Light Oil Exploration Potential for Devonian-Silurian (Fortin and Chaleurs Groups) Carbonates/Mudstones, Central Gaspe, Quebec, Canada, near the Grande Riviere Transform Fault*

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Abstract

Improved seismic processing has made it possible to interpret complex thrusts and transform faults in the Central Gaspe Peninsula. The prospective section includes the Devonian Gres de Gaspe (York River) sandstones, Devonian Fortin Group mudstones and carbonates, Devonian-Silurian Chaleurs Group, and Upper Ordovician Matapedia Group (Whitehead Formation). These rocks have demonstrated light oil and gas potential in the eastern Gaspe Peninsula in the Galt Field and Haldimond Field areas currently under development near the York River Syncline. The play for light oil is likely to extend into the Central Gaspe Peninsula. The encouraging results of the ABBA Quebec Resources Mont Alexandre #1 well (2009) have been integrated into an improved geological and geophysical interpretation. The Mont Alexandre #1 well provided much needed Lower Devonian stratigraphic information and log petrophysical measurements, including evidence of hydrothermal dolomitization of limestones and oil-condensate staining on samples. Current surface mapping and subsurface data integration are being done to assess additional areas for straight hole and directional drilling on several untested, thrust-related, anticlinal folds in permits PG 948 and PG 949. PSTM reprocessing (in 2014) of 2008-vintage Vibroseis lines in hills and valleys of the Central Gaspe permit area has improved the imaging of the thrust sheets. Key reflectors (Shiphead, Indian Point) are now mapped as over-thrust and sub-thrust Devonian and Ordovician traps. Cross section log correlation of the Mont Alexandre #1 well log with productive Devonian well log horizons in Galt Field, show similar rock quality and hydrocarbon shows, and

extend the regional potential of the Ordovician-sourced light oil play 45 kilometers southwest into Central Gaspe. The Forillion Limestone found in the Mont Alexander well correlates to the oil pay in the Galt #4.

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Pinet, N., D. Lavoie, P. Brouillette, D.J. Dion, P. Keating, D. Brisebois, M. Malo, and S. Castonguay, 2005, Gravimetric and aeromagnetic atlas of the Gaspé Peninsula: Geological Survey of Canada, Open File 5020, 68 p.

Roy, S. 2008, Thermal Maturation and petroleum generation potential of Diagenesis Belt and the potential hydrocarbons Palaeozoic successions the region of Lake Matapedia, Quebec. Ph.D. thesis, National Institute of Scientific Research - Water, Earth and Environment, Quebec Canada. 147 p.

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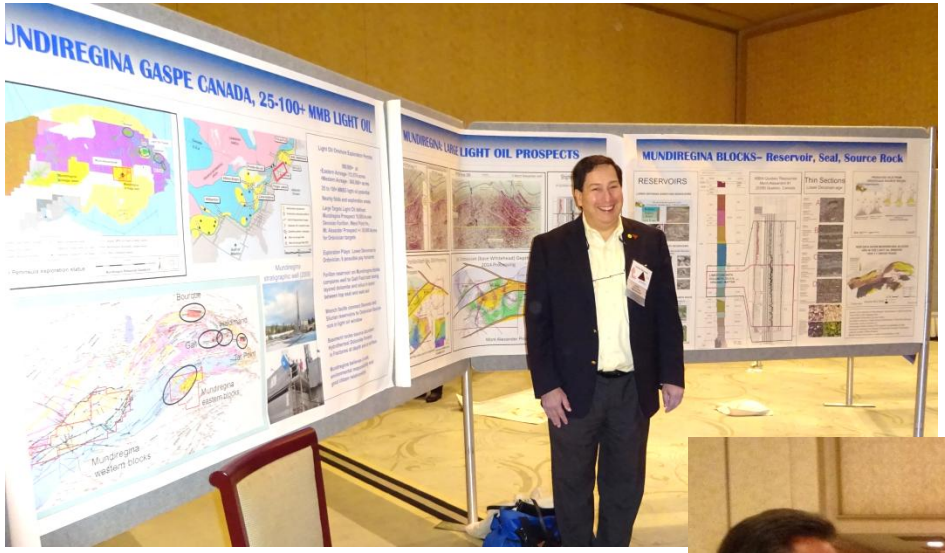
AAPG Eastern Section, London Ontario Sept. 20, 2014

London, Ontario Sept 20, 2014



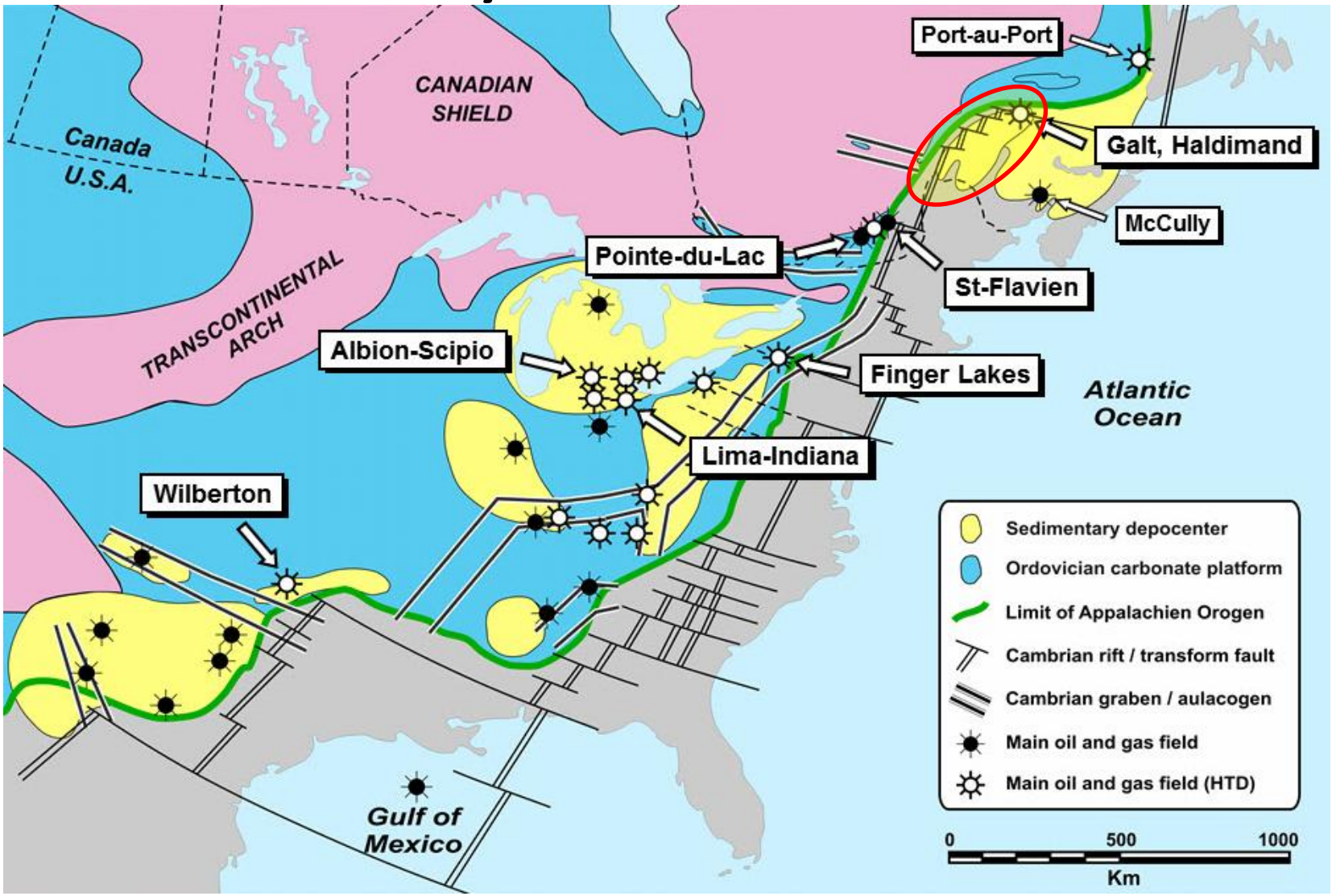
Discussions with Peter Dorrins and Junex staff indicate promising potential at nearby Galt Field based on:

- 10 oil DST's in Galt 4 well
- very high oil saturations on log evaluation (Sw=20%)

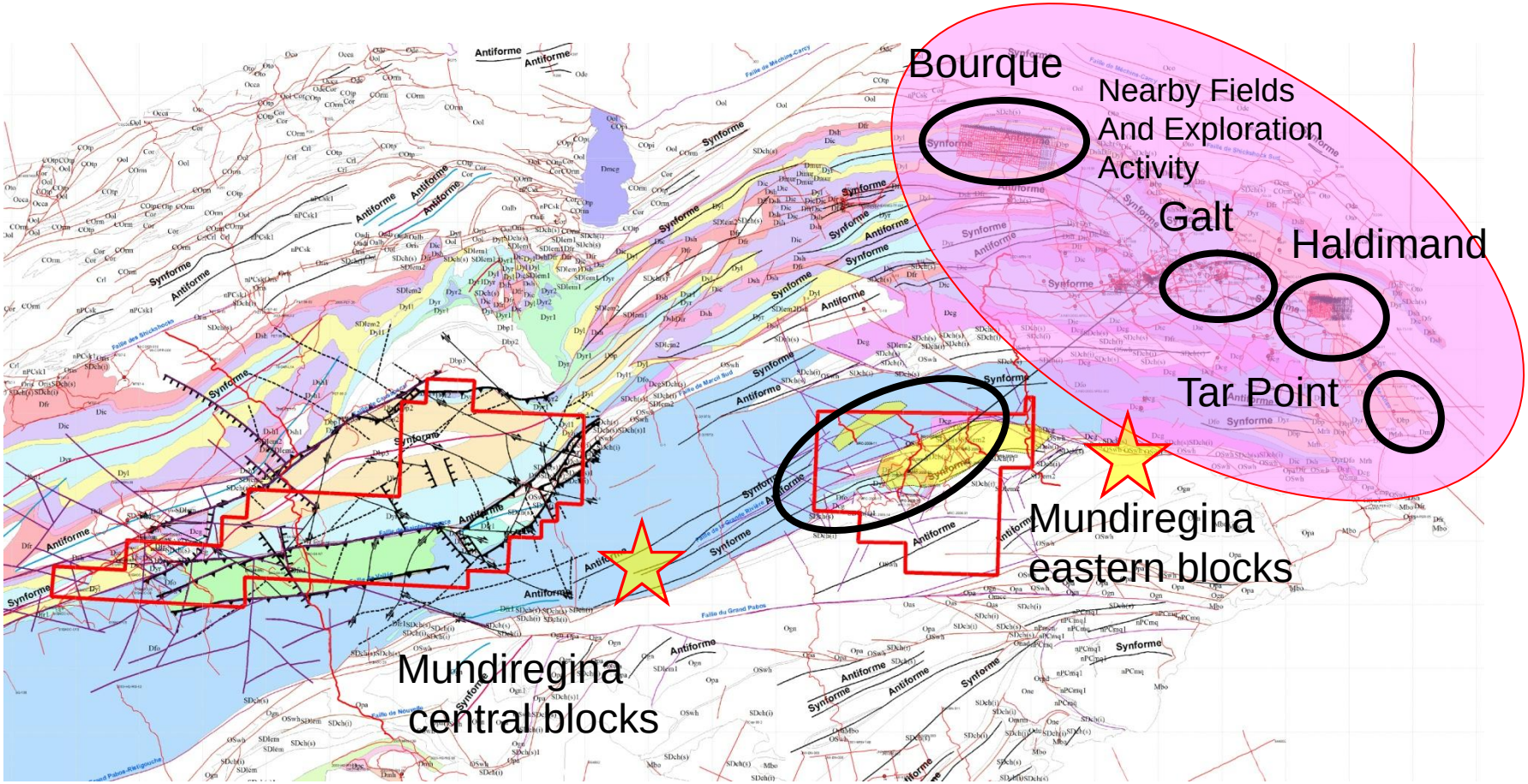
Important Points

- Seismic reprocessing (Aug to October 2014) shows critical aspects of new opportunities
- Robust Inventory of Shallow Oil targets (prospects: Mundiregina, ABBA, B, D, E and F)
- Mundiregina Prospect
  - a 10,000 acre anticline projected from surface folds on lines 8 and 11 with opposite dip on Lower Devonian to Ordovician targets
  - newly recognized fault that could source Hydrothermal Dolomite (HTD) as faults do at Galt Field. HTD common in surface rocks.
  - Forillon reservoir has dolomite and siliceous layered fabric with shale rich Shiphead top seal and Indian Lake seat seal similar to Galt Field
- ABBA Prospect
  - A 43,000 acre anticline shows large undrilled closures at Ordovician level
- Source rocks (SR) max 430 to 500 deg = light oil window
- Abundant oil shows in Devonian through Ordovician rocks at surface shows DUAL active hydrocarbon system comparable to Galt
- Mundiregina Blocks have transform faults, hydrothermal dolomite similar to Galt Field
- Western Blocks have many reservoirs, very large structures
- **Oct 15 2014 processing shows NEW Oct 15 2014 processing shows NEW CHAMPLAIN STRUCTURE ON Line 10B, Central Area**

Main Hydrocarbon Fields

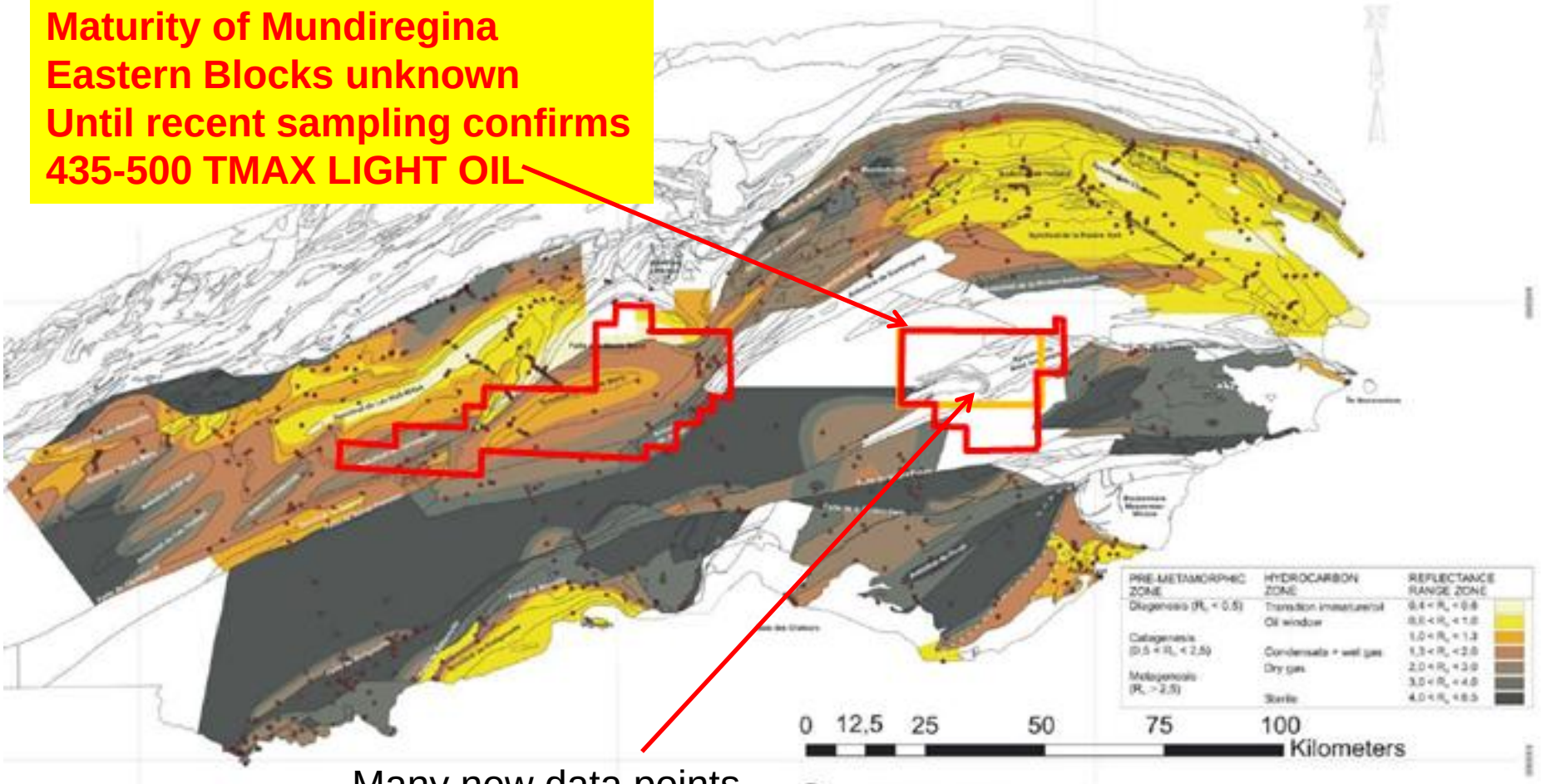


Devonian outcrops



Thermal Maturity Map

Maturity of Mundiregina
Eastern Blocks unknown
Until recent sampling confirms
435-500 TMAX LIGHT OIL

