

# COLOMBIA ROUND 2021

# UNDEVELOPED ALREADY DISCOVERED AREAS: MIDDLE MAGDALENA VALLEY BASIN

03/09/2021

## **VMM 11: Glauca (UADR)**

Database

Production

Seismic Interpretation

## **VMM-53 (Incorporated)**

Database & Well Data

Seismic Interpretation & Prospectivity

## **VMM 10-1**

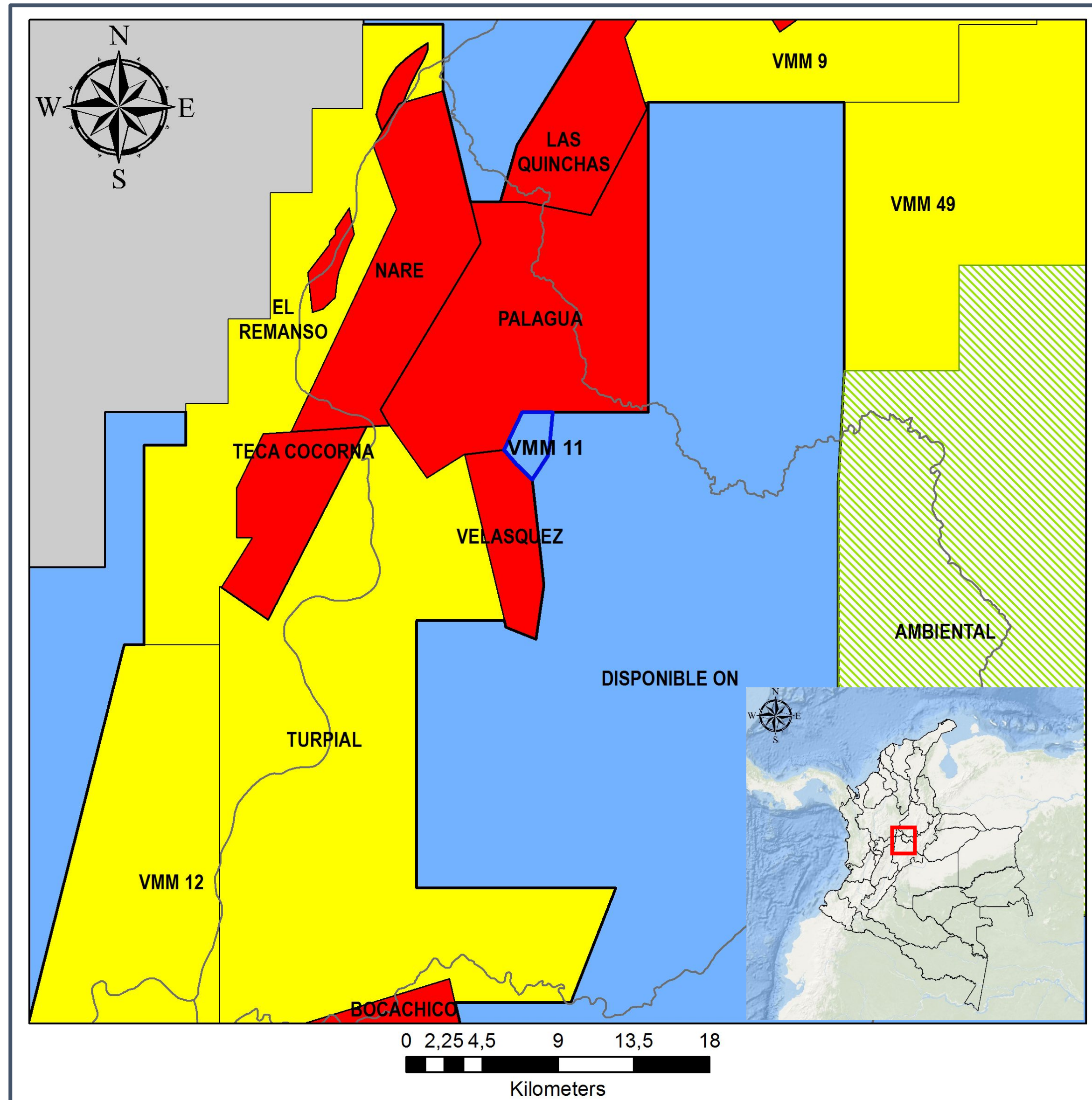
Database

Seismic Interpretation

**Conclusions**

# VMM 11: Glauca (Undeveloped Already Discovered Reservoir)

# LOCATION



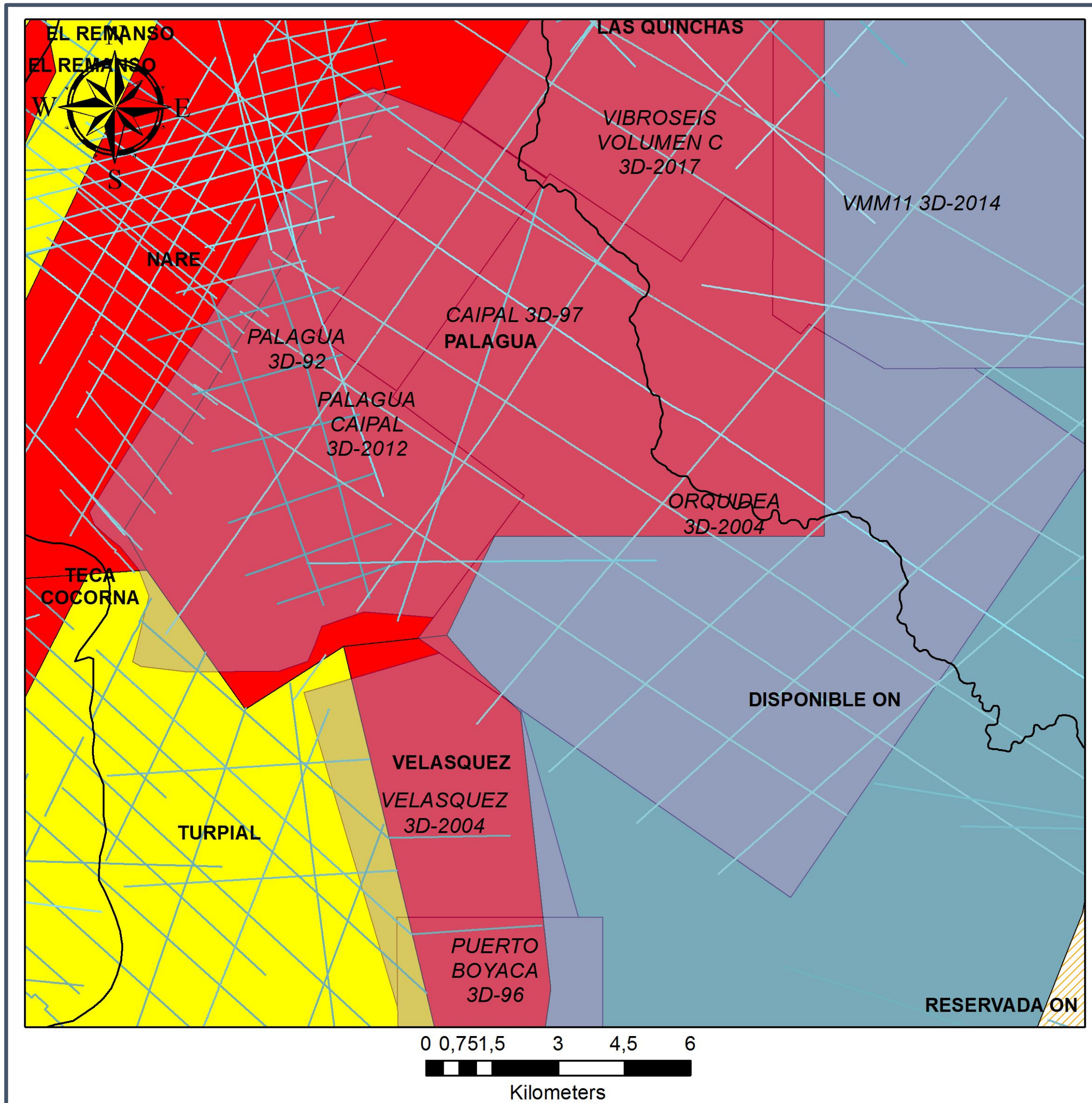
- **VMM 11 Block**

- Area: 75.5 Km<sup>2</sup>

- **Block Available:** Area available for incorporation nearby E&P and production areas like Palagua & Velasquez

- **Department**

- Boyacá



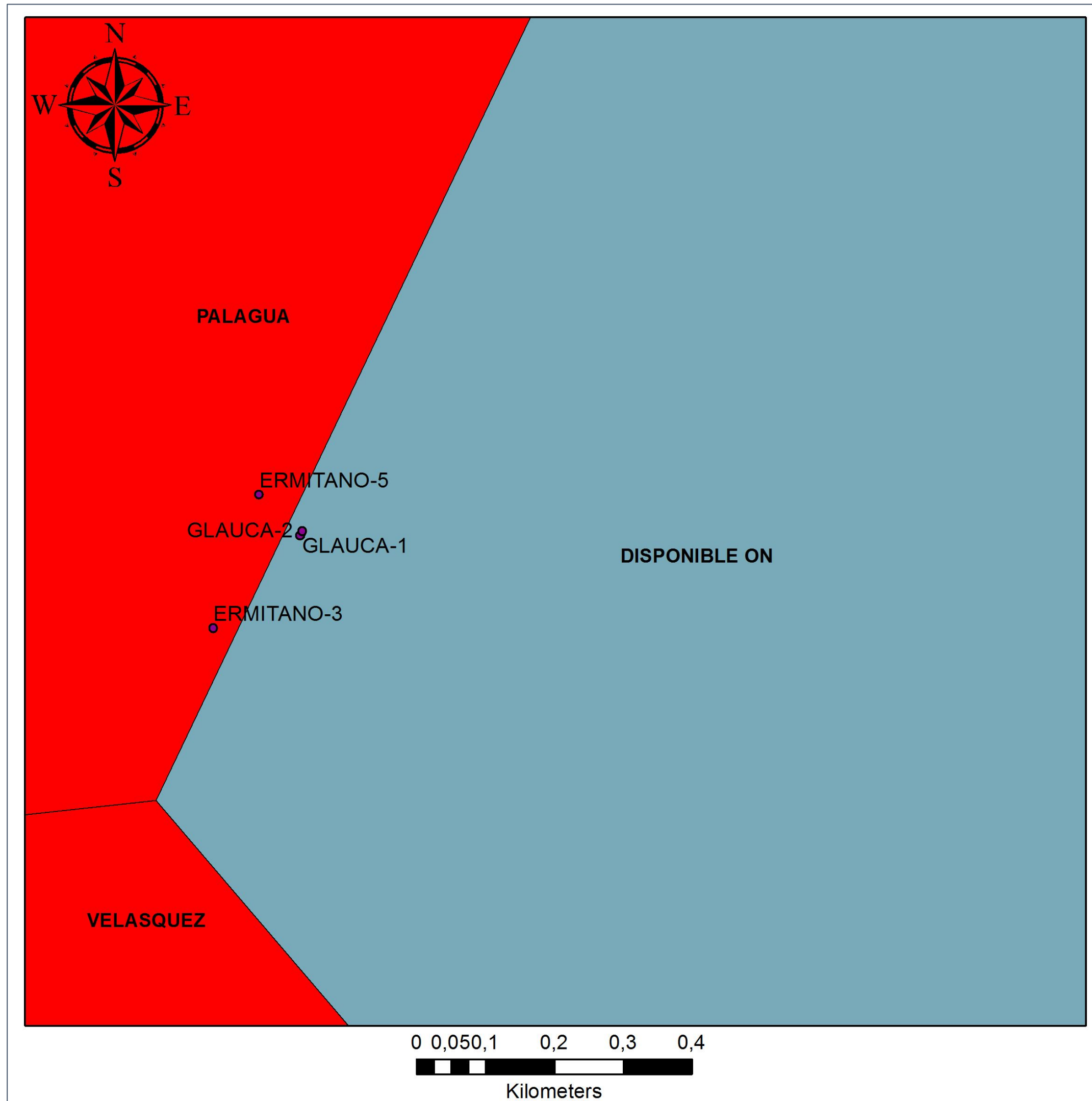
## 2D Seismic Programs (2 Surveys)

- Santander – 89
- Caipal – 84

## 3D Seismic

- Palagua – Caipal 3D - 2012
- Orquidea 3D – 2004

# DATABASE: WELLS



Well	Year	TD (ft)	Main Target	Secondary Target
Glauca - 1	2017	6,540	Colorado Fm.	Esmeraldas
Glauca - 2	2017	7,157	Colorado Fm.	Esmeraldas

FORMATION TOPS WELL GLAUCA-1				
FORMATION	LOG'S TOP (FT)			Δ
	MD	TVD	TVDSS	ΔTVD
Mesa/Real	Sup	Sup	470	3611
Colorado	3627	3611	-3141	1832
Mugrosa	5490	5443	-4973	618
Esmeraldas	6120	6061	-5591	315
Basamento	6440	6375	-5906	99
TD	6540	6474	-6004	----

TOP'S GLAUCA-2 WELL				
FORMATION	LOG'S (FT)			Δ
	MD	TVD	TVDSS	ΔTVD
Real	Sup	Sup	470	3543
Colorado	3698	3543	-3074	1943
Mugrosa	5977	5486	-5017	683
Esmeraldas	6764	6169	-5700	319
Basamento	7125	6488	-6019	28
TD	7157	6516	-6047	----

# TESTS & PRODUCTION GLAUCA – 1

Summary of short production tests by mean of swabbing in the intervals (6138' – 6148'/ 6169' – 6175'/ 6227' – 6235'/ 6268' – 6281'/ 6288' – 6294'/ 6299' – 6308'/ 6318' – 6337') of Esmeraldas Formation

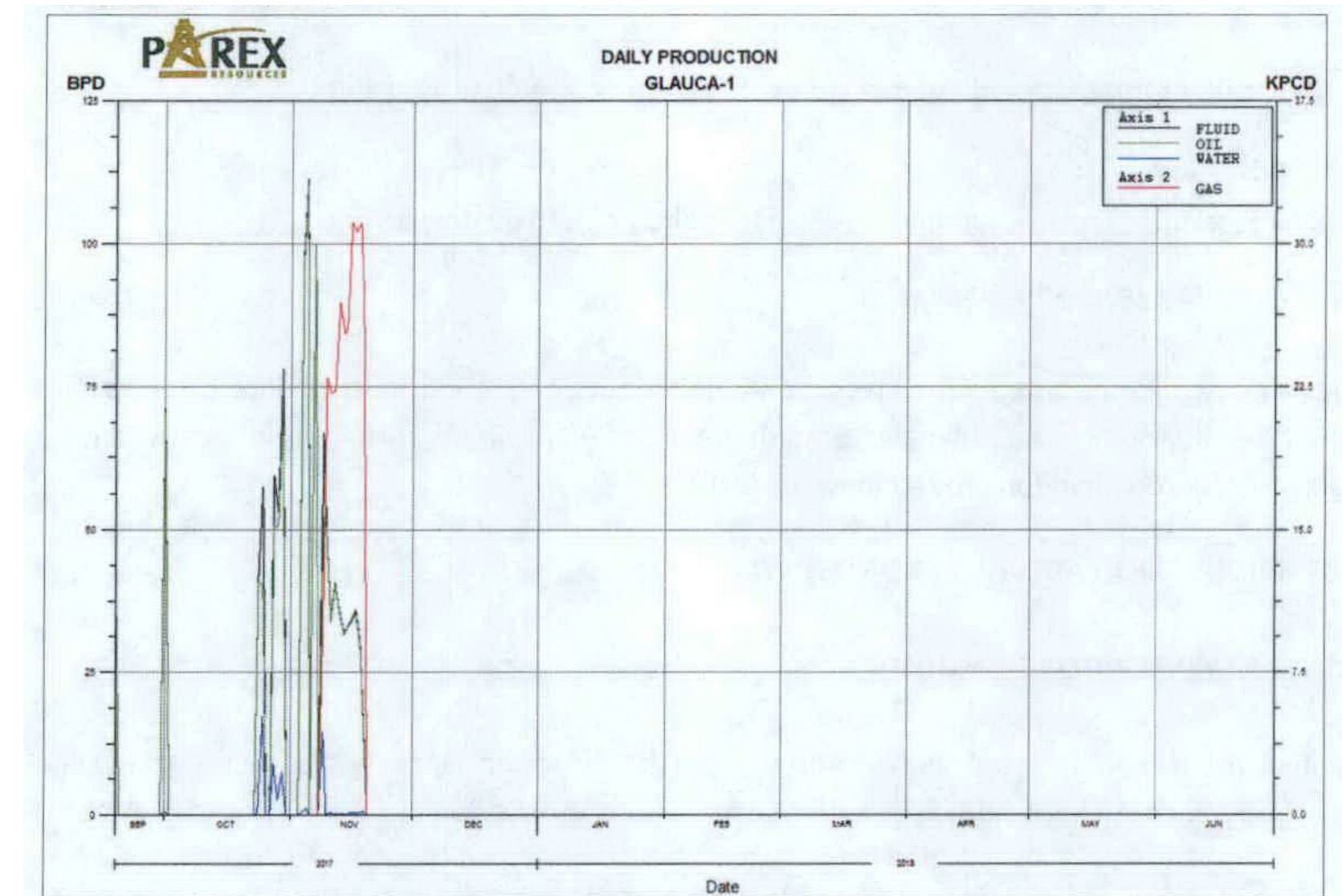
PRODUCTION GLAUCA - 1											
No.	Date of test	Status	Formation	PARAMETERS		RESULTS					
				Time (hrs)	Swab Number	BF	BO (@60°F)	BW	BSW %	GAS Kscf	GOR
1	03/09/2017	Suabeo	Esmeraldas	20,4	44,00	154,02	0,23	153,79	99,85%	0,00	0,00
2	04/09/2017	Suabeo	Esmeraldas	15,0	23,00	65,86	0,16	65,70	99,76%	0,00	0,00

