

ONSHORE LOWER CONGO BASIN

Portfolio
OPPORTUNITIES

Block
CON8

Table of Contents

	INTRODUCTION.....	4
1.	Geographic Location.....	5
2.	Geological Settings.....	6
3.	Exploration History.....	9
4.	Petroleum System.....	12
4.1	Source Rock.....	12
4.2	Reservoir.....	12
4.3	Seal Rock.....	13
4.4	Trap.....	13
5.	Exploration Opportunities.....	14
5.1	Identified Leads.....	14
5.1.1	Pre-salt Leads.....	14
5.1.2	Post-salt Leads.....	15
6.	Final Remarks.....	18
7.	References.....	18

LIST OF TABLES

Table 1:	Drilled Exploration wells.....	8
-----------------	---------------------------------------	----------

LIST OF FIGURES

Figure 1:	Location Map of Block CON 2, ANPG 2022.....	5
Figure 2:	Geological map of Block CON 2, ANPG 2022.....	6
Figure 3:	Geological model of Block CON 2, ANPG 2022.....	7
Figure 4:	Wells Map of the Block CON 8, ANPG 2022.....	9
Figure 5:	2D seismic lines, ANPG 2022.....	10
Figure 6:	Magnetometry map Block CON 2, ANPG 2022.....	11
Figure 7:	Lithostratigraphic Column of the Onshore Congo Basin, ANPG 2022.....	12
Figure 8:	Quinzau Zone - Exudation, 2015.....	13
Figure 9:	Lead 1, ANPG 2022.....	14
Figure 10:	Lead 2, ANPG 2022.....	15
Figure 11:	Lead 3, ANPG 2022.....	15
Figure 12:	Lead 4, ANPG 2022.....	16
Figure 13:	Lead 5, ANPG 2022.....	16

Introduction

The portfolio of opportunities describes the general characteristics of Block CON 8, presenting the main geological and geophysical aspects from the exploration history, petroleum system, and a series of opportunities identified in the block. This characterization is the result of the survey and framing of existing data, which allowed the seismic interpretation and the elaboration of the geological model by the ANPG/DEX team.

The Lower Congo Basin is known for its onshore and offshore exploration history of two significant plays, Pre-salt and Post-salt (Albian). The petroleum system in the pre-salt comprised the shales of the Bucomazi Formation as source rock, the sands of the Lucula Formation, carbonates of the Toca Formation, and the sands of the Chela Formation as the main reservoir, and the seal rock is composed mainly of salt of the Loeme Formation. In the Post-salt, the Pinda Albian source rock comprises carbonate facies with significant quantities of organic-rich matter. As a reservoir, the shale of the Iabe Formation seals the same formation's carbonates, and the trap types are combined.

Block CON 8 is in the southern part of the Basin. The first exploration works date to 1969 by Petrangol, Angol, and Texaco, drilling four (4) exploration wells: Quinzau-1, Quinzau-2, Ngondo-4, and Ngondo-7. Alrosa conducted a 2D seismic survey that partially covered the northern part of Block CON 8. The magnetometry and gravimetry surveys allowed us to delineate the structuring in all block extensions (Figure 5).

Structures with possible hydrocarbon accumulation at Pre-salt and Post-salt levels were identified. The leads identified from integrating geological and geophysical data present estimated prospective resources of 870 to 1 909 MMBO.

1. GEOGRAPHIC Location

The **Block CON 8** is in the western portion of the Lower Congo onshore basin, in the Tomboco region. It is limited to the North by Blocks CON 6 and CON 7, to the South by Block CON 10, to the East by Block CON 9, and to the West by Offshore Block 2, defined by parallel $12^{\circ}52'59.00''$ S and meridians $6^{\circ}38'59.00''$ to $7^{\circ}00'56.00''$ E covering a total area of approximately 757.75 Km^2 .

