

Challenges in Vaca Muerta: Tecpetrol Experience in the Exploration and Appraisal of the Play*

Sebastian Olmos¹

Search and Discovery Article #10913 (2017)**

Posted February 20, 2017

*Adapted from oral presentation given at Latin America & Caribbean Region Geoscience Technology Workshop, Buenos Aires, Argentina, November 16-18, 2016

**Datapages © 2017 Serial rights given by author. For all other rights contact author directly.

¹Tecpetrol, Buenos Aires, Argentinian, South America (sebastian.olmos@tecpetrol.com)

Abstract

The presentation will cover Tecpetrol's exploration and appraisal strategy for Vaca Muerta. The first step was to define an acreage position strategy for Tecpetrol to become a major player in Vaca Muerta. Two key elements were taken into account. The first was having a portfolio of assets diversified in all fluid windows (but with the focus in the gas window). The second was acquiring good quality acreage. Following this strategy, Tecpetrol acquired blocks in 2014 and 2015 and now has a position of around 200,000 net acres in Vaca Muerta distributed in five blocks. An exploration and appraisal strategy was defined for the evaluation of Vaca Muerta, which includes vertical wells to characterize the entire Vaca Muerta interval and to select the potential landing zones and horizontal wells to evaluate the productivity and potential of these rocks. In the areas where the results of the evaluation are successful, an appraisal plan will be carried out to complete the evaluation of the zone and to define the optimum parameters for the development of the area (well spacing, completion strategies, frac designs, etc). Tecpetrol started a drilling campaign in June 2016 with two vertical and seven horizontal wells for the exploration and evaluation of its blocks in this play.



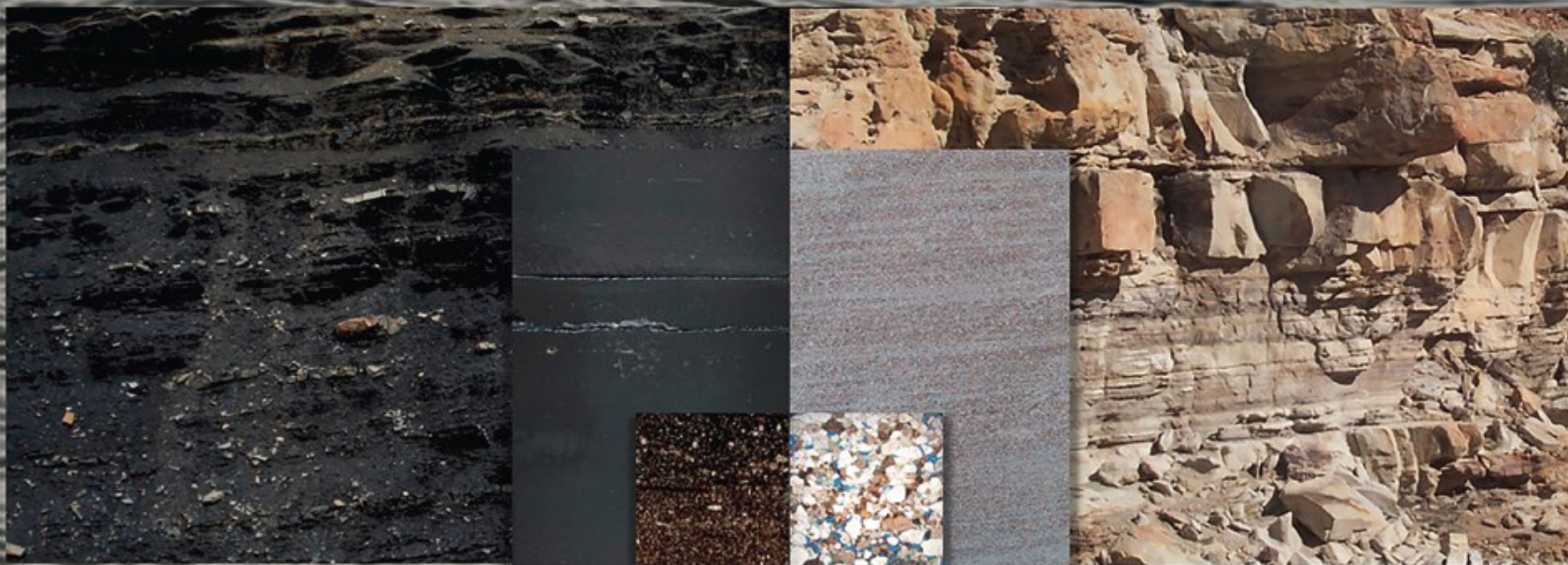
AAPG

Latin America & Caribbean Region

ARGENTINA 2016

Geosciences Technology Workshop

Co-hosted by the Argentine Association of Petroleum Geologists and Geophysicists



Moving toward the Prediction of Unconventional Plays: Lessons Learned from Tight and Shale Reservoirs in the Neuquén Basin



AAPG

Latin America & Caribbean Region

ARGENTINA 2016

Geosciences Technology Workshop

Co-hosted by the Argentine Association of Petroleum Geologists and Geophysicists

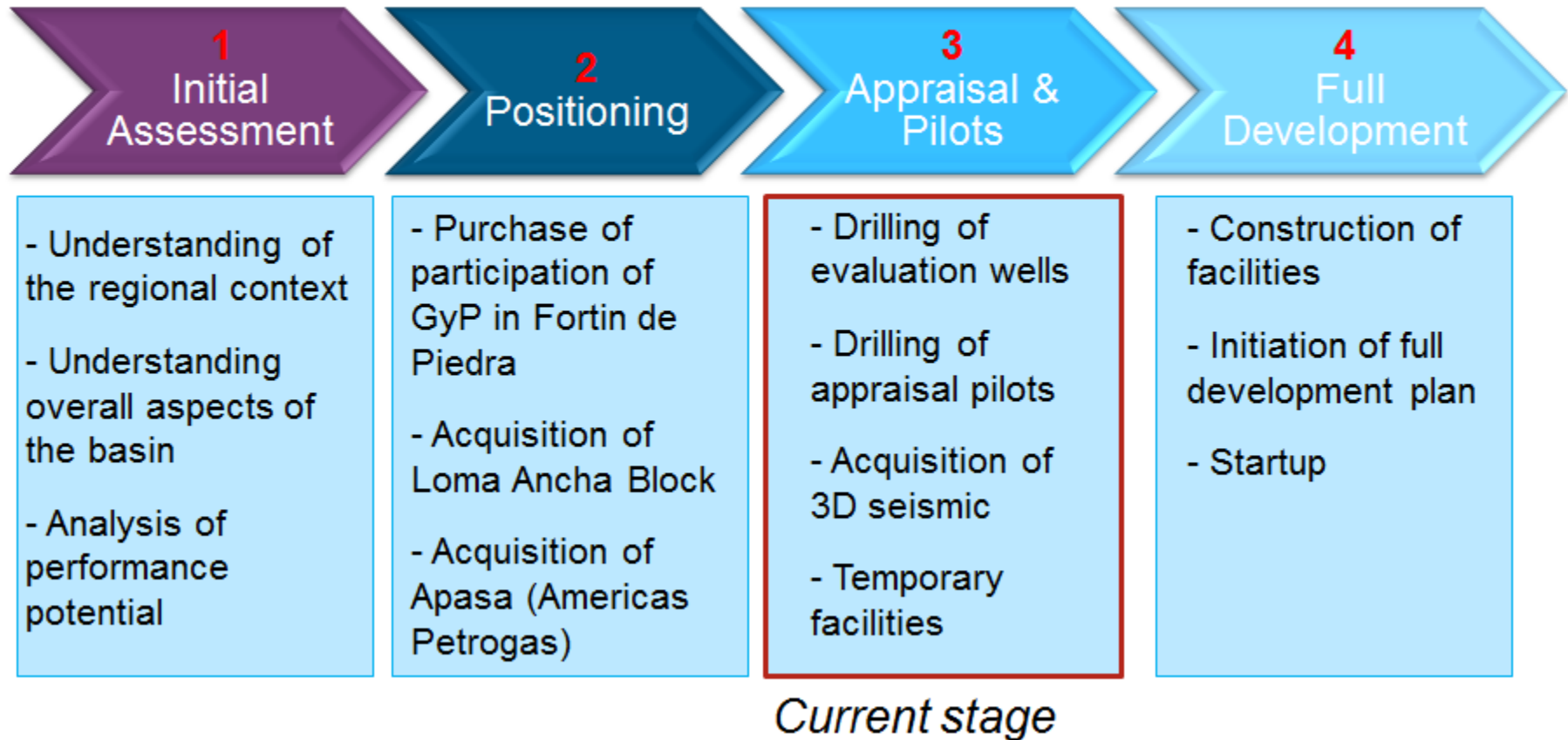


Challenges in Vaca Muerta: Tecpetrol Experience in the Exploration and Appraisal of the Play

Sebastian Olmos

– Tecpetrol

Stages of Involvement in Vaca Muerta Project



Stage 1- Initial Assessment

A) Understanding of the regional context

- Drilling & Completion best practices
- Service availability
- Infrastructure
- Regulatory framework
- Understanding of the Argentinean market and energy balance

B) Understanding of the overall aspects of the basin (G&G)

- Richness maps
- Maturity Windows
- Vaca Muerta Model
- Definition of areas of interest

