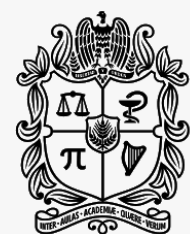


# COLOMBIA ROUND 2021



UNIVERSIDAD  
NACIONAL  
DE COLOMBIA



**Uptc**  
Universidad Pedagógica y  
Tecnológica de Colombia



**ACOGGP**  
ASOCIACIÓN COLOMBIANA DE GEÓLOGOS Y GEOFÍSICOS DEL PETRÓLEO



**AAPG**



**EAGE**

# COLOMBIA ROUND 2021 LOWER MAGDALENA VALLEY BASIN EXPLORATORY OPPORTUNITIES E & P s

07/05/2021

Location

Infrastructure

Geological Framework

**Plato Sub-Basin**

Database

Existing Producer Wells

Seismic Interpretation

**San Jorge Sub-Basin**

Database

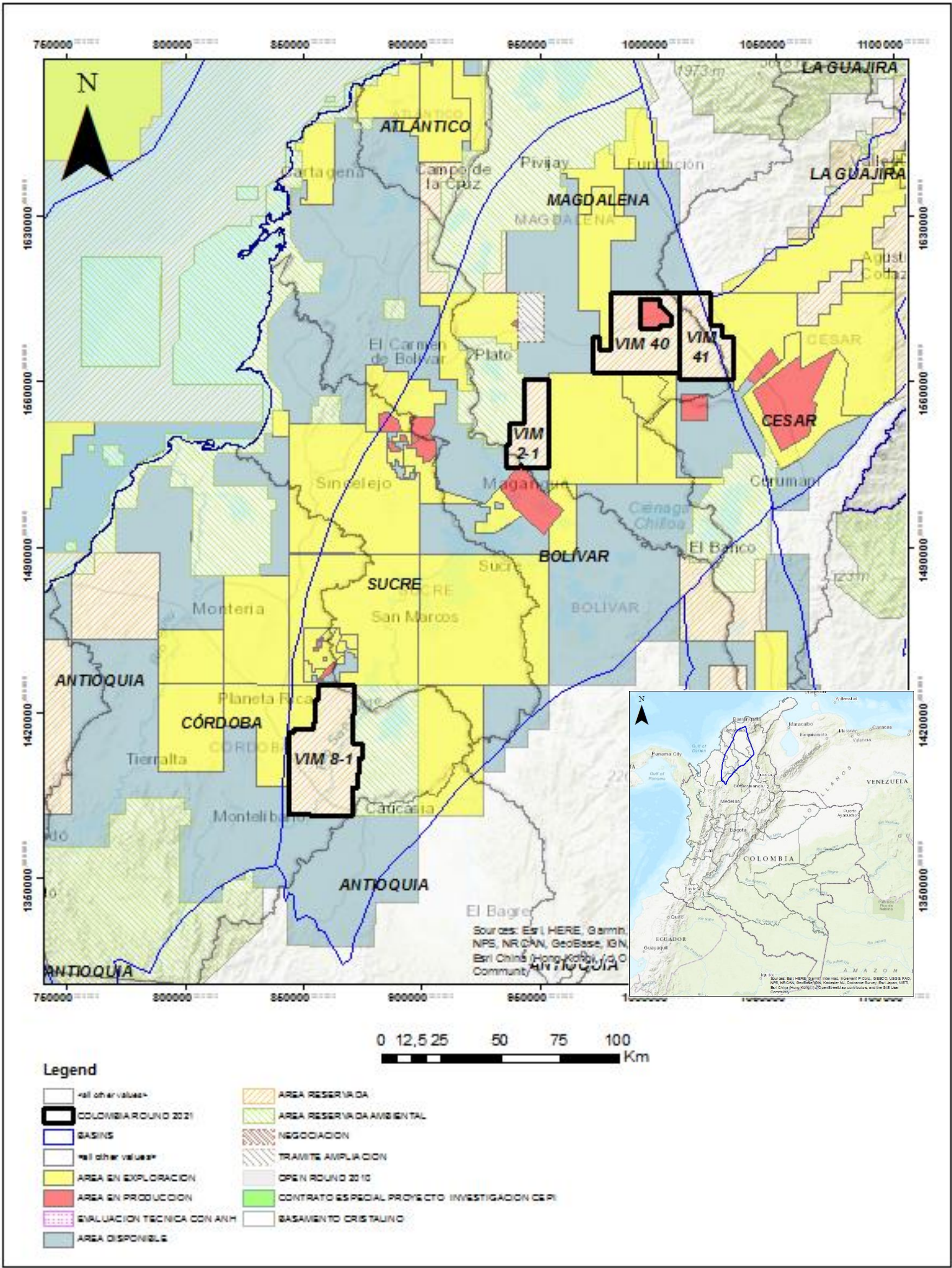
Seismic Interpretation

Prospectivity

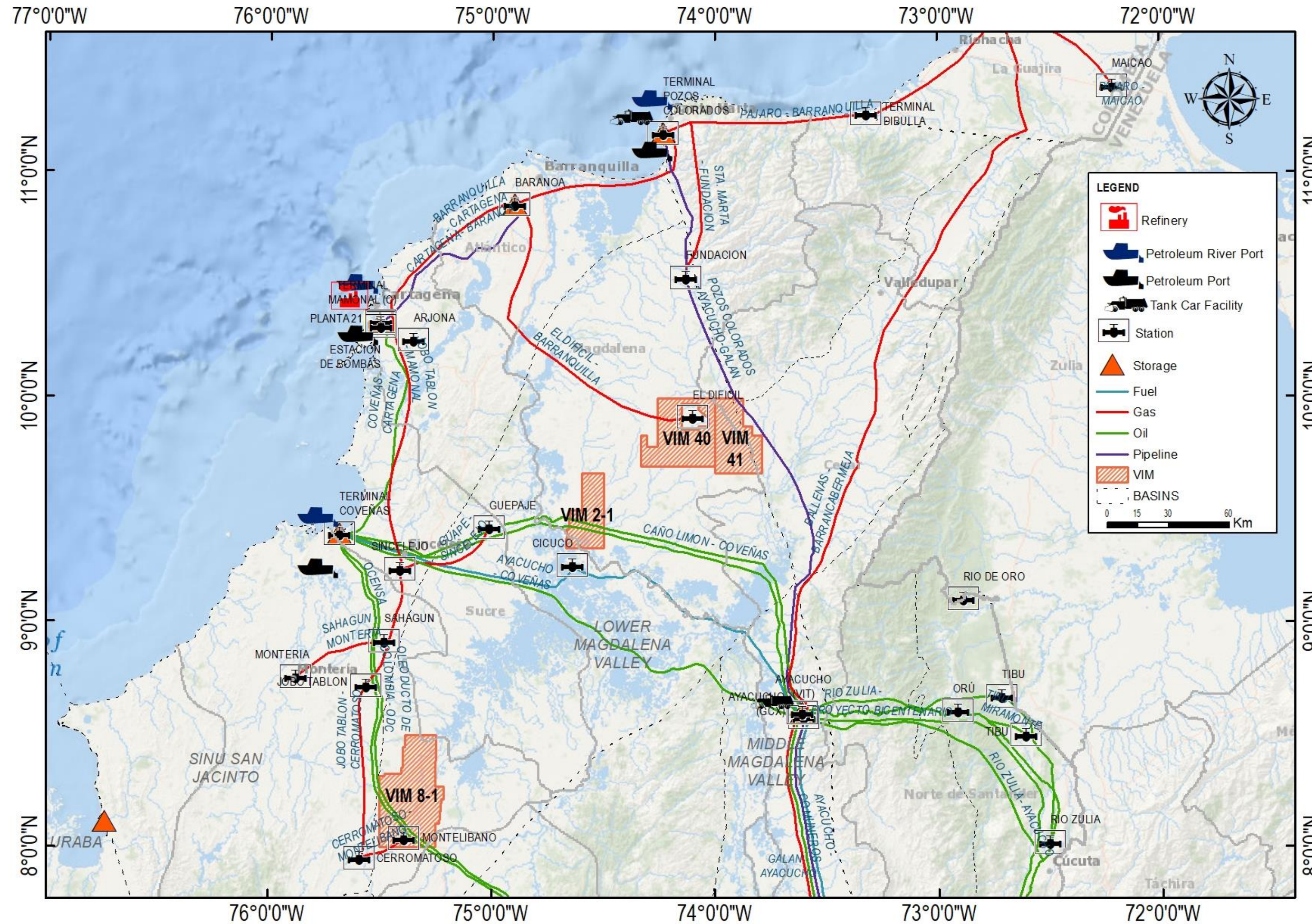
Conclusions

# INTRODUCTION

# LOCATION



BLOCK	AREA (Ha)	DEPARTMENTS
VIM-40	91,266	Cesar, Magdalena
VIM-41	69,501	Cesar, Magdalena
VIM 2-1	52,244	Bolívar, Magdalena
VIM 8-1	134,810	Córdoba, Sucre



## Main Infrastructure nearby

### Gas Pipeline

El Difícil – Barranquilla (VIM 40, VIM 41)

Jobo Tablón – Cerromatoso (VIM 8-1)

Cerromatoso – Montelíbano (VIM 8-1)

### Oil Pipeline

Caño Limón – Coveñas (VIM 2-1)

Oleoducto De Colombia – ODC (VIM 8-1)

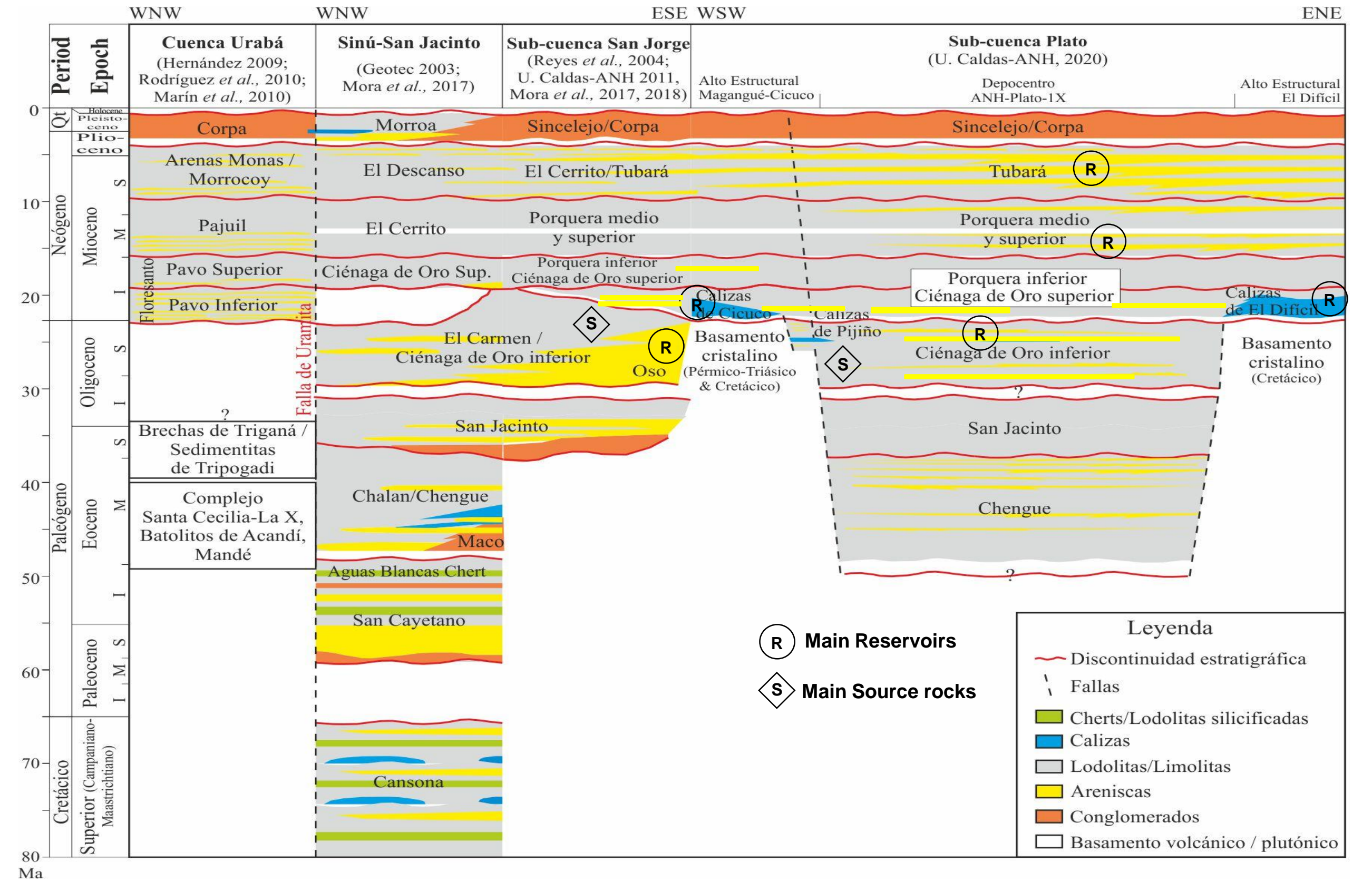
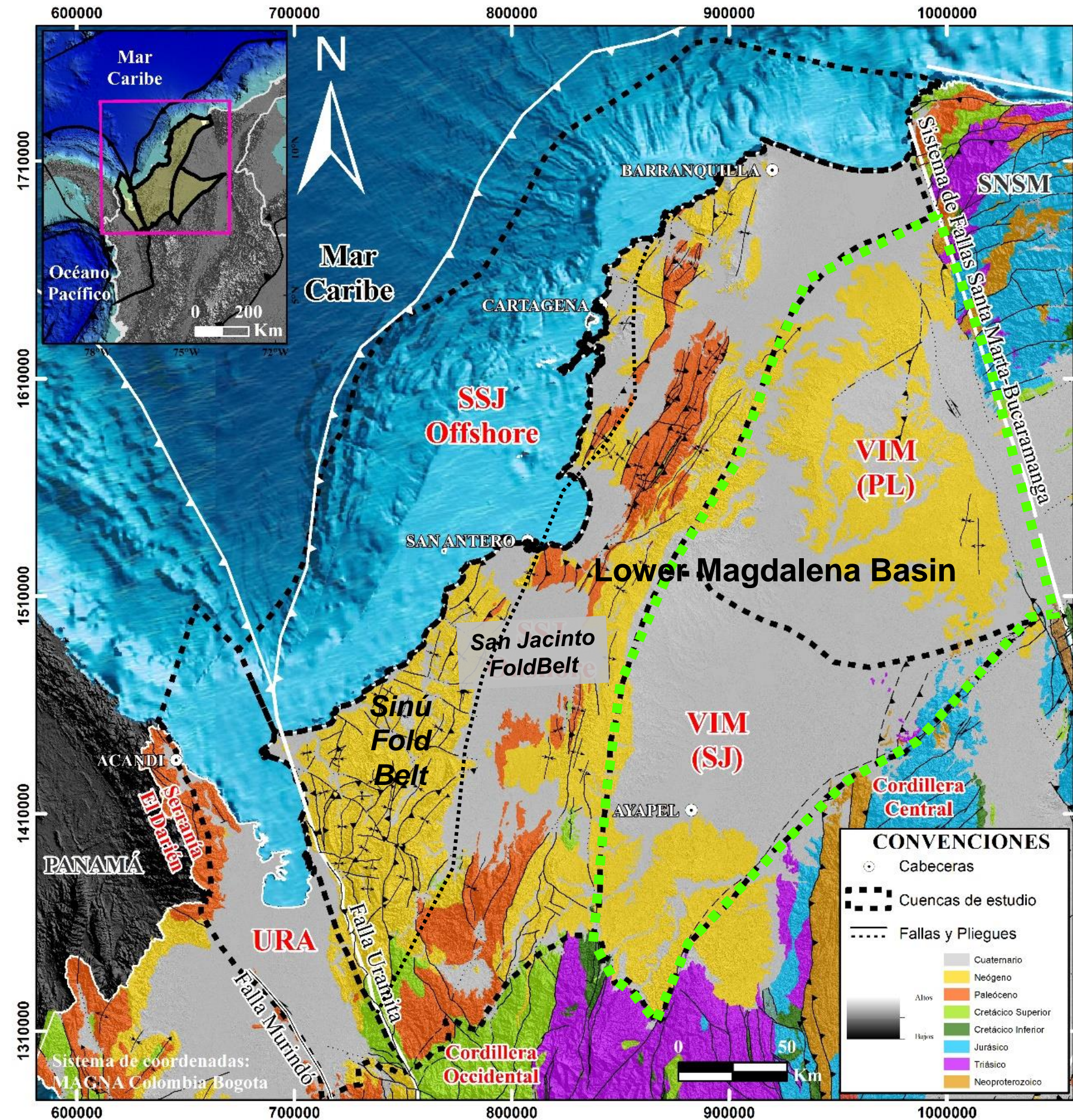
### Pipeline

Pozos Colorados – Ayacucho (VIM-41)

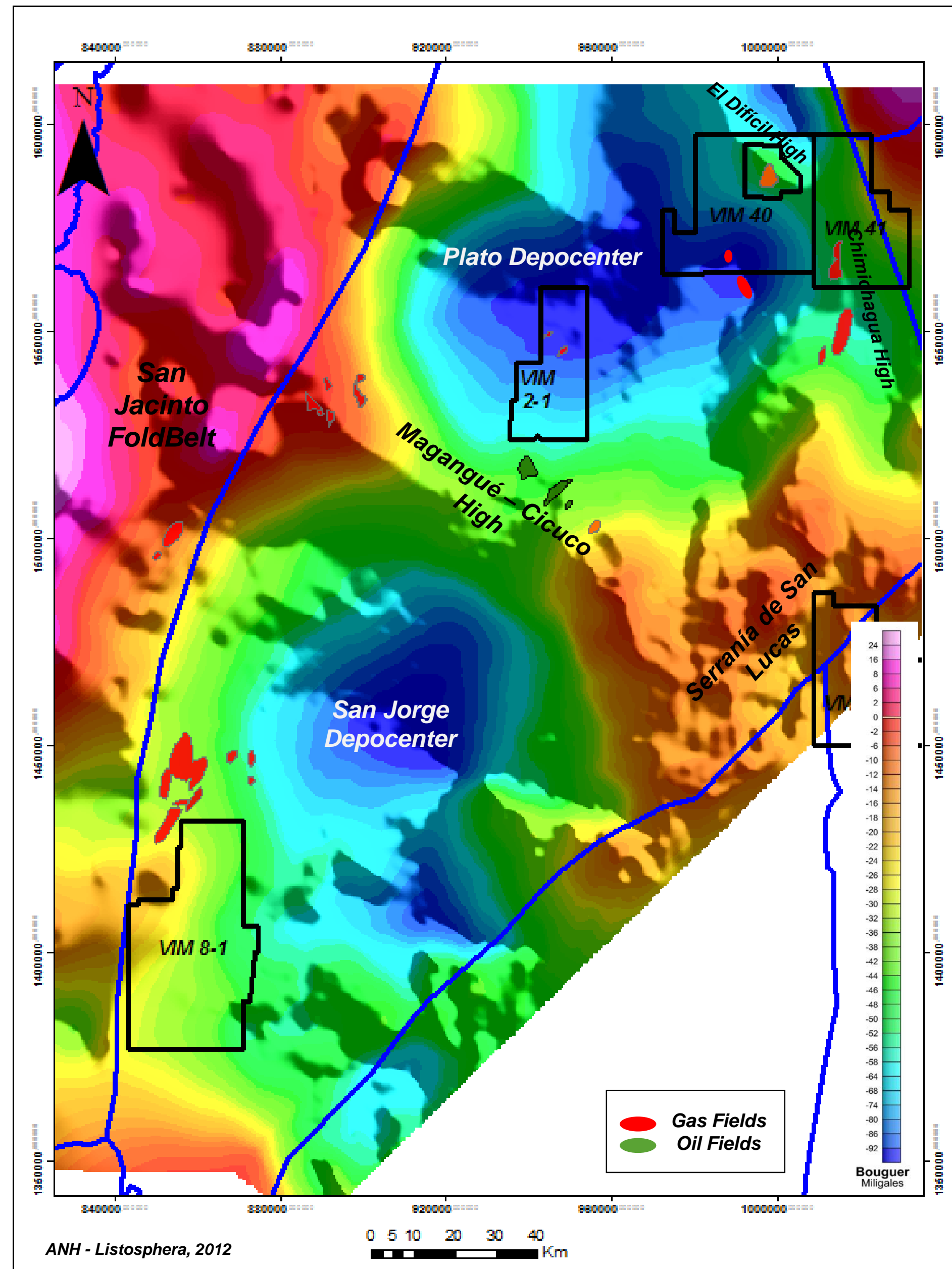
# GEOLOGICAL FRAMEWORK



# Geological Setting and Stratigraphic Chart



# Bouguer Anomaly



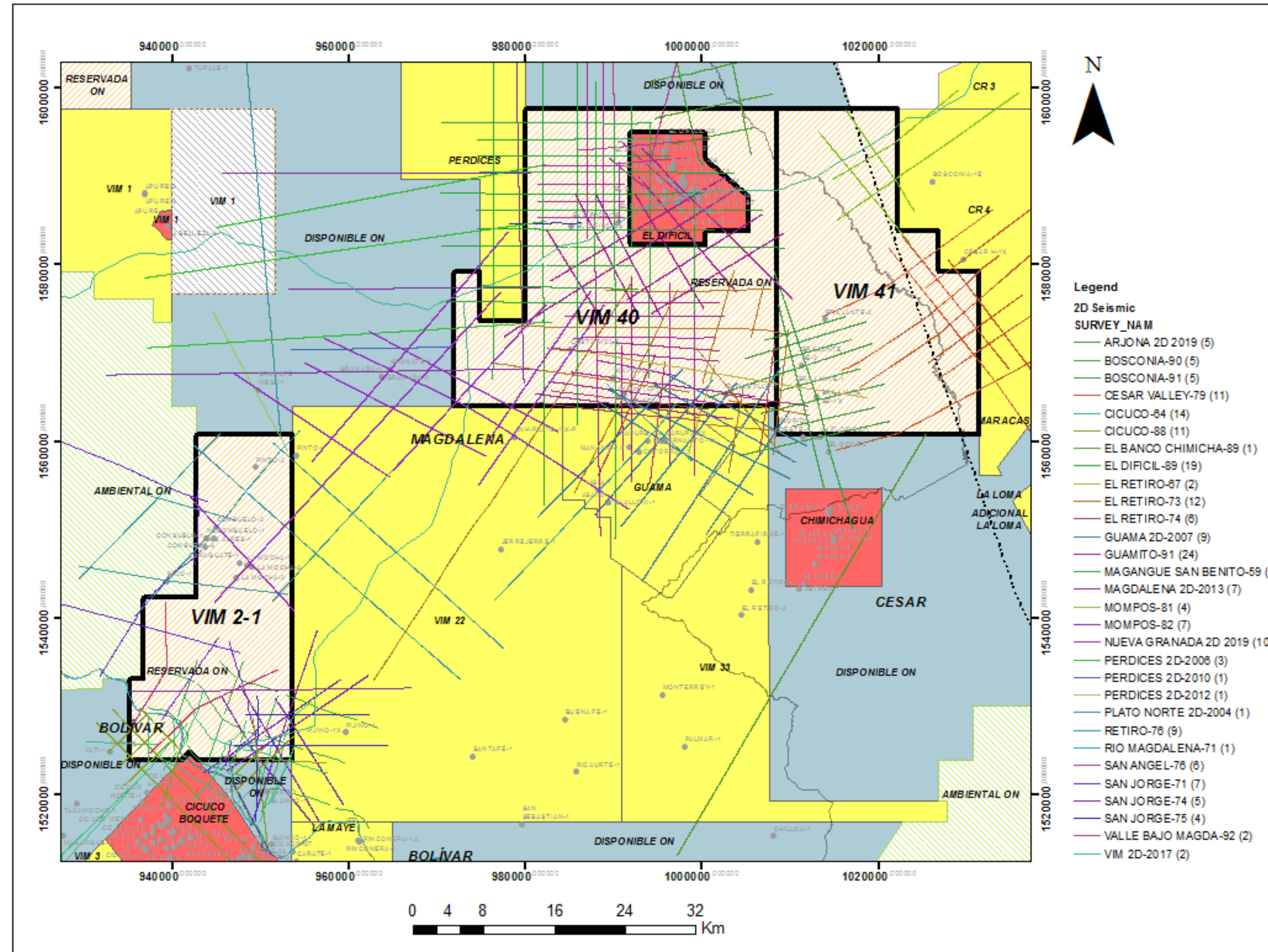
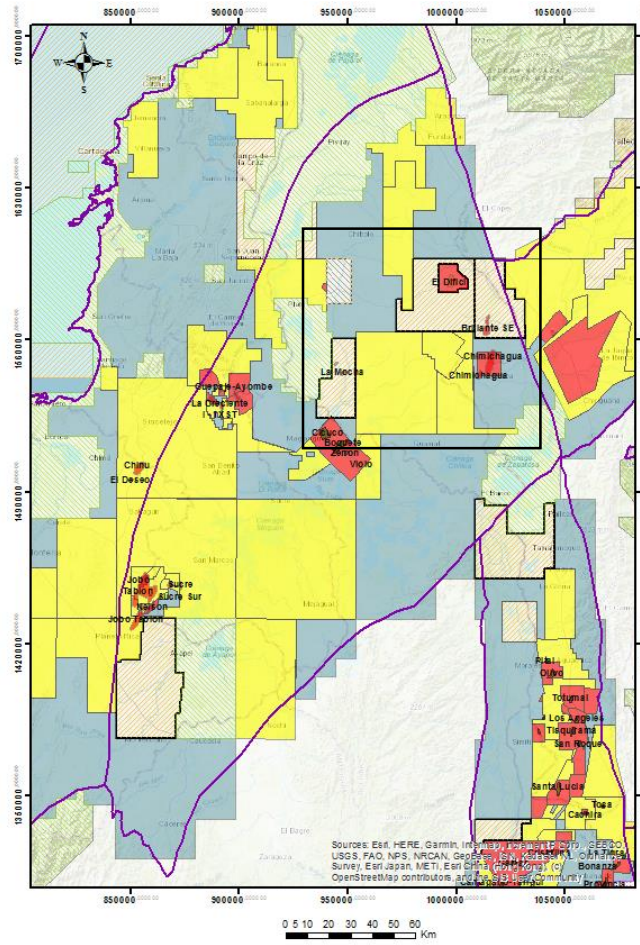
## Main Morphological Features in LMV Basin