Production traceability of Glauca – 1 (Swabbing)

Summary of short production tests by mean of PTS bomb in the intervals (6138' – 6148'/ 6169' – 6175'/ 6227' – 6235'/ 6268' – 6281'/ 6288' – 6294'/ 6299' – 6308'/ 6318' – 6337') of Esmeraldas Formation

SEGUIMIENTO DE PRODUCCIÓN GLAUCA-1											
No.	Date of test	Status	Formation	PARAMETERS		RESULTS					
				Time (hrs)	SPM	BF	BO (@60°F)	BW	BSW %	GAS Kscf	GOR
3	06/09/2017	PTS	Esmeraldas	6,0		49,60	14,65	34,95	70,46%	0,00	0,00
4	09/09/2017	PTS	Esmeraldas	5,8	4,50	62,01	24,65	37,36	60,25%	0,00	0,00

Production traceability of Glauca – 1 (PTS Bomb)



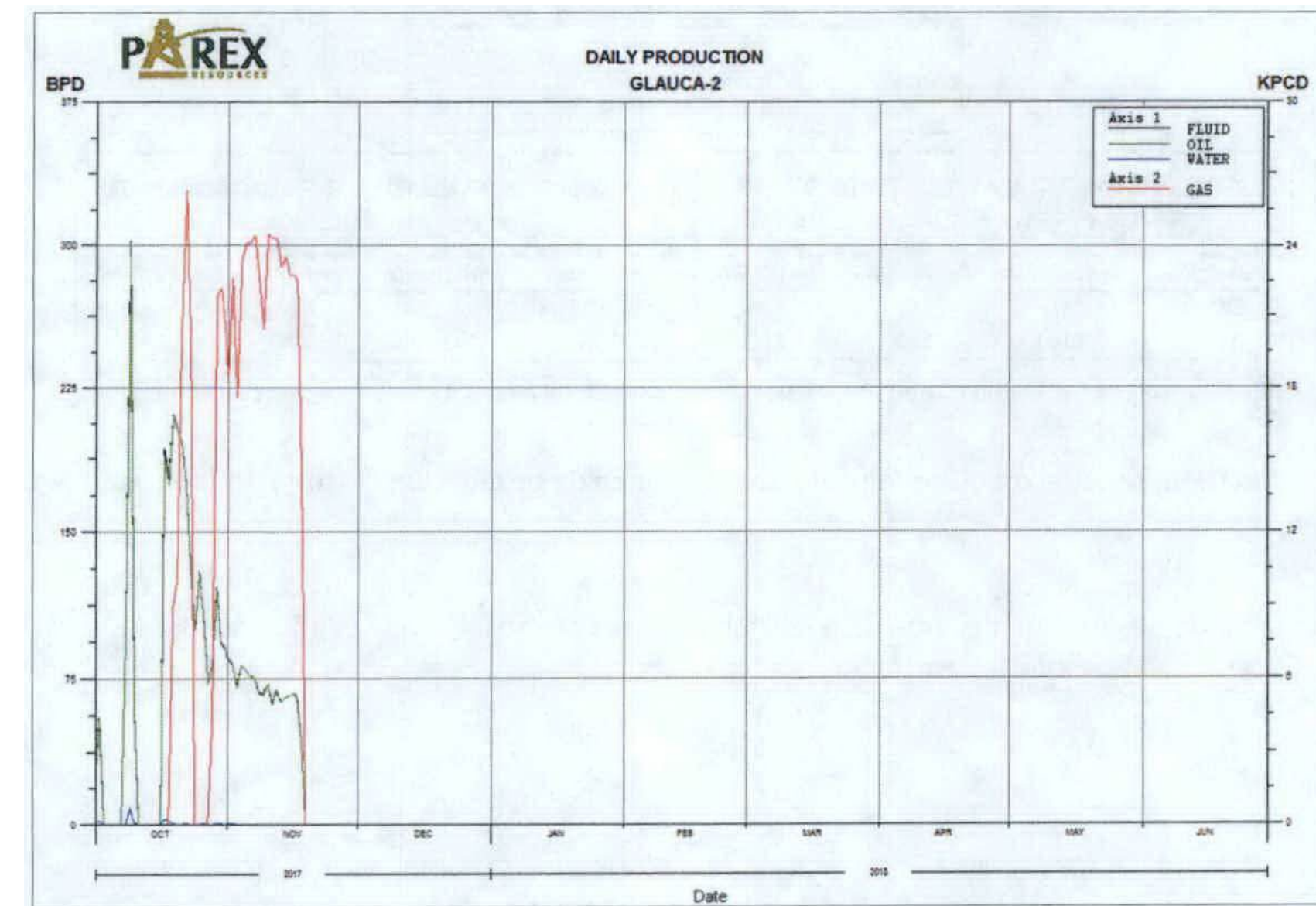


# TESTS & PRODUCTION GLAUCA – 2

Summary of short production tests by mean of swabbing in the intervals (6780' – 6884'/ 6807' – 6817'/ 6824' – 6837'/ 6867' – 6900') of Esmeraldas Formation

					SEGUIMIENTO DE PRODUCCIÓN GLAUCA-2						
					PARAMETERS	RESULTS					
Interval	No.	Date of test	Status	Formation	Time (hrs)	BFPD	BOPD (@60°F)	BWPD	BSW %	GAS Kscfpd	GOR
6.780' – 6.884'/ 6.807' – 6.817'/ 6.824' – 6.837'/ 6.867' – 6.900'	1	01/10/2017	Suabeo	Esmeraldas	24,0	29,87	28,74	1,13	3,78%	0,00	0,00
	2	02/10/2017	Suabeo	Esmeraldas	24,0	55,24	53,14	2,10	3,80%	0,00	0,00

Production traceability of Glauca – 2 (Swabbing)

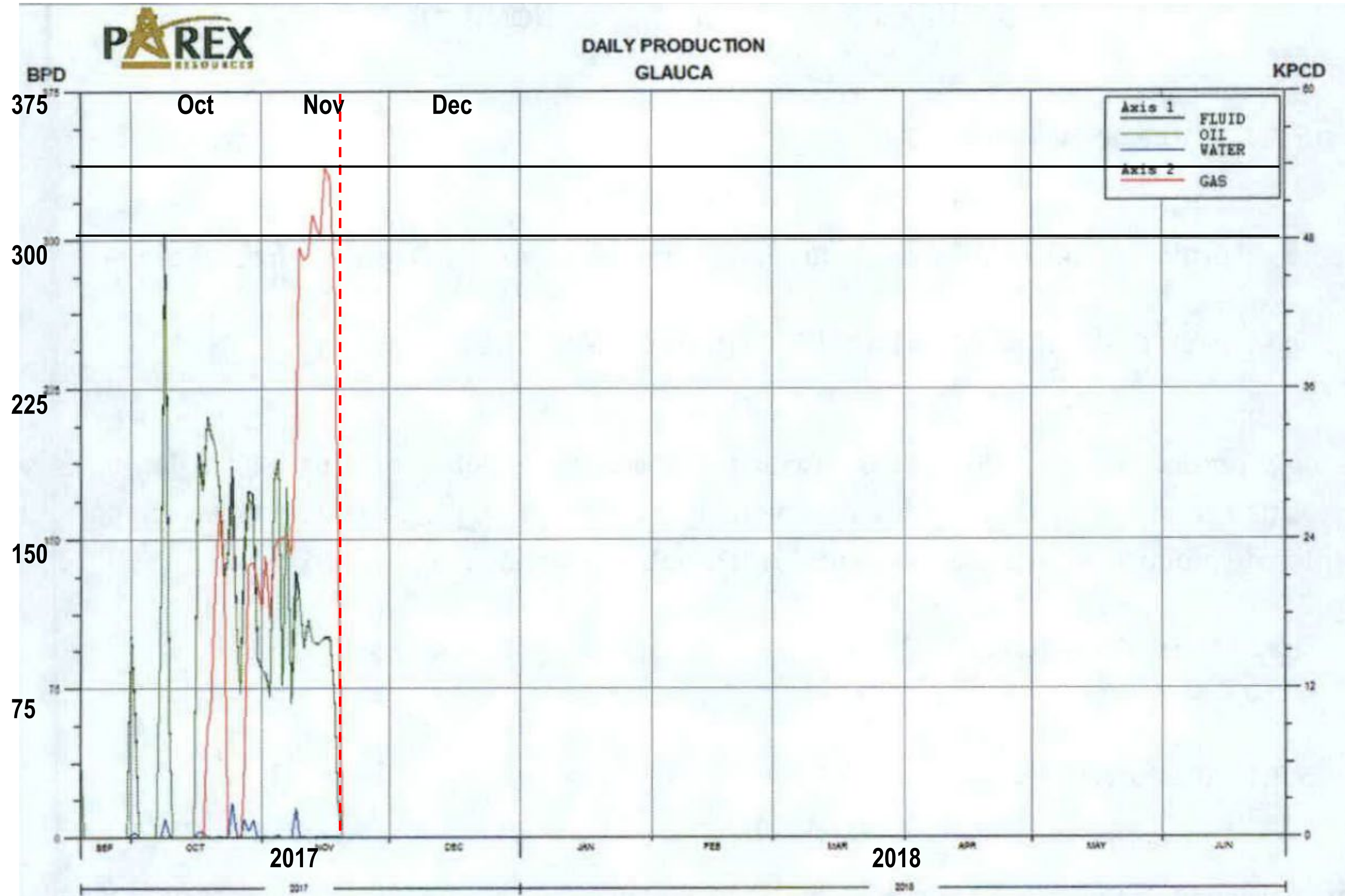


Summary of short production tests by mean of PTS bomb in the intervals (6780' – 6884'/ 6807' – 6817'/ 6824' – 6837'/ 6867' – 6900') of Esmeraldas Formation

					SEGUIMIENTO DE PRODUCCIÓN GLAUCA-2						
					PARAMETERS	RESULTS					
Interval	No.	Date of test	Status	Formation	Time (hrs)	BFPD	BOPD (@60°F)	BWPD	BSW %	GAS Kscfpd	GOR
6.780' – 6.884'/ 6.807' – 6.817'/ 6.824' – 6.837'	3	08/10/2017	PTS	Esmeraldas	24,0	101,03	100,95	0,08	0,08%	0,00	0,00
	4	09/10/2017	PTS	Esmeraldas	24,0	302,45	293,44	9,01	2,98%	0,00	0,00
	5	10/10/2017	PTS	Esmeraldas	12,0	58,95	57,95	1,00	1,70%	0,00	0,00
	6	17/10/2017	PTS	Esmeraldas	24,0	193,31	190,12	3,19	1,65%	0,00	0,00

Production traceability of Glauca – 2 (PTS Bomb)

