



Moose Oils Ltd.

**Imaging Overturned Fold Limbs
Using the Experimental 2D Seismic
Line LOFF 8**

**By A. C. Newson B. Sc P.Geol
Moose Oils Ltd**



- **Overview**
- **LOFF 8 PSDM velocity anomaly identified**
- **LOFF 8 re interpretation using RDA SCAT and MVE down plunge projection**
- **Resolution of the anomaly**
- **Where to from here?**

Foothills Stratigraphy



Moose Oils Ltd.

Age	m.	Lithology
Tertiary	700 / 1200	Sands with minor shales
Upper Cretaceous	700 / 1500	Sands with minor shales
	800	Shales with minor sands & conglomerates
Lower Cretaceous	400	Sands shales & coals
Triassic	250 / 500	Limestone sands & shales
Permian to Pennsylvanian	0/120	Sand & shale
Mississippian	400	Dolomitised limestone
Devonian	600	
Cambrian	500	
Pre-Cambrian		Igneous & metamorphic

☼ Cardium

☼ Viking

☼ Pardonet / Baldonnel

☼ Taylor Flats

☼ Turner Valley / Debolt

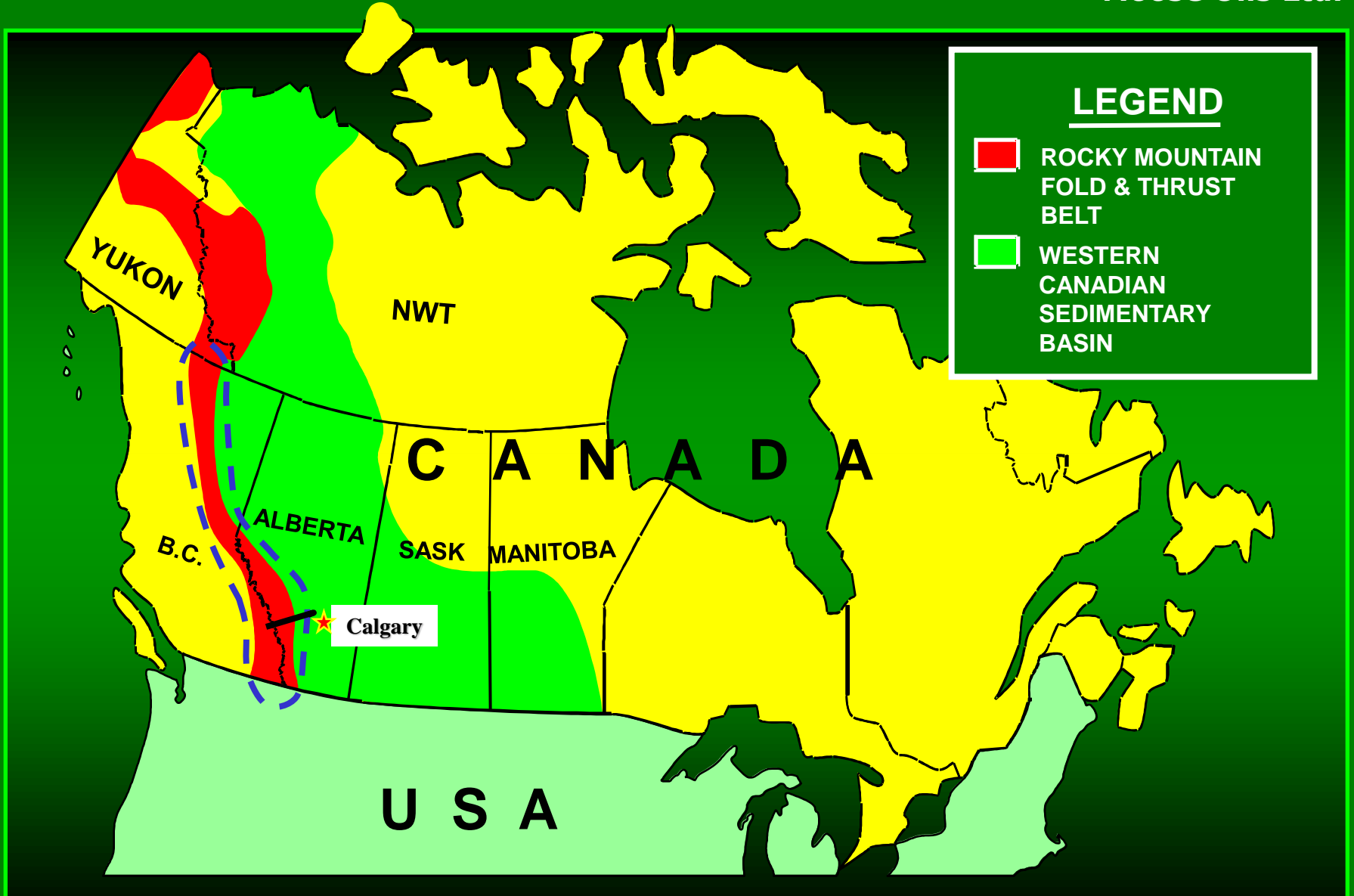
☼ Palliser

☼ Beaverhill Lake

Foothills Location



Moose Oils Ltd.



LEGEND

-  ROCKY MOUNTAIN FOLD & THRUST BELT
-  WESTERN CANADIAN SEDIMENTARY BASIN

Alberta Foothills Cross Section



Moose Oils Ltd.

Fold and Thrust Belt



Front Ranges

Foothills

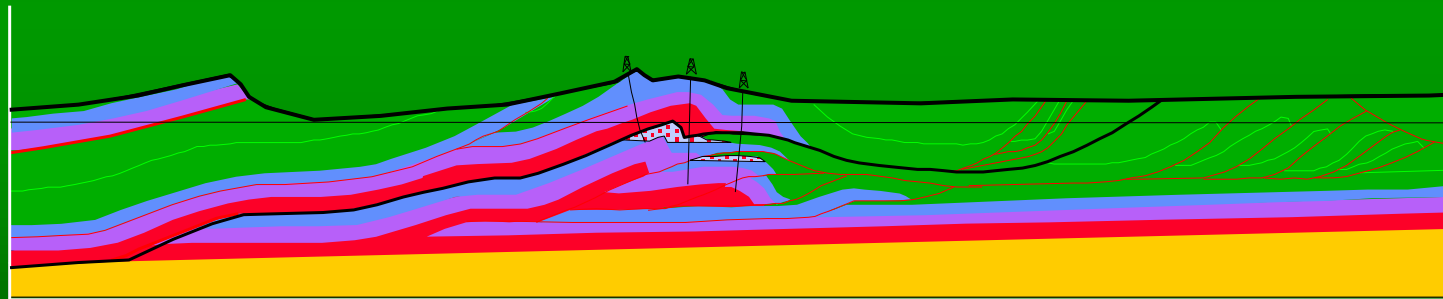
Plains

McConnell Thrust

Triangle Zone

SW

NE



Sea level

10 kms

 Cretaceous Age  Mississippian Age  Devonian Age  Cambrian Age

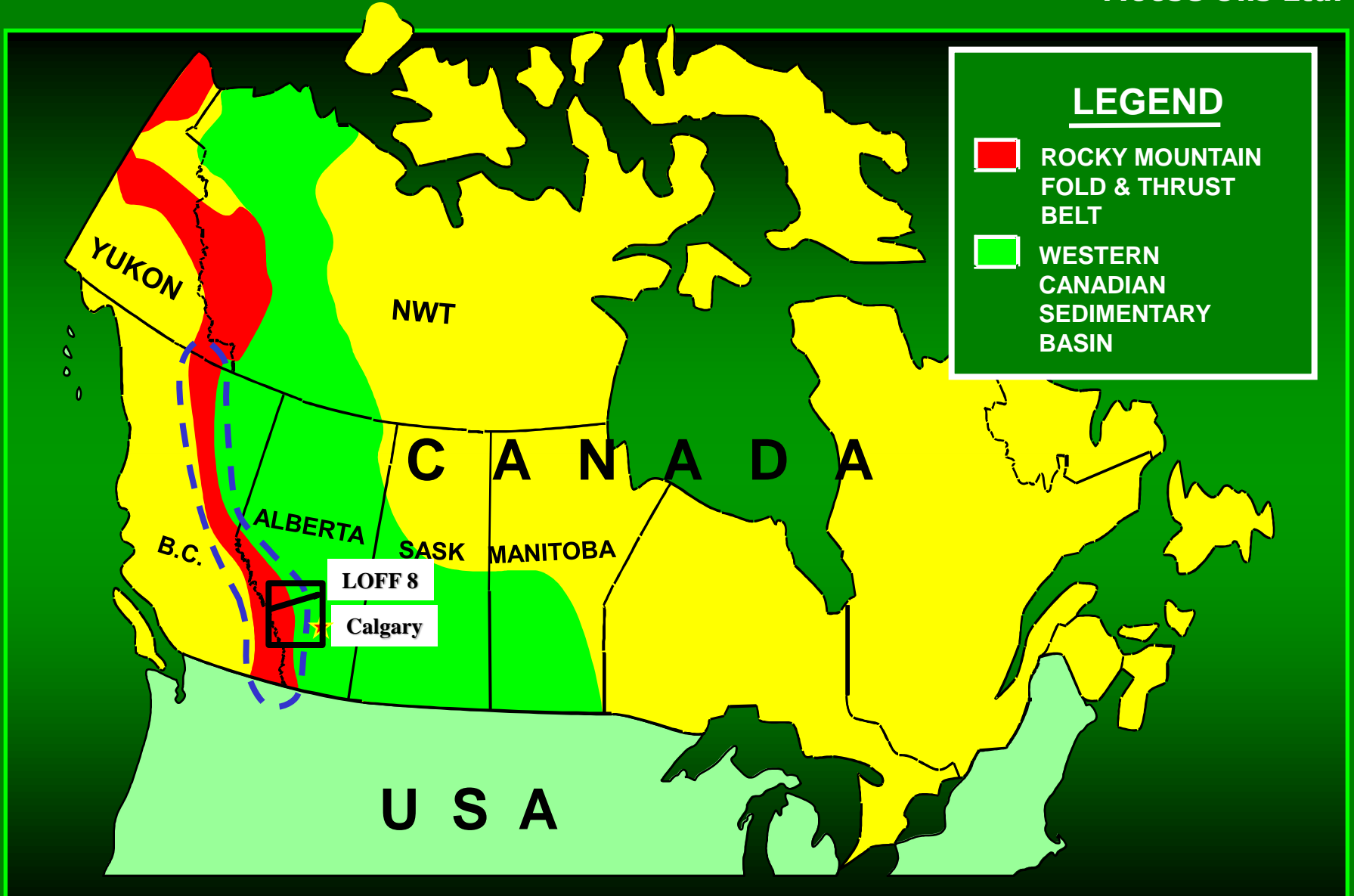


- **Overview**
- **LOFF 8 PSDM velocity anomaly identified**
- **LOFF 8 re interpretation using RDA SCAT and MVE down plunge projection**
- **Resolution of the anomaly**
- **Where to from here?**