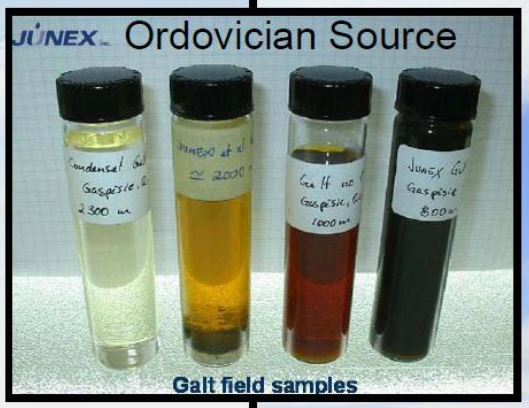


Many new data points
435-500 TMAX
LIGHT OIL WINDOW

Study area

(Source: Roy, 2008)

Galt Prospect – Light Oil



Galt field samples

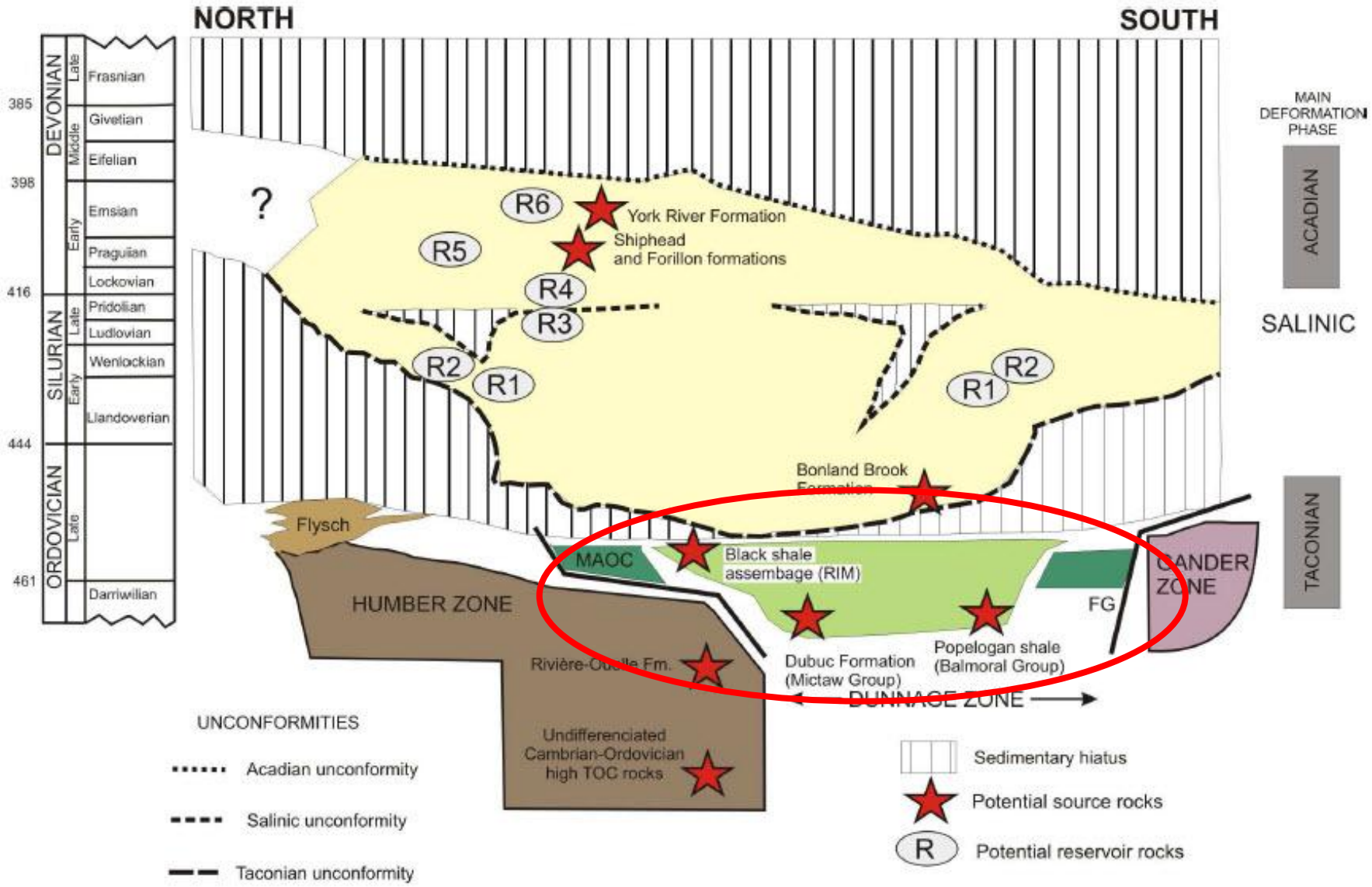


Figure 2: Potential source rocks and potential reservoir units of the Gaspé Belt (from Lavoie et al., 2009). The aim was to explore the Mount Alexandre syncline for R4- and R5-type settings.

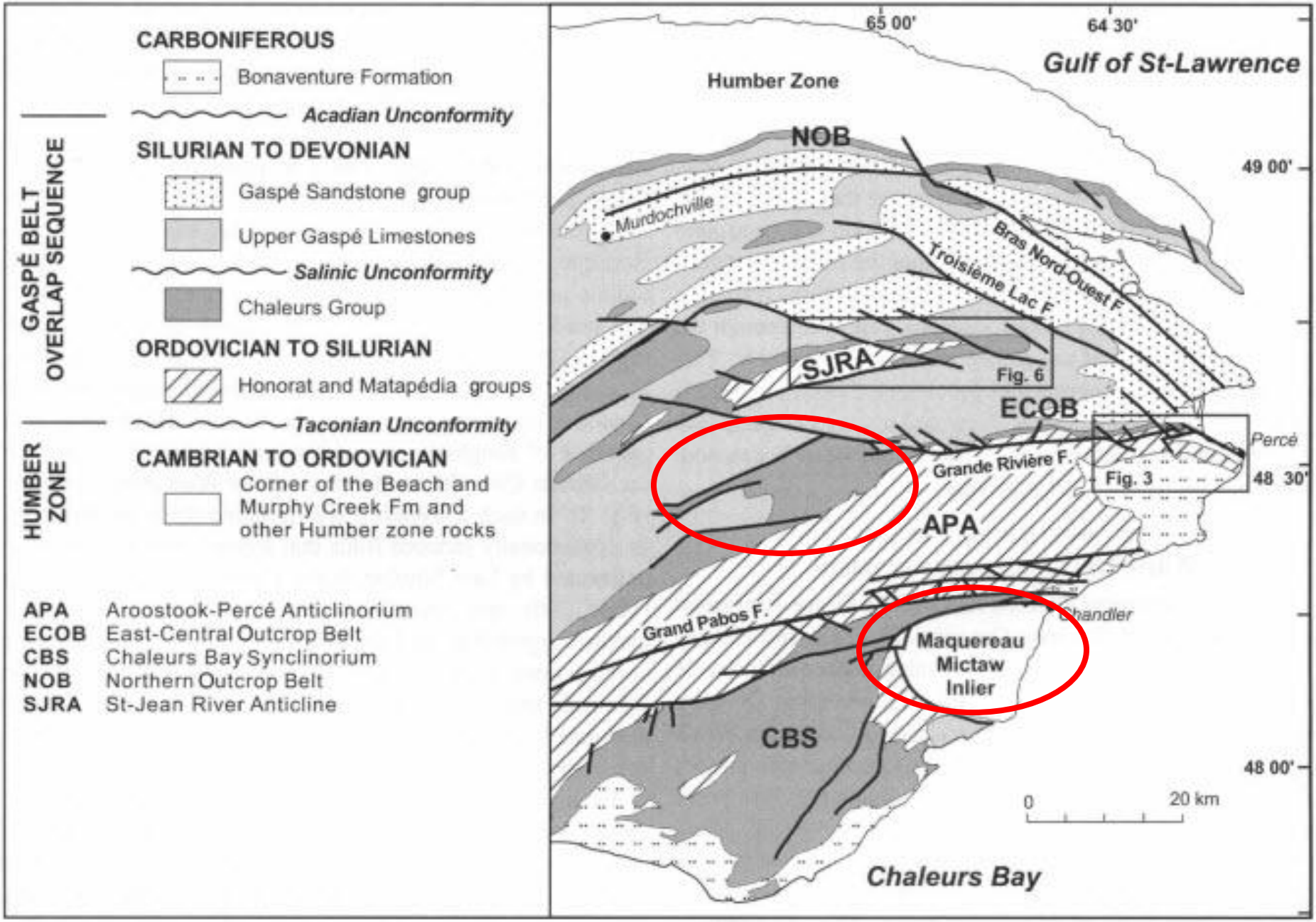


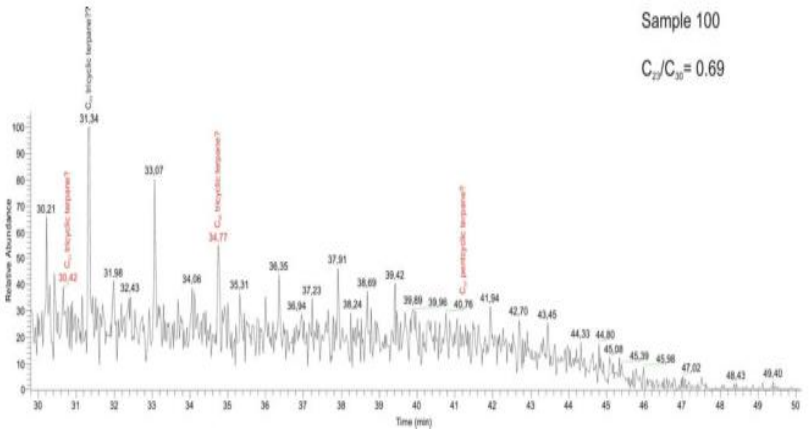
Fig. 1. Geological map of eastern Gaspé Peninsula.

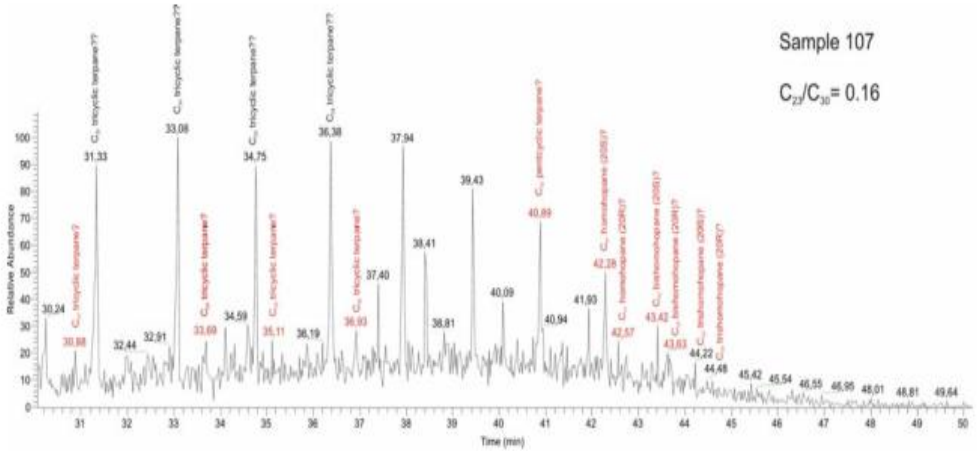
Mixed Ordovician and Devonian Oil source confirmed in surface samples on Mundiregina blocks 948/949

Fritz Neuweiler, PhD, Report submitted to: ABBA Quebec Resources, Inc, 2011, ROCK-EVAL ANALYSIS, GAS CHROMATOGRAPHY, AND MASS-SPECTROMETRY IN SUPPORT TO HYDROCARBON EXPLORATION, EASTERN GASPE' PENINSULA, QUEBEC

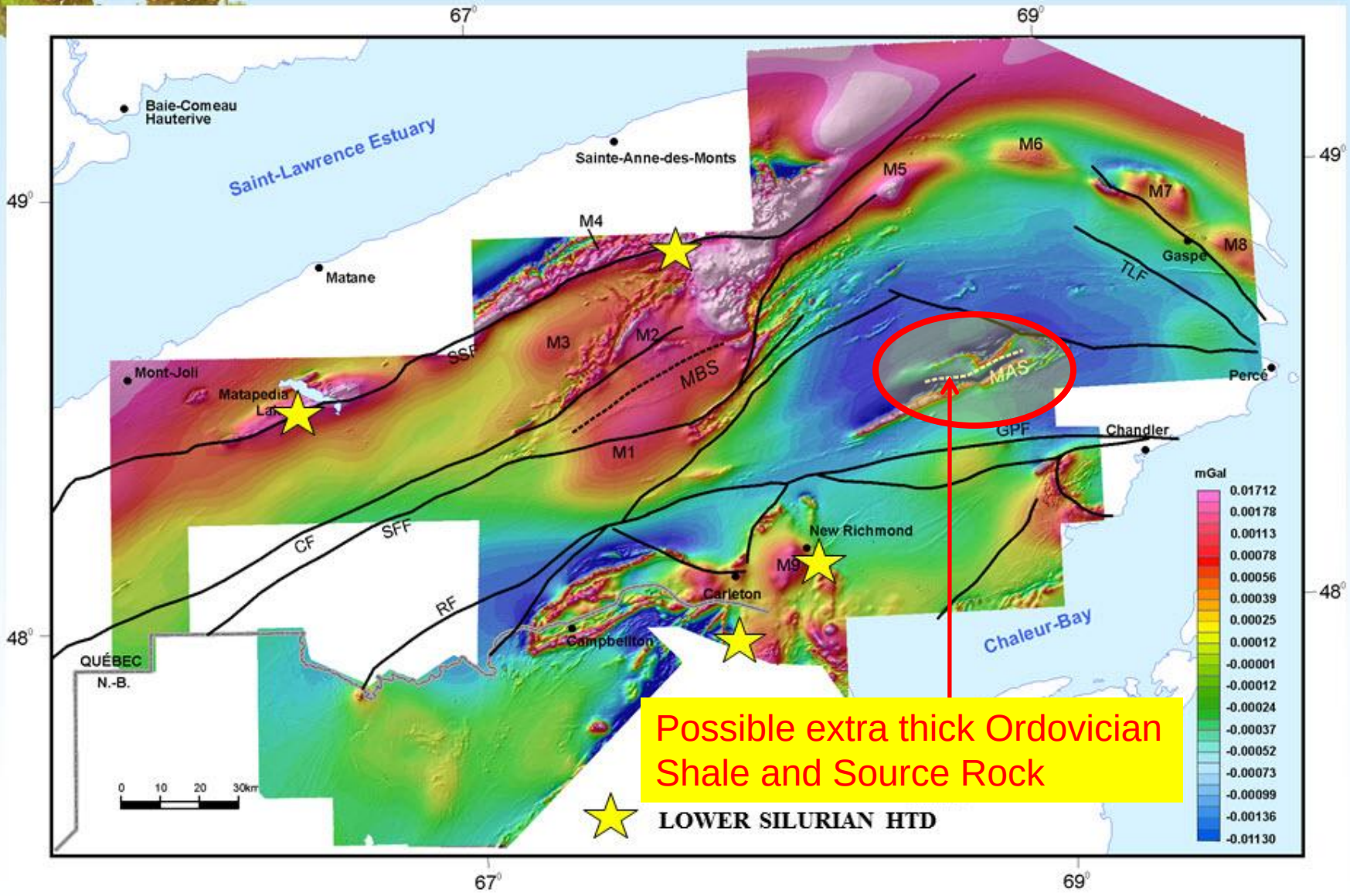
- Gas Chromatography samples confirm and illustrate (sample 100) on page 8 and (sample (107) on page 9 a mixture of Ordovician and Devonian petroleum.