- The positive anomaly representing the San Jacinto Fold Belt
- El Difícil High
- Plato Depocenter – Basement depths > 7000 m
- Magangué – Cicuco High
- San Jorge Depocenter – Basement Depths > 5000m

# PLATO SUB-BASIN

## VIM 40, VIM 41, and VIM 2-1

### Areas



## 2D SEISMIC

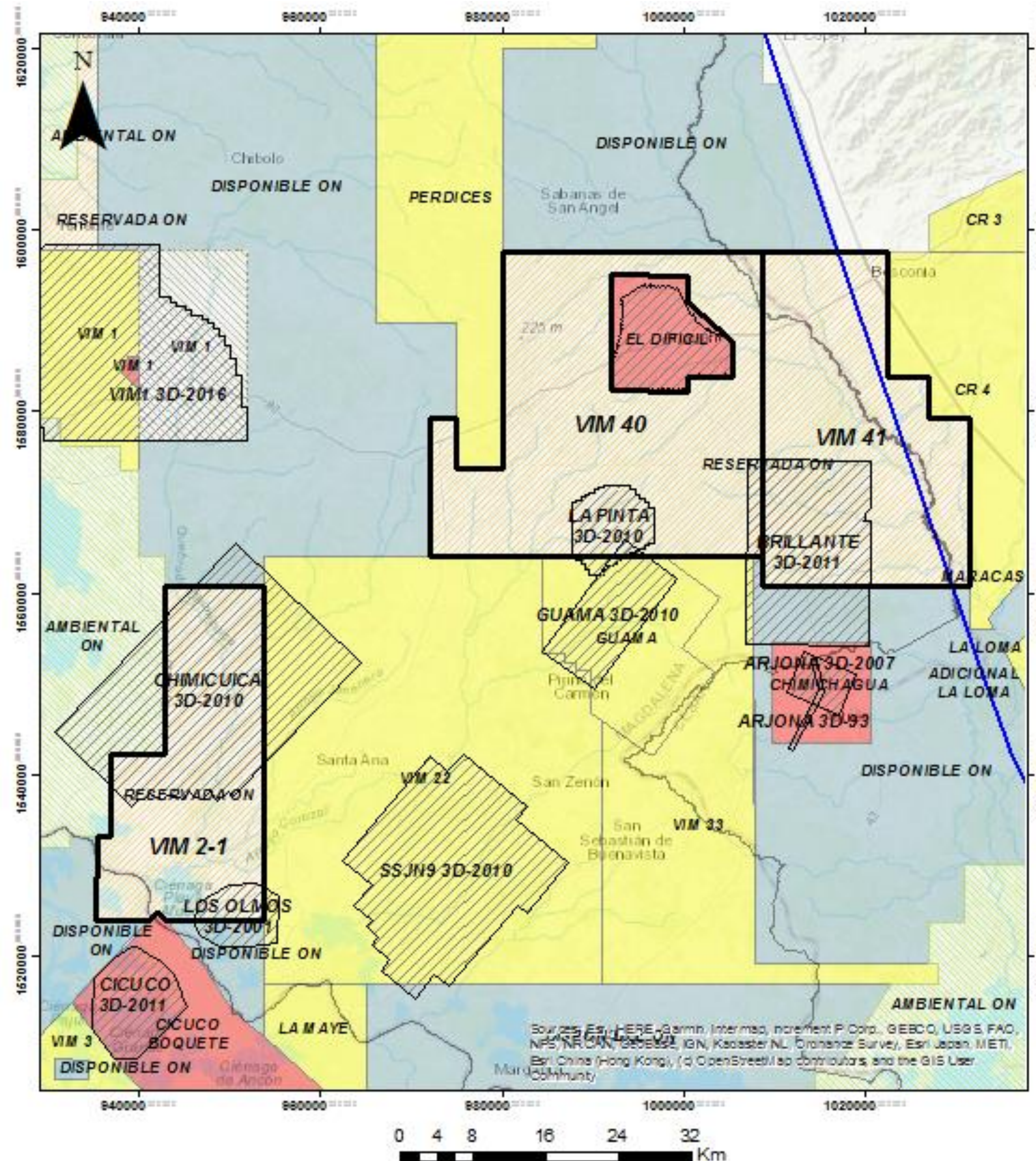
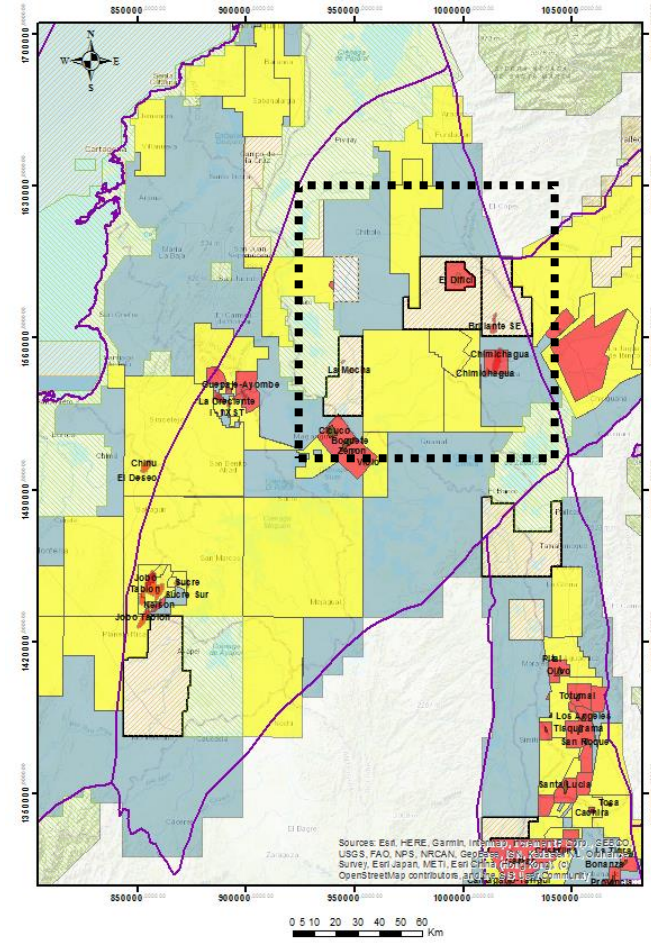
- **VIM 40 (16 Surveys): 1167 Km**
- Acquired from 1967 to 2019
- In 2019, the ANH acquired two 2D seismic surveys: Arjona 2D-2019 and Nueva Granada 2D-2019.

## VIM 41 (11 surveys): 455 Km

- Acquired from 1967 to 2017
- **VIM 2-1 (10 surveys): 322 Km**
- Acquired from 1971 to 2019 (including seismic of Nueva Granada 2D – 2019).

## ■ TOTAL LENGTH:

**1944 Km**



- **VIM 40**

**LA PINTA 3D-2010 (67 Km<sup>2</sup>)**

Area in the Block: 58 Km<sup>2</sup>
- **VIM 41**

**BRILLANTE 3D-2011 (275 Km<sup>2</sup>)**

Area in the Block: 164 Km<sup>2</sup>
- **VIM 2- 1**

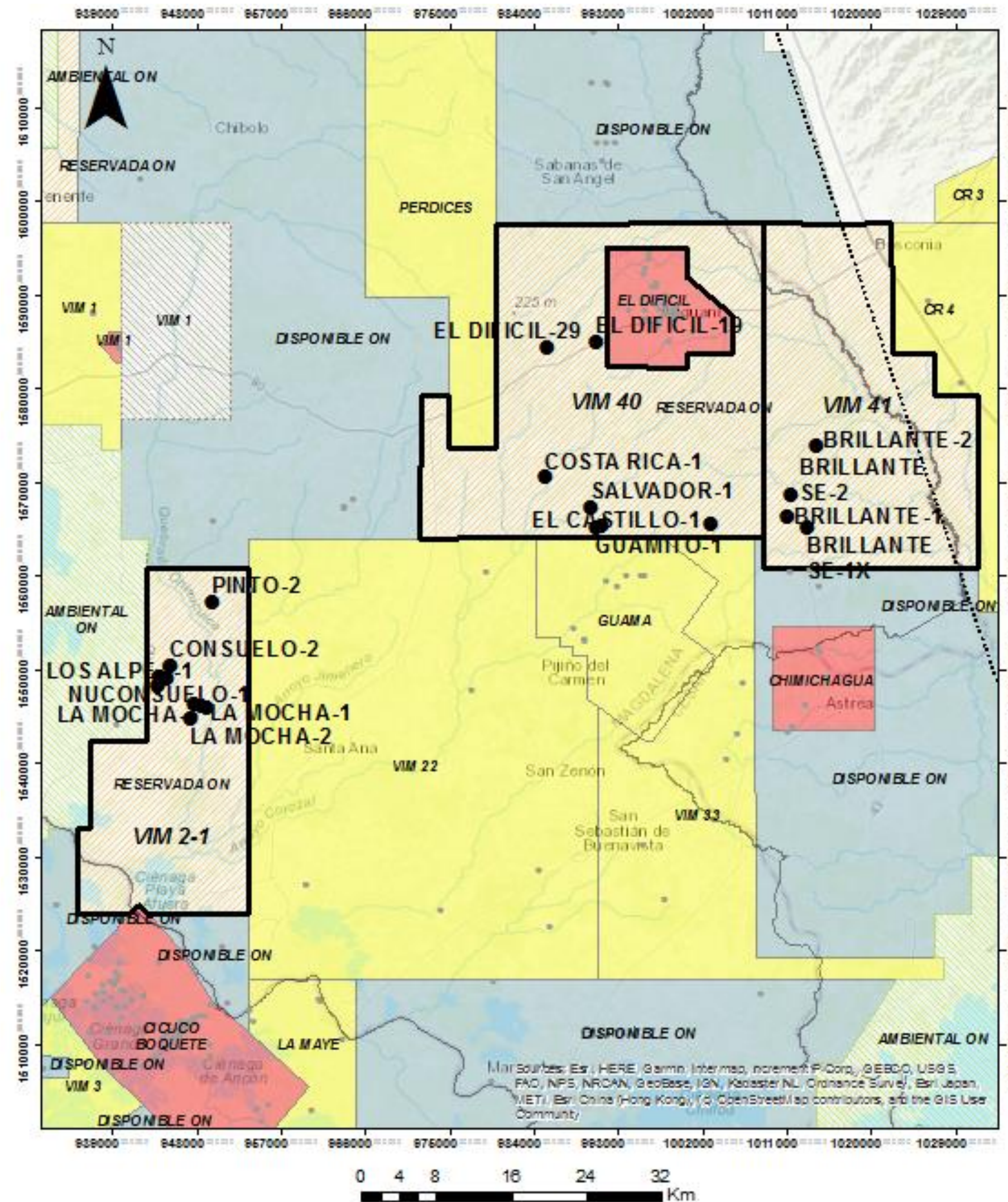
**CHIMICUICA-3D-2010 (512 Km<sup>2</sup>)**

Area in the Block: 268 Km<sup>2</sup>

**LOS OLMOS 3D-2001 (54 Km<sup>2</sup>)**

Area in the Block: 26 Km<sup>2</sup>

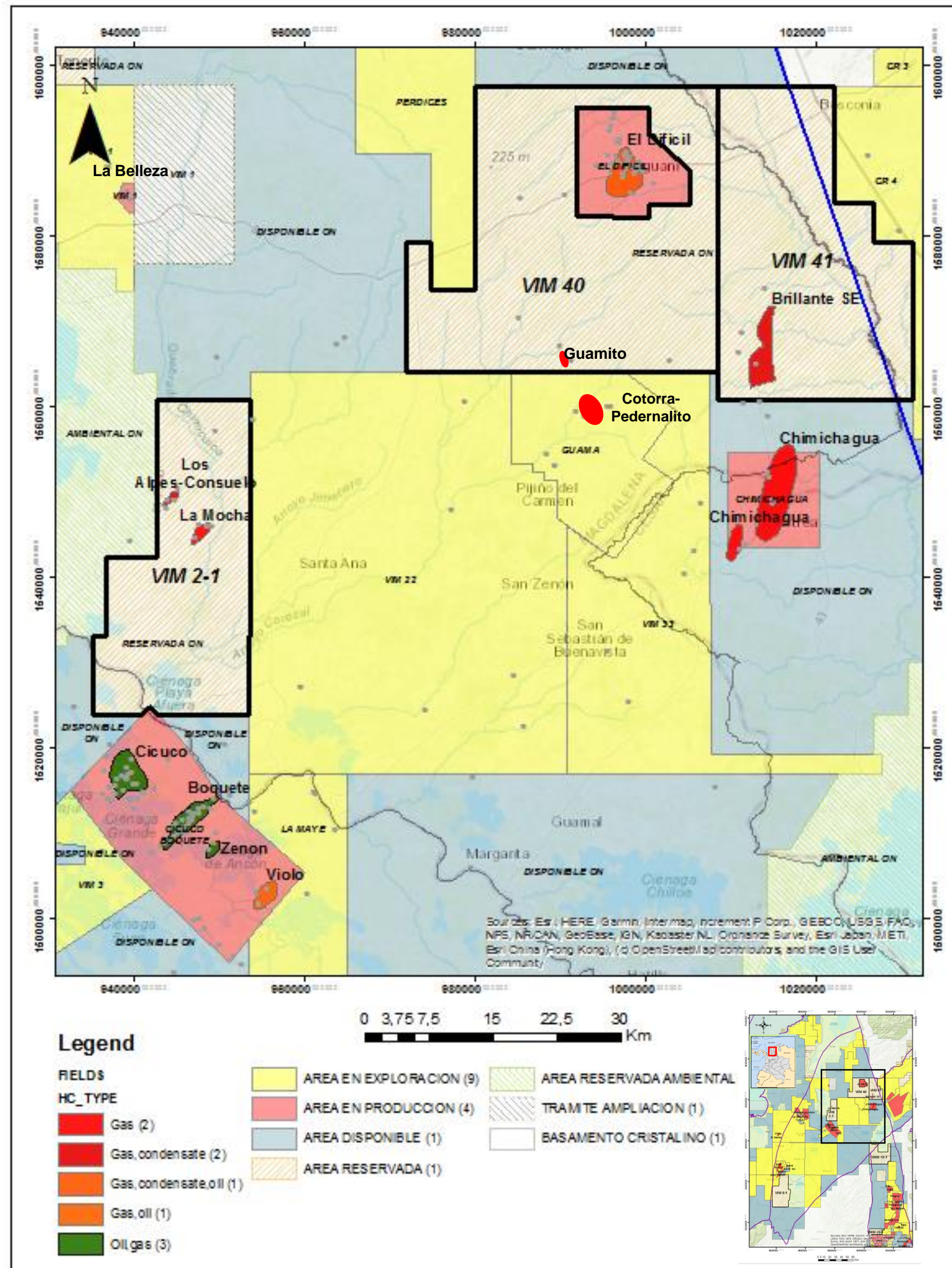
# DATABASE : Wells



## WELL SUMMARY

AREA	WELL	TD (ft)	YEAR	STATUS	COMPANY
VIM 40	COSTA RICA-1	10609	1946	PLUGGED AND ABANDONED	PETROLEOS ARIGUANI S.A.
	EL DIFÍCIL-19	7018	1949	PLUGGED AND ABANDONED	SHELL CONDOR S.A.
	EL DIFÍCIL-29	9516	1950	PLUGGED AND ABANDONED	SHELL CONDOR S.A.
	<b>GUAMITO-1</b>	<b>12060</b>	<b>1975</b>	<b>PRODUCER - ABANDONED</b>	<b>ECOPETROL S.A.</b>
	EL CASTILLO-1	11976	1980	PLUGGED AND ABANDONED	ECOPETROL S.A.
	<b>LA PINTA-1</b>	<b>11250</b>	<b>2009</b>	<b>PRODUCER - ABANDONED</b>	<b>PETROLIFERA PETROLEUM COLOMBIA LTD</b>
VIM 41	BRILLANTE-1	10260	1944	ABANDONED	SHELL E&P COLOMBIA
	BRILLANTE-2	4918	1945	PLUGGED AND ABANDONED	SHELL E&P COLOMBIA
	<b>BRILLANTE SE-1X</b>	<b>9500</b>	<b>2010</b>	<b>PRODUCER - ABANDONED</b>	<b>PETROLIFERA PETROLEUM COLOMBIA LTD</b>
	BRILLANTE SE-2	5520	2011	PLUGGED AND ABANDONED	PETROLIFERA PETROLEUM COLOMBIA LTD
VIM 2-1	<b>CONSUELO-1</b>	<b>4016</b>	<b>1963</b>	<b>PRODUCER - ABANDONED</b>	<b>TEXAS PETROLEUM CO</b>
	<b>LA MOCHA-1</b>	<b>3509</b>	<b>1963</b>	<b>PRODUCER - ABANDONED</b>	<b>TEXAS PETROLEUM CO</b>
	<b>LA MOCHA-2</b>	<b>3150</b>	<b>1963</b>	<b>PRODUCER - ABANDONED</b>	<b>TEXAS PETROLEUM CO</b>
	<b>CONSUELO-2</b>	<b>3990</b>	<b>1964</b>	<b>PRODUCER - ABANDONED</b>	<b>TEXAS PETROLEUM CO</b>
	PINTO-2	4341	1964	PLUGGED AND ABANDONED	TEXAS PETROLEUM CO
	<b>CONSUELO-3</b>	<b>3800</b>	<b>1965</b>	<b>PRODUCER - ABANDONED</b>	<b>TEXAS PETROLEUM CO</b>
	LA MOCHA-3	2904	1965	PLUGGED AND ABANDONED	TEXAS PETROLEUM CO
	LOS ALPES-1	4140	1967	PLUGGED AND ABANDONED	TEXAS PETROLEUM CO
	NUCONSUELO-1	3800	1991	PLUGGED AND ABANDONED	TEXAS PETROLEUM CO
CAÑAGUATE-1	12000	2012	PLUGGED AND ABANDONED	SK INNOVATION CO LTD	

# NEAR FIELDS



## NEAR FIELDS

FIELD	CONTRACT	RESERVOIR UNIT	PRODUCTION	DISCOVERY YEAR	OGIP (Bcf)
EL DIFÍCIL	EL DIFÍCIL	CIÉNAGA DE ORO - LIMESTONE	11,5 MMBO, 344 BCF	1943	839,01
CICUCO	CICUCO	CIÉNAGA DE ORO	51 MMSTBO & 196 BCF	1956	1465,52
VIOLO	CICUCO	CIÉNAGA DE ORO	2,6 BCF	1958	
ZENON	CICUCO	CIÉNAGA DE ORO		1959	
BOQUETE	CICUCO	CIÉNAGA DE ORO	18,5 MMSTBO & 41 BCF	1961	458,85
ARJONA	CHIMICHAGUA	CIÉNAGA DE ORO		1991	19,50
LA MOCHA	ANH	TUBARÁ	632,8 MMscf	1963	
LOS ALPES-CONSUELO	ANH	TUBARÁ	4,5 BCF	1963	
GUAMITO - LA PINTA	ANH	CIÉNAGA DE ORO, INTRAPORQUERO	13,5 MMscf & 4 MBO	1975	
MOMPOSINA	CICUCO MOMPOSINA	CIÉNAGA DE ORO	2.9 BCF	1990	
BRILLANTE SE	ANH	CIÉNAGA DE ORO	2,687 MBO & 578 MMscf	2010	
CAPURE	GUAMA	INTRA PORQUERO		2013	791,90
COTORRA	GUAMA	MIDDLE PORQUERO	149 MMscf	2012	134,37
PEDERNALITO	GUAMA	INTRA PORQUERO		2010	179,16
LA BELLEZA	VIM-1	CIÉNAGA DE ORO	Tested 2,696 BOPD & 11.8 MMcf/d of gas (4,663 boe/d combined). 43 API crude.	2019	

