

وزارة
التعليم العالي والبحث العلمي
جامعة ميسان
كلية التربية الاساسية



مجلة ميسان للدراسات الأكاديمية

للعوم الانسانية والاجتماعية والتطبيقية

Misan Journal For Academic Studies
Humanits, Social and applied Sciences

ISSN (PRINT) 1994-697X

(Online)-2706-722X

حزيران 2026

العدد 58

المجلد 25

2026 June

58 Issue

25 vol

Misan Journal

مجلة ميسان للدراسات الاكاديمية
العلوم الانسانية والاجتماعية والتطبيقية
كلية التربية الاساسية/ جامعة ميسان

حزيران 2026

العدد 58

المجلد 25

,2026 JUNE

SSUE 58

VOLE 25

 DOAJ

Google
scholar

مؤسسة الاستشهاد المرجعي وزند
العلم والتكنولوجيا في العالم الإسلامي
ISC

IRAQI
Academic Scientific Journals

ISSN
PORTAL

doi
Crossref

CC BY NC ND

رقم الايداع في المكتبة الوطنية العراقية 1326 لسنة 2009
journal.m.academy@uomisan.edu.iq
<https://www.misan-jas.com/index.php/ojs>
<https://iasj.rdd.edu.iq/journals/journal/view/298>

الصفحة	فهرس البحوث	ت
18 -1	The impact of social, economic and health factors on the employment of the elderly in the center of Amara district Wisam A. Dargal	1
40 - 19	Designing drugs by molecular docking to inhibit COVID-19 Abbas Kareem , Bahjat A. Saeed	2
53 - 41	Hexagonal Boron Nitride synthesis, its applications in dentistry and cytotoxicity: A literature review Al-Safa Malik Jaseim , Faiza Mohammed Hussain Abdul-Ameer	3
74 - 54	Racial Capitalism and the Architecture of Captivity in Colson Whitehead's The Underground Railroad Ibraheem Ajeel Dakhil	4
88 - 75	The Relationship between Linguistic Intelligence and Academic Achievement in Reading Comprehension among Students of English Department Dijla Abbood Shareef Al-Turfi	5
97 - 89	Sea Wave Energy Estimating in front of the Iraqi Coast, Northwest Arabian Gulf Adel Jassim Al-Fartusi , Sajjad k. Chasib	6
107 - 98	Reservoir Property Evaluation of the Mishrif Formation Using Integrated Petrophysical Analysis, West Qurna-1 Oilfield Zahraa Sh . Al-Maliki , Muwafaq F. Al -Shahwan	7
115 - 108	The Role of Molecular Biology in Cancer Treatment: Advances, Applications, and Future Perspectives Ali Isam Najm	8
127 - 116	Study of Morphometric Tectonic Indicators of the Wadi Al-Hay Basin in the Najaf desert using GIS data Latif Jabbar Farhan	9
140 - 128	Environmental Assessment of the Water of Haditha Dam and Reservoir for the Period (2023–2024) Using the Canadian Water Quality Index (CCME-WQI) Rajaa Kadhim Mutar	10
161 - 141	The Extent of Primary School Mathematics Teachers' Knowledge of Constructivist Teaching Skills from Their Perspectives Noor Ali Abdul Karim , Anwar Sabah Abdul-Majid	11
181 - 162	The Effectiveness of Teaching Based on Visual Interpretive Thinking in Developing Aesthetic Awareness among Art Education Students Mohsin Hameed Malik	12
198 - 182	Problems of Reliance on Lexicons in Linguistic Criticism: A Diachronic Study Murtadha Hamdan Ajib	13
214 - 199	The Integration of Artificial Intelligence and Public Relations:An Analytical Study of AI Use in Communication Messages to thePublic Aqeel Tahseen Fathallah , Ali Muhanad Hamid , Osama Kareem Rasheed	14

232 - 215	Mechanisms of domination and representations of resistance in contemporary Libyan narrative: A cultural approach to Najwa Bin Shatwan's novel, (Slave Pens). Raad Huwair Sweilem	15
243 - 233	logical analysis of the skeptical concept of faith Jabbar Nasser Yousef	16
260 - 244	The United States' Entry into World War I and Its Impact on U.S -Canadian Relations (1917-1918). Jawad Kadhil Dakhil , Ammar Khalid Ramadan	17
268 - 261	The Relationship Between Image Reading Skills and Visual Perception Among Students of the Art Education Department Fatima Jabbar Hussein	18
287 - 269	The significance of Ilm al-Rijāl and its connection with the Hadith sciences. Abbas Jassim Nasser	19
308 - 288	The Effectiveness of the Think Silently Strategy on Academic Achievement and Science Process Skills among First-Grade Intermediate Students in Biology Ali Jabbar Yaseen	20
328 - 309	Performance in Contemporary Plastic Art ,as an Evolutionary Manifestation of Perspectival Representation Zahraa Mahood Mohammad	21
359 - 329	Future Thinking and Professional Agency as Predictors of Academic Transition Shock among Newly Appointed University Instructors Seenaa Ahmed Ali	22
371 - 360	The Effect of an Educational Program Based on the Van Hiele Model on Developing Visual Culture of Contemporary Arts among Students of the Art Education Department Hussein Rishk Khدير	23
394 - 372	Geographical Factors and Their Impact on the Cultivation of Field Crops in Misan Governorate Sahar Rami Eidan	24
416 - 395	Intellectual Reform in the First Hijri Century (The Protest of the Companions in Defense of the Legitimacy of the Caliphate of Imam Ali Ibn Abi Talib (peace be upon him) in 11 AH/632 CE as a Model) Fatima Abd Saeed Al-Maliki	25

