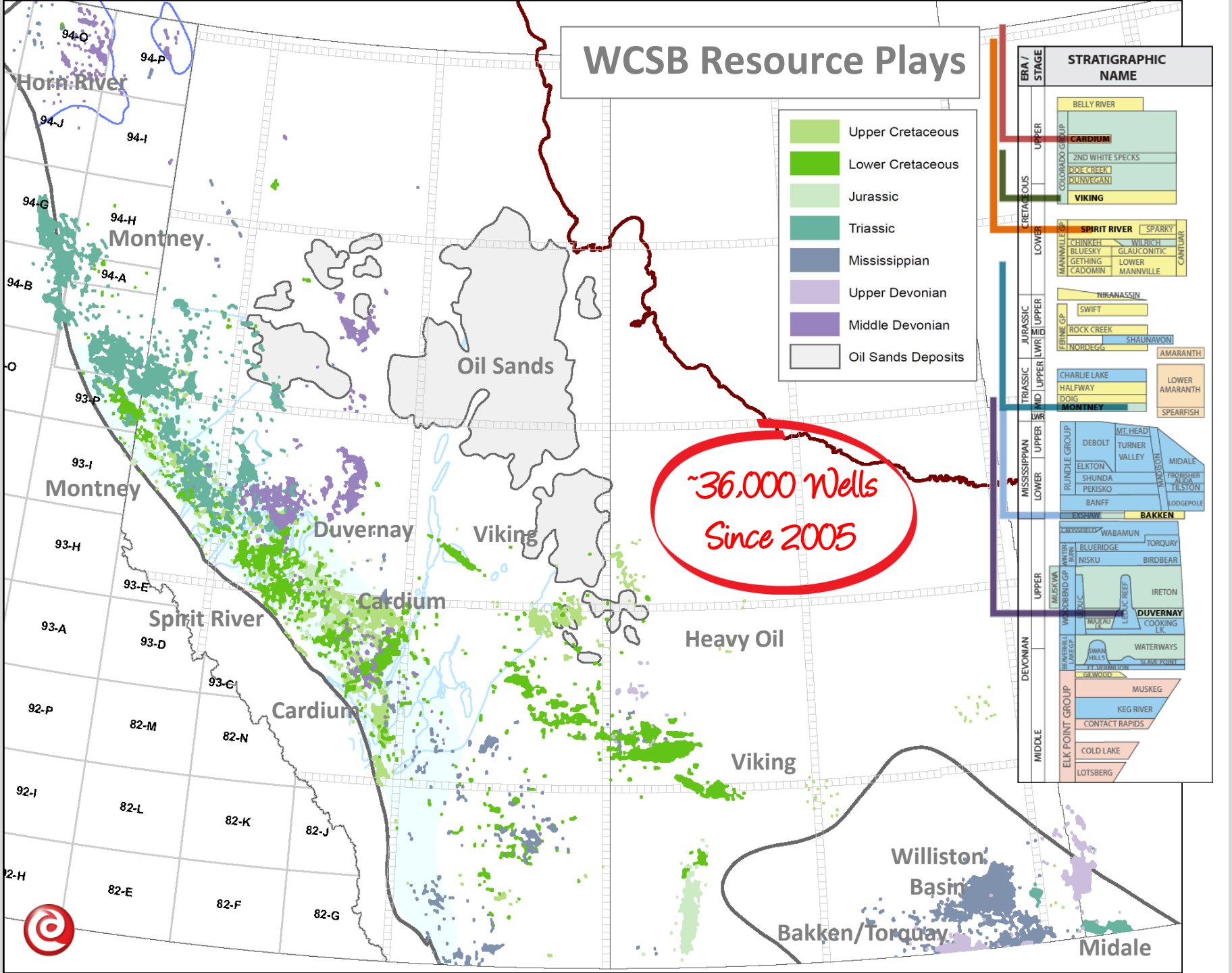
The information contained herein has been prepared solely for information purposes and is not intended to be used for trading or investment purposes or as an offer to sell or the solicitation of an offer to buy any security or financial product. The information has been compiled by Canadian Discovery from internal sources as well as prepared from various public and industry sources that we believe are reliable, but no representation or warranty, expressed or implied is made by Canadian Discovery, its affiliates or any other person as to the accuracy or completeness of the information. Such information is provided with the expectation that it will be read as part of a mosaic of analyses and should not be relied upon on a stand-alone basis. Past performance should not be taken as an indication or guarantee of future performance, and Canadian Discovery makes no representation of warranty regarding future performance. The opinions expressed in this report (presentation) reflect the judgment of Canadian Discovery as of the date of this report and are subject to change without notice. This report (presentation) is not an offer to sell or a solicitation of an offer to buy any securities. To the full extent provided by law, neither Canadian Discovery nor any of its affiliates, nor any other person accepts any liability whatsoever for a direct or consequential loss arising from any use of this report (presentation) or the information contained herein. As in all aspects of oil and gas evaluation, there are uncertainties in the interpretation of engineering, reservoir and geological data: therefore, the recipient should rely solely on its own independent investigation, evaluation, and judgment with respect to the information contained herein and any additional information provided by Canadian Discovery or its representatives. All trademarks, service marks, and trade names not owned by Canadian Discovery are the property of their respective owners.

Forward-Looking Statements

This presentation may contain certain forward-looking information as defined in applicable securities laws (referred to herein as “forward-looking statements”). Forward-looking statements involve known and unknown risks, uncertainties and other factors which are beyond Canadian Discovery’s ability to predict or control and may cause Canadian Discovery’s actual results, performance or achievements to be materially different from any of its future results, performance or achievements expressed or implied by forward-looking statements.

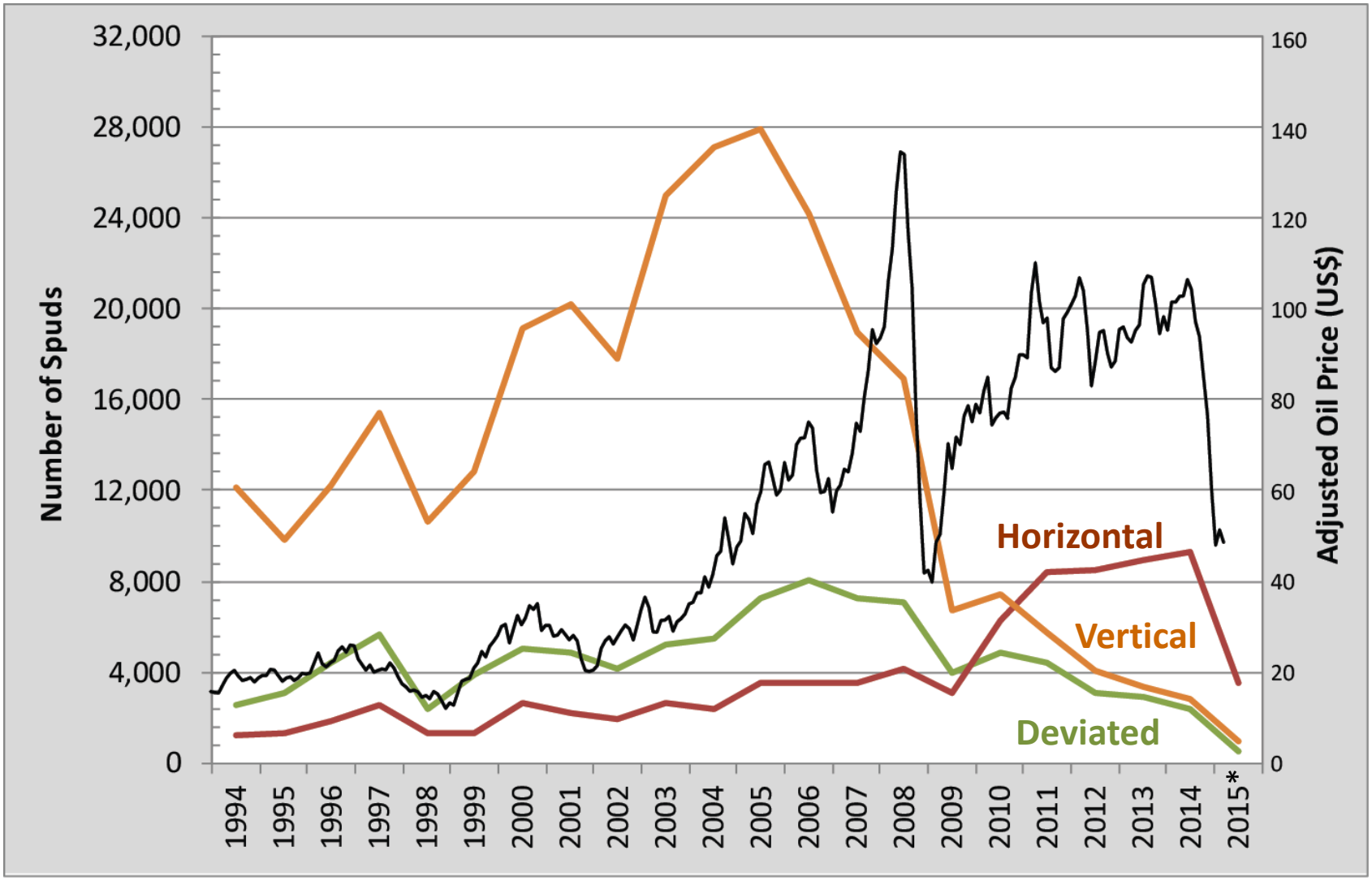
Accordingly, readers should not place undue reliance on forward-looking statements. The forward-looking statements contained herein are made as of the date hereof, or such other date or dates specified in such statements. Canadian Discovery undertakes no obligation to update publicly or otherwise revise any forward-looking statements contained herein whether as a result of new information or future events or otherwise, except as may be required by law. If the Company does update one or more forward-looking statements, no inference should be drawn that it will make additional updates with respect to those or other forward-looking statements.

Historical Trends


WCSB Resource Plays
Upper Cretaceous
Lower Cretaceous
Jurassic
Triassic
Mississippian
Upper Devonian
Middle Devonian
Oil Sands Deposits
~36,000 Wells
Since 2005
Horn River
Montney
Montney
Oil Sands
Duvernay
Viking
Cardium
Spirit River
Heavy Oil
Cardium
Viking
Williston
Basin
Bakken/Torquay
Midale
94-O
94-P
94-J
94-I
94-G
94-H
94-B
94-A
93-P
93-I
93-H
93-E
93-A
93-D
93-C
92-P
82-M
82-N
92-I
82-L
82-K
82-J
82-H
82-E
82-F
82-G
STRATIGRAPHIC NAME
ERA / STAGE
CRETACEOUS
JURASSIC
TRIASSIC
MISSISSIPPIAN
DEVONIAN
UPPER
LOWER
MIDDLE
BELLY RIVER
CARDIUM
2ND WHITE SPECKS
DOE CREEK
DUNVEGAN
VIKING
SPIRIT RIVER
SPARKY
CHINKEH
WILRICH
BLUESKY
GLAUCONITIC
GETHING
LOWER MANNVILLE
CADOMIN
NIKANASSIN
SWIFT
ROCK CREEK
SHAUNAVON
NORDEGG
AMARANTH
CHARLIE LAKE
HALFWAY
DOIG
MONTNEY
LOWER AMARANTH
SPEARFISH
DEBOLT
MT. HEAD
TURNER VALLEY
ELKTON
SHUNDA
PEKISKO
BANFF
MIDALE
FROBISHER
ALIDA
TILSTON
LODGEPOLE
EXSHAW
BAKKEN
WABAMUN
TORQUAY
BLUERIDGE
NISKU
BIRDBEAR
IRETON
DUVERNAY
COOKING LK.
WATERWAYS
SWAN HILLS
GILWOOD
MUSKEG
KEG RIVER
CONTACT RAPIDS
COLD LAKE
LOTSBERG

Canadian Discovery Ltd.

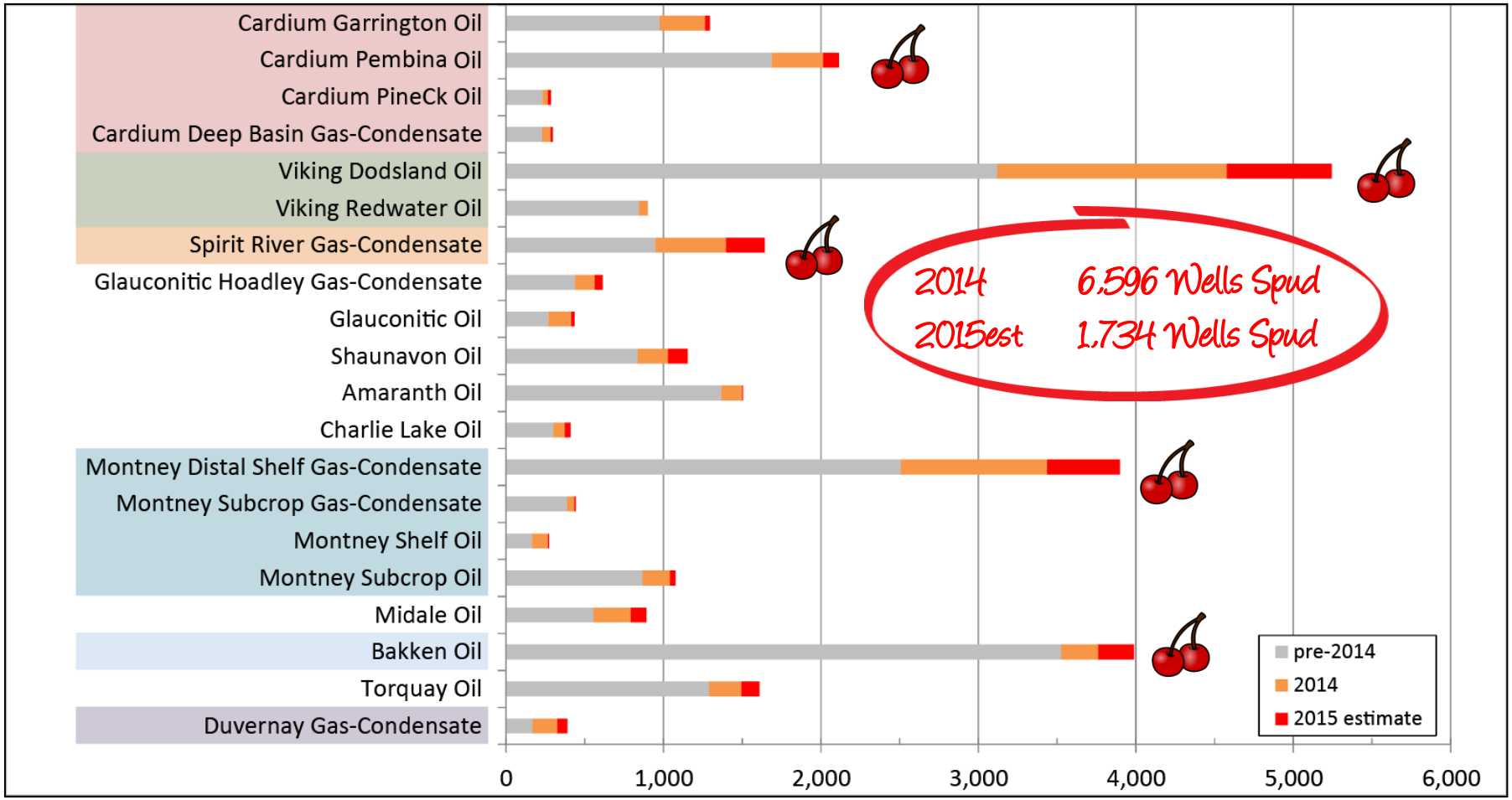
HISTORICAL
1994-2015 Vertical vs Horizontal Spuds



