



Ministry of Petroleum & Gas SUDAN



Investment Opportunities In Oil & Gas Sector



Promotion Section 2018



Outlines



• Introduction

• Upstream Investment Opportunities

• Farm-in Opportunities

• Downstream Investment Opportunities

• Biofuel Investment Opportunities

• Petroleum Infrastructure

• Investments Procedures in Oil & Gas Sector

• Why to invest in Sudan Oil & Gas Sector



Introduction

- History of Oil Exploration in Sudan goes back to 1959 when AGIP oil Company licensed the Red Sea Coast of Sudan.
- Many International Oil Companies had worked in Sudan e.g. Chevron, Total, AGIP, Sun oil, CNPC, PETRONS ,ONGC etc.
- Oil and Gas business in Sudan is administrated by the Ministry of Petroleum & Gas (Policies and Plans).
- Concession obtaining will start with courtesy visit to review the current opportunities then followed by data review, expression of interest, negotiation then contract signature.

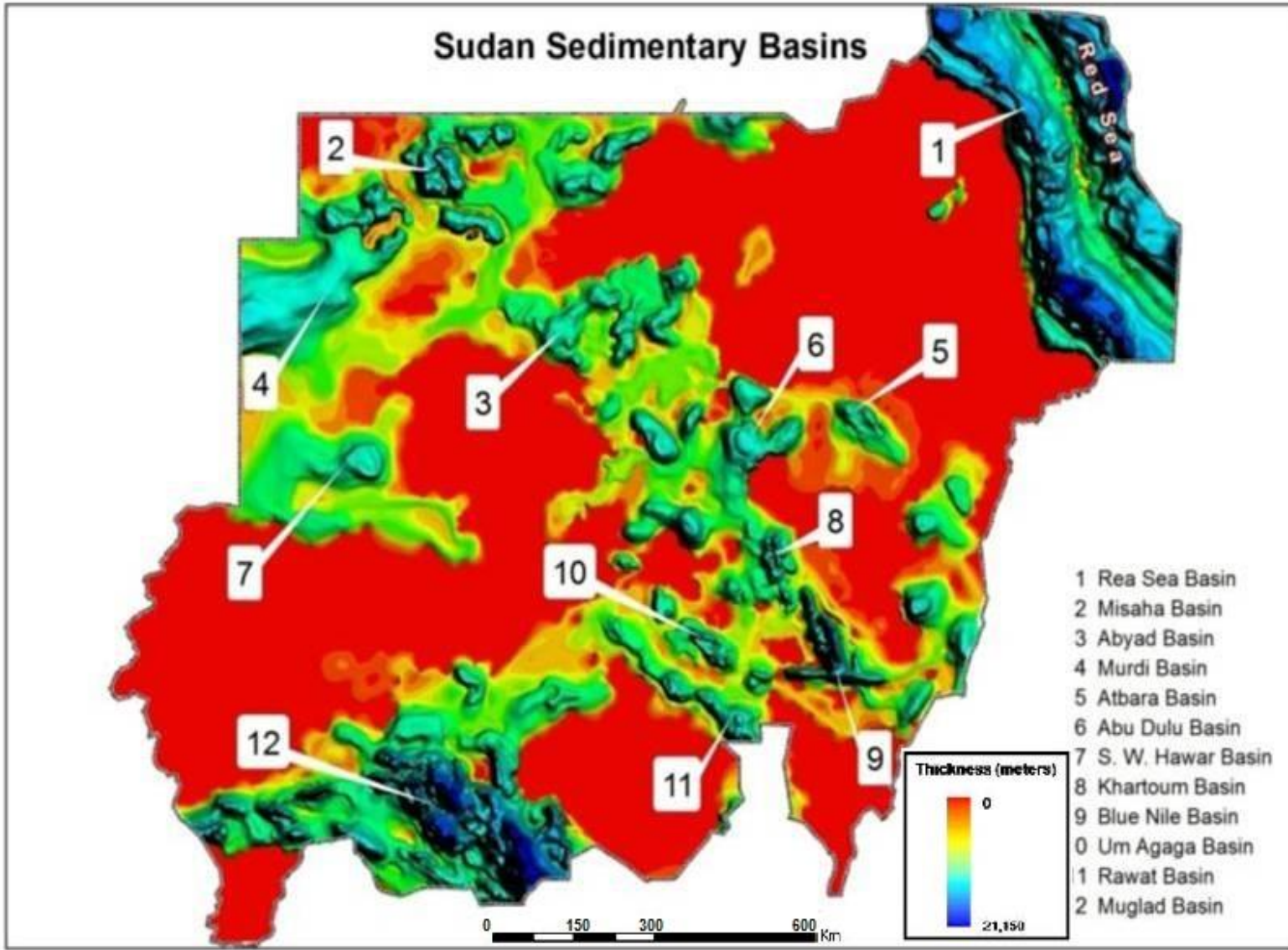


Upstream Investment Opportunities





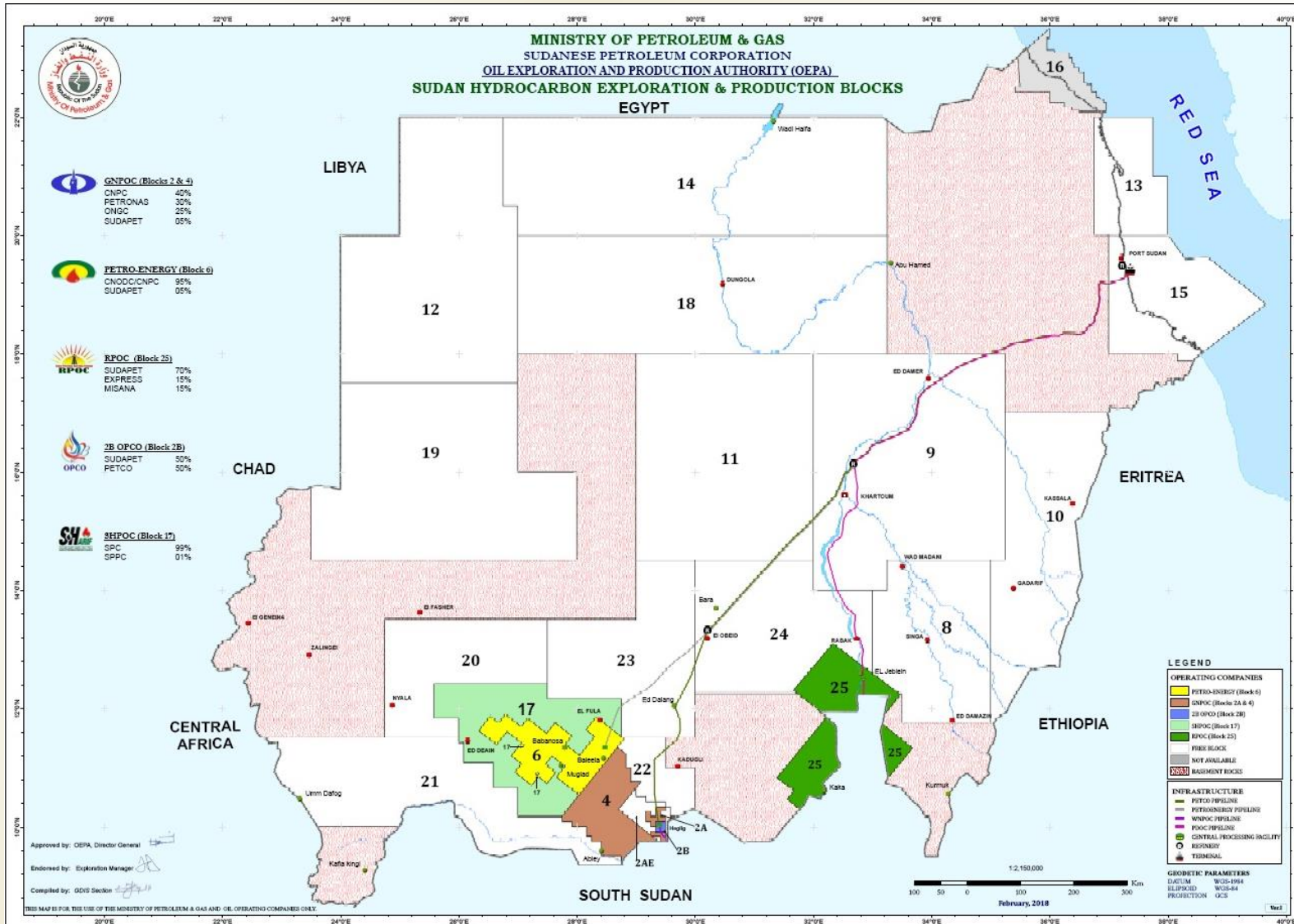
Sedimentary Basins in Sudan



12 Sedimentary Basins Delineated in Sudan



Sudan Petroleum Concession Map



23 Concession Areas in Sudan | 16 Free Blocks | 6 licensed



Red Sea Area Blocks (13 & 15)



Block Name	Area (sq.km)	Gravity & Magnetic	2D Seismic	Wells
Block-15	45,985.26	Covered the whole block	11,268 km	11 (2 discoveries)
Block-13	25,905.13	Covered the whole block	8,235 km	3