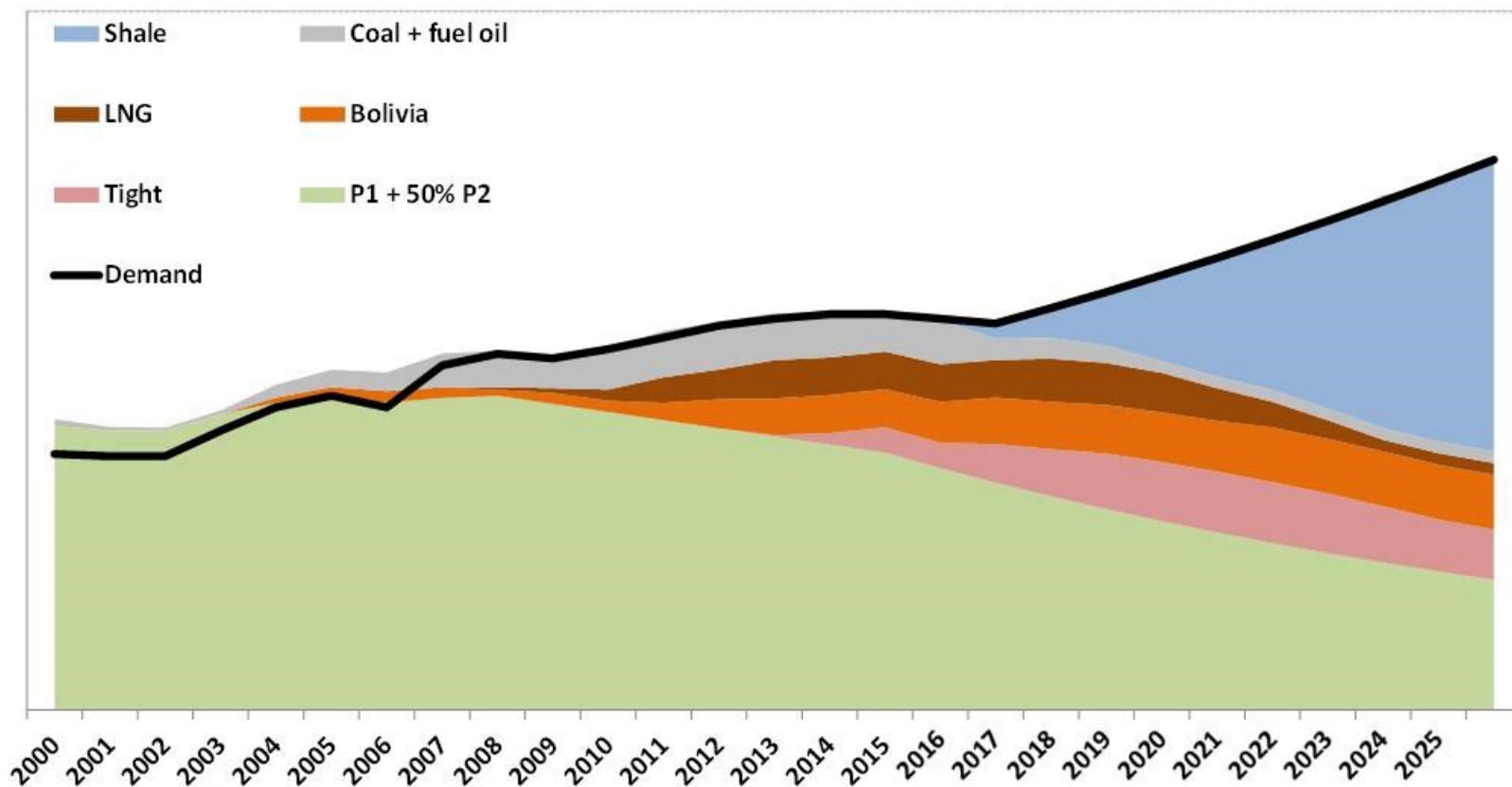
C) Analysis of performance potential

- Productivity per window
- Type wells
- Potential landing zones

a) Understanding of the regional context

Argentina Gas Demand & Production Forecast

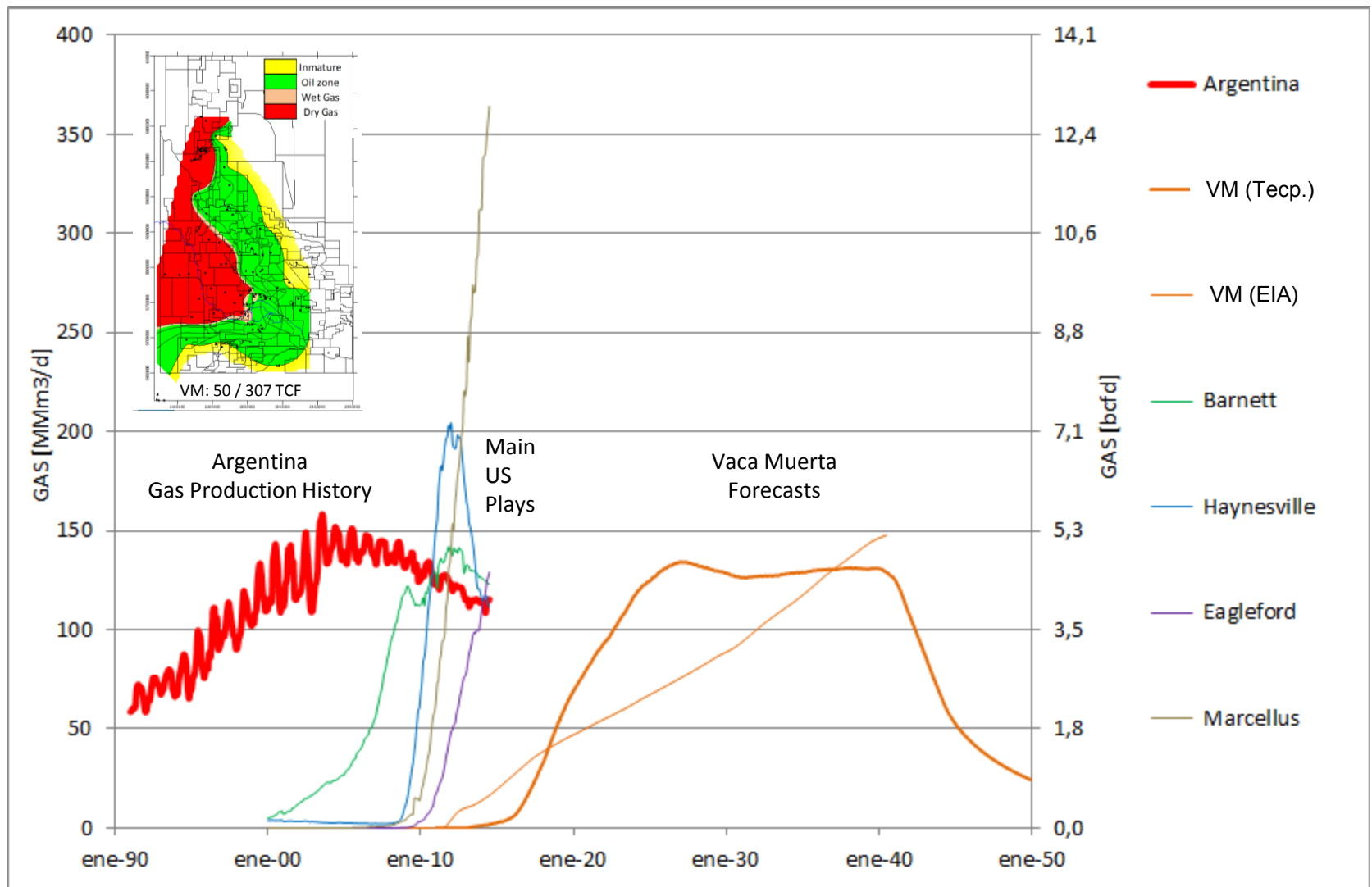
Gas [MMm3/d]



Shale gas resources are key to supply the projected demand

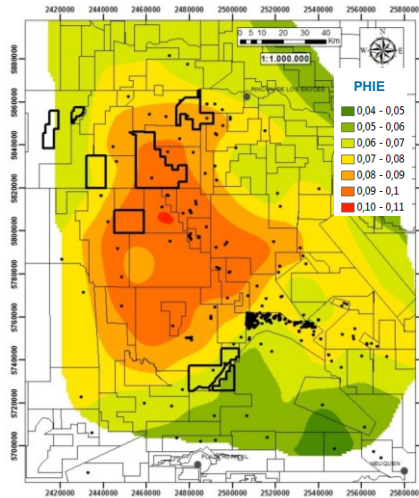
a) Understanding of the regional context

Vaca Muerta Forecasts vs US plays

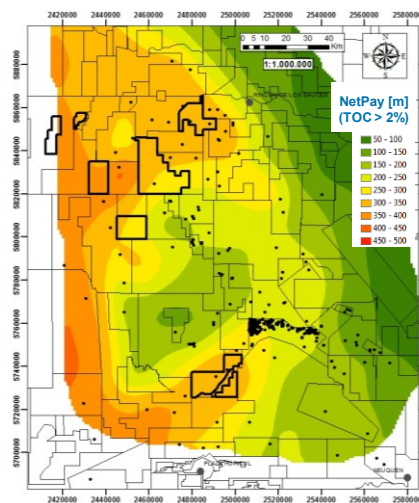


b) Understanding of the overall aspects of the basin Neuquen Basin – Regional Screening