LOFF 8 Location



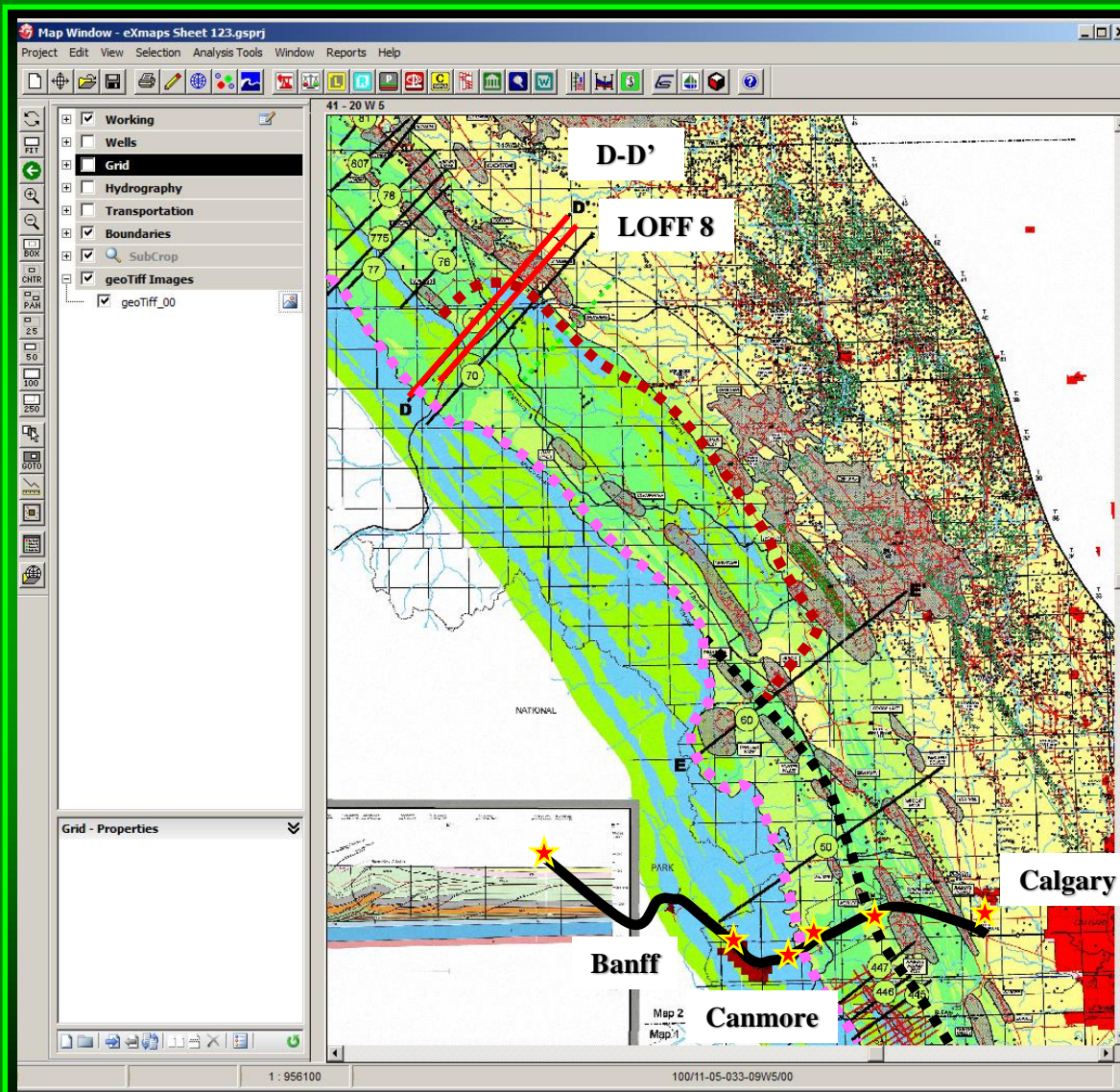
Moose Oils Ltd.



LOFF 8 Structures and Fields



Moose Oils Ltd.

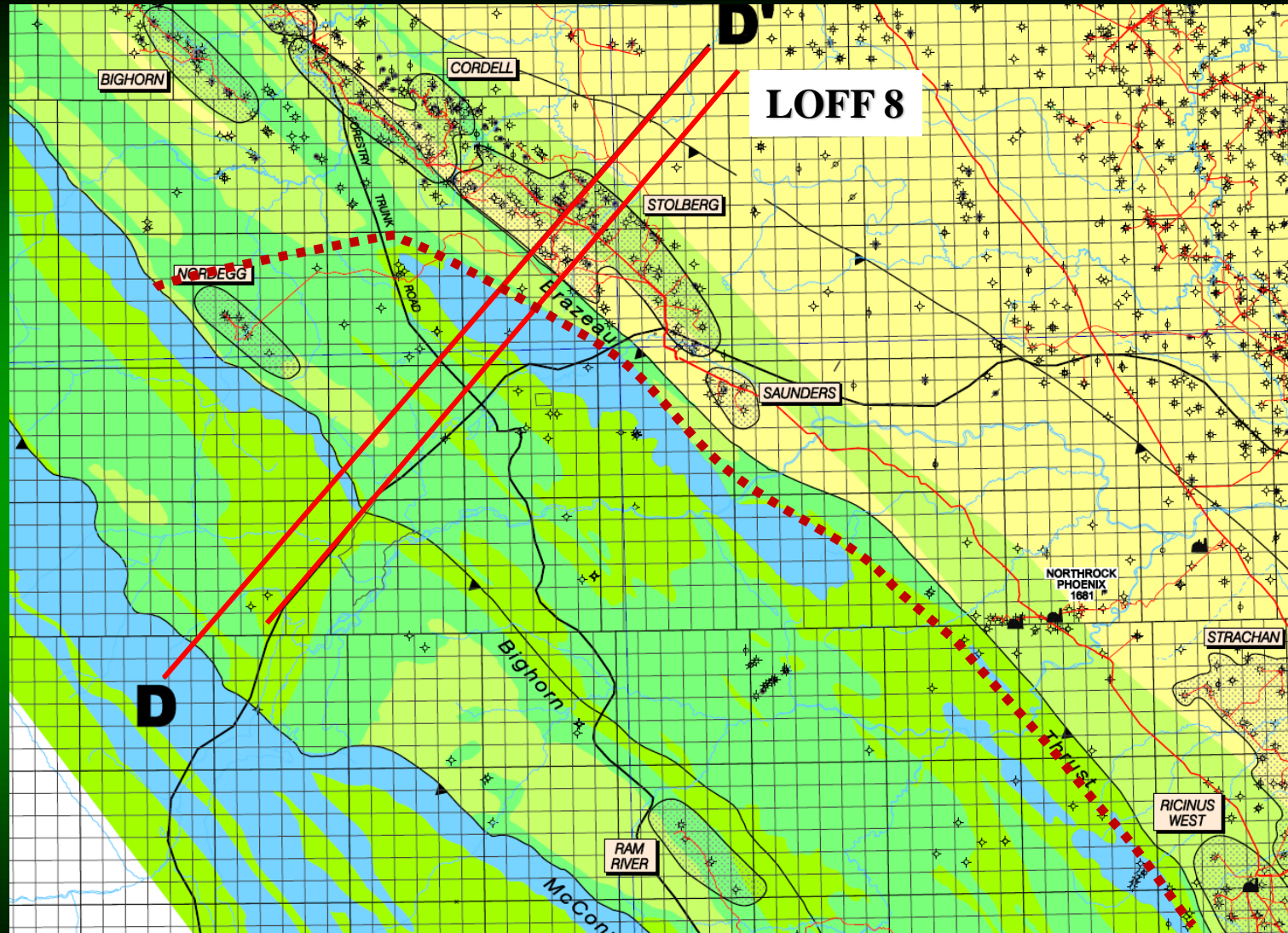


- Palaeozoic hanging wall cutoff:
- McConnell Thrust
- MooseThrust
- Brazeau Thrust
- Field trip route
- Field trip stops

LOFF8 and Cross Section D-D' in detail



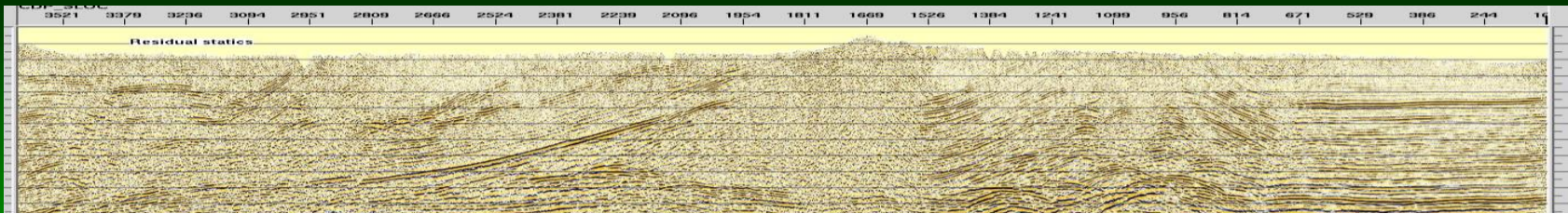
Moose Oils Ltd.



Brute stack and AGS Section



LOFF 8 long offset high intensity line



This data is proprietary to, and a trade secret of, SeisVentures Resources Ltd. Use of this data is restricted to companies holding a valid license from SeisVentures and is subject to the confidentiality terms of that license.

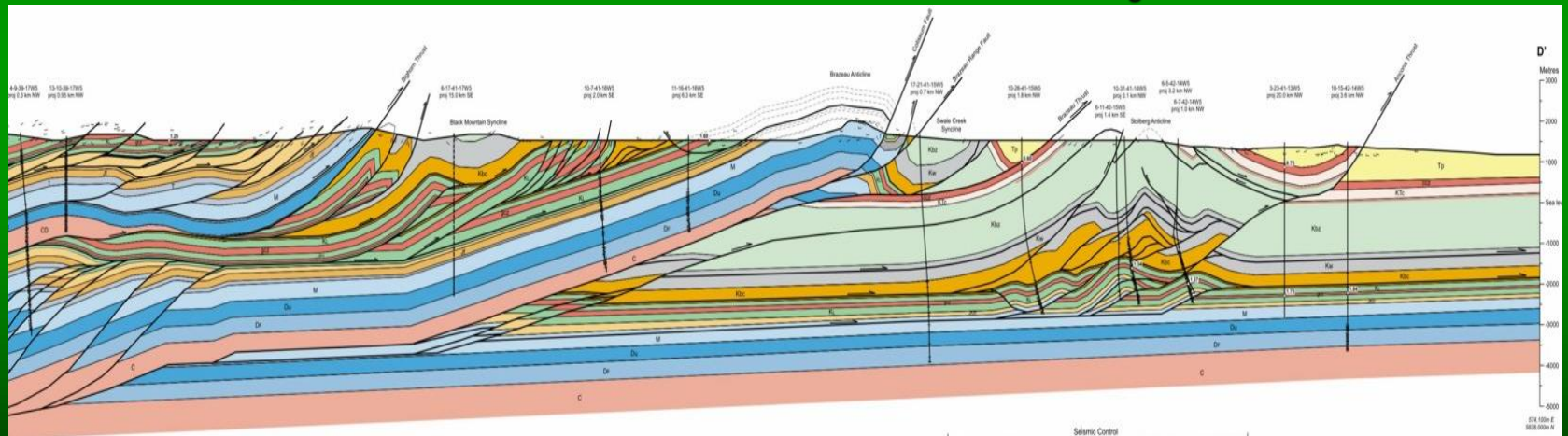
Nordegg

Bighorn thrust

Brazeau thrust

Triangle zone

Deep basin



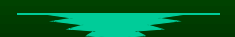
gas field



gas field



oil and gas field



oil and gas field

Long offset acquisition parameters



Moose Oils Ltd.