- On page 12: (a) Rock Eval analysis (b) Gas –Chromatgraphy (c) Mass-Spectrometry suggests a mixture of Ordovician (family A) and Devonian (family B) derived petroleum to be present within the lower parts of the York River (sandstone) formation. This interpretation is in support of prior suggestions expressed in Denis Lavoie (GSC) and others (2009). See pg. 13 " Our Data and interpretations are in support to explore stacked reservoirs of the Galt-Haldimand type " (Lavoie et al , 2009, Fritz Neuweiler 2010)





Residual total magnetic field

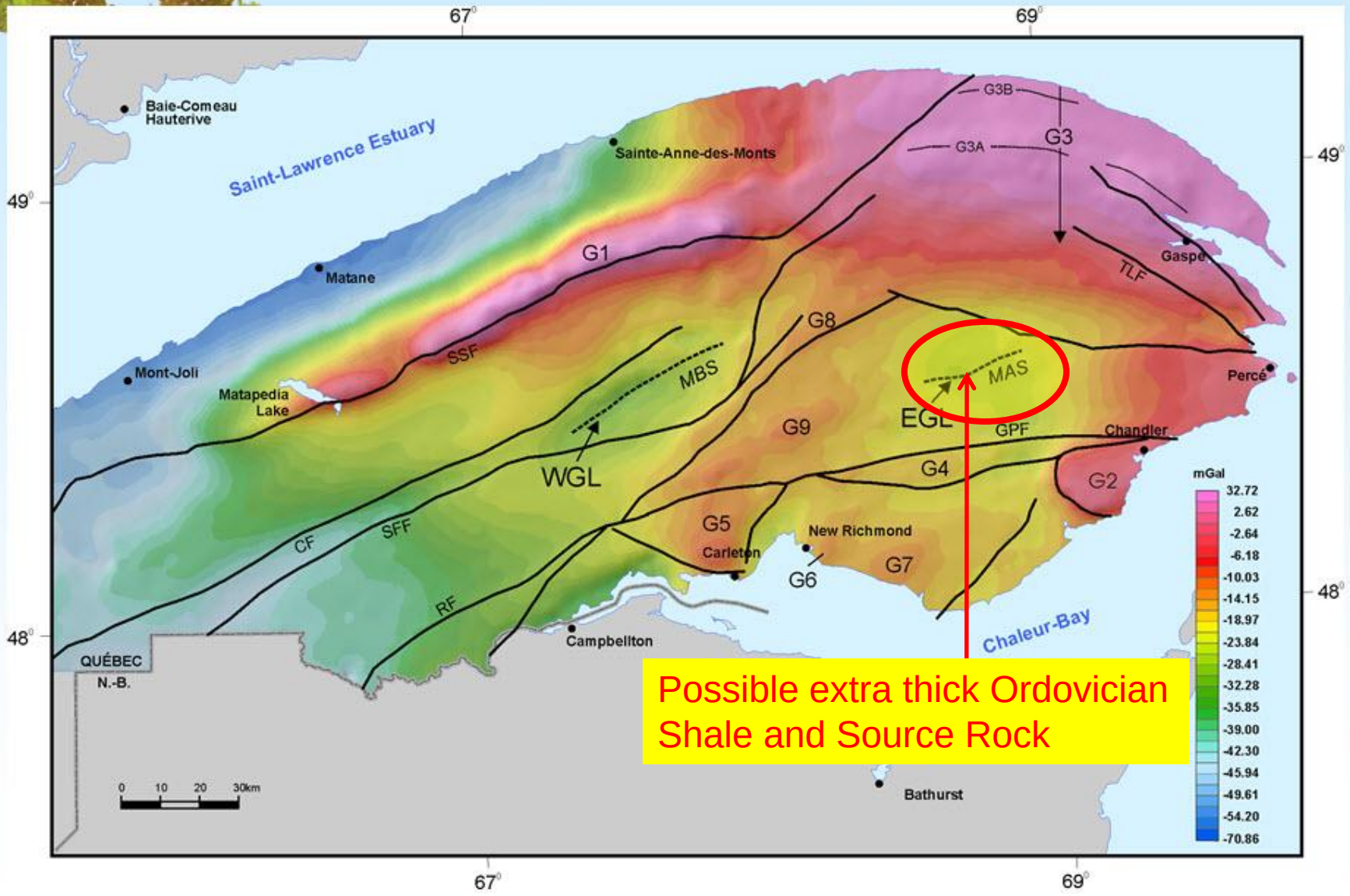


Natural Resources Canada | Ressources naturelles Canada

Pinet et al (2005); Brouillette et al (2006)

Canada

Bouguer anomaly map

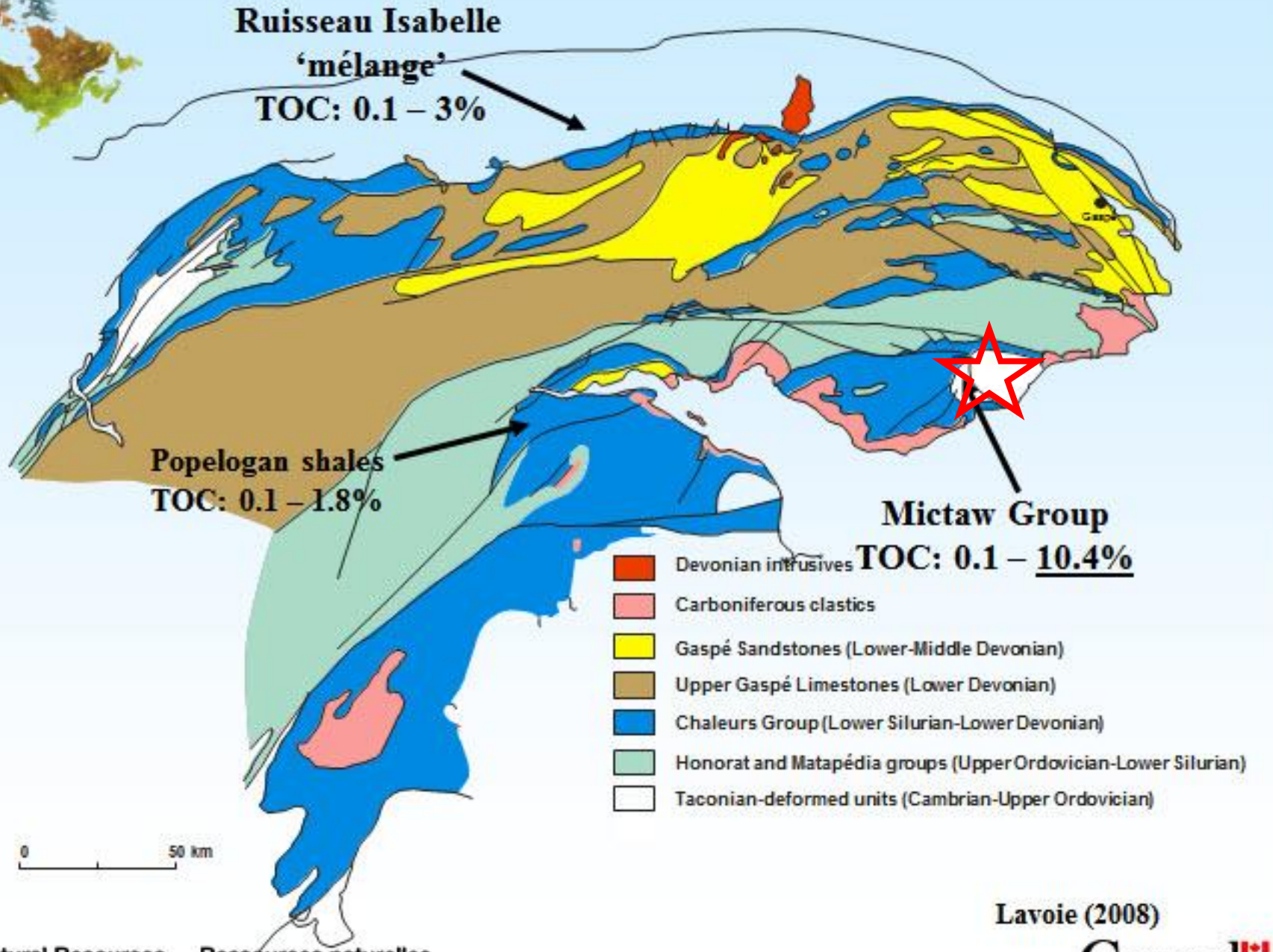


Natural Resources Canada | Ressources naturelles Canada

Pinet et al (2005); Brouillette et al (2006)

Canada

Windows of Ordovician rocks within the Gaspé Belt



Lavoie (2008)

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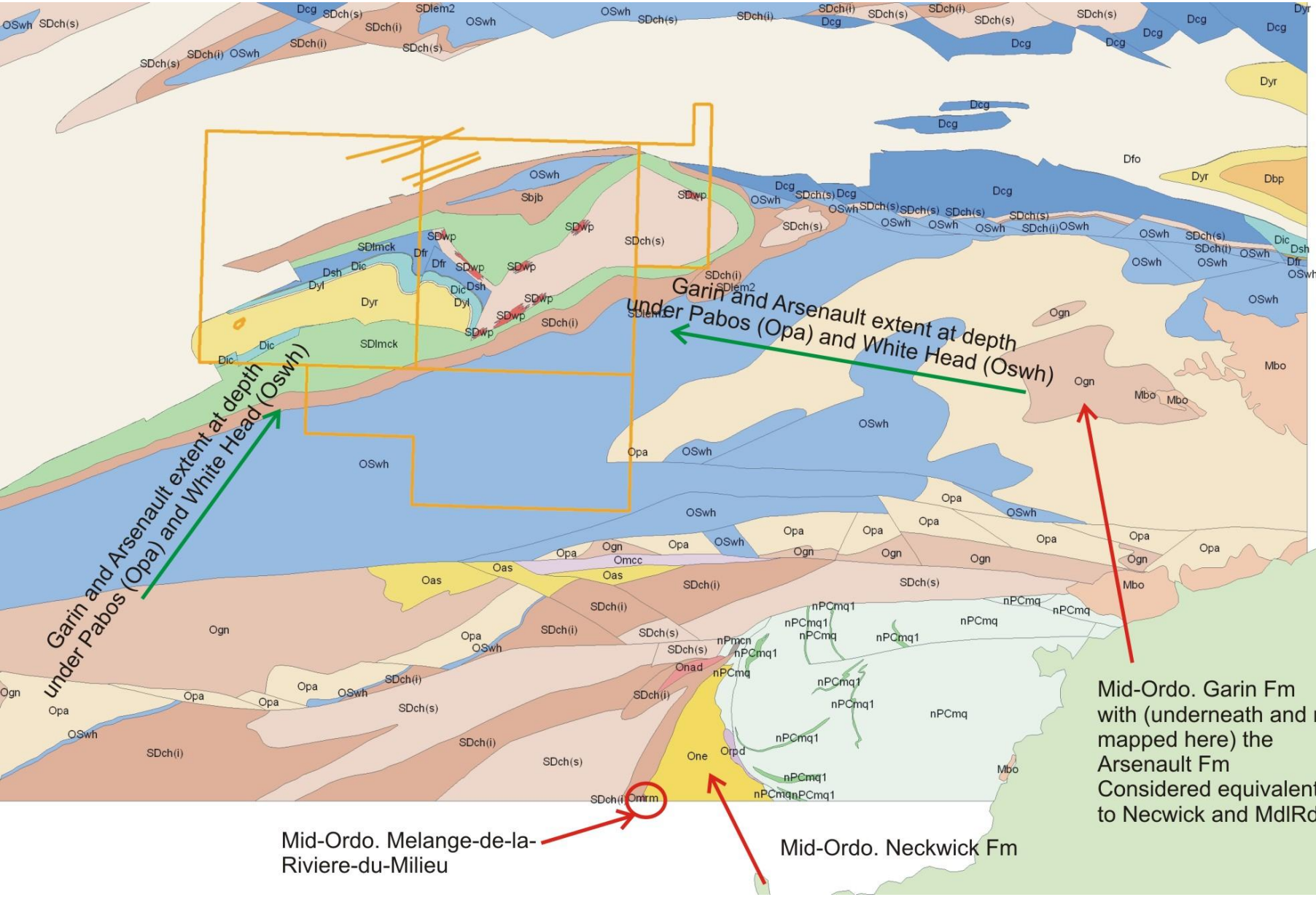