# EXISTING PRODUCER WELLS



# PLATO SUB-BASIN VIM 40 AREA

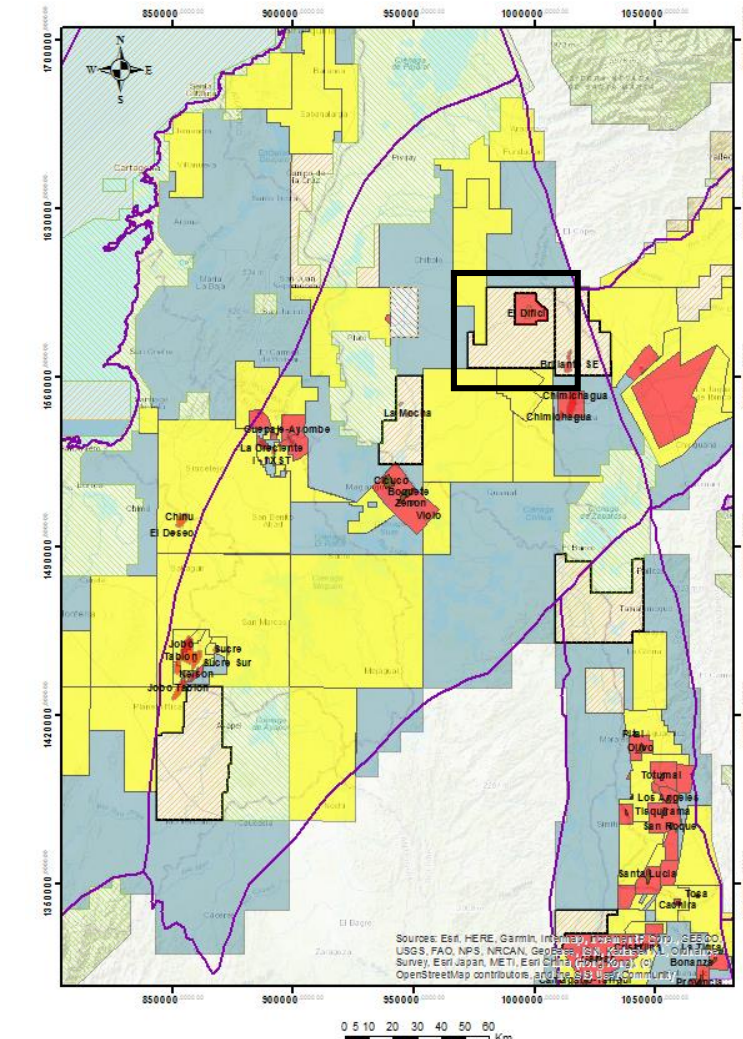
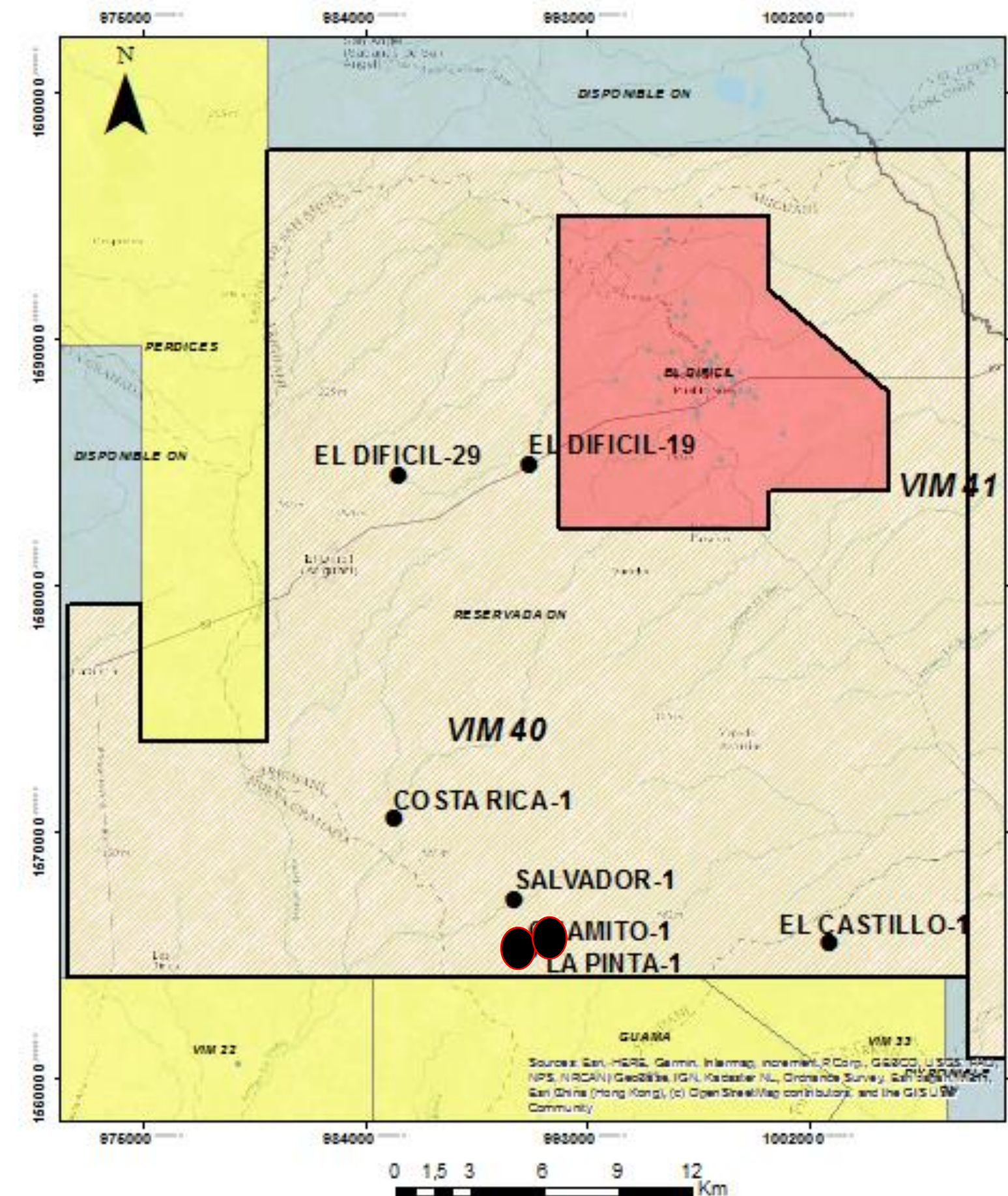
# Guamito – La Pinta Wells

## Guamito-1 (1975) (TD 12,060')

- Drilled by Chevron. The well produced gas and condensate in the Intra Porquero Unit and Ciénaga de Oro Fm.
- The well test results indicated presence of liquid and gaseous hydrocarbons at the Intra Porquero level, 120 BOPD of 47,7° API, 750 KSCFD and at the top of the Ciénaga de Oro Formation in 10,200 feet, 406 BOPD of 46.9° API and 1.8 MMSCFD.
- The well was closed on June - 1979, and abandoned in 1984. Gas was not commercial at that time.

## La Pinta-1 (2009) (TD: 11,250')

- Drilled by Petrolífera Petroleum Limited. The well produced from the Upper Porquero and Ciénaga de Oro Formations since Dec-2011 to Dec-2012.
- Cumulative production was **2,763 bbl of condensate, 10,774 kscf of gas** and 3,776 bbl of water.
- The commerciality was not declared. The definitive abandonment was carried out in 2013.



# PLATO SUB-BASIN VIM 41 AREA

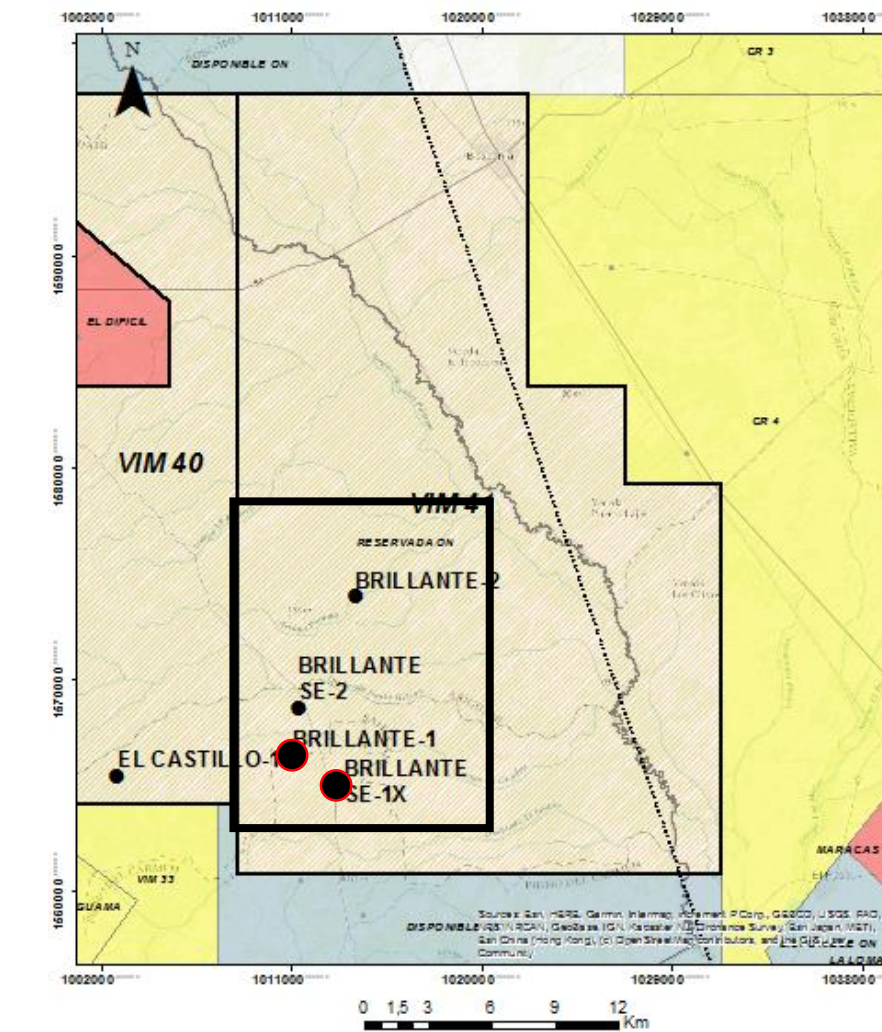
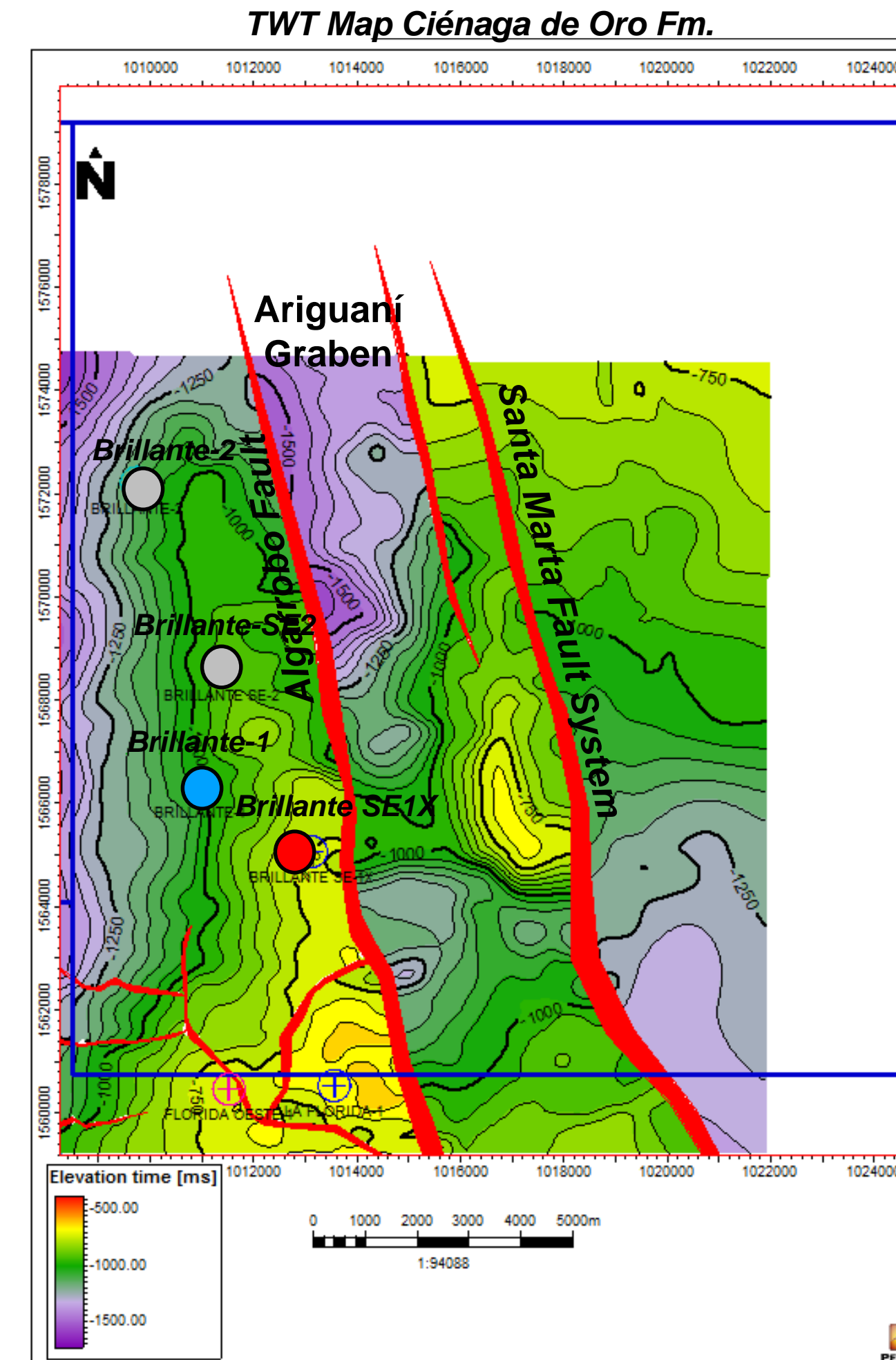
## Brillante Wells

### Brillante-1 (1944) TD (10,259')

- Drilled by Shell. The reservoir was the sands from Ciénaga de Oro Formation, in the Brillante structure.
- Strong gas and oil shows in different intervals. In 10,256': While the well was drilling up to T.D., it showed gas and oil in mud. Recovered 40 gallons of 33,8° API.
- After 3 ½ months of tests, the well was abandoned.

### Brillante SE-1X (2010) TD (9500')

- Drilled by Petrolífera Petroleum Ltd. Reservoir: Sands from Upper Ciénaga de Oro Formation: thickness: 225', porosity: 13%, SW: 38%. Net Pay: 105,5'.
- Cumulative production was of **578 MMSCF of gas, 2,687 Bls of oil and 44 Bls of water.**
- The low capacity on the transportation solution ("virtual gas pipeline") caused that the well and the field finally closed on June - 2014.



The Brillante structure is a three way dip closure against normal faults, associated with the transcurrent Santa Marta Fault system, just west of the Ariguani Graben.

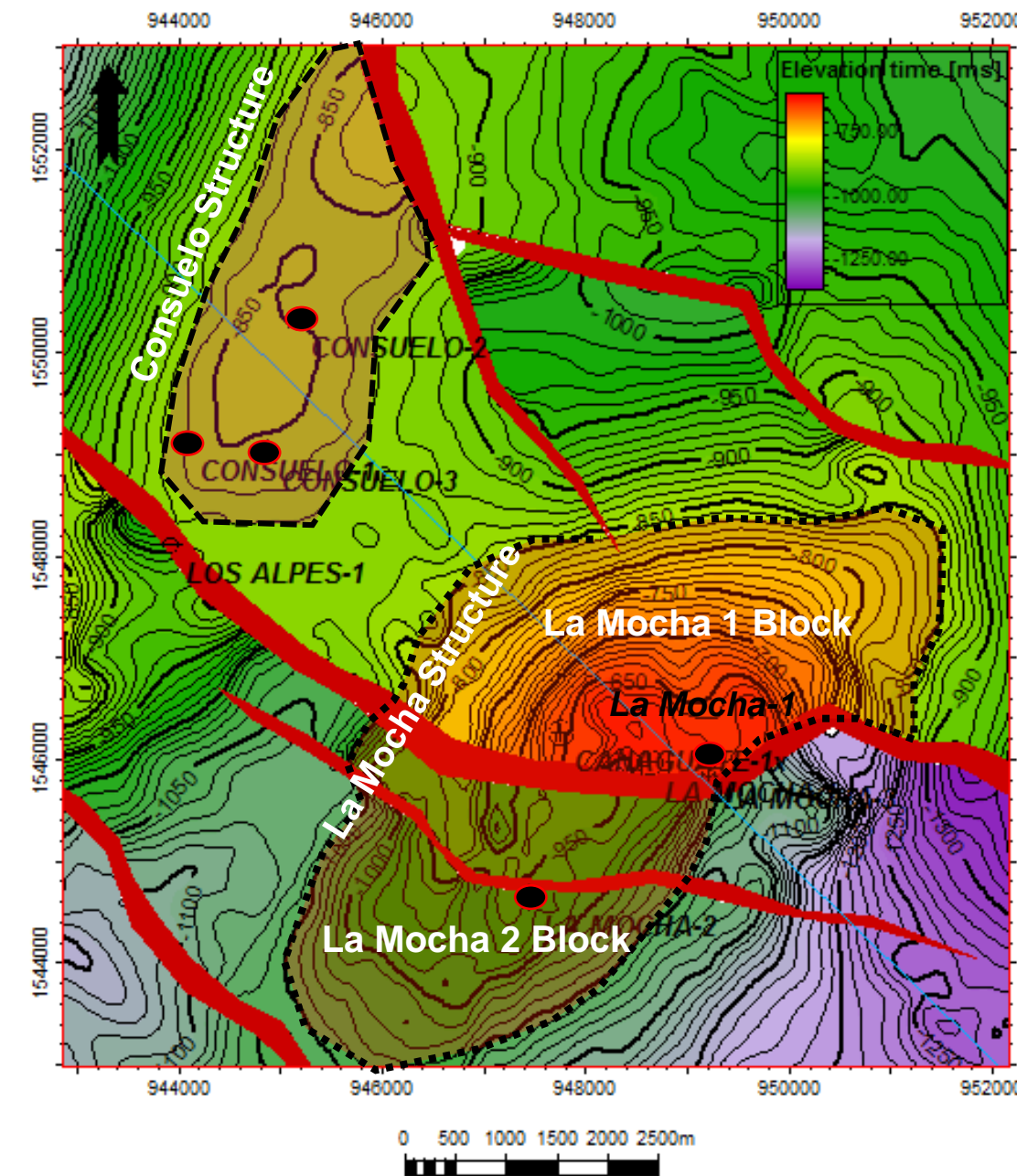
# PLATO SUB-BASIN VIM 2-1 AREA

# La Mocha - Consuelo Wells

## La Mocha Wells - Tubará Fm.

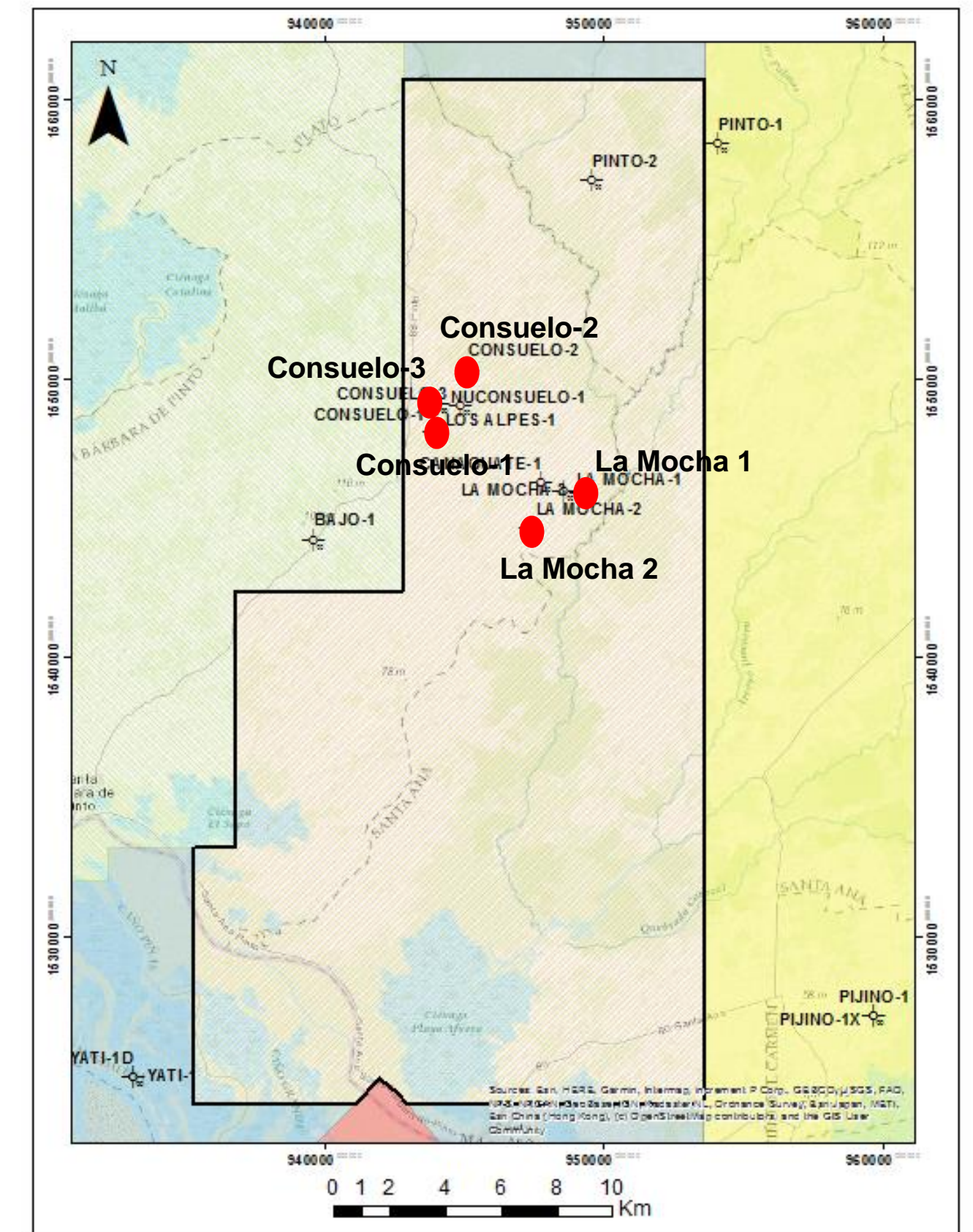
- **La Mocha 1 (TD 3509')** and **La Mocha 2 (TD 3150')** both were drilled in 1963 by Texas Petroleum Co.
- Both Wells are considered independent reservoirs, and they were gas producers.
- Production started in May 1969. La Mocha – 1 and 2 had a cumulative production of **632.859 MCFG** until December 1971.
- La Mocha-2 seems to be the best producer with still additional reserves.
- The La Mocha-1 well block is discarded of having additional reserves due to the high BSW.

TWT Map Tubará Top



## Consuelo Wells – Tubará Fm.

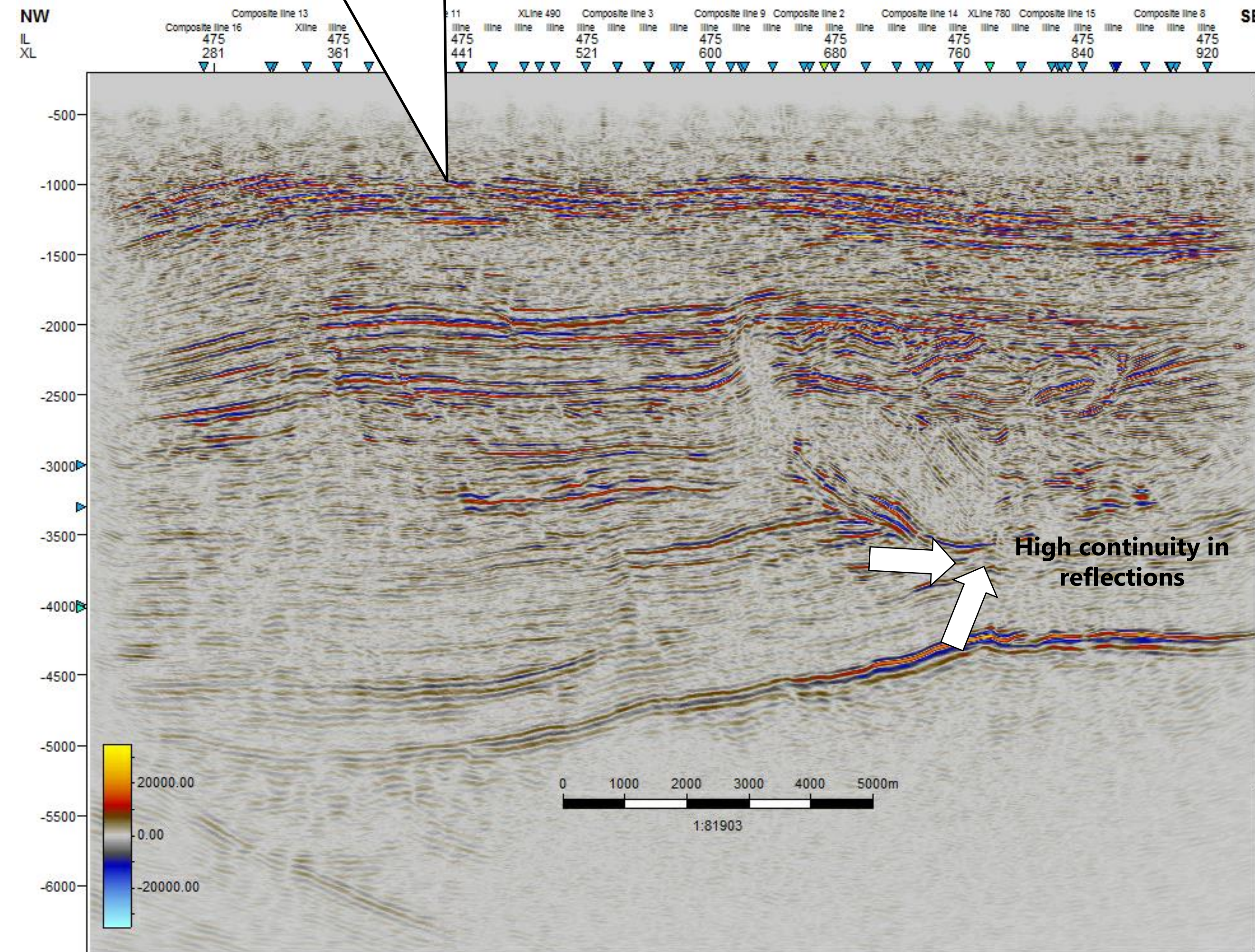
- Consuelo-1 (TD 4,016'), Consuelo-2 (TD 3,951') and Consuelo-3 (TD 3,486') wells were drilled by Texas Petroleum Co. (1963-1965), and they were gas producers.
- Cumulative production until 1971: **4.5 BCF**
- Consuelo wells were drilled near to gas-water contact, and in 1973 they were completely invaded by water.