- 1. LINE LOFF-8**
- 2. Year 2005**
- 3. N. SP (dynamite) 587**
- 4. SP Int. (dynamite) 90m**
- 5. CDP 203-7245**
- 6. CDP. Int. (m) 7.5m**
- 7. Trace Int (m) 15m**
- 8. N. Ch. 1600**
- 9. Max. offset 12000m**

Long offset PSDM workflow



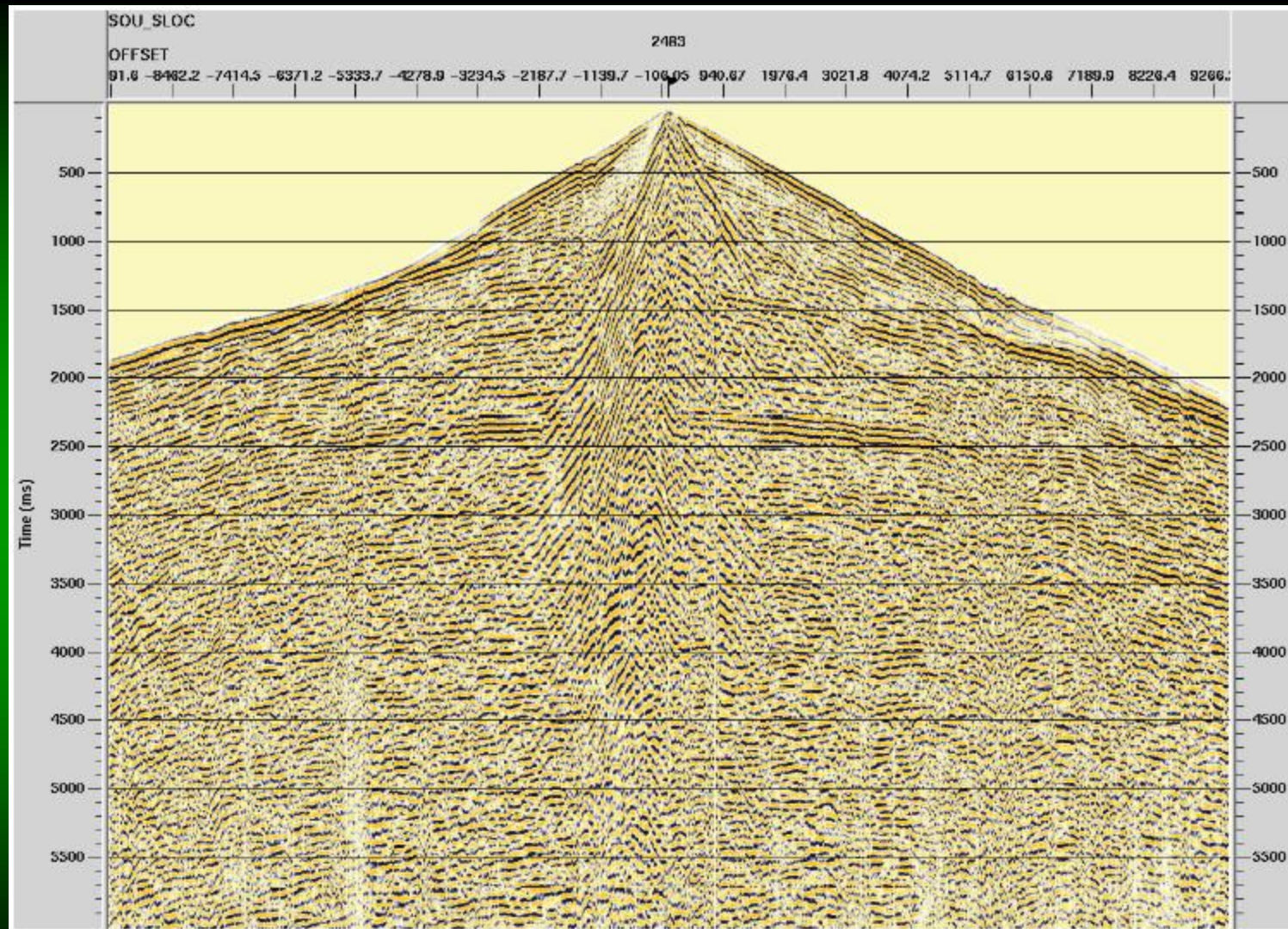
Moose Oils Ltd.

1. FB picking (up to maximum available offset)
2. Turning ray tomography
3. Long Offset-PSDM,
 type: maximum amplitude travel-time arrivals
 depth int.= 10m
 migration aperture=6000m
 DP2000m a.s.l.
4. Interface picking on depth migrated stack section
5. Migration velocity analysis (CIG flattening analysis)
6. Velocity field update (CIG tomography and velocity scan)
7. Iteration of steps 3. to 6. to end of section
8. FK filter
9. BP filter
10. Top Mute and Surgical Mute
11. RMS gain

Single Shot Record



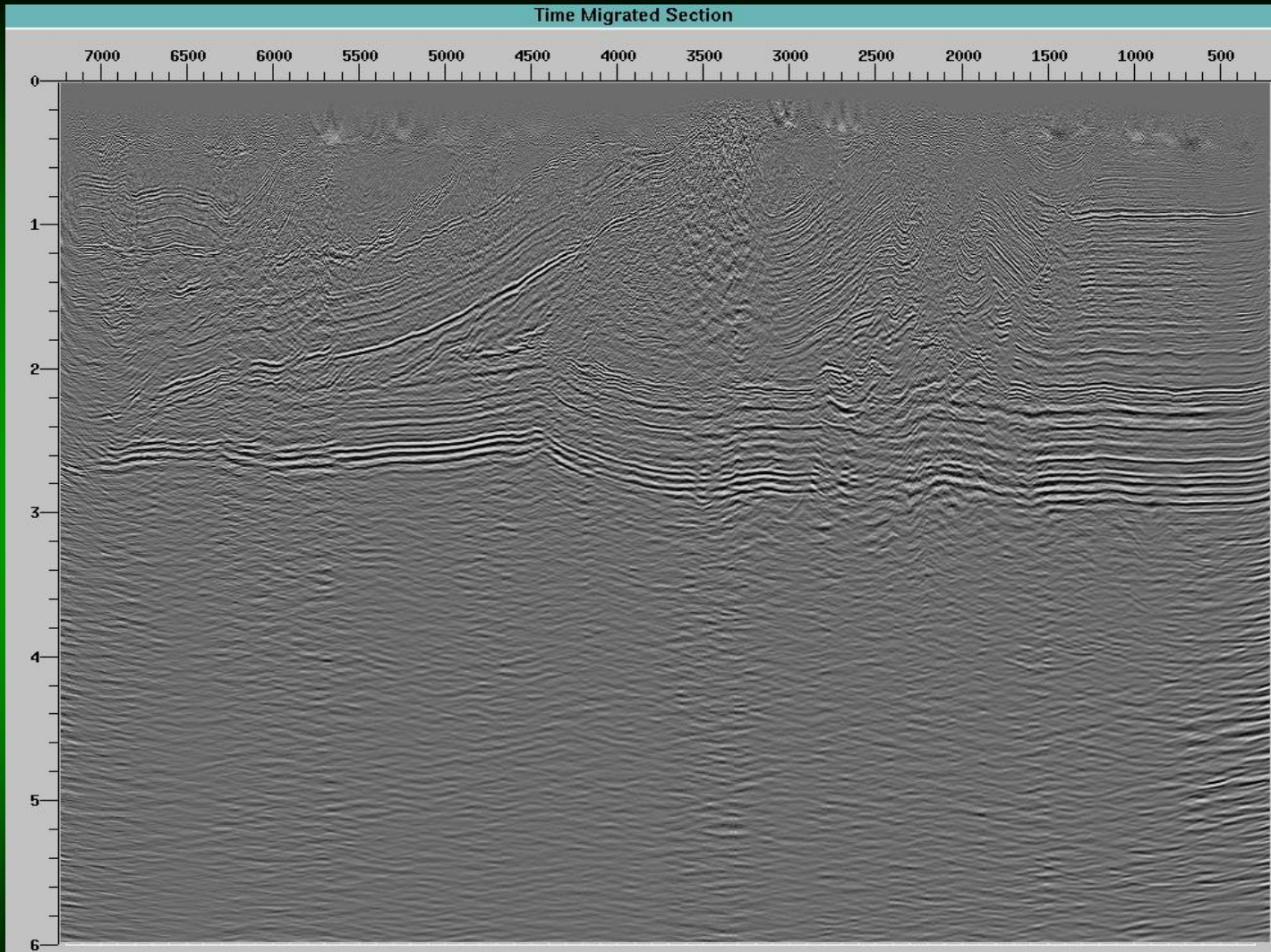
Moose Oils Ltd.



First PSTM



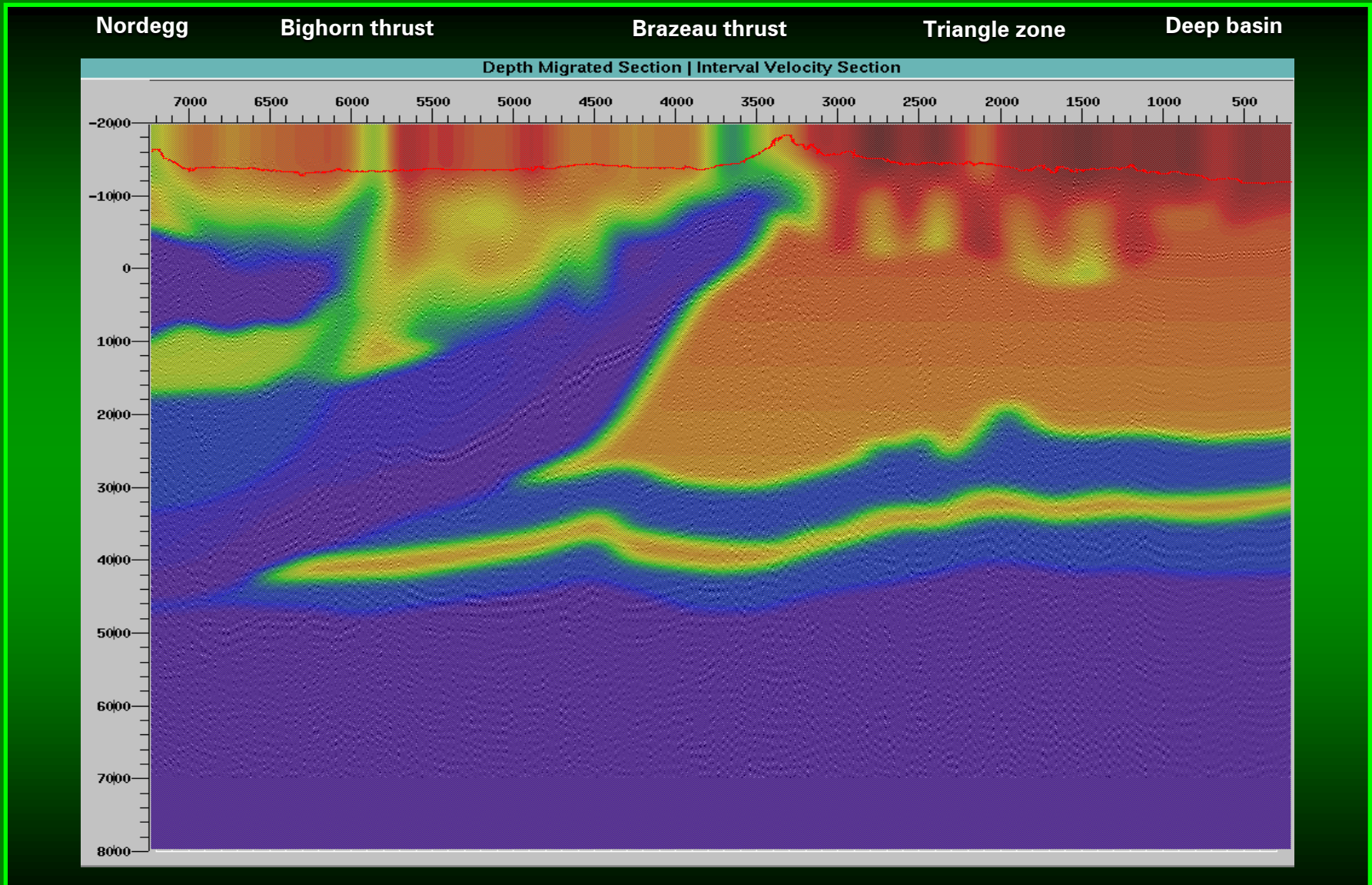
Moose Oils Ltd.



First PSTM with velocite model



Moose Oils Ltd.