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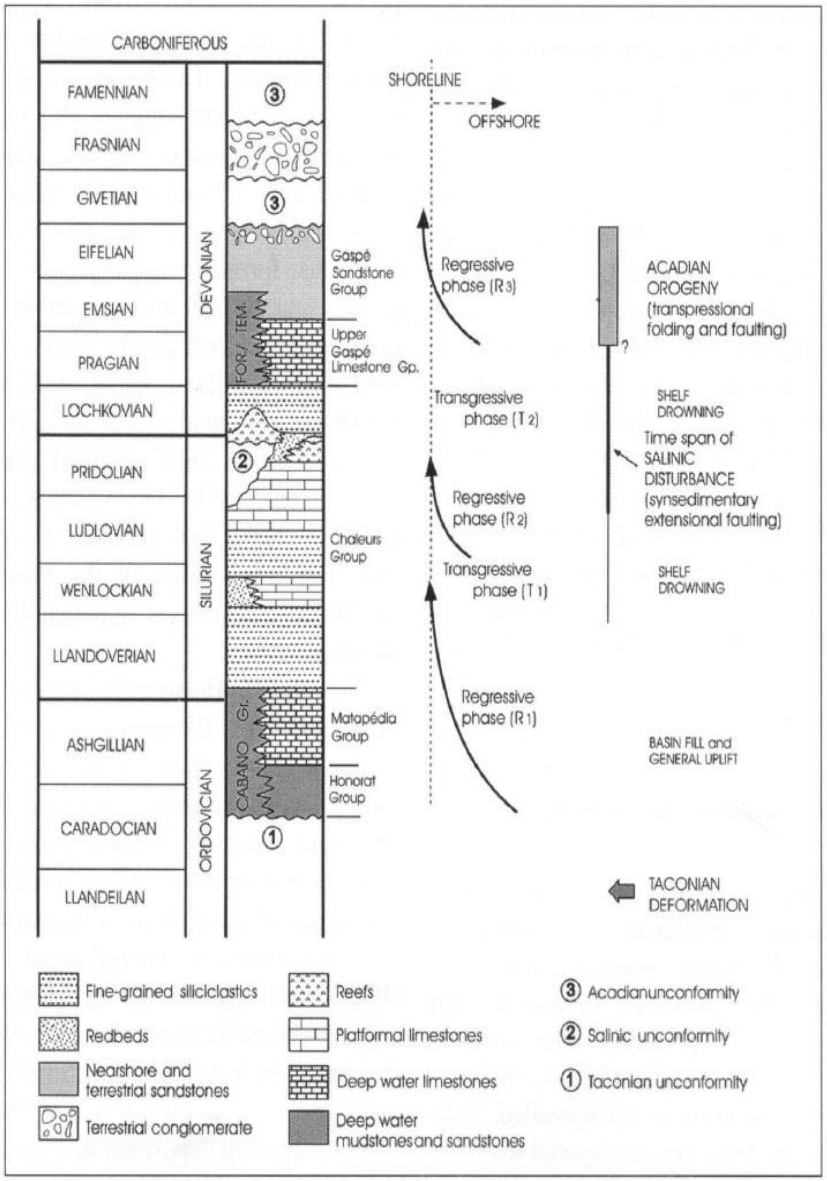
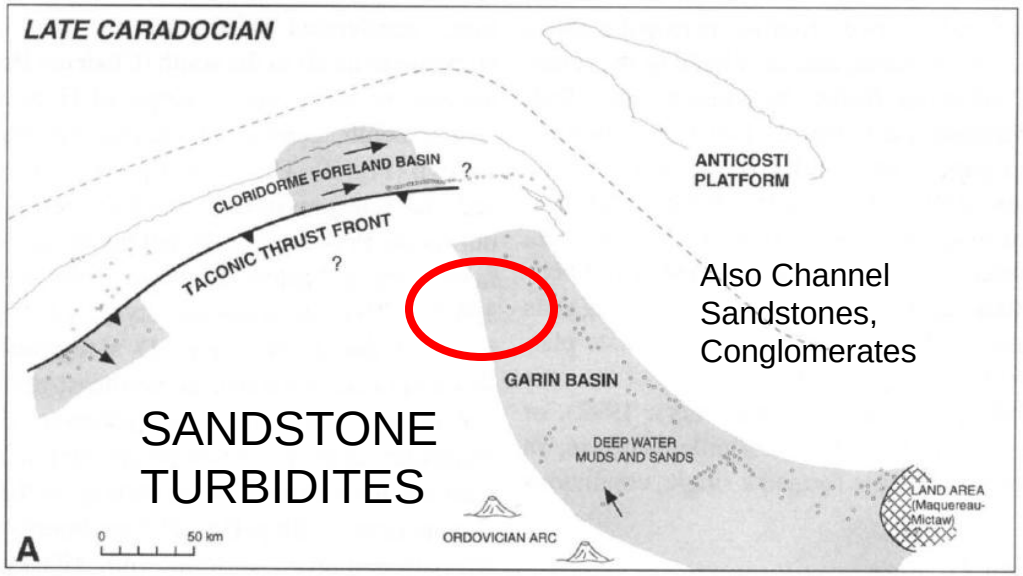
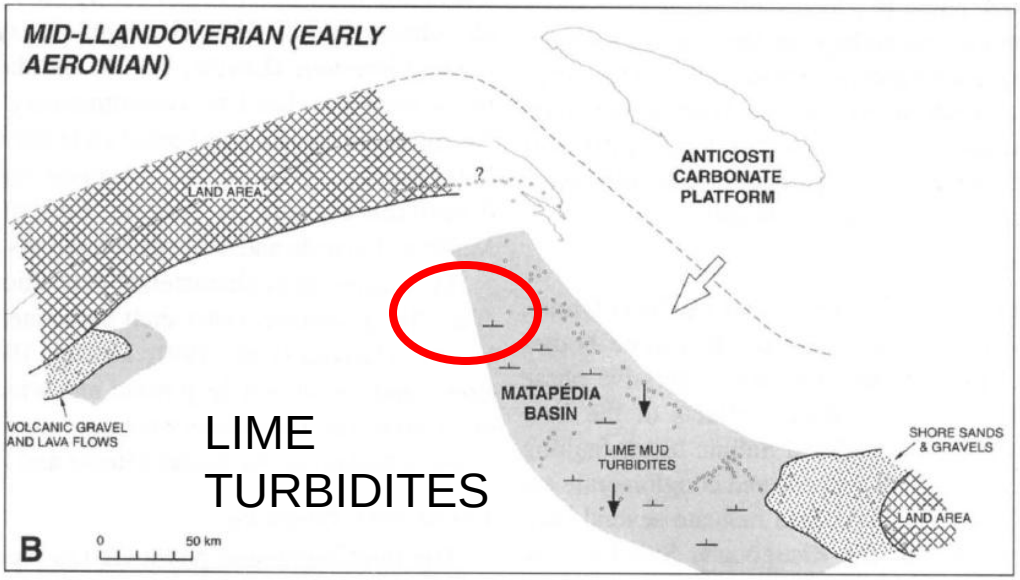
ORDOVICIAN SOURCE ROCK & RESERVOIRS







Bourque, Malo, Kirkwood CSPG 2001

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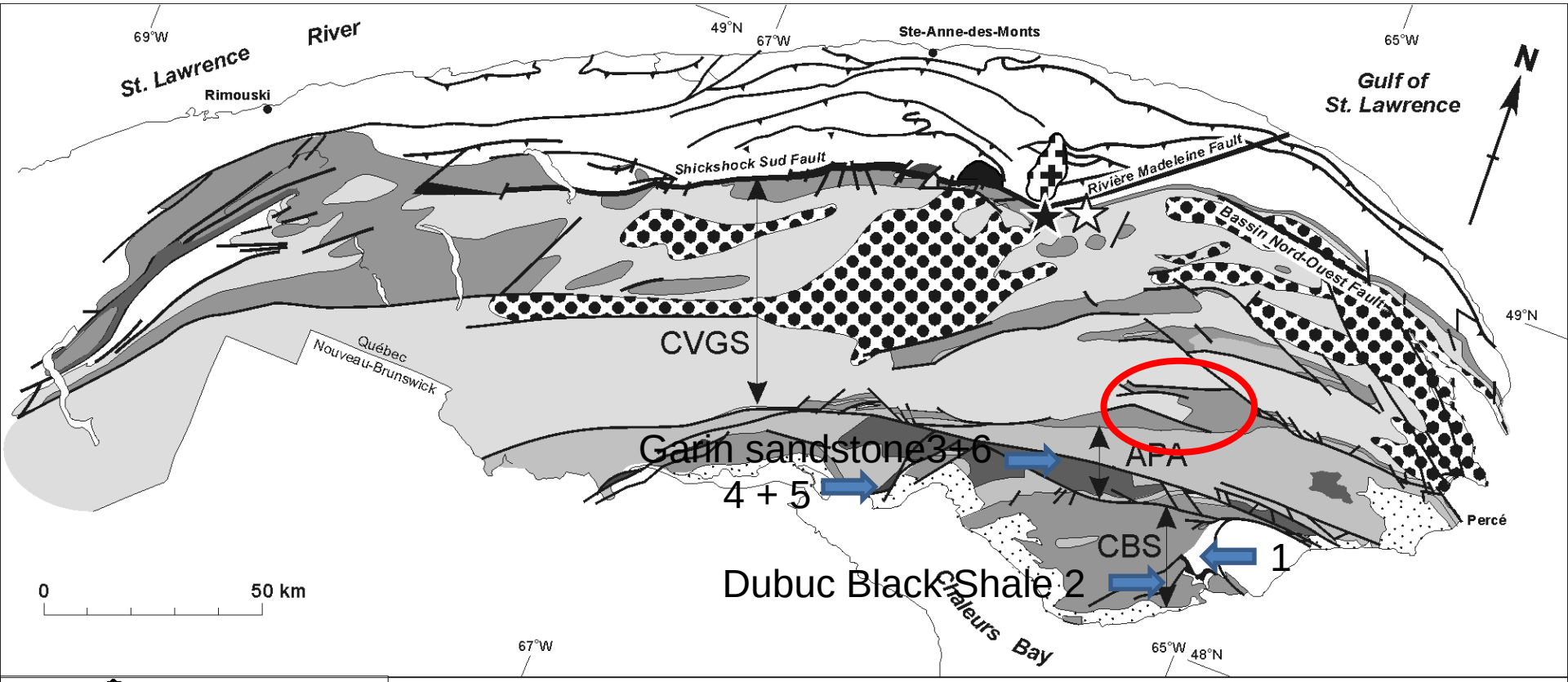

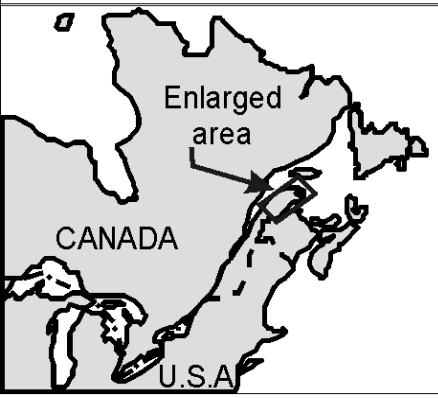

Humber and Dunnage Zones
(Early Cambrian - Upper Ordovician)

- Undifferentiated
- Ultramafic assemblages (Mont Albert and La Rédemption complexes)

Gaspé Belt
(Upper Ordovician - Middle Devonian)

- Intrusives
- Gaspé Sandstones (Low. Dev.)
- Upper Gaspé Limestones and Fortin Gr.; Témiscouata Fm. (Low. Dev.)
- Chaleurs Group (Low. Sil. to Low. Dev.)
- Matapédia Group (Upp. Ord. to Low. Sil.)
- Honorat Gr. (Gaspésie; Upp. Ord.) Cabano Gr. (Témiscouata: Upp. Ord to Low Sil.)

Post-Acadian units
(Late Devonian - Carboniferous)

- Undifferentiated

CVGS: Connecticut Valley-Gaspé synclinorium
APA: Aroostook-Percé anticlinorium
CBS: Chaleurs Bay synclinorium

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Dubuc Black Shale

Photo courtesy of Dr. Denis Lavoie

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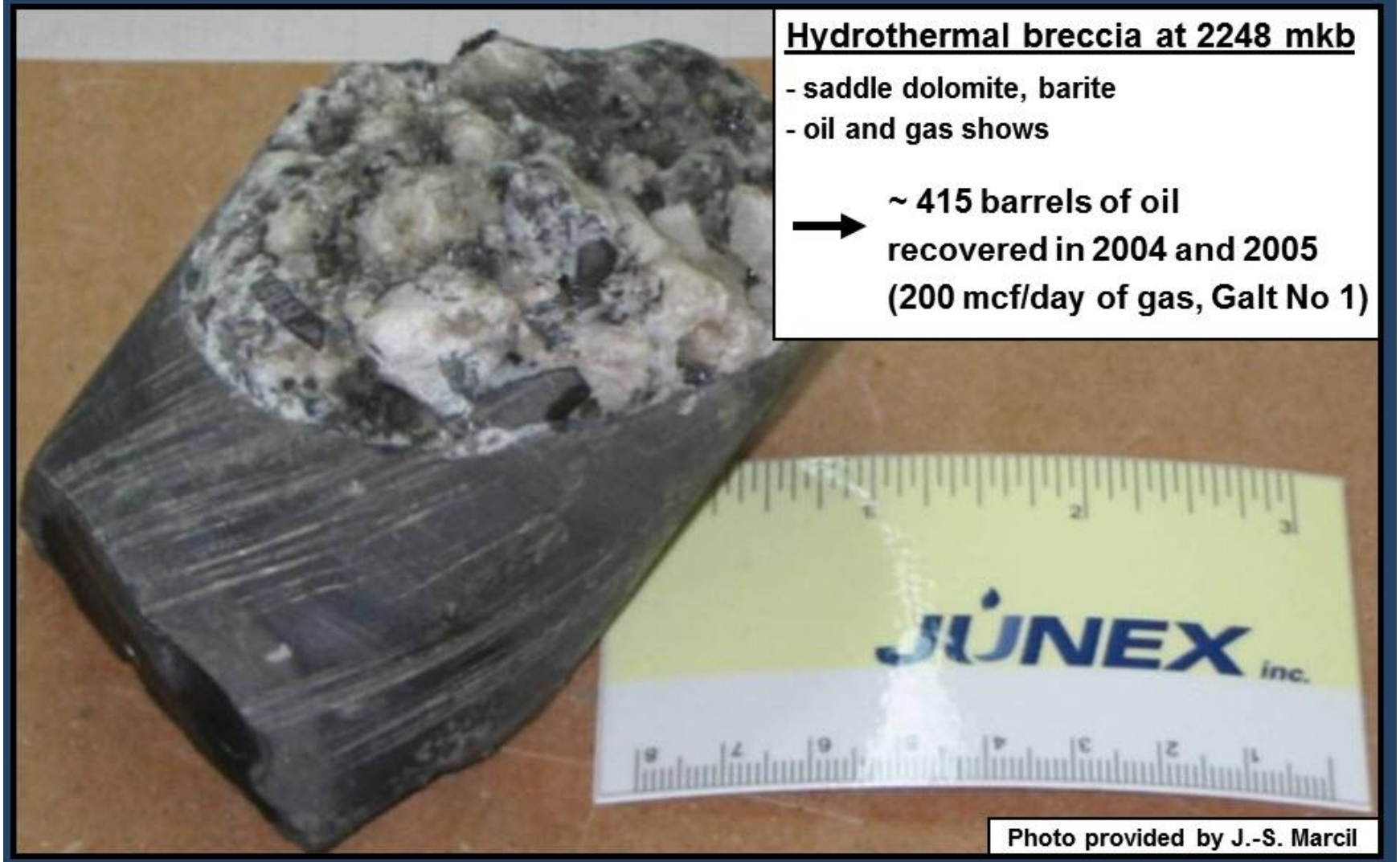
Garin sandstone

Photo courtesy of Dr. Denis Lavoie

Junex Lemaire H-Q, Galt No 3 Well



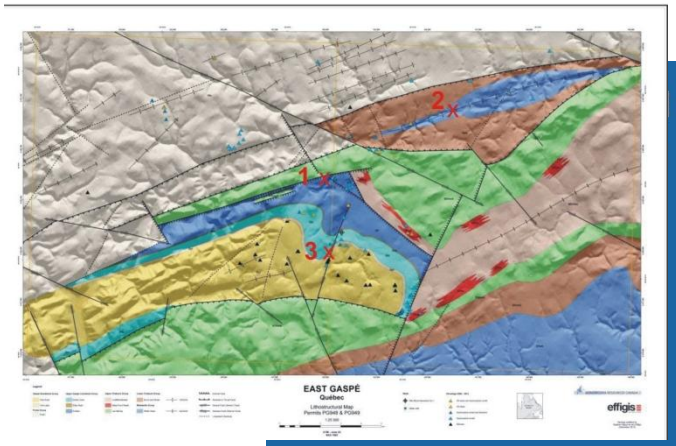
Hydrothermal breccia at 2248 mkb

- saddle dolomite, barite
- oil and gas shows

→ ~ 415 barrels of oil recovered in 2004 and 2005 (200 mcf/day of gas, Galt No 1)