# SEISMIC QUALITY

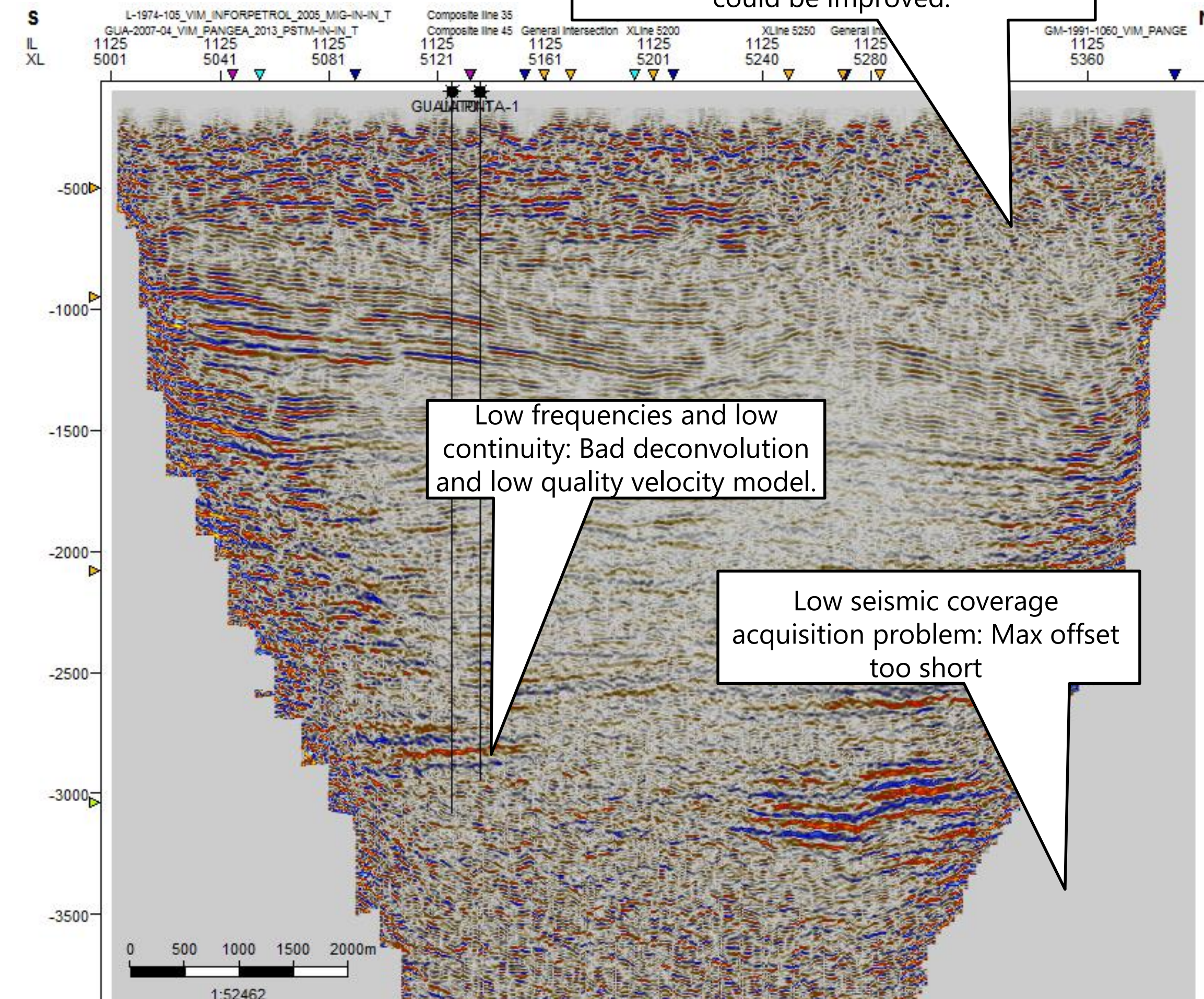
# SEISMIC QUALITY

Low continuity in reflections:  
Facies variations response



**CHIMICUICA 3D-2010 (High Quality)**

Chaotic reflections, static corrections  
could be improved.



**LA PINTA 3D-2010 (Low Quality)**



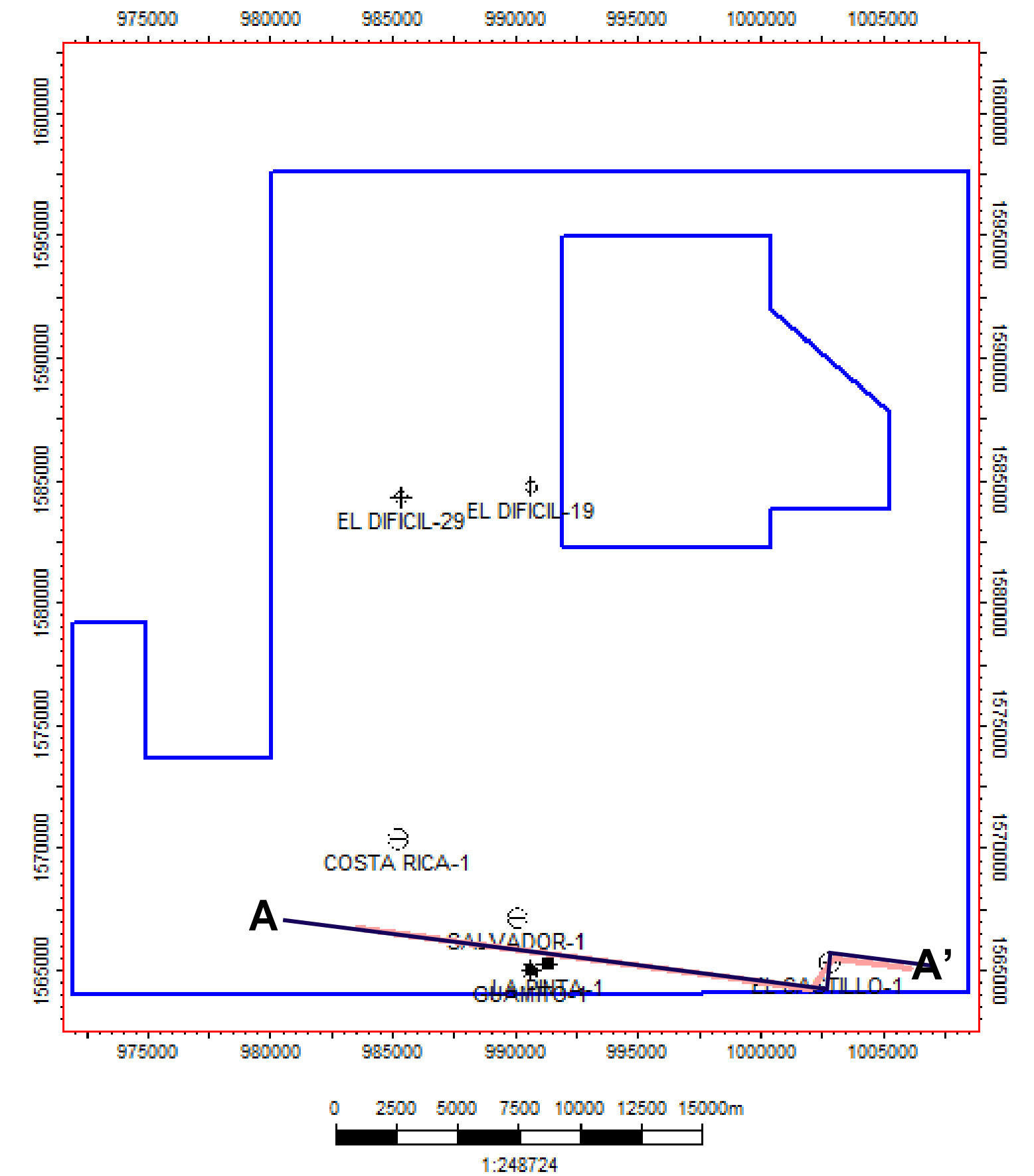
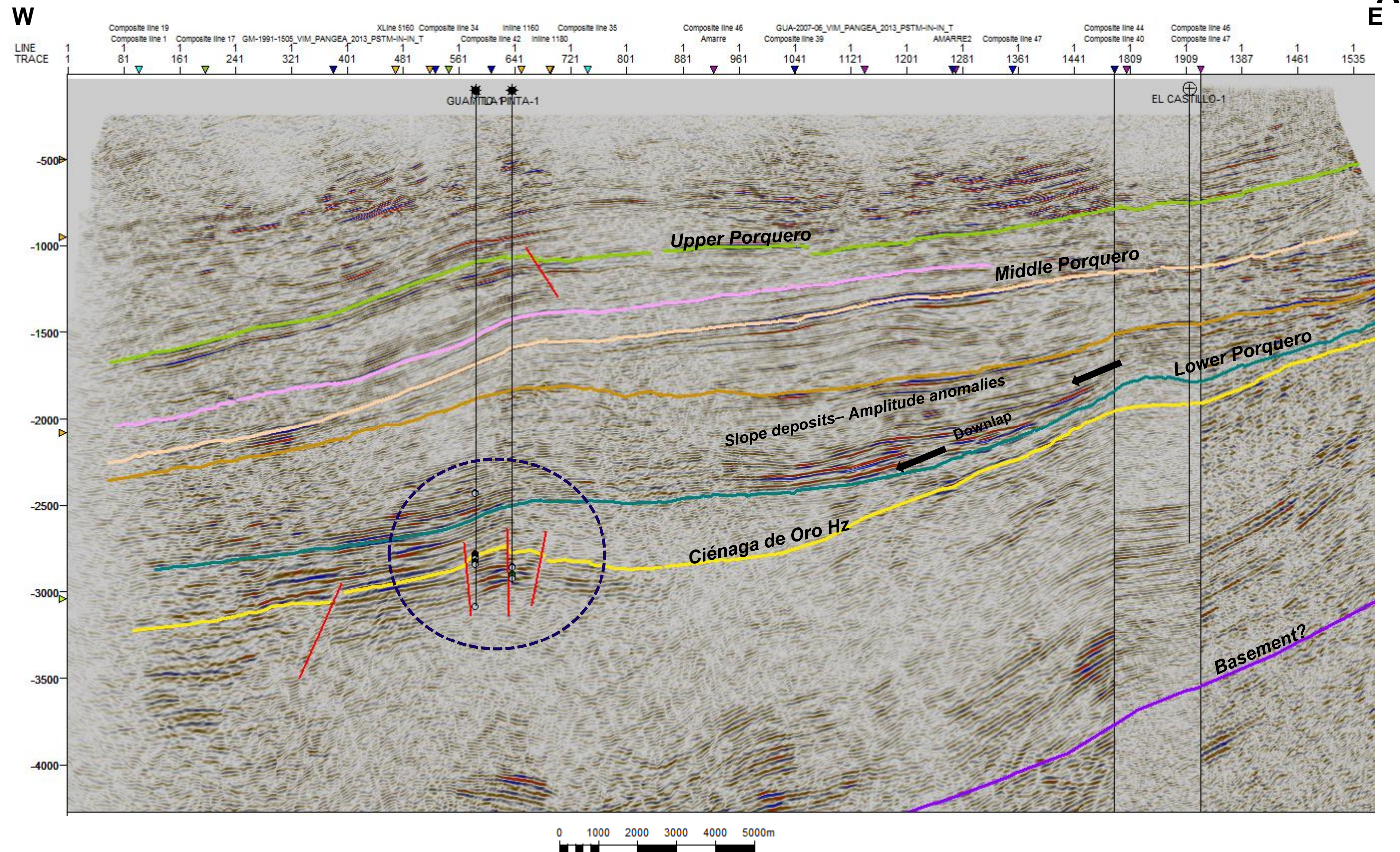
# SEISMIC INTERPRETATION

# PLATO SUB-BASIN VIM 40 AREA

# SEISMIC INTERPRETATION VIM 40:

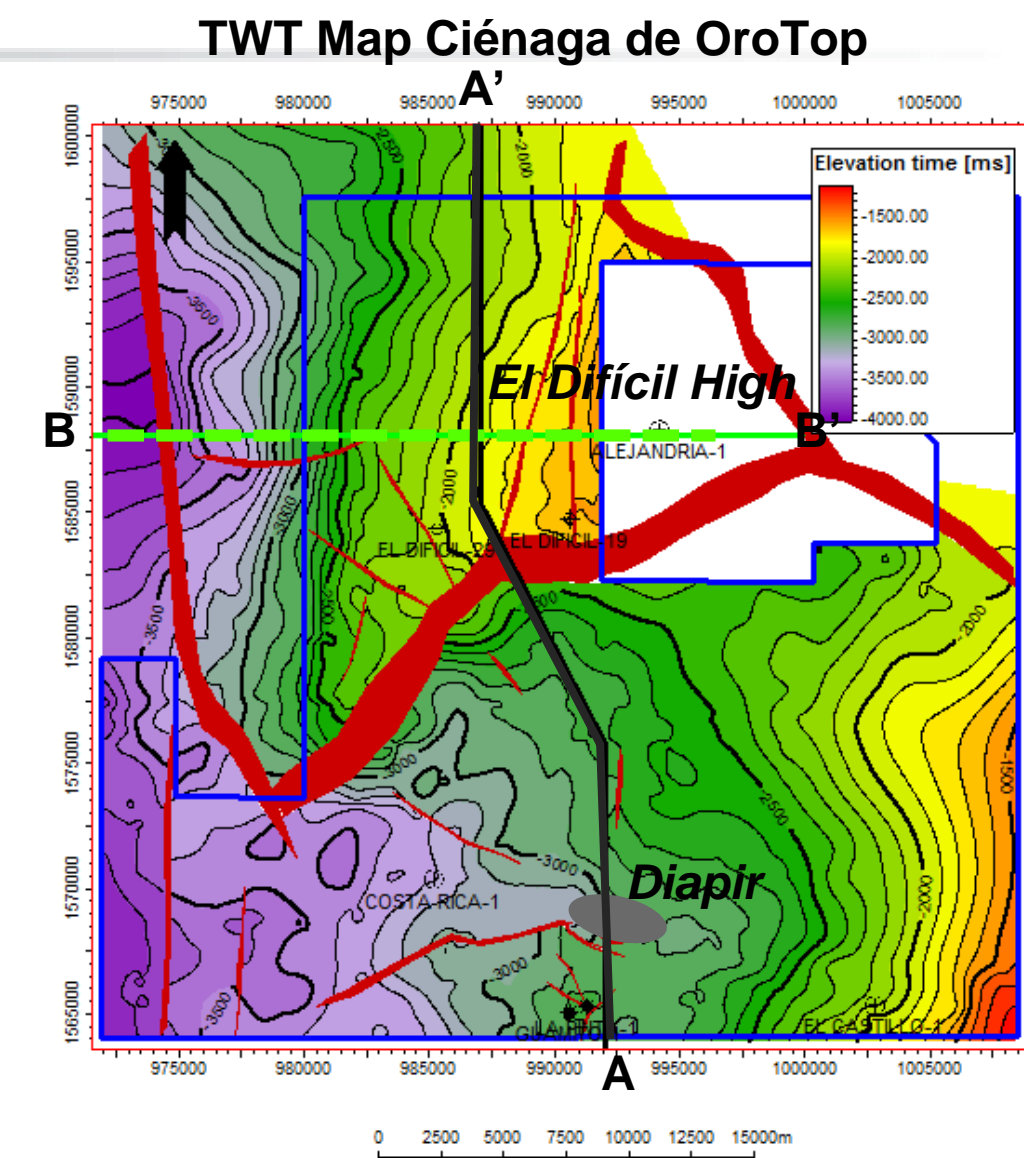
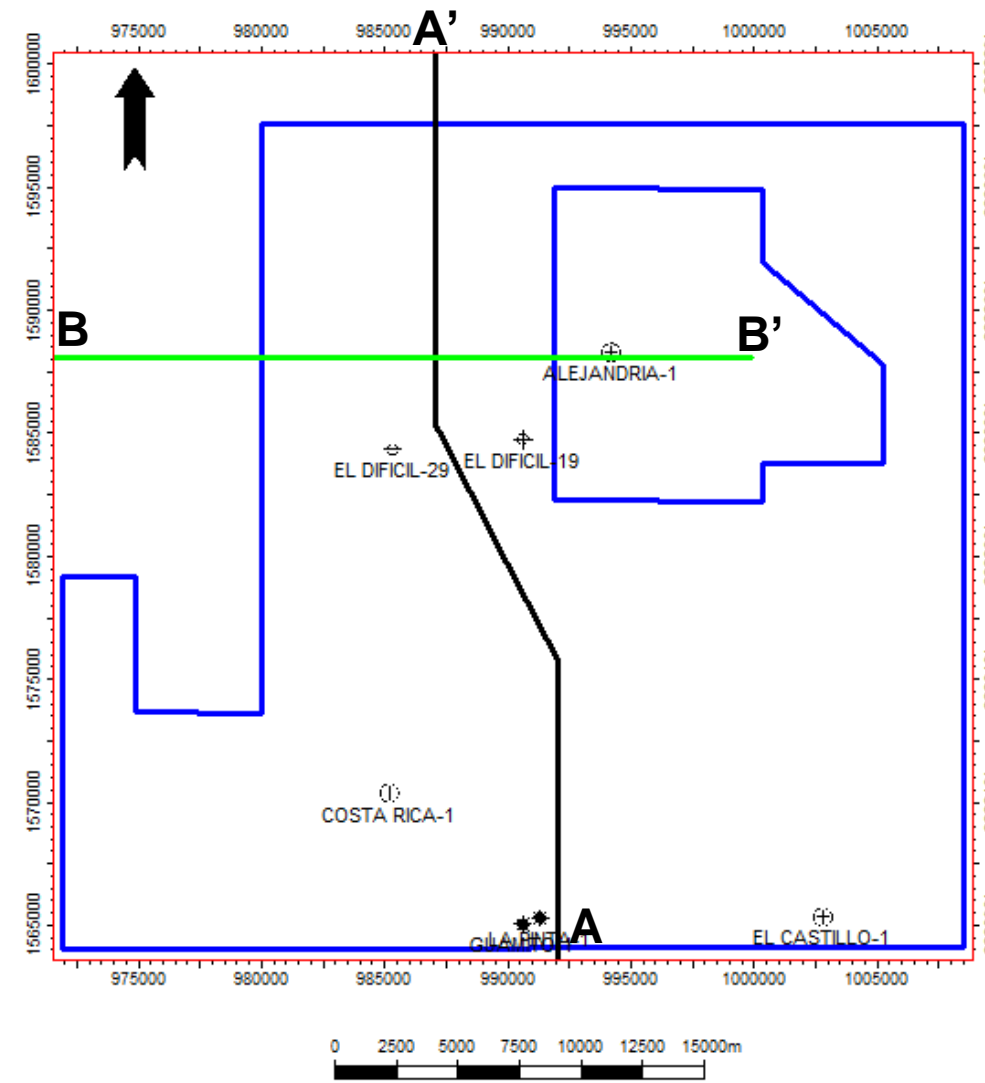
- PLAYS
- Structural: Faulted Anticline (Ciénaga de Oro. Fm.)
- Stratigraphic: Amplitude Anomalies with downlap patterns (slope deposits - IntraPorquero levels).

## A Dip Line

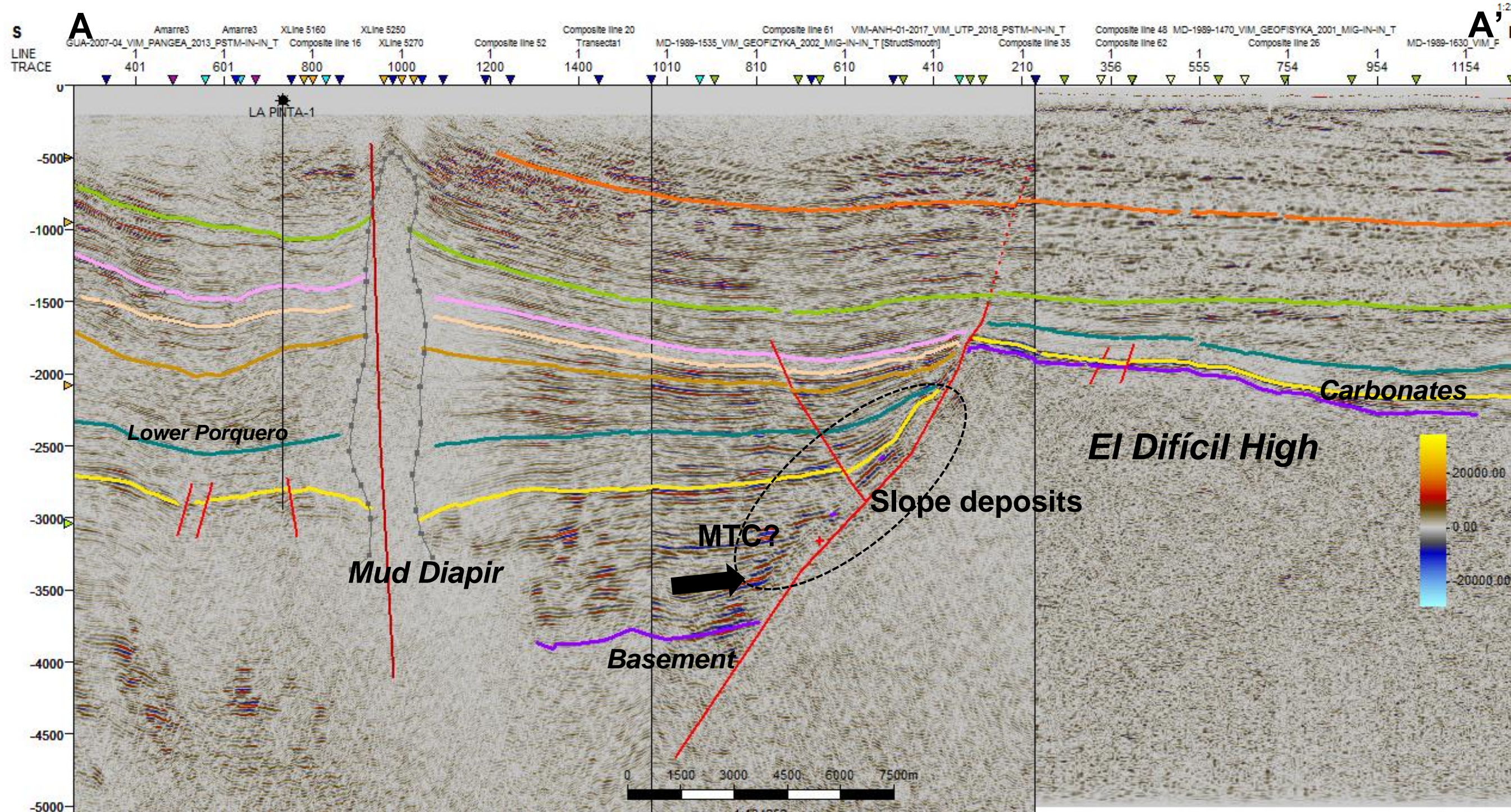


# SEISMIC INTERPRETATION VIM 40:

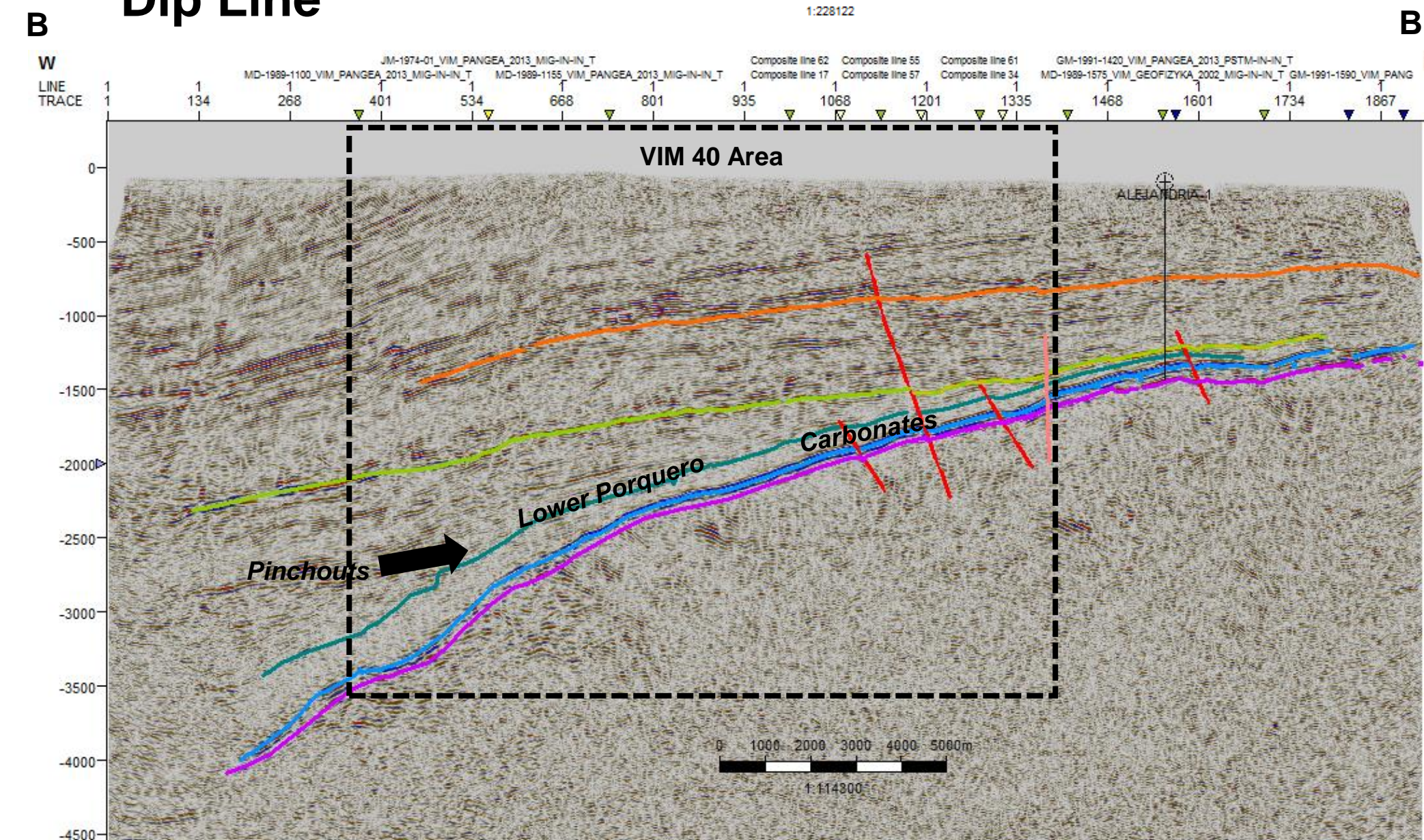
- PLAYS
- Folding related to diapirism dynamics
- Carbonates of Early Miocene age over basement paleohighs controlled by normal faults
- Slope deposits involved into growth strata (mass transport complex - MTC) –High amplitudes with lobular geometry
- Stratigraphic traps (onlaps and pinch outs)