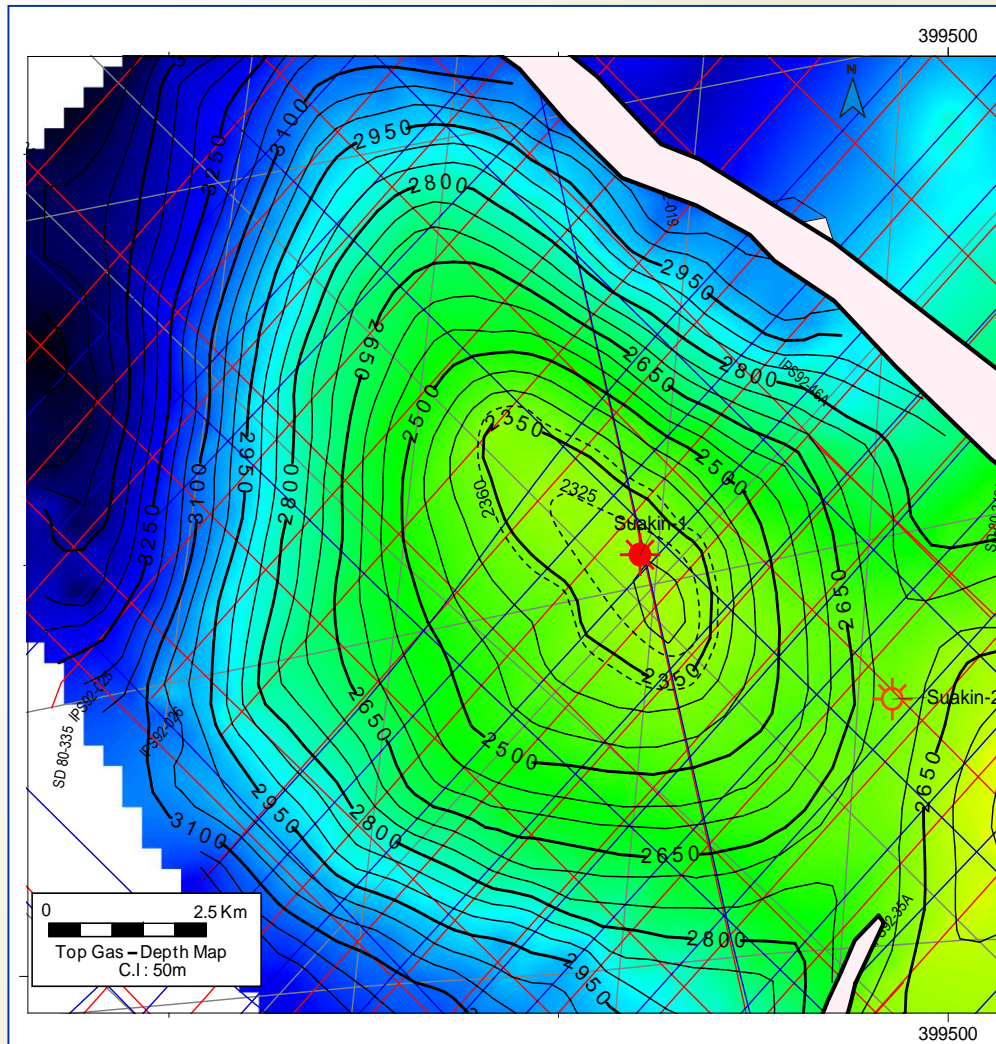


Discoveries Summary



SUAKIN

- Two wells were drilled, Suakin-1 (TD: 2744m) by Chevron in 1976 and Suakin-2 (TD: 3231) by IPC in 1996.
- Both wells targeted post-salt objective.
- Suakin-1 was a gas and condensate discovery, whereas Suakin-2 was P&A with oil & gas shows only.