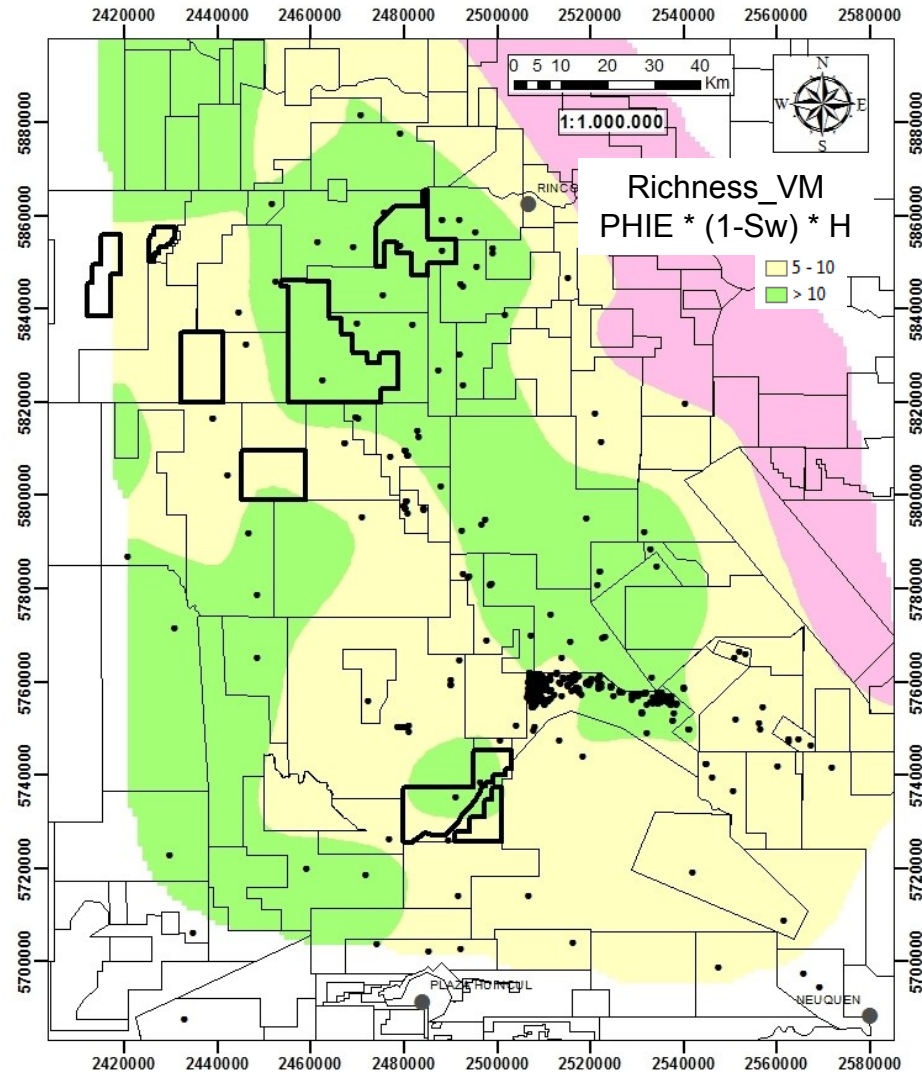
Average Porosity Map



Thickness Map (TOC > 2%)



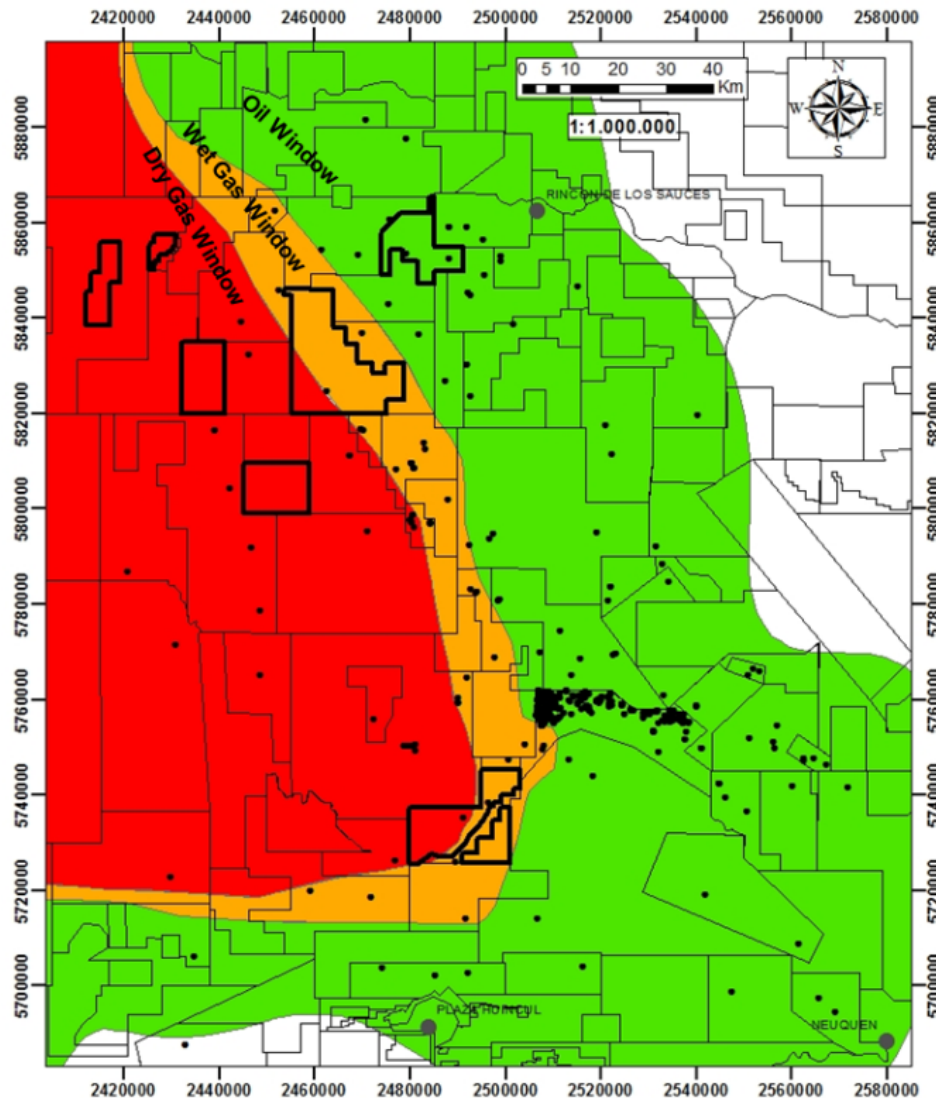
Richness Map Vaca Muerta



Areas with

- Thick VM
- High TOC
- High PHIE
- Low Sw
- Over P

b) Understanding of the overall aspects of the basin Vaca Muerta Fluid Windows



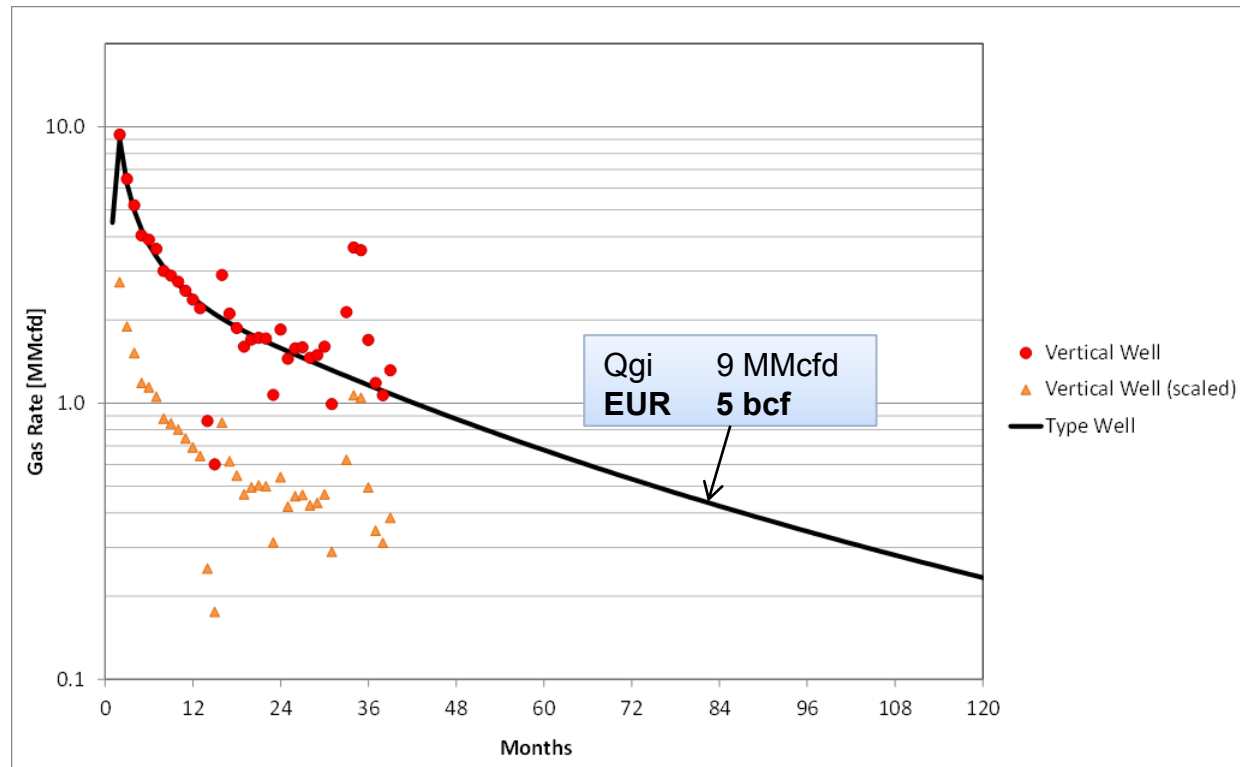
Objective

- Diversification
- Gas as a priority

c) Analysis of performance potential Productivity – Type Wells

Oil and Gas Type Wells (1500m lateral - 15 fracs)