## Strike Line



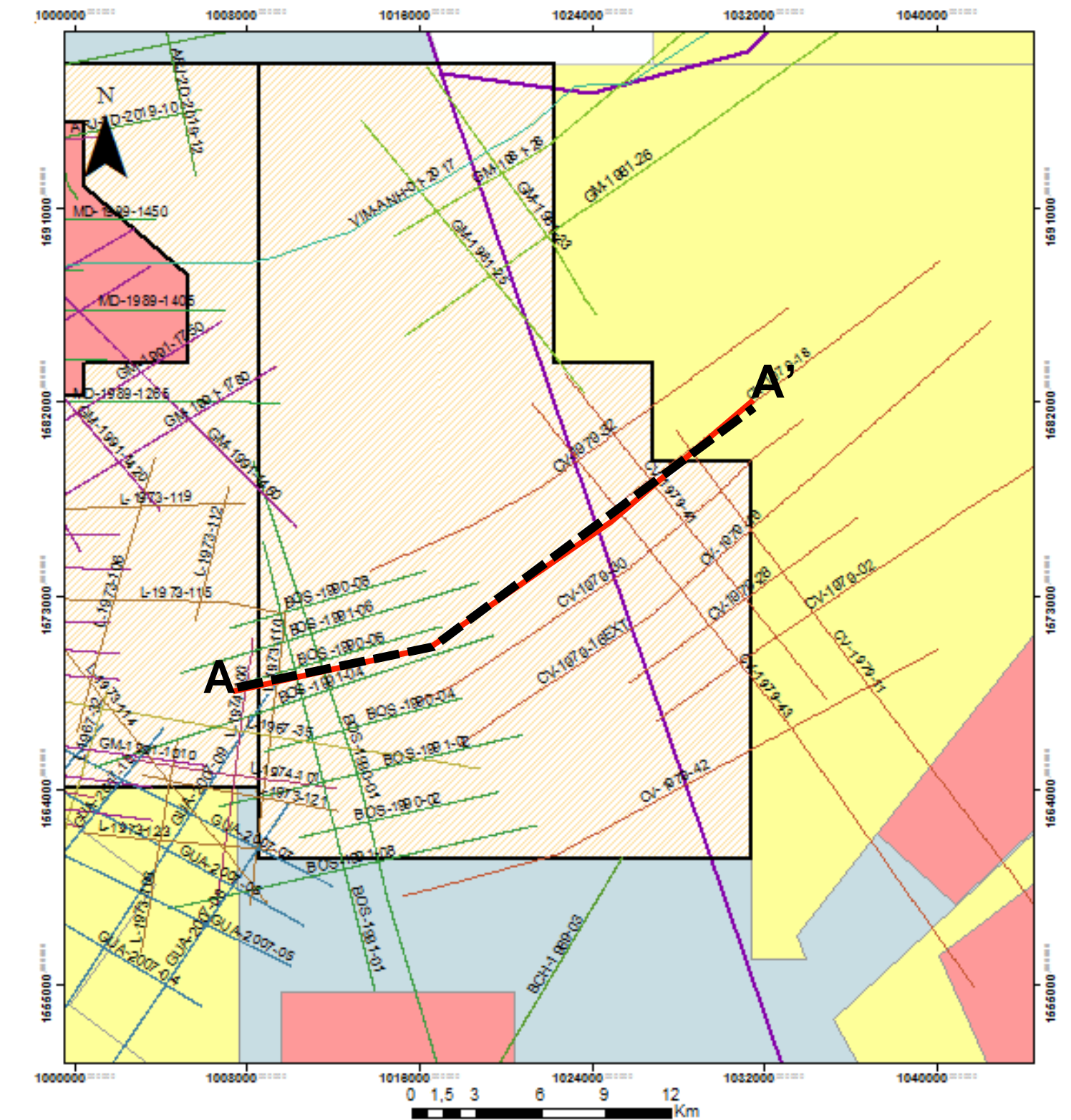
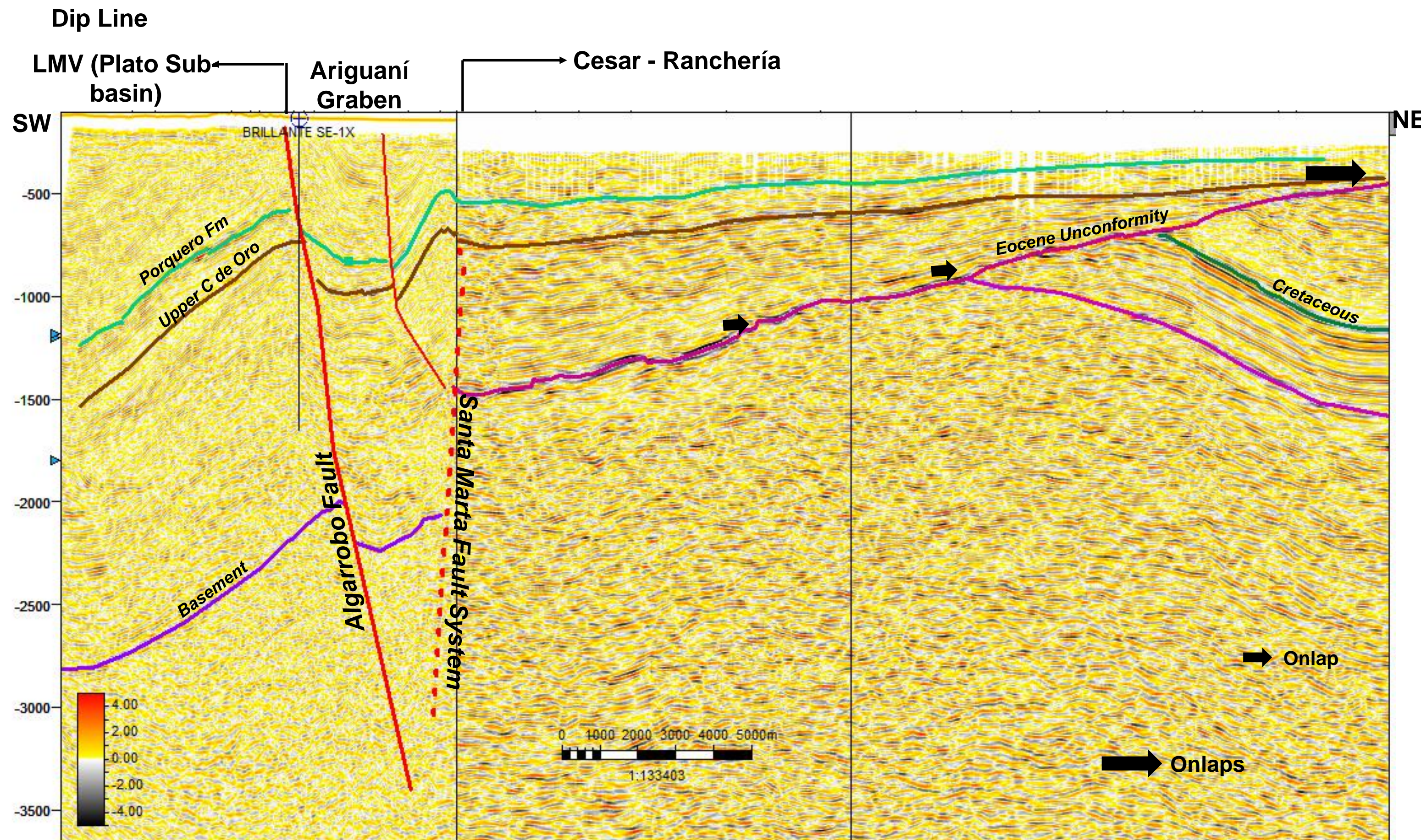
## Dip Line



# PLATO SUB-BASIN VIM 41 AREA

# SEISMIC INTERPRETATION VIM 41:

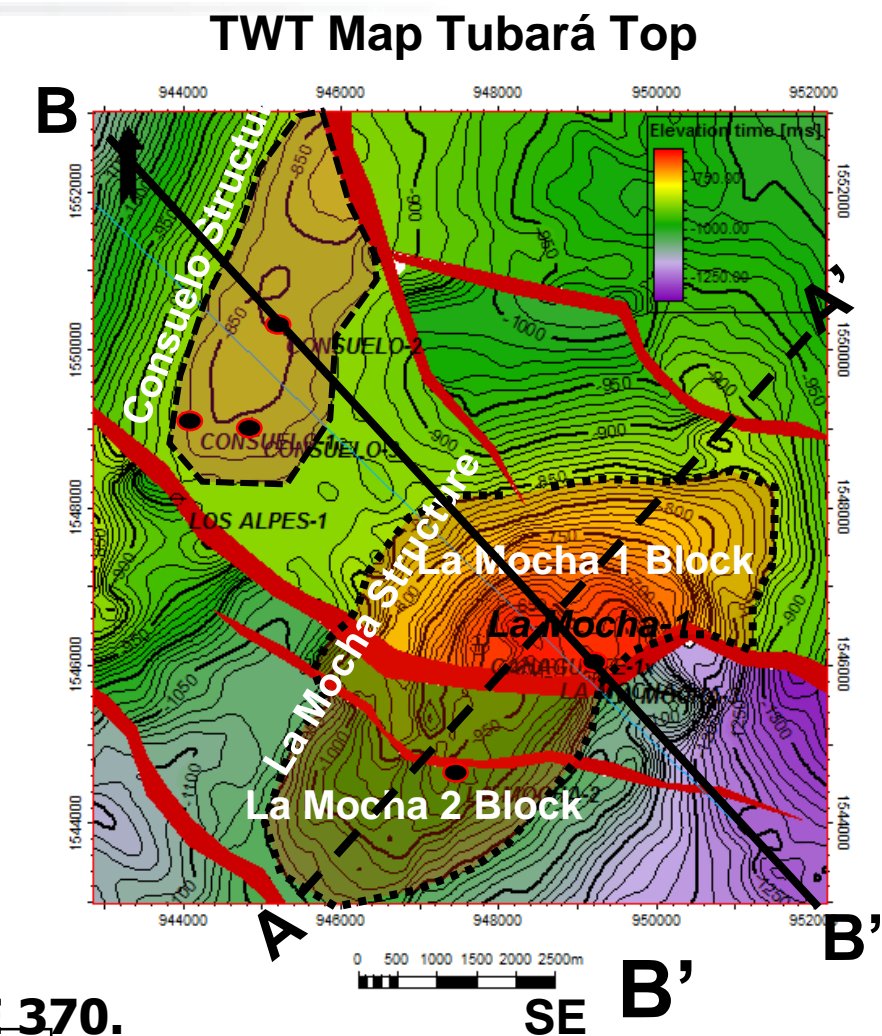
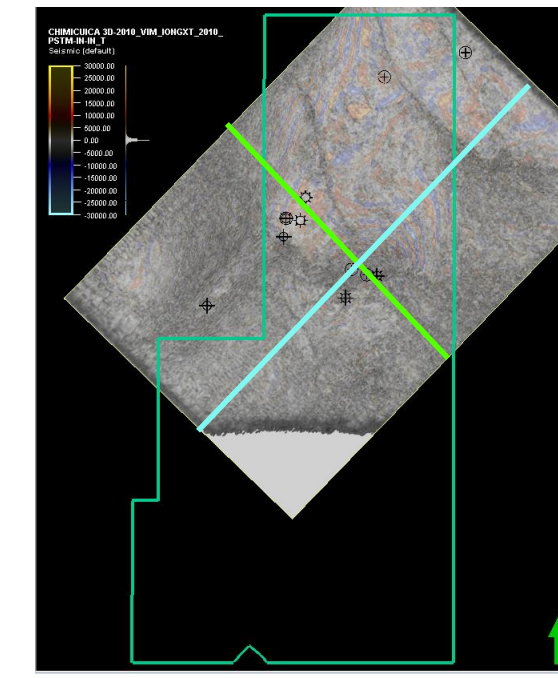
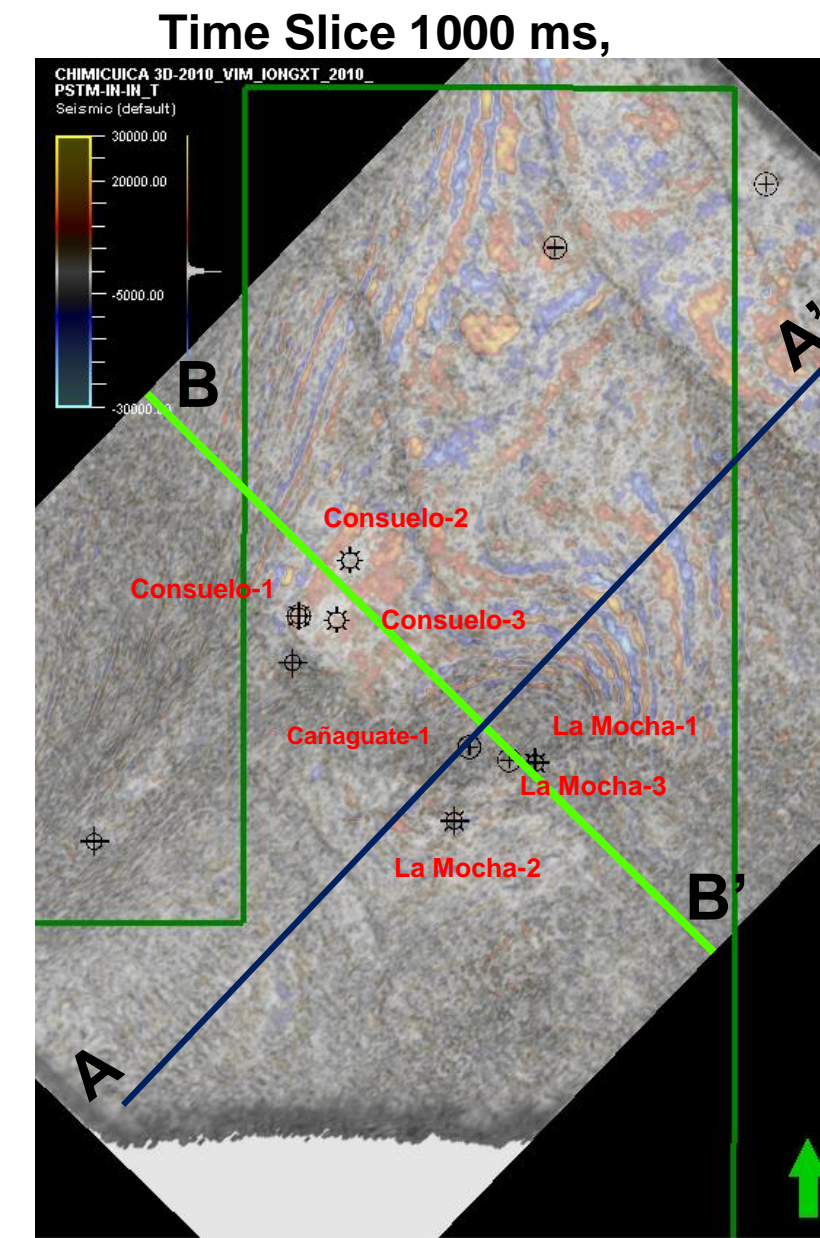
- **PLAYS**
- **Anticline with a three way closure against normal faults.** Associated with the transcurrent Santa Marta Fault System.
- **Four way dip closure in sediments of the Lower Miocene**
- Possible **stratigraphic traps** associated to Eocene Unconformity (onlaps patterns of Miocene deposits).



# PLATO SUB-BASIN VIM 2-1 AREA

# SEISMIC INTERPRETATION VIM 2-1:

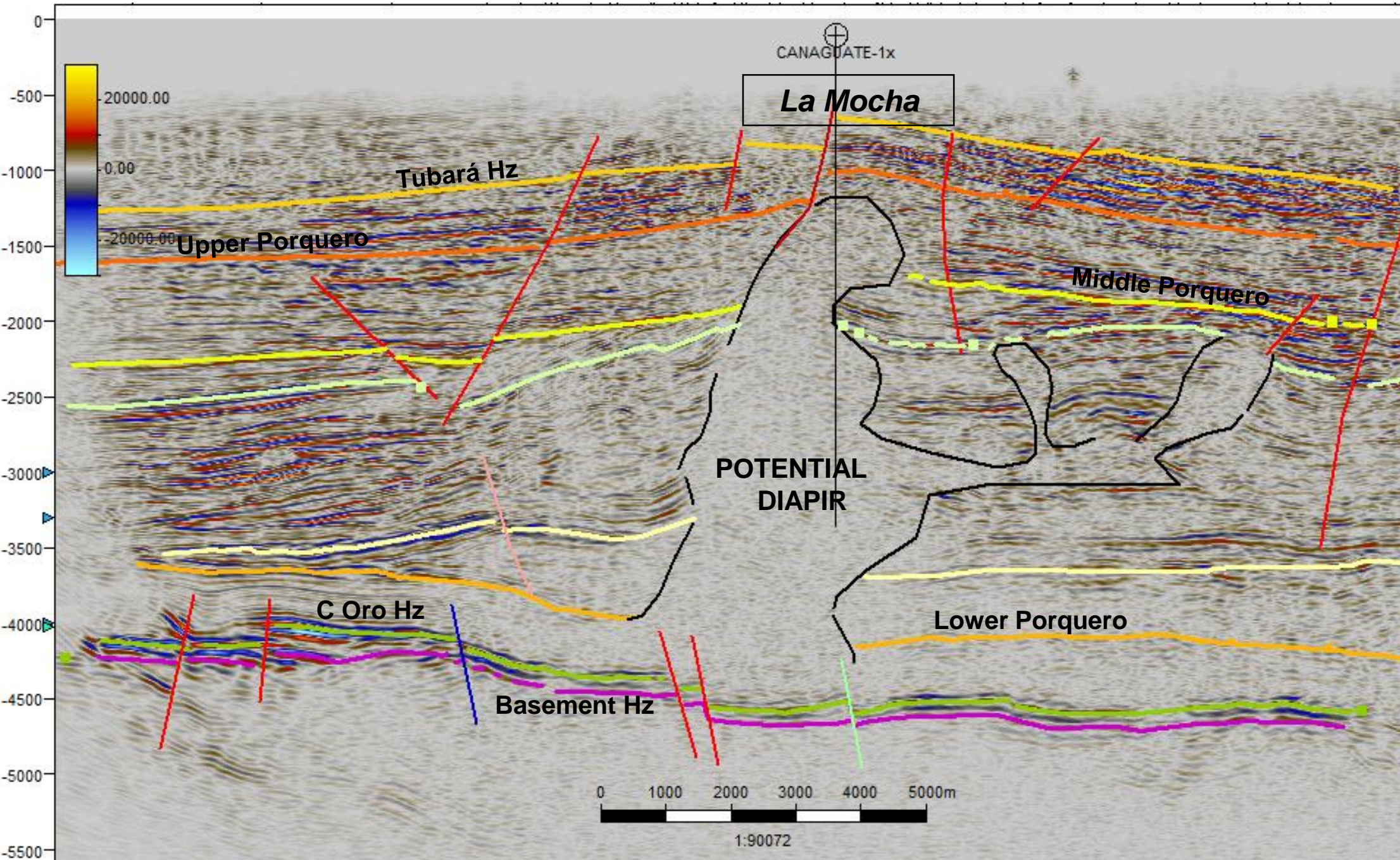
- PLAYS
- Traps associated to mud diapirism (IntraPorquero levels)
- Faulted Anticline – La Mocha Structure (Tubará Fm.)
- Anticline with four way dip closure – Consuelo structure
- Amplitude Anomalies (IntraPorquero levels)
- Structural Highs controlled by normal faults (Ciénaga de Oro Fm.)



**A**  
sw Strike Line

CHIMICUICA 3D XLINE 640

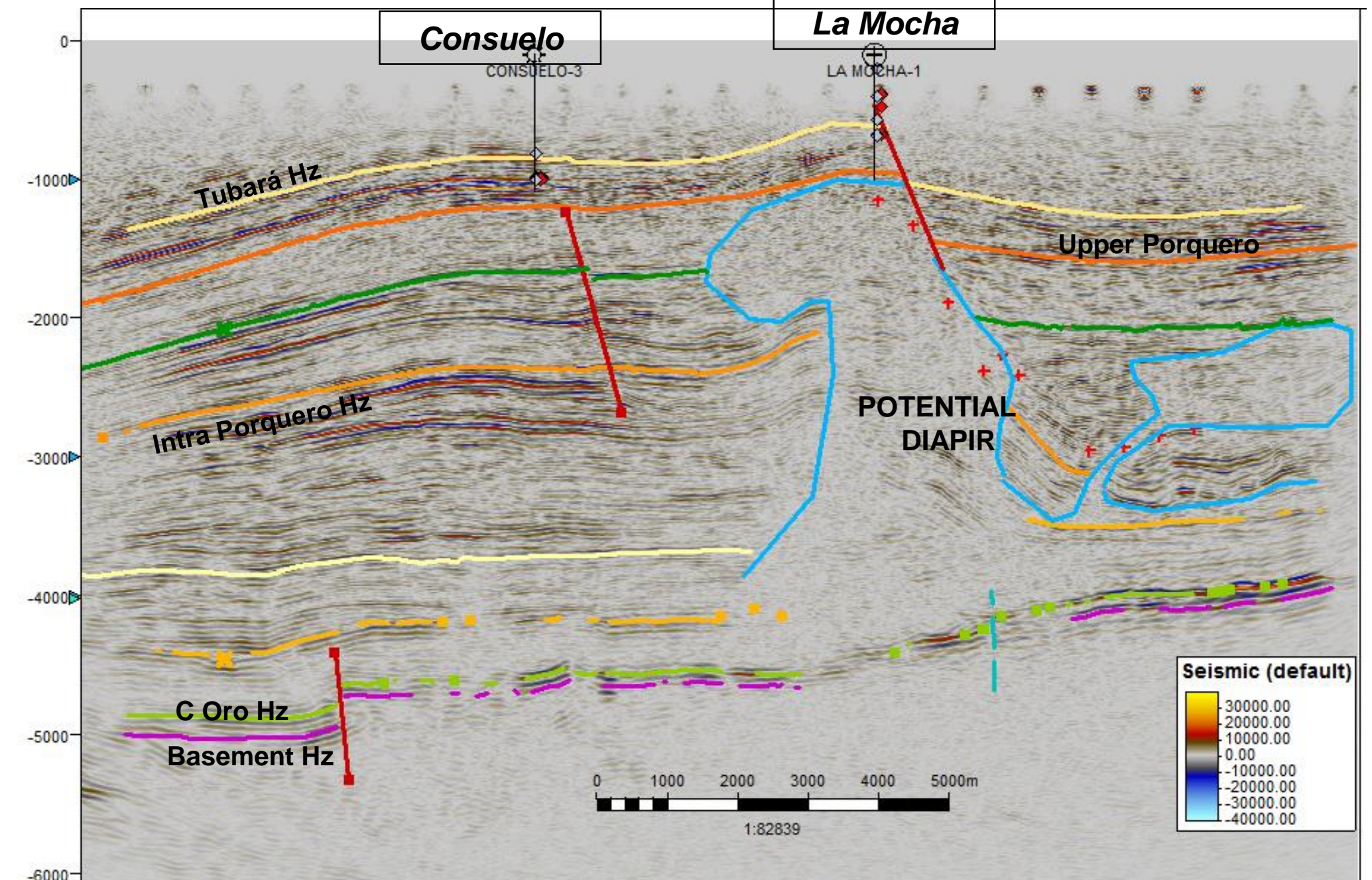
**A'**  
NE



**B**  
NW Dip Line

CHIMICUICA 3D INLINE 370.