Discoveries Summary

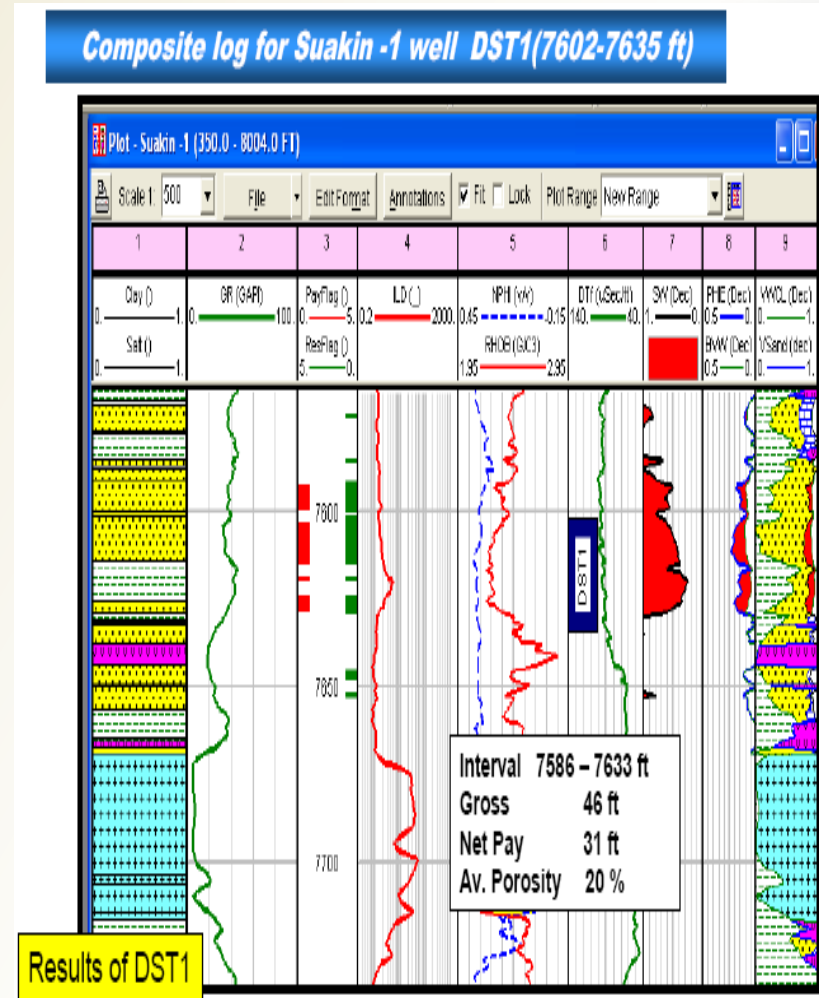


Suakin-1 : Zone-2 (2313-2335m)

DST #1 (2317-2326m) flowed 6.89 MMscf/d gas and 1158 stb/d condensate, 52 API on 48/64" choke

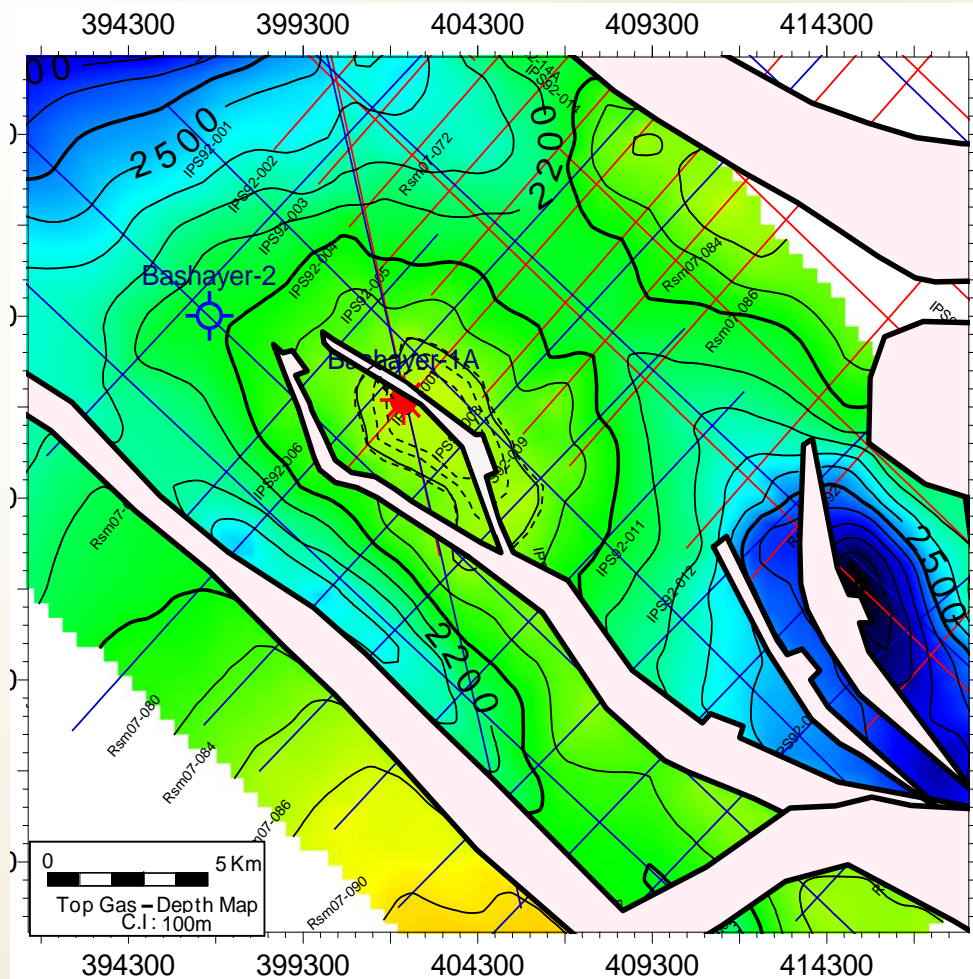
Porosity = 20%
Net Pay = 9m

It is realized that there're several other zones where the log signatures are similar to this zone, but not tested.





Discoveries Summary



BASHAYER

Two wells were drilled, Bashayer-1A (TD: • 2787m) by Chevron in 1976 and Bashayer-2 (TD: 2700m) by TOTAL in 1981.

- Both wells targeted post-salt objective.
- Bashayer-1A was a gas discovery, whereas
- Bashayer-2 was P&A with gas show only.