ISSN (Print) 1994-697X
ISSN (Online) 2706-722X

DOI: <https://doi.org/10.54633/2333-025-058-007>

Received: 6/Dec/2025
Accepted: 11/Jan/2026
Published online: 30/June/2026



MJAS: Humanities, Social and Applied
Sciences
Publishers

The university of Misan.
College of Basic Education This article is an
open access article distributed under the terms
and conditions of the Creative Commons
Attribution

(CC BY NC ND 4.0)

<https://creativecommons.org/licenses/by-nc-nd/4.0/>

Reservoir Property Evaluation of the Mishrif Formation Using Integrated Petrophysical Analysis, West Qurna-1 Oilfield

¹Zahraa Sh . Al-Maliki , ²Muwafaq F. Al –Shahwan
^{1,2}Department of Geology, College of Science,
University of Basrah, Basrah, Iraq
zahraa.shakir.nasser@gmail.com
<https://orcid.org/0009-0008-5278-3808>

Abstract:

This study presents a comprehensive petrophysical evaluation of the Mishrif Formation within the West Qurna-1 Oilfield , utilizing Techlog software (2015) , and data from six key oil wells. Lithological identification via Schlumberger charts , confirmed a limestone-dominant composition with high calcite content. Based on integrated petrophysical log analysis, the Formation was subdivided into three primary reservoir units including (mA, mB1, and mB2) separated by two distinct cap rocks. The evaluation revealed that the mA unit exhibits the highest reservoir quality, followed by mB2, while mB1 showed relatively lower potential. This hierarchical classification provides a fundamental

framework for Contracting a robust static reservoir model which is crucial for , enhancing reserve estimation accuracy and optimizing future field development strategies.

Keyword: Porosity, West Qurna, Mishrif Formation, Reservoir, Lithology

1. Introduction:

The West Qurna-1 Oilfield, which is located in the Mesopotamian plain, considered as one of the most significant hydrocarbon fields in Iraq (Abdullah et al., 2018.). Stratigraphic investigations have revealed _multiple Cretaceous hydrocarbon bearing reservoirs in this field (Ismail & Al-Najm, 2019), with the sequence from oldest to youngest comprising the Yamama, Zubair, Mauddud, Mishrif, Khasib, and Sa'adi formations (Abdulhameed et al., 2024). Among these, the Mishrif Formation, a Middle Cenomanian Early Turonian carbonate sequence (Jassim & Goff, 2007), is of paramount economic importance, recognized the largest carbonate reservoir unit in southern Iraq, containing up to 30% of the Iraq's total of hydrocarbon reserves (Ahr, 2008). However, the reservoir quality of the Mishrif Formation is characterized by significant

heterogeneity (Al-Najm, 2012), that's due to complex diagenetic processes posing a crucial challenge for efficient field development and production planning. To mitigate these challenges, making a detailed reservoir characterization is essential. This study provides an evaluation of the reservoir quality utilizing well log data. The principal objective is to calculate key petrophysical properties and, based on these analyses, divide the Formation into distinct productive and nonproductive reservoir units. This position will provide a serious foundation for optimizing future development and production strategies in the field.

2. Study area:

The West Qurna-1 Oilfield is situated in the southern part of Iraq, in Basrah Governorate, approximately 14 km from Qurna city and 60 -70 km from Basrah city. The West Qurna Oilfield is geographically situated between latitudes 30°53'30.6918" N and 31°0'47.0524" N and longitudes 47°54.2129" E and 47°27'6.9785" E. The Euphrates River divides the field into two parts: the southern part, commonly known West Qurna-1, and the northern part, known as West Qurna-2 (Fig 1). The West Qurna Oilfield extends approximately 40Km in length and 17 Km in width.