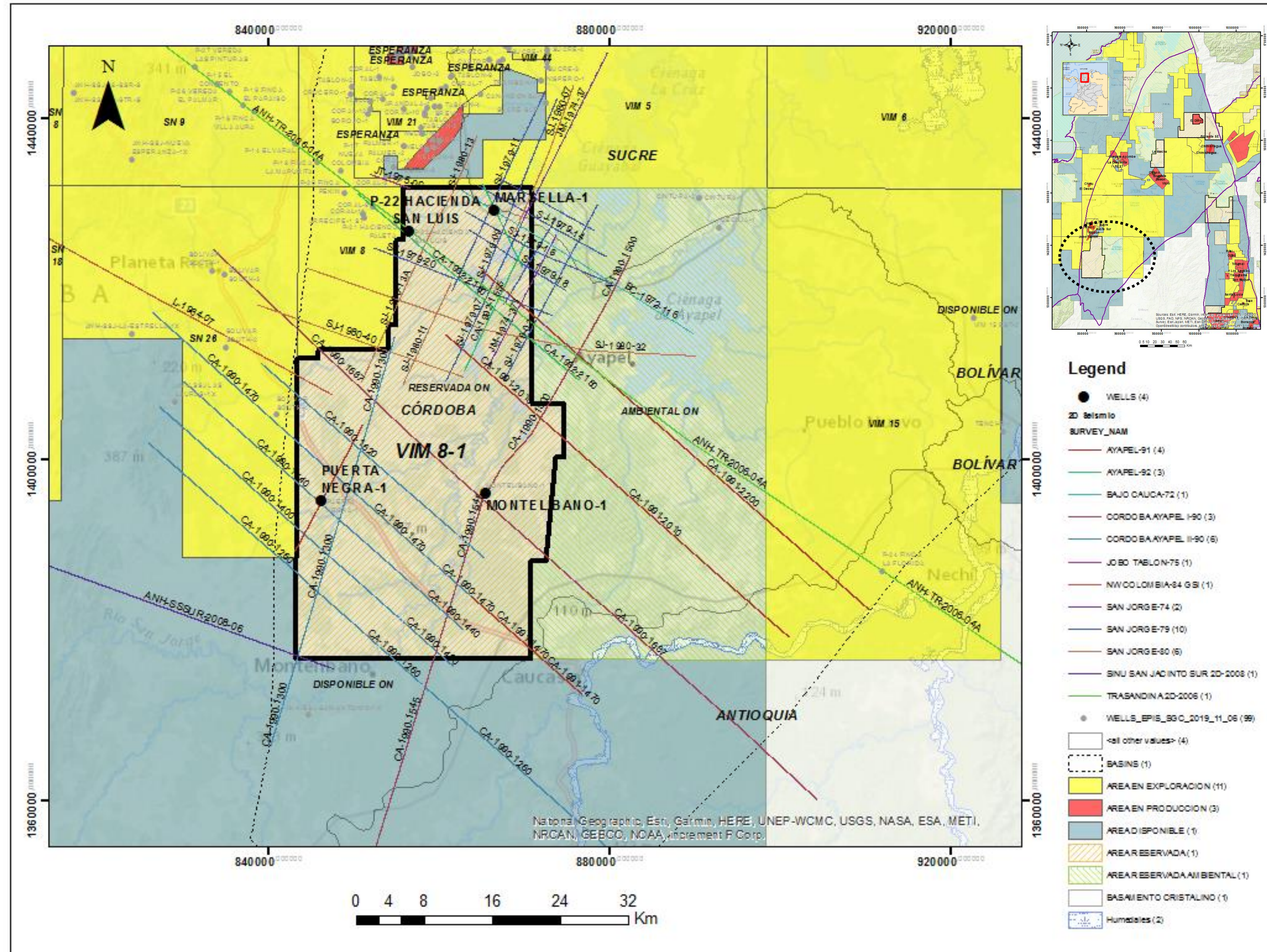
**B'**  
SE





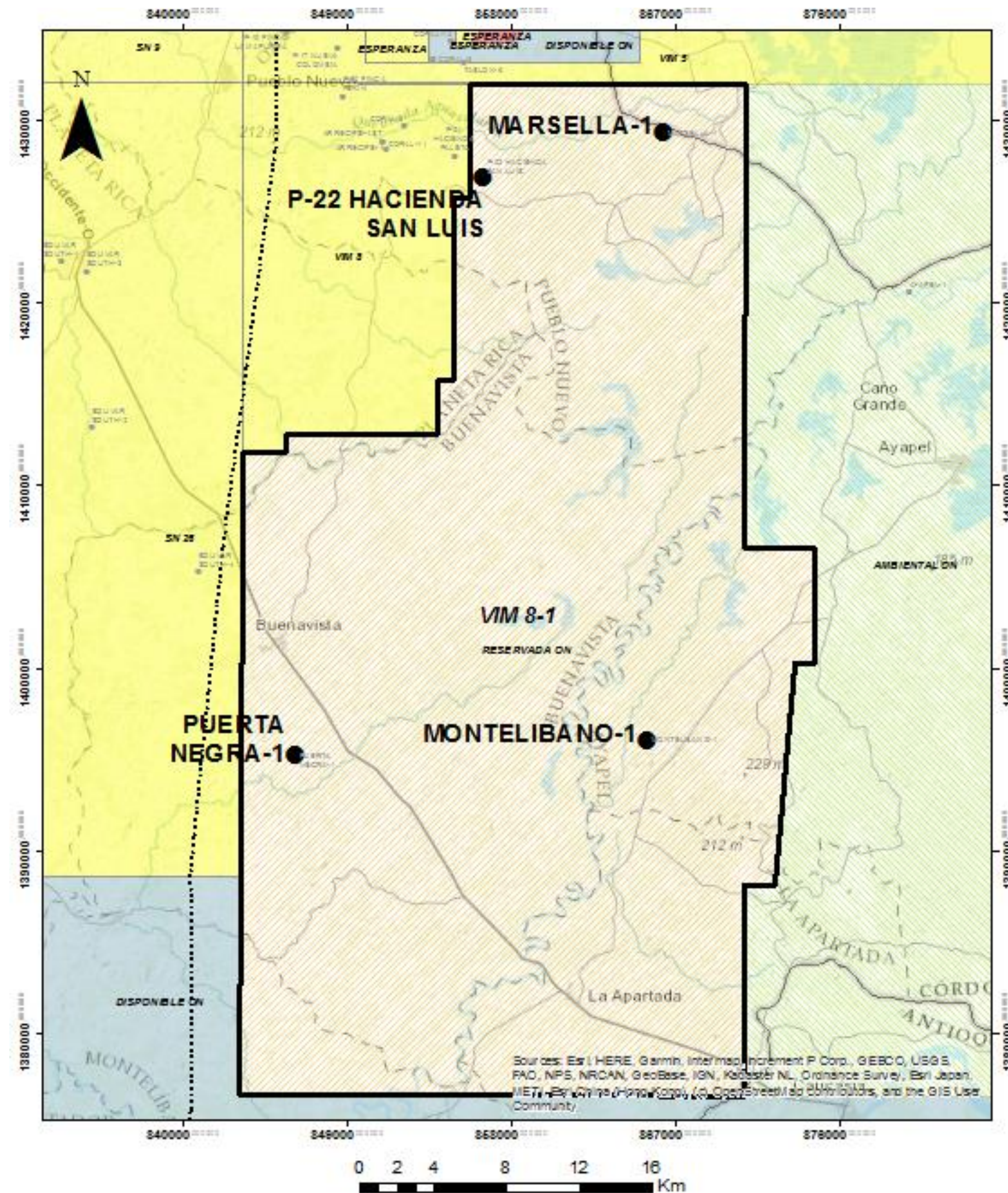
# SAN JORGE SUB-BASIN

## VIM 8-1 Area



## SEISMIC

- 2D Seismic Surveys (12)
- Acquired from 1972 to 2008
- Length: 352 Km

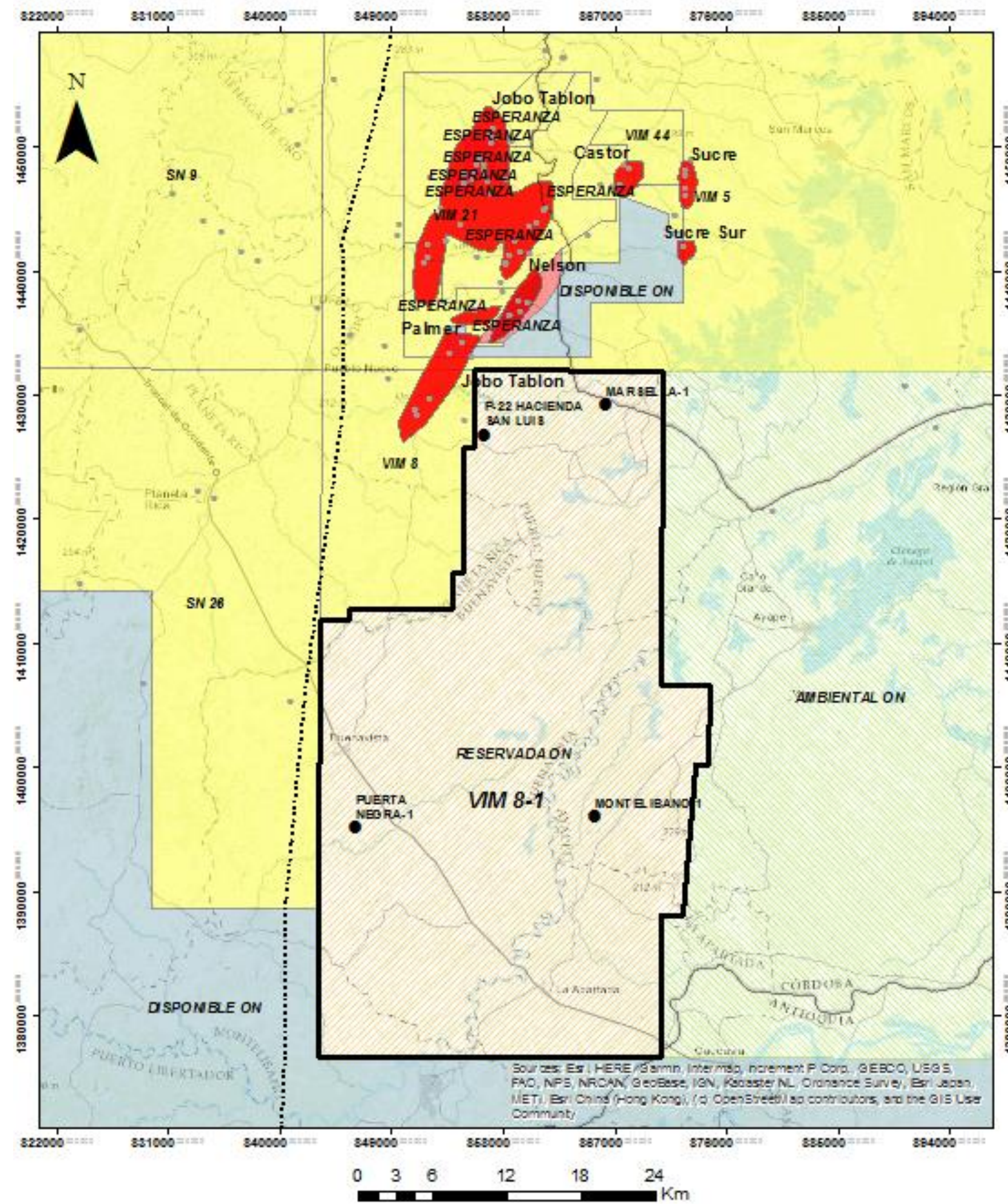


## WELLS

AREA	WELL	TD (ft)	DATE	COMPANY
VIM 8-1	MONTELIBANO-1	7298	1958	ECOPETROL S.A.
	MARSELLA-1	10167	1983	INTERCOL
	PUERTA NEGRA-1	6700	1991	ECOPETROL S.A.
	P-22 HACIENDA SAN LUIS	990	2009	ANH

- Montelíbano-1** (Stratigraphic well): Interbedding of sandstones, clays and calcareous levels in Ciénaga de Oro Fm.
- Marsella-1 (A3)**: It was drilled on a high basement structure, and it found a sequence of coarse grained sandstones, interbedding with claystones, overlying ~200 feet of limestones.
- Puerta Negra-1**: Had poor gas shows in Ciénaga de Oro Fm. The Porquero Fm. had the best gas shows.

# Near Fields



**FIELDS**  
**HC\_TYPE**

- Gas
- Gas, condensate

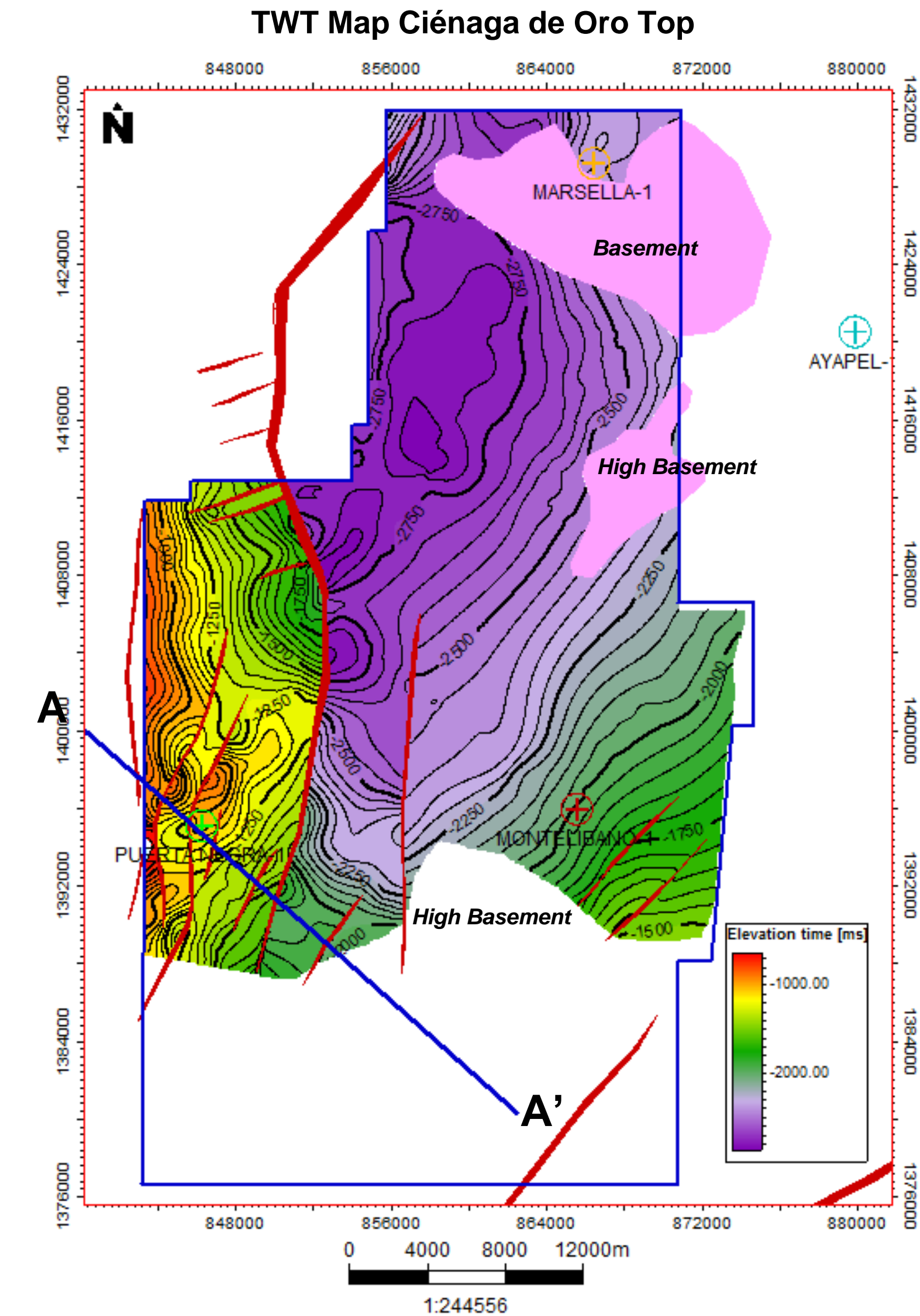
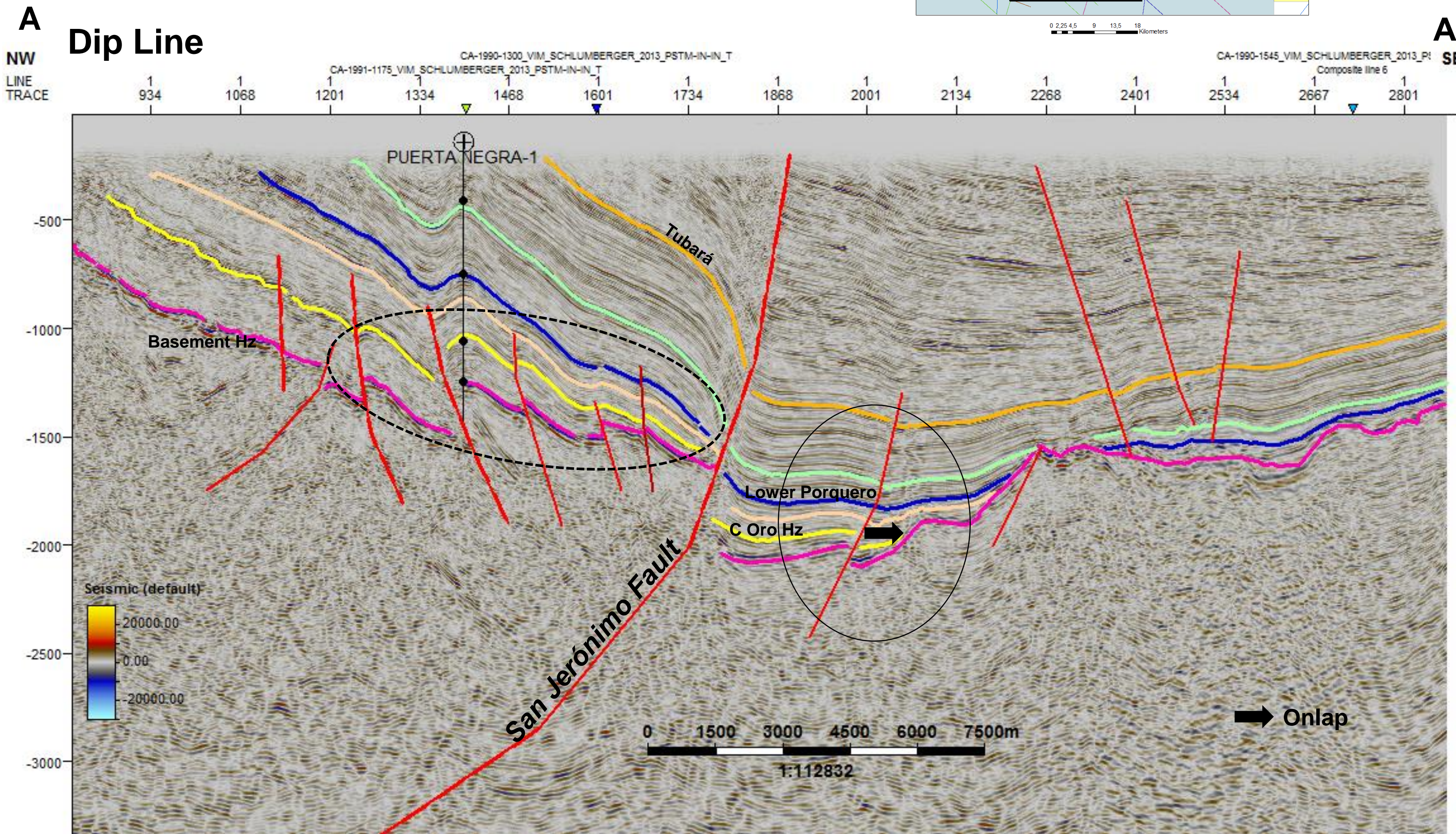
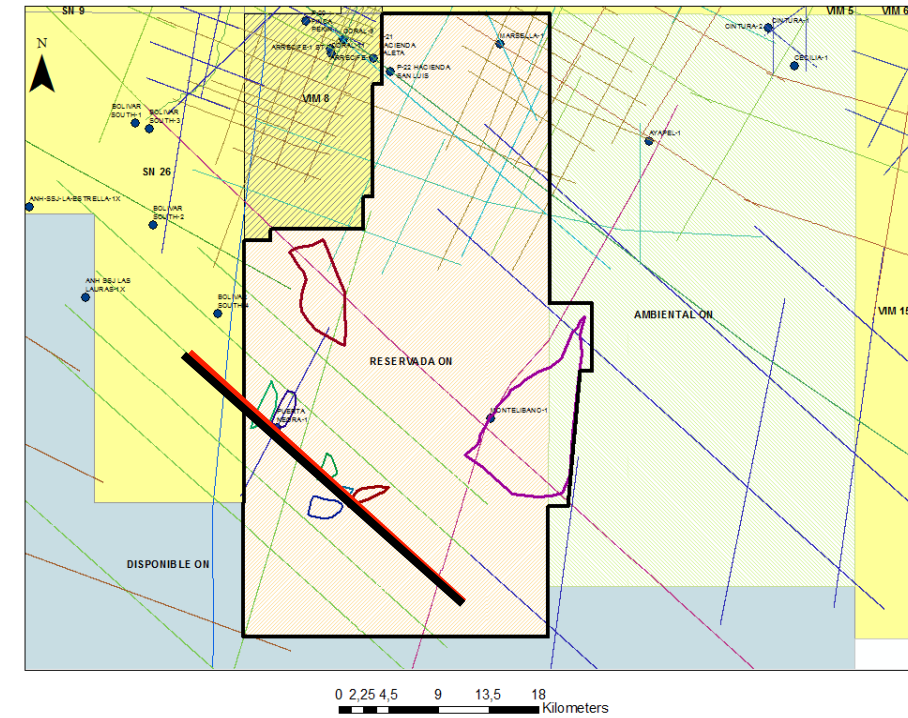
FIELD	CONTRACT	EXPLORATION PLAY	FLUID	PRODUCTION	YEAR	OGIP (Bcf)
→ <b>JOBO TABLÓN</b>	VIM-21	UPPER C ORO - PORQUERO	GAS	193 BCF (cumm prod-2011)*	1947	
<b>SUCRE</b>	VIM-5	C ORO	GAS	20,4 (cumm prod-2011)*	1977	
<b>CASTOR</b>	ESPERANZA	C ORO	GAS	14.1 BCF (cumm prod. -2011)	1980	
<b>SUCRE SUR</b>	VIM-5	C ORO	GAS	14,1 BCF (Cumm. Prod - 2011)*	1981	
→ <b>NELSON</b>	ESPERANZA	C ORO	GAS	120 BCF		342,76
<b>CLARINETE</b>	VIM-5	UPPER C ORO - PORQUERO	GAS	24.7 MMscfd	2014	247,93
<b>ARRECIFE</b>	VIM-8	UPPER C ORO - PORQUERO	GAS	3-10MMscfd (Tests)	2018	
<b>PANDERETA</b>	VIM-5	UPPER C ORO - PORQUERO	GAS			121,83
<b>OBOE</b>		UPPER C ORO - PORQUERO	GAS			296,56
<b>ARIANNA</b>	ESPERANZA	C ORO	GAS		2011	8,05
<b>CAÑAFLECHA</b>	ESPERANZA	C ORO	GAS		2011	1,82
<b>CAÑAHUATE</b>	ESPERANZA	C ORO	GAS			28,51
<b>NISPERO</b>	ESPERANZA	C ORO	GAS			27,90
<b>PALMER</b>	ESPERANZA	C ORO	GAS			53,50
<b>TORONJA</b>	VIM-21	C ORO	GAS			32,67
<b>OBOE</b>	VIM-5	C ORO	GAS			296,56
<b>KATANA</b>	ESPERANZA	C ORO	GAS			13,57