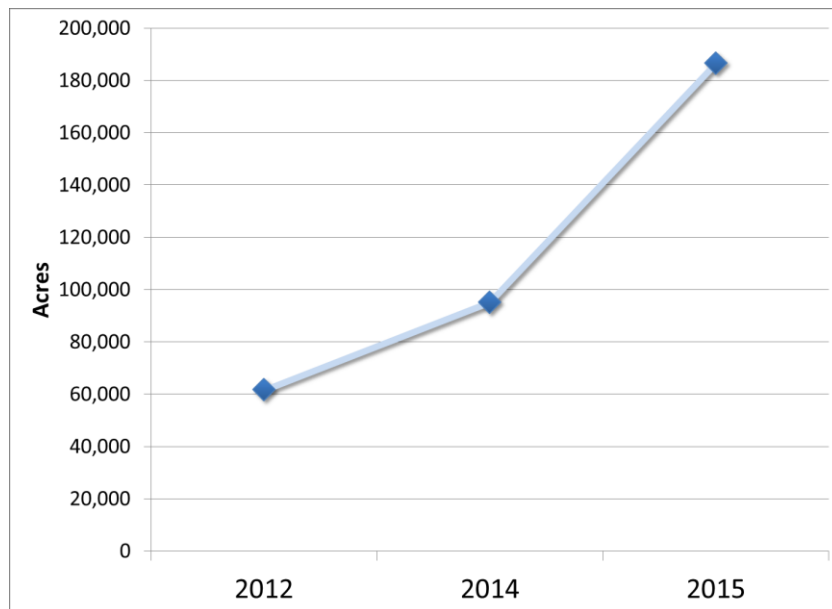
- Type wells estimated using public VM production data.
- Production calibrated for lateral length and number of stages.
- Validated with volumetric analysis. Unknown parameters (drainage area, recovery factor) assumed from US analogs.



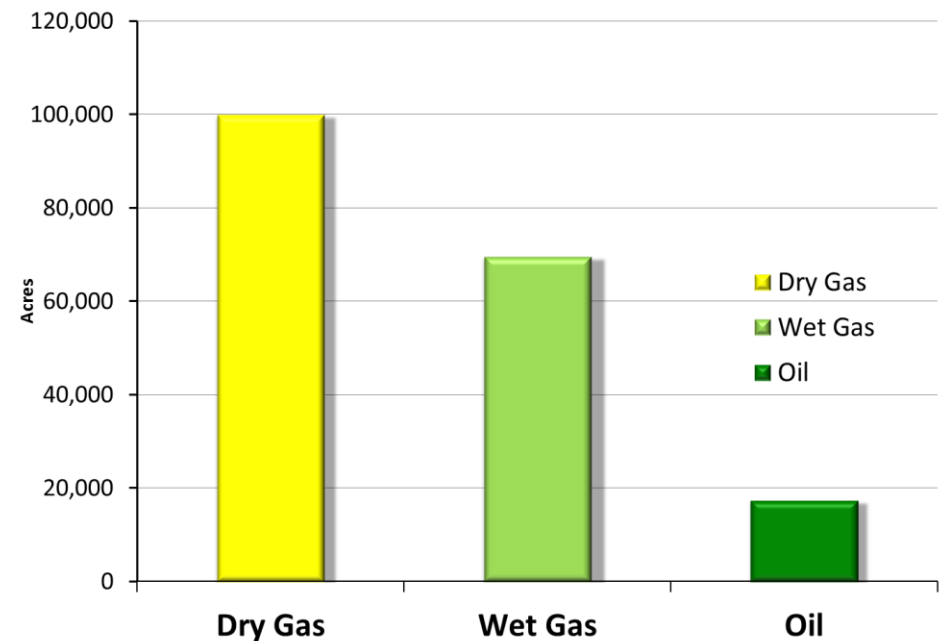
Stage 2 - Positioning

- Purchase of participation of GyP in Fortin de Piedra
- Acquisition of Loma Ancha Block
- Acquisition of Apasa (Americas Petrogas)

Tecpetrol acreage through time



Acreage according to type of HC



Positioning

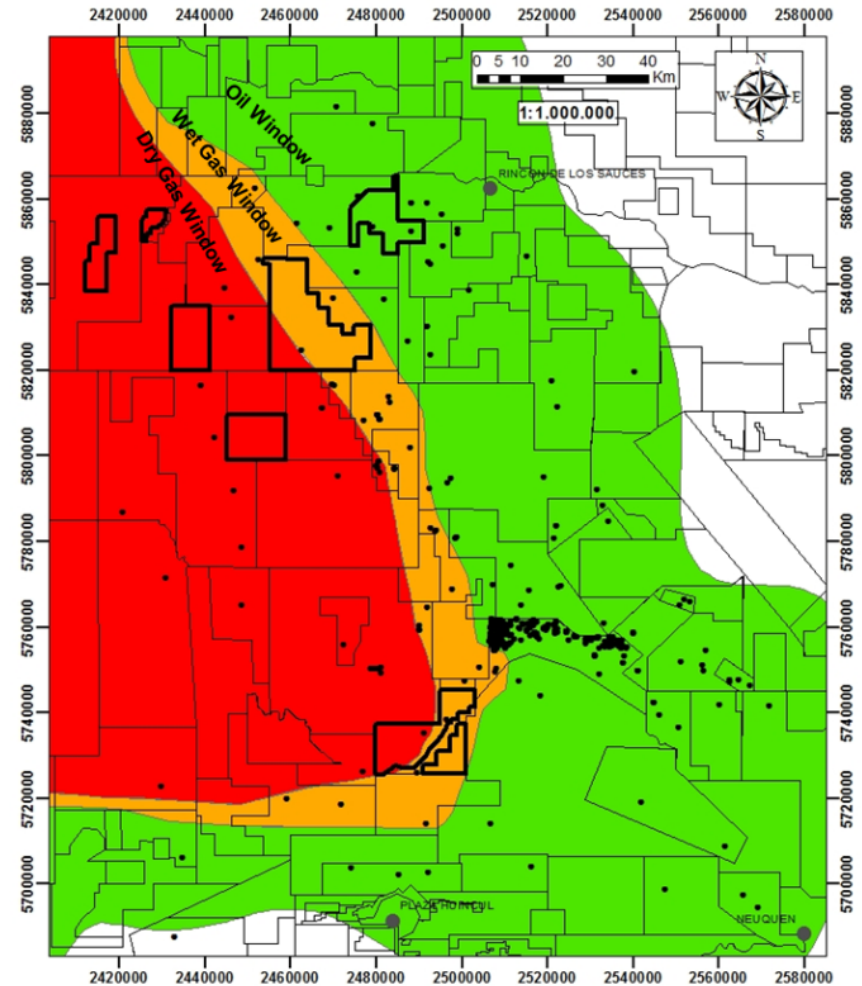
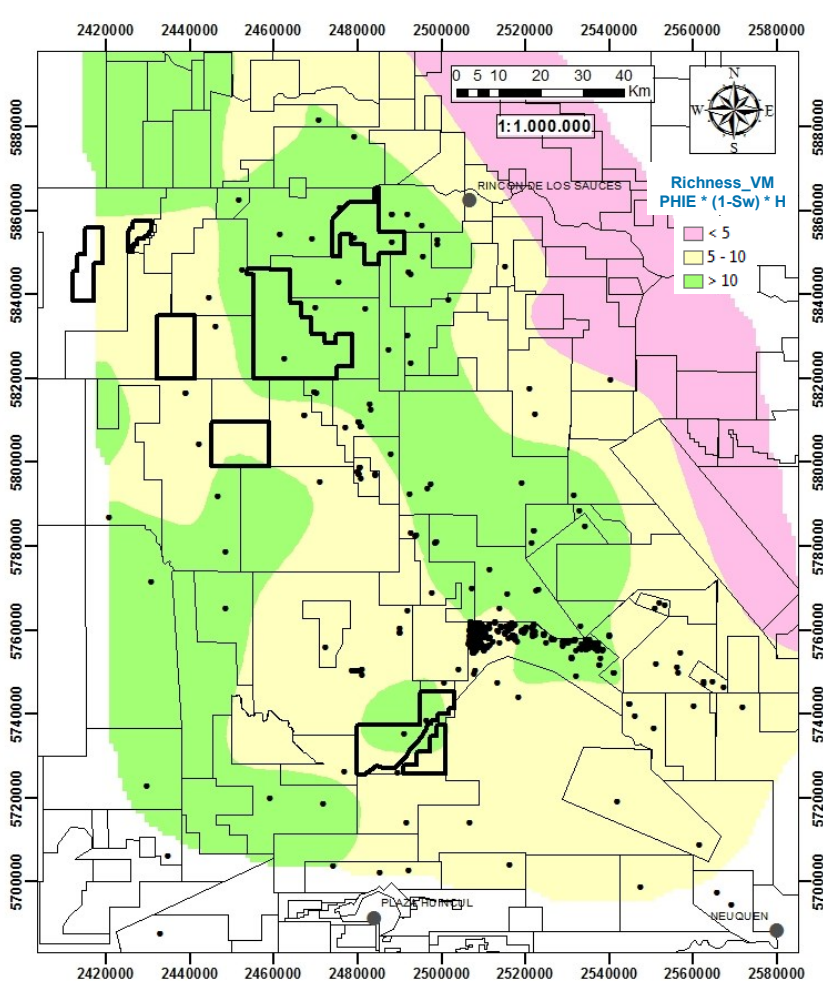
Tecpetrol's Blocks in Vaca Muerta