Photo provided by J.-S. Marcil

Hydrothermal Dolomite Abundant On Mundiregina Eastern Blocks



trench digging revealed numerous occurrences of dolomitized

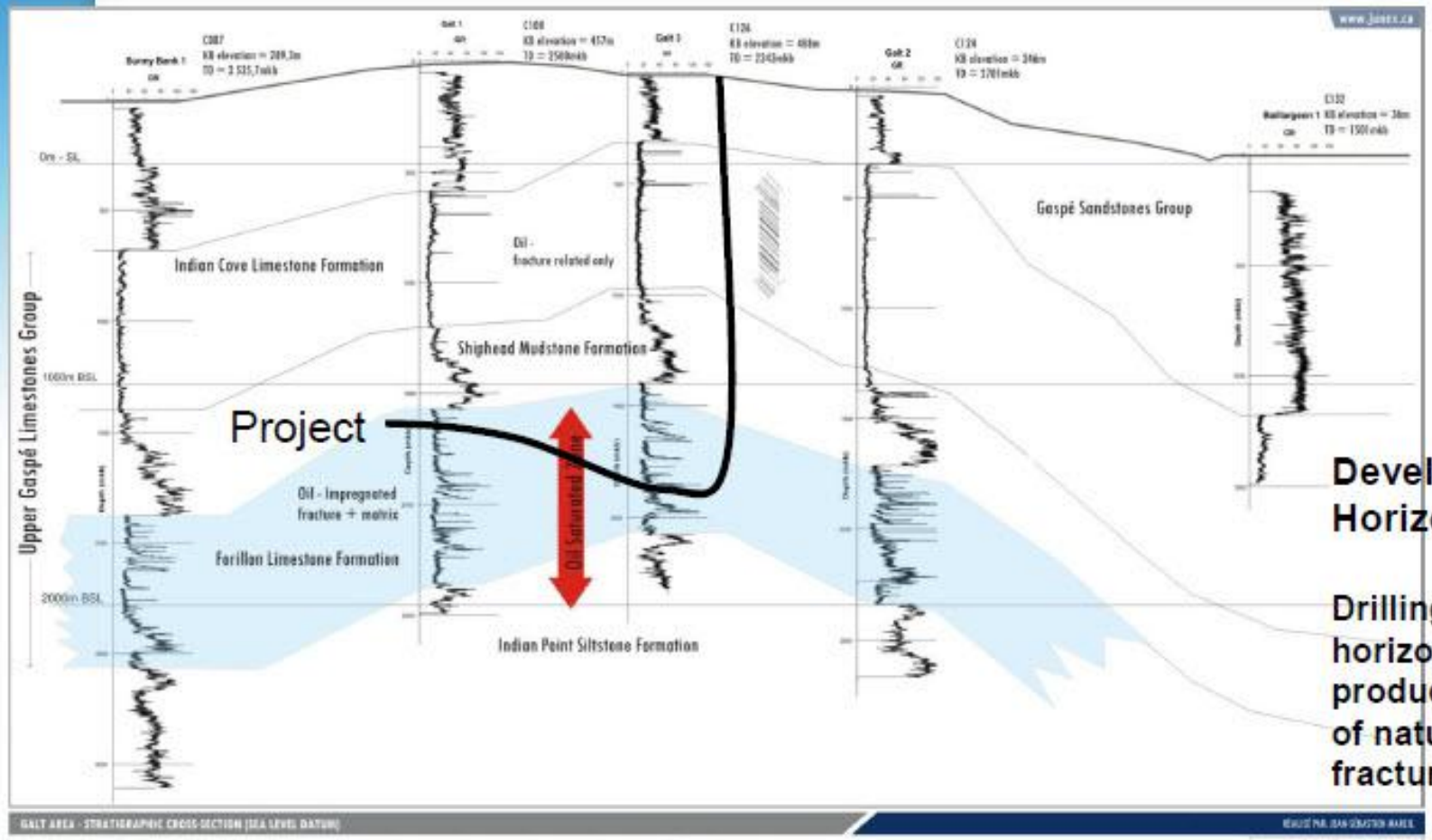
Hydrothermal breccia in White Head

Normal fault contact exposed in a trench

Digging a trench in a white-cut area

Resource Play Potential

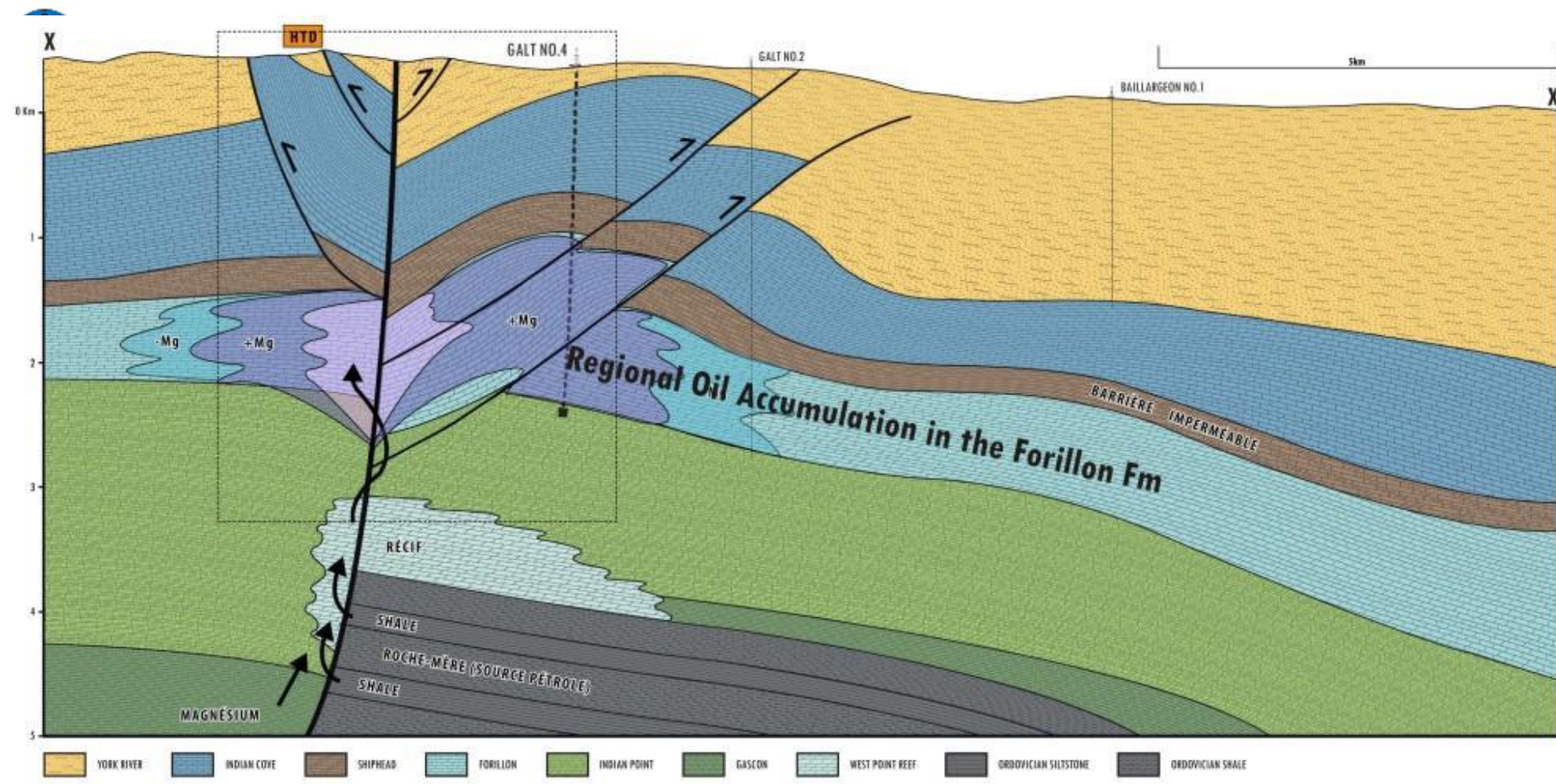
Directional Drilling



Development via Horizontal Drilling

Drilling in the dolomitic horizon with maximized production by the input of natural vertical fractures

Marcil et al. (2013)



A regional Oil Accumulation

From June

The petroleum potential of the Forillon Formation on Junex's Galt Field property was prev
for Junex by Netherland, Sewell & Associates, Inc., ("NSAI"), a firm of worldwide petrol
based in Texas. In its report, NSAI placed their **Best Estimate of the total Oil-Initially-I**
resources at 330 million barrels for the Forillon Formation on Junex's Galt Field pr
million barrel figure includes **Discovered Contingent OIIP volumes of 36 milli**
Undiscovered Prospective OOIP volumes of 294 million barrels.

Shiphead, Forillon, Indian Point

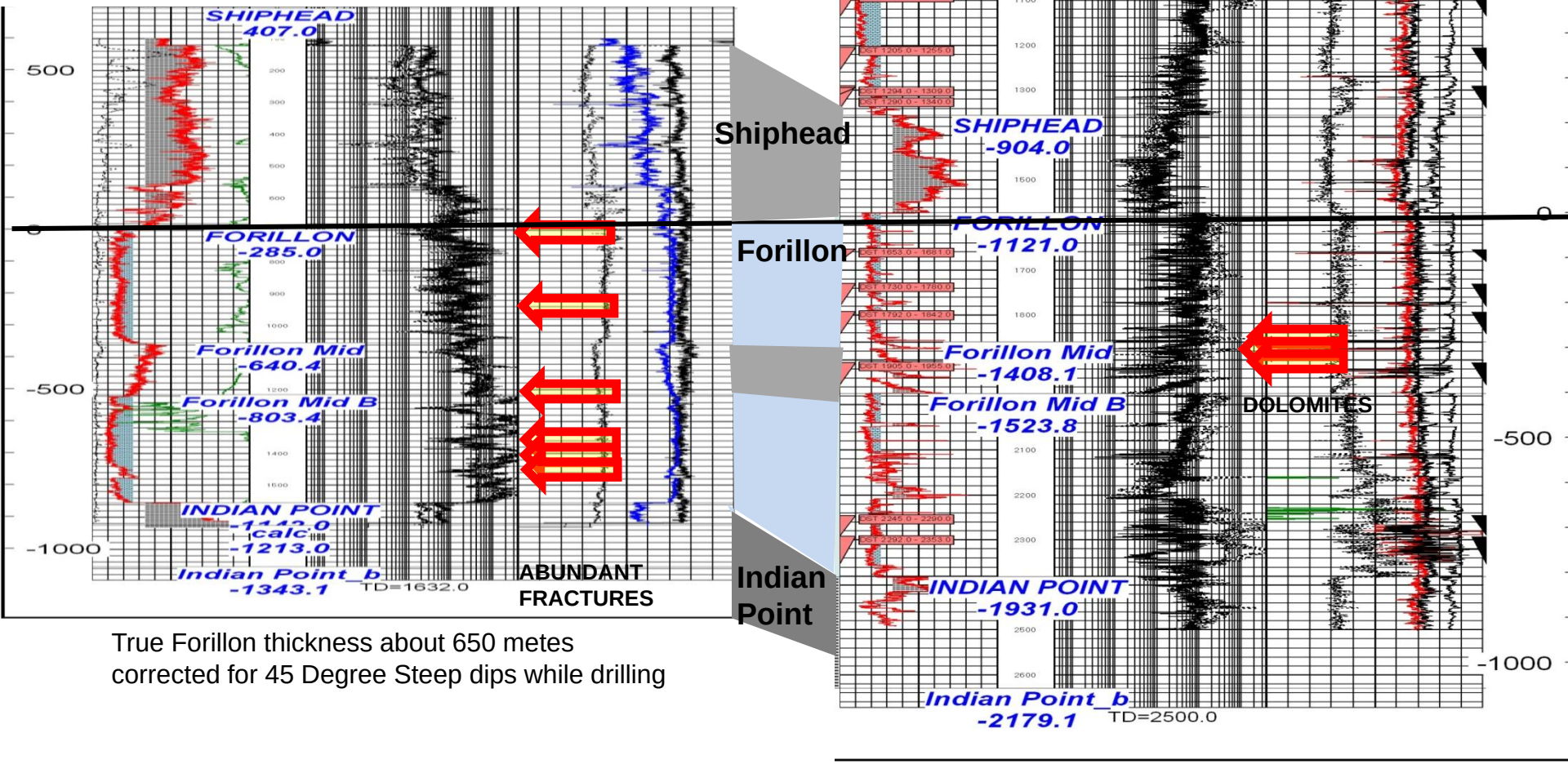
EASTERN MUNDIREGINA BLOCKS

GAULT FIELD ANALOG

MT ALEXANDER WELL #1

52 KM

GALT 1 WELL



True Forillon thickness about 650 metes
corrected for 45 Degree Steep dips while drilling

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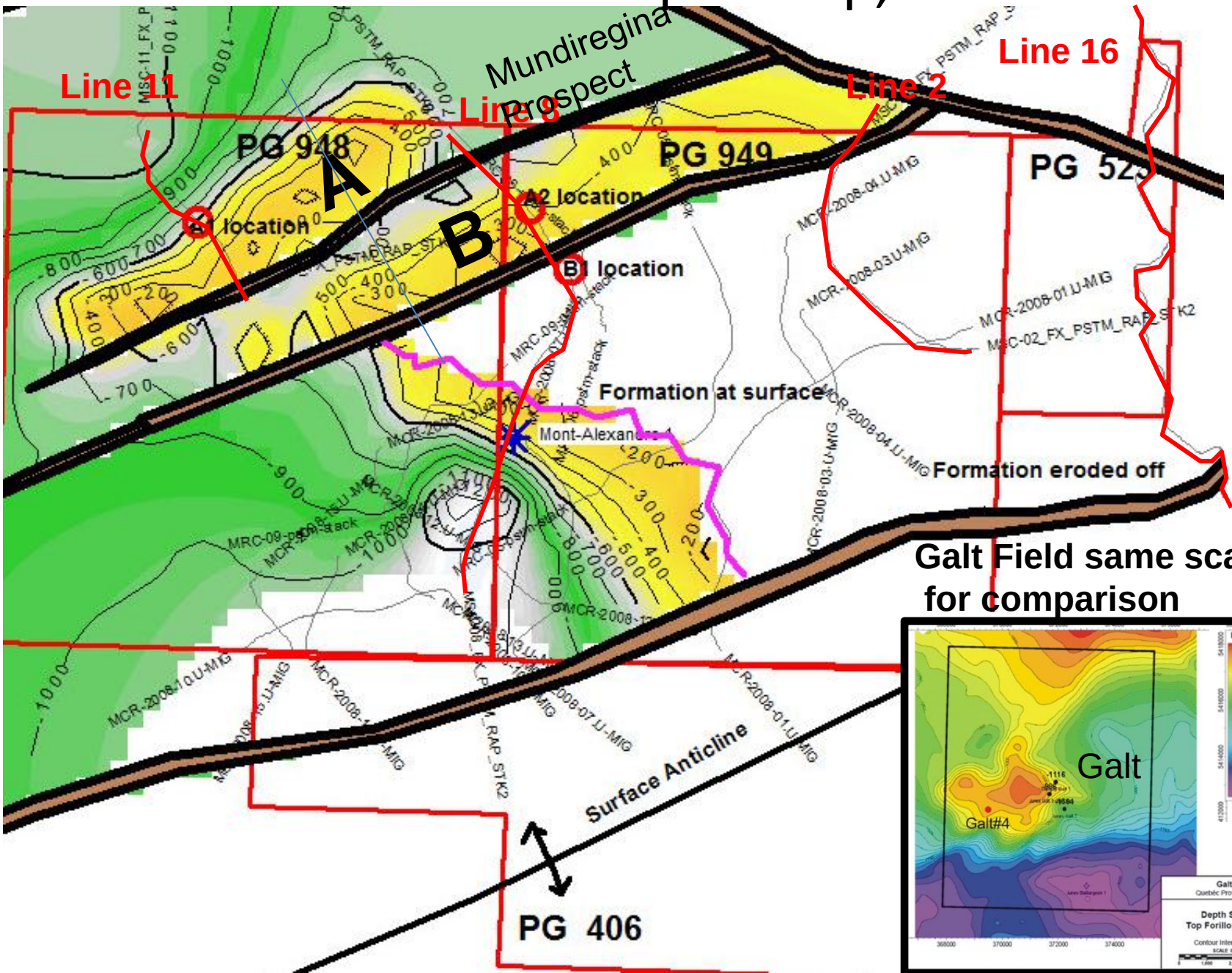
Forillon Depth Map, 2014 Processing