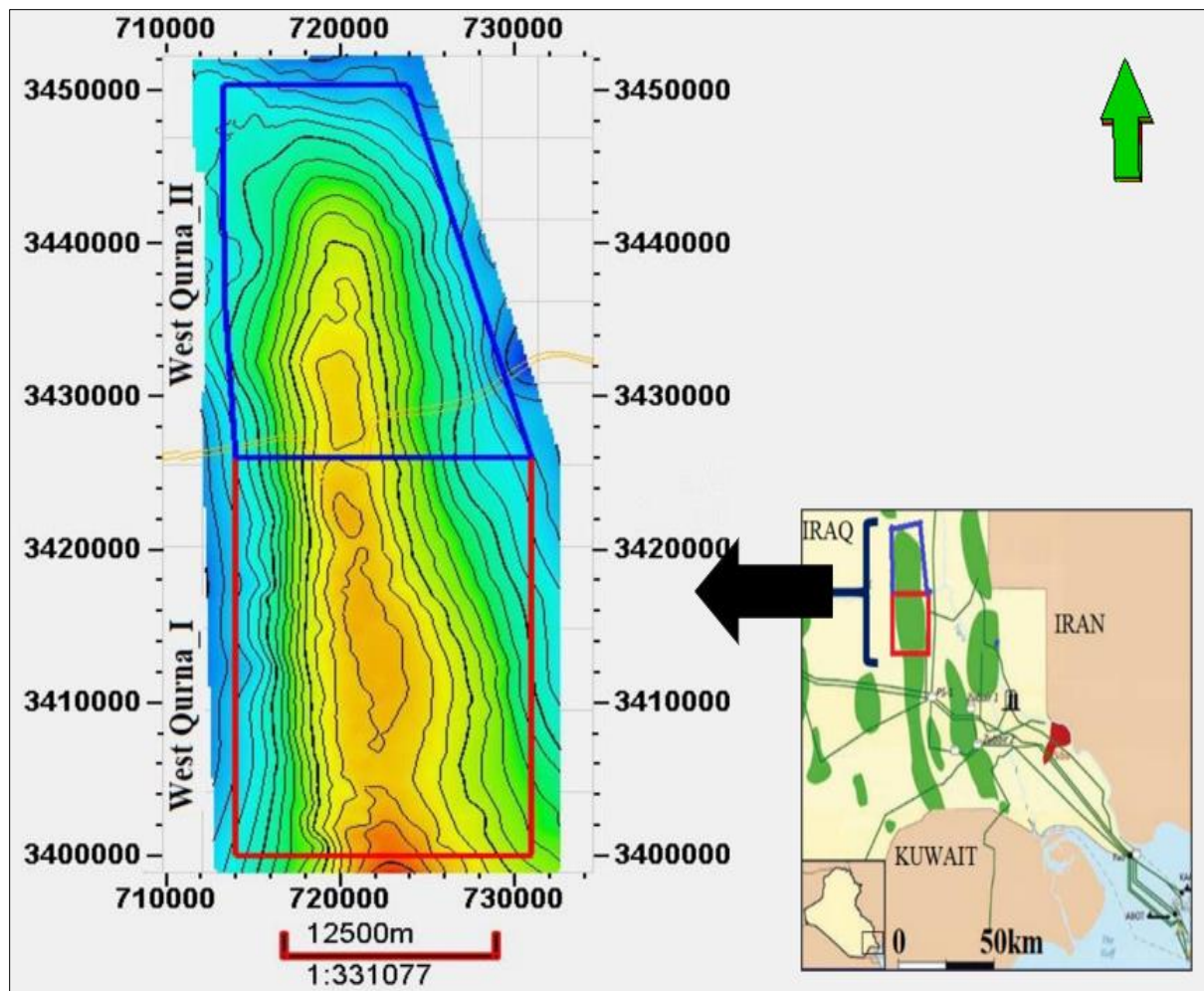


Fig 1. Location map of West Qurna-1 Oilfield

3. Geological Setting:

The Formation represents a complex carbonate ramp system (Davies et al., 2015), shaped by the interplay of depositional, diagenetic, and tectonic processes (Al-Muhamed, 2014). It comprises a succession ranging from mudstone to rudstone limestones, with noticeable chert interbeds, deposited within a shallow marine carbonate ramp environment (Al-Ali et al., 2019). The age of deposition spans from middle Cenomanian to early Turonian (95–92 MA) (Sharland et al., 2004). Stratigraphically, the Formation is sharply overlain by the Khasib Formation, indicating an early to mid-Turonian unconformity, while its lower boundary transitions conformably into the Rumaila Formation as illustrated in (Fig. 2).

Age	Group		Formation	Lith.	Description	Thickness (m)	AP	Super seq.			
	period	epoch									
Tertiary	L. Miocene - Recent	Kuwait	Q. deposits		Clay and silt	180	AP11	IV			
			Dubbdiba		Sand and gravel	240					
			Fatha		Marl and limestone	120		III			
			Ghar		Sand and gravel	90					
	E-M Miocene	Hasa	Dammam		dolomite	220	AP10	I			
			Ruz		Anhydrite	30					
	Cretaceous	Paleocene - early Eocene	Aruma	Umm-Radhuma		dolomite	450	AP9	IV		
				Tayarat		dolomite	260				
		Late cretaceous	shiraih		Marly limestone	105					
			Hartha		Limestone and dolomite	190					
Sadi				Limestone	220						
Tanuma				Shale	45						
Khasib				Limestone	60						
Middle cretaceous			Wasia	Mishrif		Limestone	180			APS	IV
				Rumaila		Limestone	80				
				Ahmadi		Limestone	140				III
	Mauddud			Limestone	110						
Early cretaceous	Thammama	Nhr Umar		Sand and Shale	260	APS	II				
		Shuaiba		Limestone and Dolomite	80						
		Zubair		Sand and Shale	400		I				
		Ratawi		Limestone with Shale	260						
Jurassic	U-Jurassic		Yammama		Limestone	280					
			zuly		Argillaceous Limestone	240					