Block	WI %	Total Area(km2)	Type of HC	%	Area (km2)		Area (10^3 acres)	
					Gross	Net	Gross	Net
Fortín de Piedra	100	250	Dry Gas	46	114	114	28	28
	100		Wet Gas	54	136	136	33	33
Los Toldos I	45	398	Dry Gas	19	74	33	18	8
	45		Wet Gas	81	324	146	80	36
Los Toldos II	45	156	Oil	100	156	70	38	17
Loma Ancha	95	143	Dry Gas	100	143	136	35	33
Loma Ranqueles	90	135	Dry Gas	100	135	121	33	30
Totals					1080	756	267	187

Diversified portfolio of high quality blocks for Vaca Muerta

Positioning Tecpetrol's Blocks in Vaca Muerta

-) Diversified Portfolio: Presence in the Dry Gas, Gas-Condensate and Black Oil HC Windows.
-) Blocks situated in good quality VM areas: Thick Interval, High TOC, High PHIE, Low Sw, Over-P

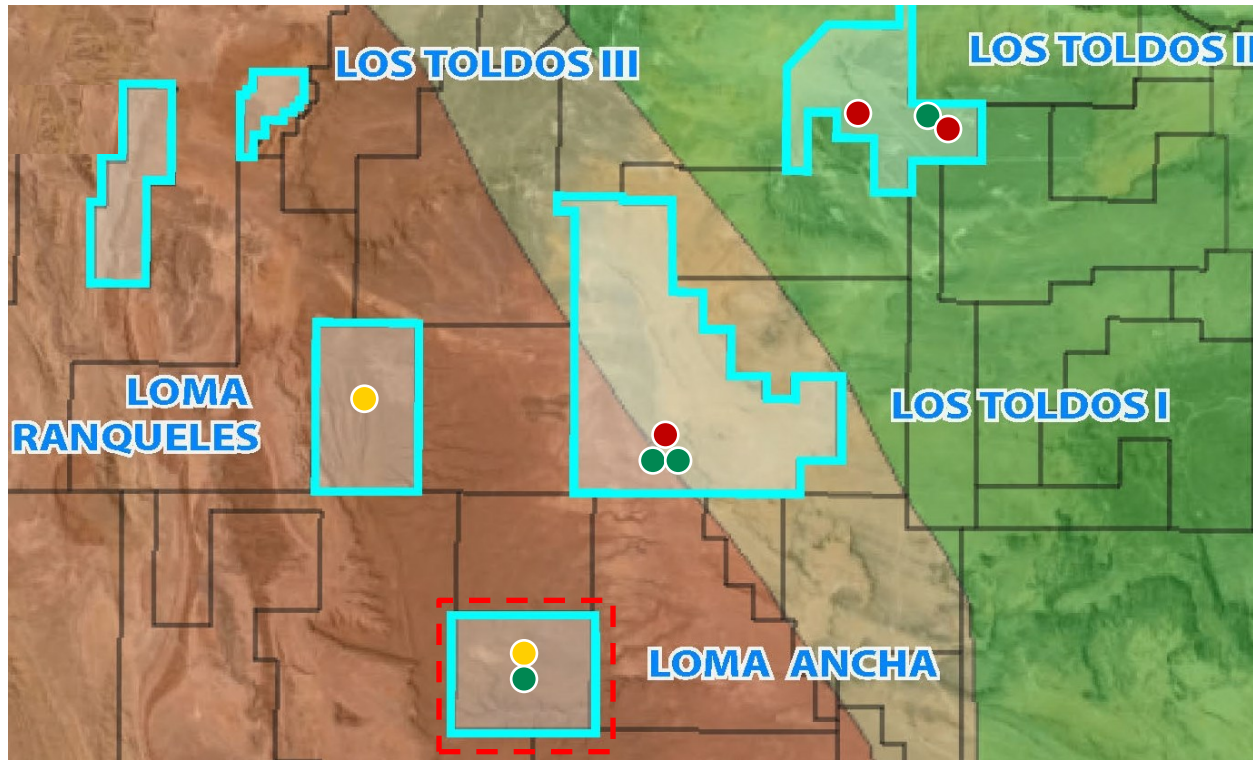


Stage 3 - Appraisal / Pilot Projects

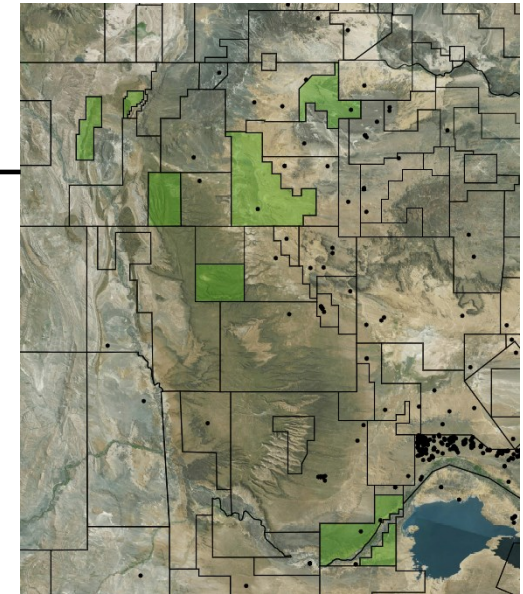
- Vertical evaluation wells (frac'd and tested) to characterize the entire Vaca Muerta interval and select potential landing zones.
- Horizontal evaluation wells to evaluate productivity of Vaca Muerta.
- Vertical pilots to adjust the structural model (geosteering) and to refine the characterization of Vaca Muerta throughout the blocks.
- Appraisal pilots to optimize development strategy (lateral length, well spacing, completions, landing zones).
- Acquisition of 3D seismic.
- Early Production Facilities