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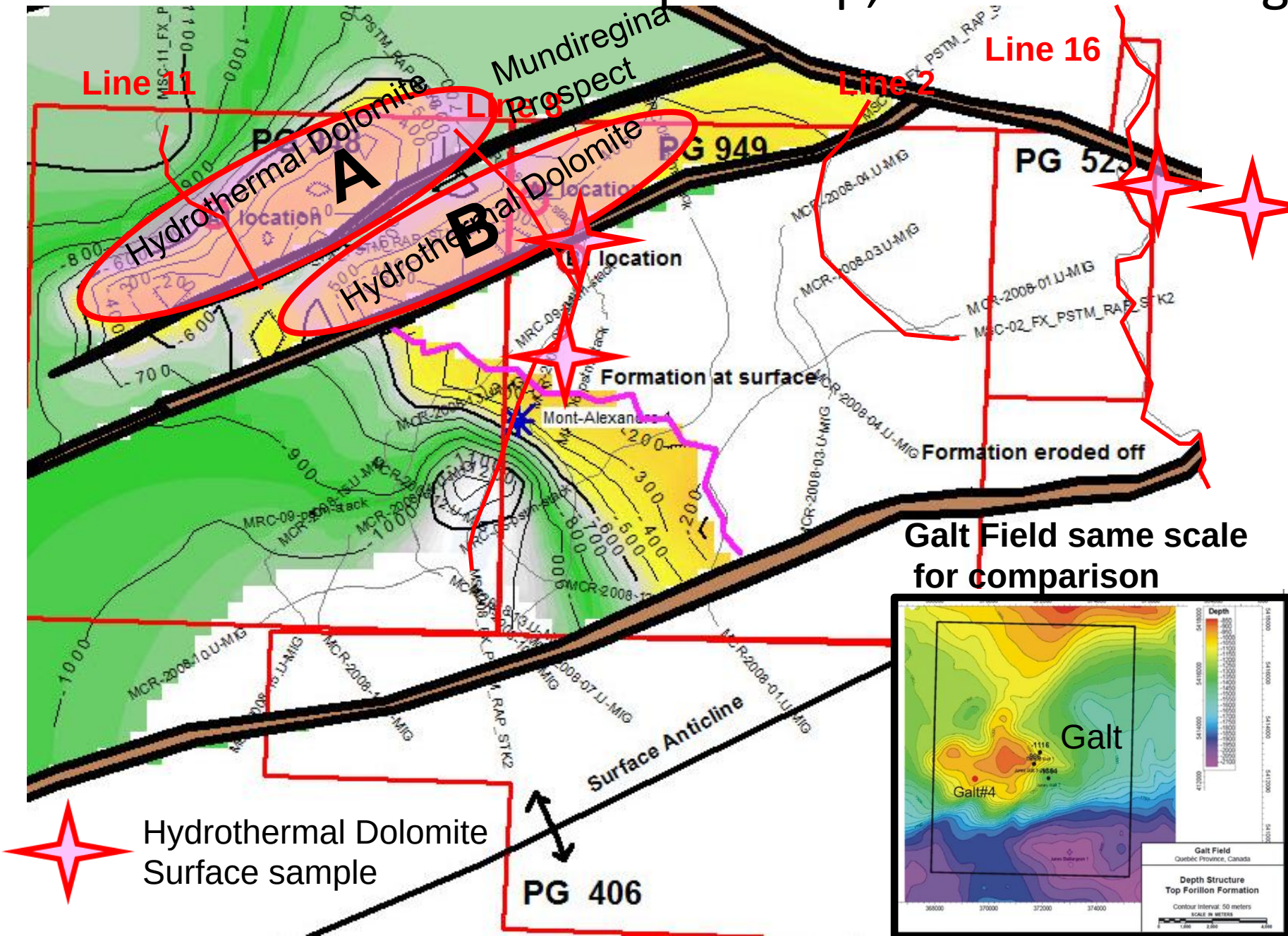
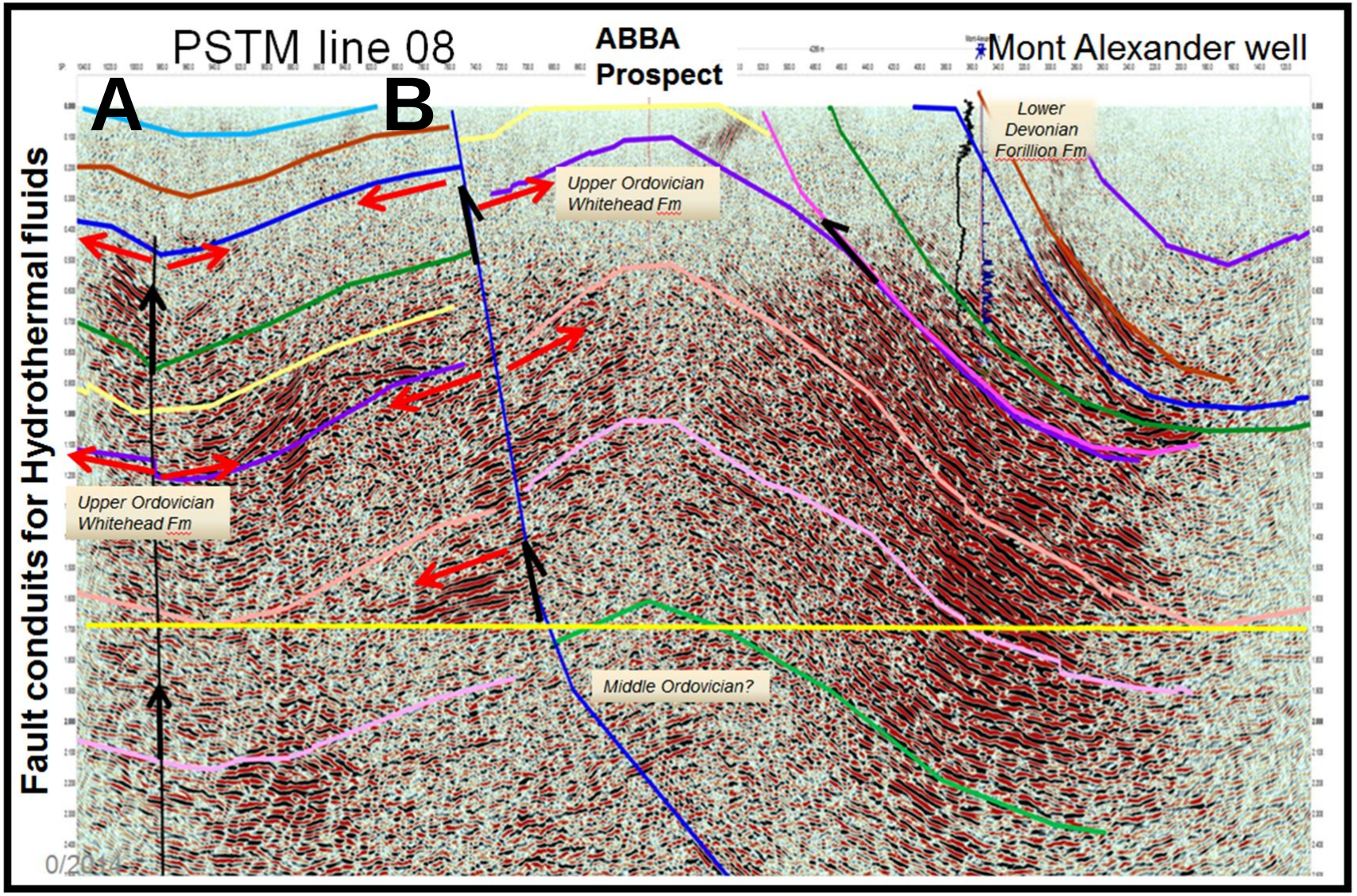
Forillon Depth Map, 2014 Processing



Line 8 2014 Processing



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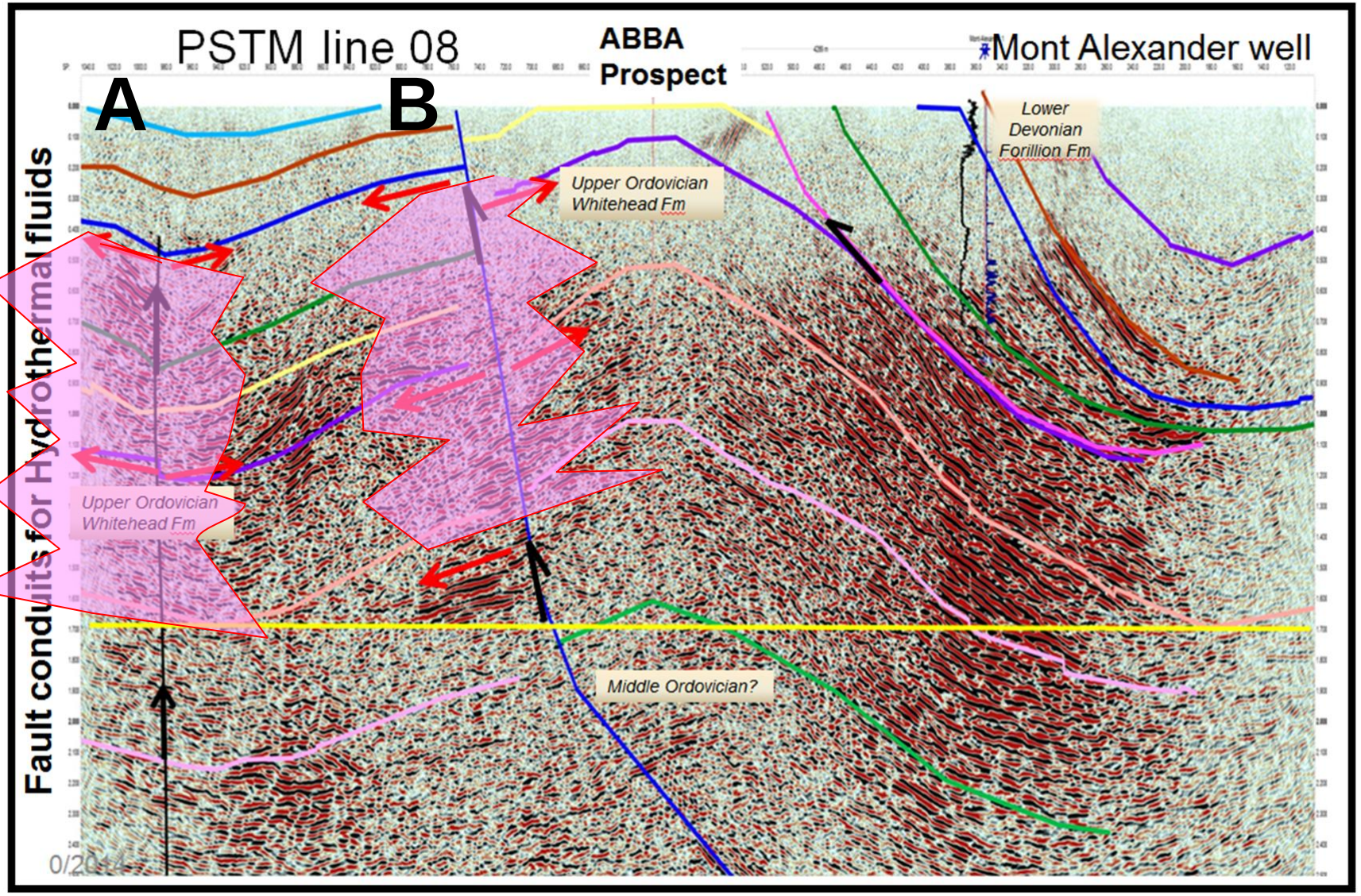
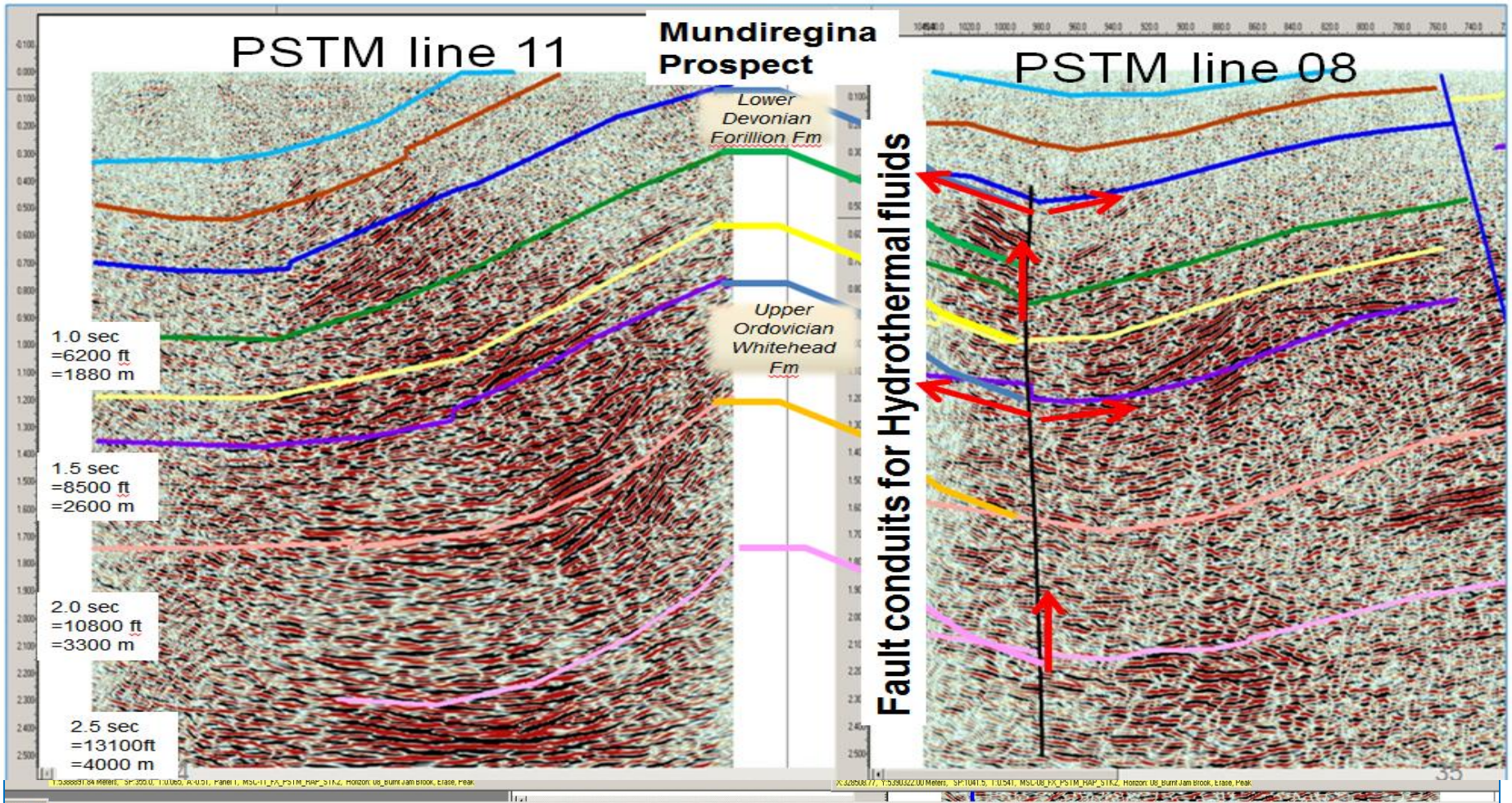
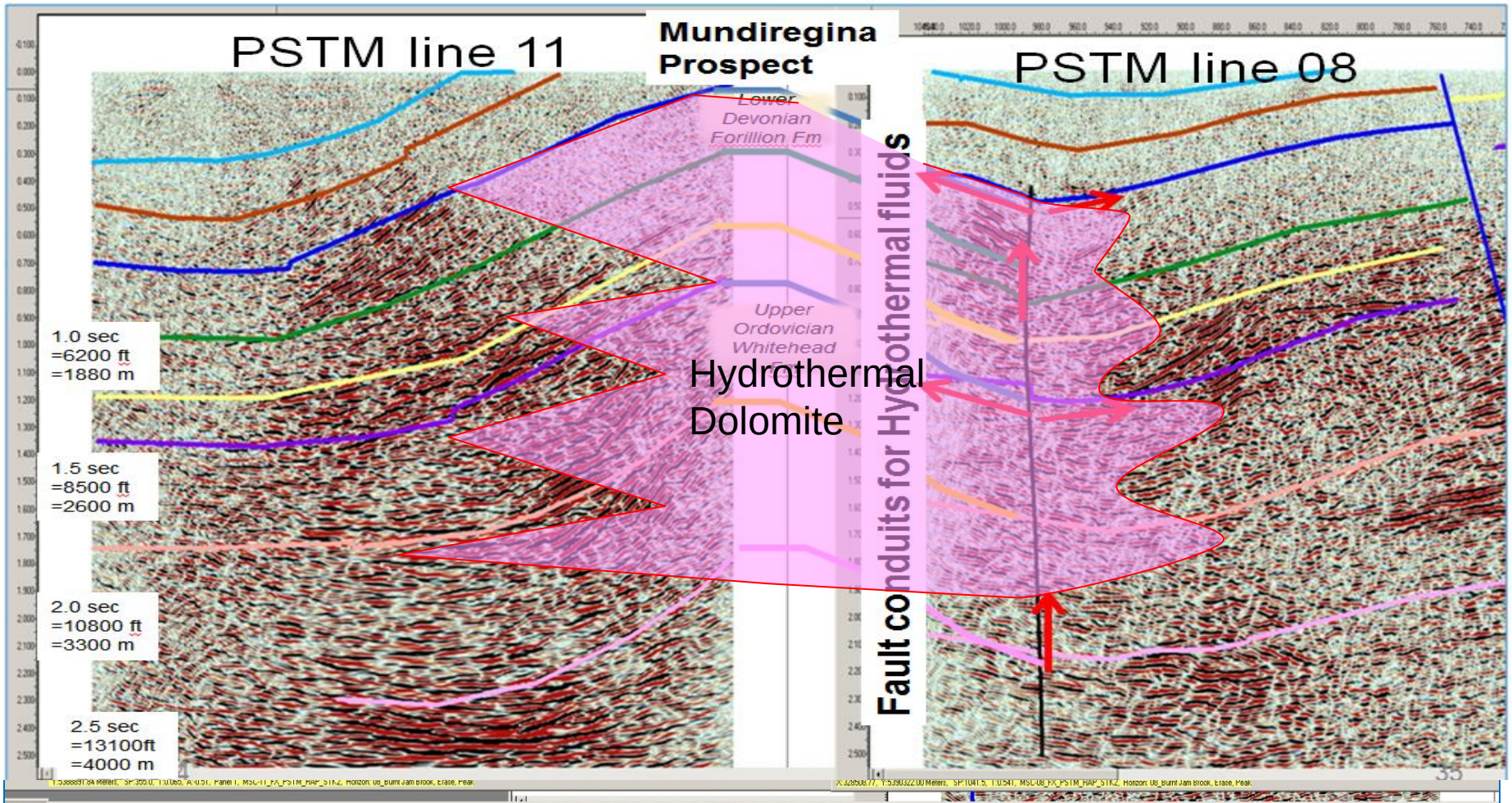