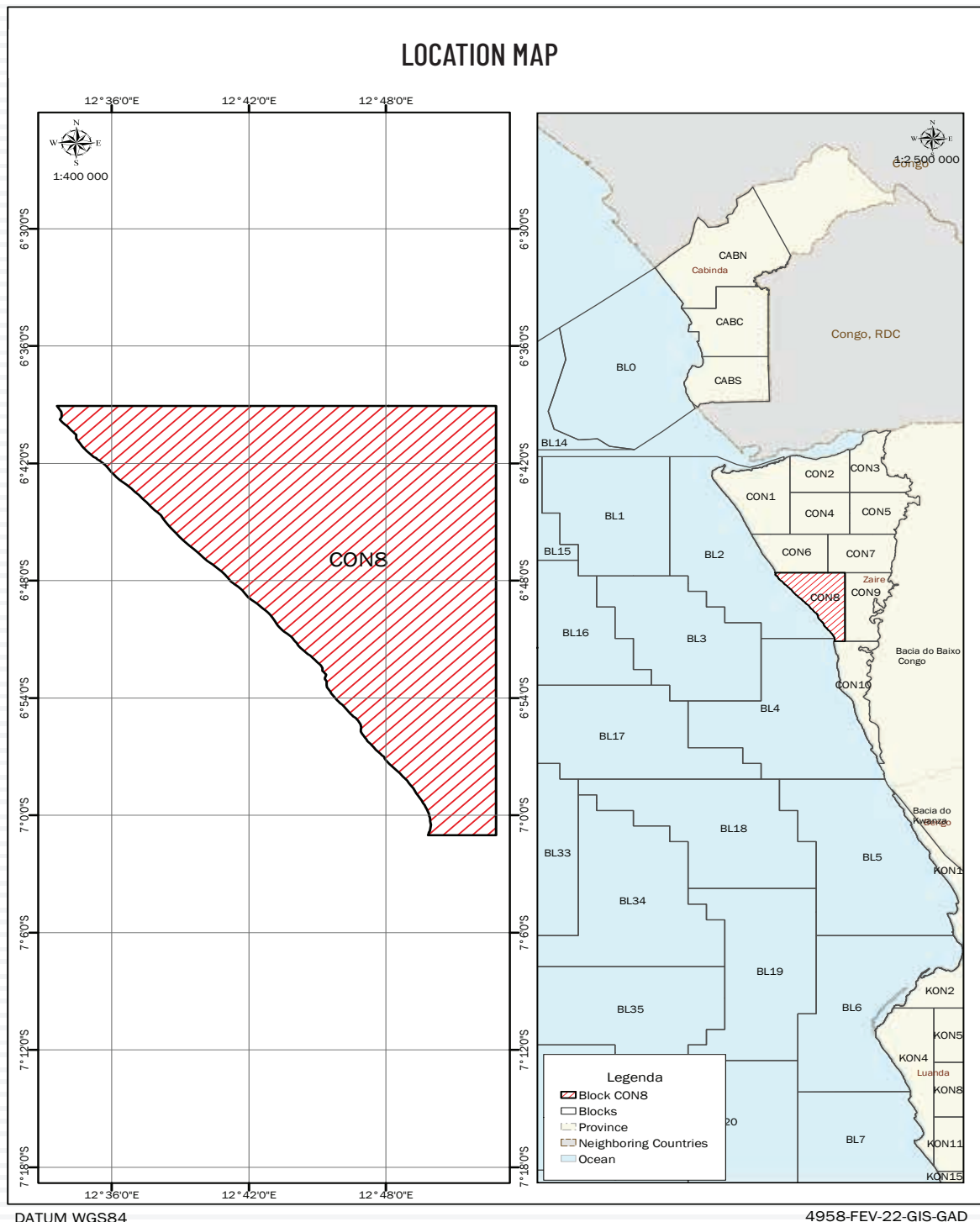


Figure 1: Location Map of Block CON 8, ANPG 2022

2. GEOLOGICAL Settings

The outcrops of Block CON 8 are represented by sediments of Albian to recent age, according to the geological chart of the Onshore Congo Basin (Figure 2). Block CON 8 is part of the Inner portion of the Lower Congo Basin. Its sedimentary history is characterized by paleoenvironmental variations between continental, transitional, and marine environments, in which two (2) lithostratigraphic units are evident: Pre-salt and Post-salt play.

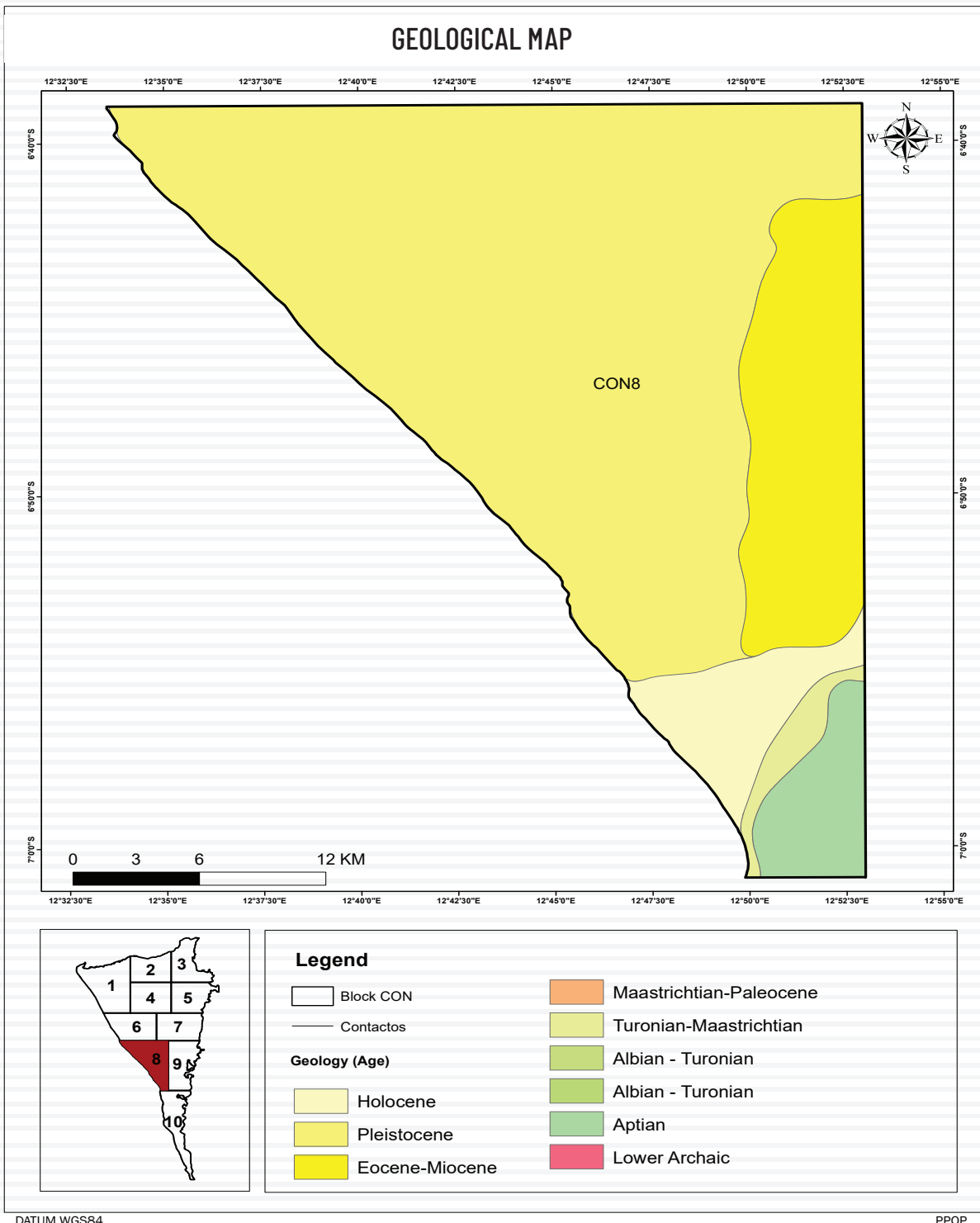


Figure 2: Geological map of the Block CON 8, ANPG 2022

Pre-salt Unit

Characterized by a strongly faulted basement, with structural highs and lows "horst and grabens" as a consequence of rift tectonics due to the opening of the South Atlantic. In the grabens, fine sediments rich in organic matter of the Bucomazi Formation were deposited, forming the source rock of this unit.

The reservoirs in the pre-saliferous sequence are the sandstones on the pinch-out horst flanks, the Toca Formation carbonates deposited on top of the horst, and the sands of the Chela Formation.

At the beginning of the Aptian, with the influence of the first marine incursions and high temperatures, a lagoonal depositional system developed in which the salt layer representing this unit's primary seal rock was deposited.

Post-salt Unit

The Post-saliferous unit is represented by extensional structures resulting from salt tectonics and sedimentary overburden, a series of listric normal faults, and roll-overs structures bounded by faults at the Albian level.

The argillaceous, calcareous sediments "calcilutites" of the organic-rich Pinda Formation correspond to the Albian source rocks. Fractured dolomitic limestones and sandstones comprise the primary reservoir rocks and the clays of the Iabe Formation of the Upper Cretaceous as the seal rock.

The Upper Cretaceous was marked by major marine transgressions, which led to the deposition of vast amounts of pelagic sediments such as marls, gray clays, brown limestones and micaceous siltstones, and sandstones deposited during minor marine regressions. The clays at the Upper Cretaceous level of the Iabe Formation are proven source rock.