*to Oct 10, 2015

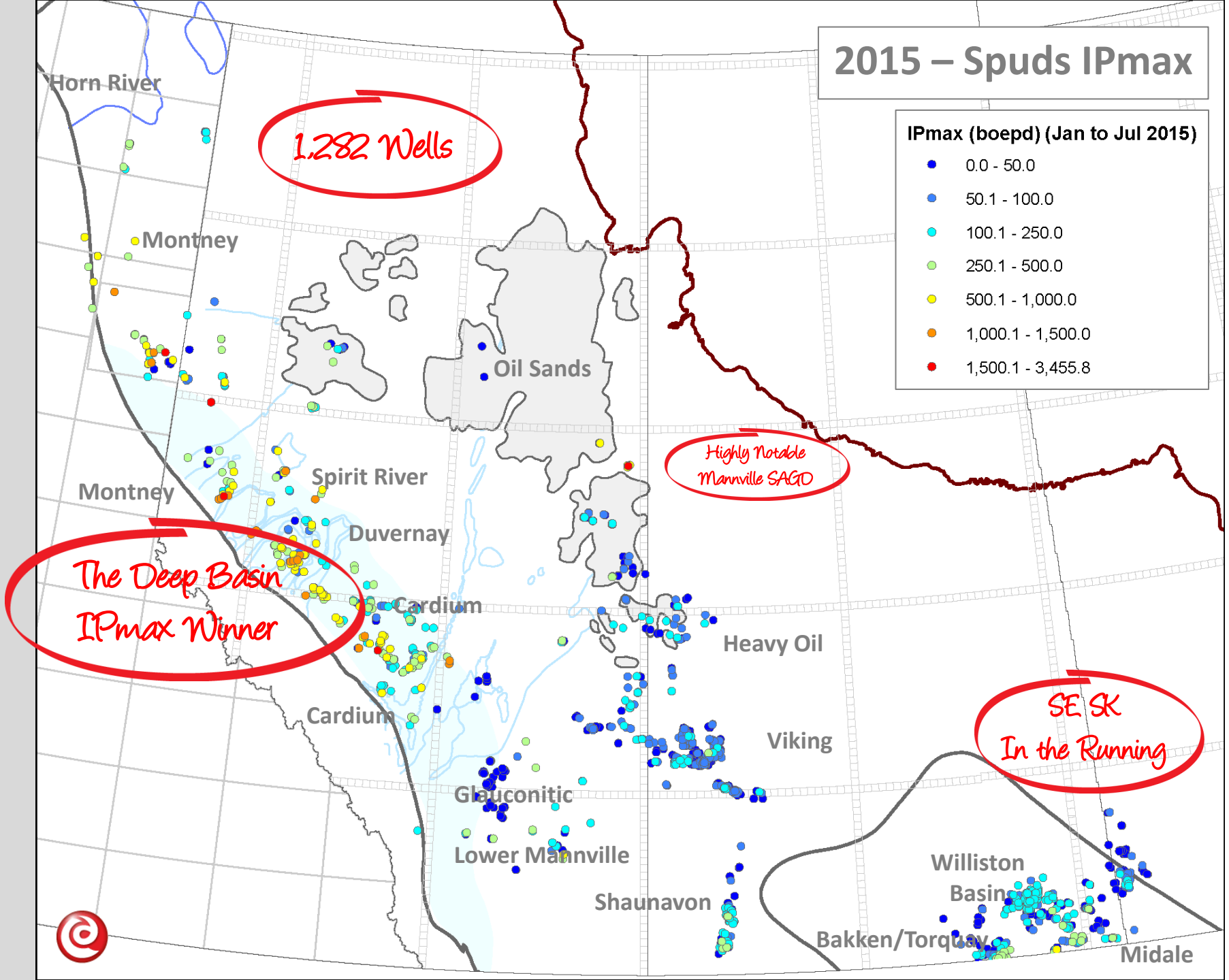
Powered by IHS Data; US EIA website

HISTORICAL
Selected Resource Plays – Wells Spud by Year



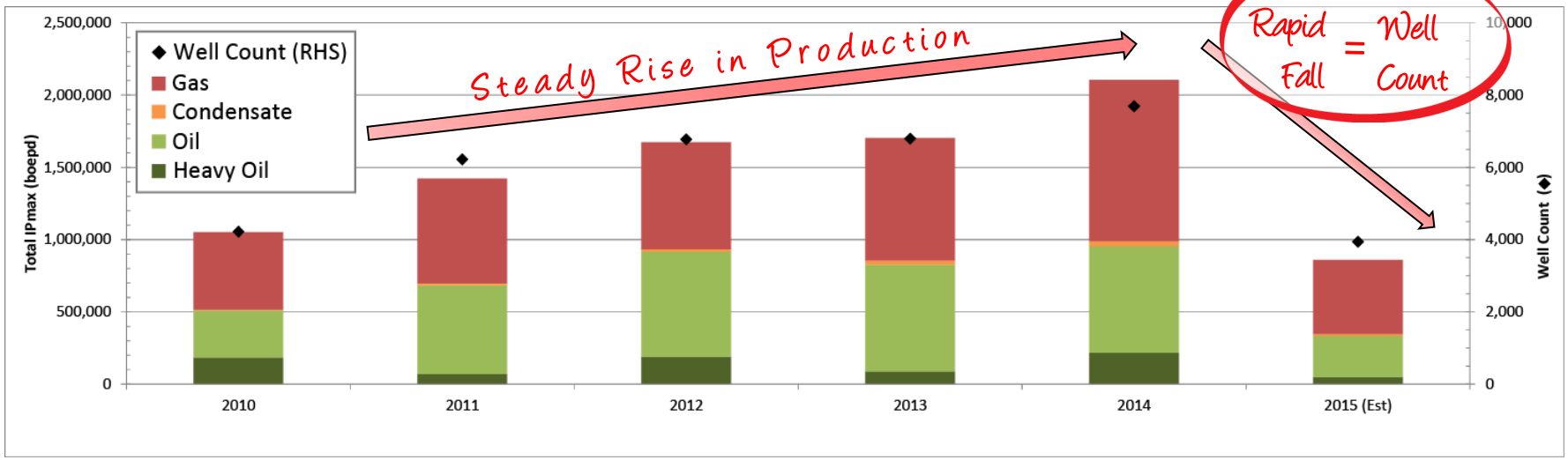
Powered by IHS Data

Production Metrics

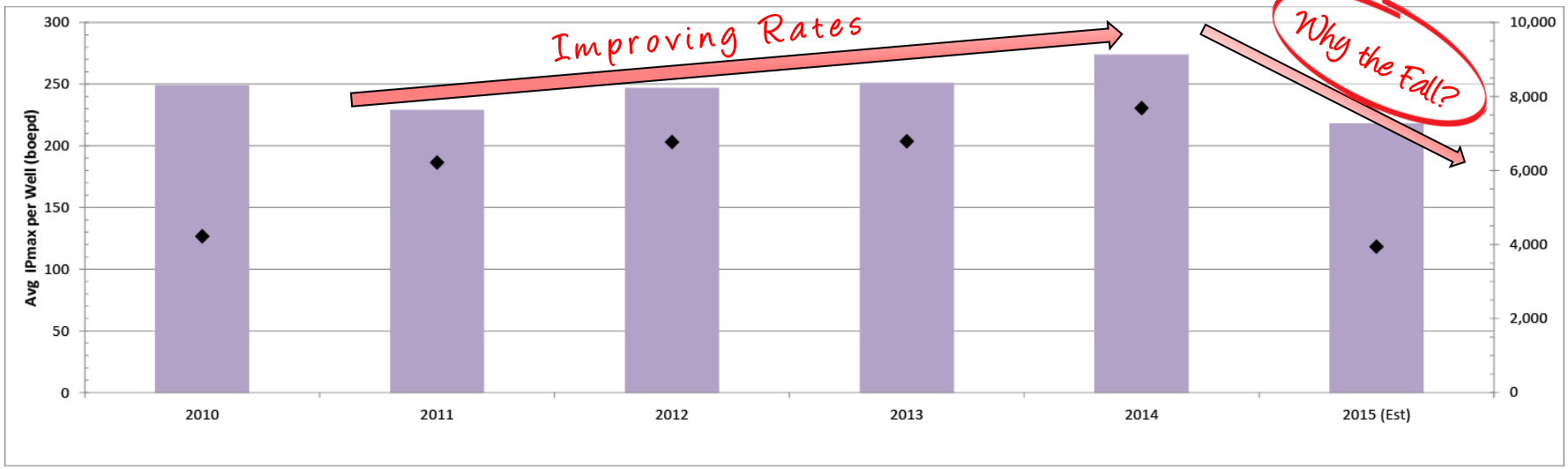

2015 – Spuds IPmax
IPmax (boepd) (Jan to Jul 2015)
0.0 - 50.0
50.1 - 100.0
100.1 - 250.0
250.1 - 500.0
500.1 - 1,000.0
1,000.1 - 1,500.0
1,500.1 - 3,455.8
1,282 Wells
Horn River
Montney
Oil Sands
Highly Notable Mannville SAGD
Montney
Spirit River
Duvernay
The Deep Basin IPmax Winner
Cardium
Heavy Oil
Cardium
Viking
SE SK In the Running
Glauconitic
Lower Mannville
Shaunavon
Williston Basin
Bakken/Torquay
Midale

PRODUCTION METRICS
WCSB Resource Wells - IPmax Trends

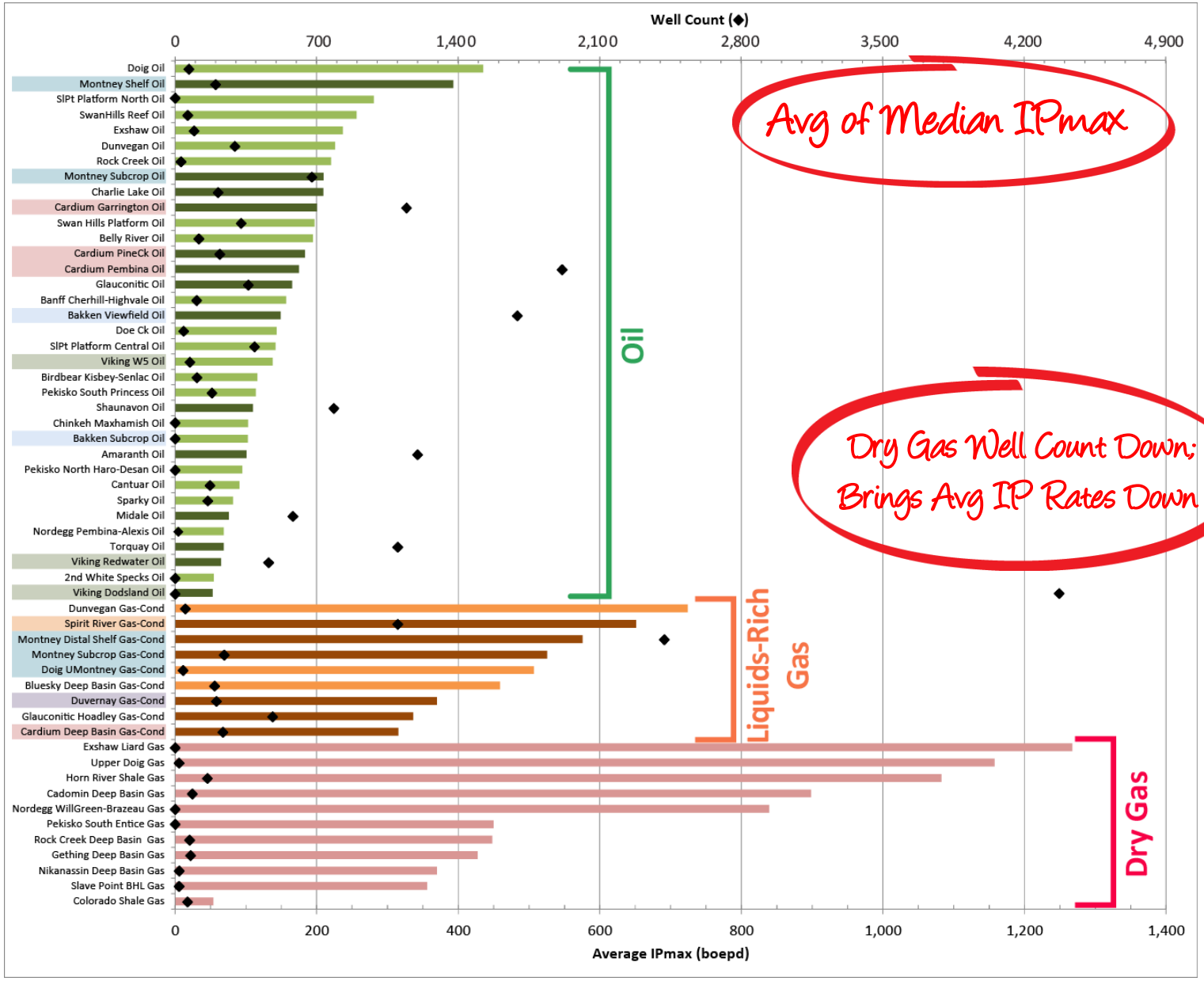
Total IPmax (boepd)



Average IPmax per well (boepd)



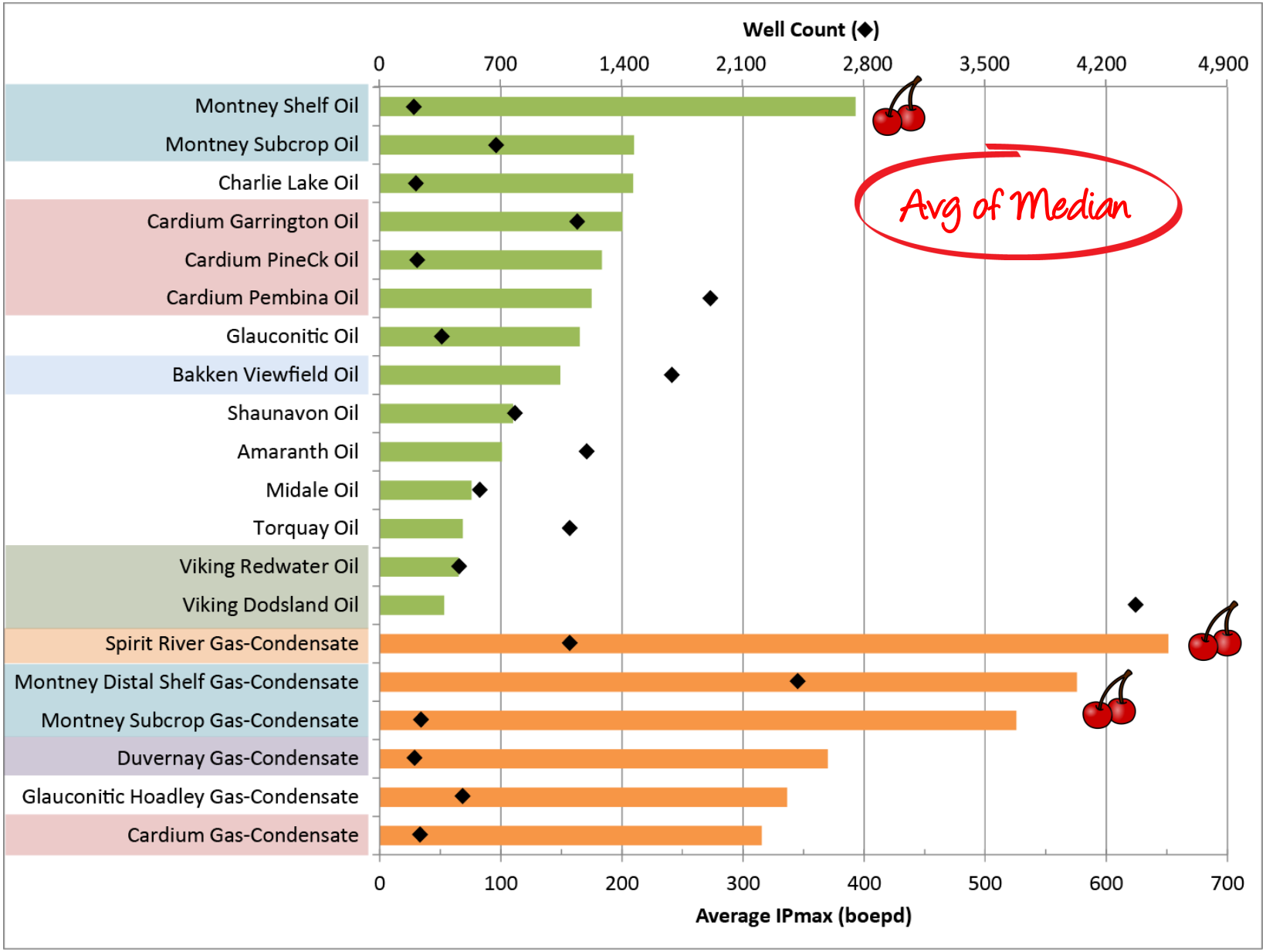
PRODUCTION METRICS
WCSB Resource Plays – Average IPmax



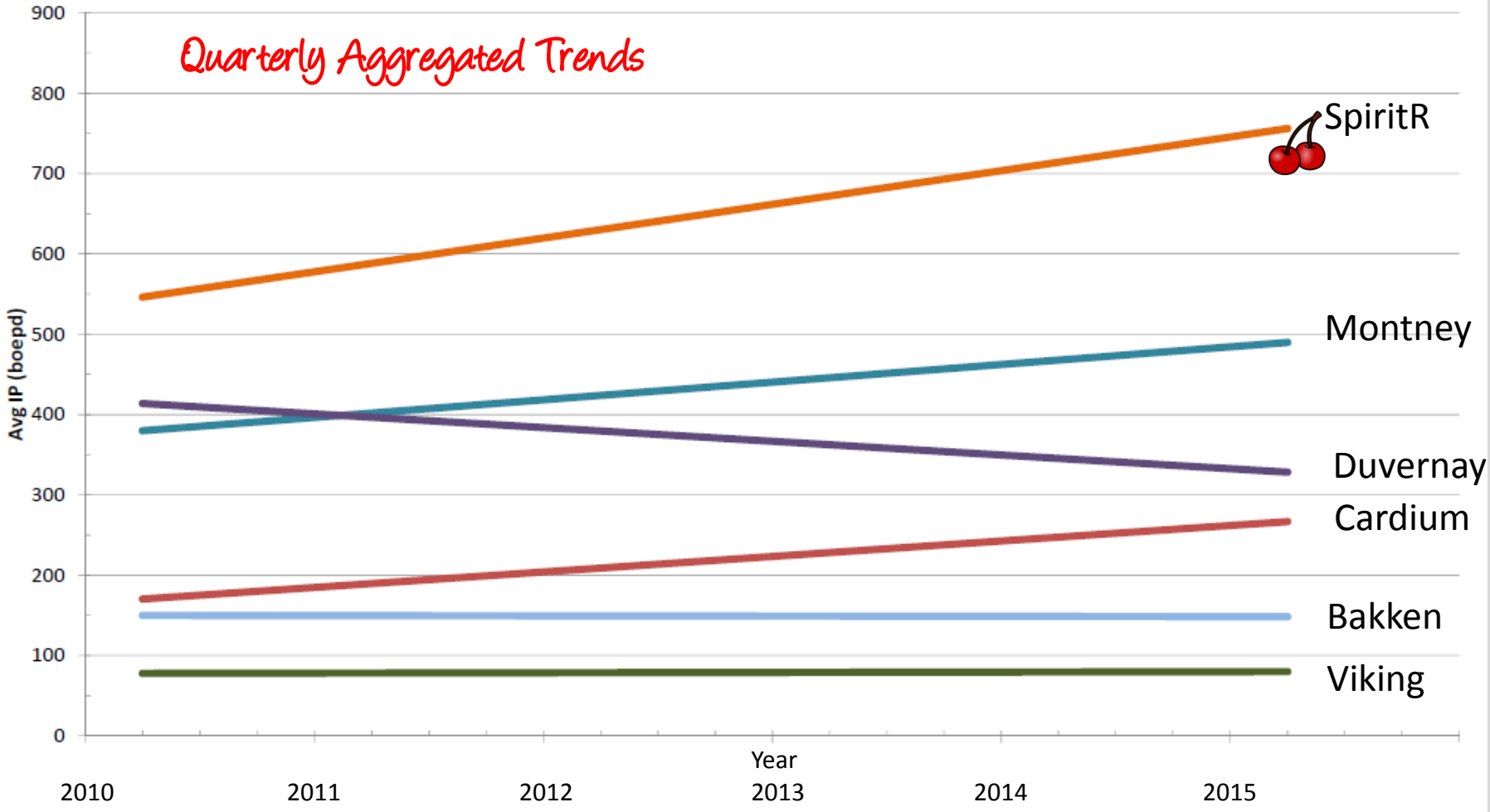
Canadian Discovery Ltd.

PRODUCTION METRICS

Selected Resource Plays – Average IPmax



PRODUCTION METRICS
Selected Plays – Average IPmax Trends

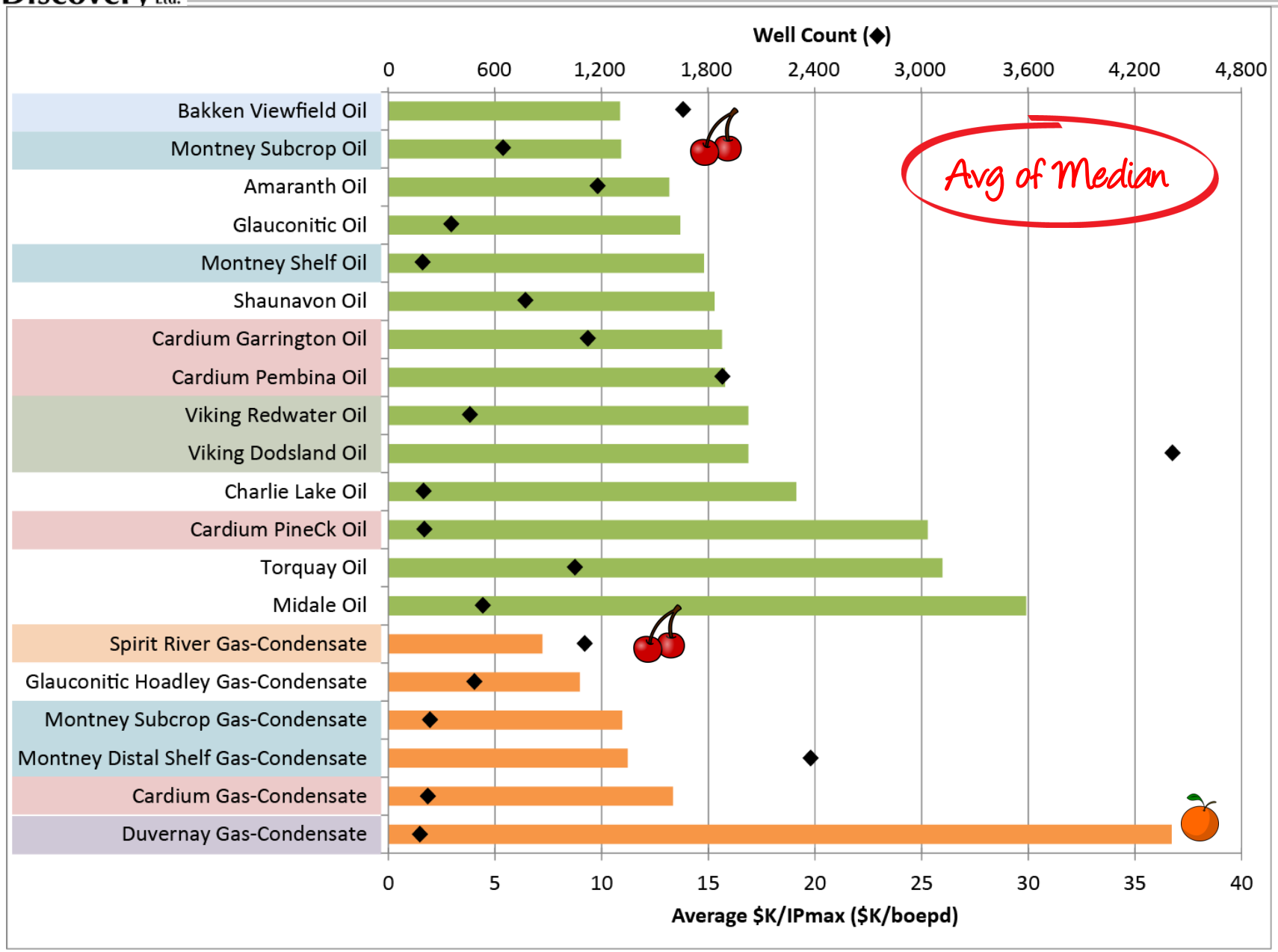


Powered by IHS Data

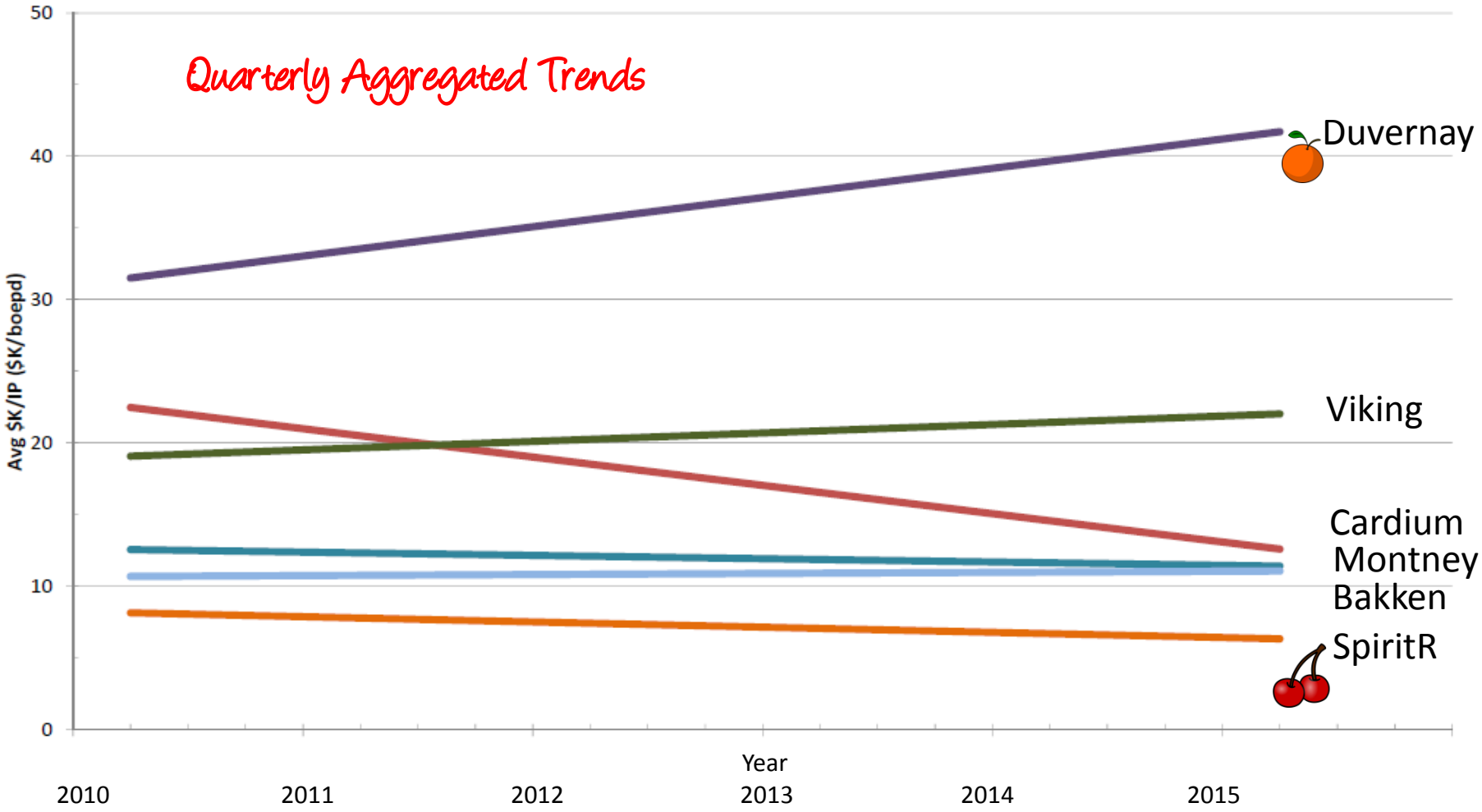
Canadian Discovery Ltd.