Mundiregina Structure: Opposite dipping events on ends of Line 11 and Line 8



Mundiregina Structure: Opposite dipping events on ends of Line 11 and Line 8



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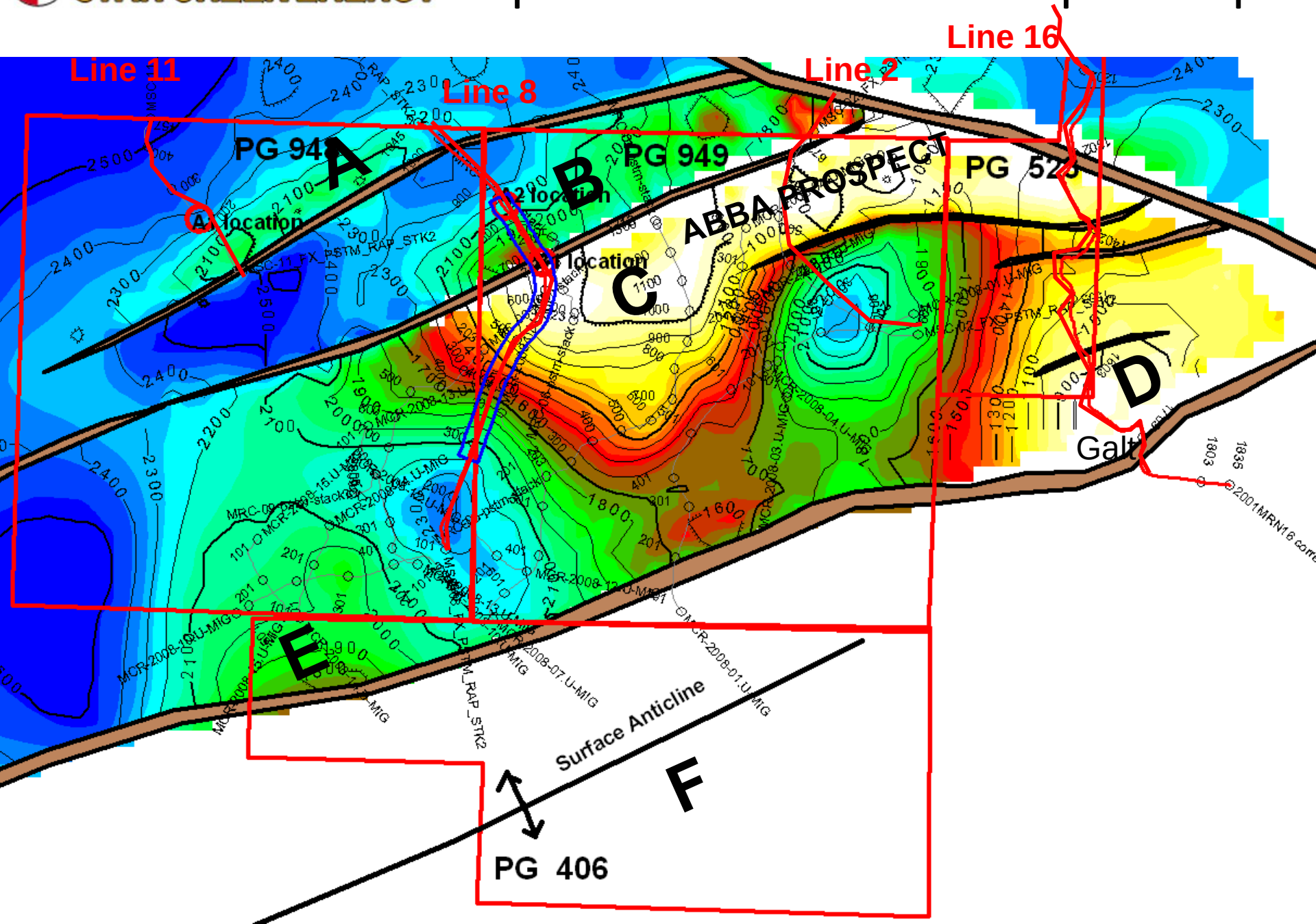
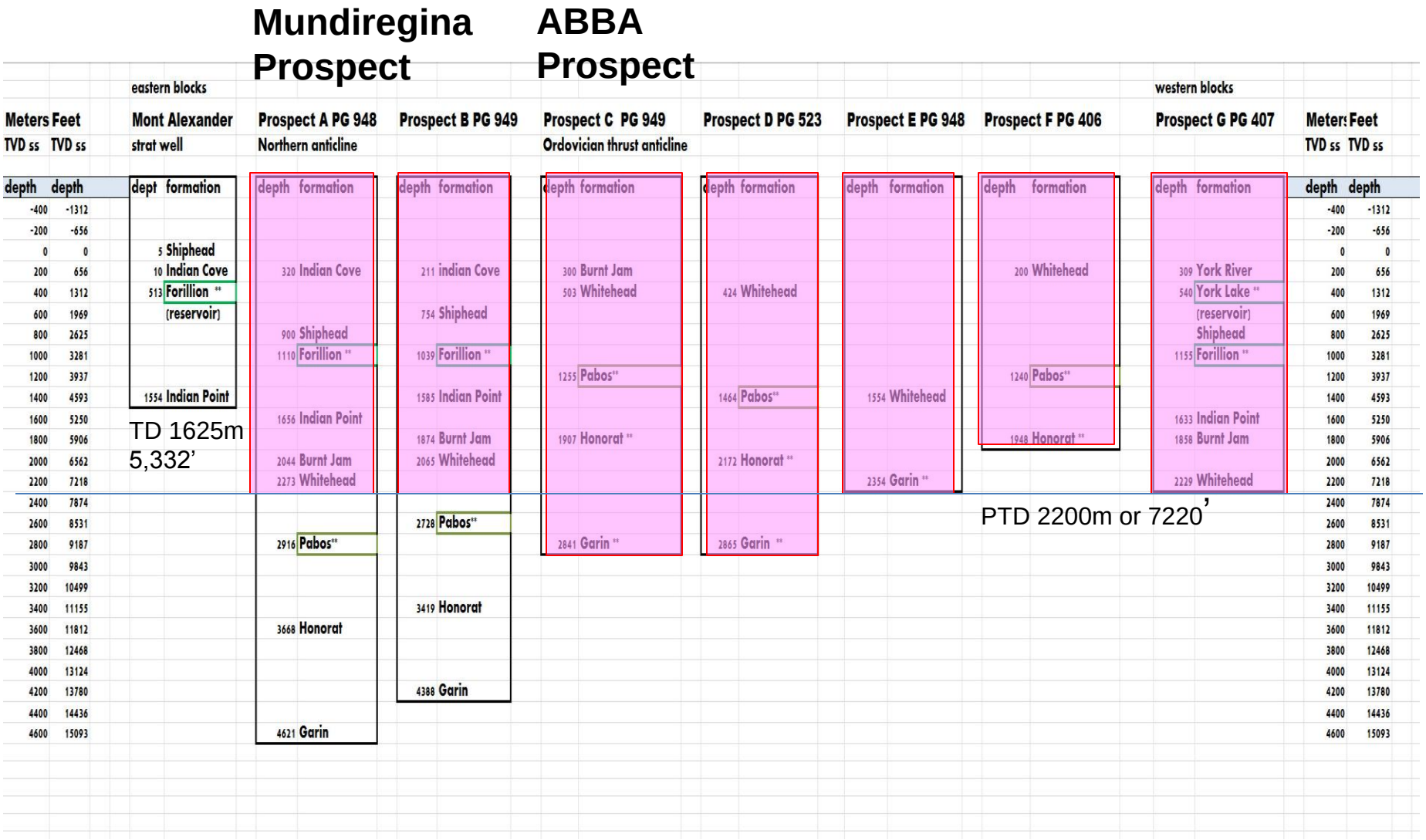
Up. Ordovician Pabos Depth Map



Eastern Area Potential

- A **Mundiregina Prospect**, Forillon and Silurian targets, tops , possible pays starting at 200 meter, 500 m column, 8,000 ac, TD 5,000', Additional dip & strike2D
- B Forillon and Silurian targets, tops, possible pays starting at 200 meter, 250 m column, 5,000 ac, TD 5,000', Additional dip & strike2D
- C **ABBA Prospect**, pays starting beneath Whitehead at 800 meter, 800 m column, 15,000 ac, TD 5,000' to upper zones, 10,000' to Garin, reprocess additional lines
- D Mt. Alexander, pays starting beneath Whitehead at 800 meter, 800 m column, 15,000 ac, TD 5,000' to upper zones, 10,000' to Garin, reprocess additional lines
- E Block 406 Surface Anticline, acquire 2D seismic after drilling Mt. Alex
- F Western Block line 10B, Lower Devonian sandstones and carbonates, York River, Forillon, Silurian Val Briant, Ordovician, Large Surface Anticline 20,000 Acres, reprocess 10B, acquire additional 2D