GEOLOGICAL MODEL

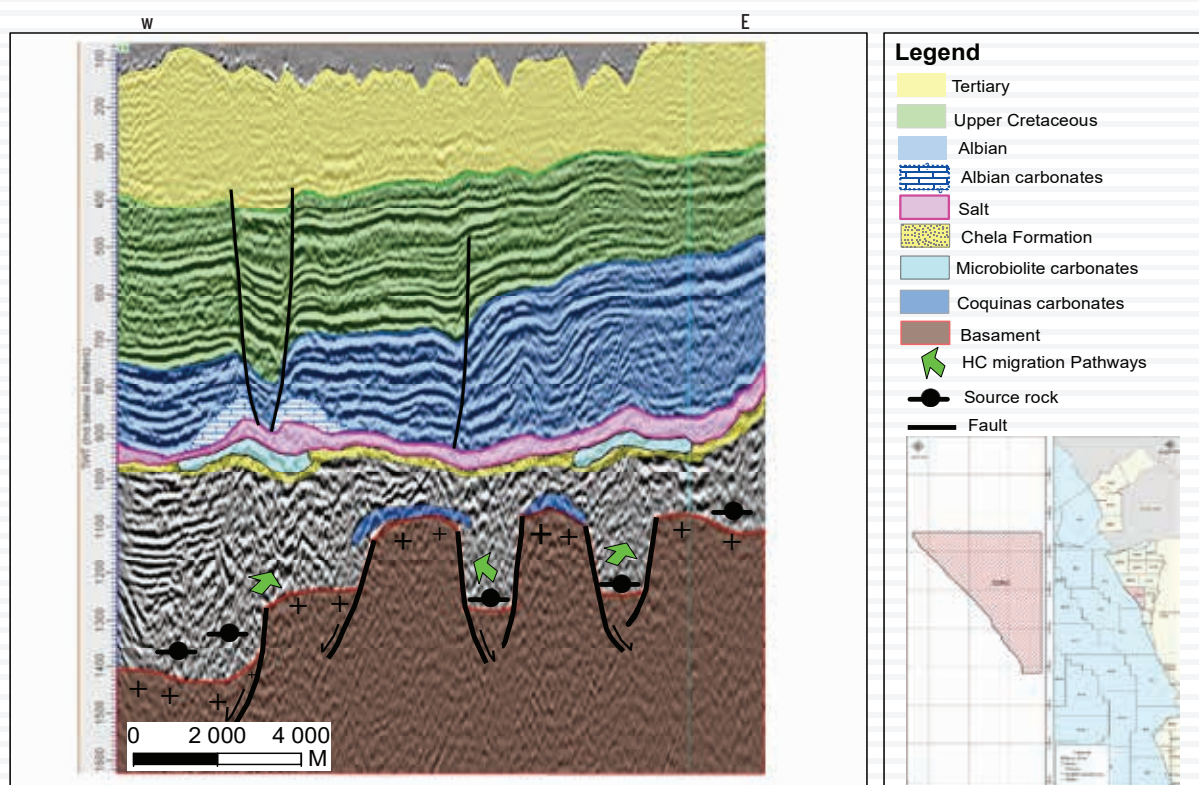


Figure 3: Geological model of Block CON 2, LCO-511-03, ANPG 2022

3. EXPLORATION History

The first exploration works in the Block date to 1969 by the companies Petrangol, Angol, and Texaco, with the drilling of four (4) exploration wells: Quinzau-1, Quinzau-2, Ngondo-4, and Ngondo-7.

Between 2008 and 2009, Alrosa acquired 2D seismic coverage of approximately 397,783 km, partially covering the northern part of the block with 63,227.74 linear km of seismic line.

In 1998 ENI and 2009-2012, Geokinectics conducted aero gravimetric and magnetometric surveys of the basin (Figure 5).

The Quinzau-1 well had as objectives the reconnaissance of the stratigraphic series up to the basement and the identification of Pre and Post salt petroleum opportunities, reaching a final depth of 1350.5 m. The carbonate reservoirs of the Pinda Formation at the Albian level showed evidence of oil (Table 1).

Well	WD (m)	TD (mMD)	Spud	Reservoir (Objectives)	Results
Quinzau-1	N/A	1350,5	04/05/ a 22/06 de 1969	Primary: Albian Carbonates	Oil shows
				Secondary: Chela Sandstone	
Quinzau-2	N/A	1275,5	N/A	Pinda Fm.	Dry
Ngondo-4	N/A	N/A	N/A	Pinda Fm.	Oil shows
Ngondo-7	N/A	N/A	N/A	Pinda Fm.	Oil shows