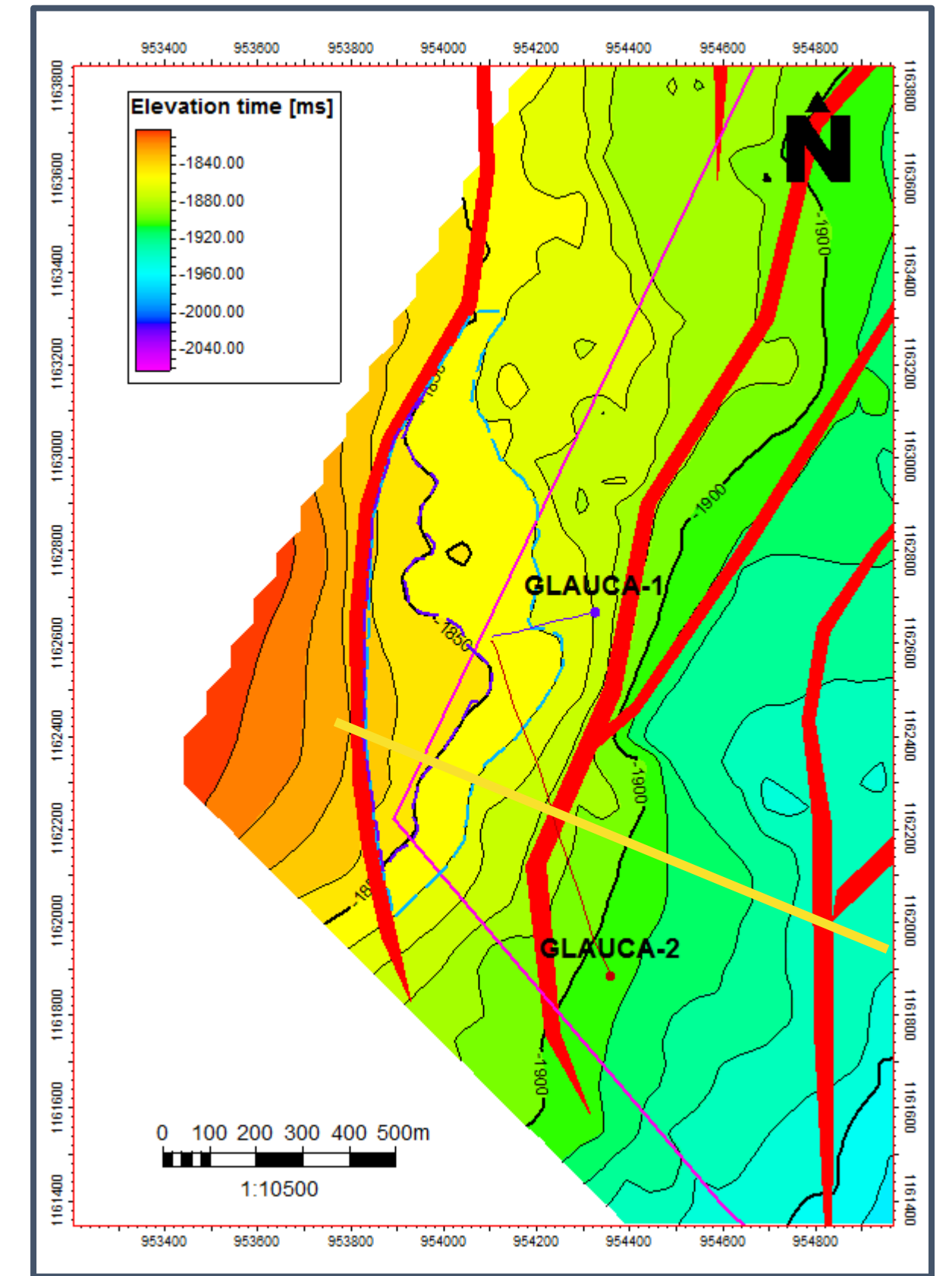
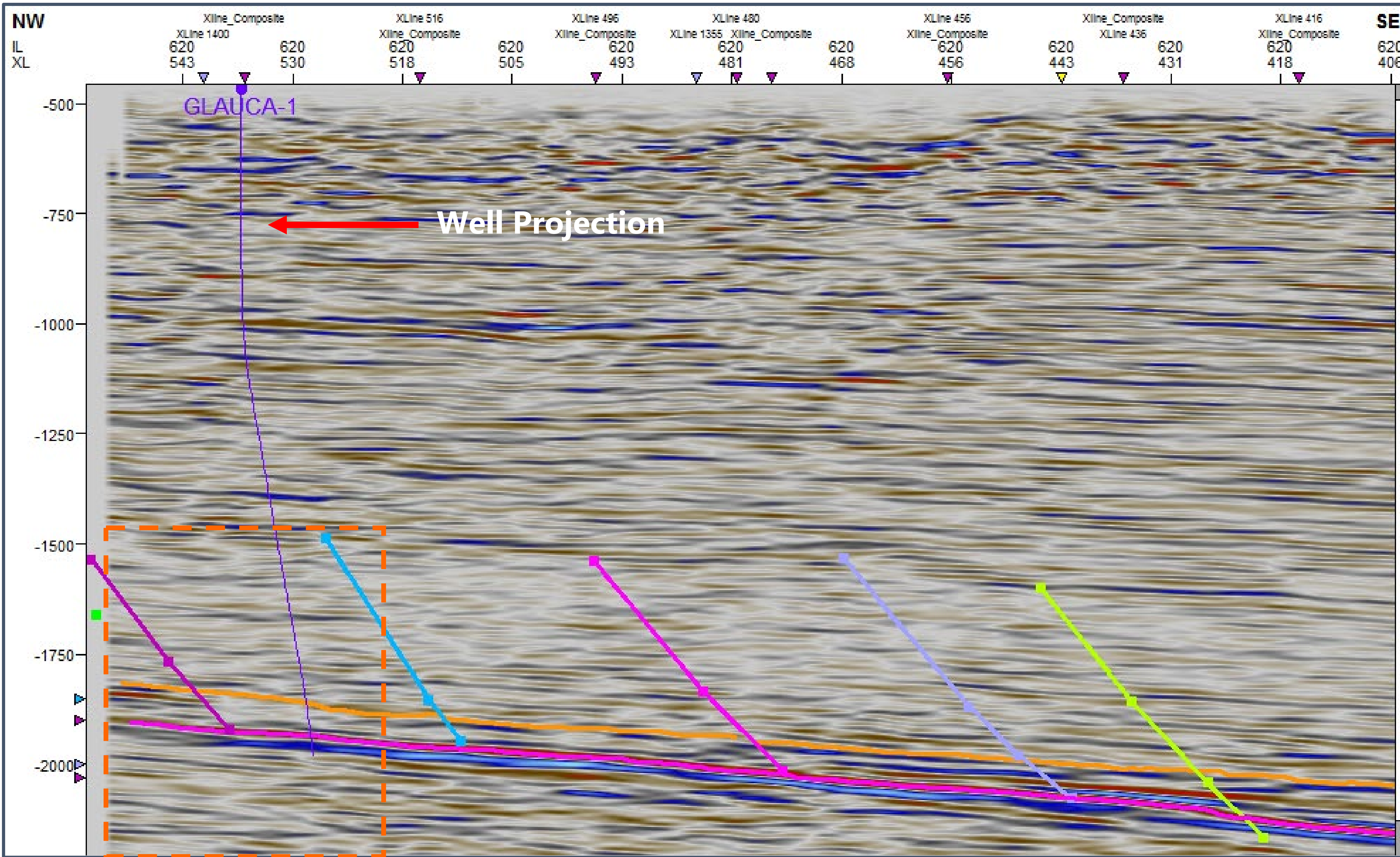
# DAILY PRODUCTION GLAUCA



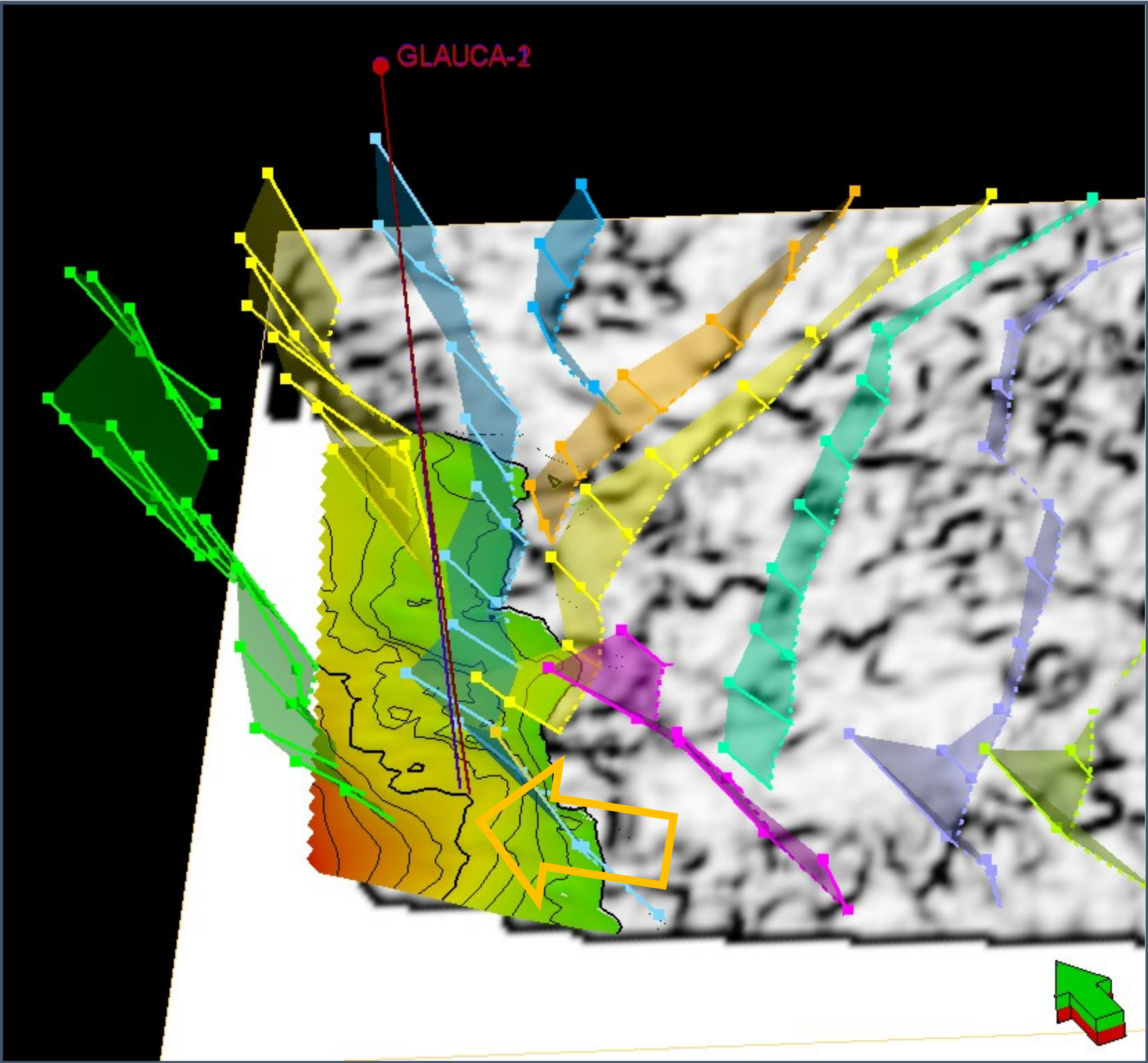
## Main Production Results

- Duration of production: 2 months
- Peak oil production: 300 BPD
- Peak gas production: 54 KCFD

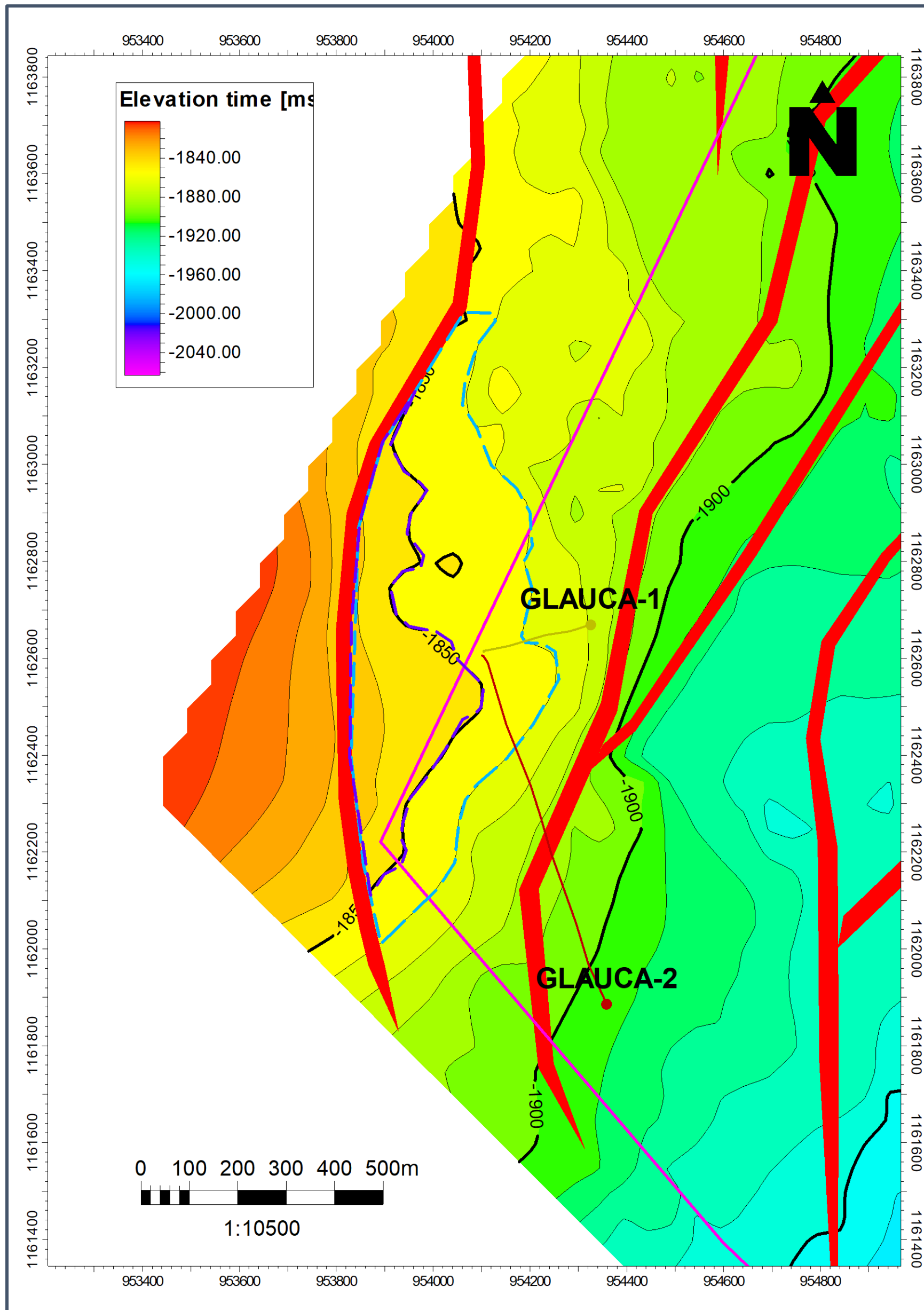
# SEISMIC INTERPRETATION: DIP LINE



# SEISMIC INTERPRETATION: FAULT MODEL IN VARIANCE TIME SLICE



# PROSPECTIVITY: ESMERALDAS FM



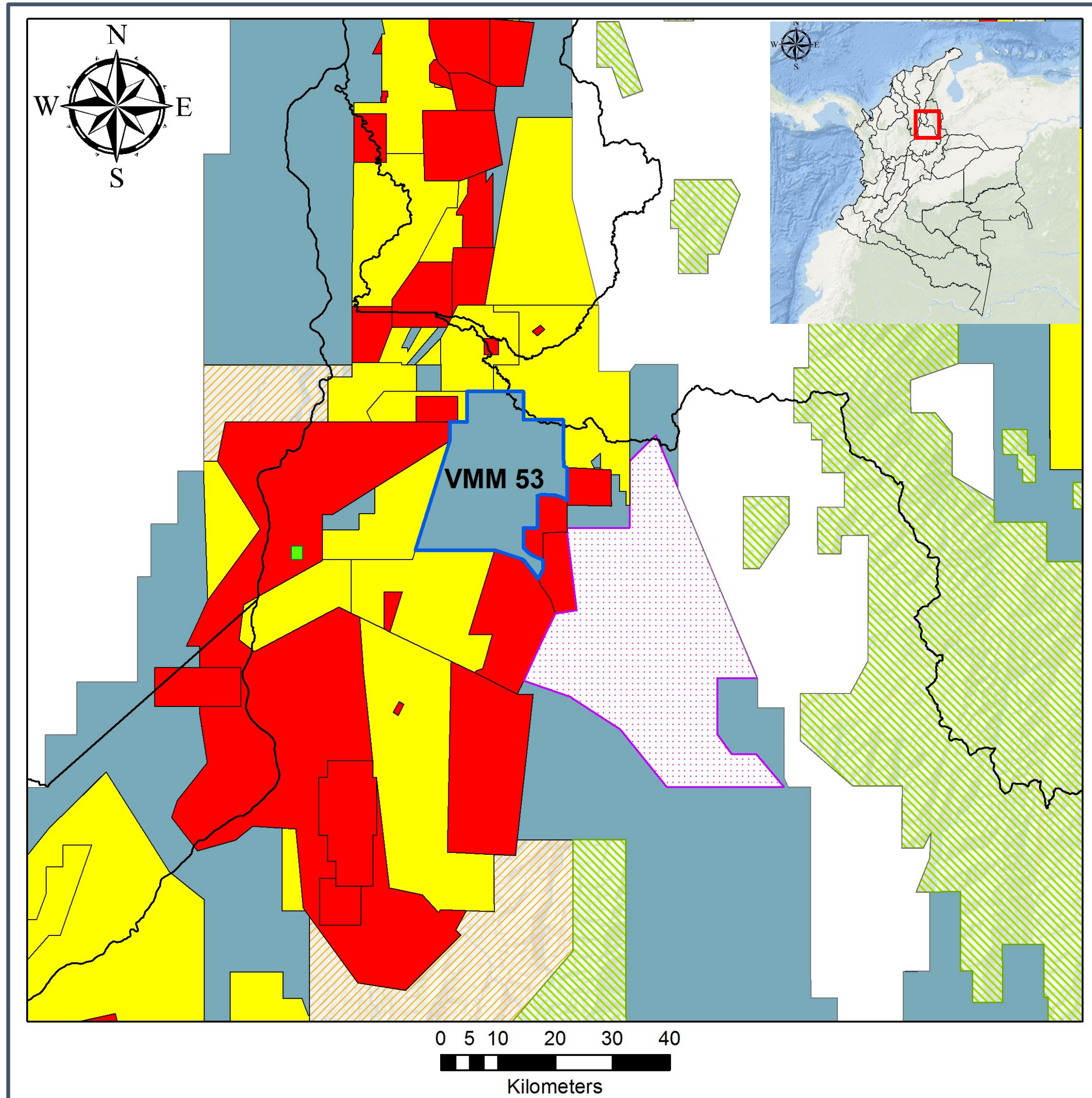
## AREAS

- **High Estimate** (0,32 Km<sup>2</sup> - 79 Acres)
- **Best Estimate** (0,12 Km<sup>2</sup> - 30 Acres)