PRODUCTION METRICS

Selected Resource Plays – Average $K/BOEPD



PRODUCTION METRICS
Selected Plays – Average $K/BOEPD Trends

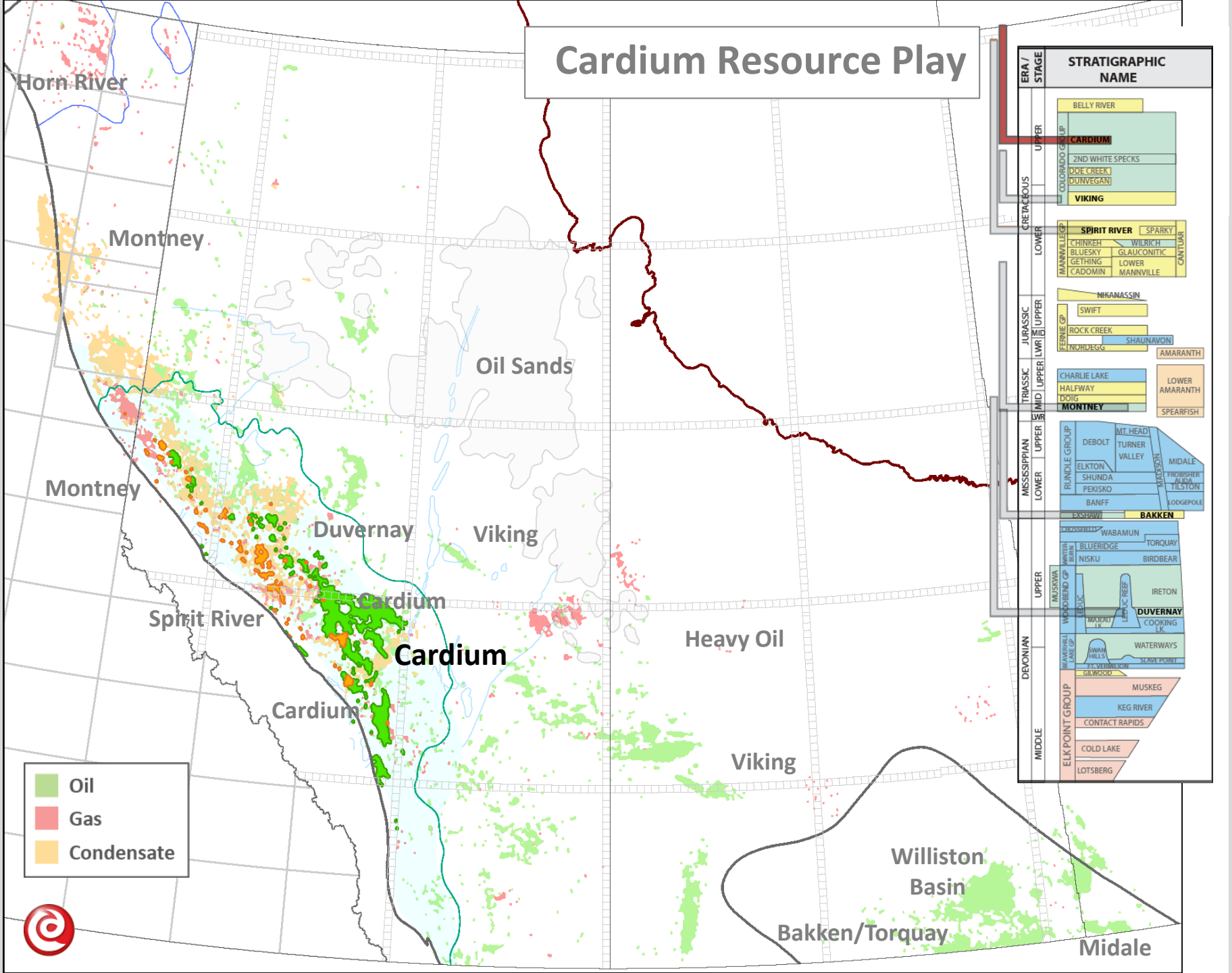


Powered by IHS Data

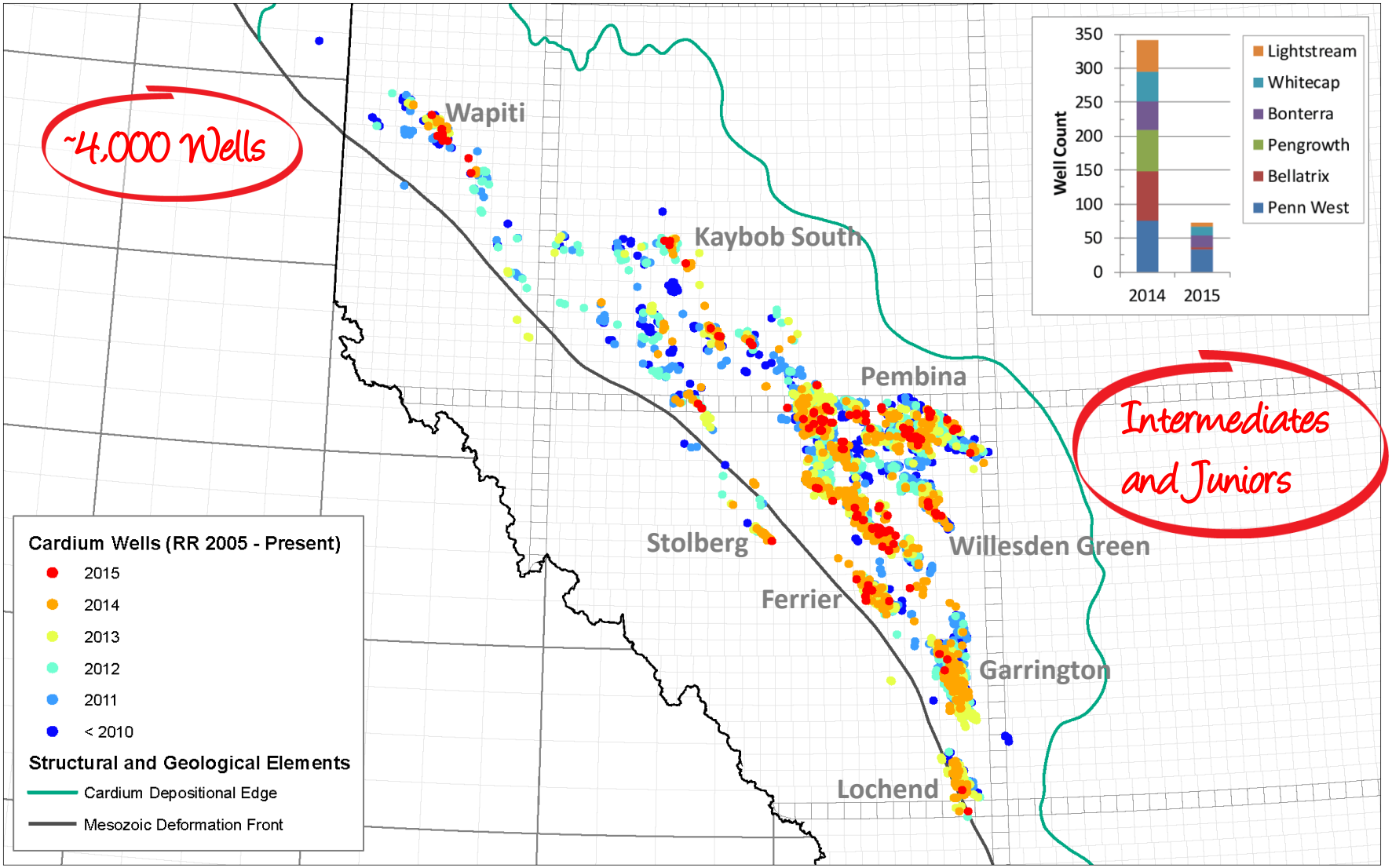
Most Active Resource Plays

Low(er) Hanging Fruit

Cardium Resource Play



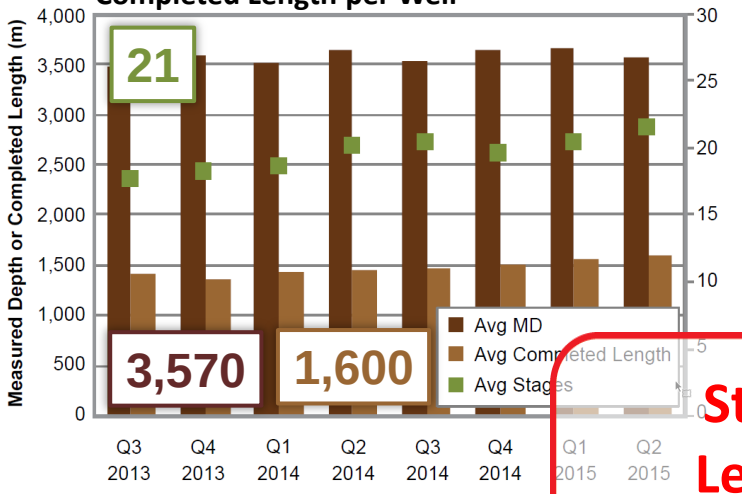
CARDIUM
Play Development



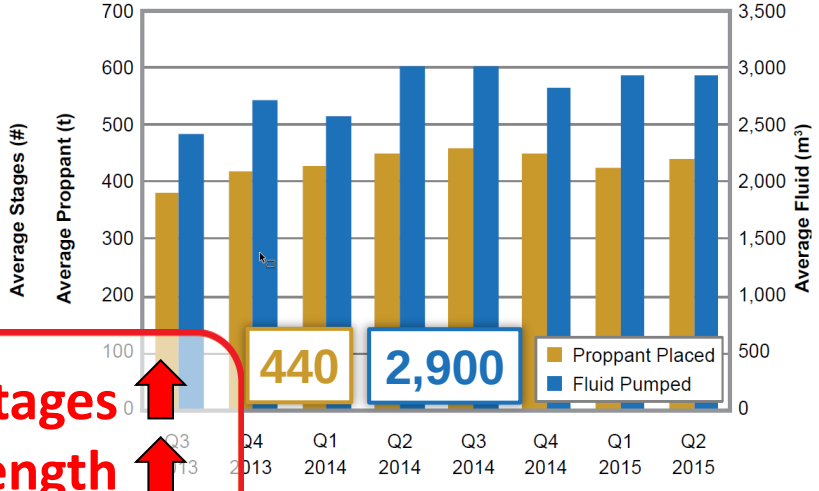
Powered by IHS Data

Cardium Oil Completions Trends

Avg Stages, Measure Depth and Completed Length per Well

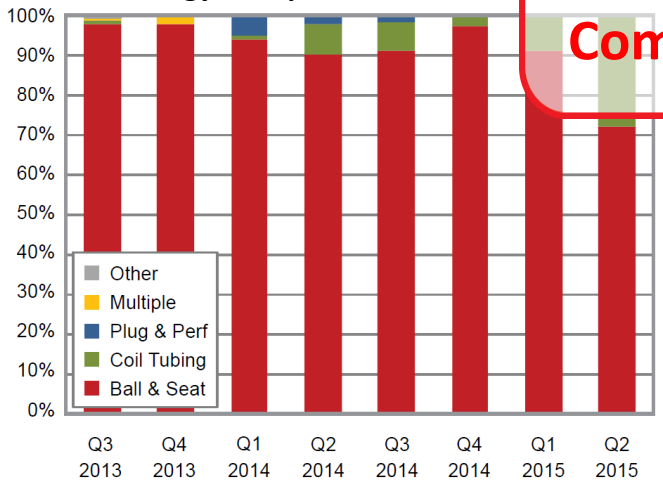


Avg Proppant and Fluid per Well

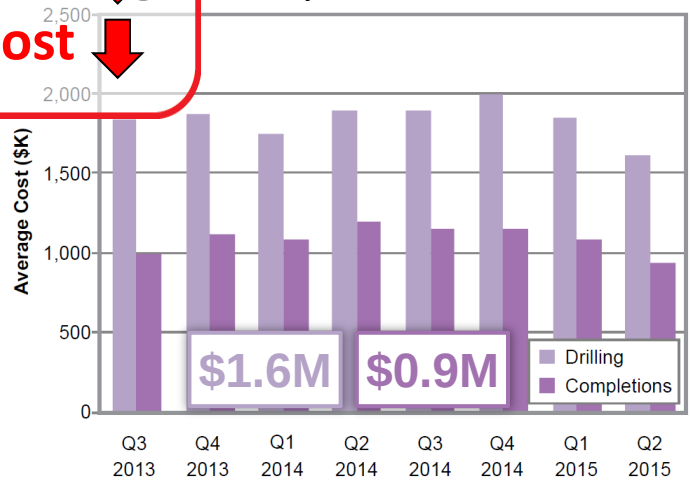


Stages ↑
Length ↑
Drill Cost ↓
Comp Cost ↓

Technology Group Distribution

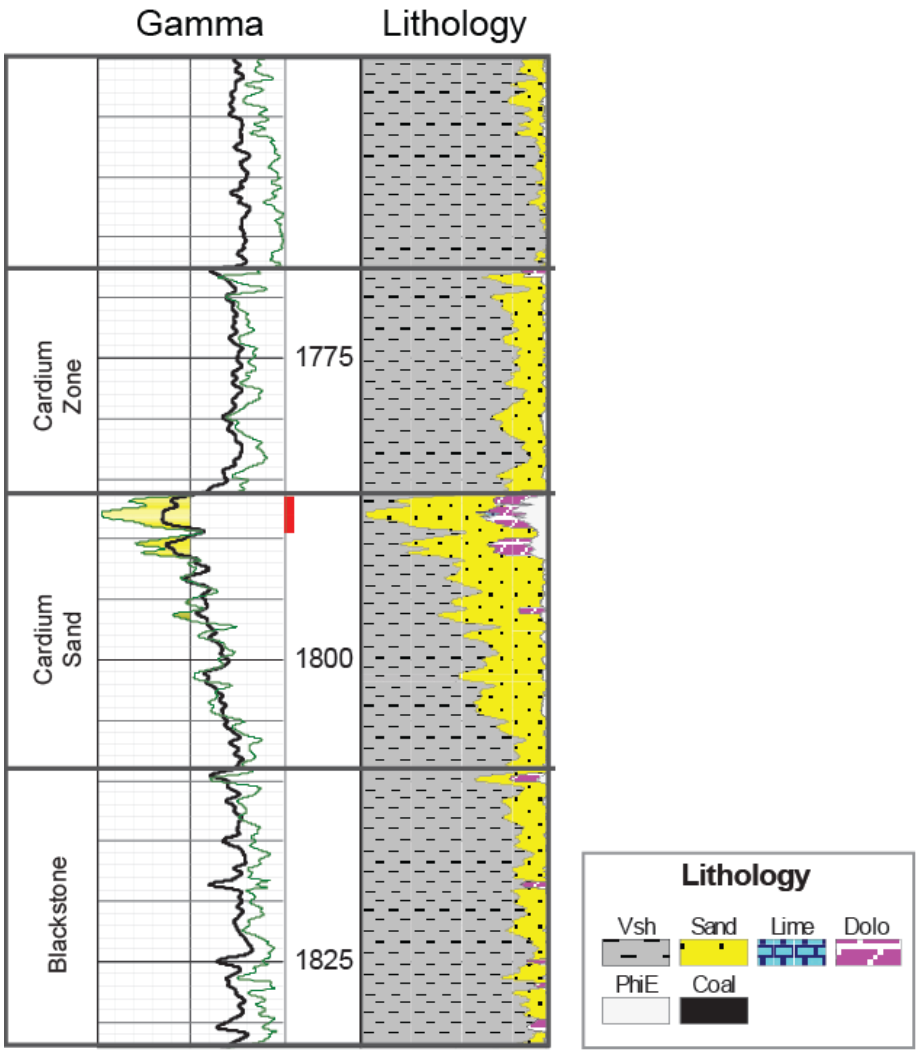


g D&C Costs per Well



CARDIUM
Pros and Cons

14-20-50-12W5



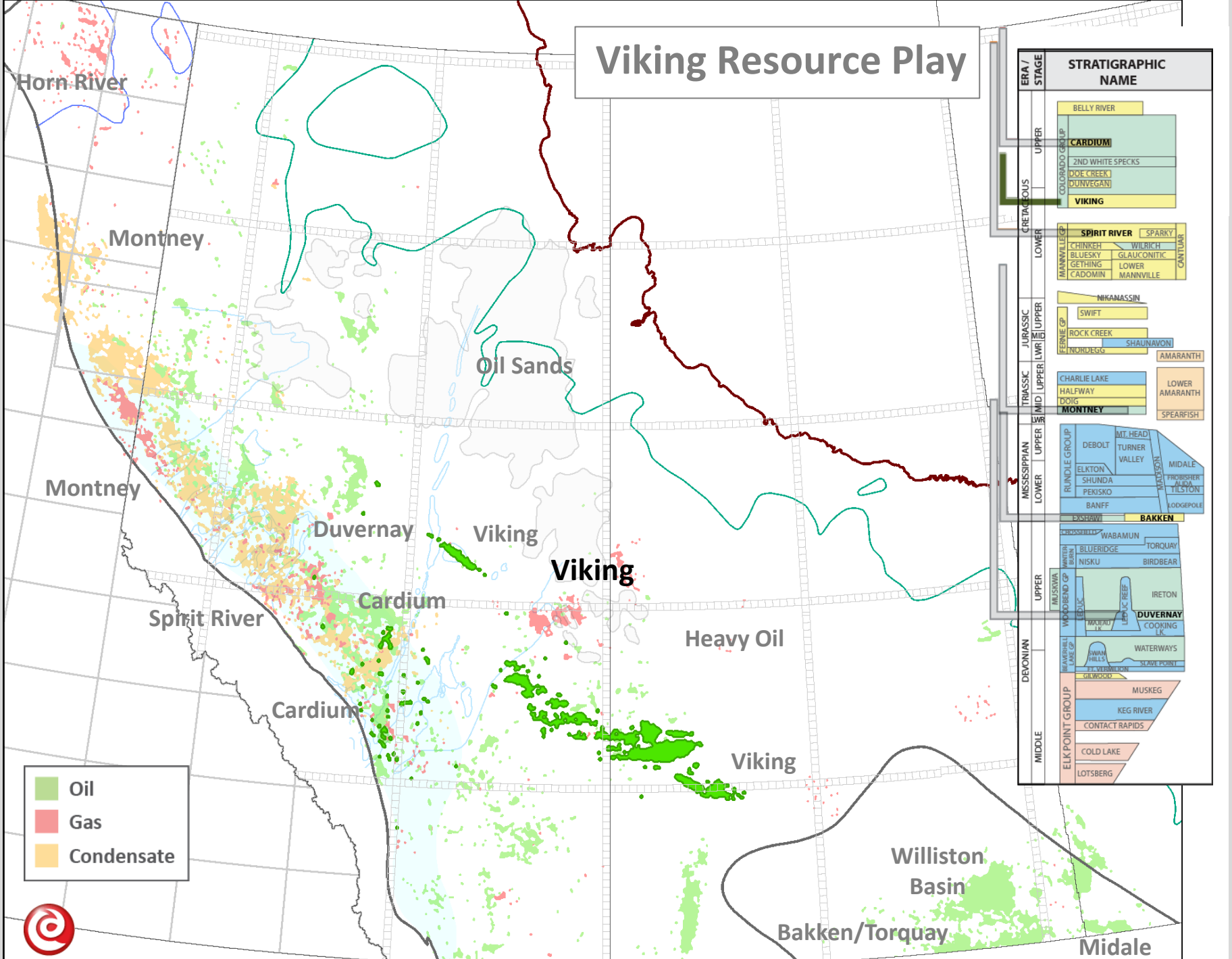
Pros
- IPmax trend ⇧
- $K/IPmax trend ⇩
- Drill, Comp Costs ⇩
- Existing Infrastructure