Table 1 Drilled Exploration wells n the Block **CON 8**

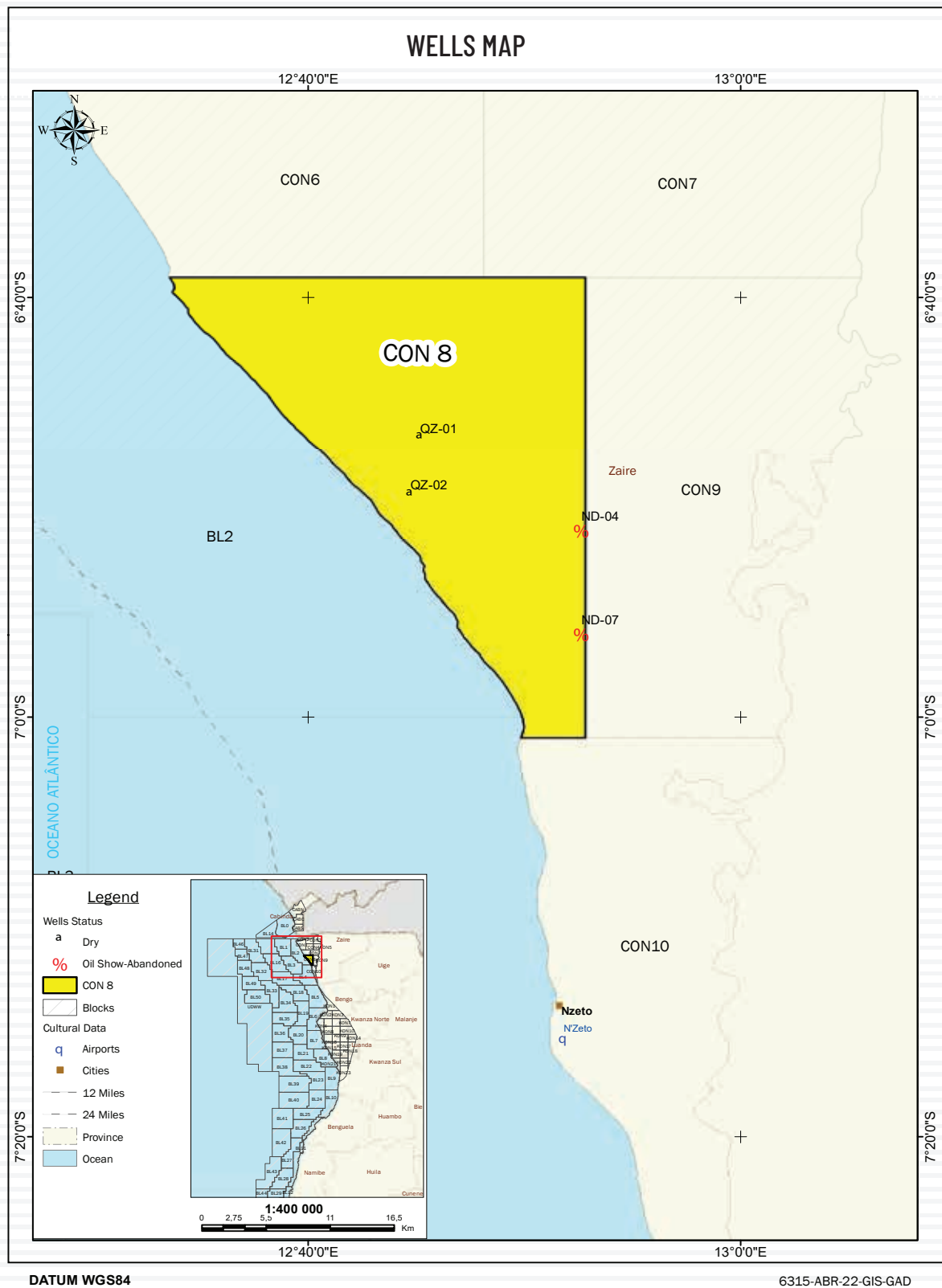


Figure 4: Wells map of Block CON 8, ANPG 2022

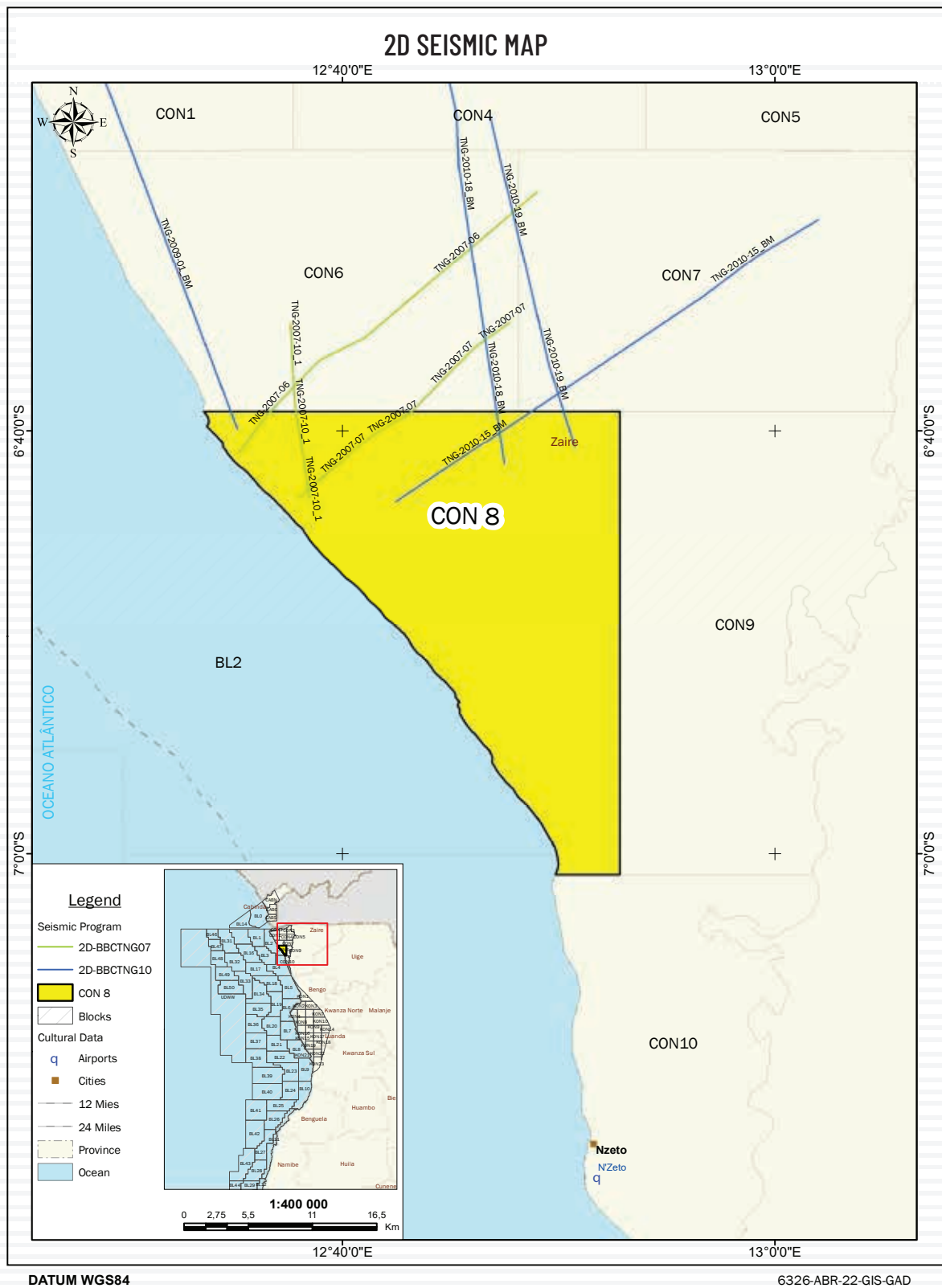


Figure 5: 2D seismic lines, ANPG 2022

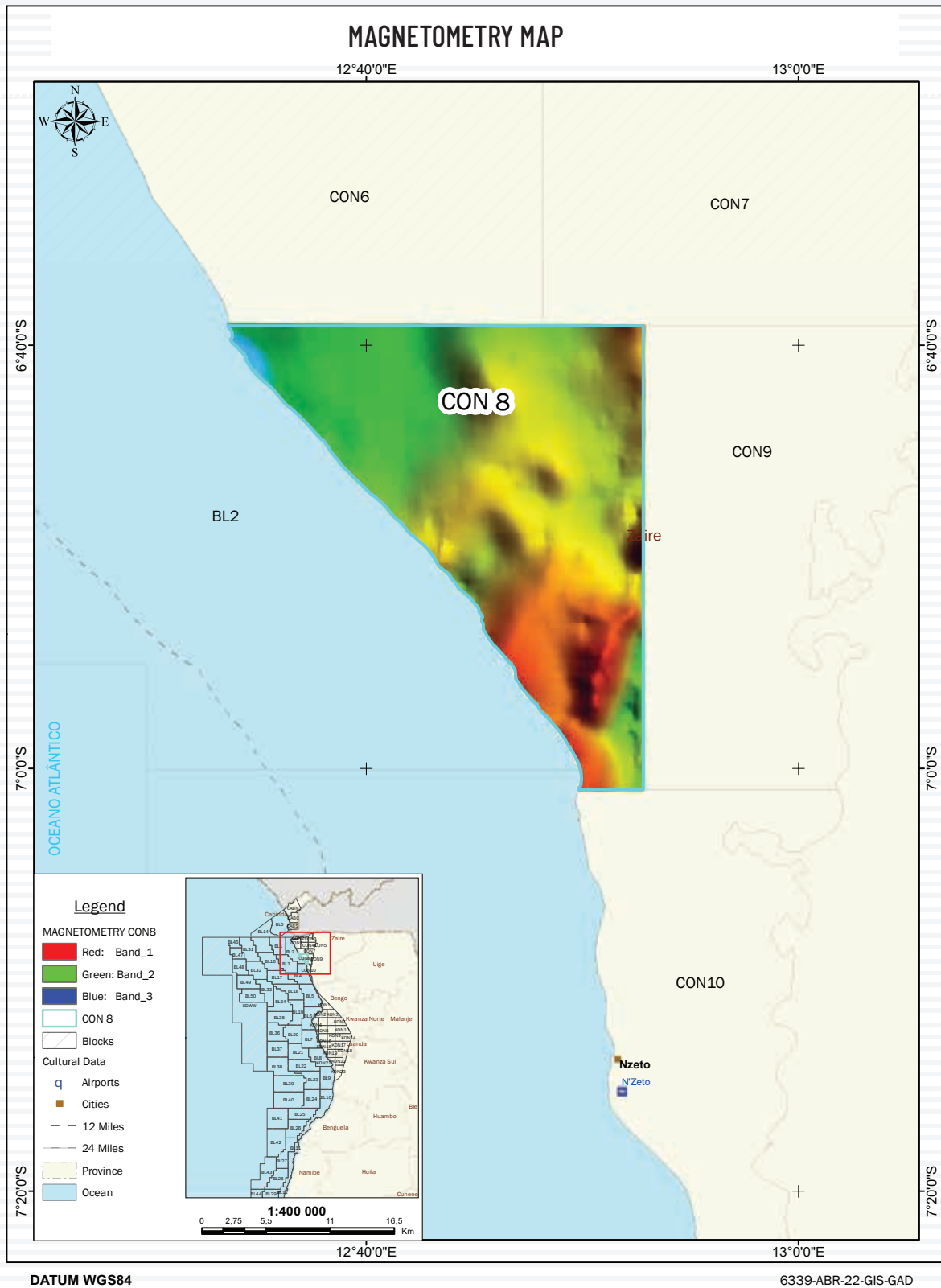


Figure 6: Magnetometry map Block CON 8, ANPG 2022

4. PETROLEUM System

Based on the results of the wells drilled along the block, it was possible to determine the lithostratigraphy and describe the petroleum system of the two mega-sequences (Pre-salt and Post-salt).

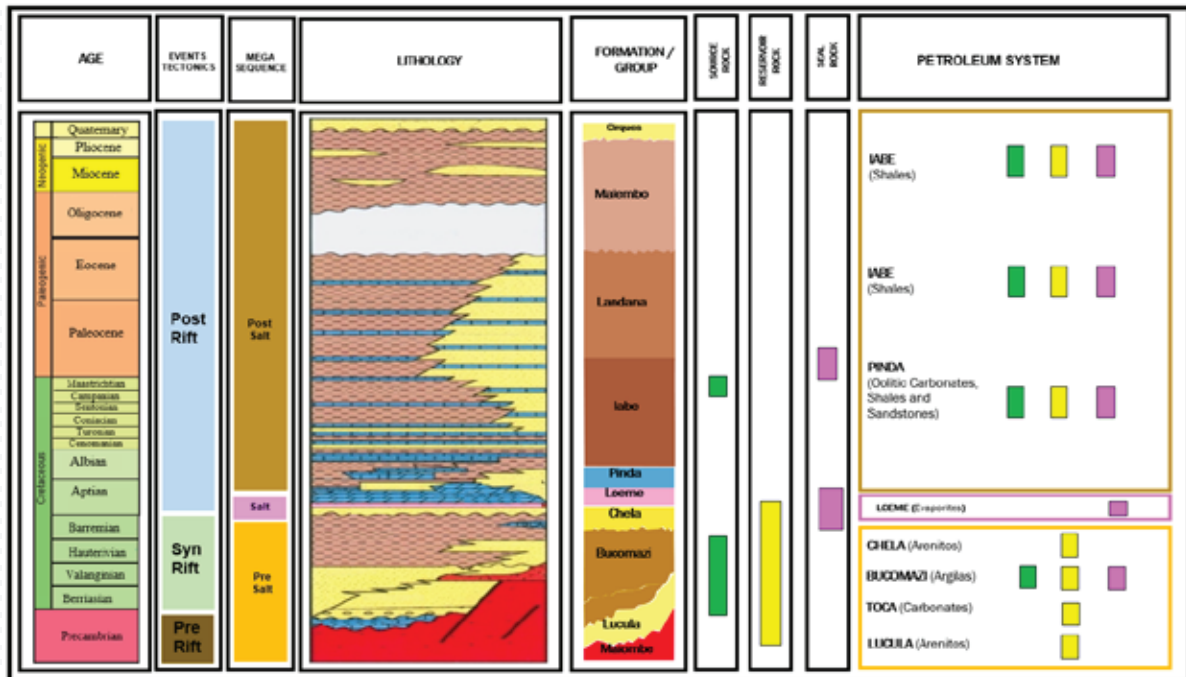


Figure 7: Lithostratigraphic Column of the Onshore Congo Basin, ANPG 2022

4.1 Source Rock

Predominantly formed by organic-rich Bucomazi Formation clays in the Pre-salt. Carbonates with more predominant "calclutite" clays from the Pinda Formation in the Albian and organic-rich clays from the upper Cretaceous of the labe Formation are the primary source rocks in the post-salt.

4.2 Reservoir

The Pre-salt unit's main reservoirs are the Lucula, Erva, and Chela Formations sandstones and the Toca Formation carbonates. The Post-salt is composed of carbonate reservoirs corresponding to the Pinda Formation.

Oil Exudation

A geological expedition was carried out to recognize the area and confirm the existence of bitumen exudations and impregnations in the Quinzau area, Tomboco municipality, Zaire province. The Quinzau area is in the onshore portion of the Lower Congo Basin, specifically in Block CON 9, west by CON 8. The existence of unconventional hydrocarbons was confirmed in the Quinzau area (Figures 8, 9).