Discoveries Summary

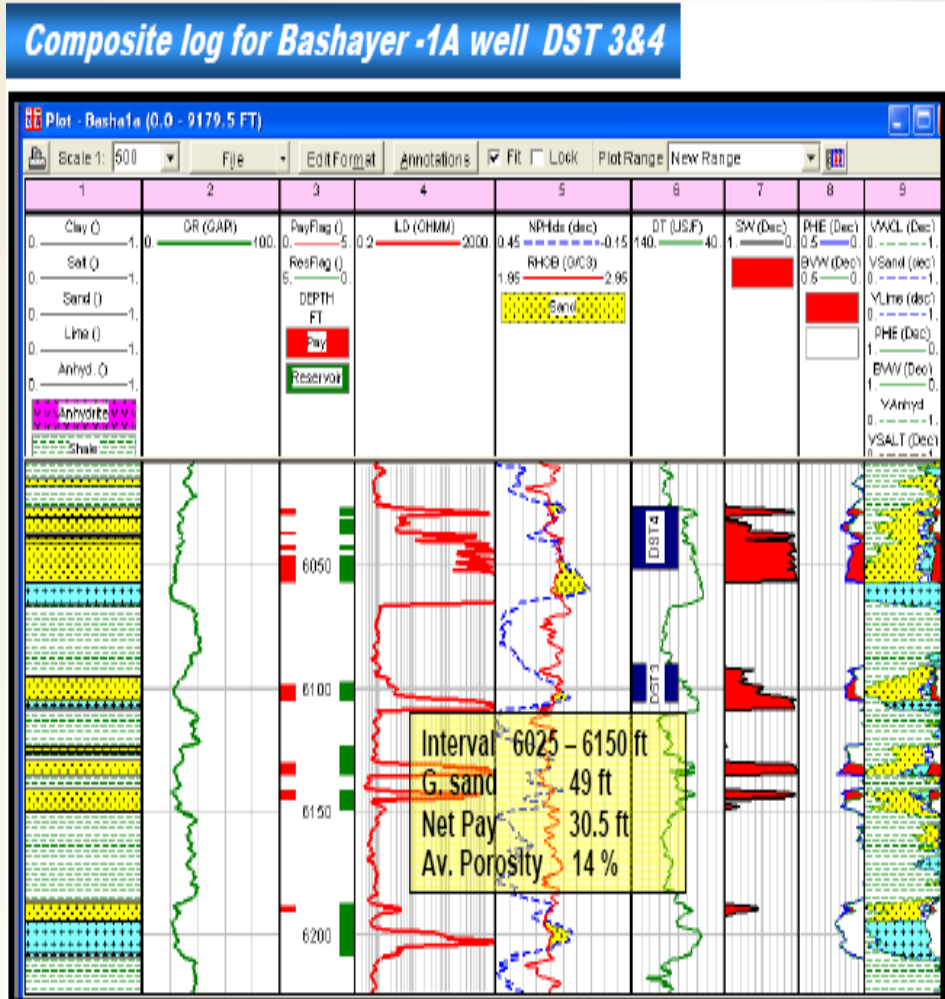


From the two well test results in this well (assuming good cement behind casing), the Zeit Formation at **this well could possibly contain more pay than expected.**

Pressure Data is not available to confirm fluid type / fluid system

DST #4 (1837-1844m)
Flowed 2.2 MMscf/d gas
Porosity = 14%
Sw = 22%
Net Pay = 5m

DST#3 (1856-1861m)
Flowed 7.2 MMscf/d gas and 115 bpd water on 36/64" choke
Porosity = 15%
Sw = 29%
Net Pay = 4m





Discoveries Summary



Discovery	GIIP (BCF)			
	P85	P50	P15	Mean
Suakin	265	515	875	561
	CIIP (MM bbl)			
	P85	P50	P15	Mean
	44	87	147	94
Bashayer	GIIP (BCF)			
	P85	P50	P15	Mean
	62	115	183	122
	Total Discoveries GIIP (BCF)			682
	Total Discoveries CIIP (MM bbl)			94