Cons
- 2014 vs 2015 Activity ⇩
- Net Pay 2-15m

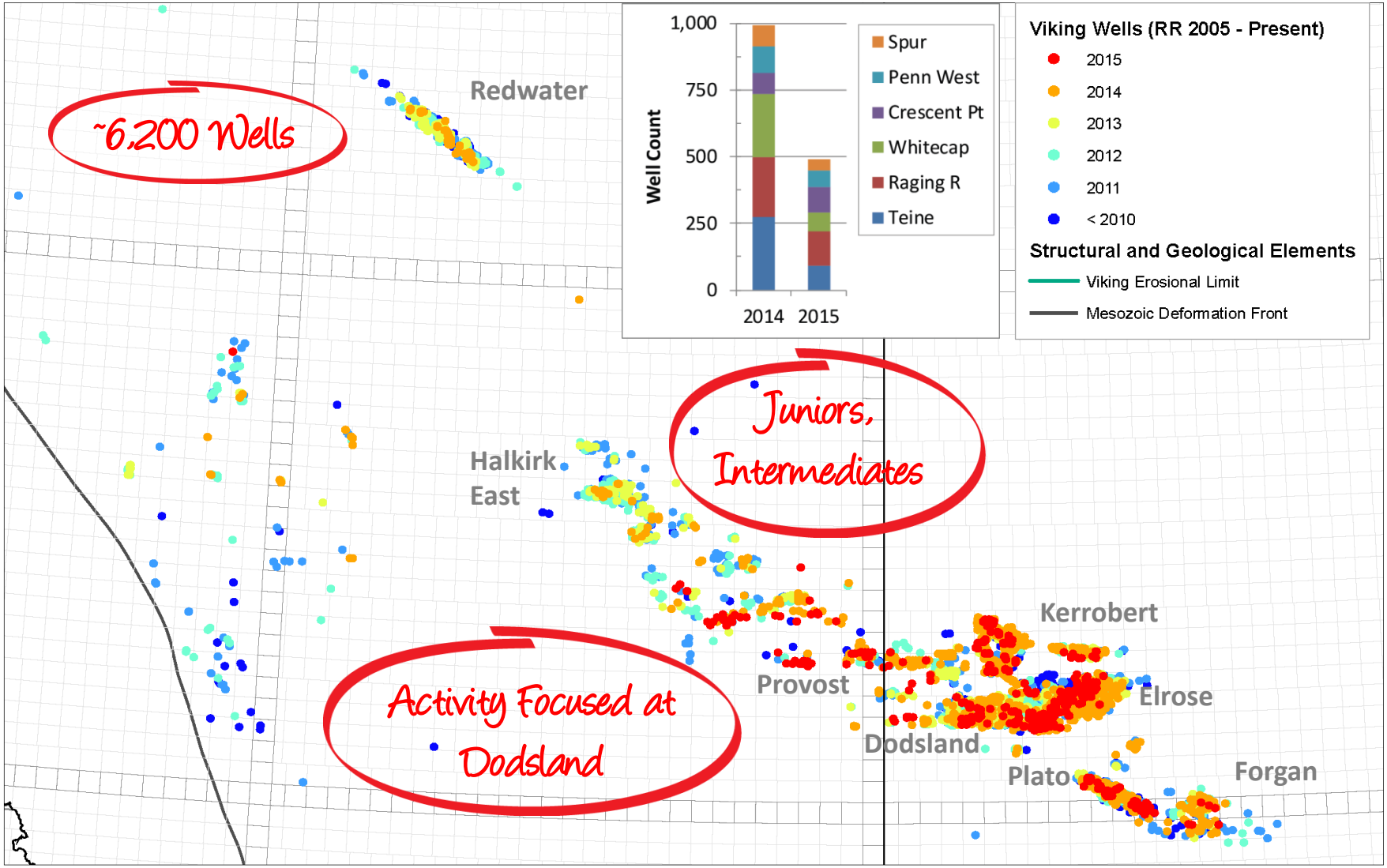
Summary
- Avg D&C Cost - $2.7MM
- $K/IPmax - $17.0K

Log Analysis generated by HDS Petrophysical Software™; Powered by IHS Data

Viking Resource Play



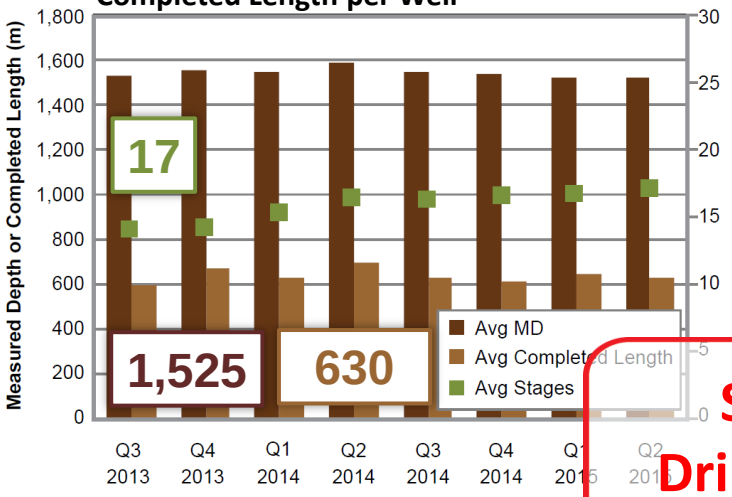
VIKING
Play Development



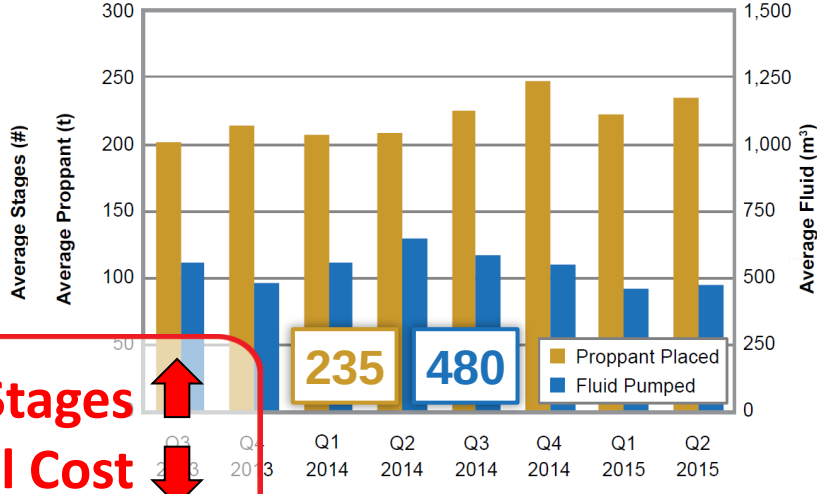
Powered by IHS Data

Viking Oil Completions Trends

Avg Stages, Measured Depth and Completed Length per Well



Avg Proppant and Fluid per Well

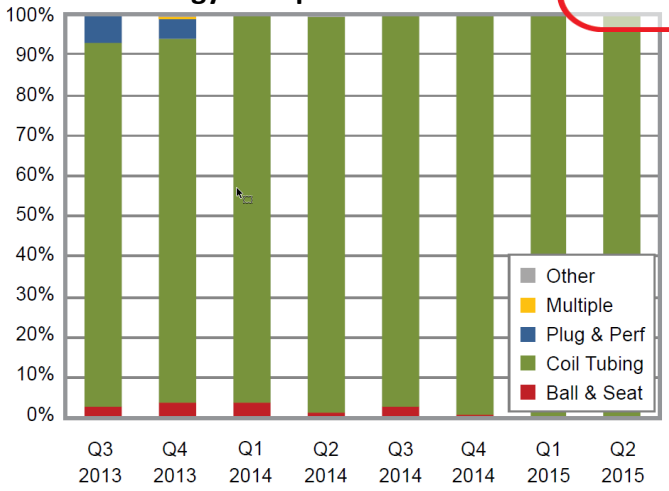


Stages

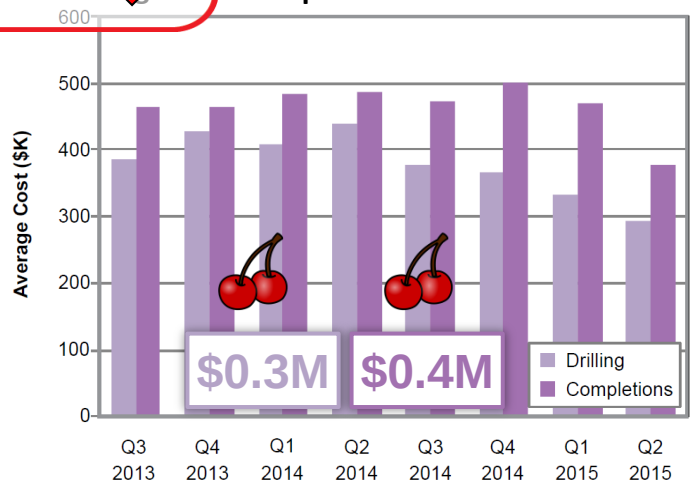
Drill Cost

Comp Cost

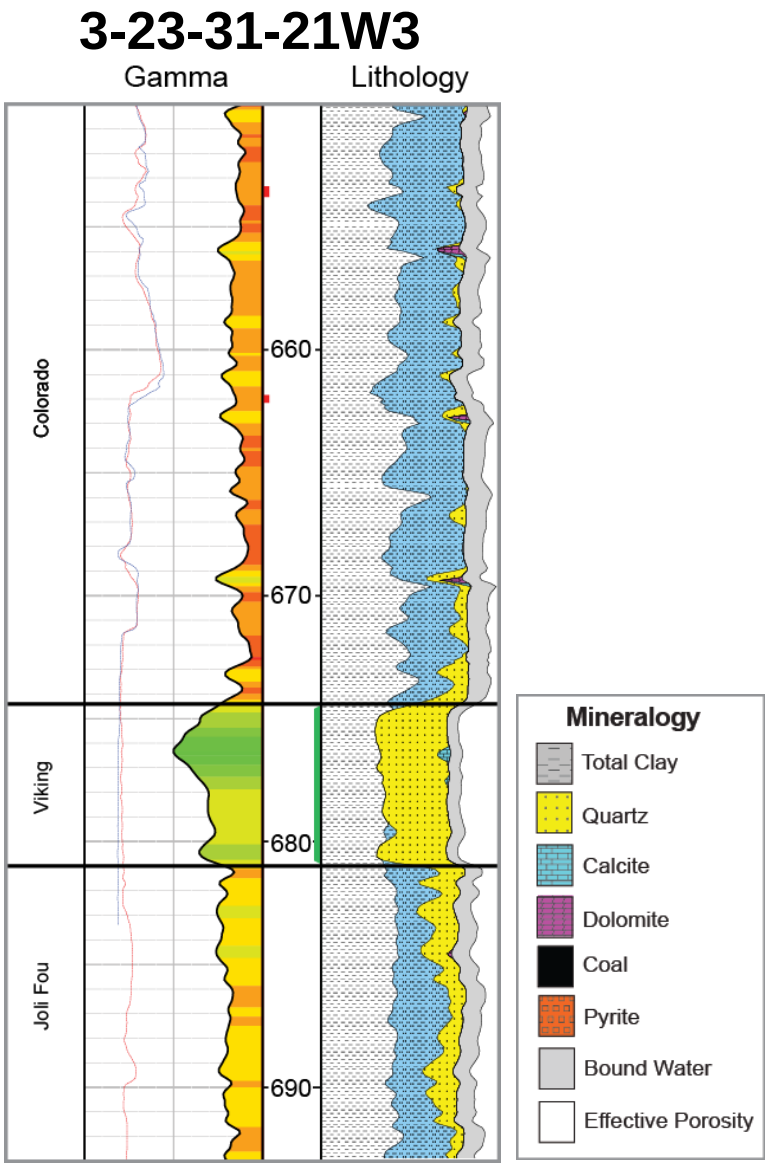
Technology Group Distribution



Avg D&C Costs per Well



VIKING
Pros and Cons



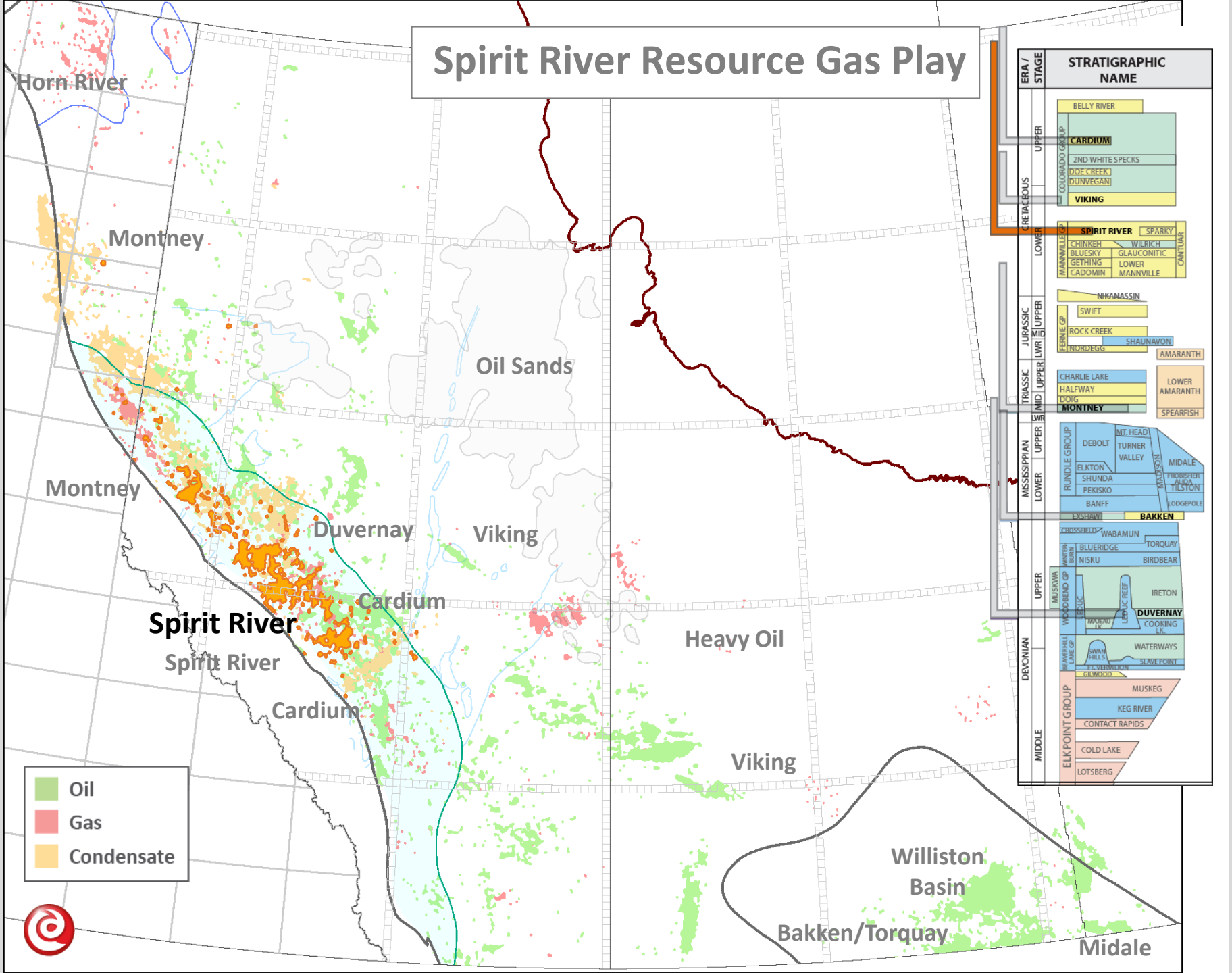
Pros
- Most active play WCSB
- Lowest cost play WCSB
- IPmax trend steady ⇔
- $K/IPmax trend steady ⇔
- Drill, Comp Costs ⇩

Cons
- Net Pay 5-10m

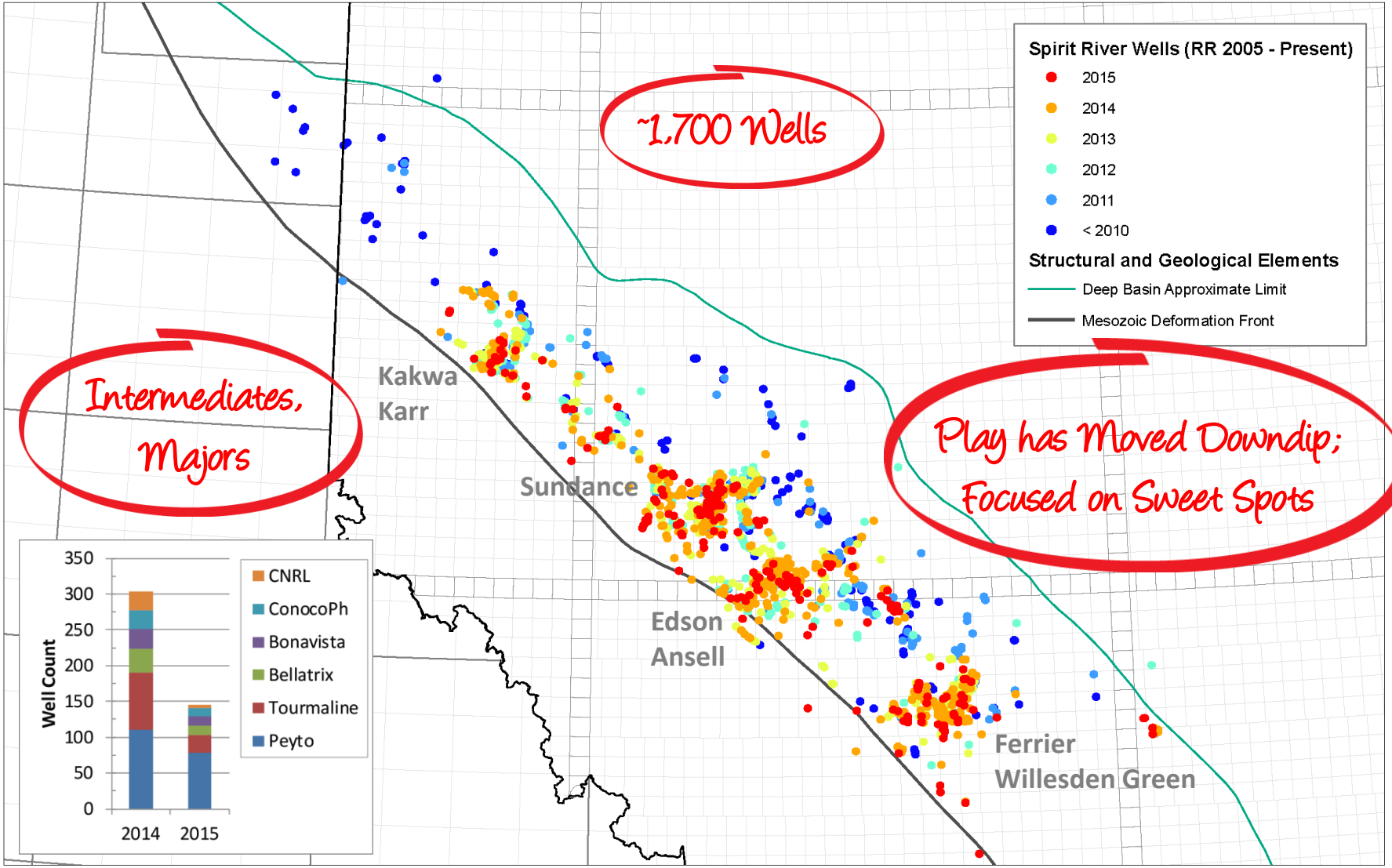
Summary
- Avg D&C Cost - $0.7MM
- $K/IPmax - $15.0K