Eastern Area Opportunities



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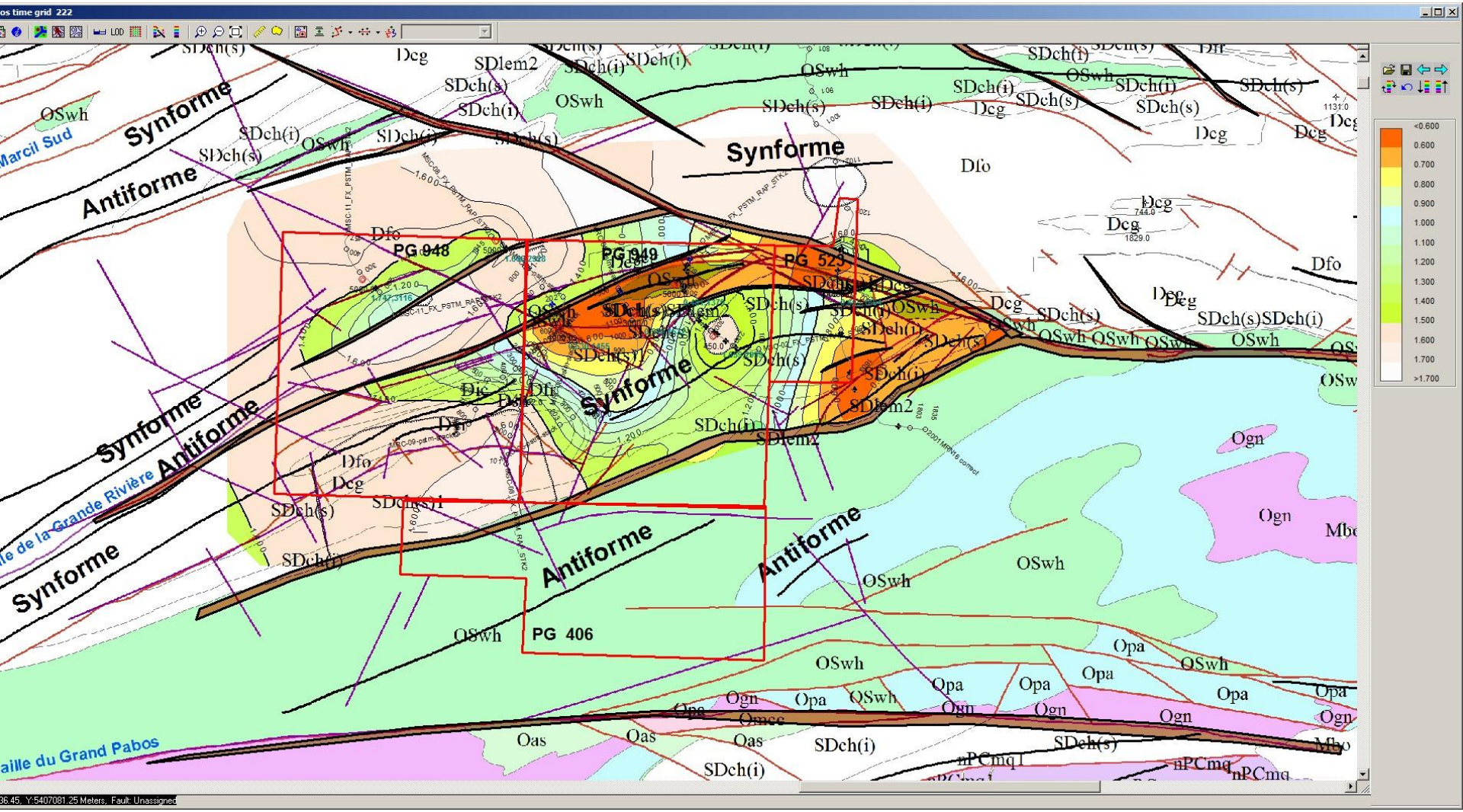
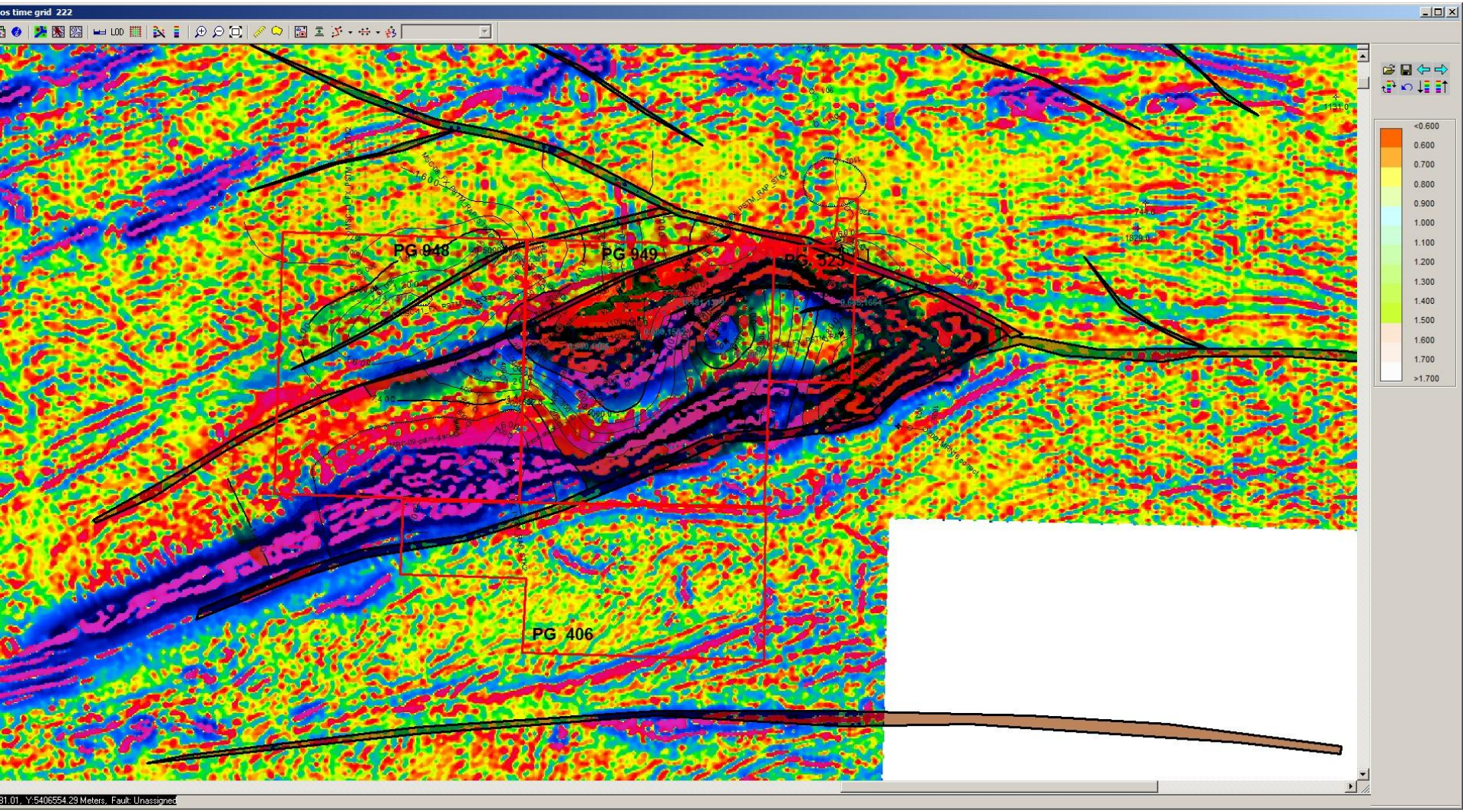
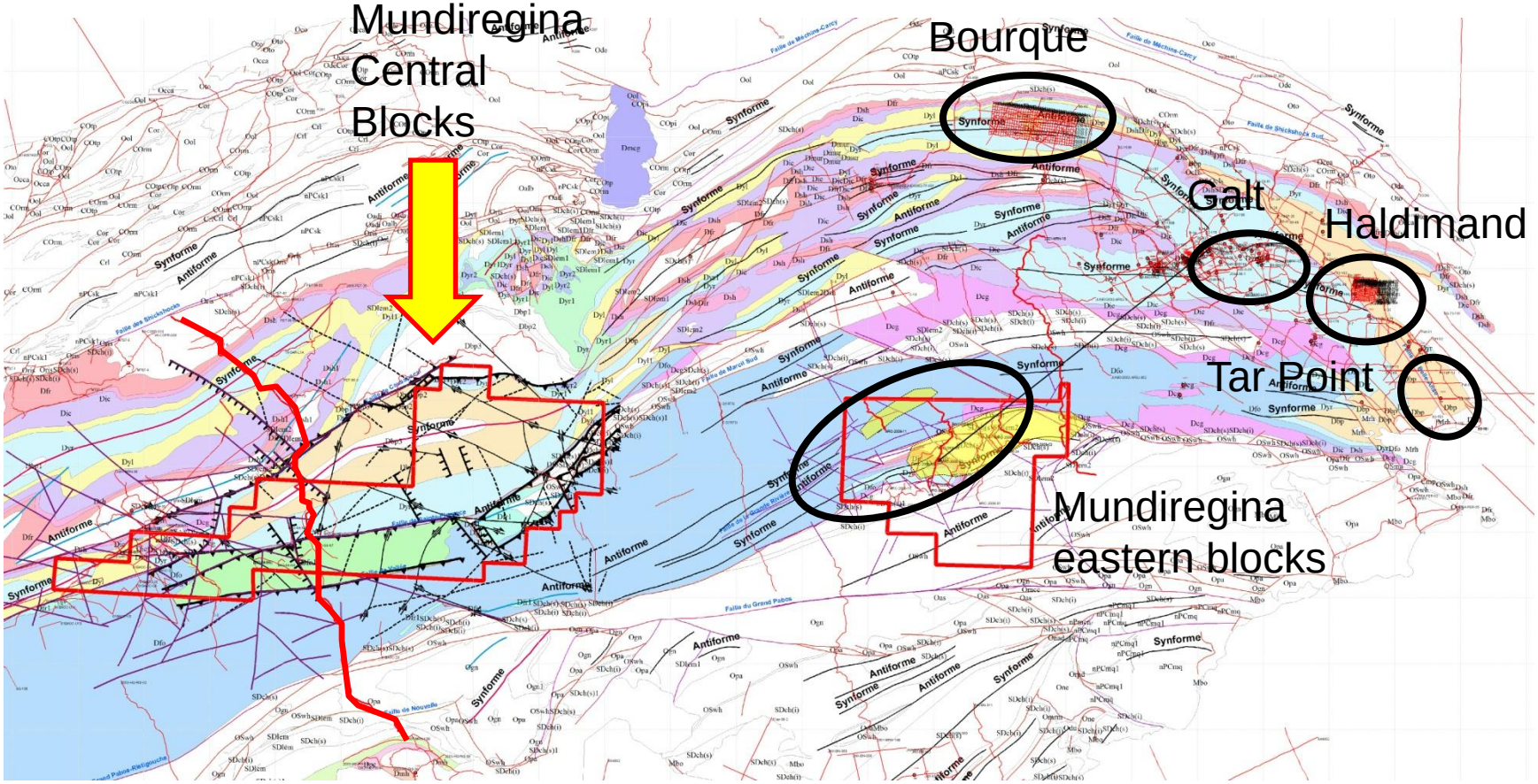
Upper Ordovician (time contours) with regional Cambrian trends



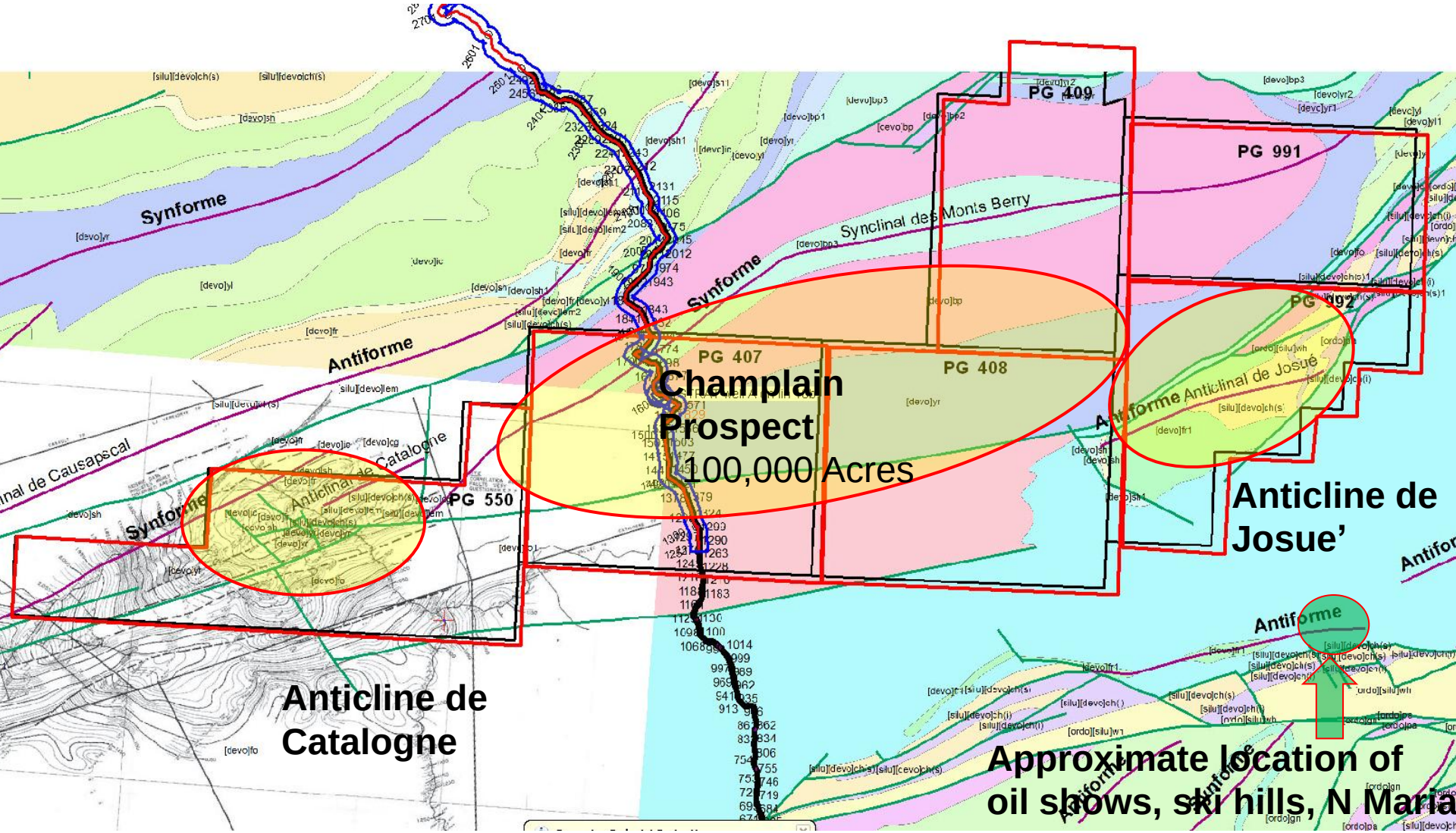
Aeromagnetic gradient map shows thrust structures seen on seismic



Devonian outcrops



Central Area Large anticlinal structures



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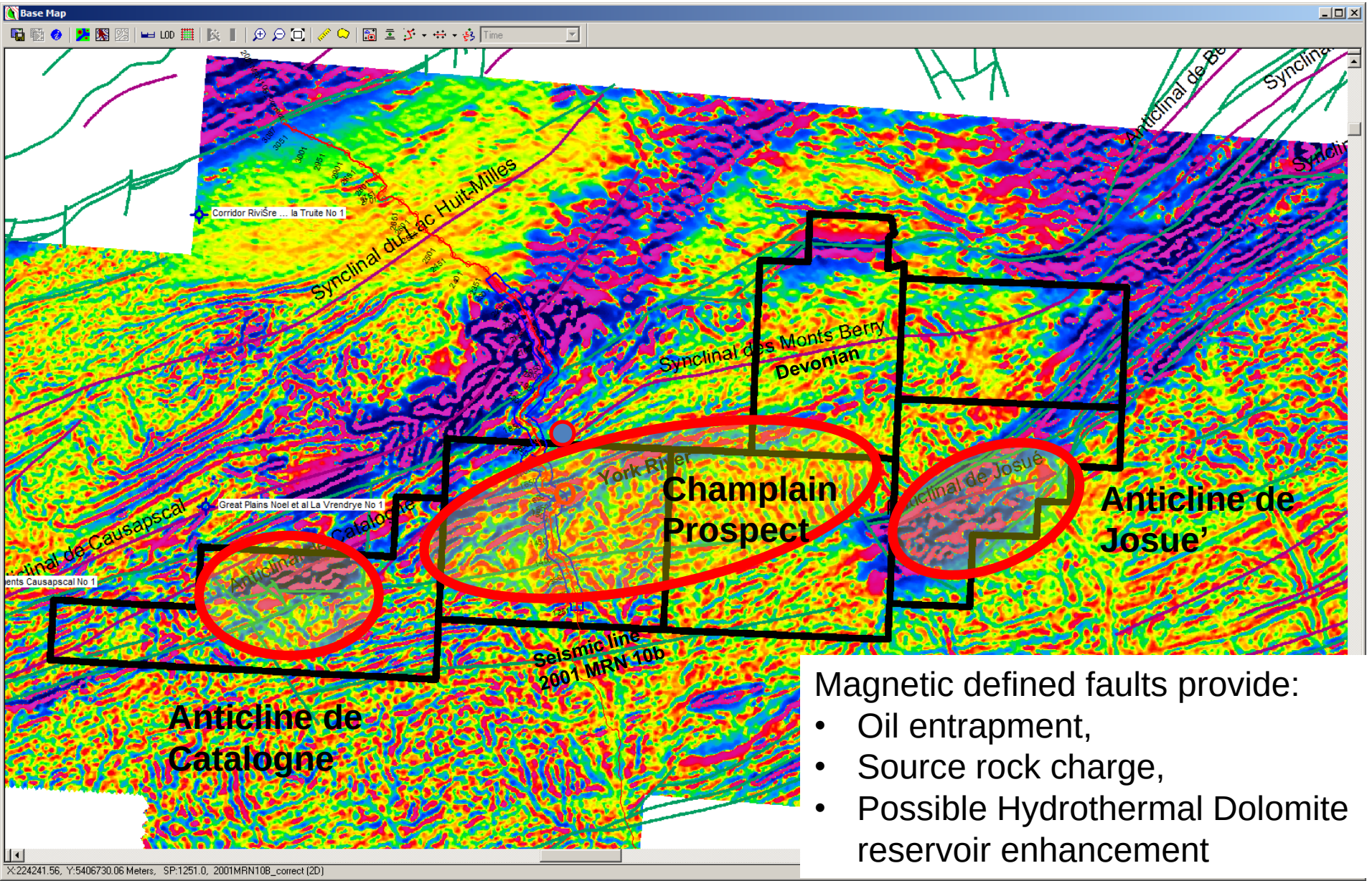
Central Blocks Magnetic Second Derivative



Magnetic defined faults provide:

- Oil entrapment,
- Source rock charge,
- Possible Hydrothermal Dolomite reservoir enhancement

Oil shows from shallow water well in Ski Hill Area, north of the town of Maria

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Note: structures are undrilled; stratigraphic columns are interpretations Of possible rock layers

Interpretation of Line 10b after reprocessing