Fig 2. The Stratigraphic Column for West Qurna Oilfield(Mahdi & Aqrawi, 2014)

4. Materials and Method:

The investigation using data from six representative oil wells, which were initially processed by digitizing logs through Didger-5 software, and subsequently imported into the Techlog, 2015 software for analysis and interpretation. The evaluation followed a dual approach: a qualitative phase, driven by log response patterns and cross-plot correlations, and a quantitative phase focused on determining key petrophysical parameters specifically shale volume (V_{sh}), effective porosity

(ϕ_{eff}), and hydrocarbon saturation (Sh). This integrated methodology provided the technical basis for precisely delineating the reservoir units across the studied Formation.

5.Results and Discussion:

5-1 Qualitative Interpretation:

The combination of density, neutron, and sonic logs has many applications; besides porosity identification, this suite of logs can be utilized to determine the lithology and mineralogy of the reservoir unit, by the application of cross-plot techniques (Lina Mawlood Salman, 2023.). The Mishrif Formation was found to be composed mainly of limestone with minor dolomite by the Schlumberger curve, as shown in the (Fig 3). While the M-N cross plot utilized neutron, density and sonic to determine mineralogy (Salih & Qader, 2025) , the Formation was found to be composed mainly of calcite with minor existence of dolomite and anhydrite (Fig 4).

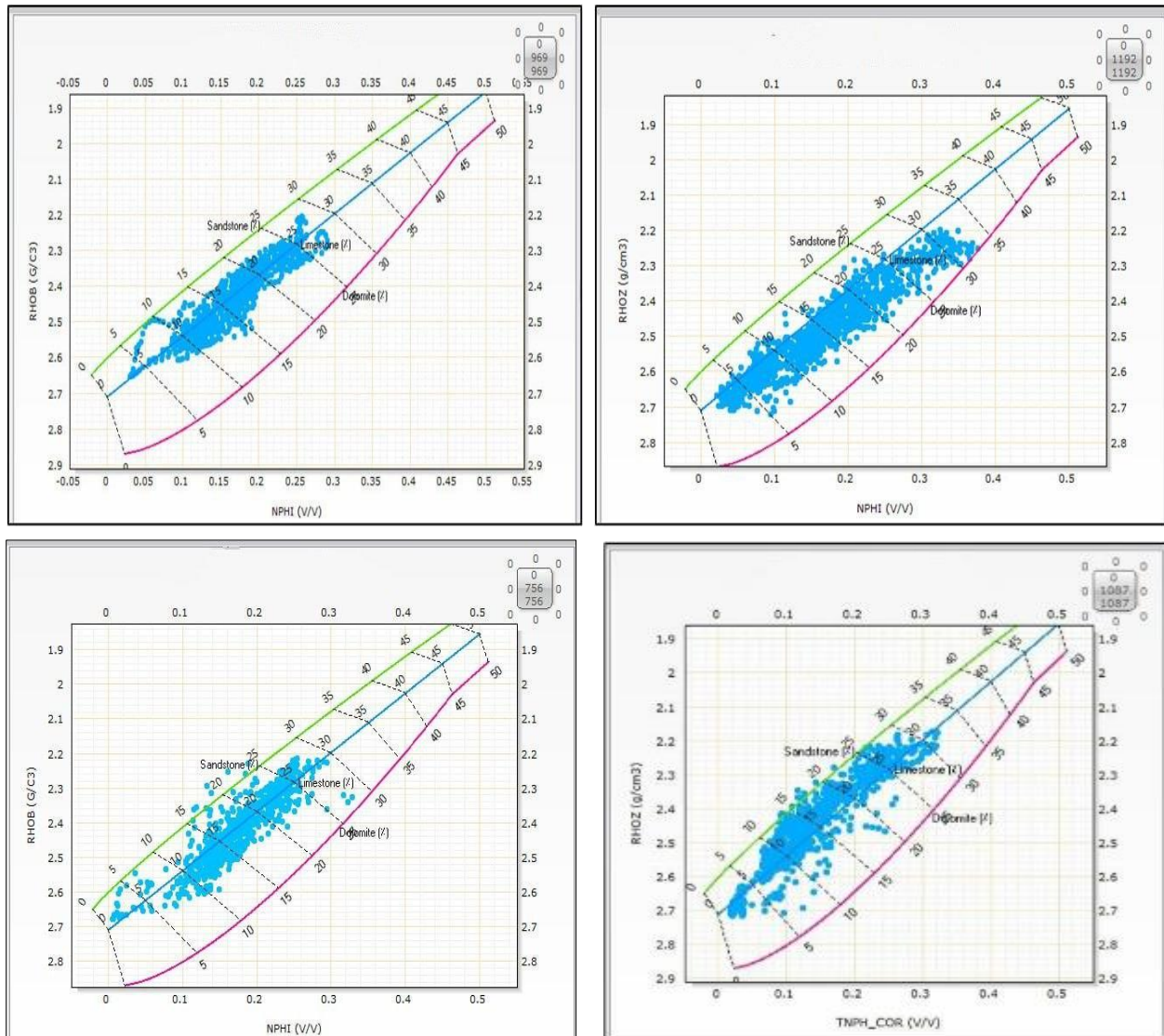


Fig 3: Neutron Vs density cross plot.