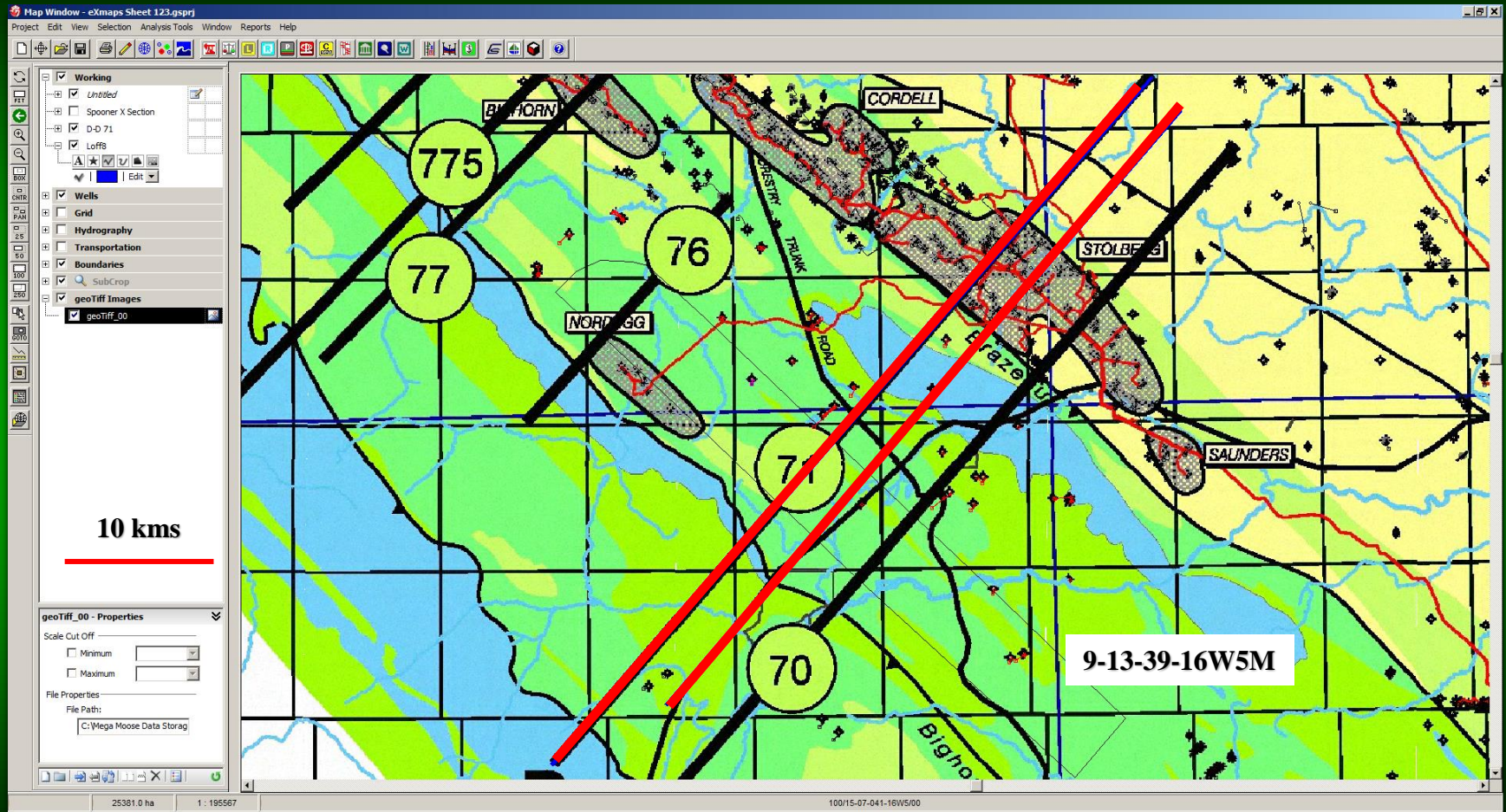


- **Overview**
- **LOFF 8 PSDM velocity anomaly identified**
- **LOFF 8 re interpretation using RDA SCAT and MVE down plunge projection**
- **Resolution of the anomaly**
- **Where to from here?**

GEOSCOUT July 2014 Wells



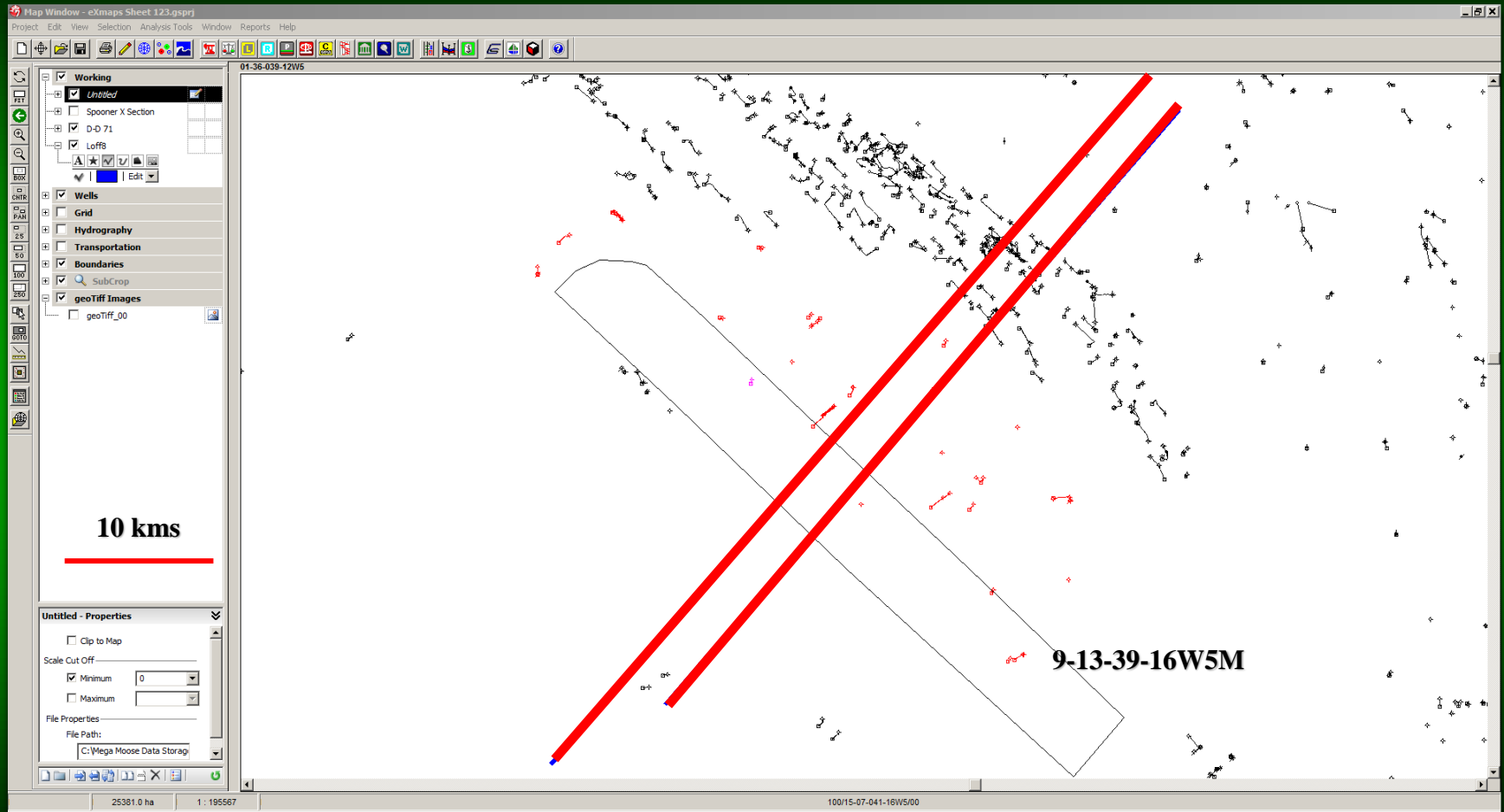
Moose Oils Ltd.



GEOSCOUT July 2014 Wells



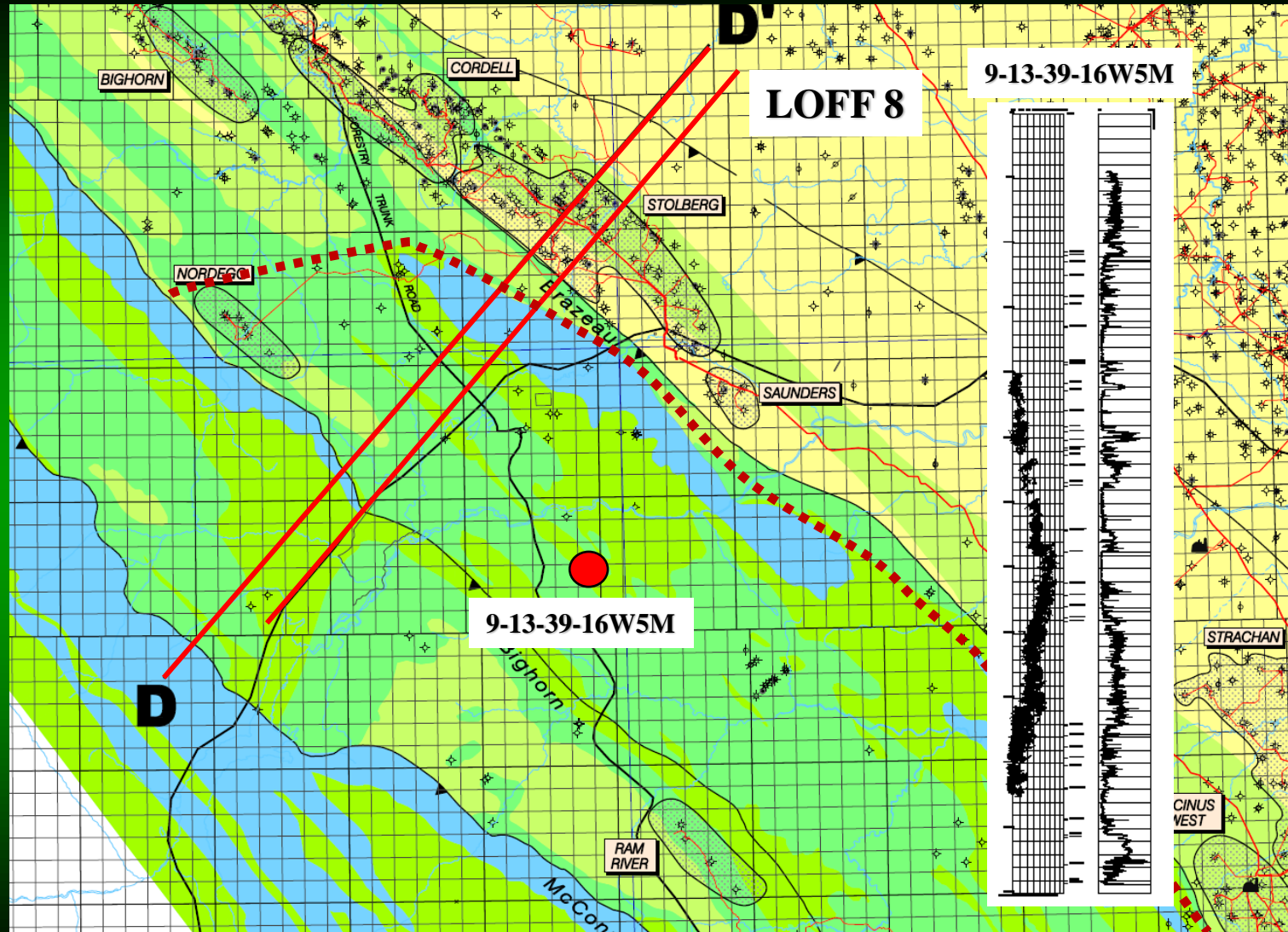
Moose Oils Ltd.