Log analysis generated with GeoLog Multimin® Software; Powered by IHS Data

Spirit River Resource Gas Play

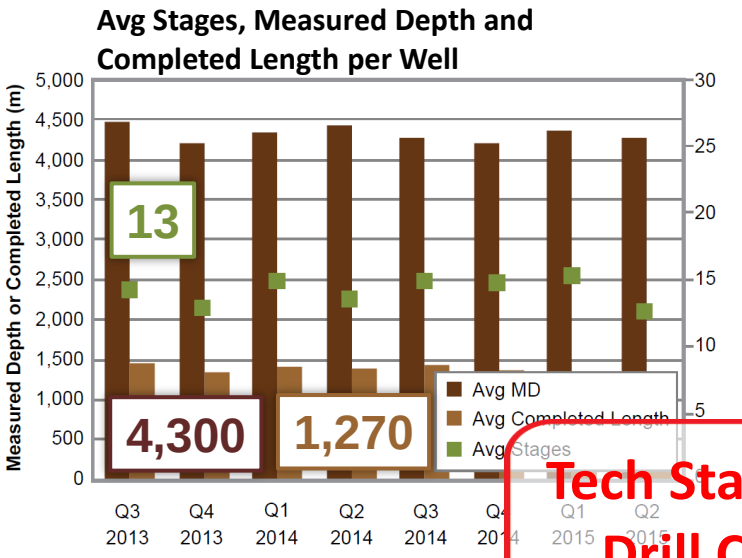


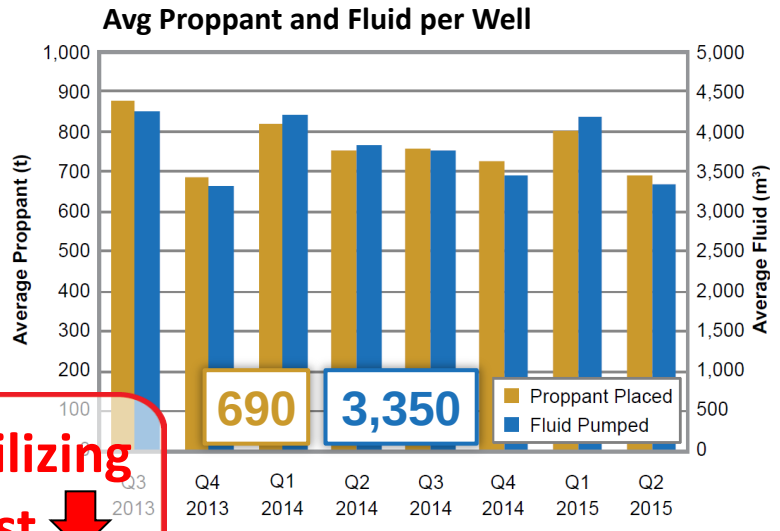
SPIRIT RIVER
Play Development



Powered by IHS Data

Spirit River Gas Completions Trends

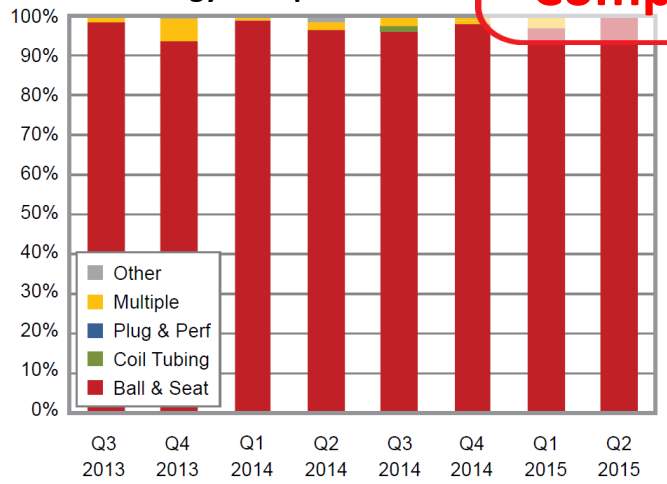


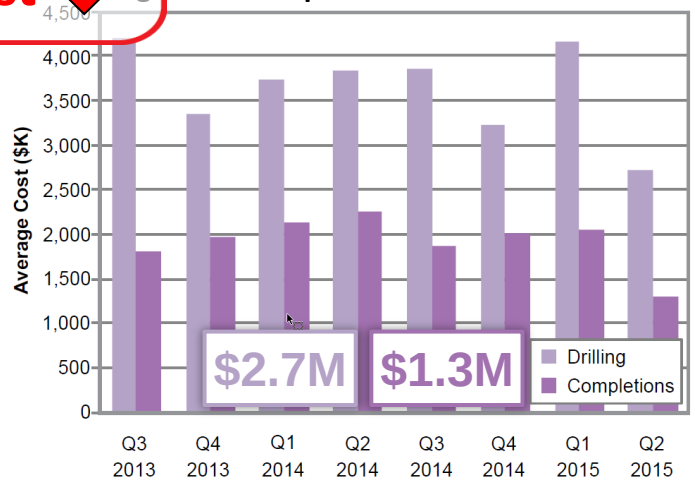


Tech Stabilizing

Drill Cost ↓

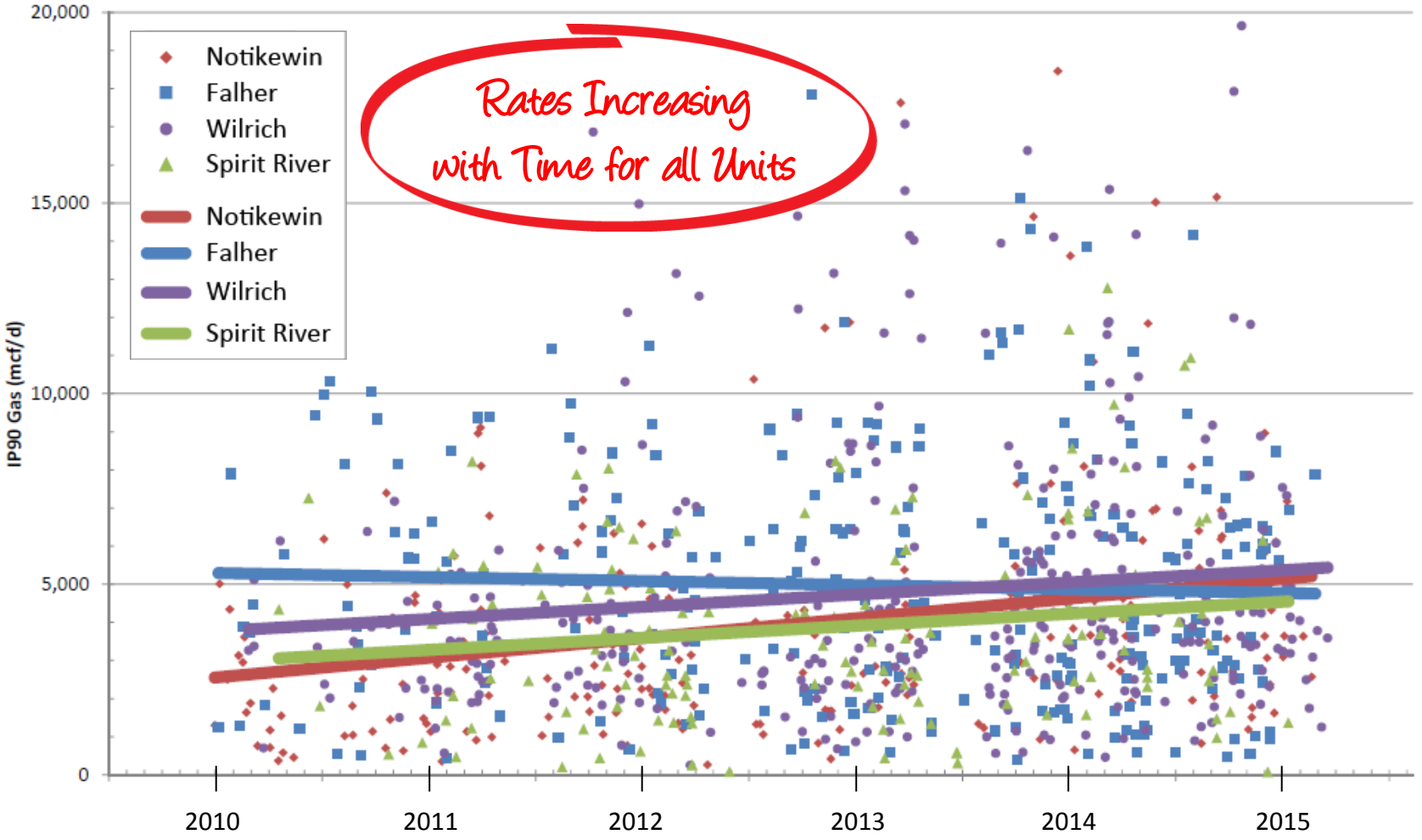
Comp Cost ↓





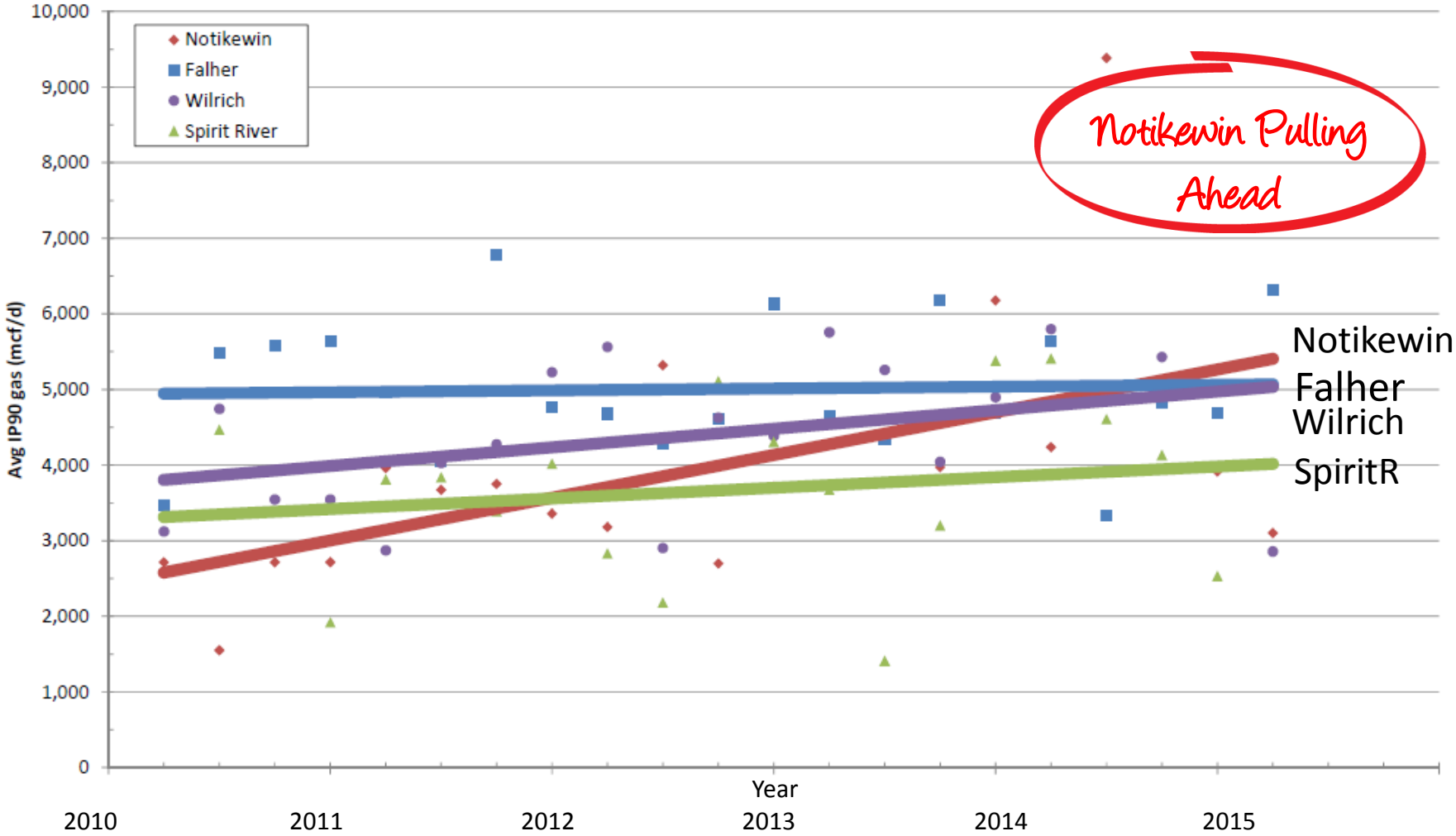
Data from Canadian Discovery's Well Completions & Frac Database

SPIRIT RIVER
IP90 Production Trends



Powered by IHS Data

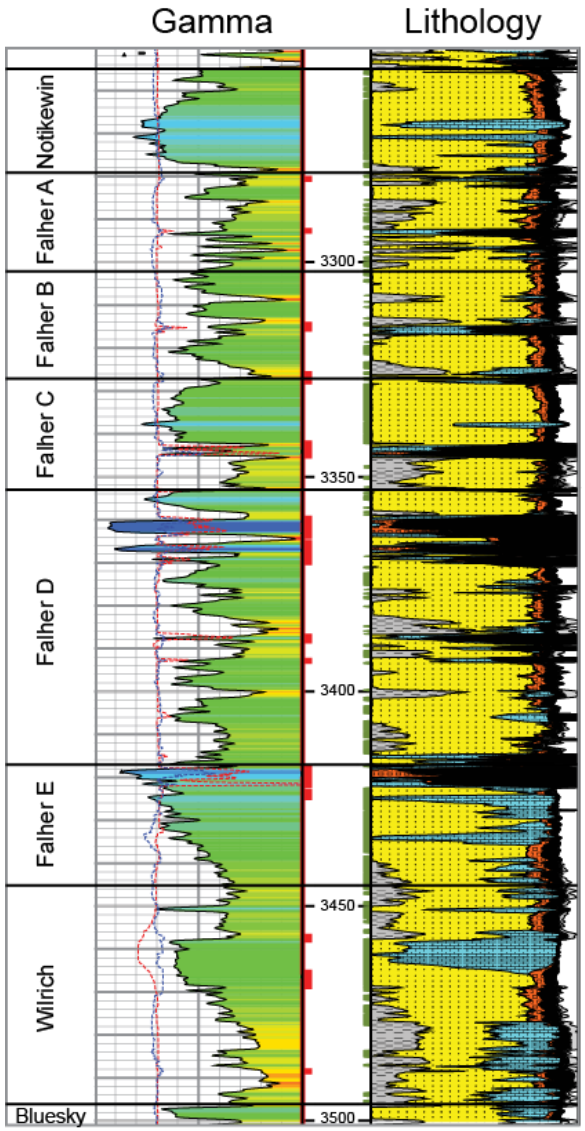
SPIRIT RIVER
Quarterly IP90 Production Trends



Powered by IHS Data

SPIRIT RIVER
Pros and Cons

5-23-57-1W6

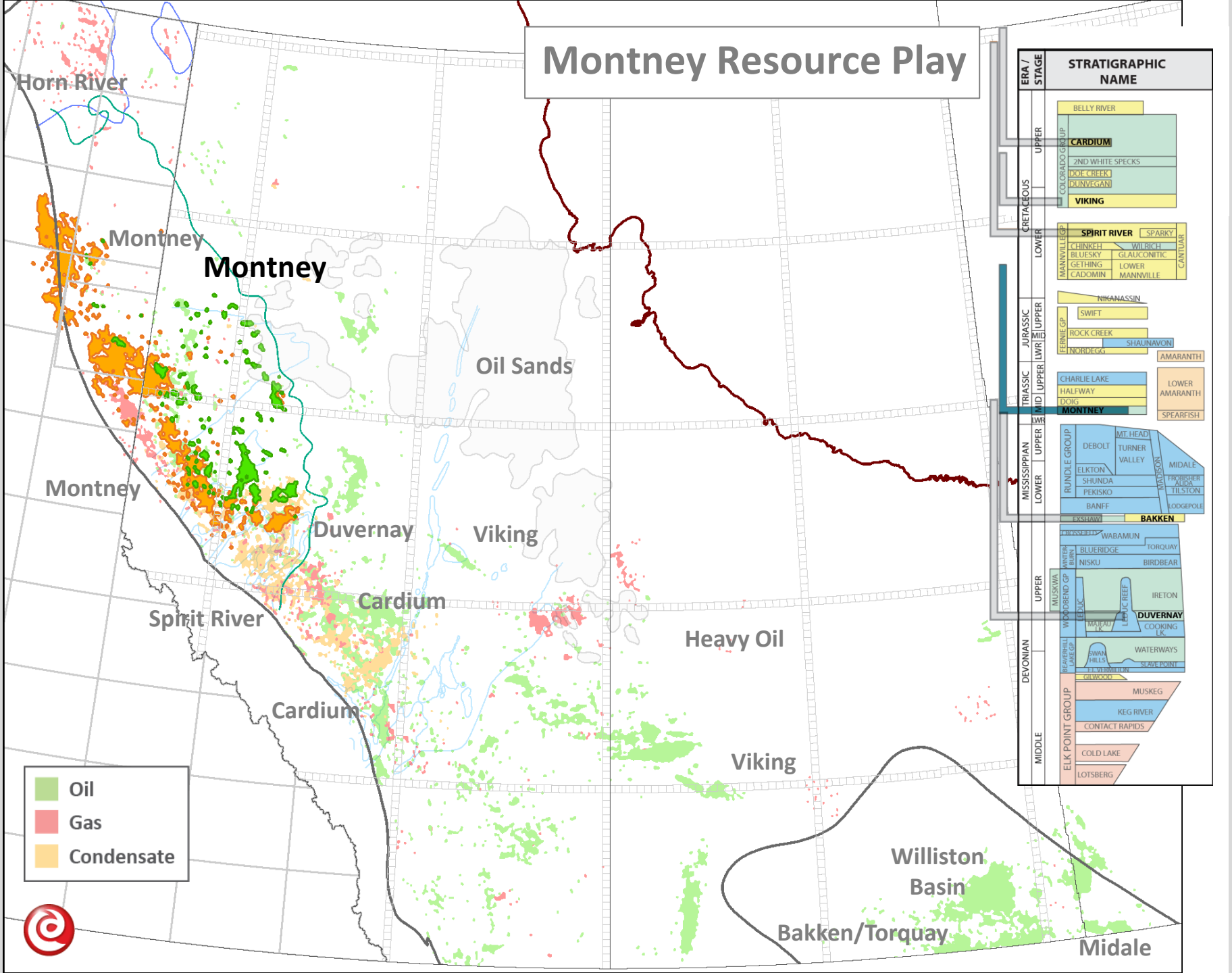


Pros
- Highest IP rates, trend ⇧
- $K/IPmax ⇩
- Drill, Comp Costs ⇩
- Net Pay ~ 120m

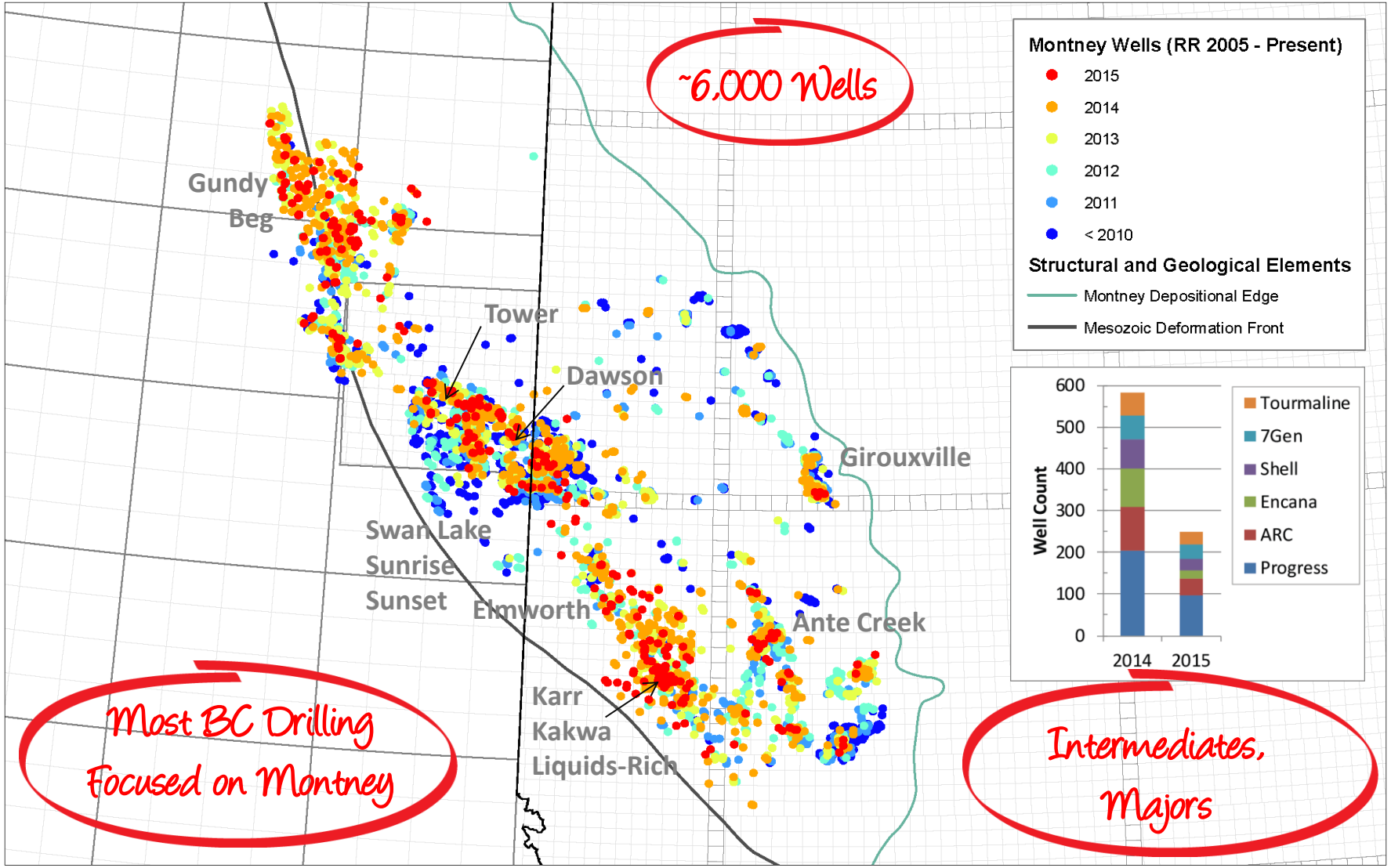
Cons
- Capital Intensive
- Reservoir heterogeneity
- Liquids variable