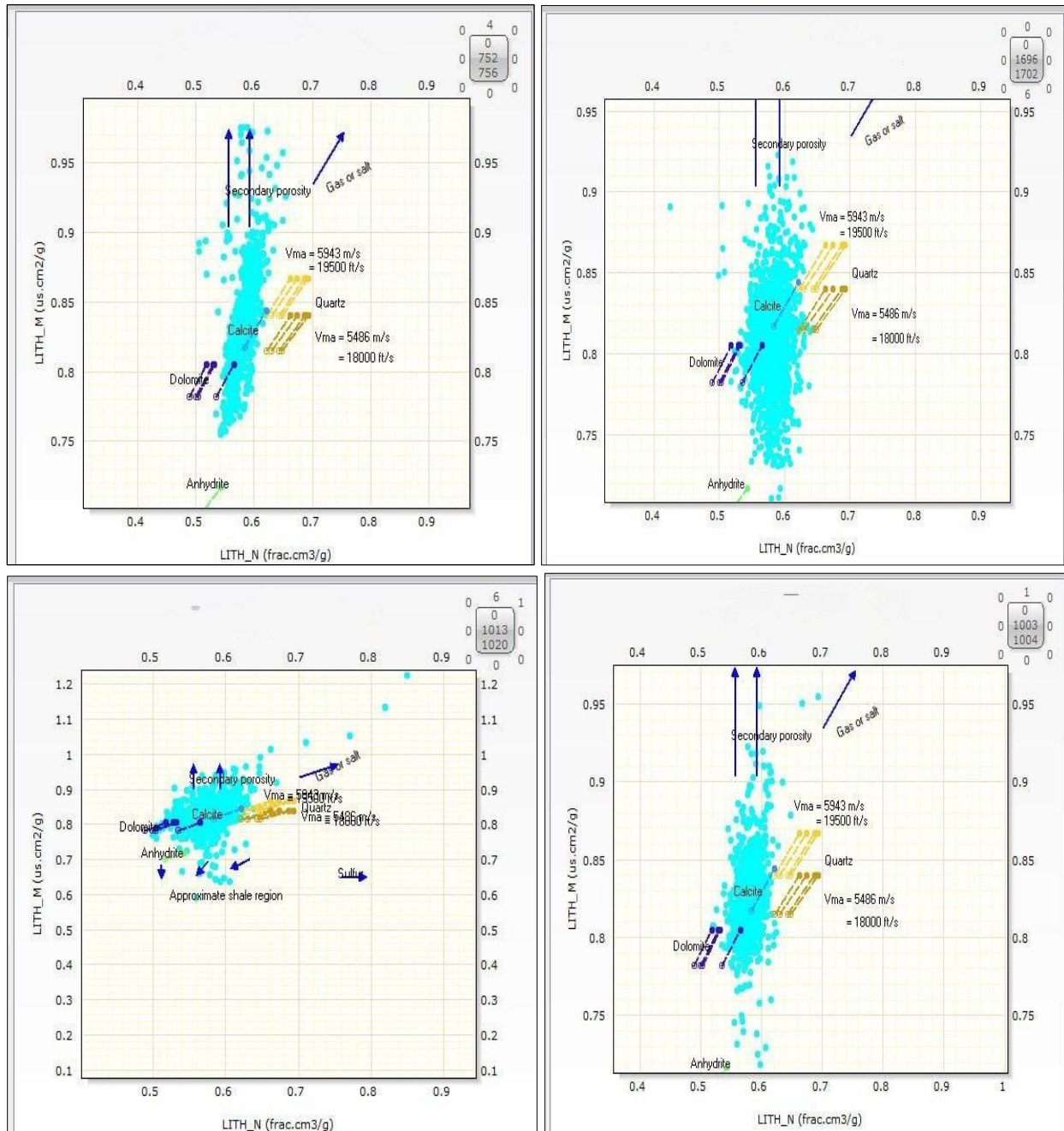


Fig.4: M-N Cross plot analysis.

5-2 Reservoir Evaluation:

Reservoir evaluation is based on quantitative tests that measure the amount of hydrocarbons and describe the main properties of the reservoir (Al-Fahdawi & Al-Kubaisi, 2025). This study includes three main parts: finding units that hold hydrocarbons, figuring out how much storage space they have, and how many hydrocarbons they hold. To do a thorough investigation, several petrophysical parameters were calculated from well-log data.