PROSPECT	Area (Acres)	Thickness (Net Pay) (ft)	Porosity (%)	SO (%)	Boi	OOIP (BLS)	FR (%)	Resources (BLS)
Glauca Fm Esmeraldas Best Estimated	30	50	0.19	0.55	1.0500	1,158,159	0.15	173,724
Glauca Fm Esmeraldas High Estimated	79	60	0.23	0.60	1.0500	4,833,012	0.17	821,612

VMM – 53 (Incorporated)

# LOCATION



- **Block Available**

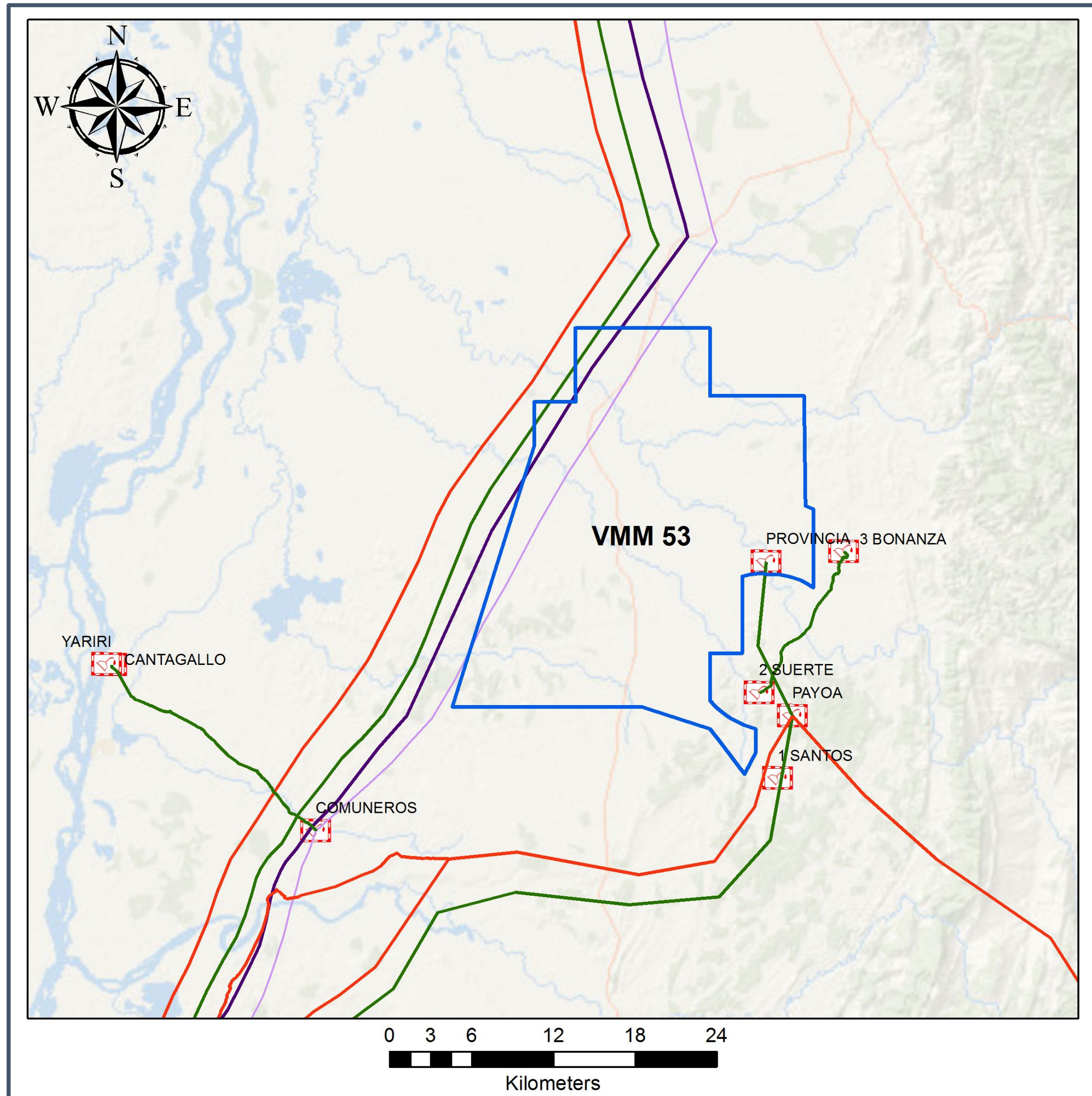
- VMM – 53

- **Area VMM**

- 520.4 Km<sup>2</sup>

- **Department**

- Santander & Norte de Santander



## Main Infrastructure nearby

### 3 Oil Pipelines (4 Stations)

- Provincia (Inside area)

- 3 Bonanza (2,5 Km)

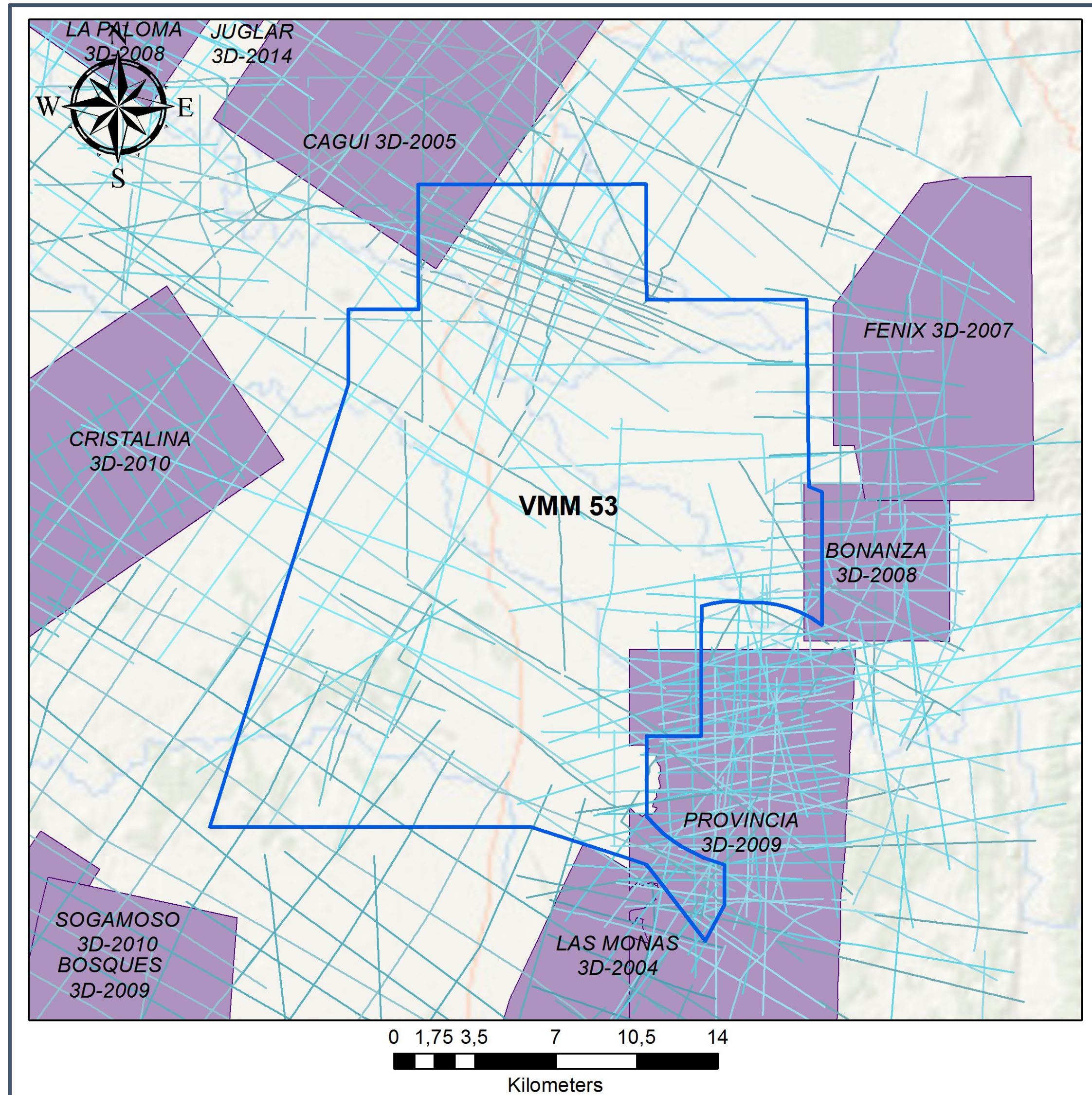
- Santos (3,1 Km)

- Cantagallo (26,0 Km)

### 3 Gas Pipelines (1 Station)

- Payoa (4,0 Km)





## 2D Seismic Programs

- Cristalina Playon 2D-2008
- Cristalina Playon 2D-2010
- Sogamoso – 77
- Este Gironda – 77
- Provincia – 55
- Provincia – 57
- Provincia – 60
- Liebre Provincia – 93
- Provincia – 60
- Lebrija – 81
- Magdalena Medio – 76
- Ordones – 79
- Provincia – 77
- Toca San Alberto – 79

14 Surveys

8 Surveys

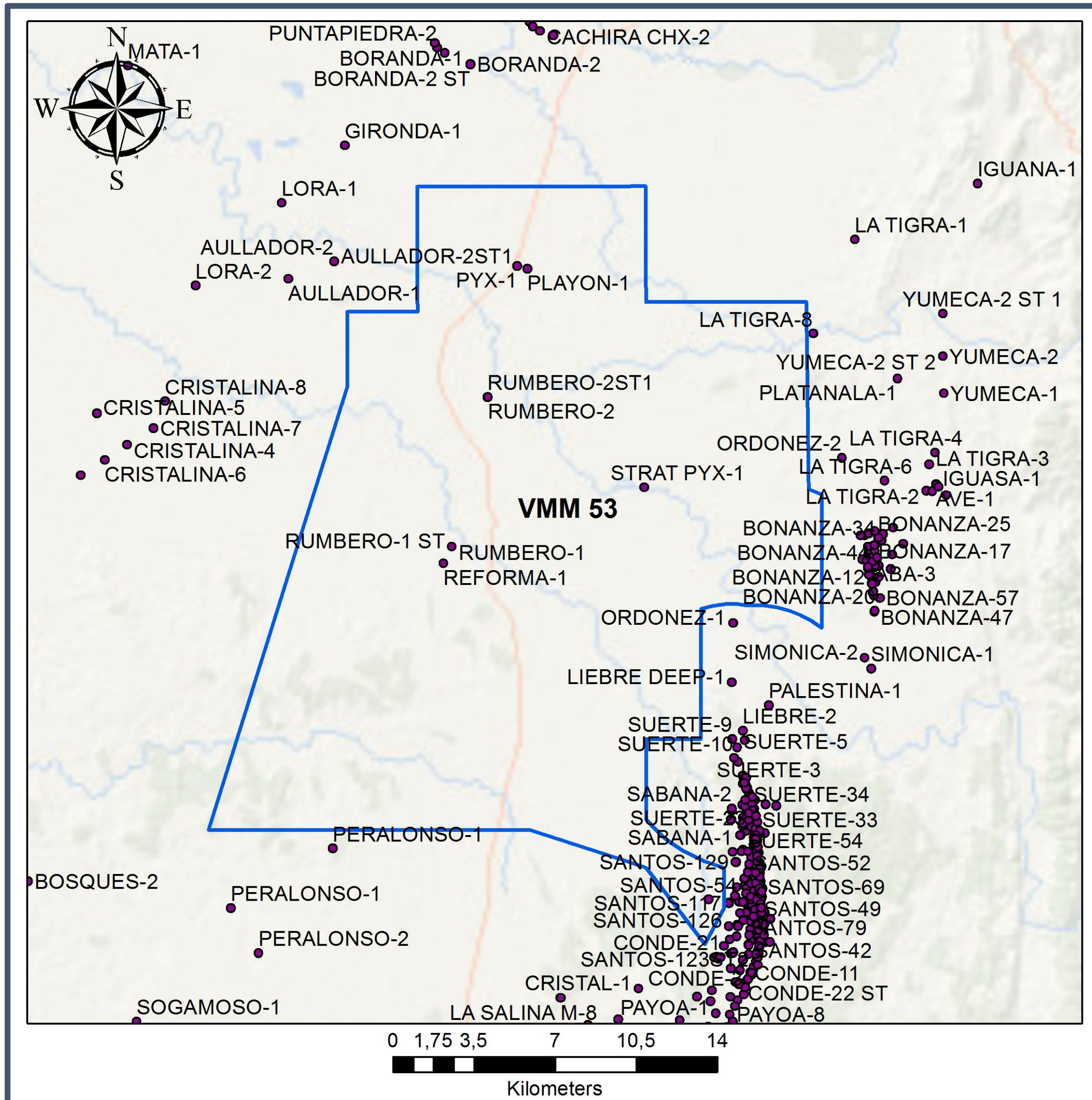
- Reforma – 76
- Reforma – 77
- Provincia - 97
- Playon 2D – 2009
- Provincia – 68
- West Provincia – 79
- Sogamoso – 86
- **Total Length 1000 Km**

## 3D Seismic

3 Surveys

- Bonanza 3D – 2008
- Provincia 3D – 2009
- **Total Area 34 Km<sup>2</sup>**

# DATABASE: WELLS



Well	Year	TD (ft)	Main Target
Playon – 1	1960	13,997	N/A
Strat PYX – 1	1959	N/A	N/A
PYX - 1	1959	905	N/A
Rumbero – 1ST	2011	14,055	Esmeraldas
Rumbero – 2ST	2014	14,098	Esmeraldas
Reforma - 1	1956	11,368	No data available
Provincia - 1	1959	6,583	No data available