Onshore wells drilled by Agip in 1962





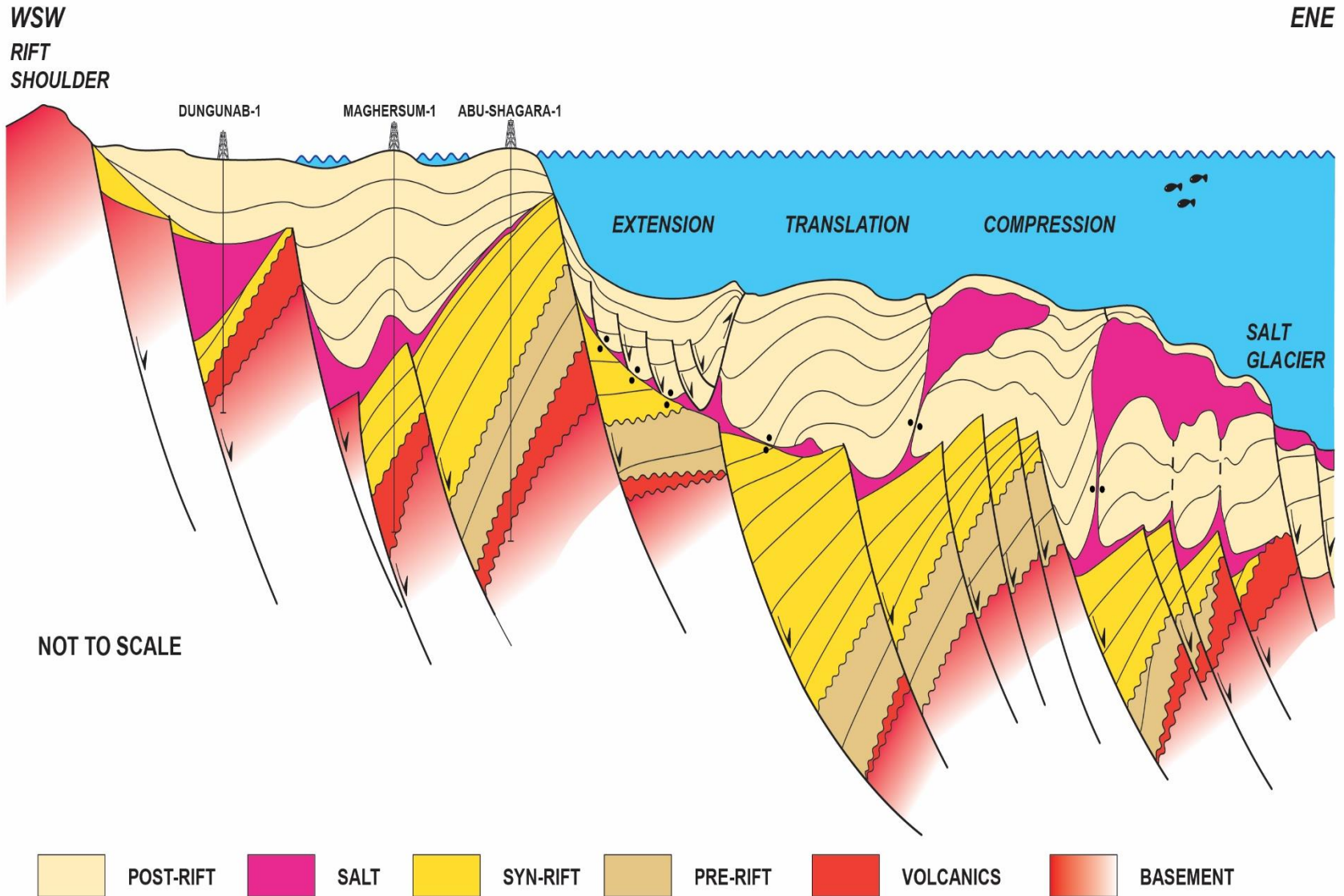
Well Geochemical Results



Well m	Interval Depth	SCI%	R0	TOC	Pyrolysis		
					T max	HI	OI
Abu Shagra-1 (2292.8)	446-725	1.5-9	-	0.11-1.78	438-443	77-271	38-321
Dungonab-1 (1565)	1086-1273	3.5-7	0.42-0.53	0.19-1.86	-	7	*53
Magarasm-1 (2254)	1211-1284	8.5-9	0.48-0.71	0.13-0.87	429-433	18-274	167-833