Summary
- Avg D&C Cost - $4.0MM
- $K/IPmax - $6.3K

Montney Resource Play



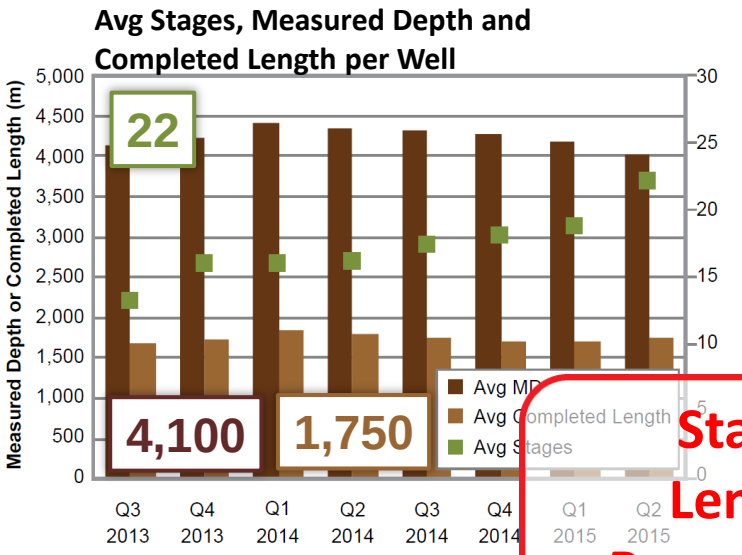
MONTNEY
Play Development

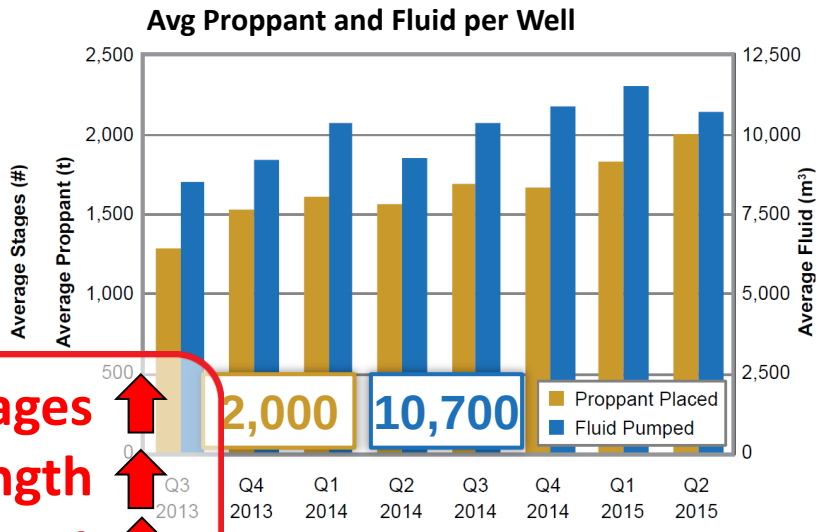


Powered by IHS Data

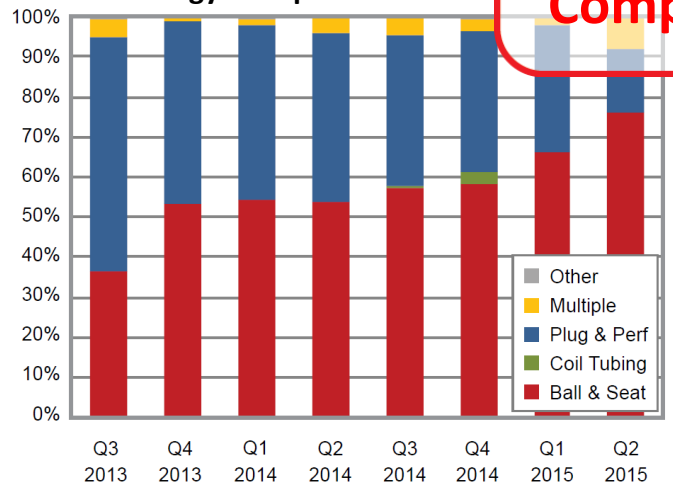
MONTNEY

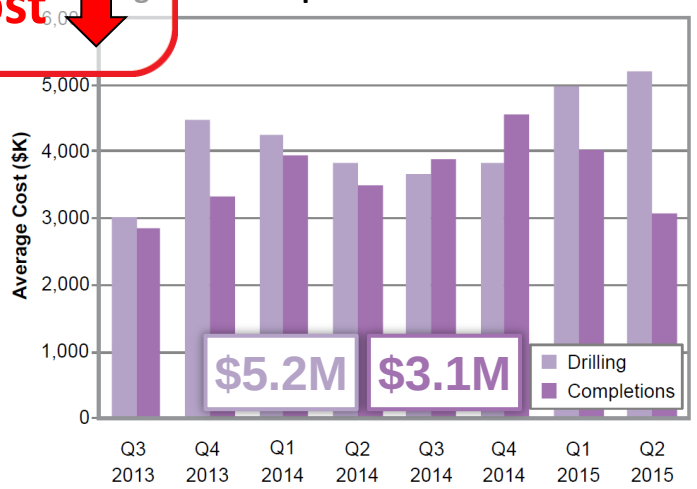
Montney Gas Completions Trends





Stages
Length
Proppant
Comp Cost



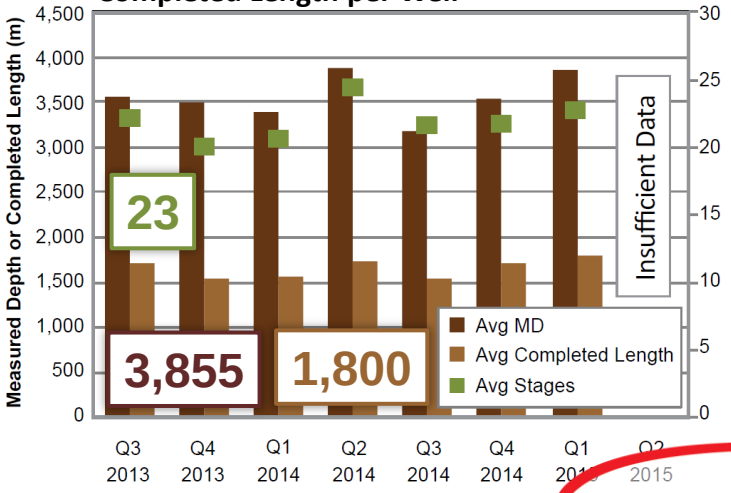


Data from Canadian Discovery's Well Completions & Frac Database

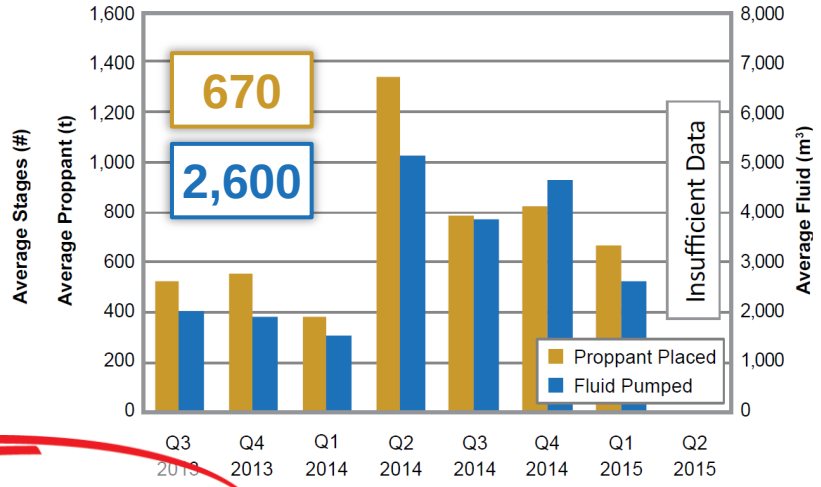
MONTNEY

Montney Oil Completions Trends

Avg Stages, Measured Depth and Completed Length per Well

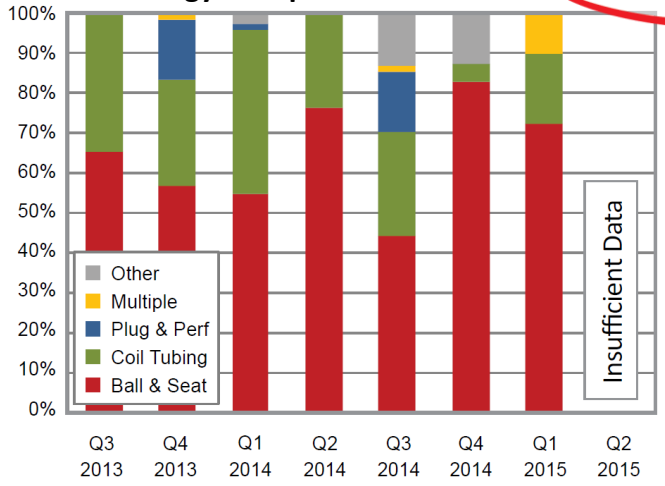


Avg Proppant and Fluid per Well

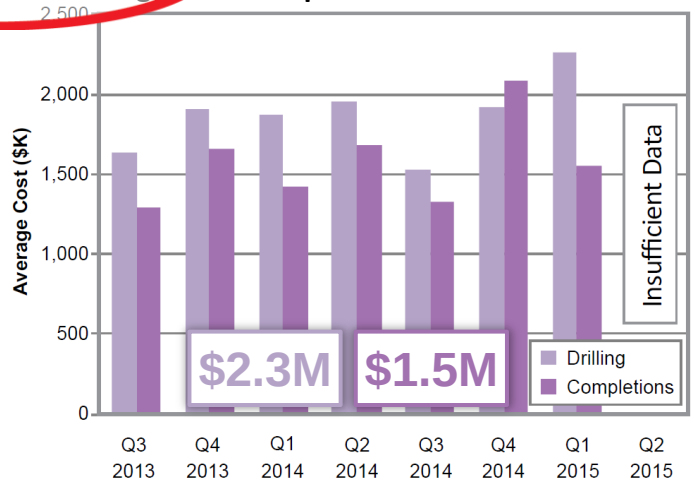


Still Experimenting

Technology Group Distribution

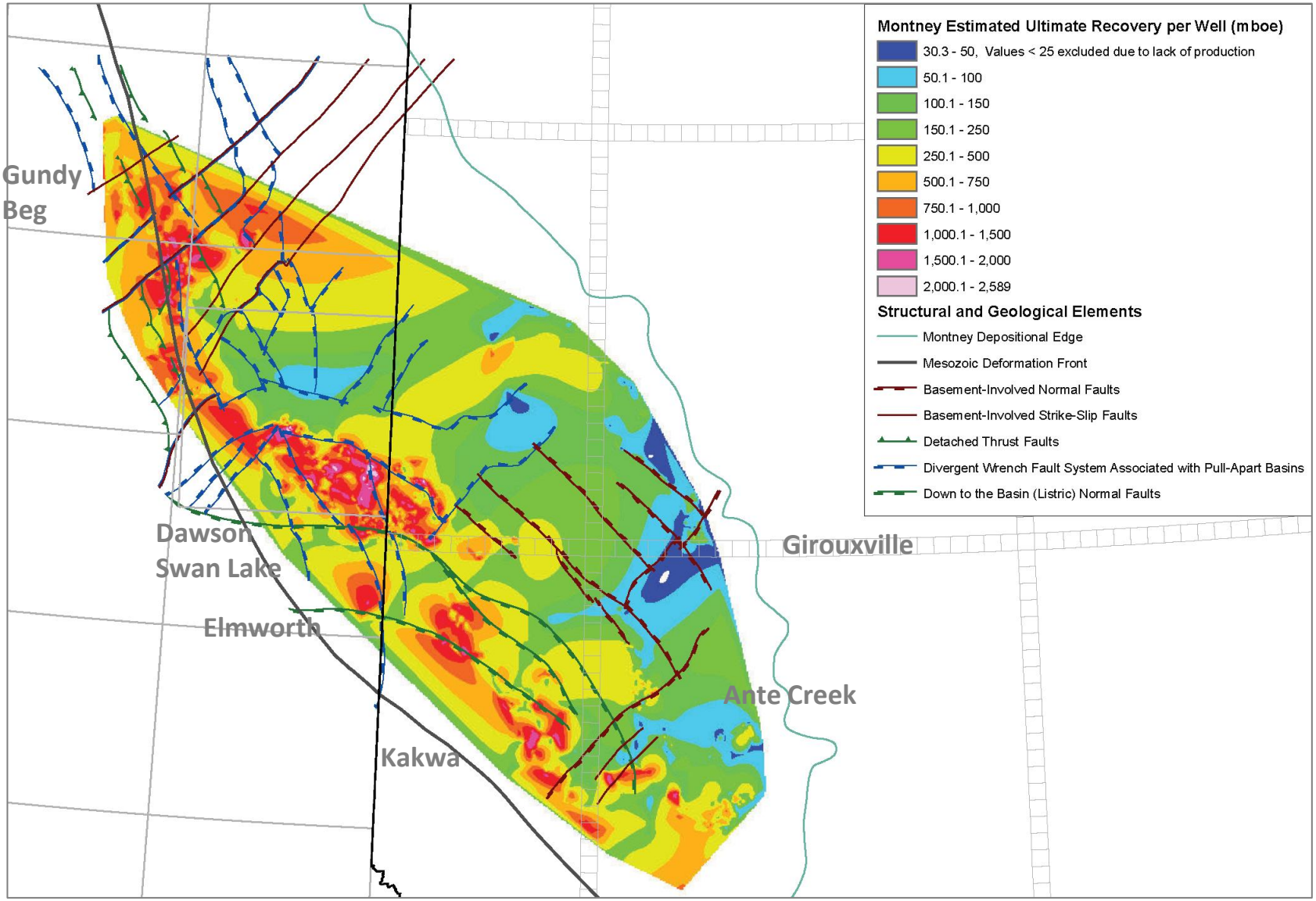


Avg D&C Costs per Well

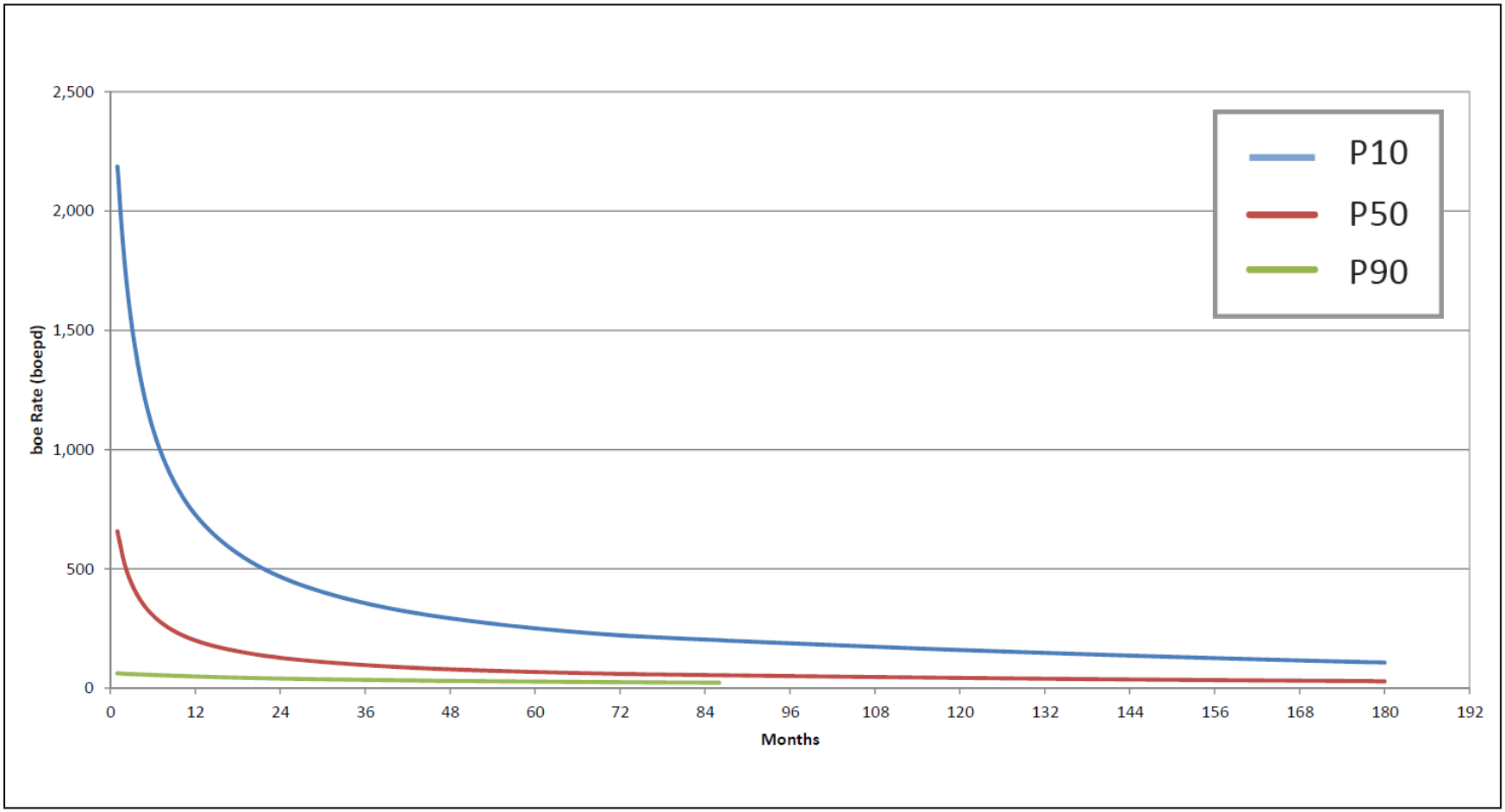


Data from Canadian Discovery's Well Completions & Frac Database

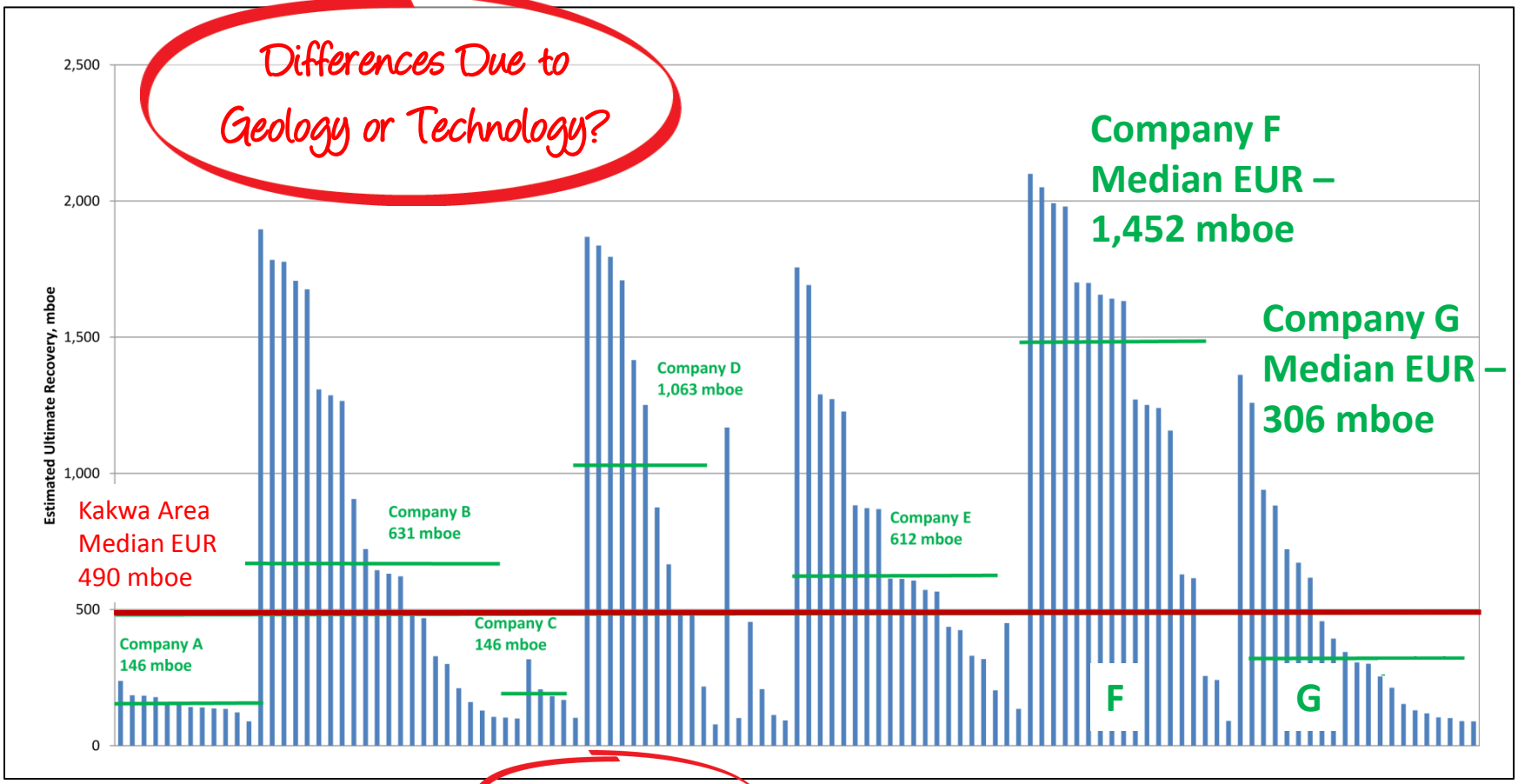
MONTNEY
Estimated Ultimate Recovery (EUR) per Well