\* Taken and modified from ANH-Eafit (2011)

# SEISMIC INTERPRETATION

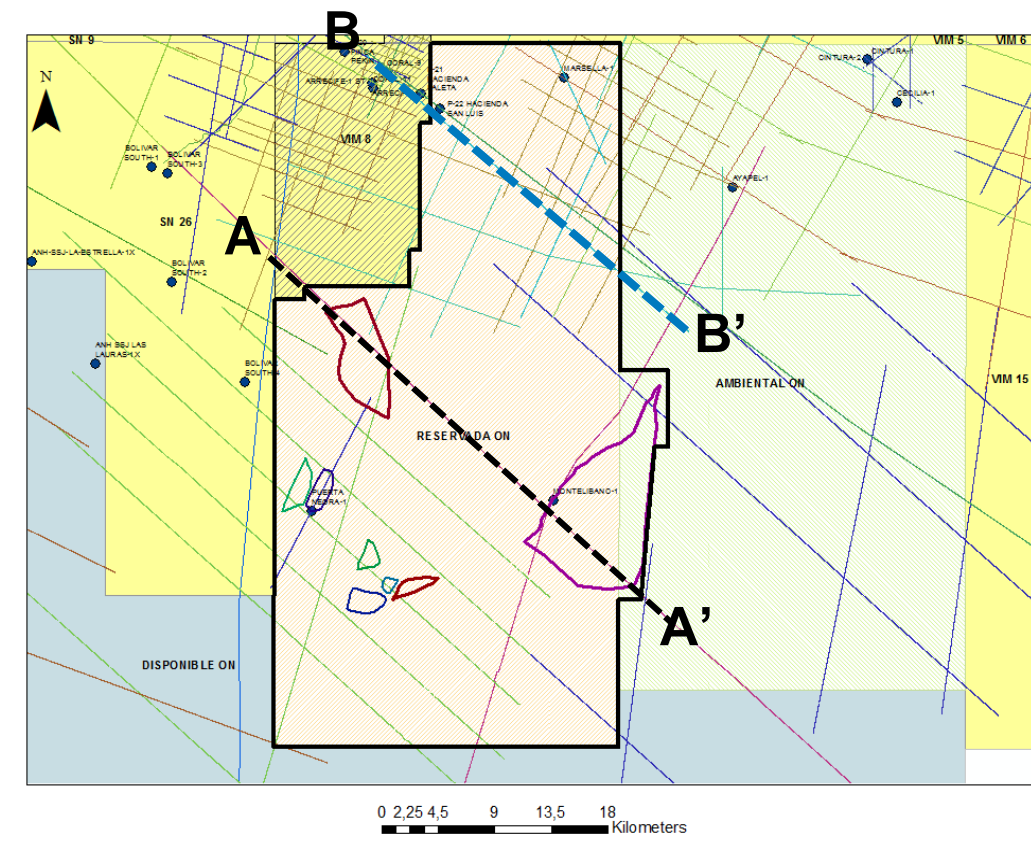
# SEISMIC INTERPRETATION VIM 8-1:

- PLAYS
- Anticlines structures associated to reversal faults (West)
- Onlap of Cenozoic sediments against basement paleohighs

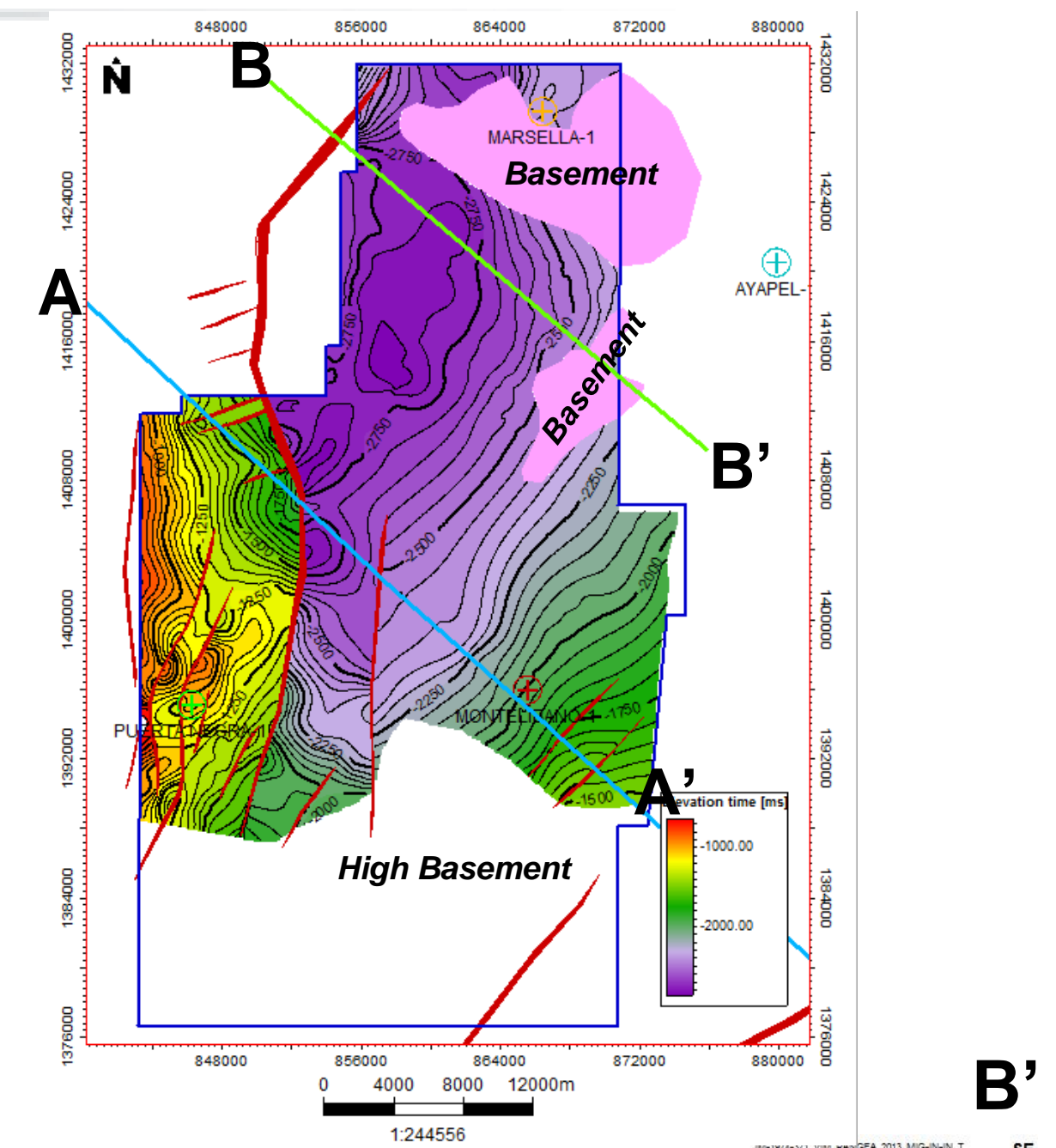


# SEISMIC INTERPRETATION VIM 8-1:

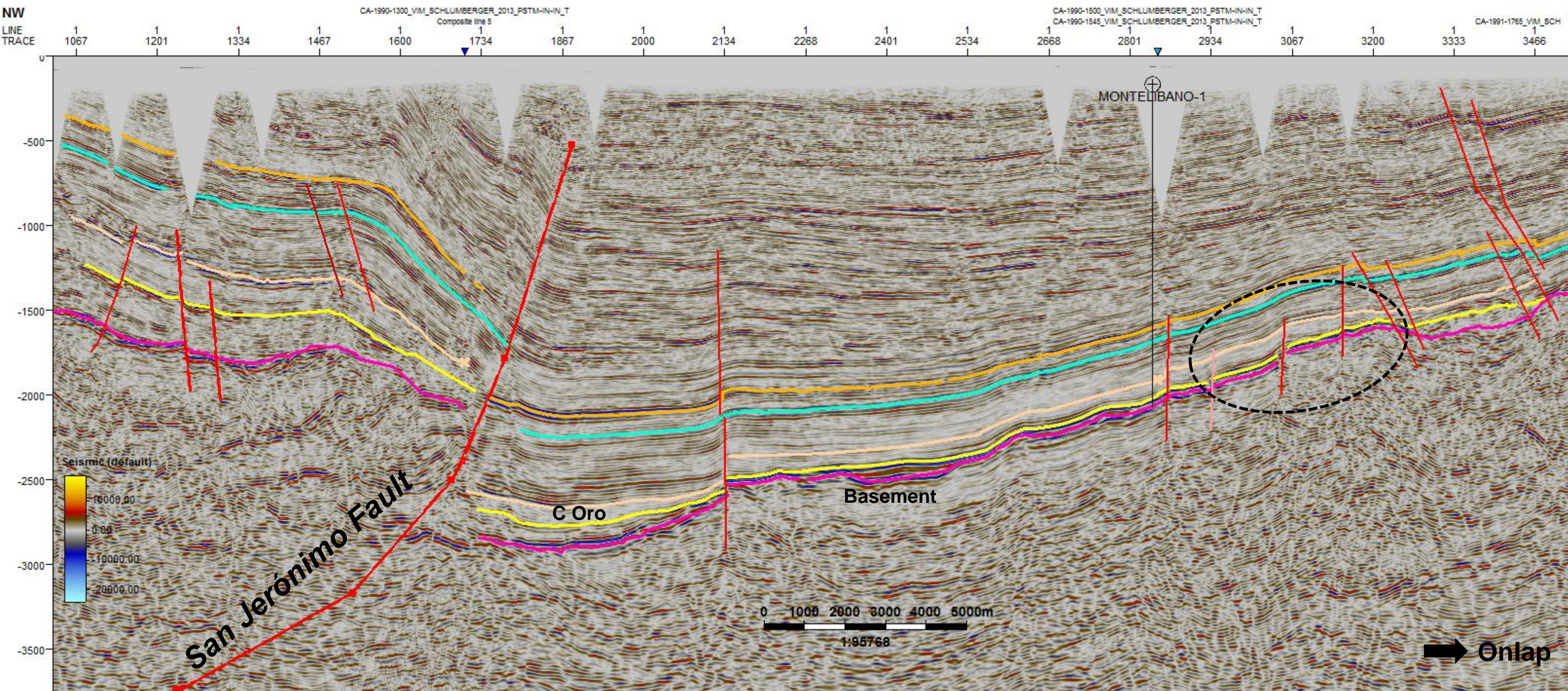
- PLAYS
- Anticlines structures associated to reversal faults (West)
- Onlap of Cenozoic sediments against basement paleohighs
- Structural highs controlled by normal faults (East)



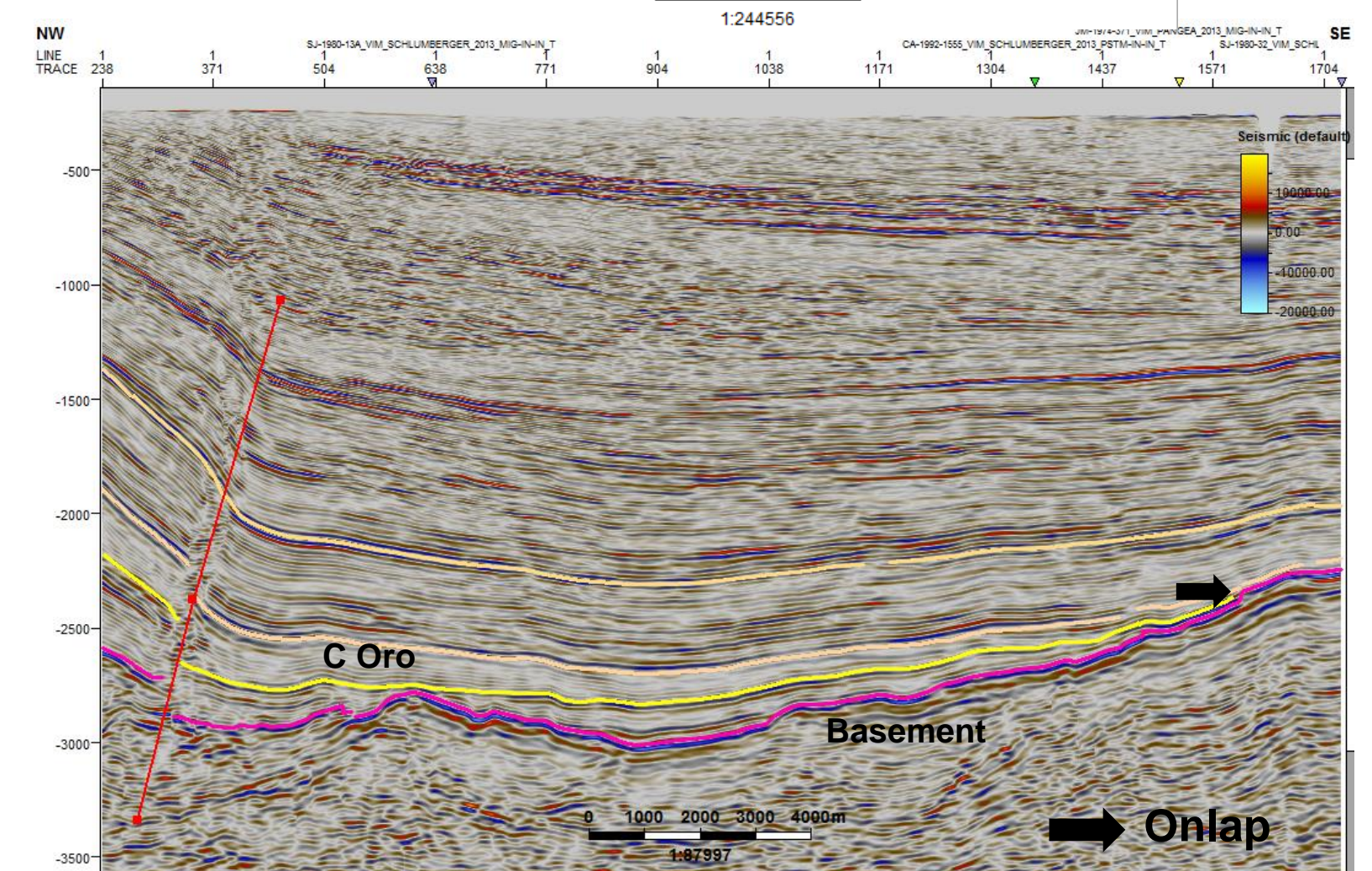
TWT Map Ciénaga de Oro Top



A Dip Line

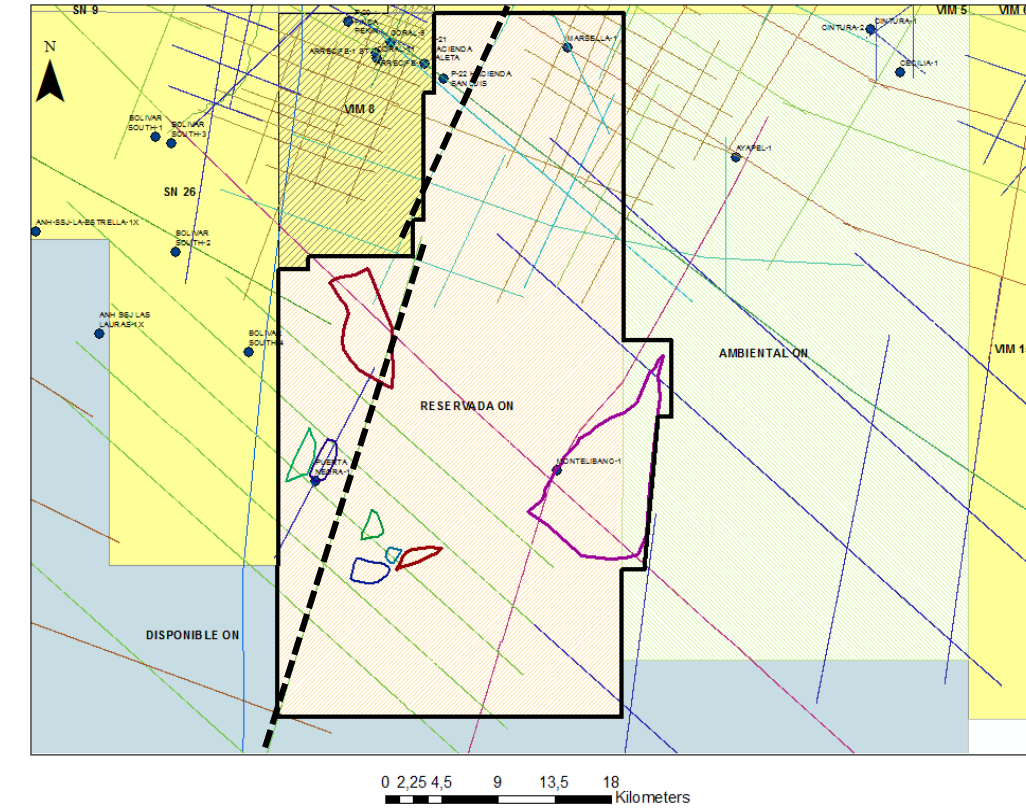


B

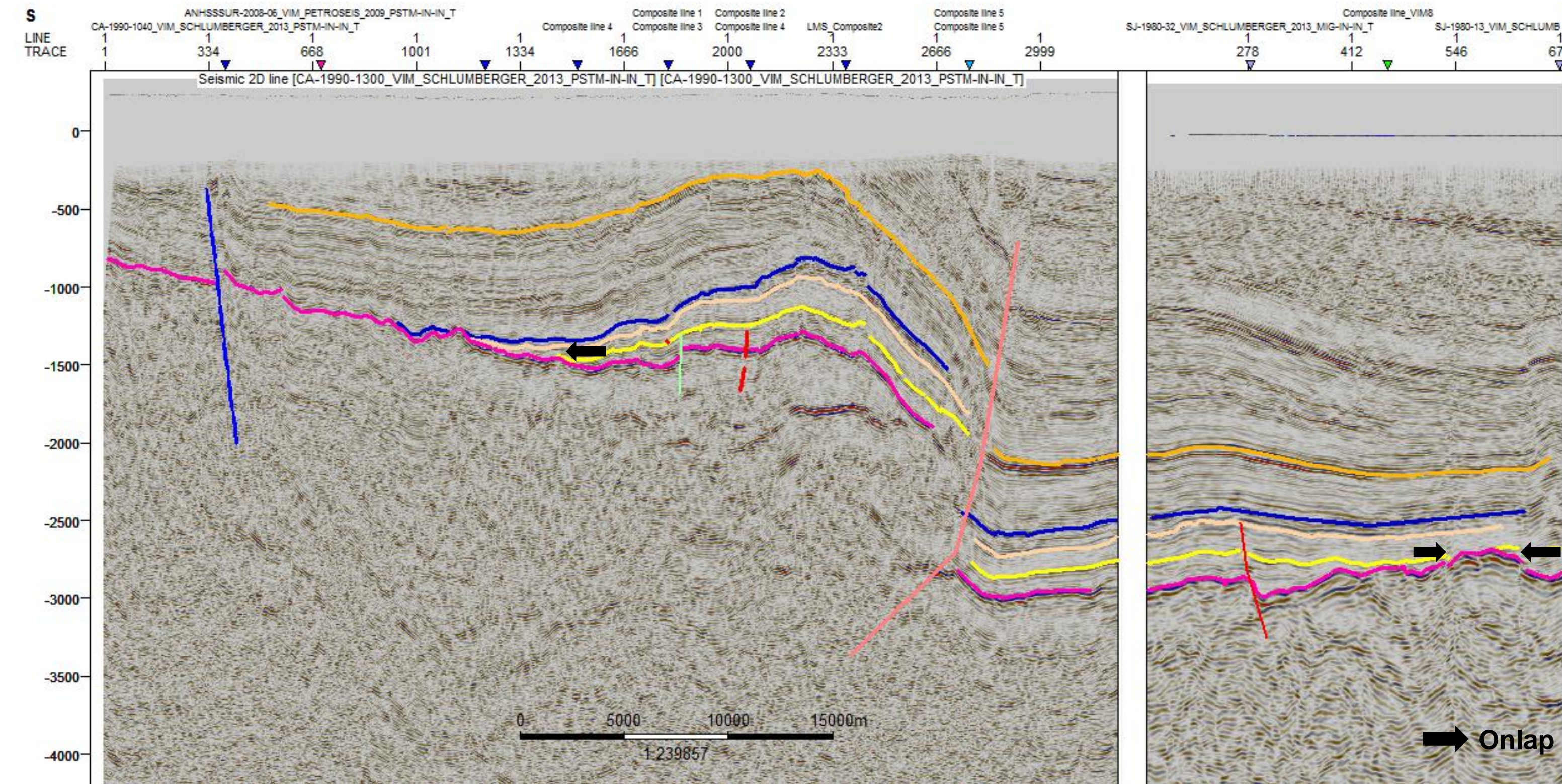


# SEISMIC INTERPRETATION VIM 8-1:

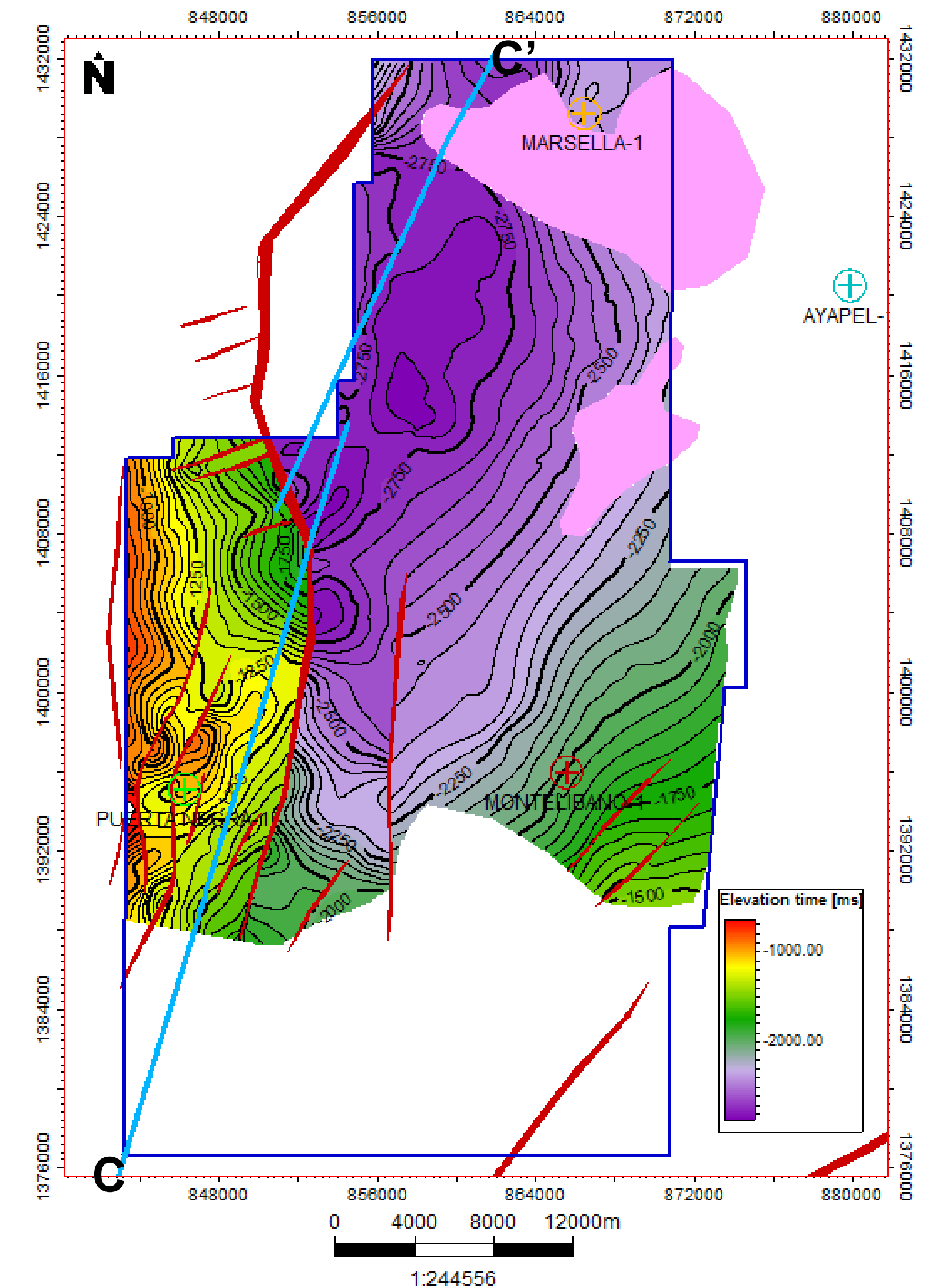
- PLAYS
- Anticlines structures associated to reversal faults (West)
- Onlap of Cenozoic sediments against basement paleohighs
- Structural highs controlled by normal faults (East)