Revised well analysis and projection



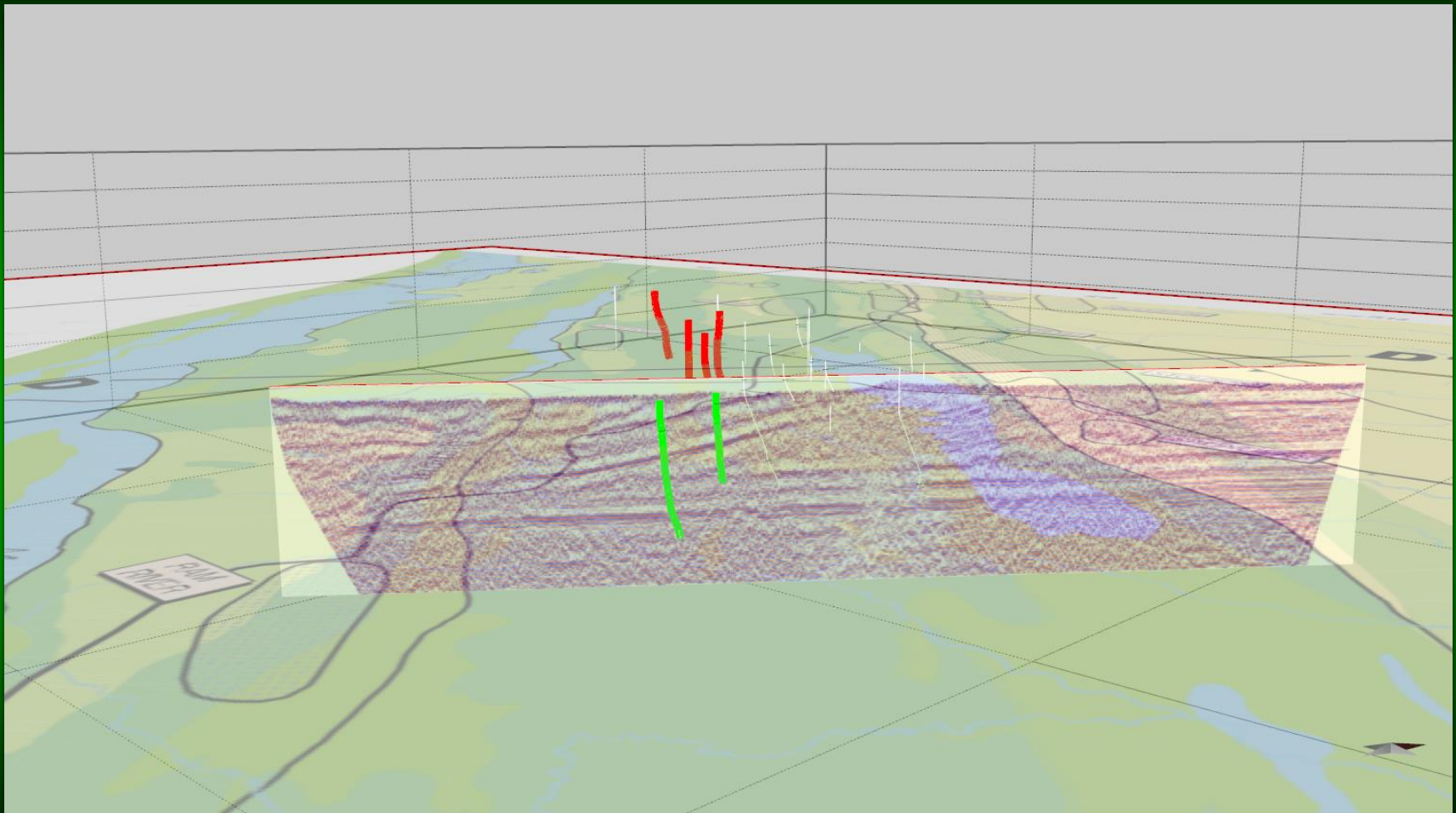
Moose Oils Ltd.



MVE Move Down Plunge Projection



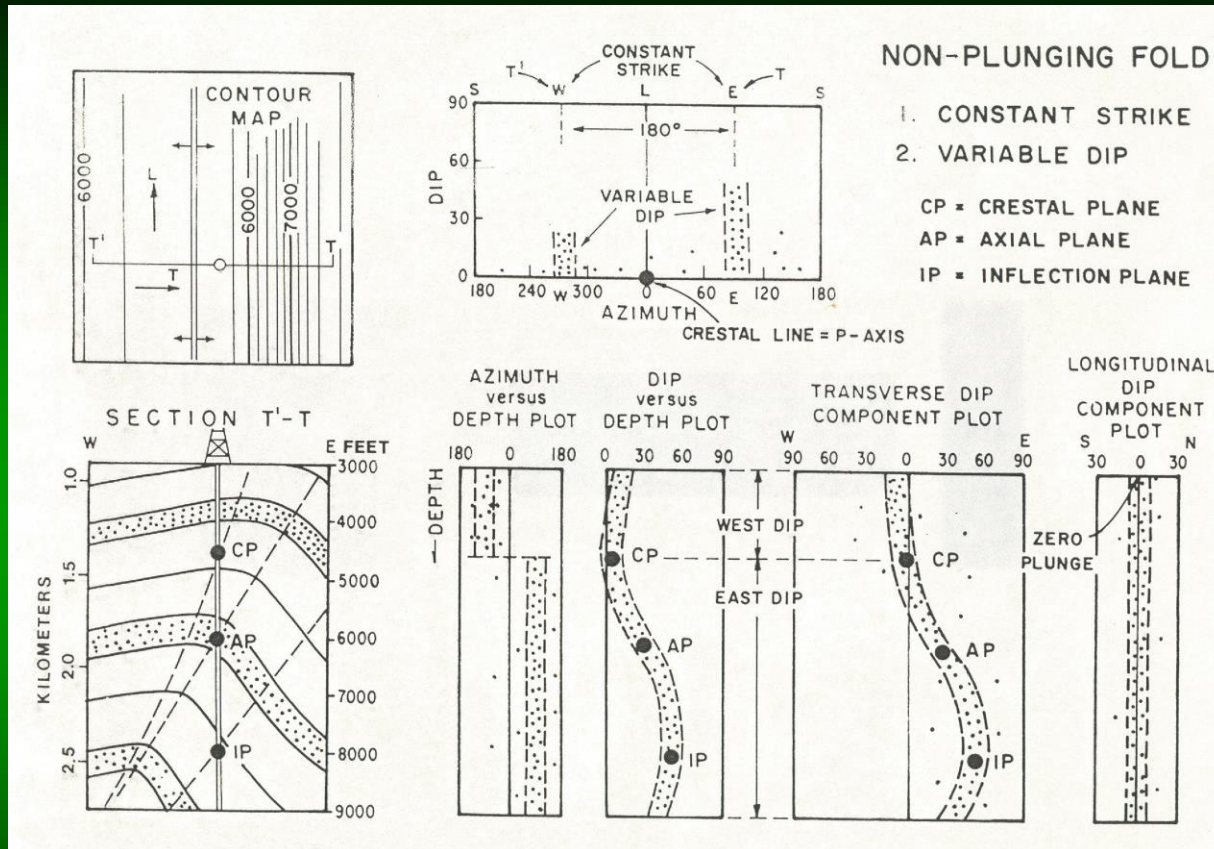
Moose Oils Ltd.



SCAT by Bengston



Moose Oils Ltd.