Appraisal / Pilot Projects

2016 - 2017 Activity

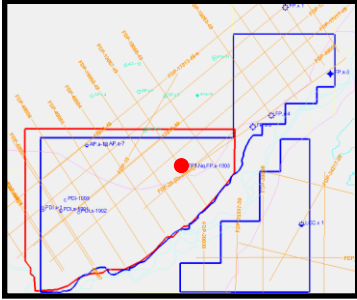


- Vertical well
- Horizontal well
- Prior VM vertical well
- 3D seismic



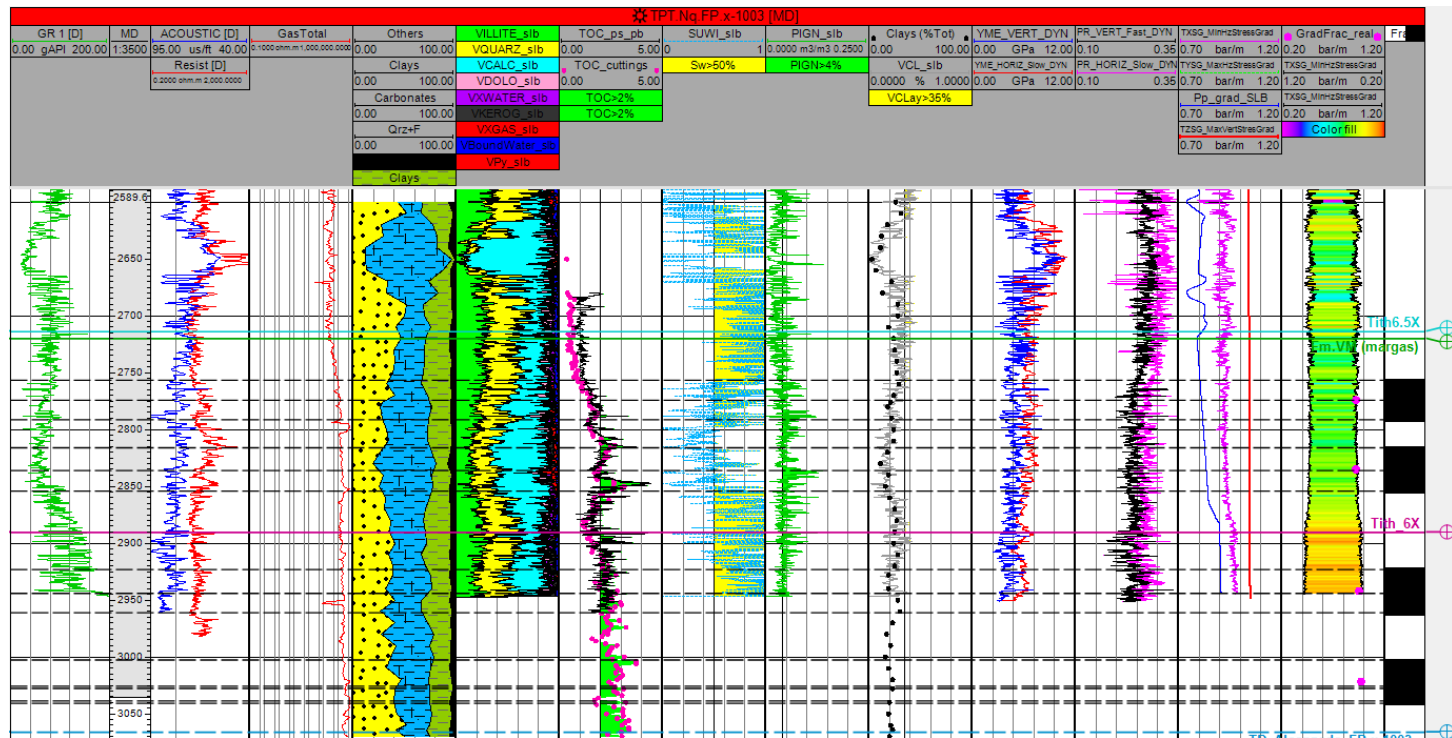
Appraisal / Pilot Projects

Workflow Fortin de Piedra – FPx-1003



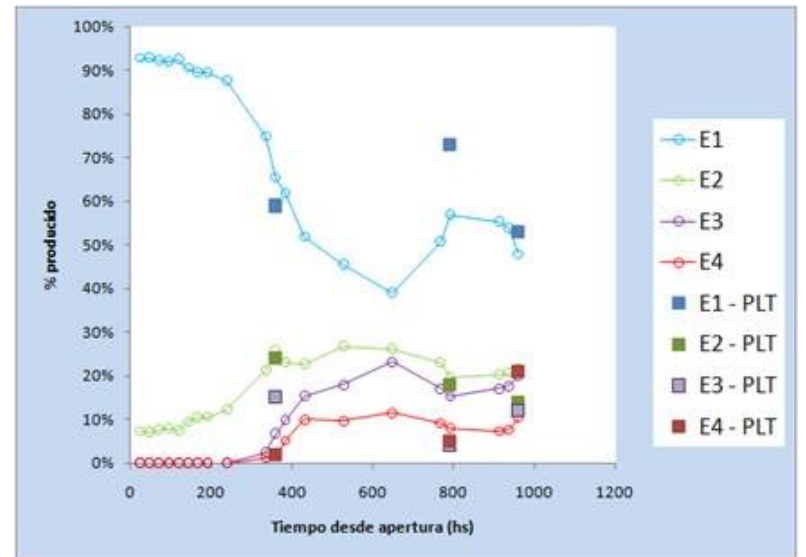
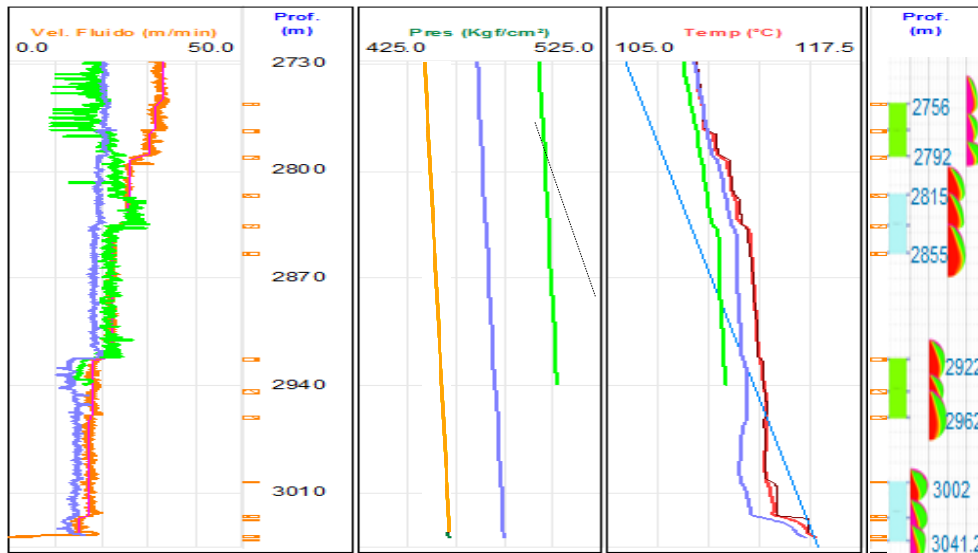
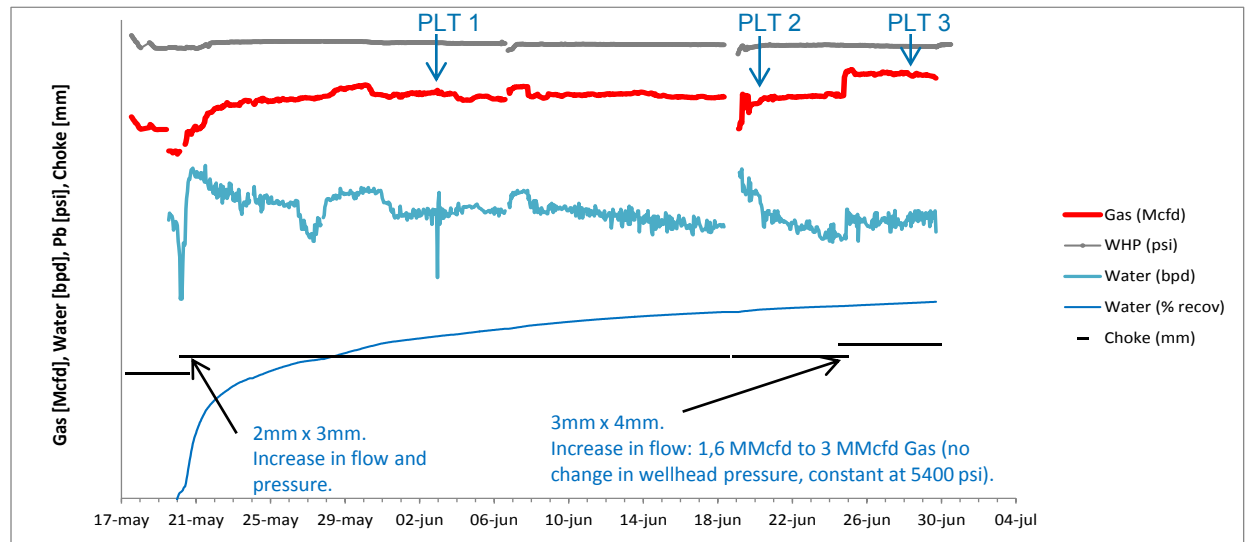
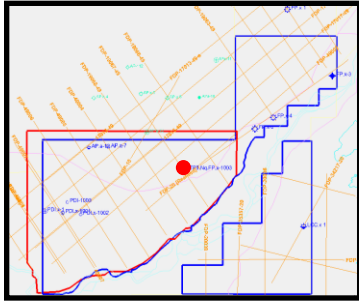
FP.x-1003 Competition Program

- Intervals selection with log data, cutting analysis and mudlog.



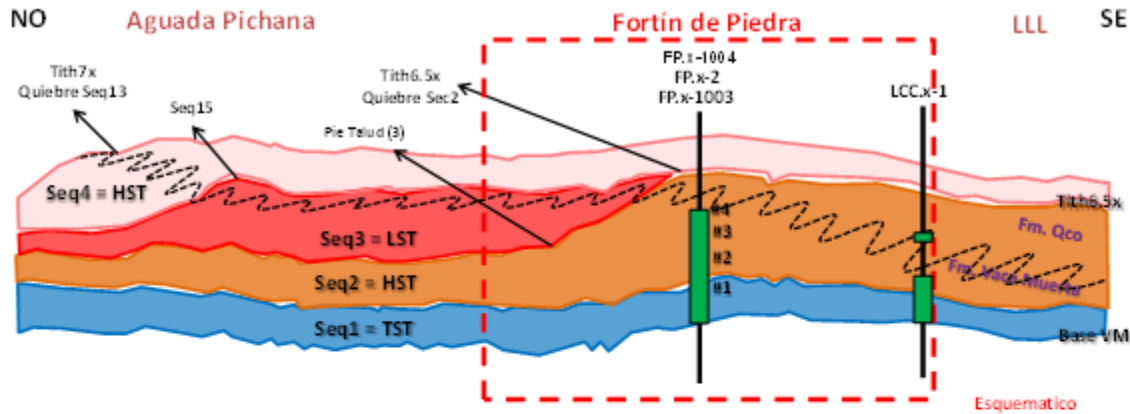
Appraisal / Pilot Projects

Workflow Fortin de Piedra – FPx-1003

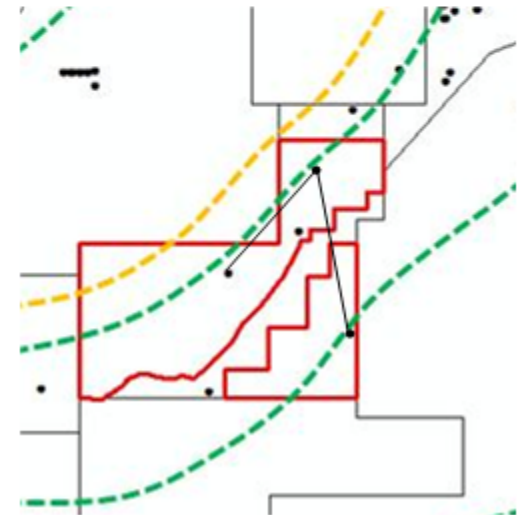
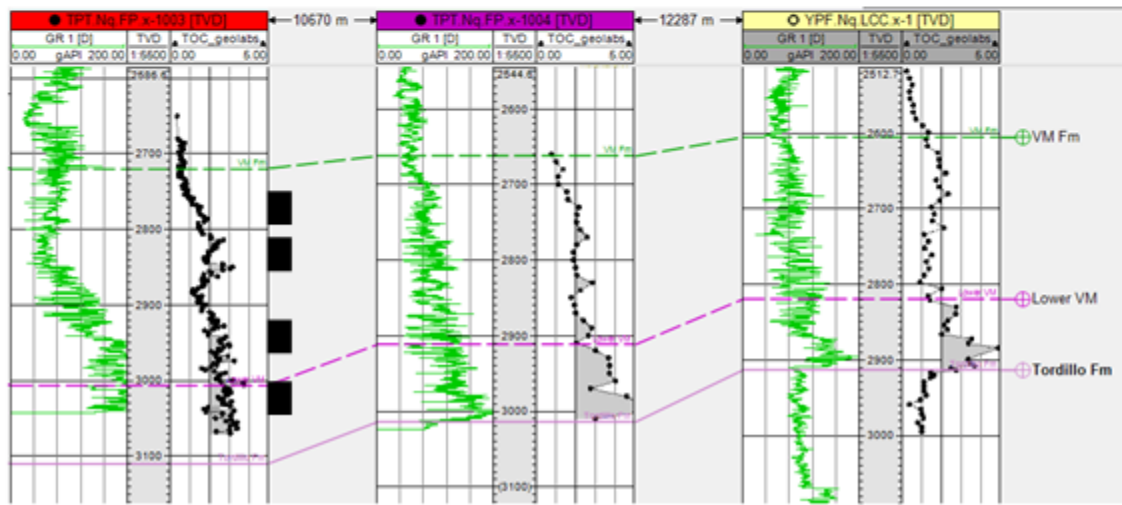