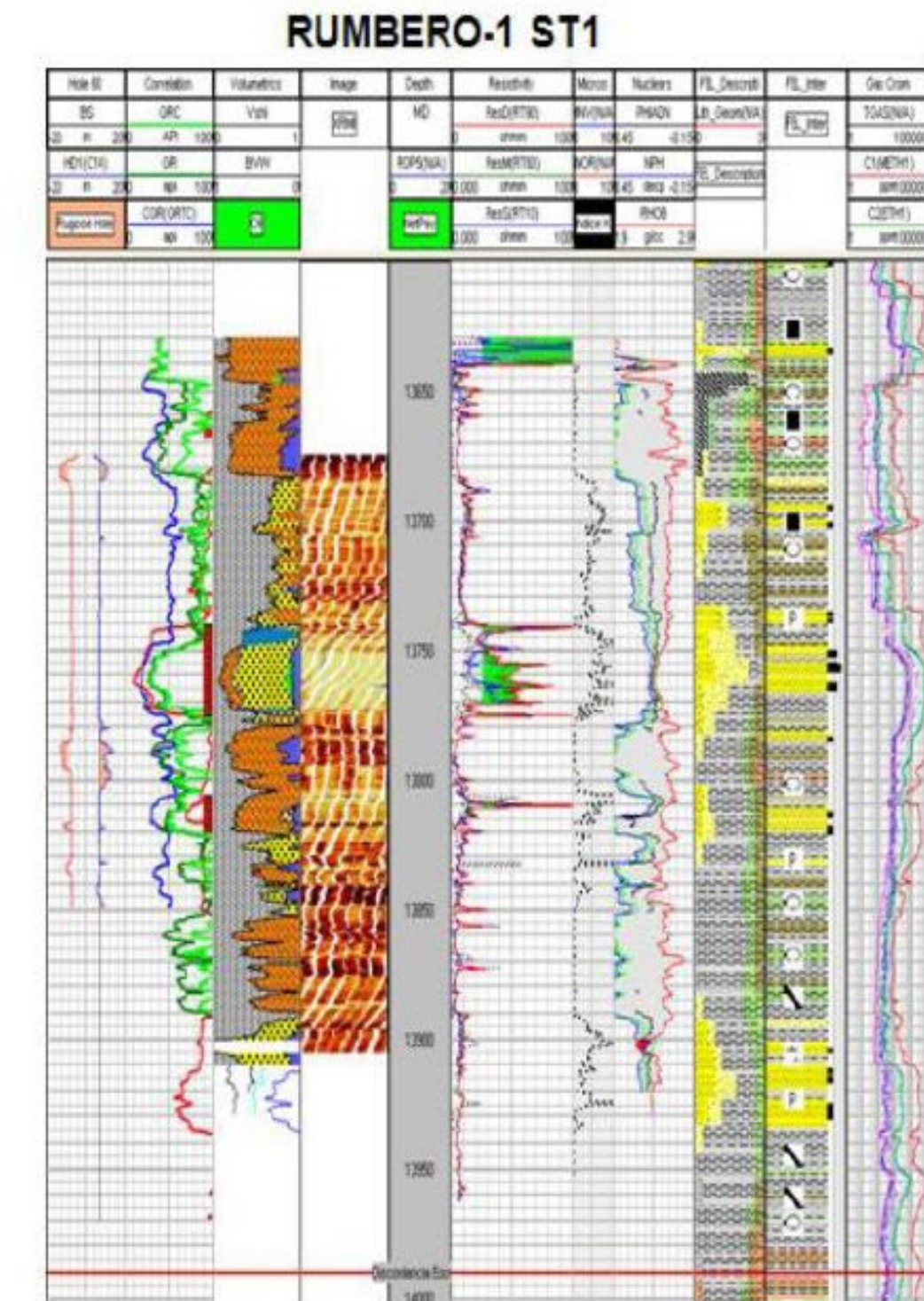
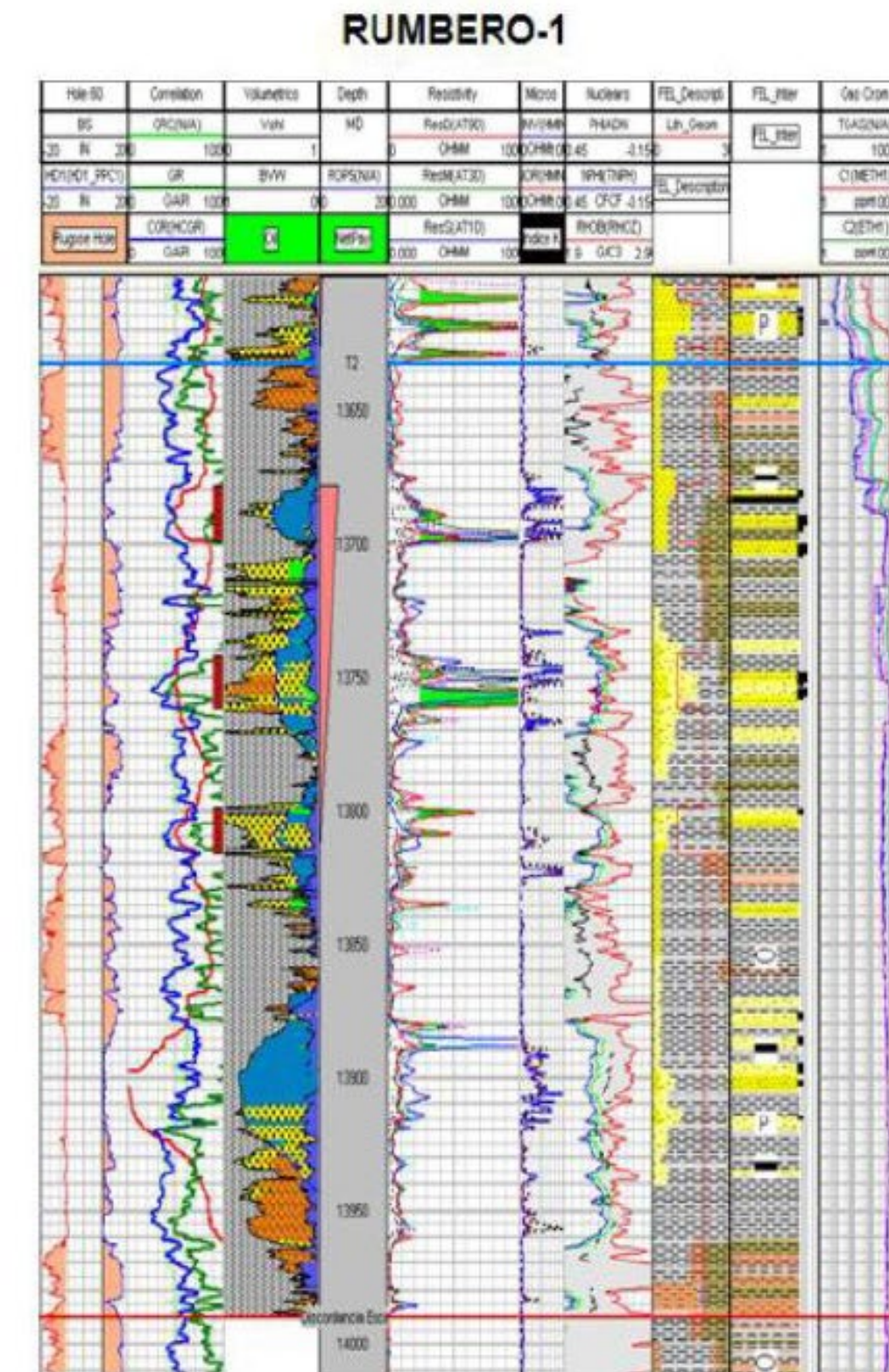
# WELL DATA

## Rumbero – 1

- Well drilled by Ecopetrol in 2011 with a MD of 14,110'
- Three DSTs were taken (DST – 1R, DST – 2A & DST – 2B) identifying the presence of hydrocarbons in all of the intervals
- The DST-1R had a production of **0,015 BPD/psi**
- The DST – 2A and DST-2B tests weakened the mechanical status of the well.
- In order to fracture the interval tested in the DST-1 was necessary to perform a sidetrack

## Rumbero 1 - ST

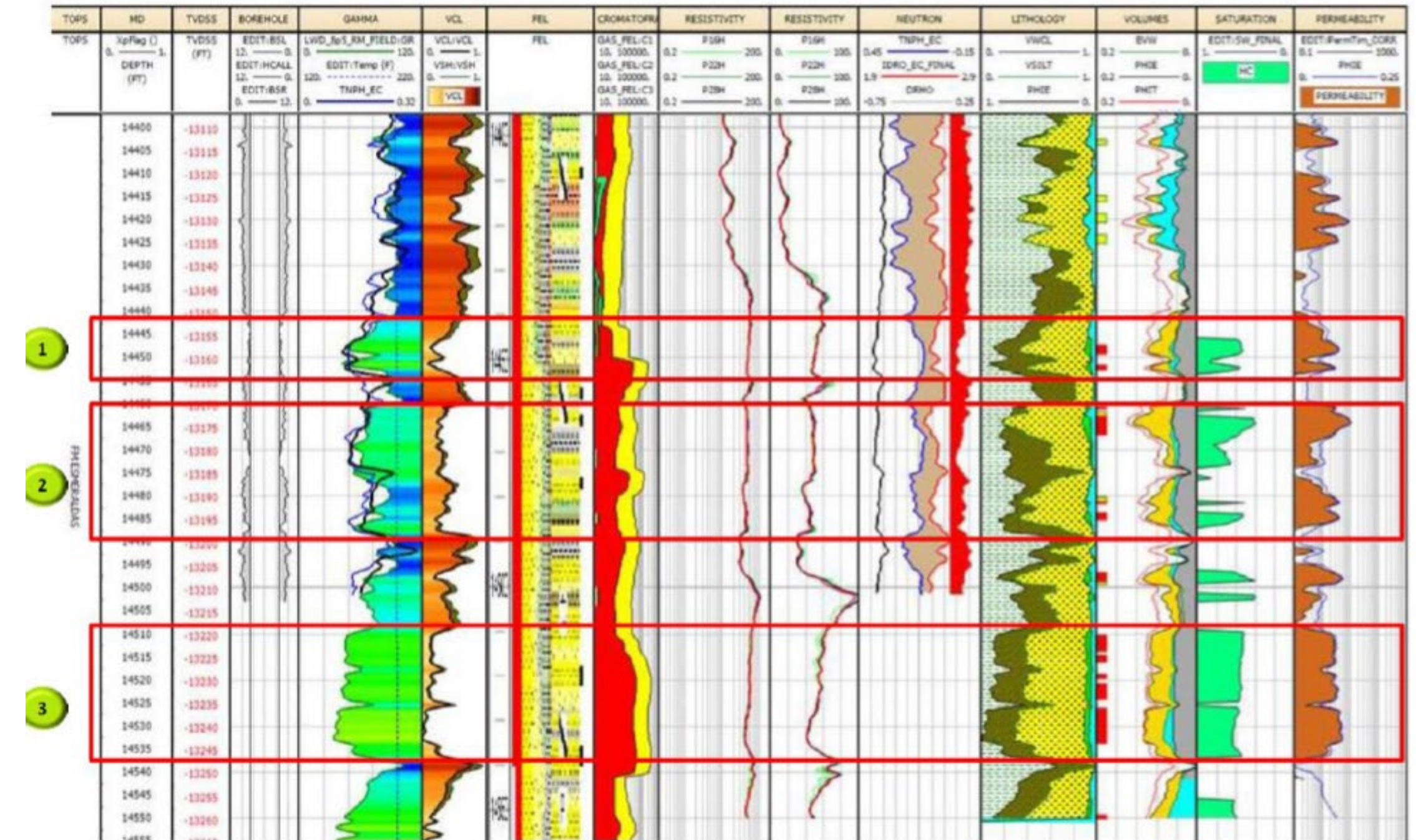
- Deviated well drilled by Ecopetrol in 2011 with a MD of 14,060'
- The main target of the well was to find oil in the Esmeraldas Fm.
- Based on well logs and petrophysics the well was classified as commercial
- Few gas shows where the highest quantity of shows were presented in the Esmeraldas Fm.
- The well was tested in the Esmeraldas Fm producing **562 bbls** of oil



# WELL DATA

## Rumbero 2 – ST1

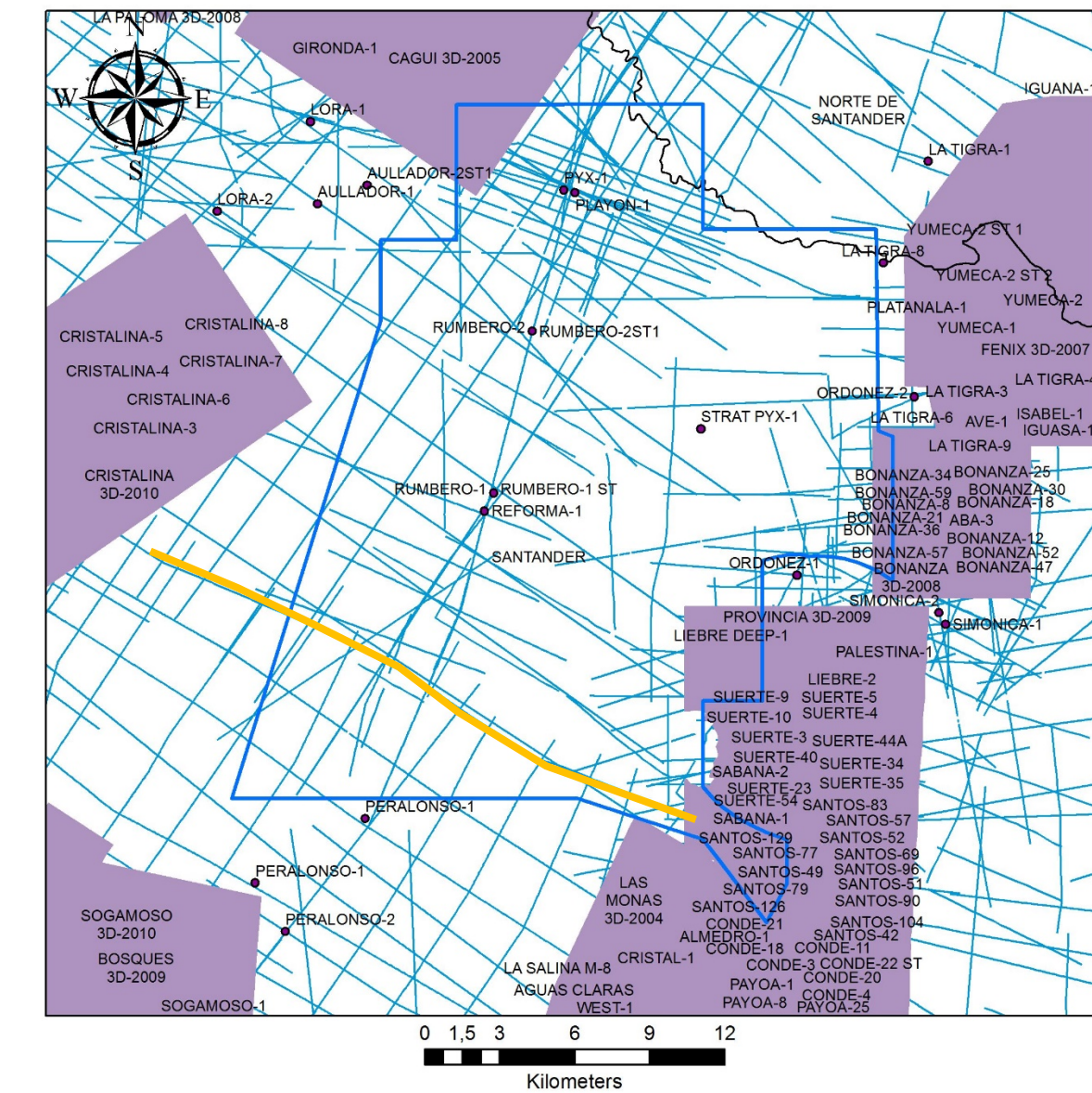
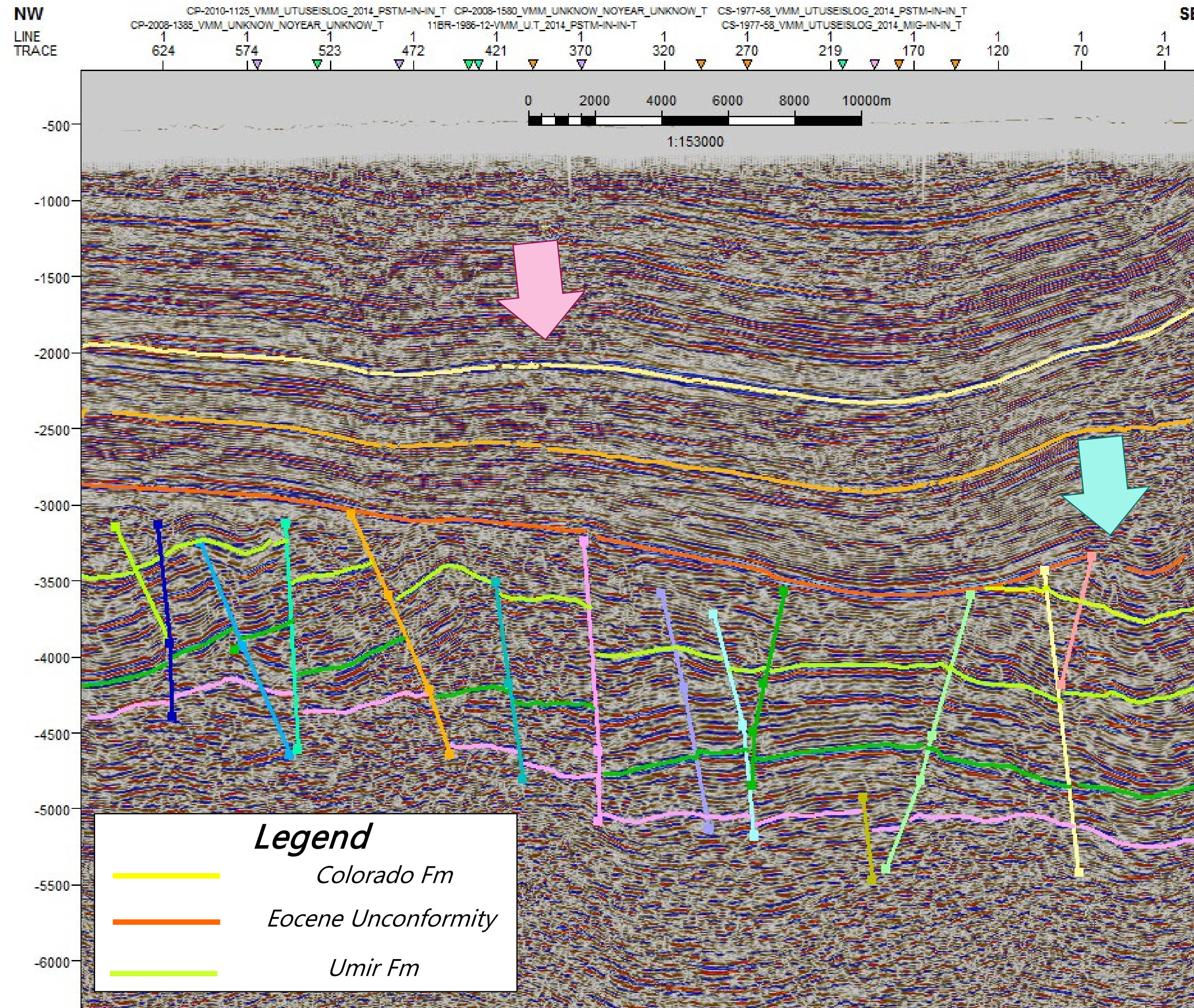
- Deviated (J type) well drilled by Ecopetrol in 2014 with a MD of 14,099'
- The main target was to establish the Rumbero structure extent for the Esmeralda Fm basal sands
- The basal sands from Esmeraldas Fm probed hydrocarbon in the Rumbero-1 and Rumbero 1ST1 wells
- The well was tested in the Esmeraldas Fm with low productivity (K~0,3 mD). During DST-1 the well found two intervals :
  - The first one in the upper sandstones (low Pressure) produced 37 bls of formation water and **traces of oil** with **31,2°API**
  - The other in the lower sandstones (high Pressure). Many mechanical and operational issues did not allow to acquire complete geological information, and complete and test the lower part of the Fm.
- The well was abandoned because of the test results and the impossibility to probe de lower sandstone.