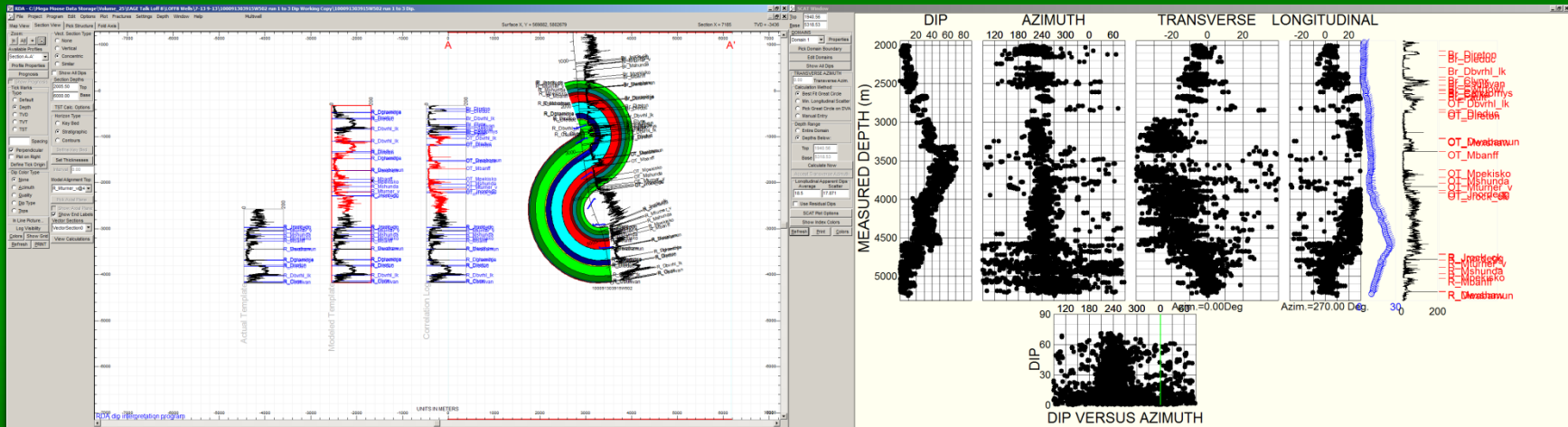


Statistical Curvature Analysis Technique (SCAT).
 C. A. Bengston AAPG 1980



RDA Interactive 3D Dip Modelling

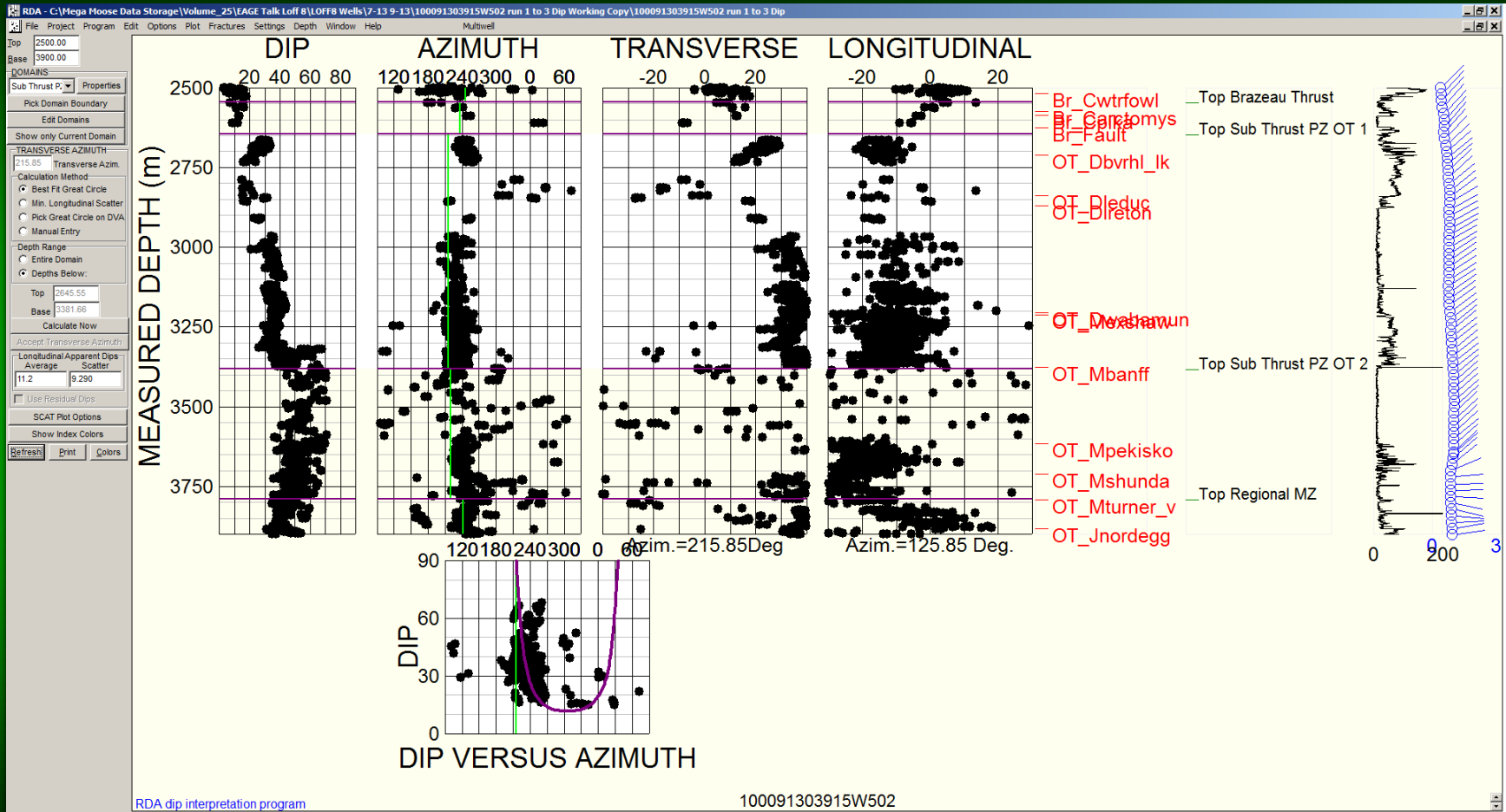
RDA SCAT



RDA SCAT

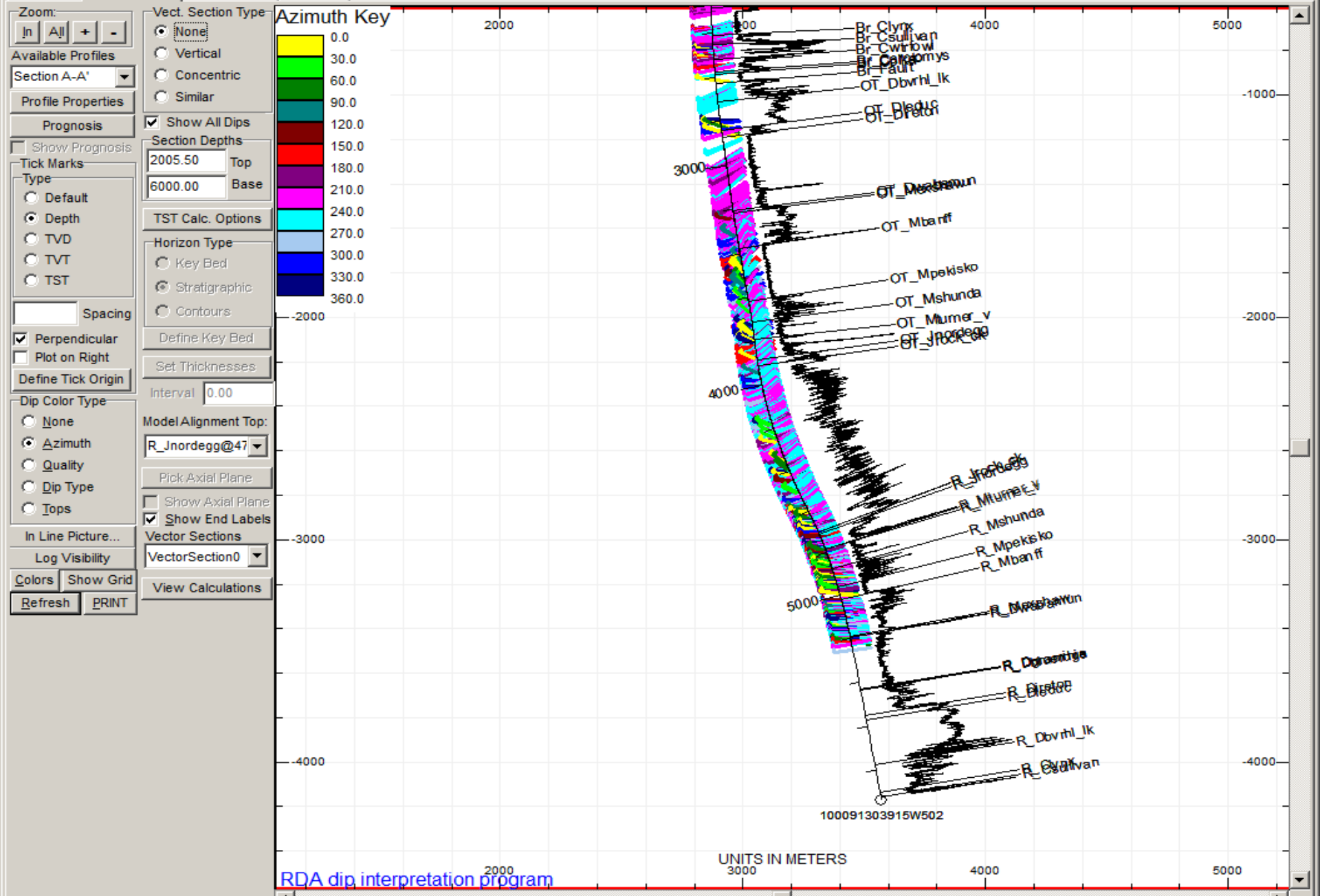


Moose Oils Ltd.



RDA dip interpretation program

100091303915W502



Zoom: In All + -

Available Profiles: Section A-A'

Profile Properties

Prognosis

Show Prognosis

Tick Marks Type: Default, Depth, TVD, TVT, TST

Spacing

Perpendicular, Plot on Right

Define Tick Origin

Dip Color Type: None, Azimuth, Quality, Dip Type, Tops

In Line Picture... Log Visibility

Colors Show Grid

Refresh PRINT

Vect. Section Type: None, Vertical, Concentric, Similar

Show All Dips

Section Depths: 2005.50 Top, 6000.00 Base

TST Calc. Options

Horizon Type: Key Bed, Stratigraphic, Contours

Define Key Bed

Set Thicknesses

Interval: 0.00

Model Alignment Top: R_Jnordegg@47

Pick Axial Plane

Show Axial Plane

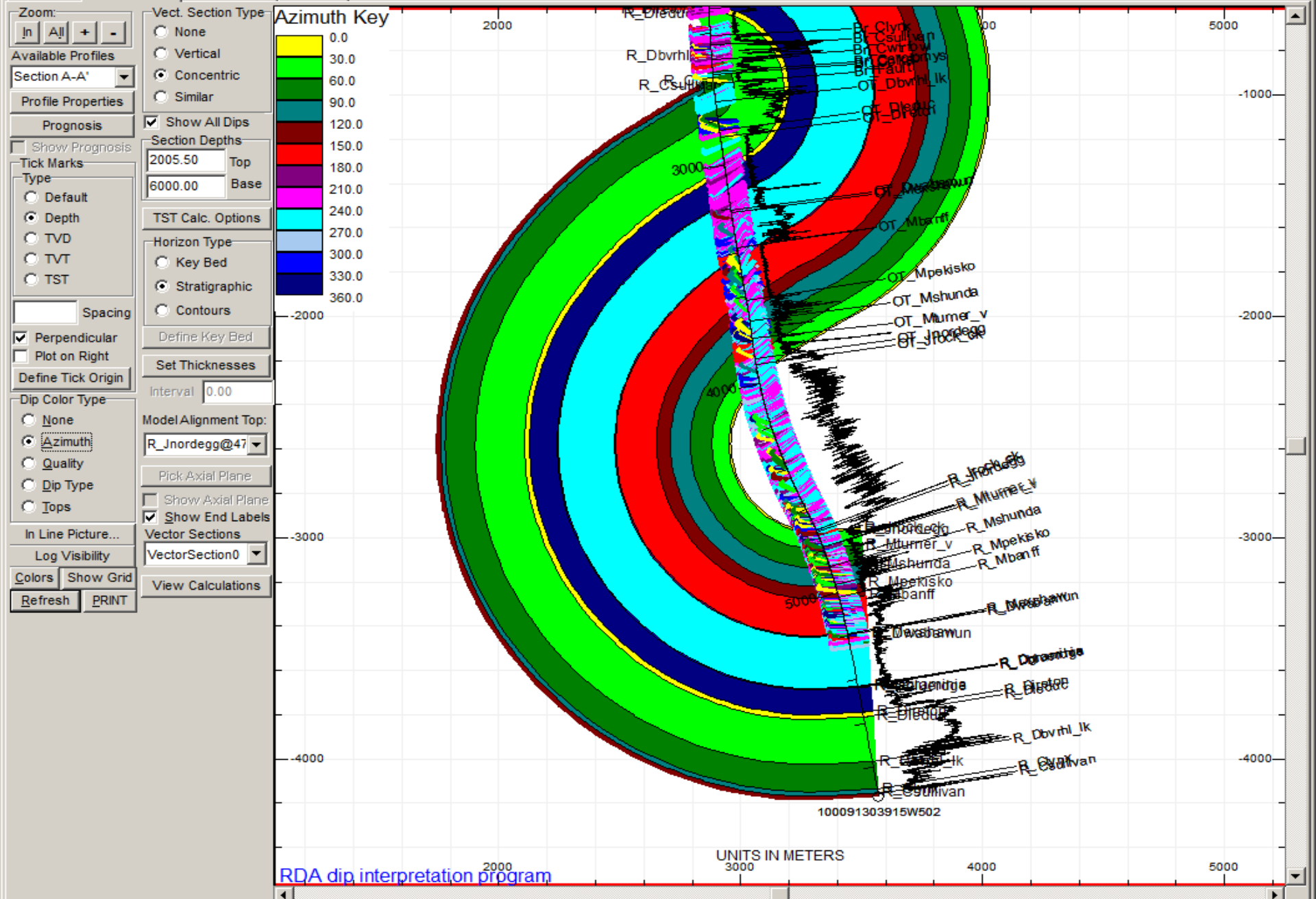
Show End Labels

Vector Sections: VectorSection0

View Calculations

Azimuth Key

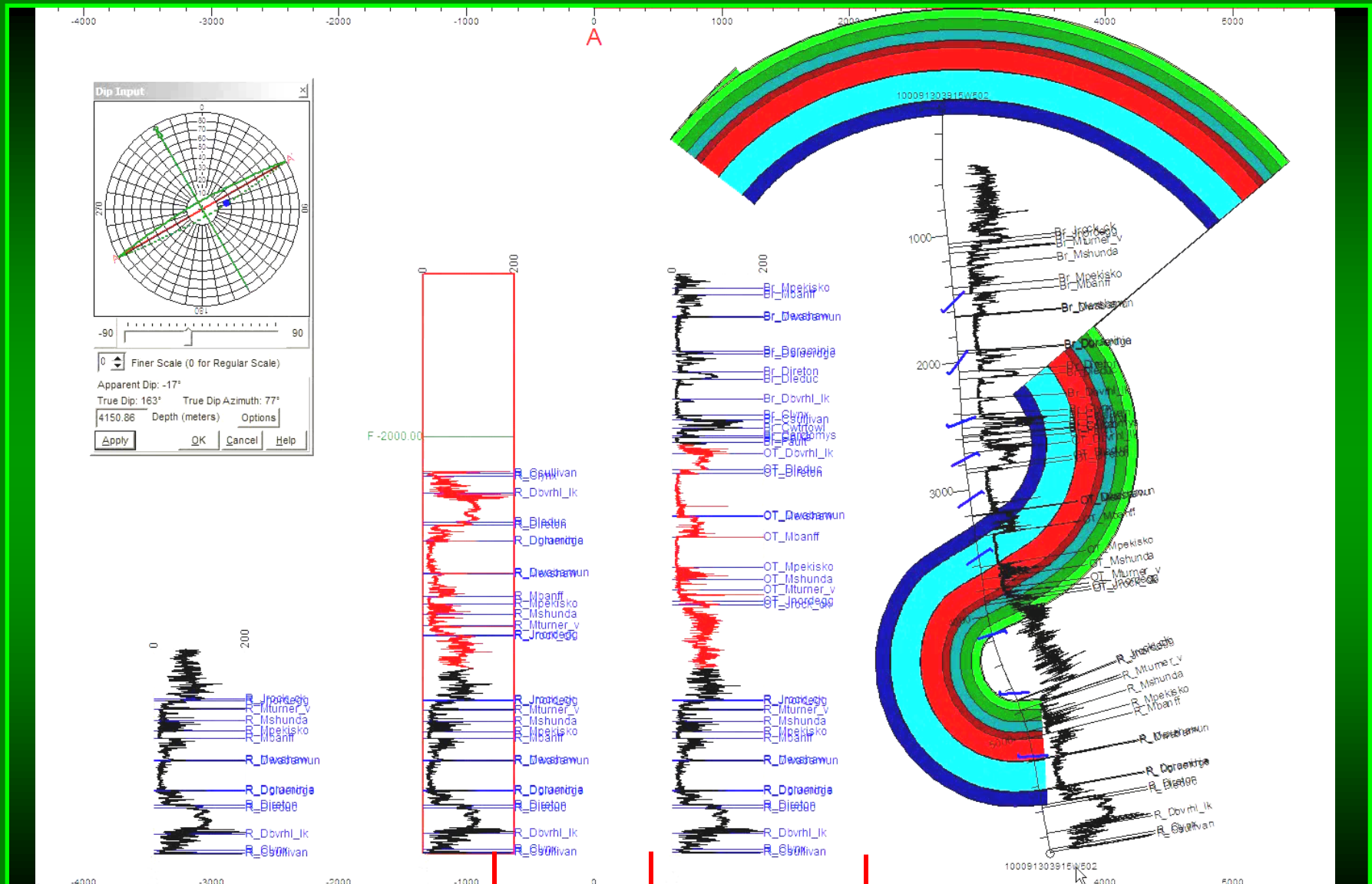
- 0.0
- 30.0
- 60.0
- 90.0
- 120.0
- 150.0
- 180.0
- 210.0
- 240.0
- 270.0
- 300.0
- 330.0
- 360.0