Kakwa-Karr BOE Type Curve



Montney Kakwa Operator EUR Comparison

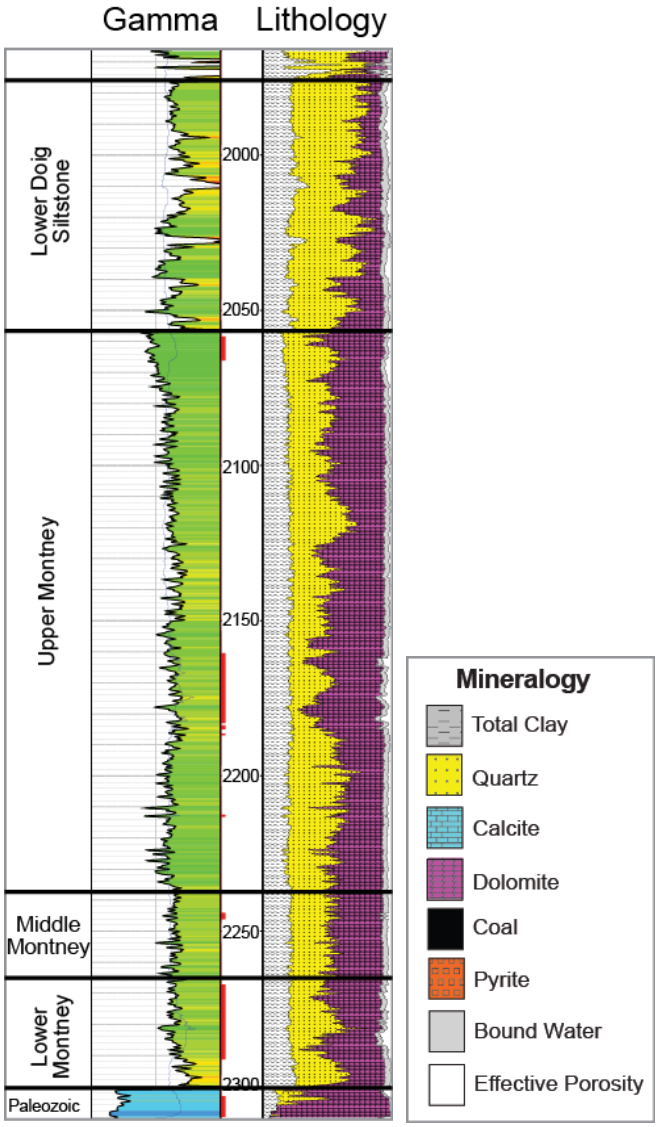


Company F vs Company G — Tech Wins

- Bigger Completions (Longer Laterals, More Stages , More Proppant/Fluid
- D&C Costs – 58% Higher
- EUR 4.7 X Greater

MONTNEY
Pros and Cons

15-25-80-16W6

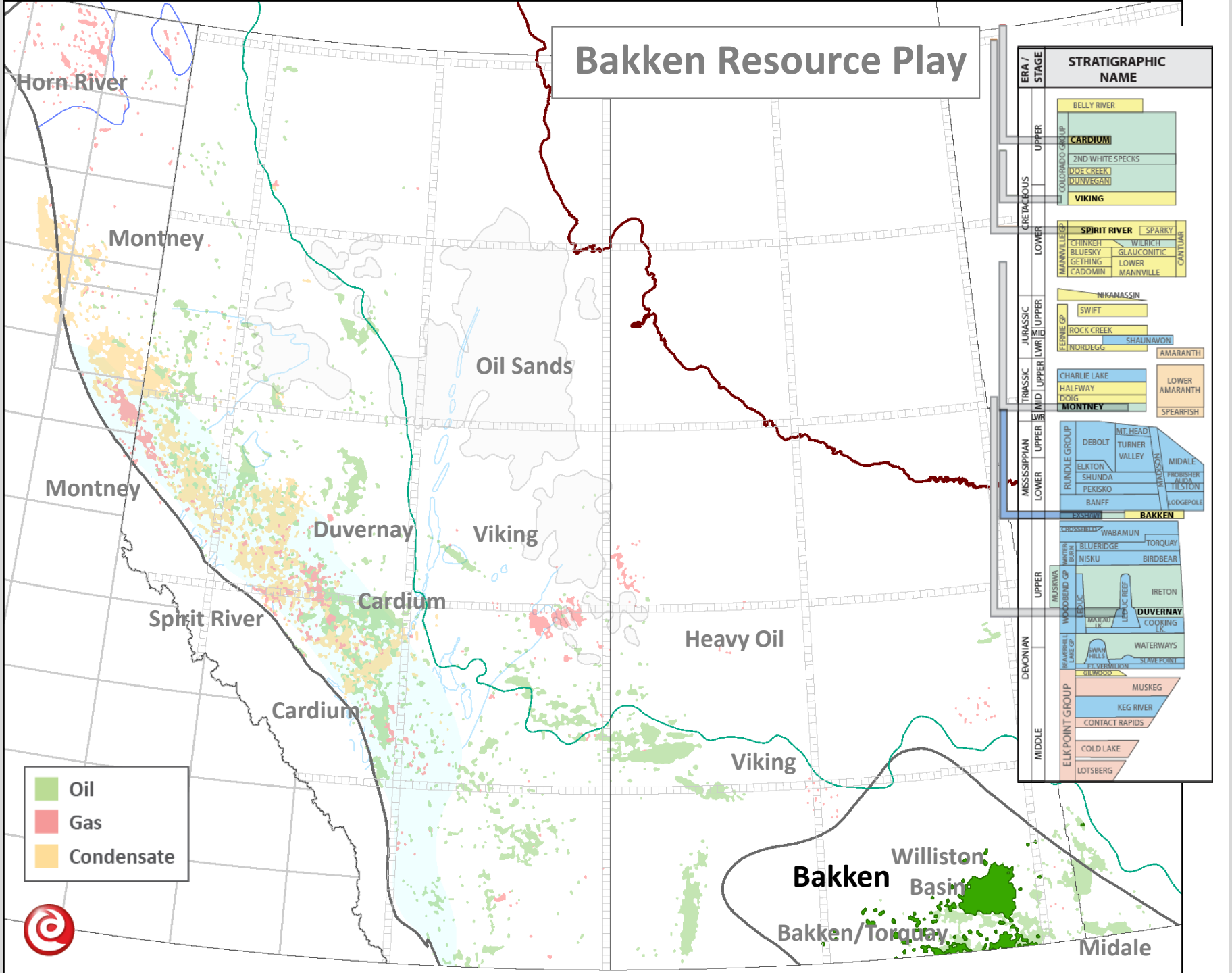


Pros
- IPmax trend ⇧
- $K/IPmax trend ⇩
- Net Pay ~ 300m
- Potential for vertically stacked laterals

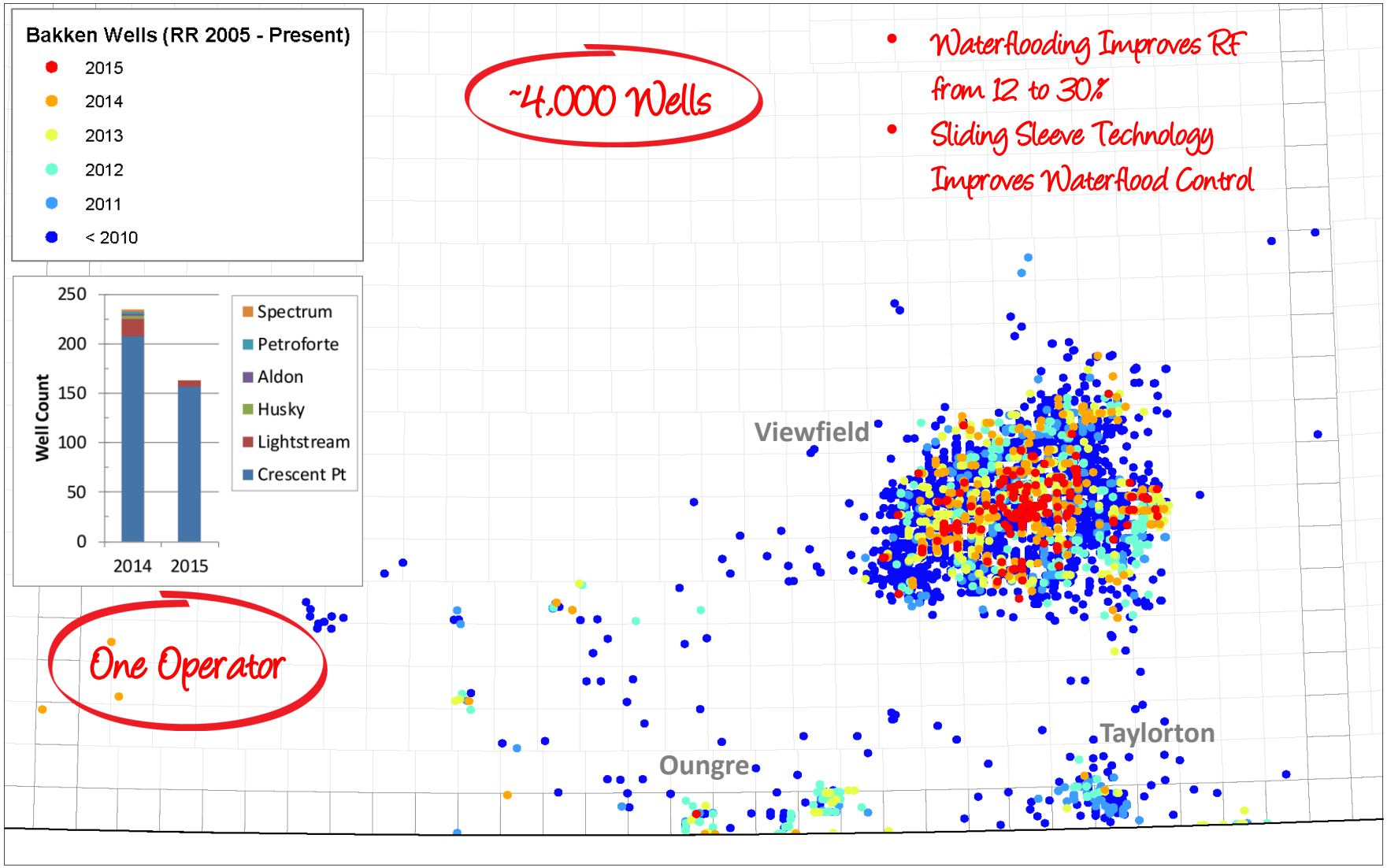
Cons
- Reservoir heterogeneity
- Variable liquids rates

Summary
- Avg D&C Cost - $8.3MM
- $K/IPmax - $16.3K

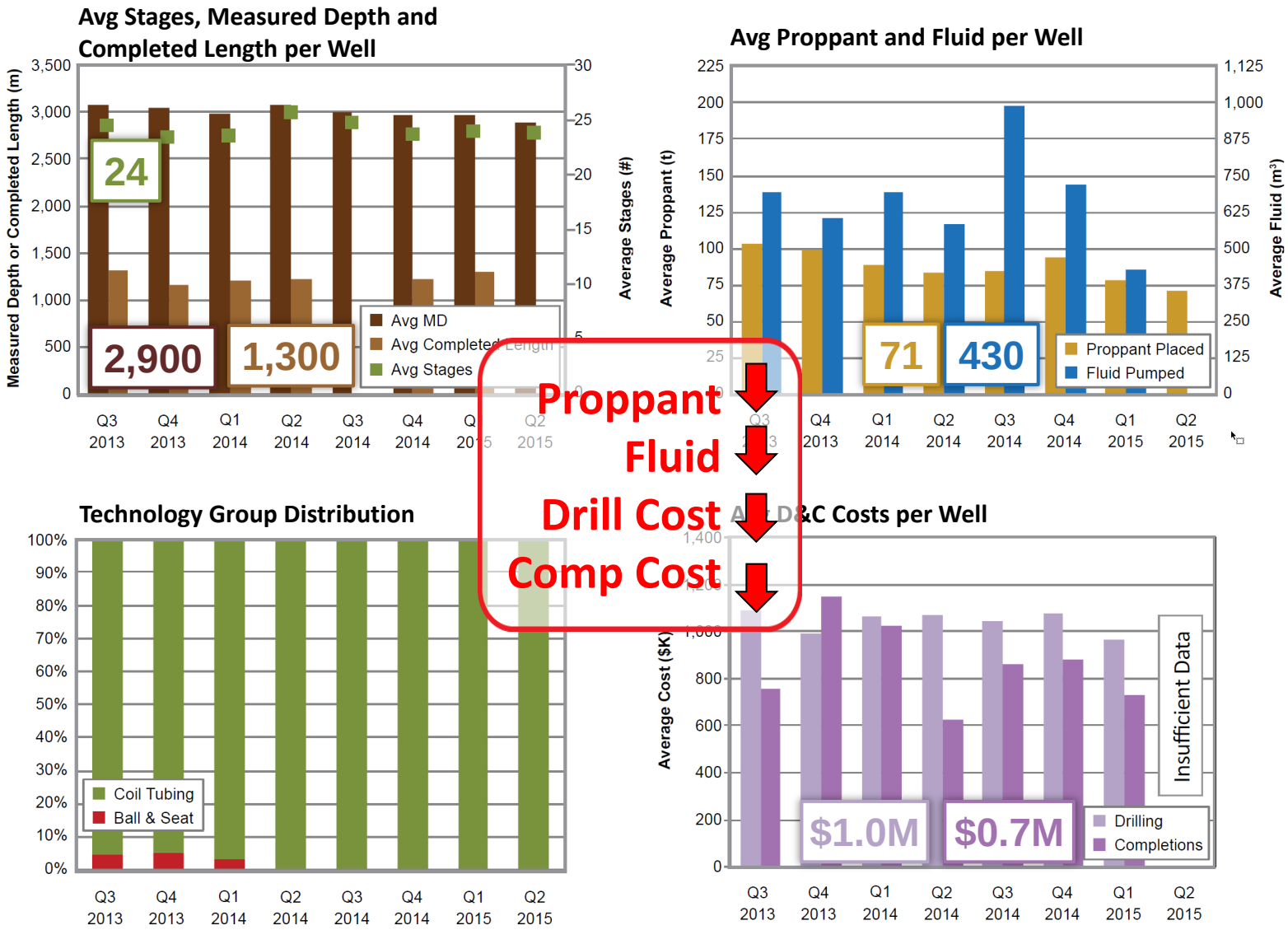
Log analysis generated with GeoLog Multimin® Software; Powered by IHS Data


Bakken Resource Play
Horn River
Montney
Montney
Oil Sands
Duvernay
Viking
Cardium
Spirit River
Heavy Oil
Cardium
Viking
Oil
Gas
Condensate
Bakken
Williston
Basin
Bakken/Torquay
Midale
STRATIGRAPHIC NAME
ERA / STAGE
BELLY RIVER
CARDIUM
2ND WHITE SPECKS
DOE CREEK
DUNVEGAN
VIKING
SPIRIT RIVER
SPARKY
CHINKEH
WILRICH
BLUESKY
GLAUCONITIC
GETHING
LOWER MANNVILLE
CADOMIN
NIKANASSIN
SWIFT
ROCK CREEK
SHAUNAVON
NORDEGG
AMARANTH
CHARLIE LAKE
HALFWAY
DOIG
MONTNEY
LOWER AMARANTH
SPEARFISH
MT. HEAD
DEBOLT
TURNER VALLEY
ELKTON
MIDALE
SHUNDA
FROBISHER ALIDA
PEKISKO
TILSTON
BANFF
LODGEPOLE
EXSHAW
BAKKEN
WABAMUN
TORQUAY
BLUERIDGE
NISKU
BIRDBEAR
IRETON
DUVERNAY
COOKING LK.
WATERWAYS
SLAVE POINT
GILWOOD
MUSKEG
KEG RIVER
CONTACT RAPIDS
COLD LAKE
LOTSBERG

BAKKEN
Play Development

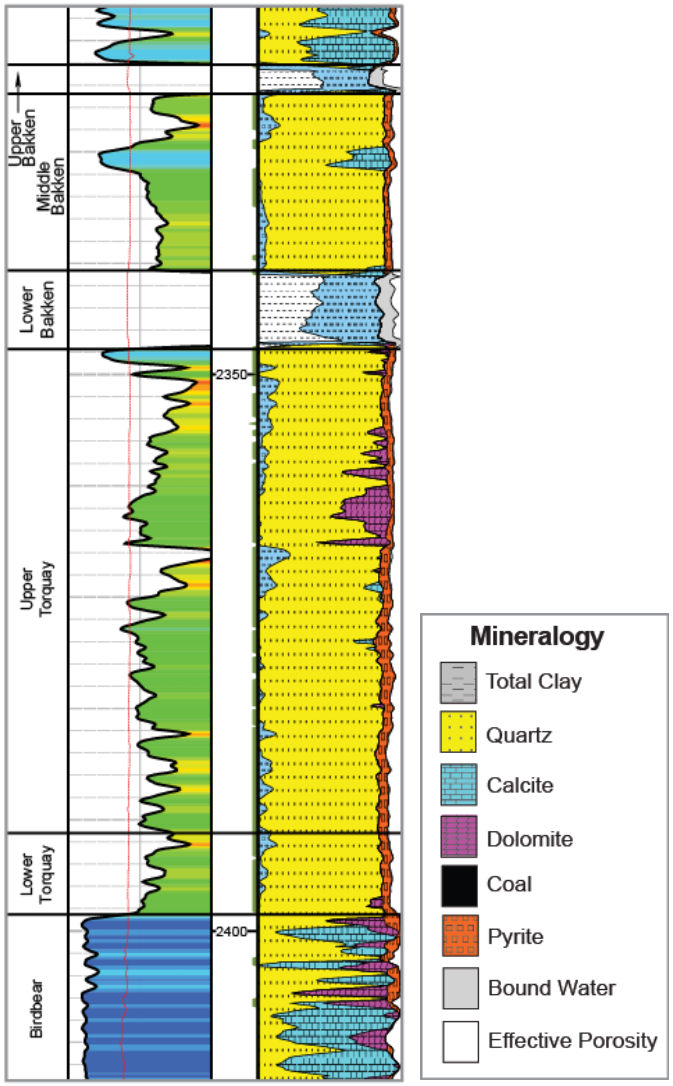


Bakken Oil Completions Trends



BAKKEN
Pros and Cons

21/5-17-1-15W2



Pros

- Activity holding ⇔
- IPmax trend steady ⇔
- $K/IPmax trend steady ⇔
- Some overlap with Torquay play
- Waterflood improves RF