## Reforma – 1

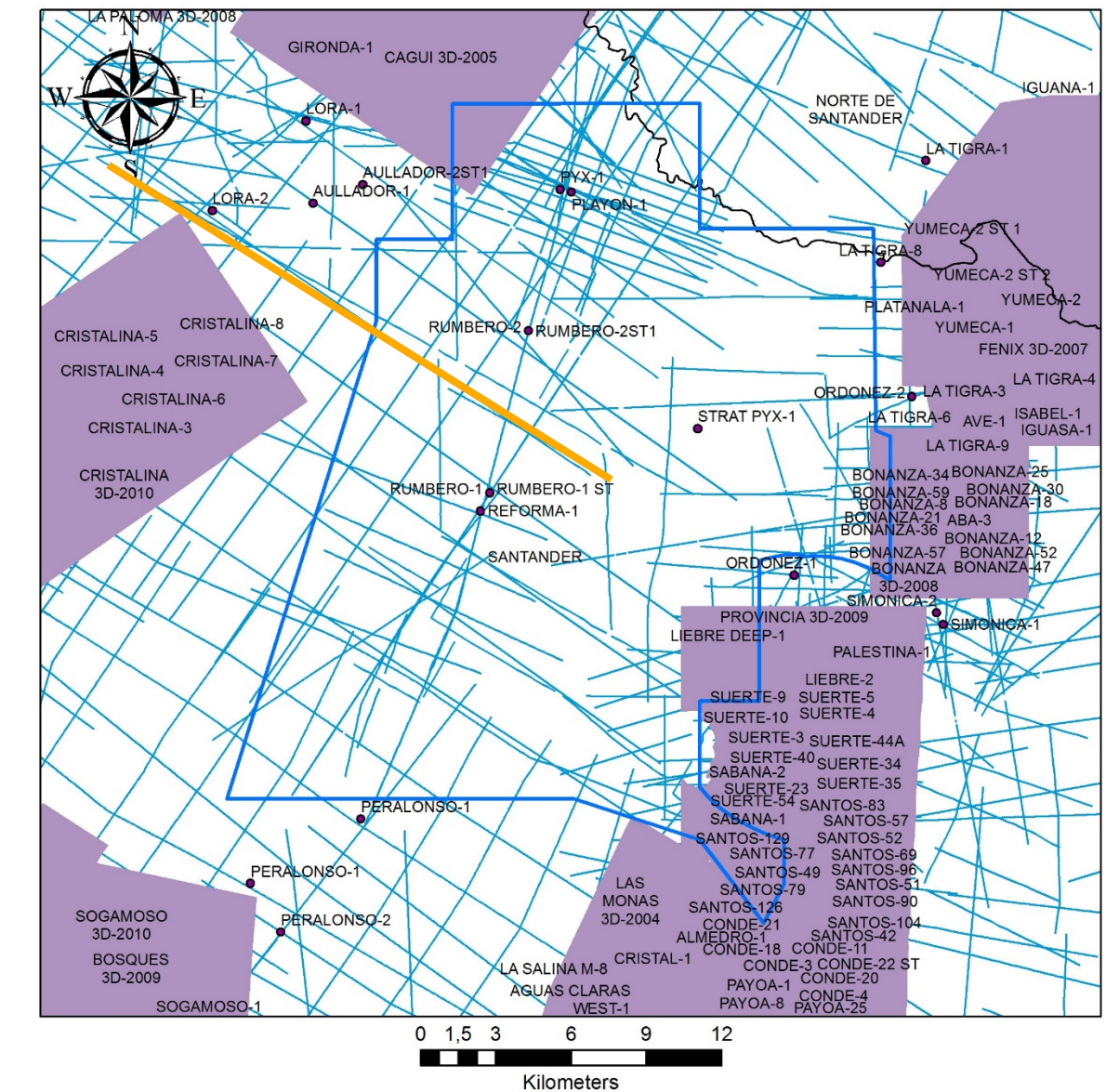
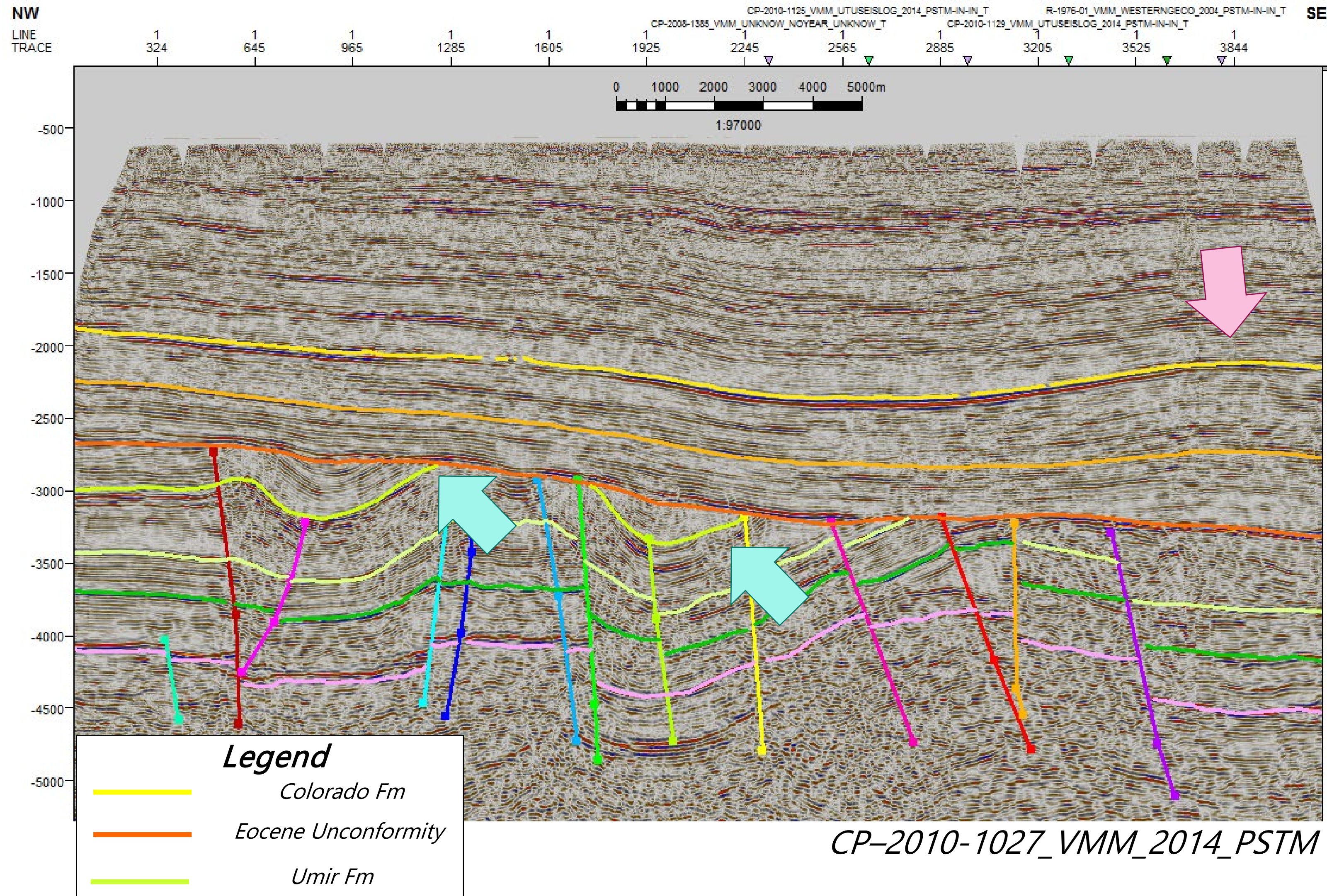
- The well was drilled by International Petroleum (Colombia) in 1956 with a MD of 11,358' (?)
- Despite the fact that sandstone samples from the drill cuts had good petrophysical properties, any of them showed hydrocarbons stains in the interest interval (6,450-7,620)

# SEISMIC INTERPRETATION

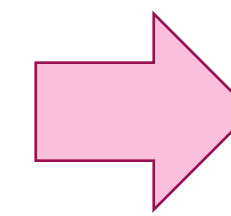
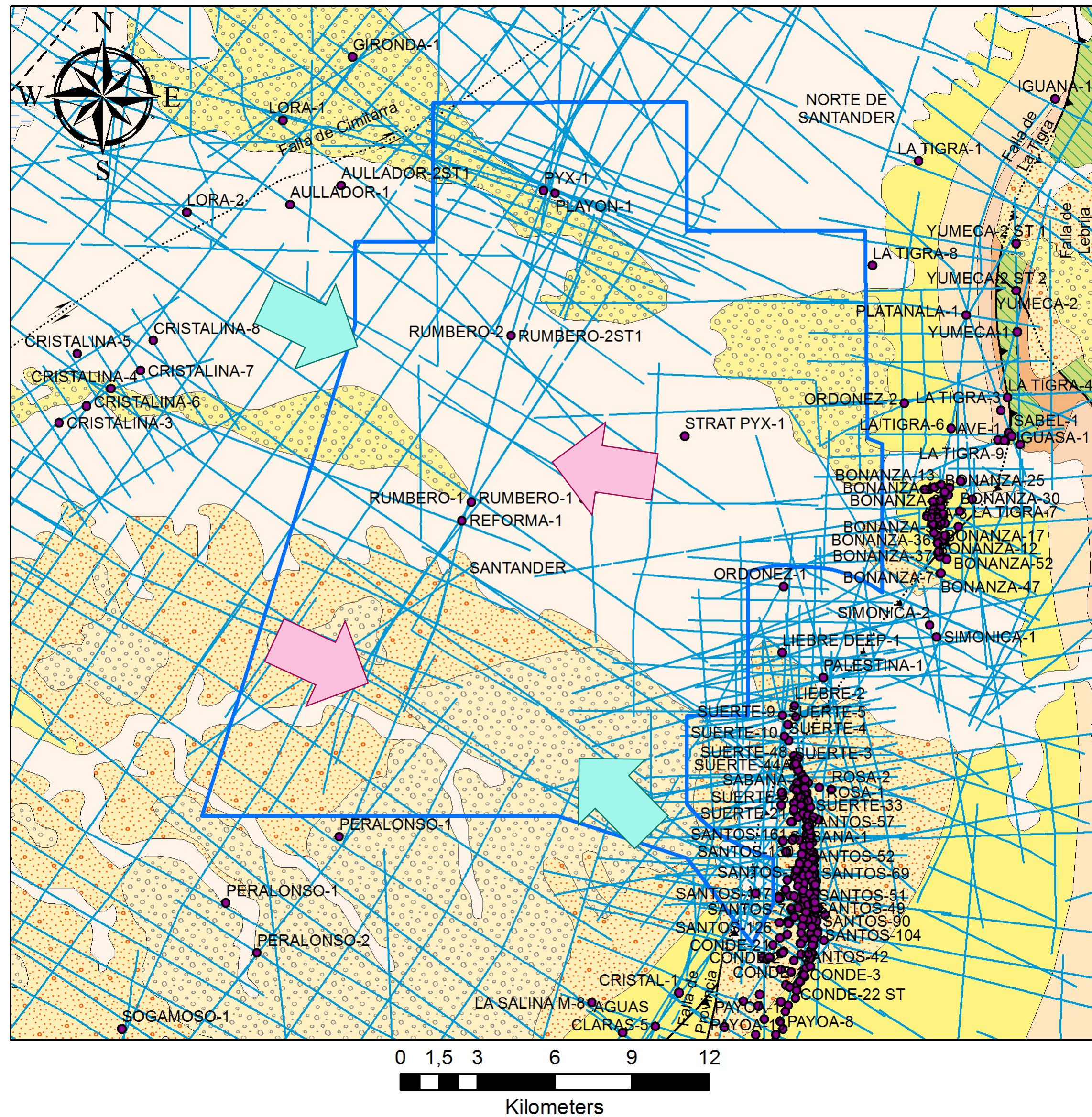


CS-1977-01\_VMM\_2014\_PSTM

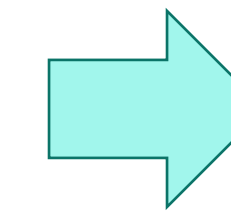
# SEISMIC INTERPRETATION: DIP LINE



# PROSPECTIVITY



■ Structural opportunities identified in the Colorado Fm

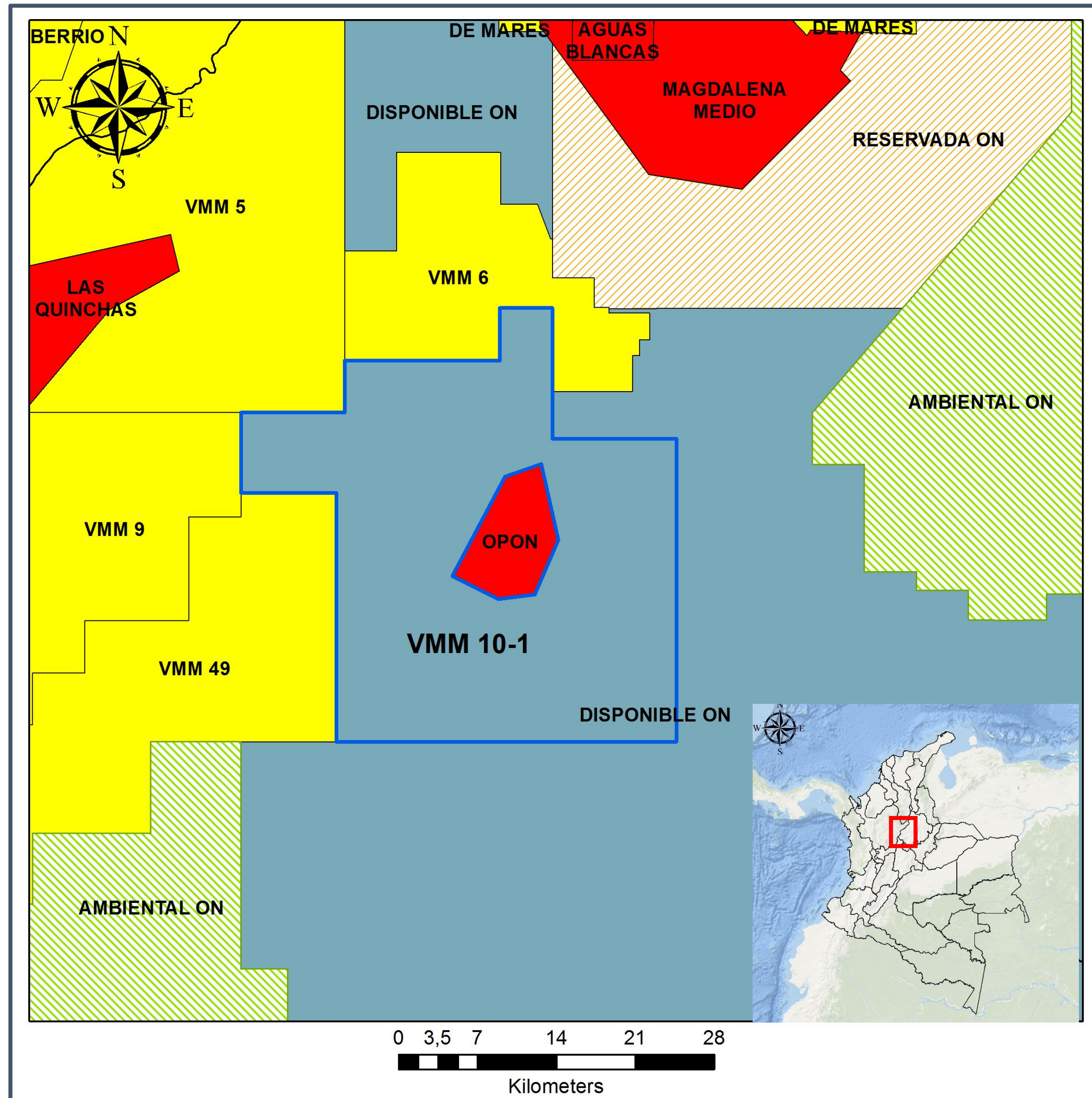


■ Stratigraphic opportunities identified at the truncation of the lower Lisama Fm