Shale Volume: Shale volume plays a crucial role in porosity calculations because radioactive isotopes tend to accumulate more in shale compared to other rock types (Moradi et al., 2016), significantly influencing effective porosity estimates (Asquith & Krygowski, 2004). While neutron and density logs are less reliable due to gas interference in shale, making detection and correction difficult (Khan et al., 2019). The gamma-ray (GR) log remains the most dependable method for determining volume of shale. To calculate the shale volume (Vsh) from (GR) log, a linear equation proposed by (Schlumberger, 1974) as follows:

$$IGR = \frac{GR \log - GR \min}{GR \max - GR \min} \quad (1)$$

$$Vsh = 0.33 [2^{2*IGR} - 1] \quad (2)$$

Where: IGR: Gamma ray index, GR log: Gamma ray from log, GRmin: Gamma ray minimum, GR max: Gamma ray maximum

Total porosity: Represents the ratio of void space to the rock's bulk volume (Serra, 2007), is a critical petrophysical parameter. In this study, it was derived from a combination of neutron and density logs using the standard equation proposed by (Schlumberger, 1974), as follows:

$$\phi_t = \frac{\phi_N - \phi_D}{2} \quad (3)$$

Where: ϕ_t : Total porosity, ϕ_N : Neutron porosity, ϕ_D : Density porosity.

Effective porosity: can be estimated from this equation:

$$\phi_{eff} = \phi_t * (1 - Vsh) \quad (4)$$

Where: ϕ_{eff} : Effective porosity, ϕ_t : Total porosity, Vsh : Shale volume

Secondary porosity index (SPI): Can be calculated from this equation:

$$SPI = (\phi_{ND} - \phi_S) \quad (5)$$

Where: SPI: Secondary porosity index, ϕ_{ND} : Neutron – density combination, ϕ_S : Sonic derived porosity

Water Saturation: According to (Schlumberger, 1998) Archie introduced an equation that enables the estimation of water saturation in clean formations as a function of true resistivity as follows:

$$S_w = \sqrt[n]{\frac{F \cdot R_w}{R_t}} \quad (6)$$

Where: S_w : Water saturation, R_w : Resistivity of water formation, R_t : formation resistivity, n : Saturation exponent, F : formation factor.

While hydrocarbon saturation can be calculated from the equation:

$$\text{Hydrocarbon saturation} = SW - 1 \quad (7)$$

Residual and movable hydrocarbon: According (Schlumberger, 1987) can be calculated:

$$ROS = 1 - S_{xo} \quad (8)$$

$$MOS = S_{xo} - S_w \quad (9)$$

Where: ROS: Residual hydrocarbon, S_{xo} : Water saturation of the invaded zone, MOS: Movable hydrocarbon, S_w : Water saturation

Bulk Volume of Water (BVW): It's the product of porosity and water saturation:

$$BVW = S_w * \phi \quad (10)$$

5-3 Result of Petrophysical Evaluation:

mA Unit:

Analysis of well log data establishes mA unit as the primary reservoir unit within the field, owing to its superior petrophysical characteristics. The most favorable properties, namely high porosity and low water saturation, are predominantly concentrated in the central part of the field, as recorded in Well No. 6 (Table1).

mB1 Unit:

Petrophysical log analysis indicates that mB1 unit possesses lower rock quality compared to mA unit, exhibiting predominantly moderate porosity values across the study area. This unit is characterized by elevated water saturation in the southeastern sectors. However, its rock quality shows a marked improvement towards the western region.

mB2 Unit:

Well log data indicates a divergence in reservoir quality between the mA and mB units. While the mA unit remains the benchmark for reservoir performance in the field, the mB unit, and particularly its mB2 subunit, exhibits significantly better rock quality than the other subunit within mB (Fig 5). The mB2 subunit is characterized by its good porosity, which shows better development in the southern part of the field, although it is notably absent in the southeastern region.

Table 1: Petrophysical results of the studied wells.

Well no	Reservoir unit	Thickness	V-shale	Effective Porosity	SW
Well 1	mA	34	0.08	0.23	0.25
Well 2	mA	52	0.08	0.16	0.34
Well 3	mA	42	0.1	0.16	0.22
Well 4	mA	44.99	0.1	0.18	0.22
Well 5	mA	35.7	0.09	0.20	0.15
Well 6	mA	49	0.07	0.20	0.11
Well 1	mB1	45.05	0.09	0.18	0.26
Well 2	mB1	49	0.09	0.18	0.32
Well 3	mB1	50.84	0.1	0.15	0.26
Well 4	mB1	41	0.08	0.16	0.15
Well 5	mB1	61.43	0.07	0.18	0.10
Well 6	mB1	36.87	0.07	0.11	0.23
Well 1	mB2	97	0.1	0.23	0.32
Well 4	mB2	98	0.1	0.19	0.16
Well 5	mB2	98	0.09	0.13	0.13
Well 6	mB2	100	0.05	0.2	0.15