Figure 8: Quinzau Zone - Exudation, 2015

4.3 Seal

The cover rock in the Pre-salt is formed by the intraformational clays of the Bucumazi Formation and the Evaporites of the Loeme Formation. In the Post-salt, the fine sediments composed of clays of the labe Formation serve as a seal for the reservoirs at this age level.

4.4 Trap

The traps characteristic of Pre- and Post-salt units are predominantly combined.

5. EXPLORATION Opportunities

5.1 Identified Leads

As described below, the geological and geophysical data acquired allowed the identification of leads in the Pre and Post salt.

5.1.1 Pre-salt Leads

Lead 1

Located north of the block, with N-S direction, an antiform type structure closed in 3 directions, discontinuous and marked reflectors under the base of the salt in the Chela Formation. Low amplitude reflectors along the grabens indicate organic-rich sediments with potential source rock at the Bucumazi level.

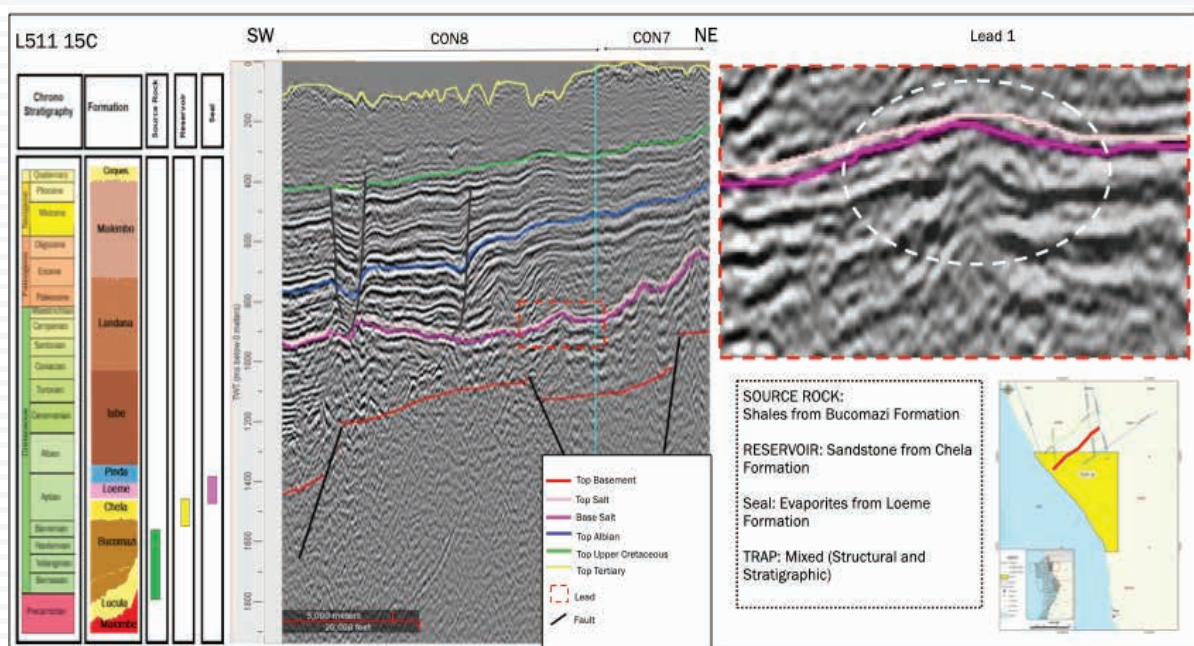


Figure 9: Lead 1, ANPG 2022

Lead 2

Located north of the block, with an N-S direction, a structure at the top of horsts truncating under the base of the salt, with discontinuous reflectors and high amplitudes over the base of the salt in the Toca Formation. Discontinuous reflectors with low amplitude along the grabens indicate the possible presence of organic-rich sediments with potential source rock at the level of the Bucumazi Formation.

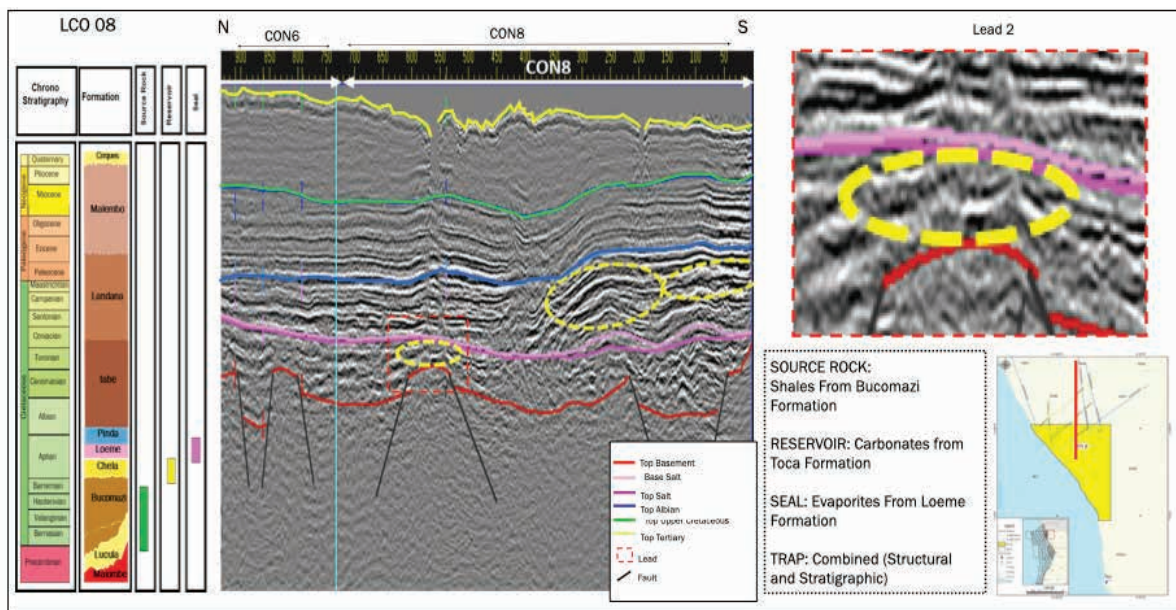


Figure 10: Lead 2, ANPG 2022

5.1.2 Post-salt *Leads*

Lead 3

Located north of the block, with a NE-SW direction, is a turtle-back structure with well-marked, poorly continuous reflectors at the level of the Pinda Formation. Reflectors with weak amplitudes at the level of the Pinda Formation indicate the possible presence of organic-rich sediments with source rock potential.