Appraisal / Pilot Projects

Workflow Fortin de Piedra – Landing Zone Selection

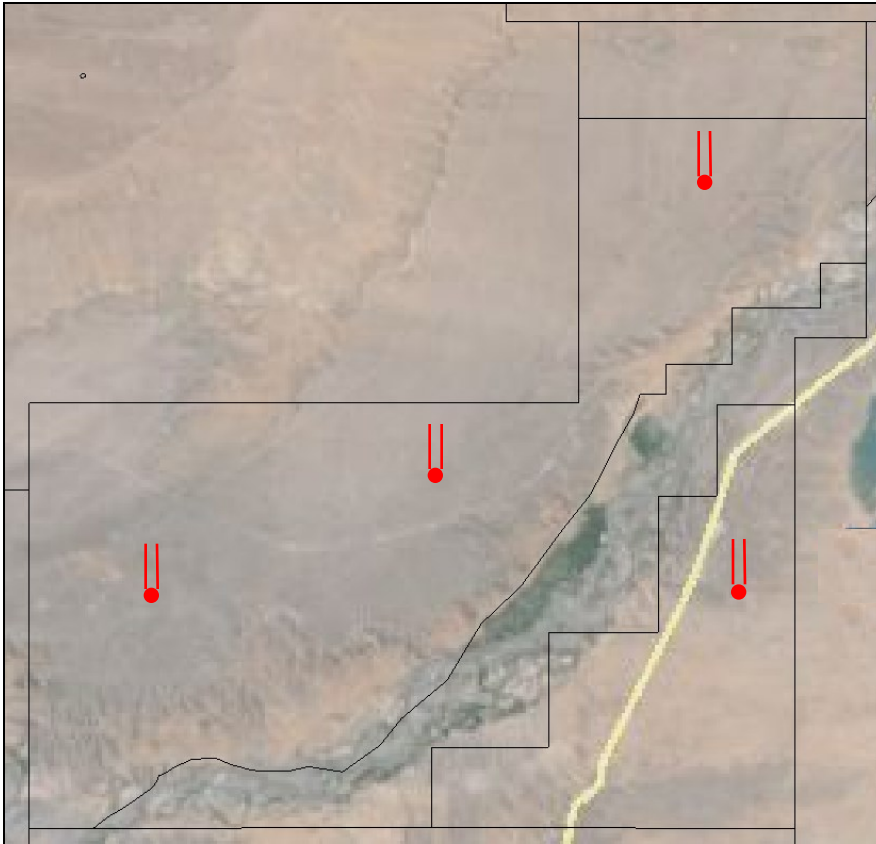


- Lower VM is the main target to be evaluated in the appraisal campaign.
- Additional potential landing zones in Upper VM.



Appraisal / Pilot Projects

Workflow Fortin de Piedra – Evaluation Wells

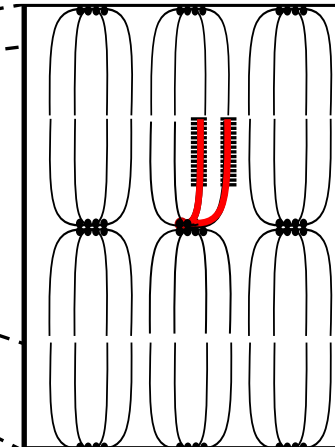
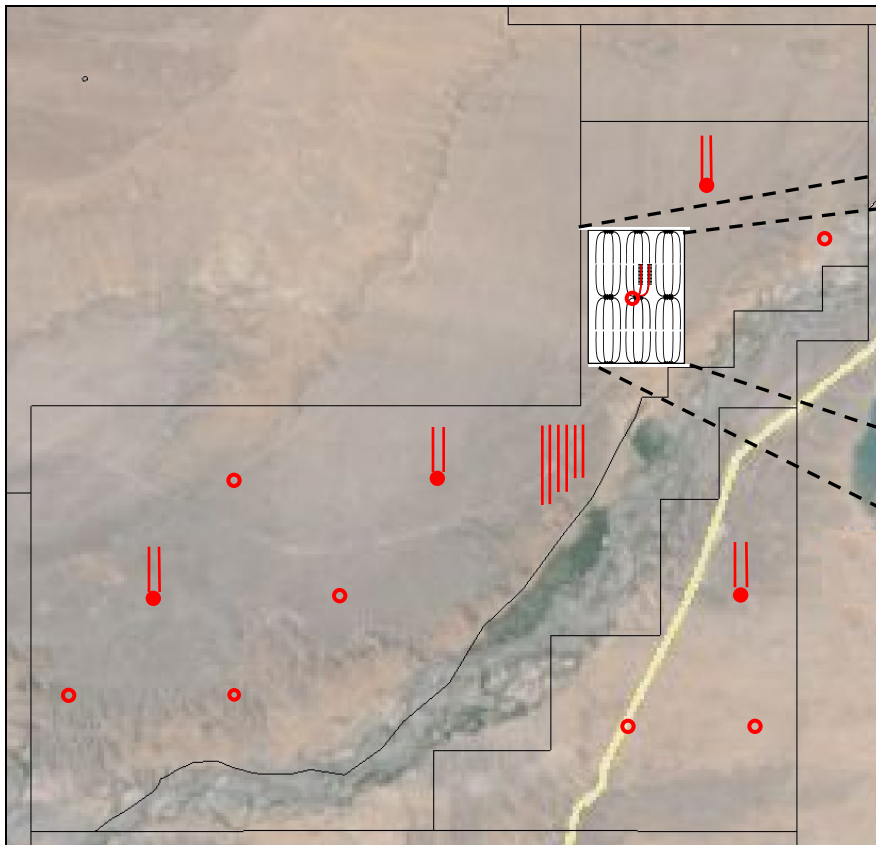


- Vertical evaluation wells (frac'd and tested) to characterize the entire Vaca Muerta interval and select potential landing zones.
- Horizontal evaluation wells to evaluate productivity of Vaca Muerta.

Appraisal / Pilot Projects

Workflow Fortin de Piedra – Pilots

- Vertical pilots for structural model and characterization of Vaca Muerta.
- Appraisal pilots to optimize development strategy (lateral length, well spacing, completions, landing zones).