Cons

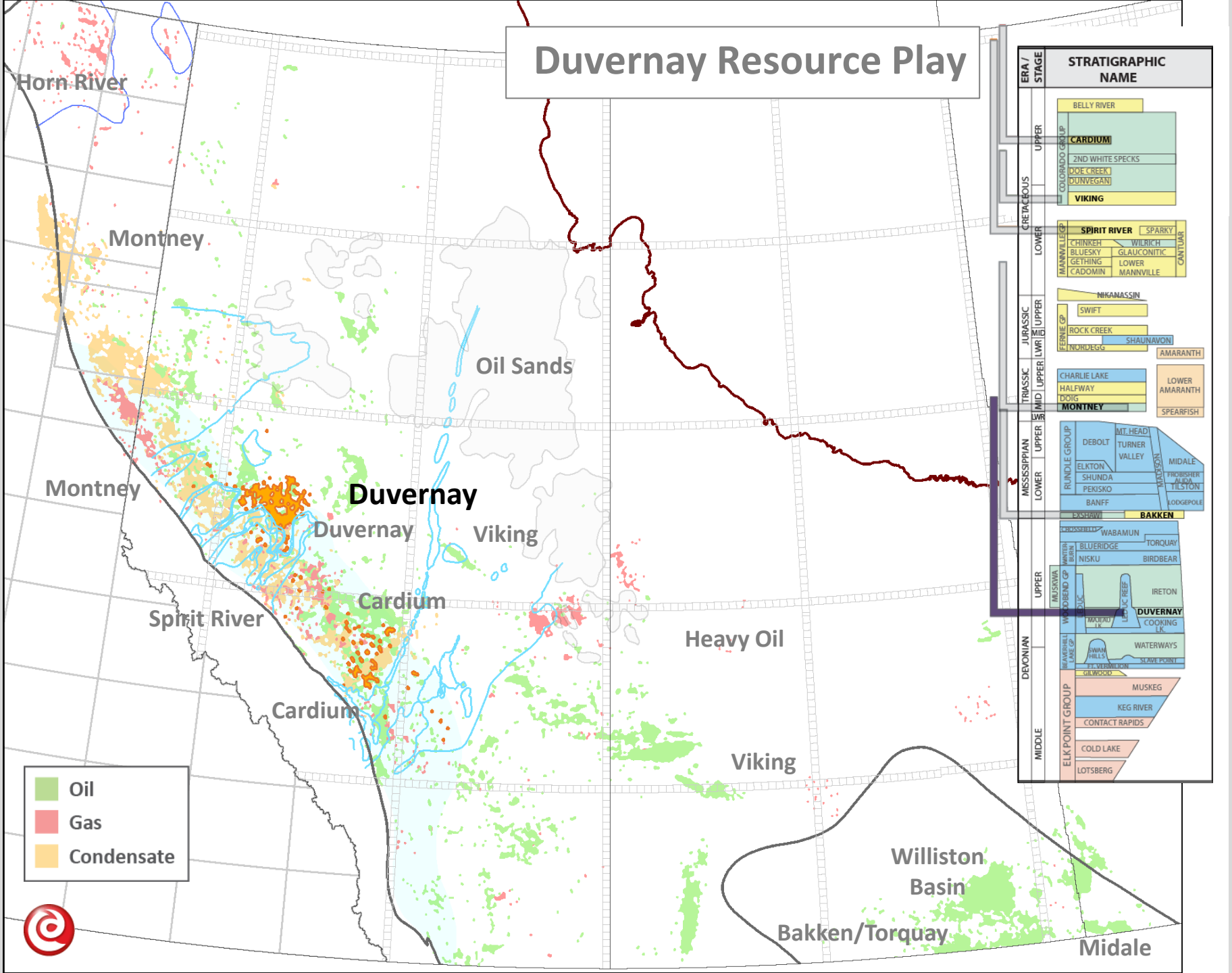
- Net Pay 5-15m

Summary

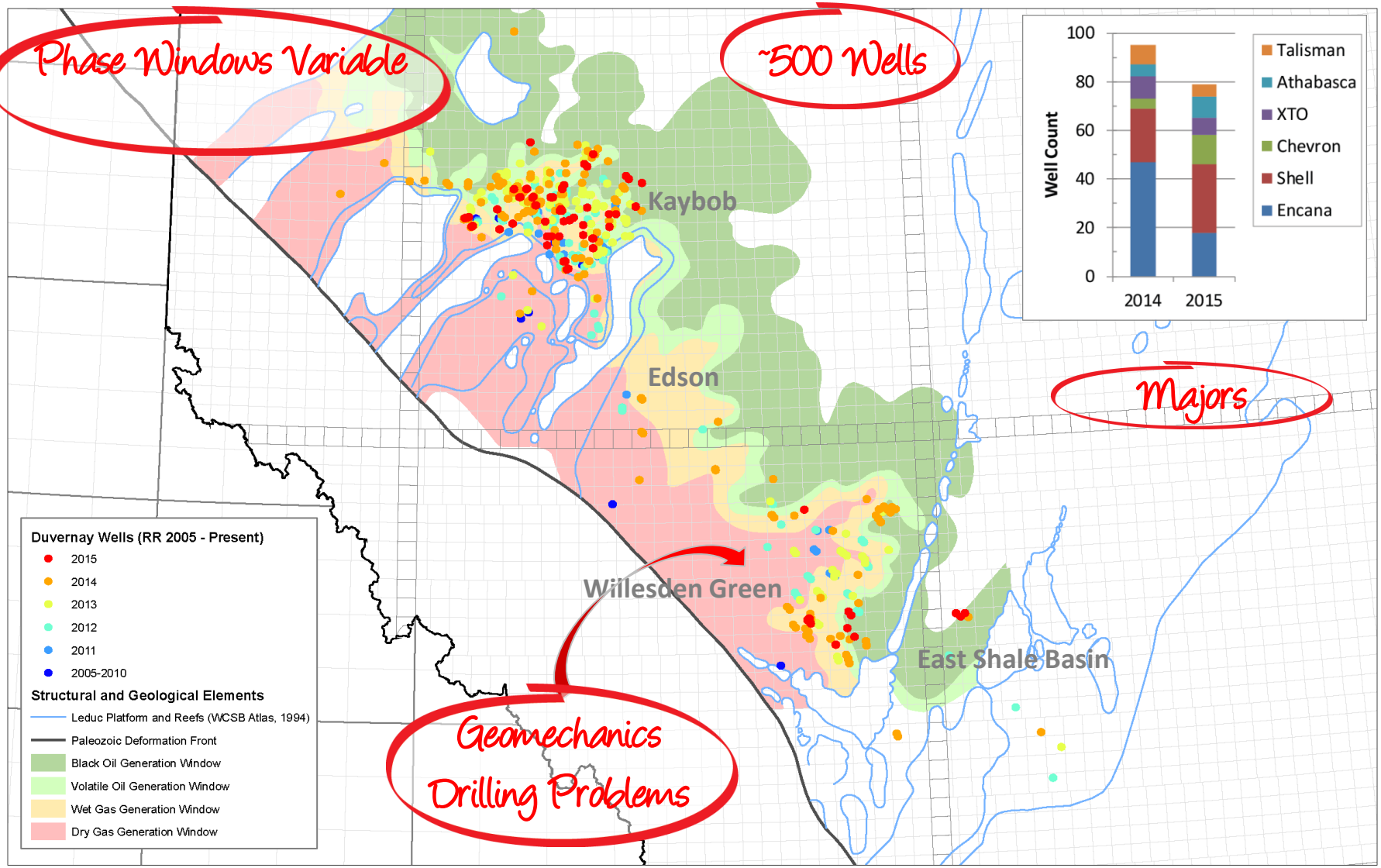
- Avg D&C Cost - $1.7MM
- $K/IPmax - $11.7K

Log analysis generated with GeoLog Multimin® Software; Powered by IHS Data

Duvernay Resource Play



DUVERNAY
Play Development

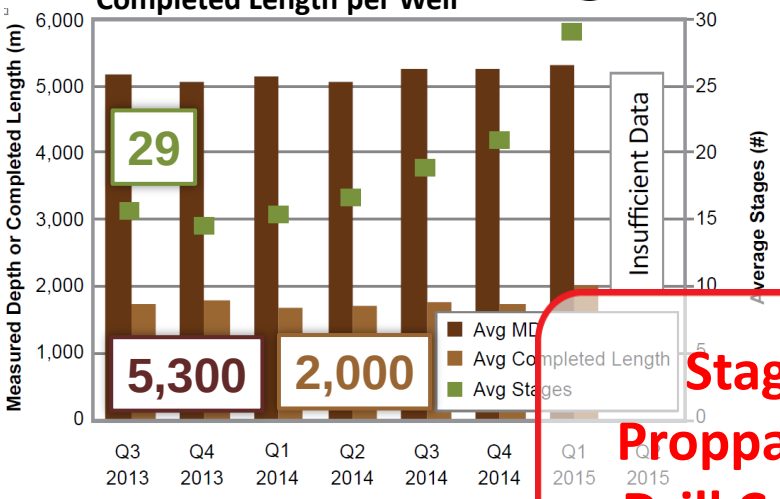


Powered by IHS Data

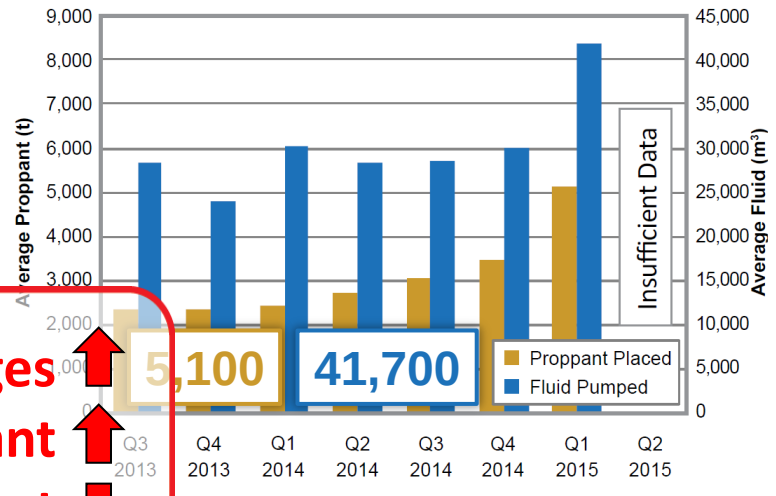
DUVERNAY

Duvernay Gas Completions Trends

Avg Stages, Measured Depth and Completed Length per Well



Avg Proppant and Fluid per Well



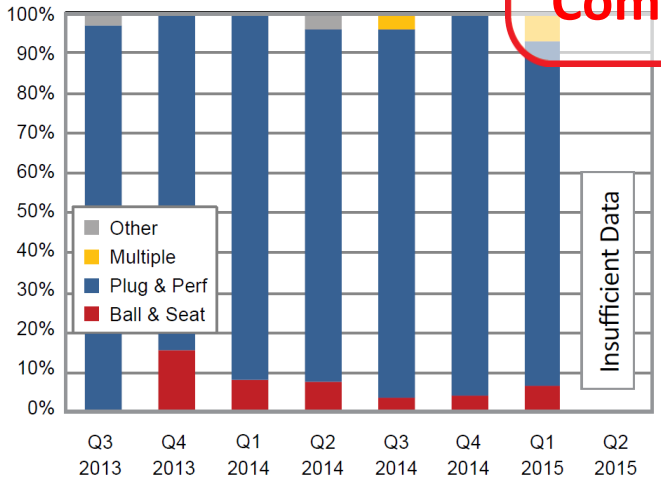
Stages

Proppant

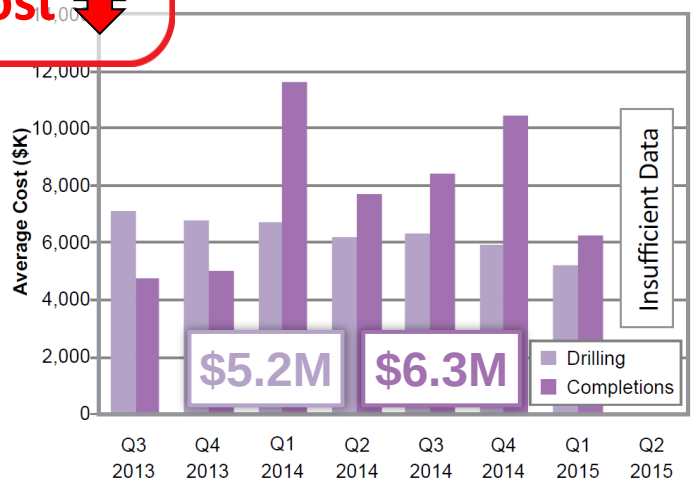
Drill Cost

Comp Cost

Technology Group Distribution



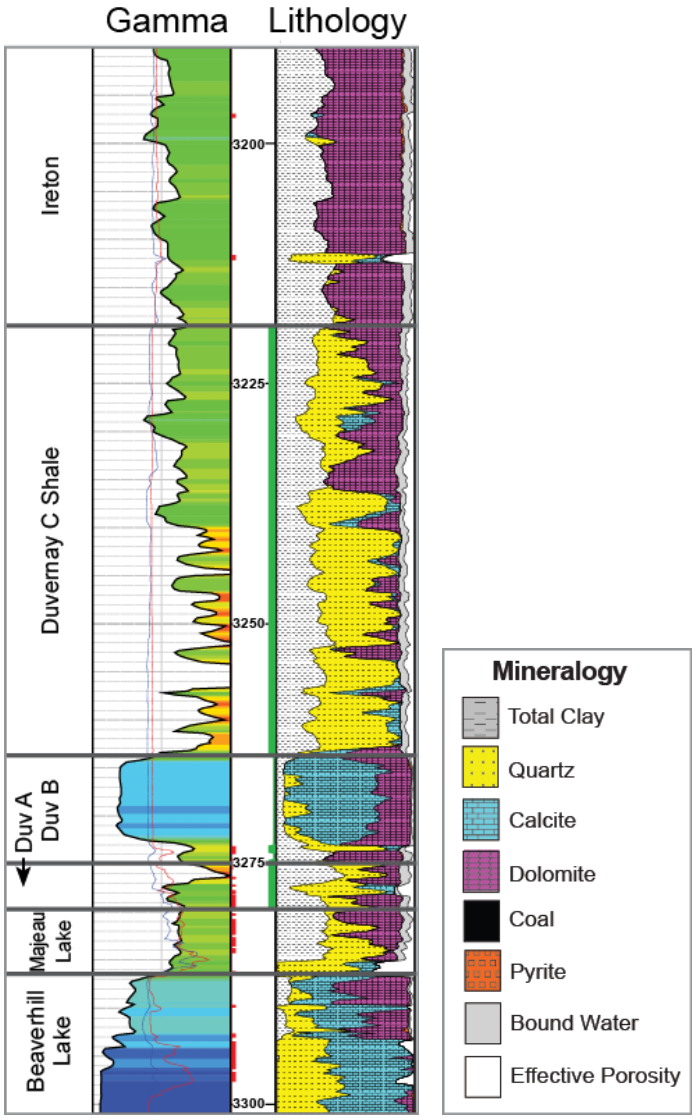
Avg D&C Costs per Well



Data from Canadian Discovery's Well Completions & Frac Database

DUVERNAY
Pros and Cons

16-4-62-21W5



Pros
- Developing play, still experimenting
- Net Pay up to 60m

Cons
- Phase window variable
- Geomechanics, drilling problems
- Capital Intensive

Summary
- Avg D&C Cost - $11.5MM
- $K/IPmax - $38.5K

Log Analysis generated with Geolog® Multimin Software, Powered by IHS Data

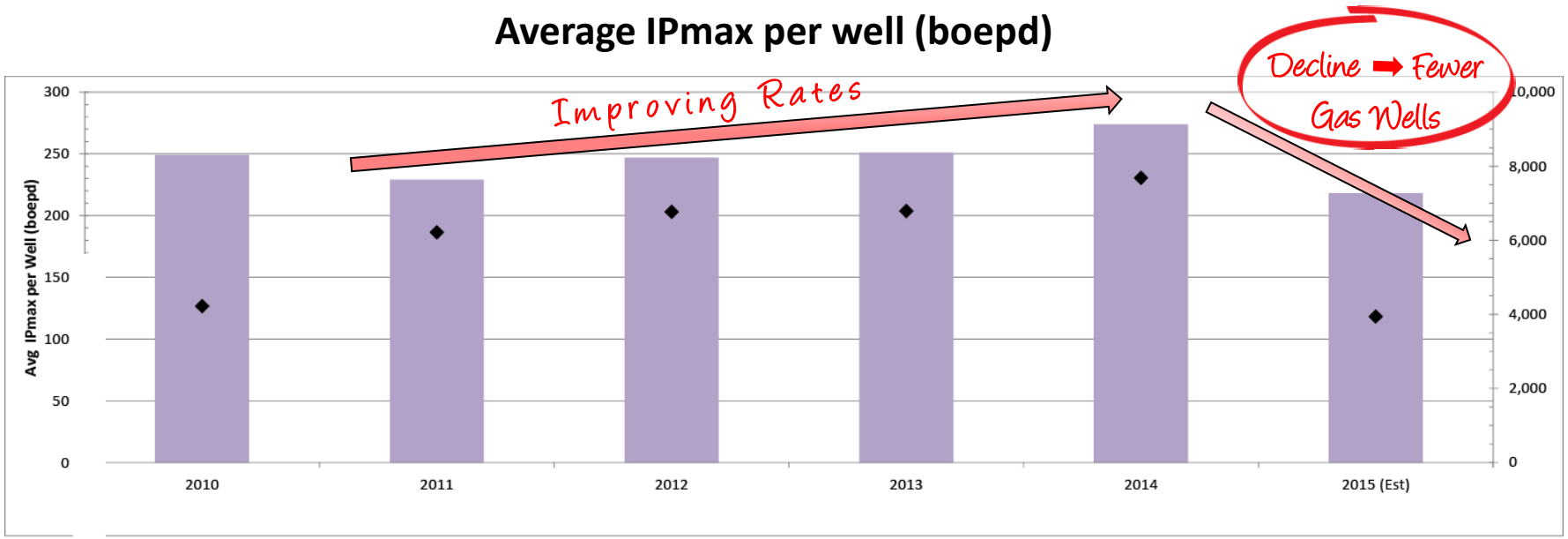
Conclusions

Cost Summary

	Avg D&C Costs ($MM) Q2 2015	Avg $K/IPmax ($K/boepd) Q1 2015
Cardium	$2.7	17.0
Viking	$0.7	15.0
Spirit River	$4.0	6.3
Montney	$8.3	16.3
Bakken	$1.7	11.7
Duvernay	$11.5	38.5*

* 2014Q2

WCSB Resource Wells - Average IPmax Trends



Conclusions

- Viking most active, followed by Montney and Spirit River
  - Bakken steady
  - Cardium sharp decline
  - Duvernay developing
- Spirit River and Montney liquids-rich plays produce at highest rates
- High-rate plays not necessarily the most economic (eg, Viking)
- Drilling/completion technologies continue to evolve
  - One size does not fit all
  - Secondary recovery, waterfloods on the rise
- Basin underexplored – there is more to discover

WCSB Deepest Penetration by Section

Thank you to other contributors

- Ben McKenzie – data maestro
- Meridee Fockler – organizer
- Paul Patton – graphic designer
- Zenith Phillips – graphic designer
- Candace Keeler – cartographer
- Ricky La – completions graphs
- Luigi Malinis – completions graphs

CDL products used for this presentation:

DISCOVERY DIGEST

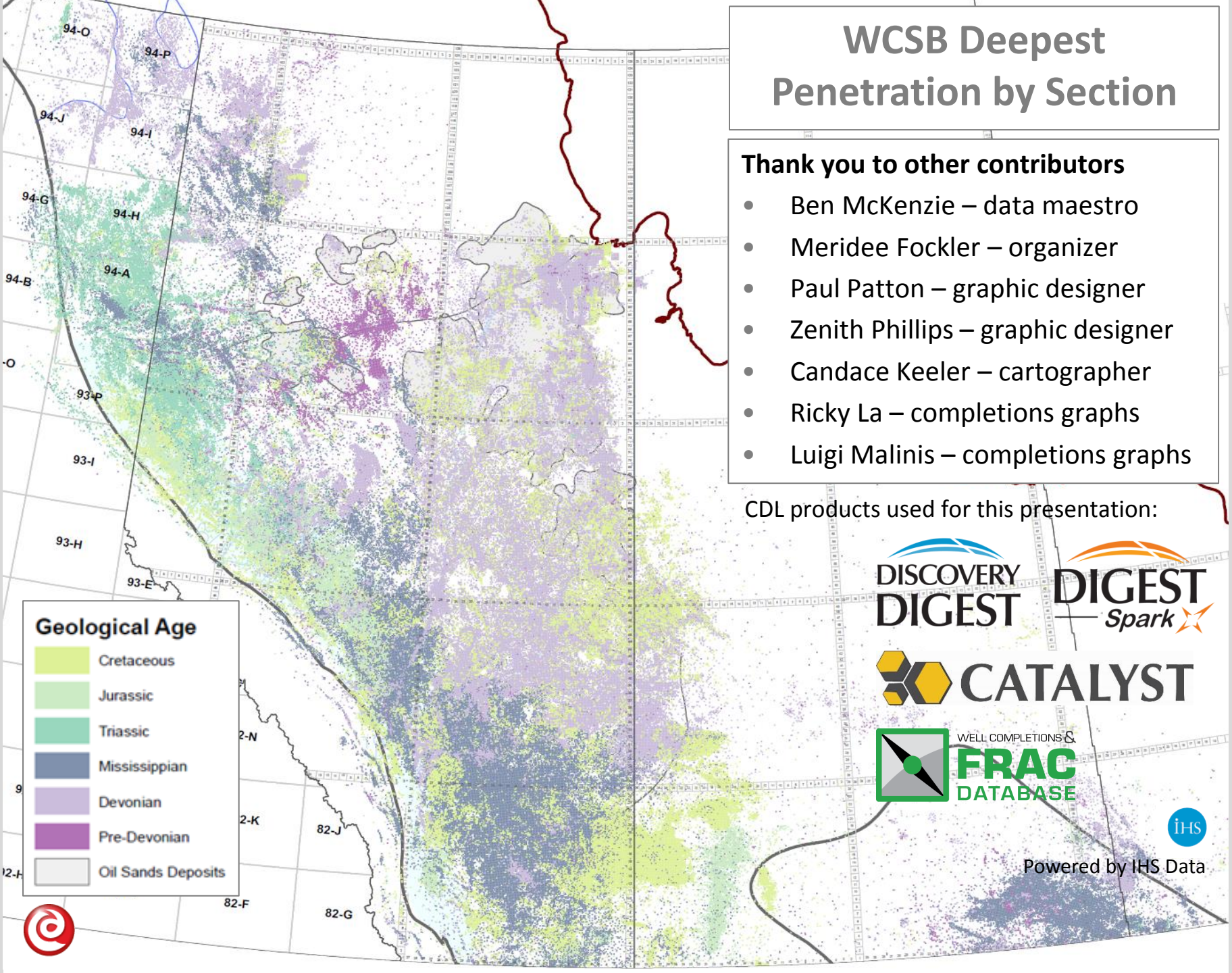
DIGEST Spark

CATALYST

WELL COMPLETIONS & FRAC DATABASE

IHS

Powered by IHS Data



Canadian Discovery Ltd.

Contact Information

For inquiries with respect to this presentation, please contact:

info@canadiandiscovery.com

403.269.3644