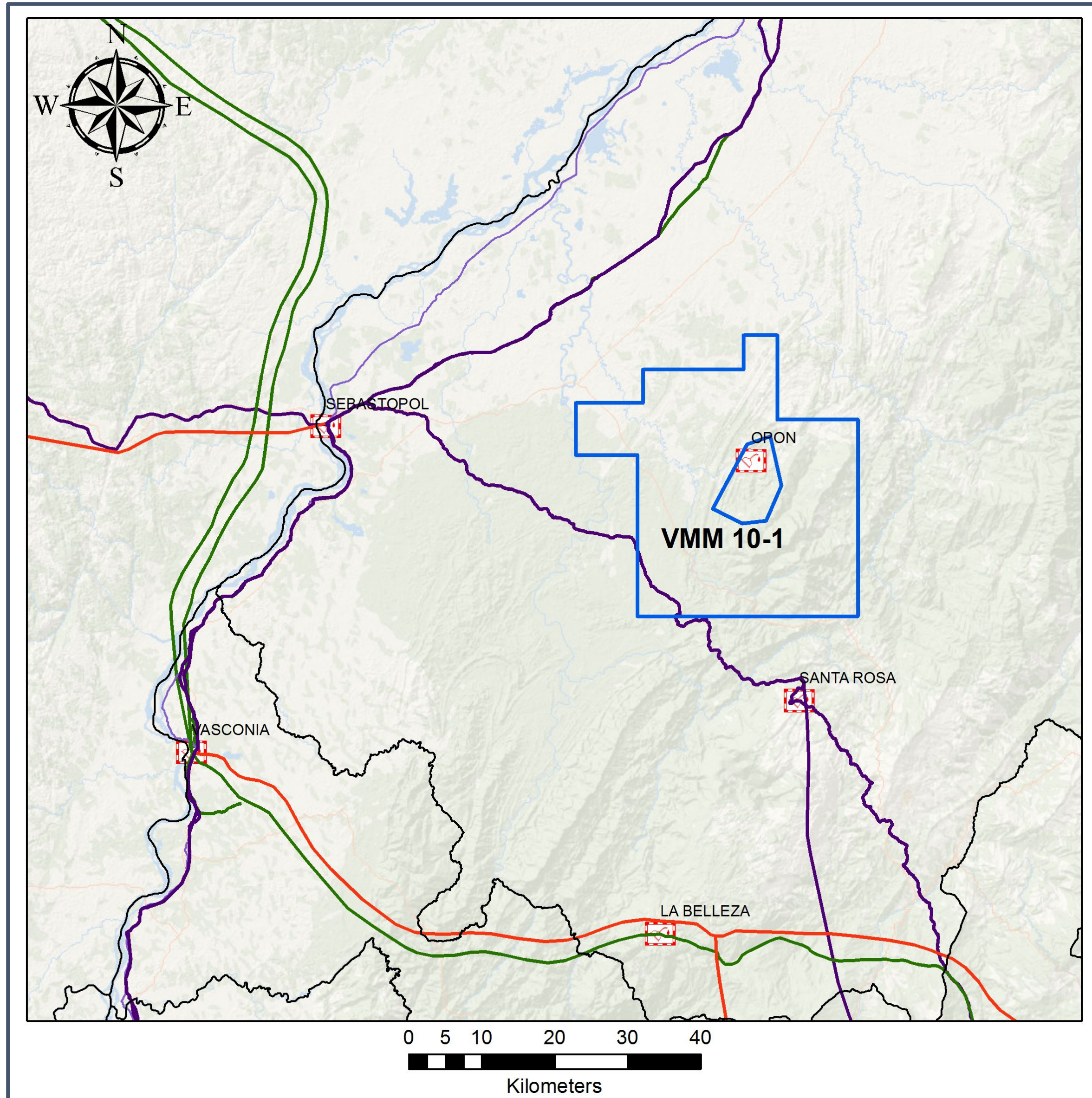
# VMM – 10 (Incorporated)



# LOCATION

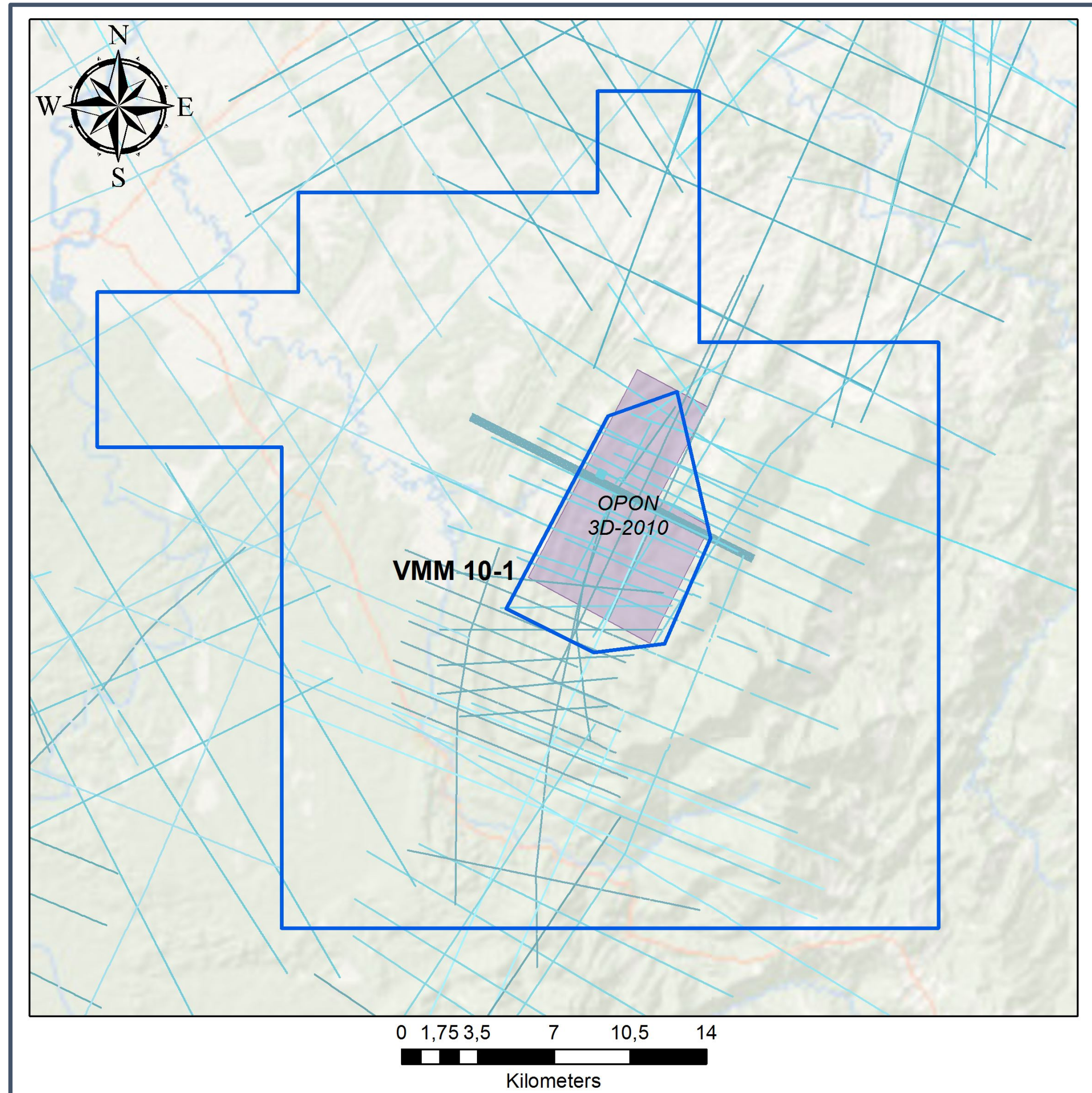


- **VMM 10-1**
- Block area: 953.3 Km<sup>2</sup>
- **Department**
- Santander



## Main Infrastructure nearby

- **5 Stations**
- Opon (5 Km)
- Santa Rosa (31 Km)
- Sebastopol (50 Km)
- Vasconia (75 Km)
- La Belleza (60 Km)



### 2D Seismic Programs

10 Surveys

- San Fernando – 77
- De Mares Este 2D – 2008
- Guayacanes 2D – 2000
- Opon – 91
- Las Amelias – 96
- Opon – 80
- Guayabito – 81
- Neftis 2D – 2010
- Opon Carare – 81
- Piedemonte Occidental – 92

7 Surveys

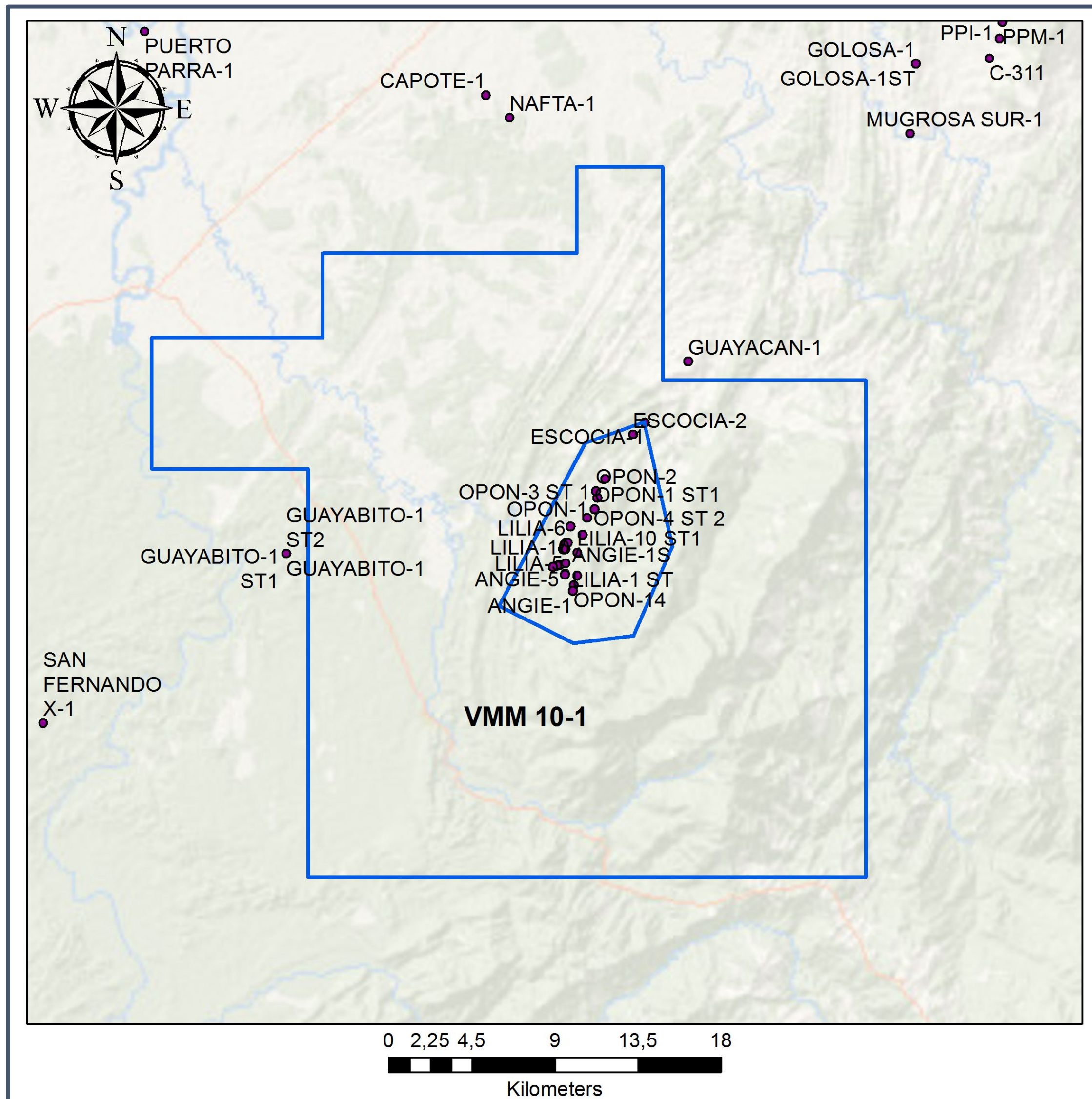
- San Fernando – 93
- San Luis – 95
- Quebrada Larga 2D – 2001
- Quebrada Larga 2D – 2003
- Quebrada Larga 2D – 2007
- Opon – 93
- Opon – 95
- Total Length: 953.36 Km