16 km² Module

One vertical pilot well in each module

One vertical tested well every four modules

Stage 4 - Development

Below Ground Factors

- Size of Potential Reserves ↑
- Productivity →
- Well optimization →



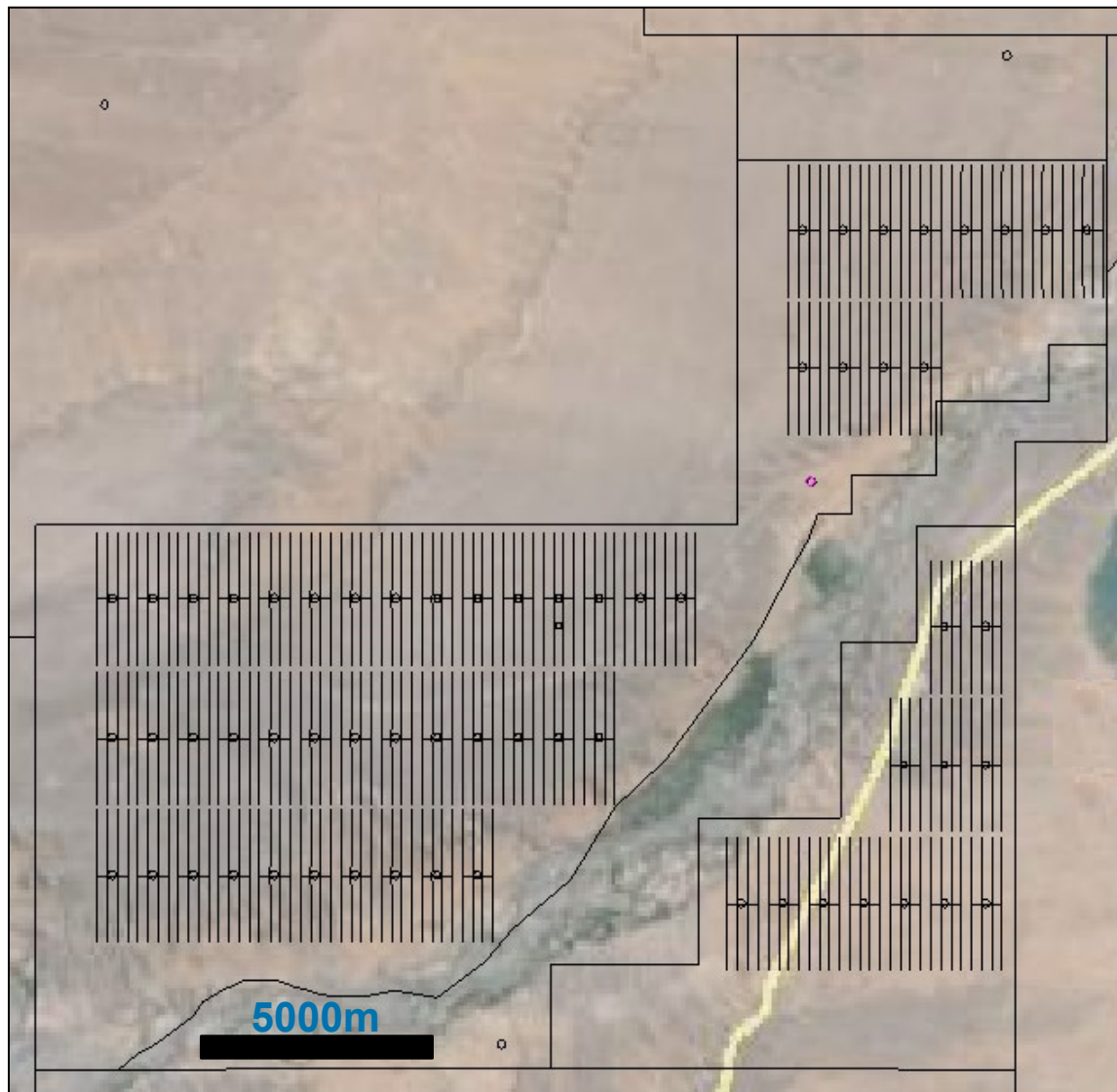
Above Ground Factors

- Fiscal Regime – Prices →
- Land Access / operability ↑
- Workforce →
- Service Sector →
- Distribution network →
- Market ↑



Development Phase

Drilling Activity Fortin de Piedra

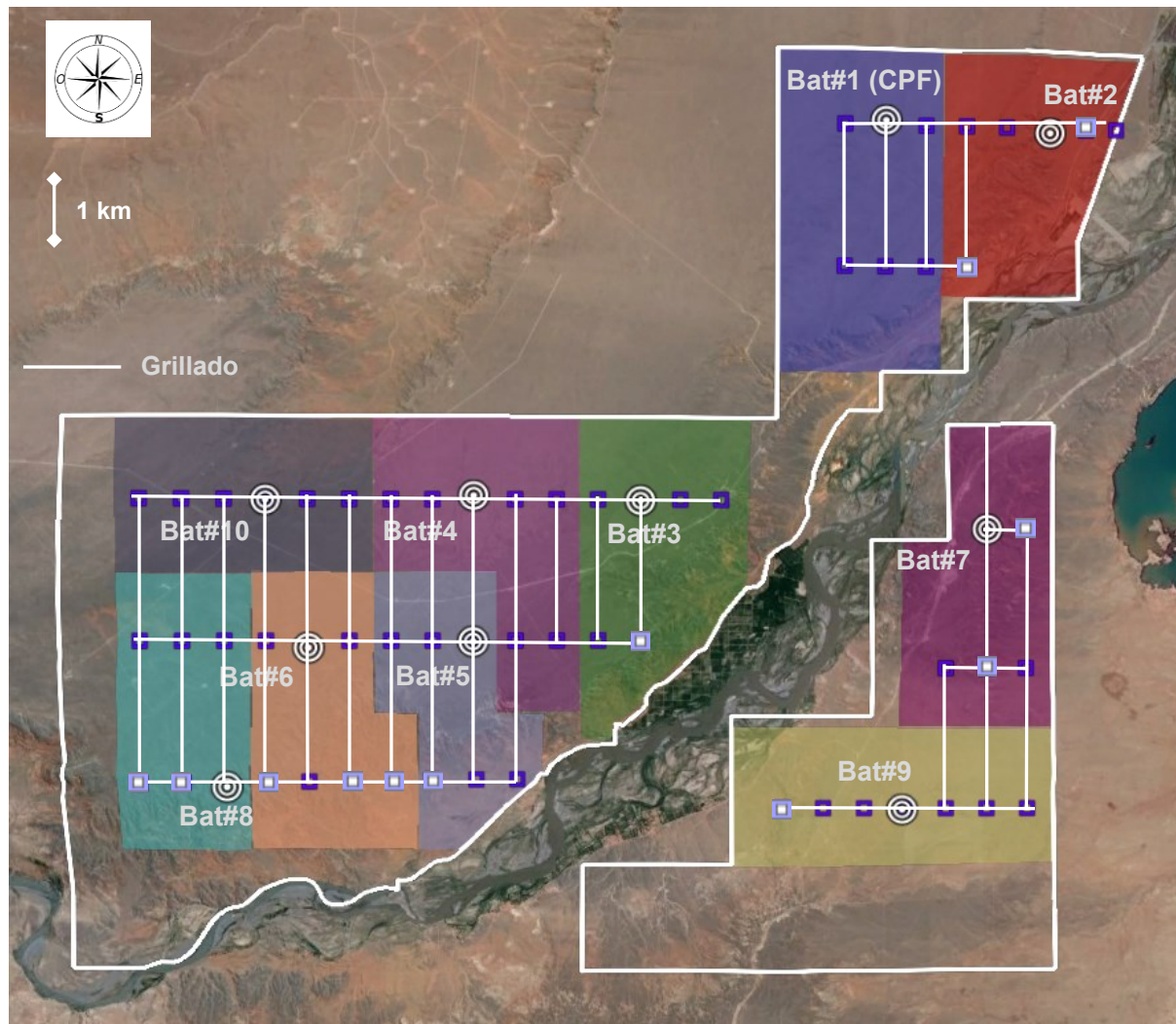


Multiwell Pad Development

- 80 acre spacing
- 500 wells
- 8 wells pads

Development Phase

Facilities Fortin de Piedra



10 Modular Bateries

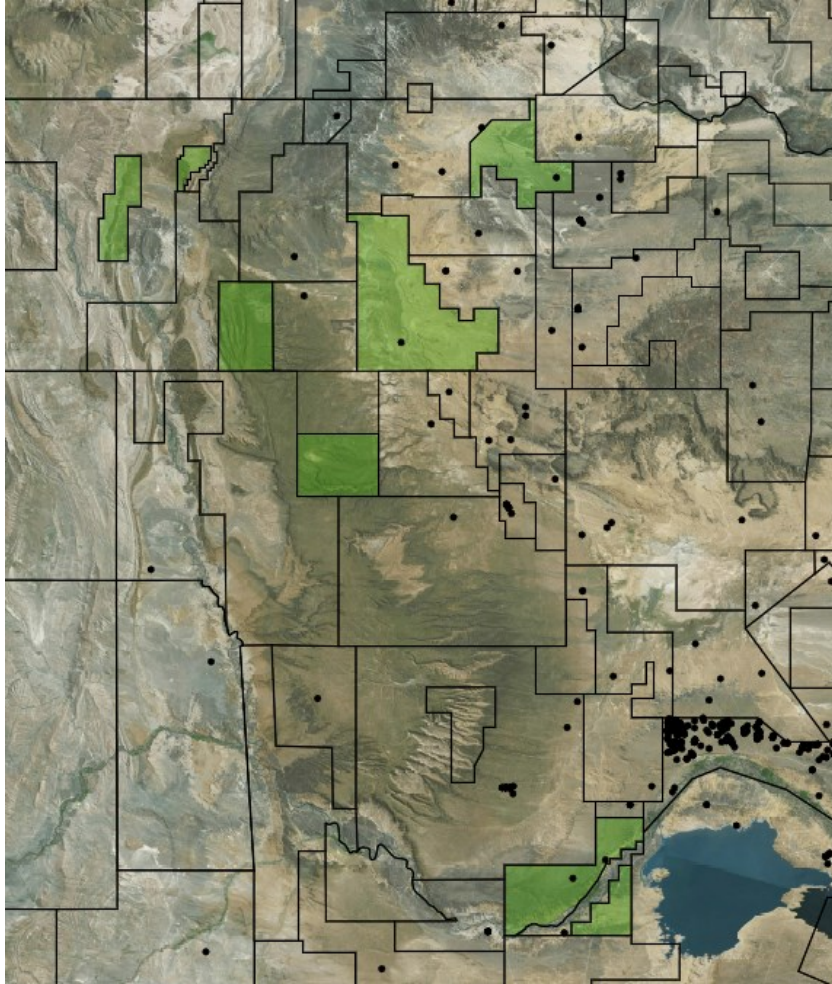
- Gathering & Separation
- Dehydration
- Compression

⊙ Batteries

▣ PADS (8 wells)

Tecpetrol's Experience in Vaca Muerta

Conclusions



Assesment

- Regional studies to understand overall aspects of the basin.

Positioning

- 187,000 net acres with 250 to 350 m of Net pay (TOC>2%) => Diversified Portfolio (Gas, condensate, oil) in good quality blocks.

Appraisal

- Moving fast in the appraisal stage with the drilling of vertical and horizontal wells to evaluate the productivity and the potential of the blocks.

Development

- Multiwell pad development will be started after successful results of the appraisal stage.



Tecpetrol

Energy that grows