RDA Interactive 3D dip modelling



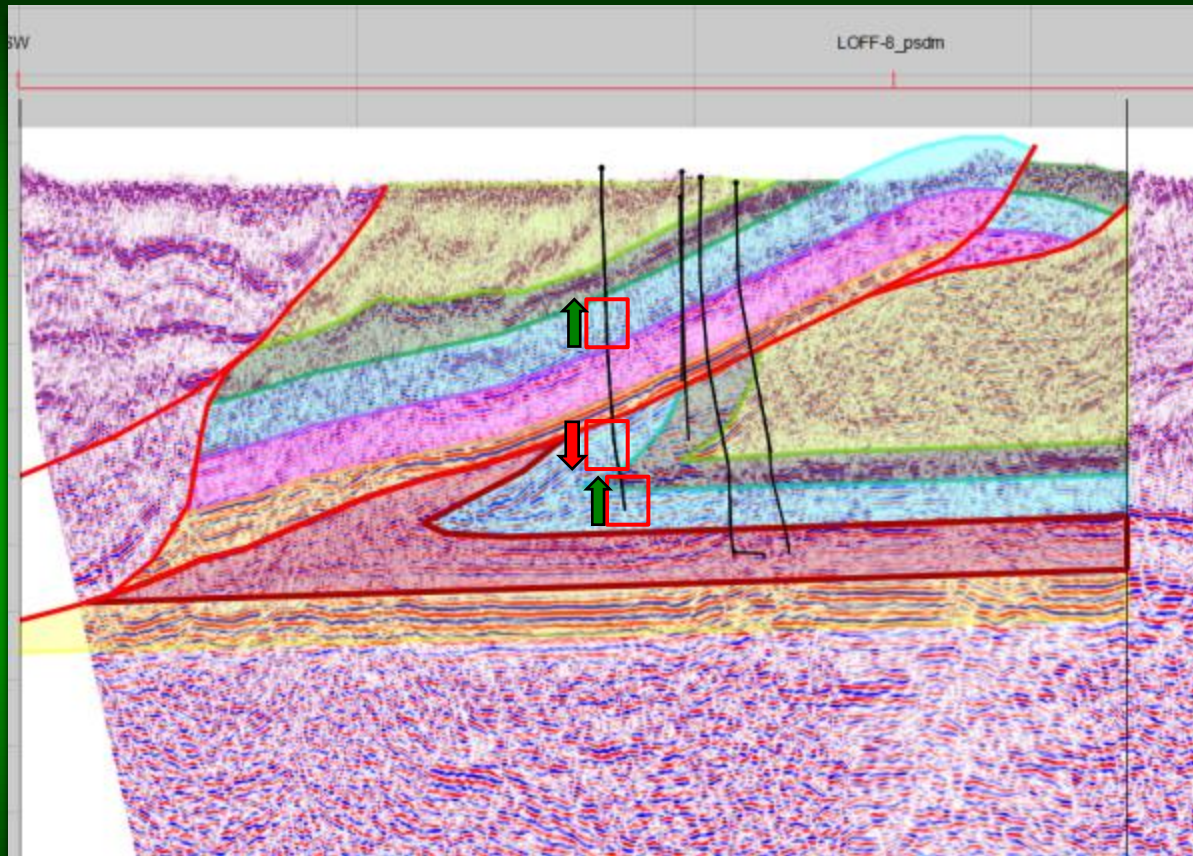
Moose Oils Ltd.



MVE Move Down Plunge Projection



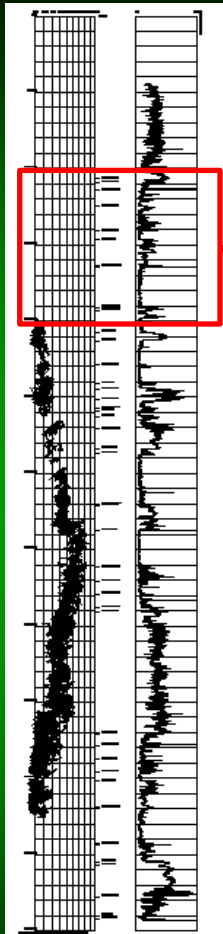
Moose Oils Ltd.



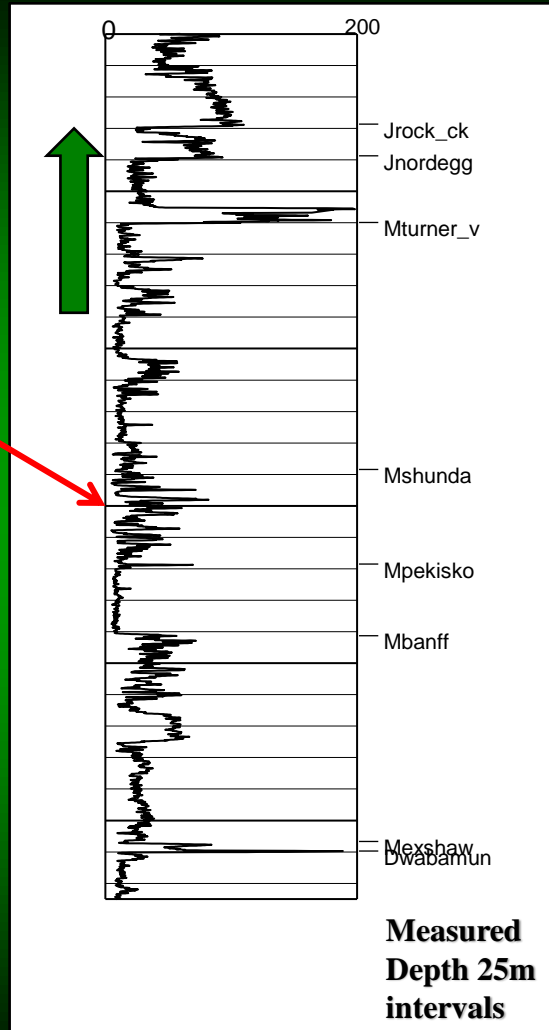
9-13 A Brazeau Thrust Mr RWU



Moose Oils Ltd.



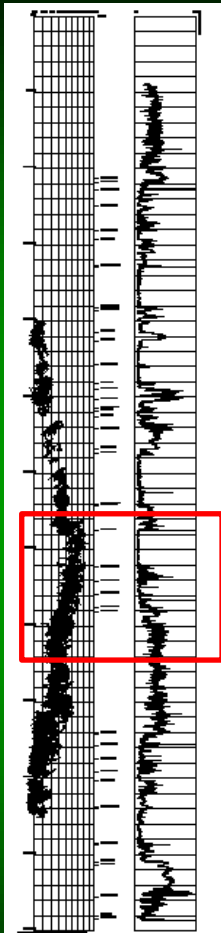
Measured
Depth 50m
intervals



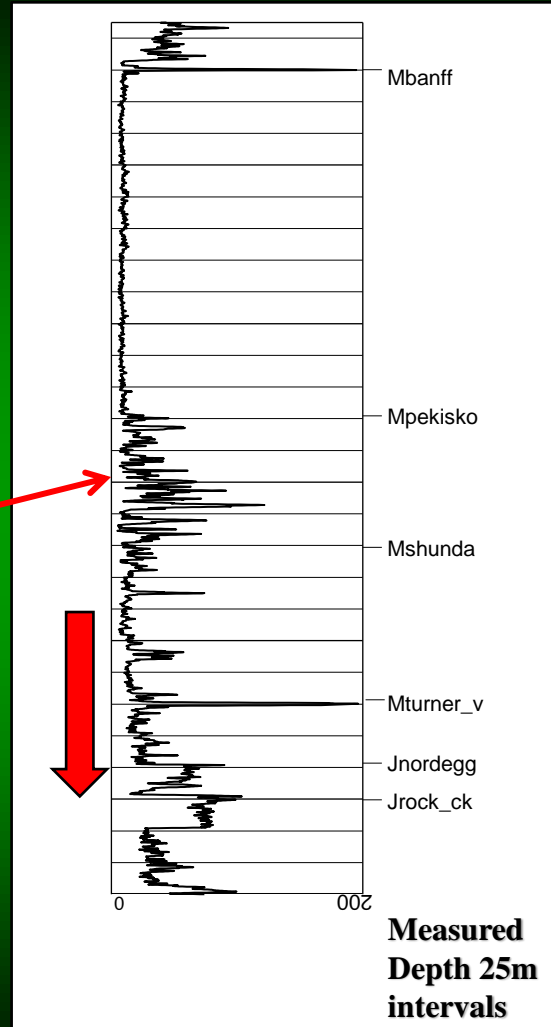
9-13 B Sub Brazeau Thrust Mr USD



Moose Oils Ltd.



Measured
Depth 50m
intervals

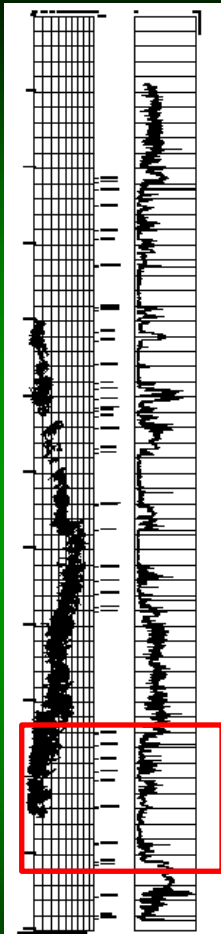


Measured
Depth 25m
intervals

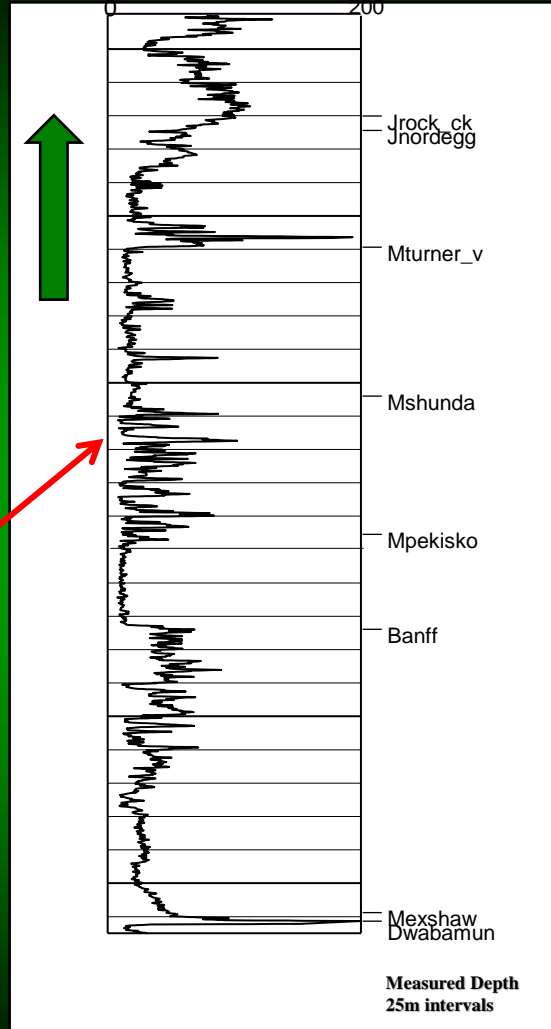
9-13 C Regional Mr RWU



Moose Oils Ltd.