Regional context of AGIP wells, conceptual cartoon



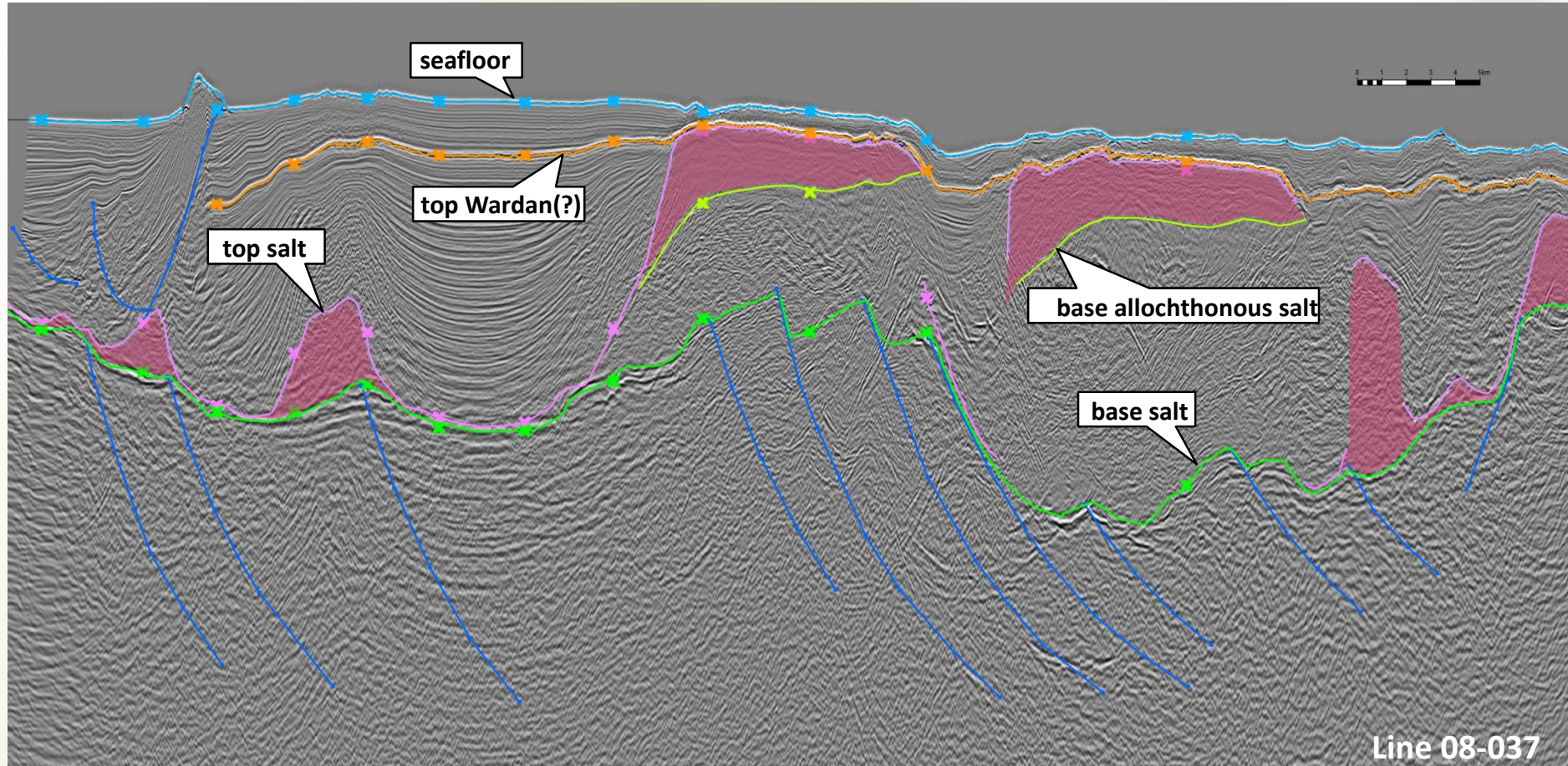


Representative seismic line with seismic horizons



WSW

ENE

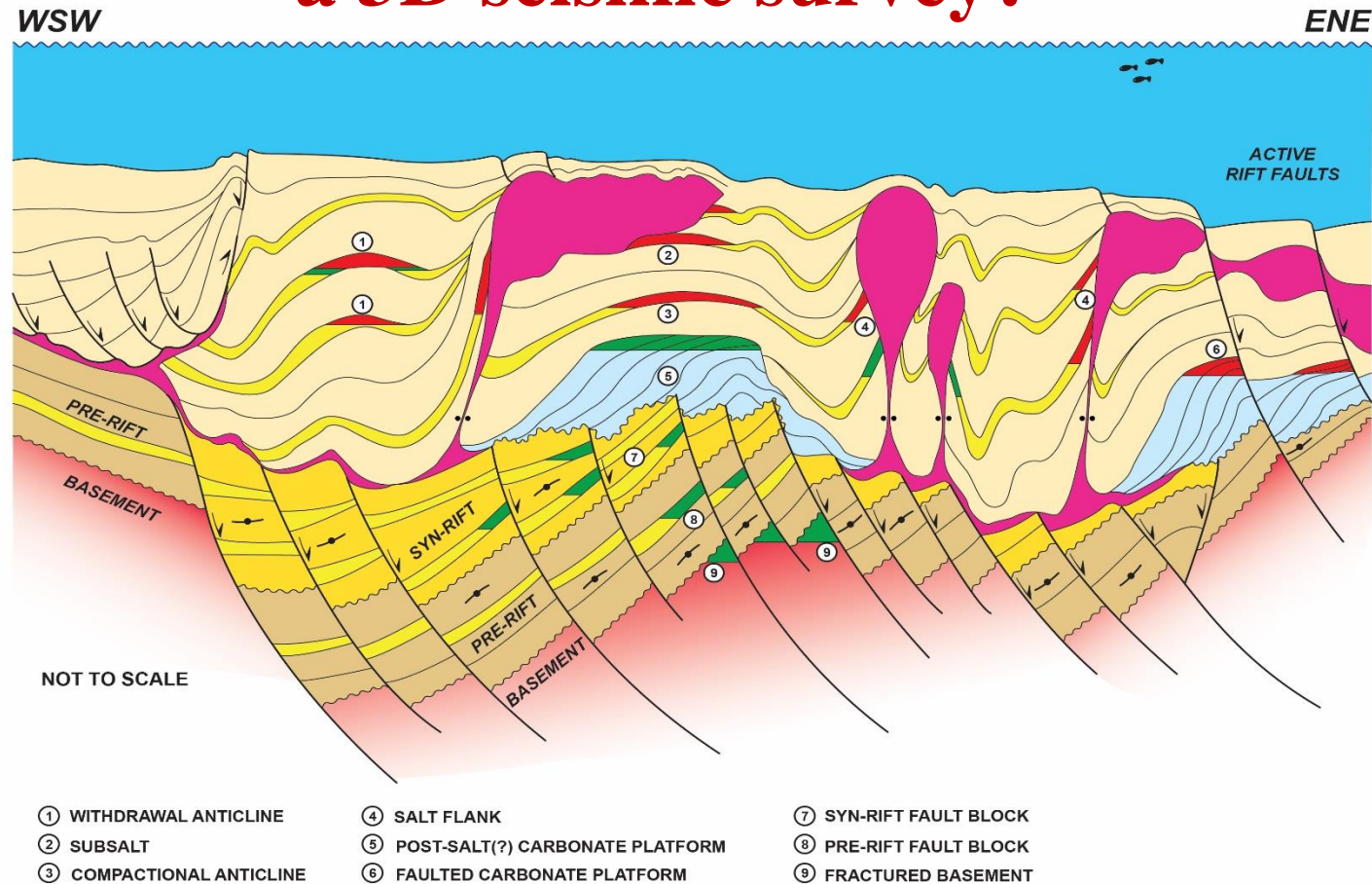


Line 08-037

No attempt was made to systematically map pre-salt horizons as the data quality is less than ideal in the deeper part of the majority of the seismic sections. The syn- and pre-rift strata need to be mapped after re-processing and, in particular, after proper PSDM work.



What needs to be done before a 3D seismic survey?



In order to firm up the specifics of the various plays shown here, a massive reprocessing of the existing 2D seismic data and a selective PSDM processing of about circa 3,000-4,000 km of the seismic data set are required. Whereas the 2D PSDM will be a critical next step, it will not provide drill-ready prospects. Therefore the acquisition of a 3D seismic survey and its 3D PSDM processing will be keys to pick the right drilling location(s).



Northern Area Blocks (14 & 18)



Block Name	Area (sq.km)	Gravity & Magnetic	2D Seismic	Wells
Block-14	148,194	Covered the whole block	849 km	-
Block-18	145,901.87	Covered the whole block	-	-



Exploration History of Block 14



GRAS/ RRI & GPC (1980s)

Geology & Gravity Surveys to promote Hydrocarbon Exploration in NW Sudan.

GRAS & TU (Berlin) FSB 69 (1970s to mid 1990s)

Geological Research studies covered most of N. & E. Africa

Study Assessment Report (2004):

An assessment report on the Hydrocarbon Potentialities of NW Sudan (2004)



Exploration History of Block 14



PetroSA 2005.

- ❑ An airborne Gravity & Magnetic Survey (13,000 km) was flown on 2005 over Misaha & Mourdi and East of Salima & Gabgaba areas.
- ❑ 2D seismic program (848.49 km) was carried out in Misaha /Mudri Areas.
- ❑ A Surface Geology was conducted in 2008 to updated the surface geological map of block 14.
- ❑ In 2013. AL-Sudan Energia has conducted and airborne survey project over Eastern part of Block 14 and block 18 which has indicated the presence Gabgaba and Abyad Basins.