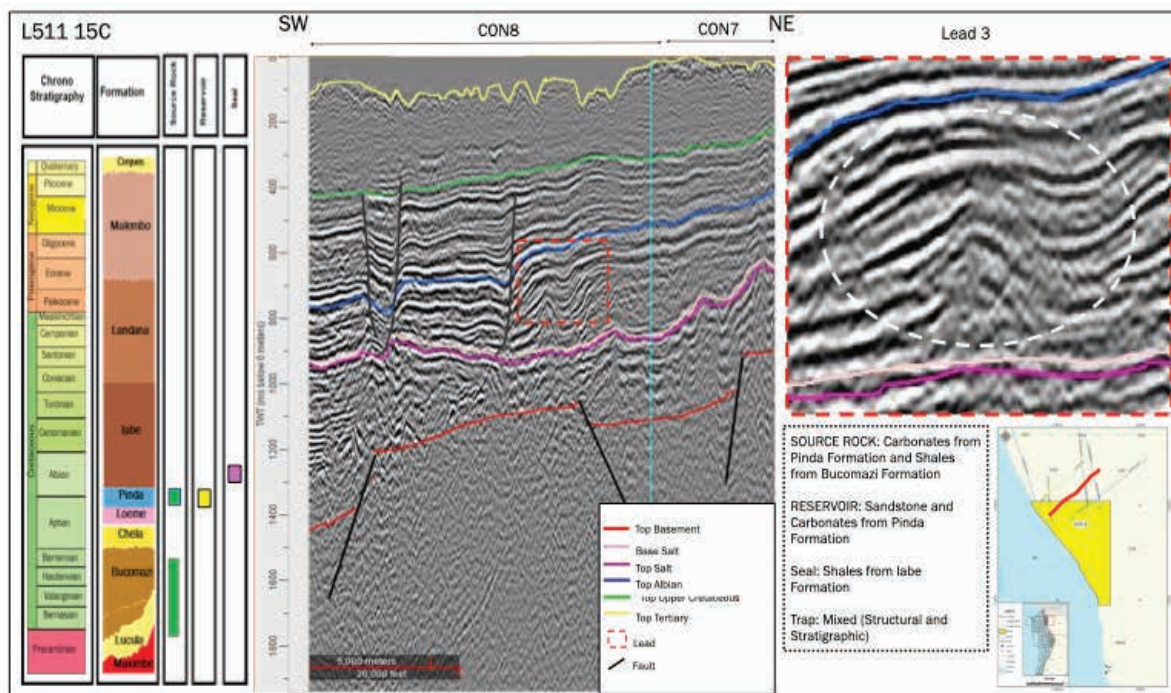


Figure 11: Lead 3, ANPG 2022

Lead 4 & 5

Located north of the block, with an N-S direction, is a turtle-back structure with well-marked, continuous reflectors at the level of the Pinda Formation. Reflectors with weak amplitudes at the level of the Pinda Formation indicate the possible presence of organic-rich sediments with source rock potential.