Measured
Depth 50m
intervals

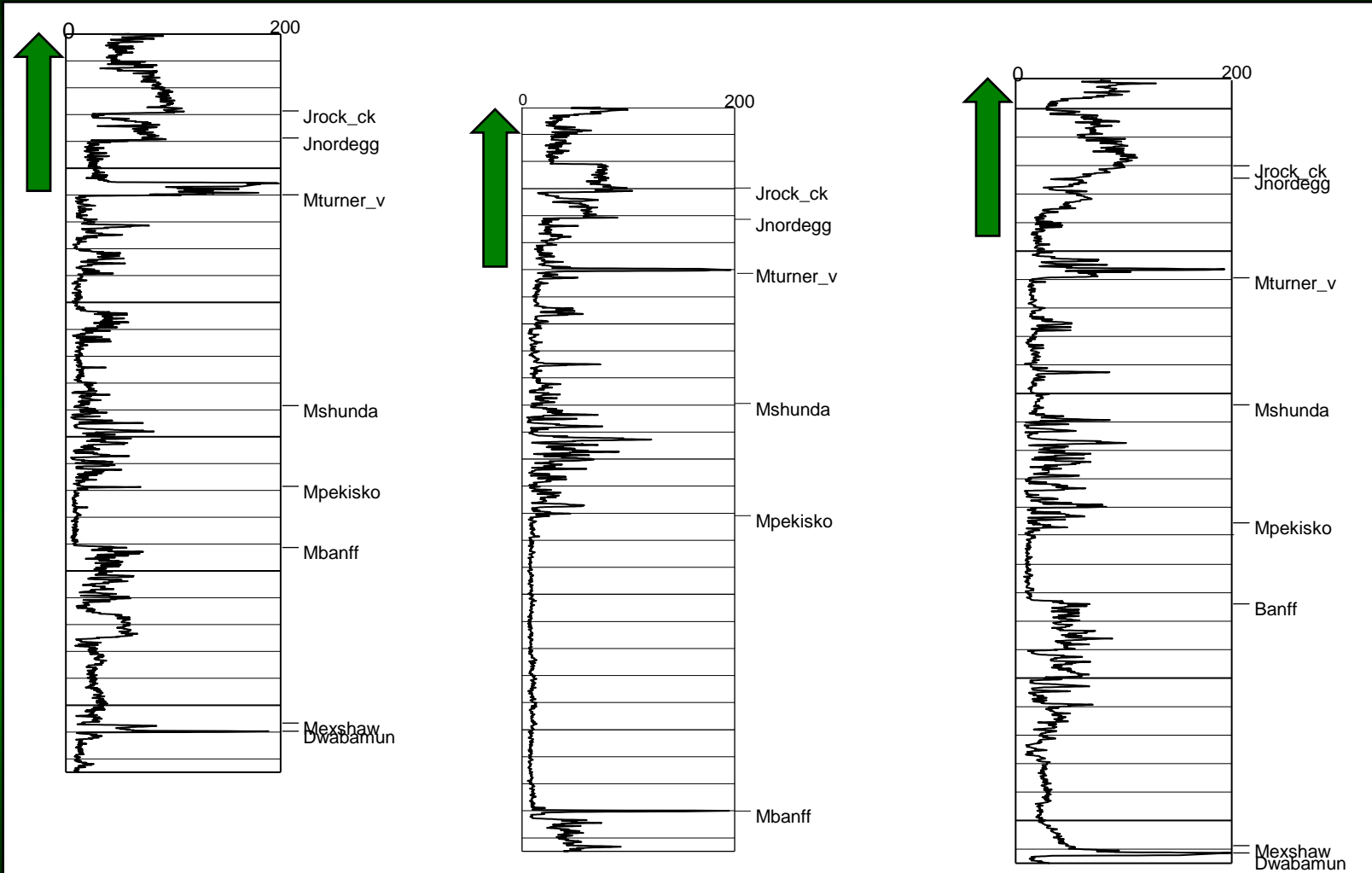


Measured Depth
25m intervals

9-13 A, B and C TST RWU



Moose Oils Ltd.



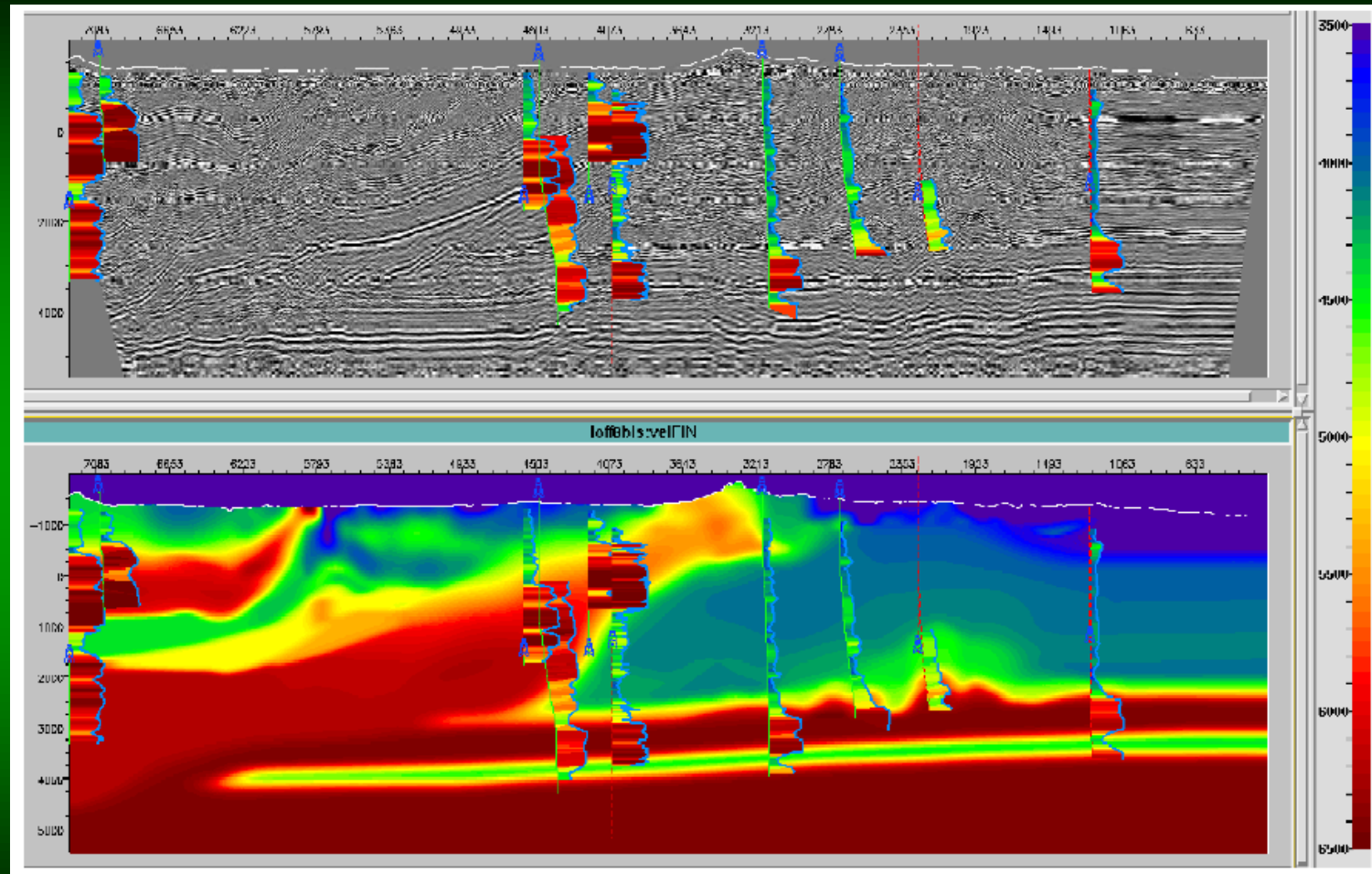


- **Overview**
- **LOFF 8 PSDM velocity anomaly identified**
- **LOFF 8 re interpretation using RDA SCAT and MVE down plunge projection**
- **Resolution of the anomaly**
- **Where to from here?**

Revised velocity field on PSDM



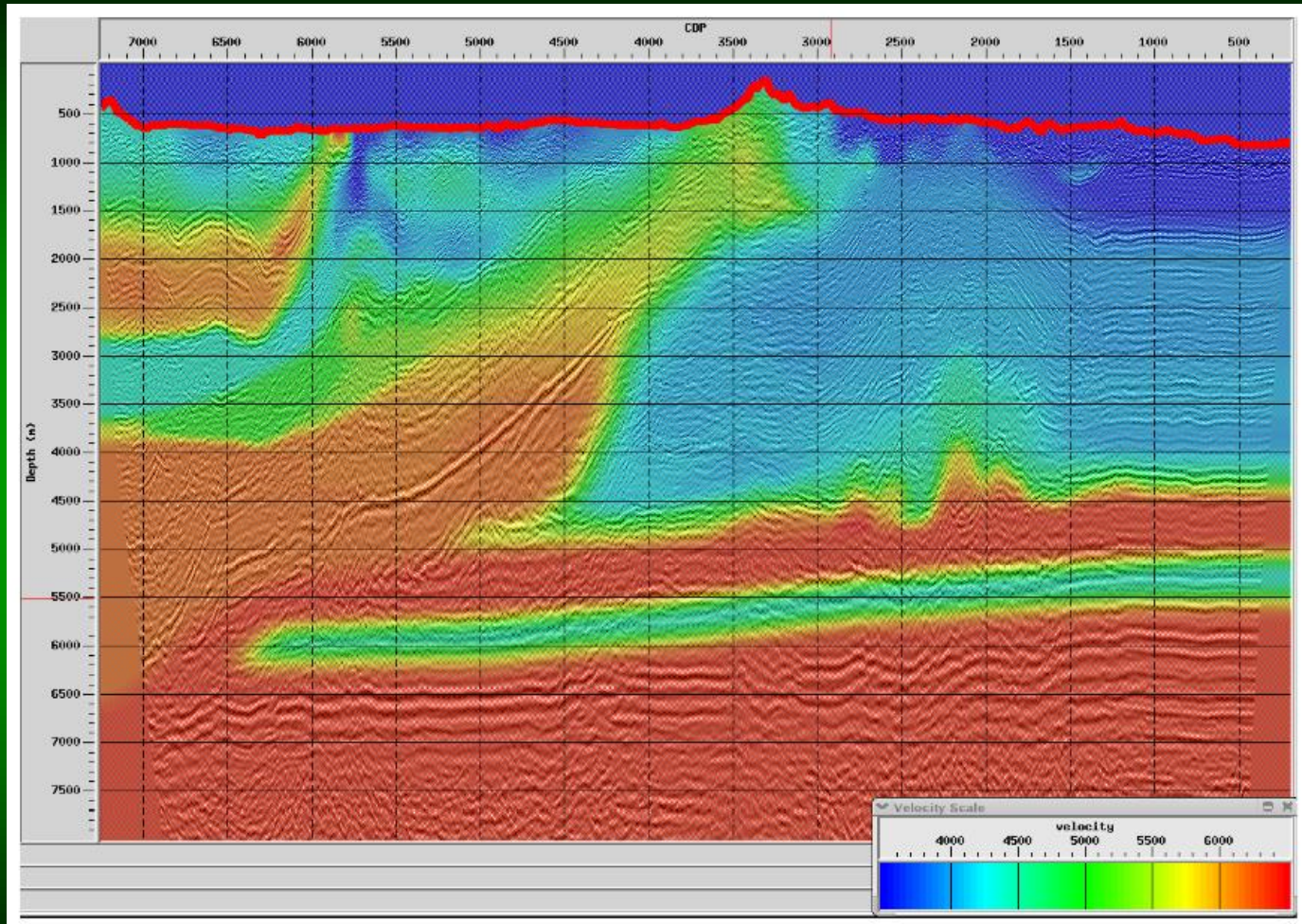
Moose Oils Ltd.



Velocity field on PSDM Stack



Moose Oils Ltd.



Sum Up



Moose Oils Ltd.

- **2D data acquired in rough terrain with major velocity inversions ie typical Foothills data**
- **Illustrates that with a high effort seismic line and advanced seismic processing it is possible to image 30 to 50 degree dipping beds, even in the fault shadow of a major thrust**

Where to from here?



Moose Oils Ltd.

- **Extend this technique to other targets on LOFF8 eg the Paleozoic in the Nordegg and the Stolberg field**
- **Re processes data using more of the offsets to increase the quality of the image and define the steeply dipping Mesozoic structures in other triangle zone fields Stolberg, Cordell, Brown Creek Basing Shaw etc etc.**

Contributors



Moose Oils Ltd.

- **Seismic by Seis Ventures Resources Ltd, Calgary**
- **Processing by GEOSYSTEM s.r.l. Via Clericetti 42/A
Milan 20133 Italy**
- **Interpretation by Moose Oils Ltd, Calgary**
- **Software used**
 - **RDA SCAT analysis for dipmeter analysis, Houston**
 - **MVE Move for down plunge projection of wells,
Glasgow**
 - **Geoscout for current up to date drilling activity,
Calgary**