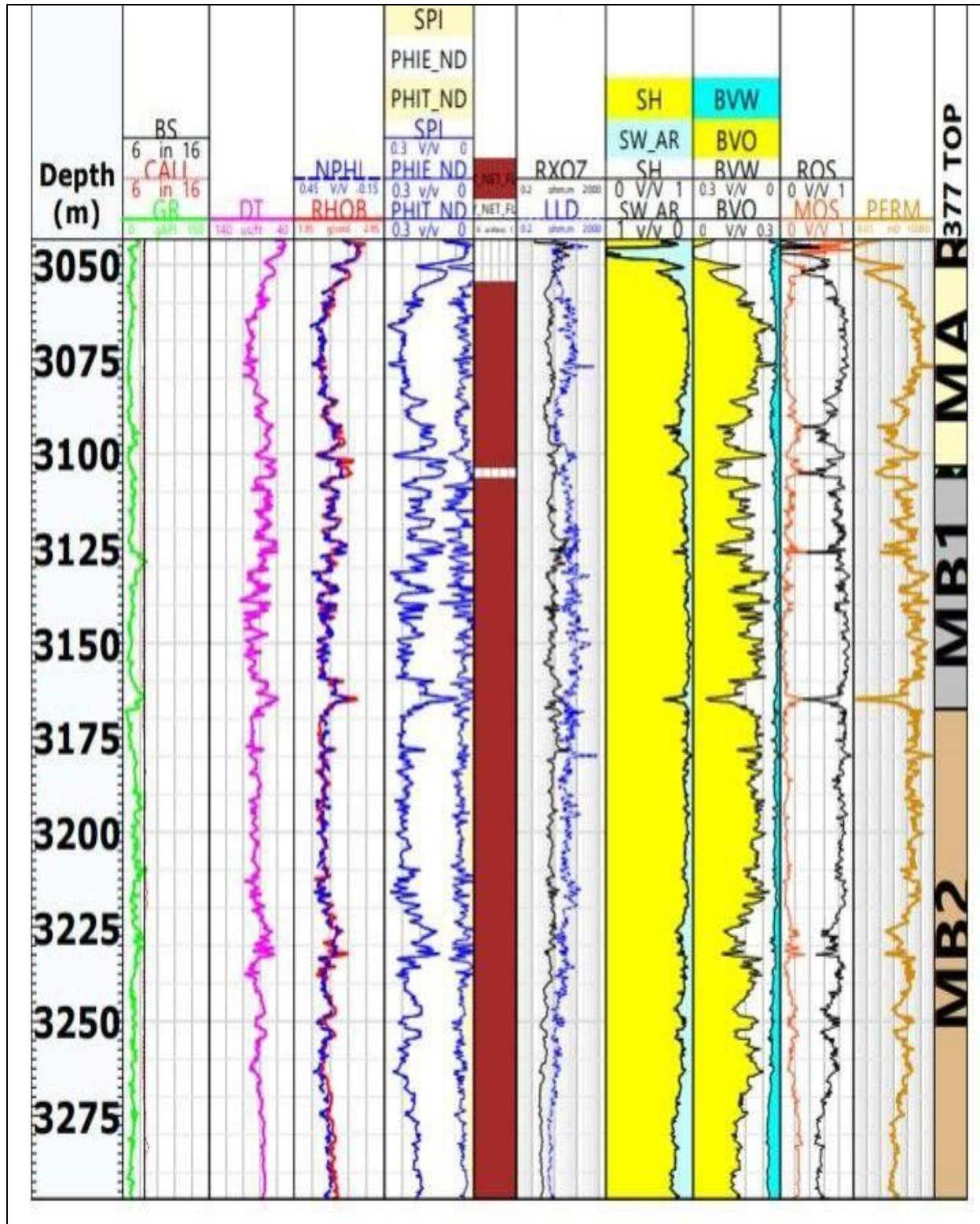


Fig 5: The computer processed interpretation (CPI)

Conclusion:

Petrophysical evaluation of the Mishrif Formation in the West Qurna-1 Oilfield, based on conventional well log analysis, identifies a complex carbonate system dominated by limestone with some dolomitic variations. The integration of petrophysical data facilitated, the zonation of the Formation into three reservoir units (mA, mB1, and mB2) separated by two cap rocks. Notably, unit mA was identified as the premier reservoir zone characterized by, superior storage and flow capacities, with porosity ranging from (0.16 to 0.23) and water saturation (below 34%). Reservoir quality sequentially, decreases through units mB2 and mB1, respectively. These findings provide a critical baseline for static modeling and strategic planning of field development in West Qurna-1.

Acknowledgment:

I would like to express my sincere gratitude to Basra Oil Company for their generous cooperation and for providing the essential data that made this research possible. My appreciation also goes to the University of Basrah – College of Science, Department of Geology, for their academic guidance and supportive environment, which greatly contributed to the completion of this study. I am also thankful to my colleagues and fellow researchers for their constructive discussions and valuable suggestions, which enriched the quality of this work.