1 Survey

### 3D Seismic

- Opon 3D – 2010
- Total Area: 5 Km<sup>2</sup>

# DATABASE: WELLS

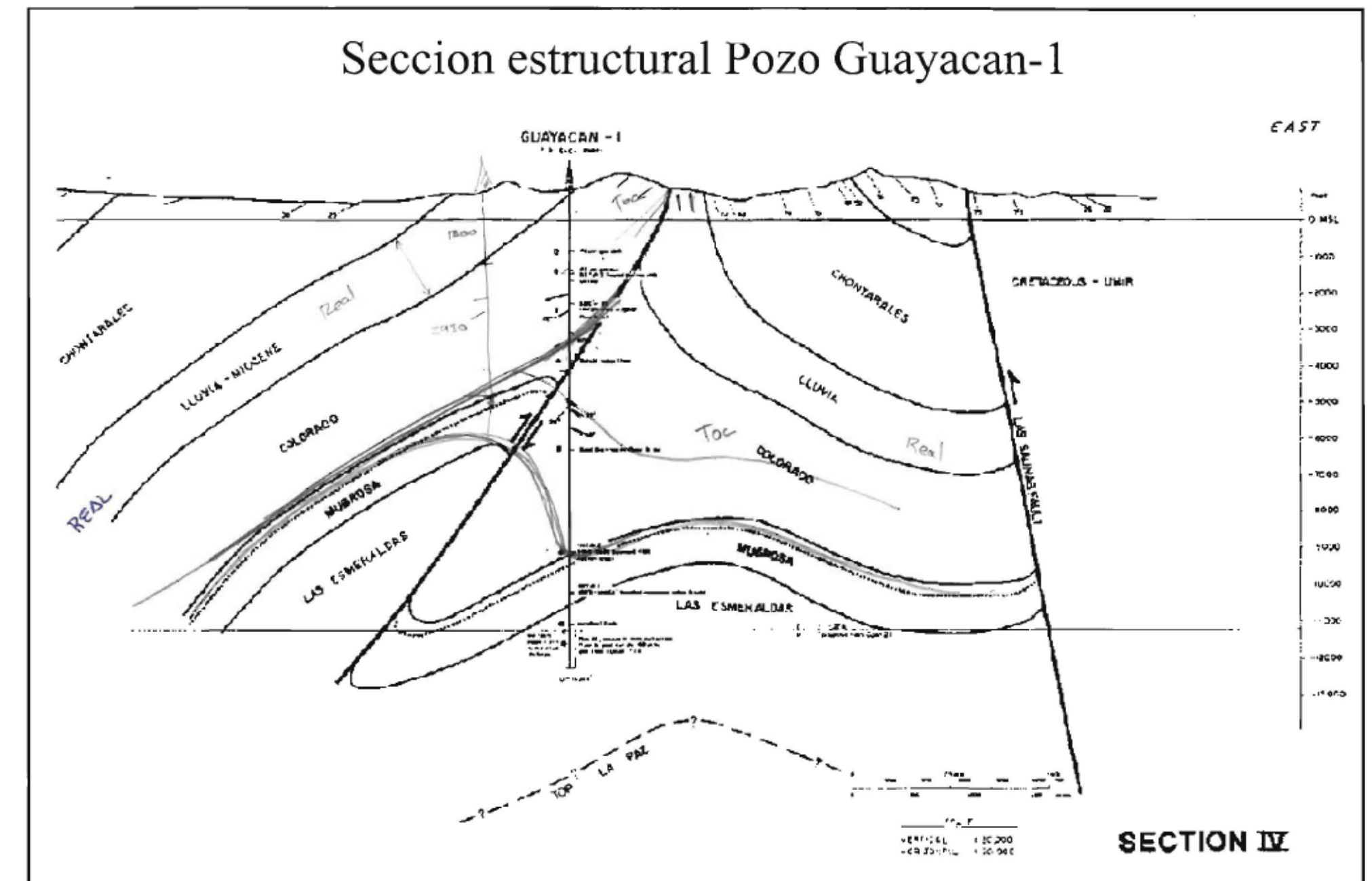


Well	Year	TD (ft)	Main Target
Guayacan – 1	1978	13,141	La Paz - Esmeraldas
Guayabito – 1 ST	1981	N/A	N/A
Escocia – 1	1974	N/A	La Paz – Esmeraldas
Escocia – 2	1982	6,002	La Paz – Esmeraldas

Field	Year of the first well drilled	Year of last well drilled	# Of Wells
Lilia	1979	1993	10
Angie	2013	2019	4
Opon	1966	1997	7

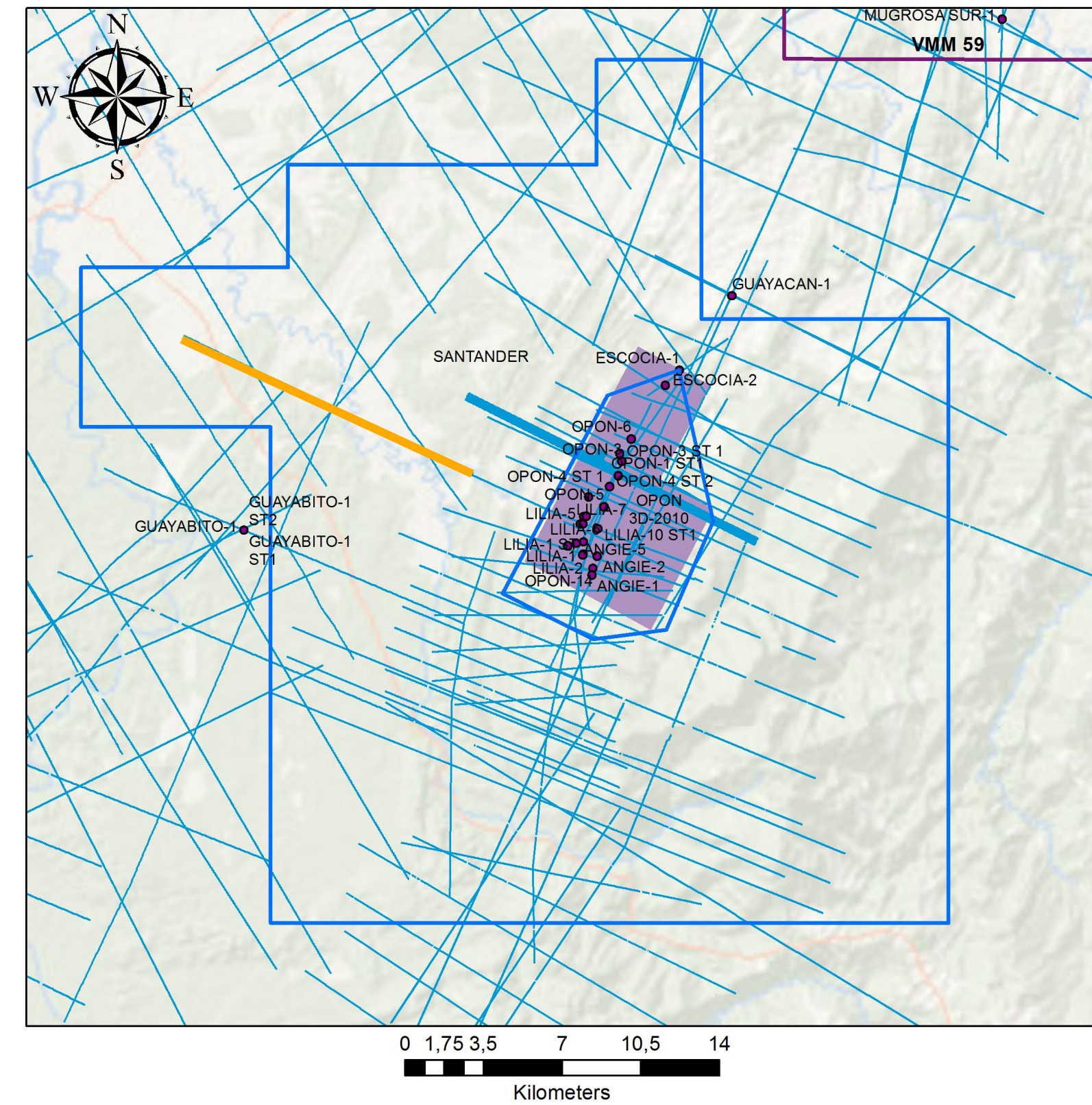
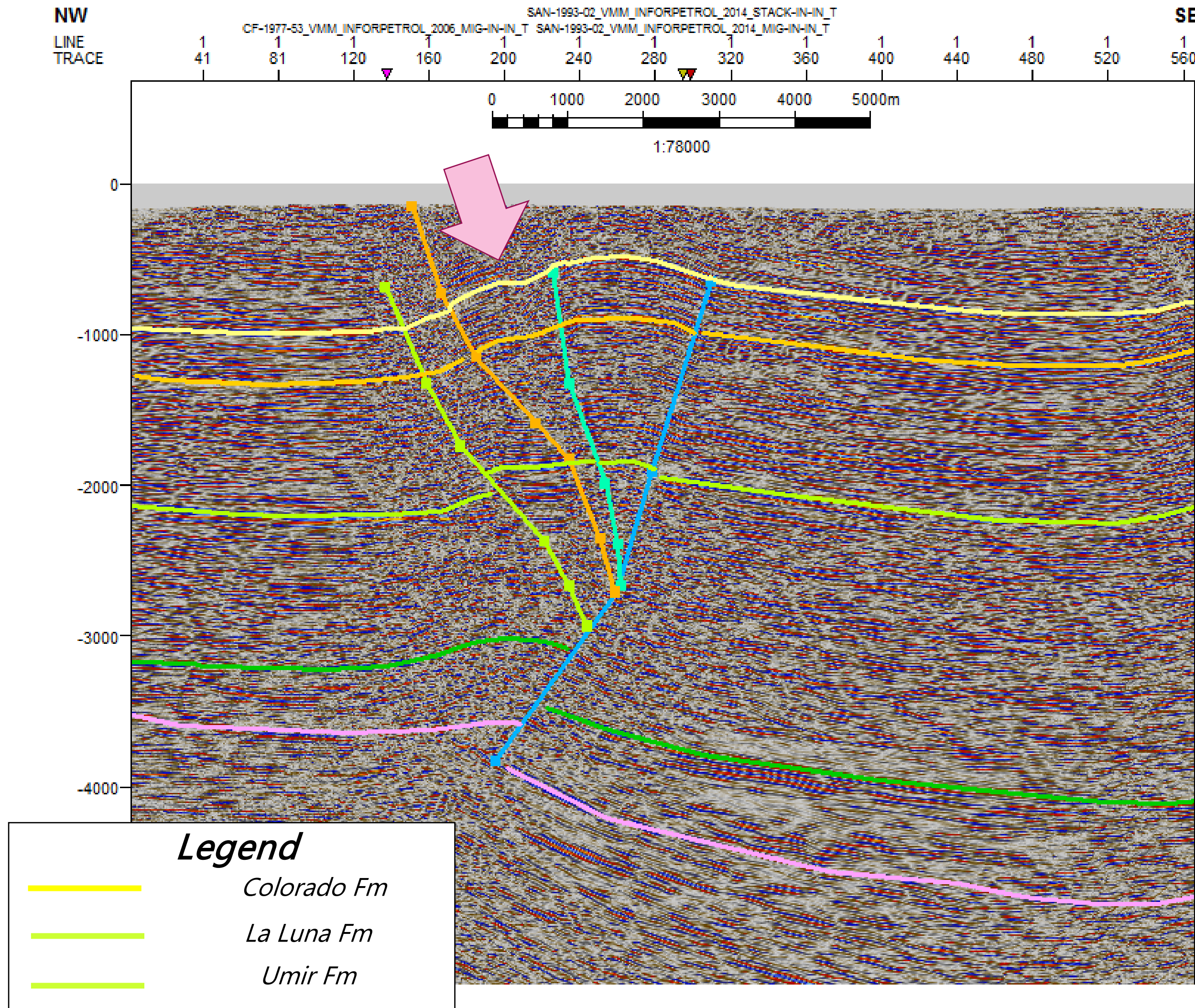
## Guayacan – 1

- The well was drilled by Ecopetrol in 1978 with a MD of 13,141'
- The target was to probe La Paz Fm sandstones in the "Anticlinal de Opon" pinchout, due to the drilling information of the Escocia-1 well
- The electric logs showed general zones of interest between 9150 to TD
- In the interval 2234'- 2242' after the well was swabbed it was started with gas flow .
- In the interval 9865'- 9852' was swabbed and after several attempts 4 barrels of 33° API and input water were recovered
- The interval 10971' – 10964' was acidized and swabbed, recovering water, acid and 3 pounds of parafin
- It was not possible to test any of the zones below 11374.

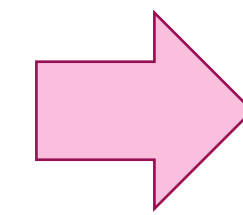
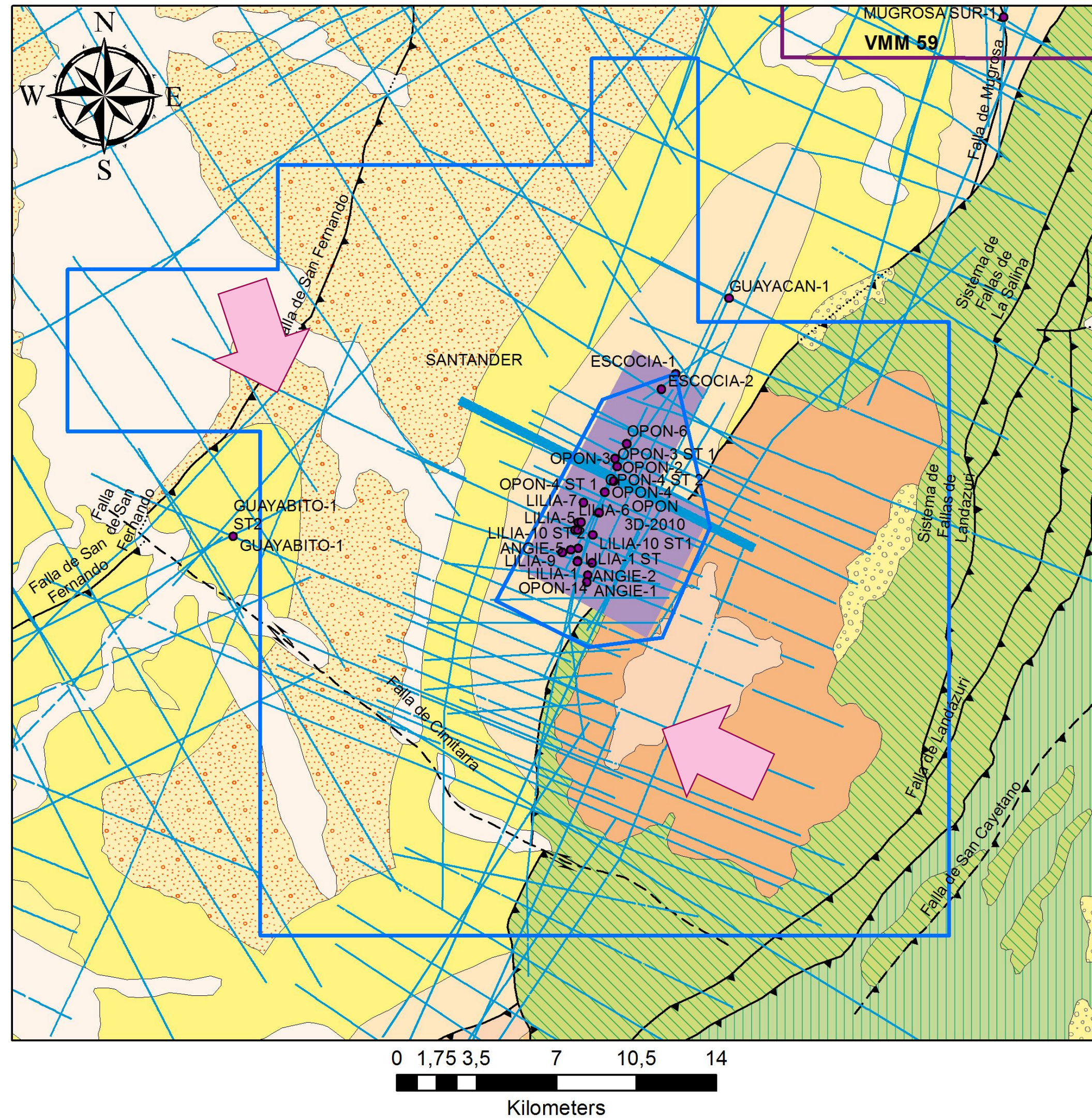


Sohio (1993)

# SEISMIC INTERPRETATION: DIP LINE



# PROSPECTIVITY



- Structural opportunities at the post Eocene Units

# CONCLUSIONS

- In the Upper Magdalena Valley one prospective sector in an available area is proposed by the ANH (**VMM-11**) and two areas proposed by the industry for incorporation are presented (**VMM-53 & VMM-10-1**)
- Glauca had two productive wells with a cumulative production at its peak of **300 BOPD** and **54 KCFGD** from the Esmeraldas Fm
- An upside exploratory opportunity is proposed at the W of the Glauca wells with an estimate in prospective recoverable resources of **173,724 bbls** in the **best estimate**
- In the incorporated area VMM – 53 the ANH have identified 4 different prospects: two at possible structural traps that involve the Esmeraldas Fm and 2 stratigraphic prospects at the **truncation of lower Lisama Fm** against the Eocene Unconformity (?).
- In the incorporated area VMM – 10-1 the ANH have identified 2 structural prospects that involve Eocene units: **One in a pop-up structure** that involves the whole sequence and one in a **subthrust associated to the Mugrosa Fault**



# Thanks

[www.anh.gov.co](http://www.anh.gov.co)