## C Strike Line



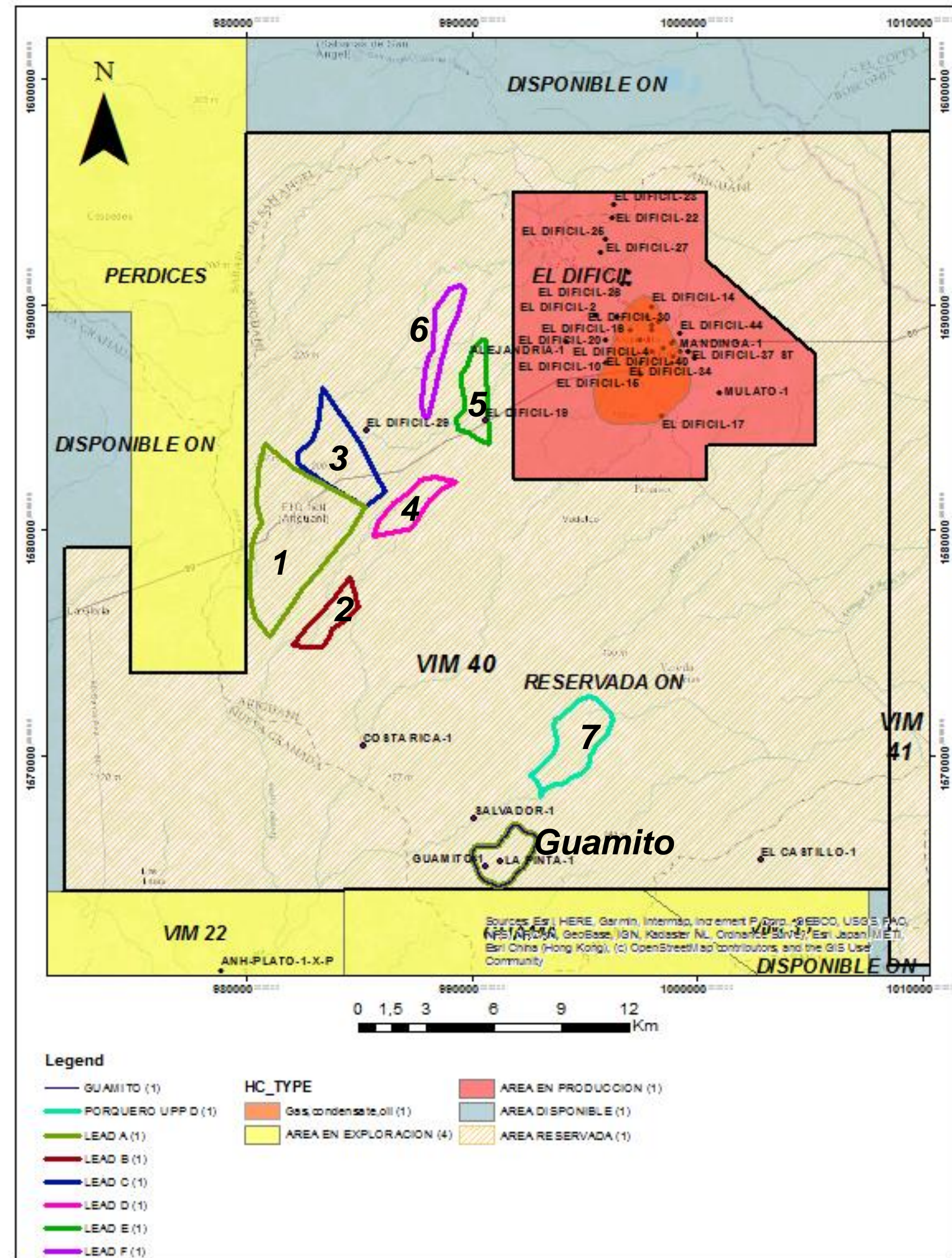
## TWT Map Ciénaga de Oro Top





# PROSPECTIVE RESOURCES

# VOLUMETRICS VIM-40:



## CONTIGENT AND PROSPECTIVE RESOURCES

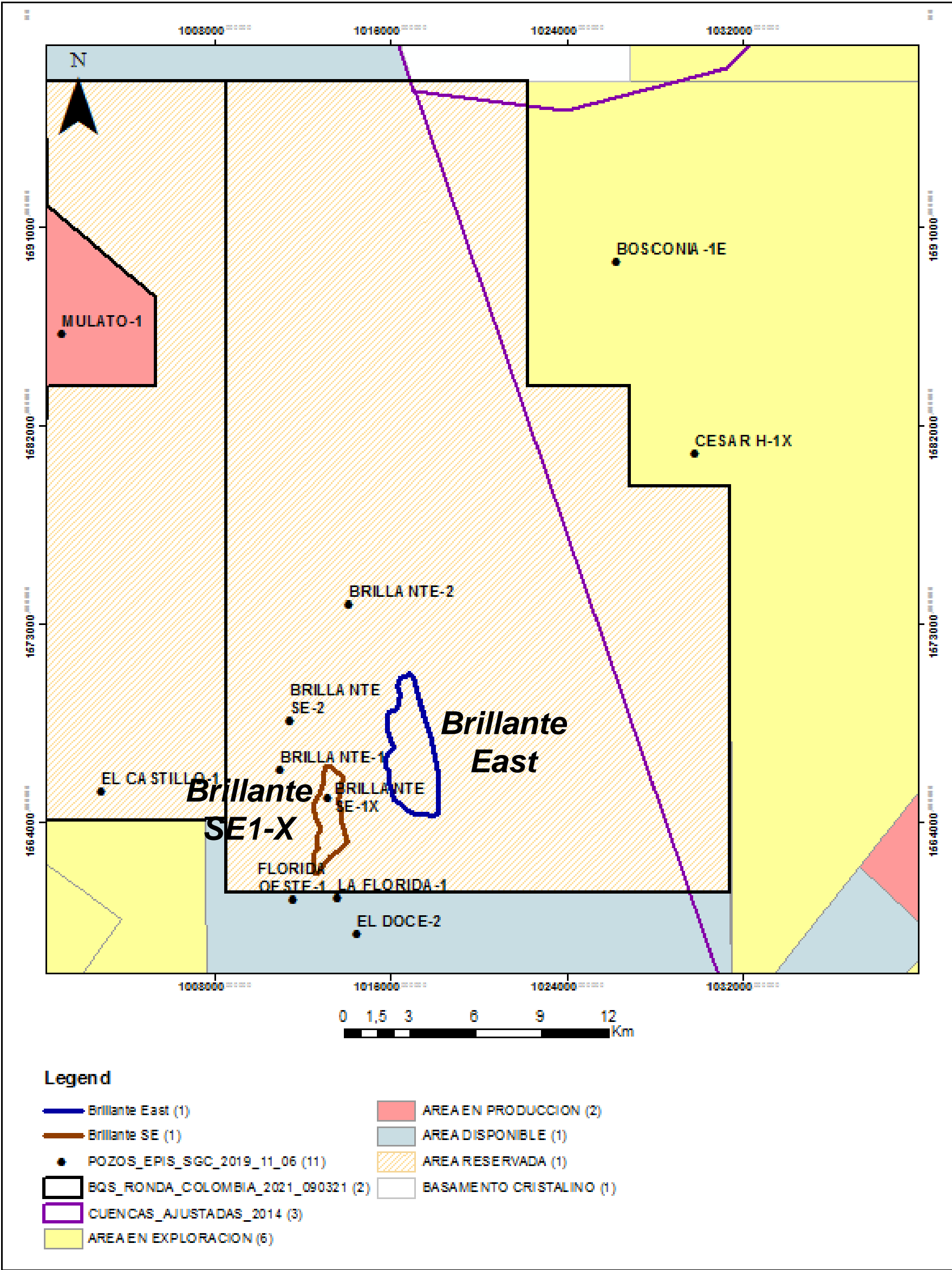
Discovered Reservoir	High Estimated Area (Acres)	OGIP (Bcf)	Contigent Resources (Bcf)
Guamito-La Pinta	1109	33,62	28,57

### 7 LEADS Prospective Resources

LEAD NO	AREA (Acres)	OGIP (Bcf)	Prospective Resources (Bcf)
1	5588	60,98	15,25
2	804	23,50	18,80
3	2251	24,56	6,14
4	877	25,63	20,51
5	1053	11,49	9,19
6	945	10,32	2,58
7	1817	80,02	64,01

**OGIP: 236,5 BCF**  
**PROSPECTIVE RESOURCES: 136,48 BCF**

# VOLUMETRICS VIM-41:



## CONTINGENT AND PROSPECTIVE RESOURCES

Discovered Reservoir	Area (Acres)	OGIP (Bcf)	Contigent Resources (Bcf)	Cumulative Production (Bcf)	Contigent Resources (Bcf)
BRILLANTE SE-1X	1127	27,69	23,54	0,578	22,96

### 1 LEAD

#### Prospective Resources

Lead	AREA (Acres)	OGIP (Bcf)	Prospective Resources (Bcf)
BRILLANTE EAST	2572	63,20	50,56

# VOLUMETRICS VIM 2-1:

## CONTIGENT AND PROSPECTIVE RESOURCES

- La Mocha Southern block: Contigent resources of 18.08 BCF.
- Consuelo Structure: Contigent resources of 2.5 BCF.

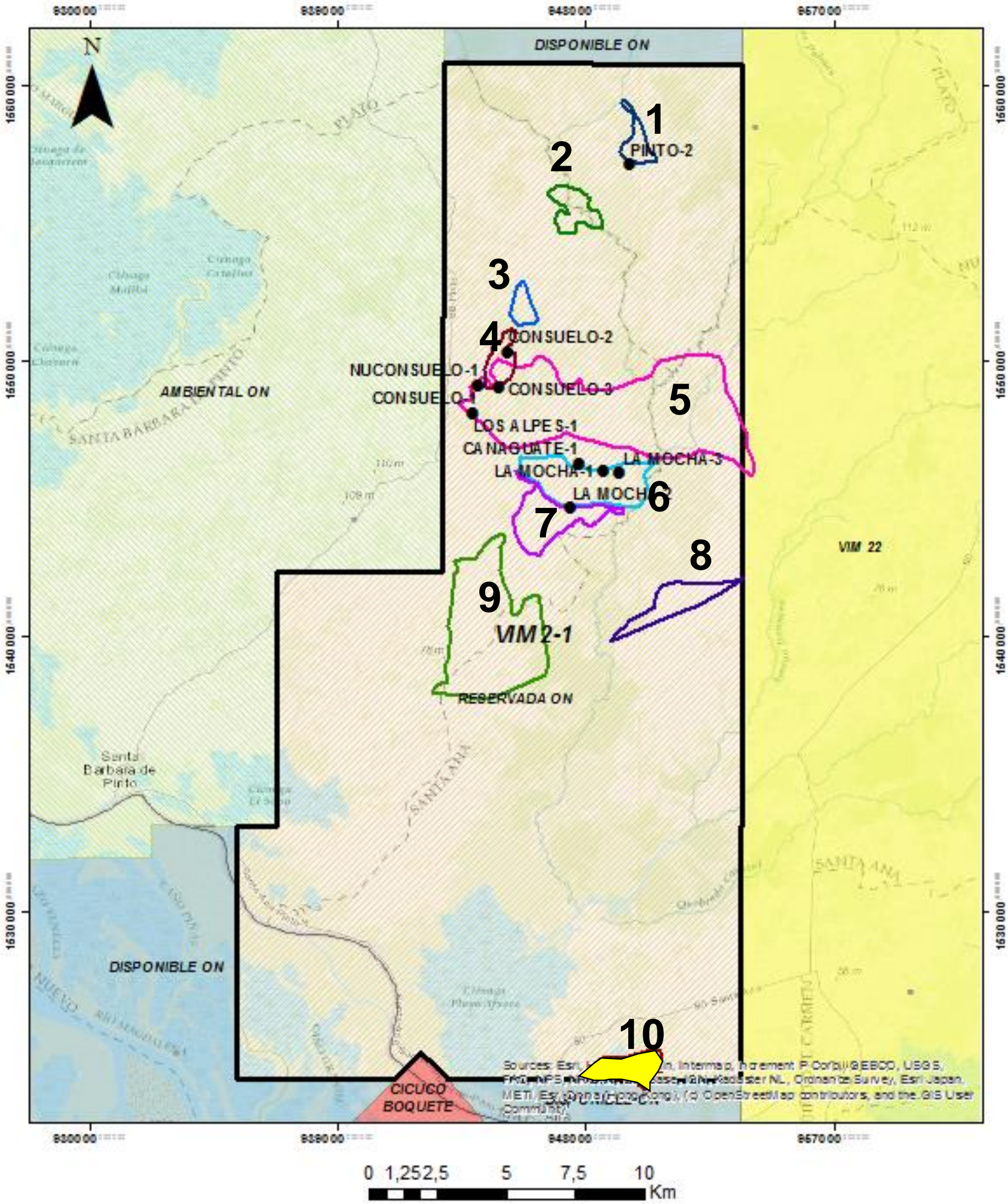
### 10 LEADS

#### Prospective Resources

Lead No	AREA (Acres)	OGIP (Bcf)	Prospective Resources (Bcf)
1	287	3,50	2,8
2	487	5,94	4,7
3	243	2,97	2,4
4	374	4,56	3,7
5	6521	31,96	25,6
6	924	21,13	16,9
7	988	22,59	18,1
8	726	3,96	3,2
9	3637	17,83	14,3
10	552	3,01	2,4

OGIP: 117,4 BCF

PROSPECTIVE RESOURCES: 99 BCF



# VOLUMETRICS VIM 8-1:

## PROSPECTIVE RESOURCES

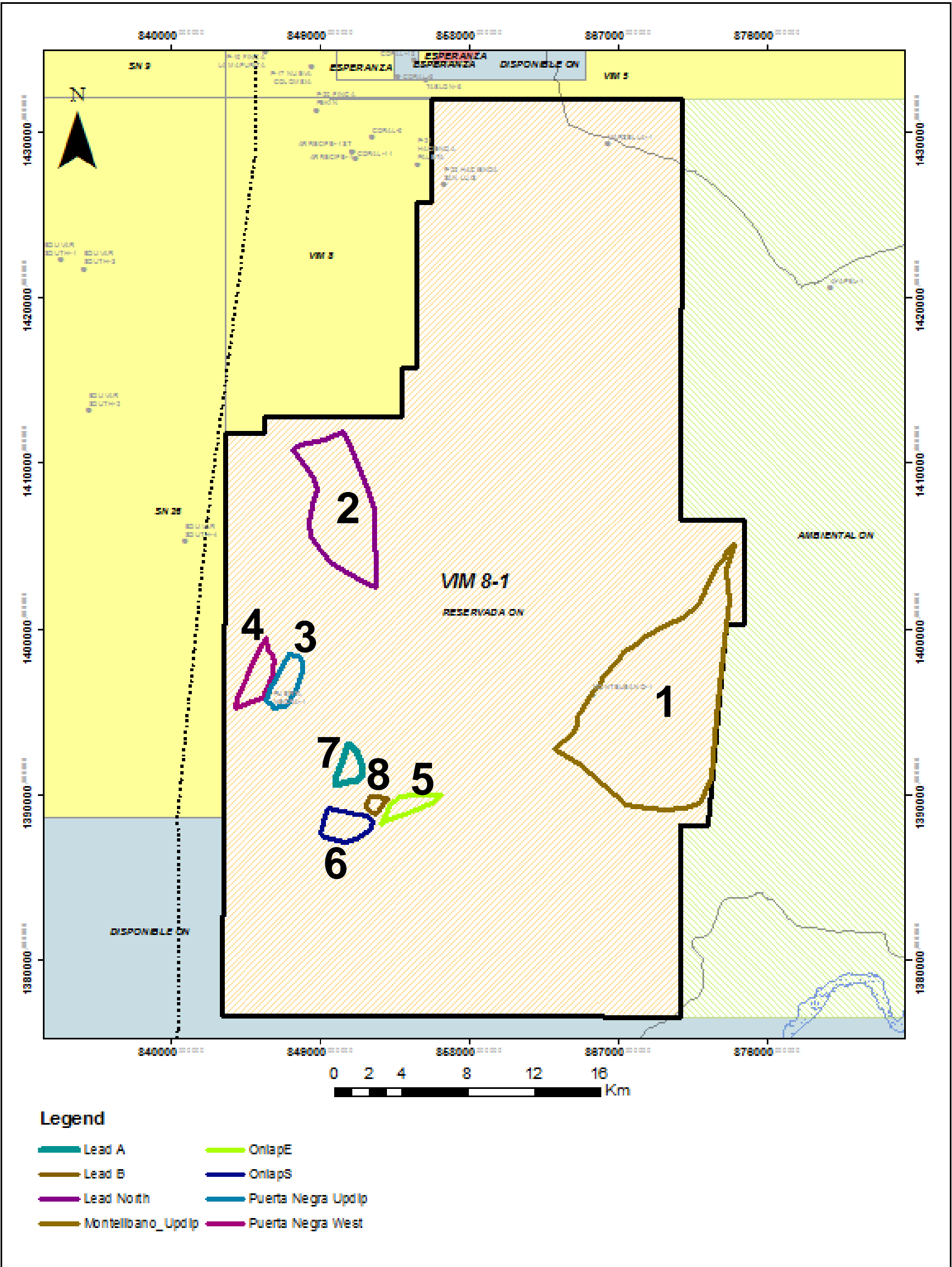
### 8 LEADS

#### Prospective Resources

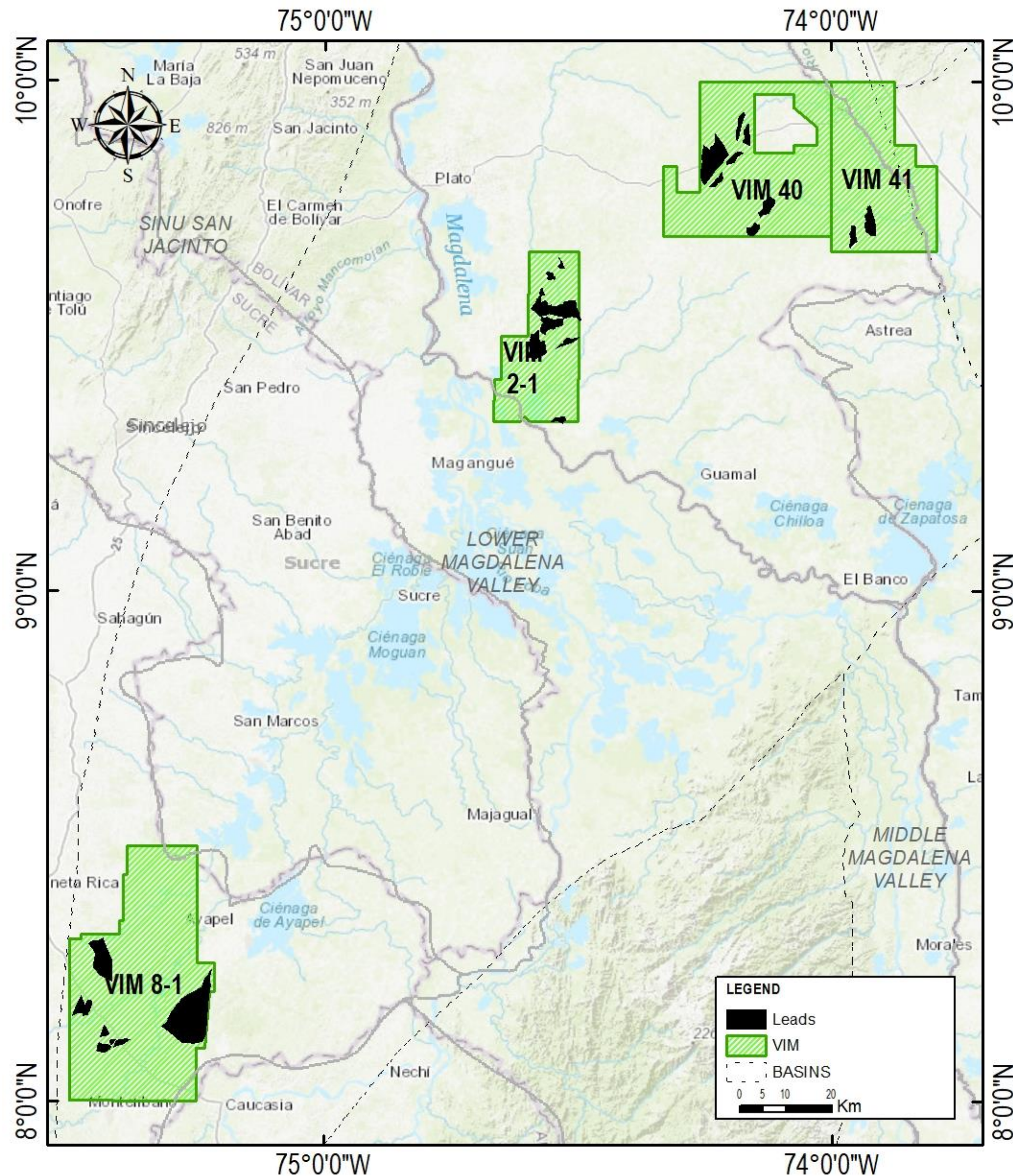
Lead No	AREA (Acres)	OGIP (Bcf)	Prospective Resources (Bcf)
1	20658	568,33	180,35
2	6820	187,63	150,10
3	1013	27,87	22,30
4	1132	31,14	24,91
5	642	17,66	14,13
6	1082	29,77	23,81
7	588	16,18	12,94
8	225	6,19	4,95

**OGIP: 884,77 BCF**

**PROSPECTIVE RESOURCES: 433,5 BCF**



# VOLUMETRICS: TOTAL



## Gas (Deterministic)

- **26 leads in total**

- **OGIP: 1302 BCFs**

Recovery factor: 25% - 80%

- **Prospective Resources**

High Estimate: 325,5 – 1041,6 BCFs

**Best Estimate: 163 – 521 BCFs**

Low Estimate: 32,55 – 104,16 BCFs

# CONCLUSIONS

- Three blocks will be offered in the Plato basin with an area of 213,011 Ha. And one block will be offered in the San Jorge Basin with an area of 134,810 Ha.
- In the Plato sub-basin, 37 2D seismic surveys and four 3D seismic surveys have been acquired in the area. Where two 2D surveys were acquired by the ANH in 2019 (Arjona and Nueva Granada). In the San Jorge sub-basin 12 2D seismic surveys have been acquired.
- At the north basin, two fields were considered commercial in the '60s: La Mocha – Consuelo with a cumulative production of 5,1 BCF of gas and three wells were considered discoverers: La Pinta – 1, Guamito-1 and Brillante SE 1X.
- Three different units are considered reservoirs: Tubará Formation, Porquero Formation and Ciénaga de Oro Formation, and the age of the source rock is considered Upper Eocene to Upper Oligocene.
- For both sub-basins we have stratigraphic and structural traps, related to extensive dynamics and structural inversion.
- Most of the leads are in trend with existent fields in a proven hydrocarbon system, such as the case of La Mocha Consuelo, Brillante, and the Canacol fields in the San Jorge Sub-basin.
- Inside the areas offered by the ANH, 26 leads have been identified with a best estimate of prospective resources from 163 – 521 Bcf, and contingent resources in offsets fields of 72,7 Bcf.

# Thanks

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