Declaration of Competing Interest:

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References:

- Abdulhameed, M. A., Al-Najm, F. M., & MAhdi, M. M. (2024). Geometry and Tectonic History of West Qurna-1 Structure, Southern Iraq, MAuddud Carbonate Reservoir as Case Study. *Iraqi Geological Journal*, 57(1), 239–251. <https://doi.org/10.46717/igj.57.1E.15ms-2024-5-26>
- Abdullah, R. A., Al-Jorany, K., Mohsin, F., ImAd, A., & Abdulrazaq, M. (2018). Edge Water Breakthrough in each of the mAjor zones within Mishrif reservoir in West Qurna phase 1 In . 1 *Journal of Petroleum Research & Studies (JPR&S)* (Issue 20)
- Al-Ali, M. M., MAhdi, M. M., & Alali, R. A. (2019). Microfacies and depositional environment of mishrif formAtion, North RumAilaoilfieldd, Southern Iraq. *Iraqi Geological Journal*, 52(2), 91–104. <https://doi.org/10.46717/igj.52.2.7ms-2019-12-30>
- Al-Fahdawi, I. F., & Al-Kubaisi, B. F. (2025). Petrophysical Properties of the Jeribe-Euphrates FormAtion in H. Oil Field, Southern Iraq. *Iraqi Geological Journal*, 58(1), 97–107. <https://doi.org/10.46717/igj.58.1B.8ms-2025-2-16>
- Al-Muhamed, R. (2014). Depositional Environment and Petrophysical Properties Studyof Mishrif FormAtion in Tuba Oilfield,Southern Iraq. <https://www.researchgate.net/publication/382941212>
- Al-Najm, F. M. (2012). *Petrophysical properties and Reservoir modeling of Mishrif FormAtion at Tuba Field, Southern Iraq Conference Paper · December 2013 CITATIONS 0 READS 707*. <https://www.researchgate.net/publication/334126662>

- Asquith, G. B., & Krygowski, D. (2004). *Basic well log analysis* (2nd ed.). Tulsa, OK: American Association of Petroleum Geologists. 244p
- Davies, Q., Green, D., Belyaeva, N., Chistyakov, A., Ershov, T., & Yakubovskiy, S. (2015). *Sequence Stratigraphy of the Mishrif Formation West Qurna-2 Field*. 1–2. <https://doi.org/10.3997/2214-4609.201414351>
- Ismail, M. J., & Al-Najm, F. M. (2019). Utilizing core and NMR data to identify rock-type and pore throat radius for mishrif formation in West Qurna. *Iraqi Geological Journal*, 52(2), 53–69. <https://doi.org/10.46717/igj.52.2.4ms-2019-12-27>
- Jassim, S. Z. ., & Goff, J. C. . (2007). *Geology of Iraq*. Dolin, Prague and Moravian Museum.
- Khan, M. F. A. H., Abid, M. F., Fareed, A., Javed, Z., Khan, M. N., & Hashmi, S. (2019). Petrophysical modelling of structure-cum-stratigraphic play for improved reservoir potential, an integrated field study of L. Goru Sands, Pakistan. *Proceedings - SPE Annual Technical Conference and Exhibition*. <https://doi.org/10.2118/196066-MS>
- Lina MAwlood SalmAn, B. (2023). *Sedimentology and Reservoir Characteristics Evaluation of Hartha Formation in Selected Boreholes of Balad Oilfield-Central Iraq*. <https://doi.org/10.46717/igj.57.1F.12ms-2024-6-21>
- MAhdi, T. A., & Aqrawi, A. A. M. (2014). Sequence stratigraphic analysis of the mid-cretaceous mishrif formation, southern Mesopotamian Basin, Iraq. *Journal of Petroleum Geology*, 37(3), 287–312. <https://doi.org/10.1111/jpg.12584>
- Moradi, S., Moeini, M., Ghassem Al-Askari, M. K., & MAhvelati, E. H. (2016). Determination of Shale Volume and Distribution Patterns and Effective Porosity from Well Log Data Based on Cross-Plot Approach for A Shaly Carbonate Gas Reservoir. *IOP Conference Series: Earth and Environmental Science*, 44(4). <https://doi.org/10.1088/1755-1315/44/4/042002>
- Salih, D. A., & Qader, F. M. (2025). PETROPHYSICAL CHARACTERISTICS OF THE SHIRANISH FORMATION FROM TWO SELECTED OILFIELDS IN THE KURDISTAN REGION, NORTH EAST IRAQ. *Iraqi Bulletin of Geology and Mining*, 21(1), 57–73. <https://doi.org/10.59150/ibgm2101a04>
- Schlumberger. (1974). *Log interpretation, Vol. I: Principles*. New York, NY: Schlumberger Ltd. 112p
- Schlumberger . (1987). *Log interpretation applications*. Sugar Land, TX: Schlumberger
- Schlumberger. (1998). *Cased Hole Log Principles/Applications*, Houston, Schlumberger Wireline
- Serra, O. (2007). *Well Logging and Reservoir Evaluation*.
- Sharland, P. R., Casey, D. M., Davies, R. B., Simmons, M. D., & Sutcliffe, O. E. (2004). *Arabian Plate Sequence Stratigraphy-revisions to SP2* (Vol. 9, Issue 1). <http://pubs.geoscienceworld.org/gpl/geoarabia/article-pdf/9/1/199/5441444/sharland>.