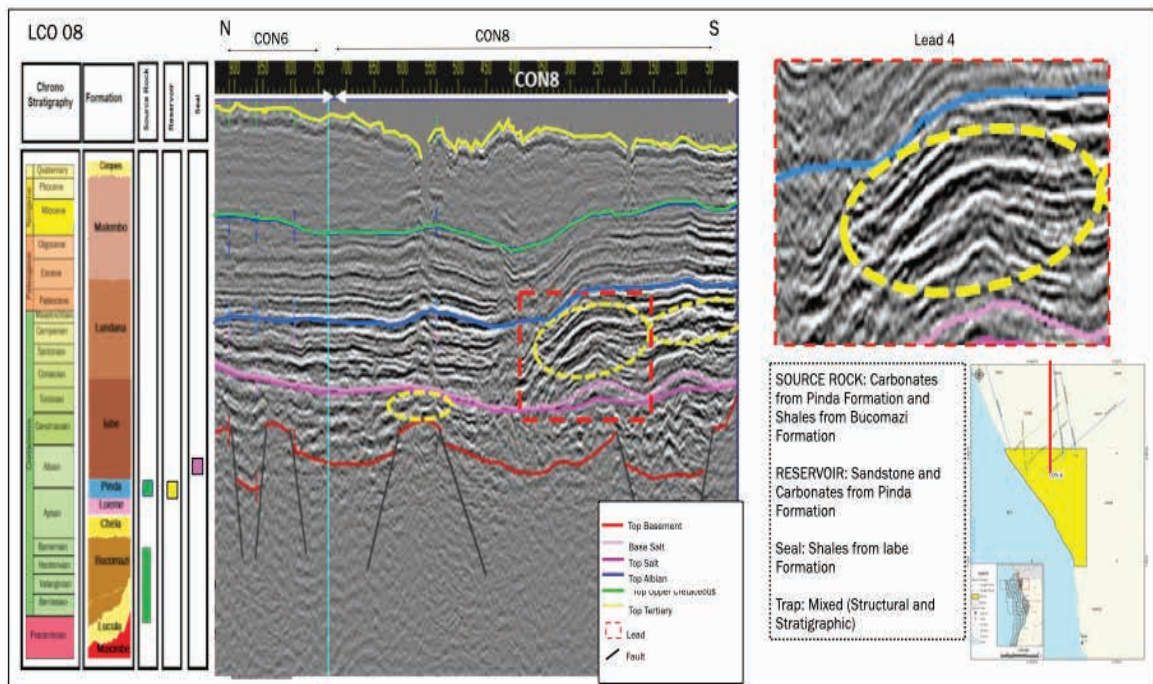


Figure 12: Lead 4, ANPG 2022

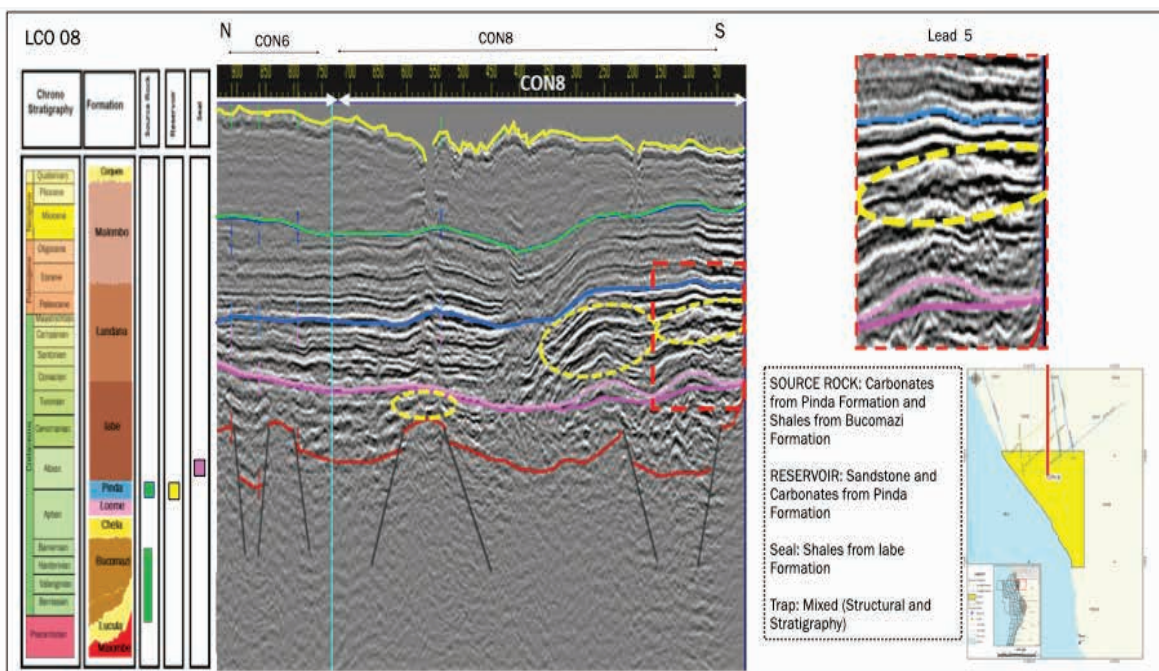


Figure 13: Lead 5, ANPG 2022

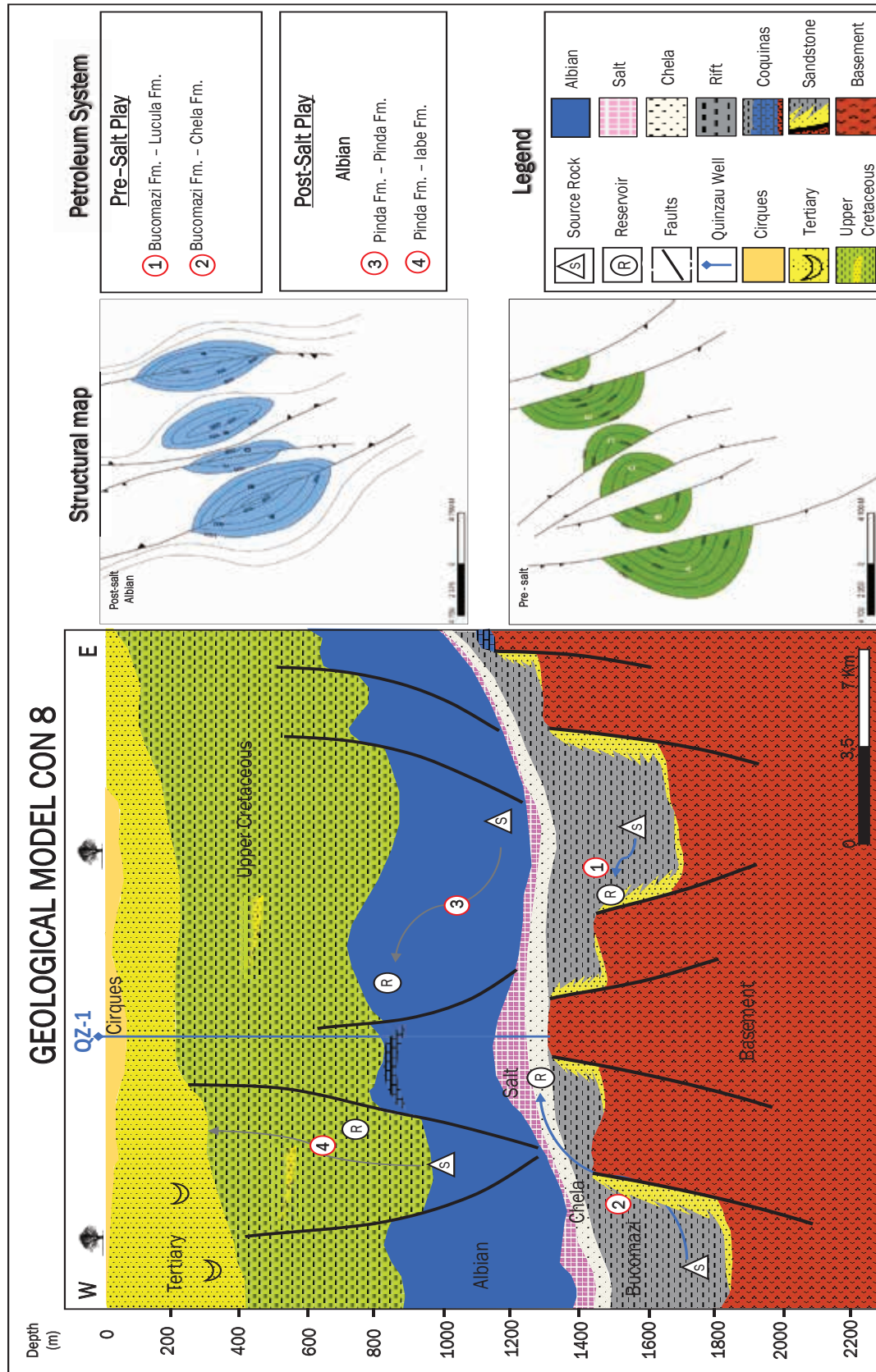


Figure 14: Geological model of Block CON 8 ANPG 2022

6. FINAL Remarks

After reassessing Block CON8, it was found that it has potential in the Pre-saliferous (Toca and Chela Formation) and Post-saliferous (Pinda Formation) units, with well-defined structures and formations with potential for hydrocarbon generation and accumulation.

In the Pre-salt, the primary source rock is the Bucomazi Formation in the lower Congo Basin. The reservoirs are the sands and carbonates of the same formation.

In the post-salt, the Pinda Albian carbonates Formation is the primary source rock, and the carbonates of the same formation are the reservoir rock.

ANPG encourages the companies to invest in this block, through additional studies, to ensure the discovery of the real potential, which should allow for the boosting of exploration activity aimed at mitigating to revert the production decline observed over the last decade.

7. References

Surface geology report of the area carried out by Argo Petroleum Portuguesa, 1973. Explanatory note of the geological chart at scale 1:1000000.

Basin of Angola. Bull. Amer. Assoc. Pet. Geol., 50 (1), pp. 118-158.

BURWOOD, R., 1999. Angola: source rock control for Lower Congo coastal and Kwanza basin petroleum systems, in: Cameron, N. R., Bate R. H. and Clure, V. S. (eds). 'The Oil and Gas Habitats of the South Atlantic'. Geol. Assoc. Spec. Pub. 153, pp. 181-194.

ONSHORE LOWER CONGO BASIN



BLOCK
CON 8



ANGOLA



ANPG
Agência Nacional de Petróleo, Gás e Biocombustíveis
E-mail: licitacao2023@anpg.co.ao
Tel.: +244 226 428 602
website: www.anpg.co.ao

Edifício Torres do Carmo-Torre 2, Rua Lopes Lima, Distrito Urbano da Ingombota,
Município de Luanda, República de Angola