Microbiological Prospecting for Oil & Gas (MPOG) Survey



- ❑ In 2007 MicroPro GmH Co was commissioned to carry out a MPOG Study in Block 14.
- ❑ The study aimed to determine the presence and relative concentration of bacteria consuming higher-order hydrocarbon constituents as an indication for crude oil and methylotrophic bacteria as an indicative of natural gas.
- ❑ A total of 1,080 samples were taken along the 2D seismic lines.
- ❑ A distinct areas with significant hydrocarbon indications could be identified.
- ❑ Level of hydrocarbon indications is comparable to other proven-hydrocarbon region analyzed before.
- ❑ MPOG results should be supported and combined with other geological and geophysical evidences to lower exploration risk.



Previous Work & Data availability (Block 18)



Geological and geophysical (gravity & magnetic) surveys have been done in this area:

- ❑ Geology & Gravity Surveys to promote Hydrocarbon Exploration in NW Sudan.
- ❑ Geological Research studies covered most of N. & E. Africa.
- ❑ An assessment on the Hydrocarbon Potentialities of NW Sudan.
- ❑ Geological Survey in 2008.
- ❑ Block 18 high resolution airborne survey – 2013.
- ❑ SEEBASE project report 2010.
- ❑ Sudapet Book.

The data of this surveys available in reports and maps



Conclusions (Block 18)



- ❑ As result of recent airborne survey of satellite study conducted 2013, confirmed the presence of Abayd sedimentary basin and considered as hydrocarbon potential area.
- ❑ The sedimentary fill ranges in depositional setting & age from shallow marine Silurian (?) through continental Permo-Triassic, Jurassic, shallow marine late Cretaceous and marine Tertiary carbonate & cherts.
- ❑ Shale sequences at the peripheries of the Abyad Basin indicate presence of potential source which embodies possible reservoirs of turbidite sands.
- ❑ The configuration of these basin is similar to that of Misaha, Salima & Gabgaba basins in Block 14 & Kom Ombo (Upper Egypt); the later is a producing basin.



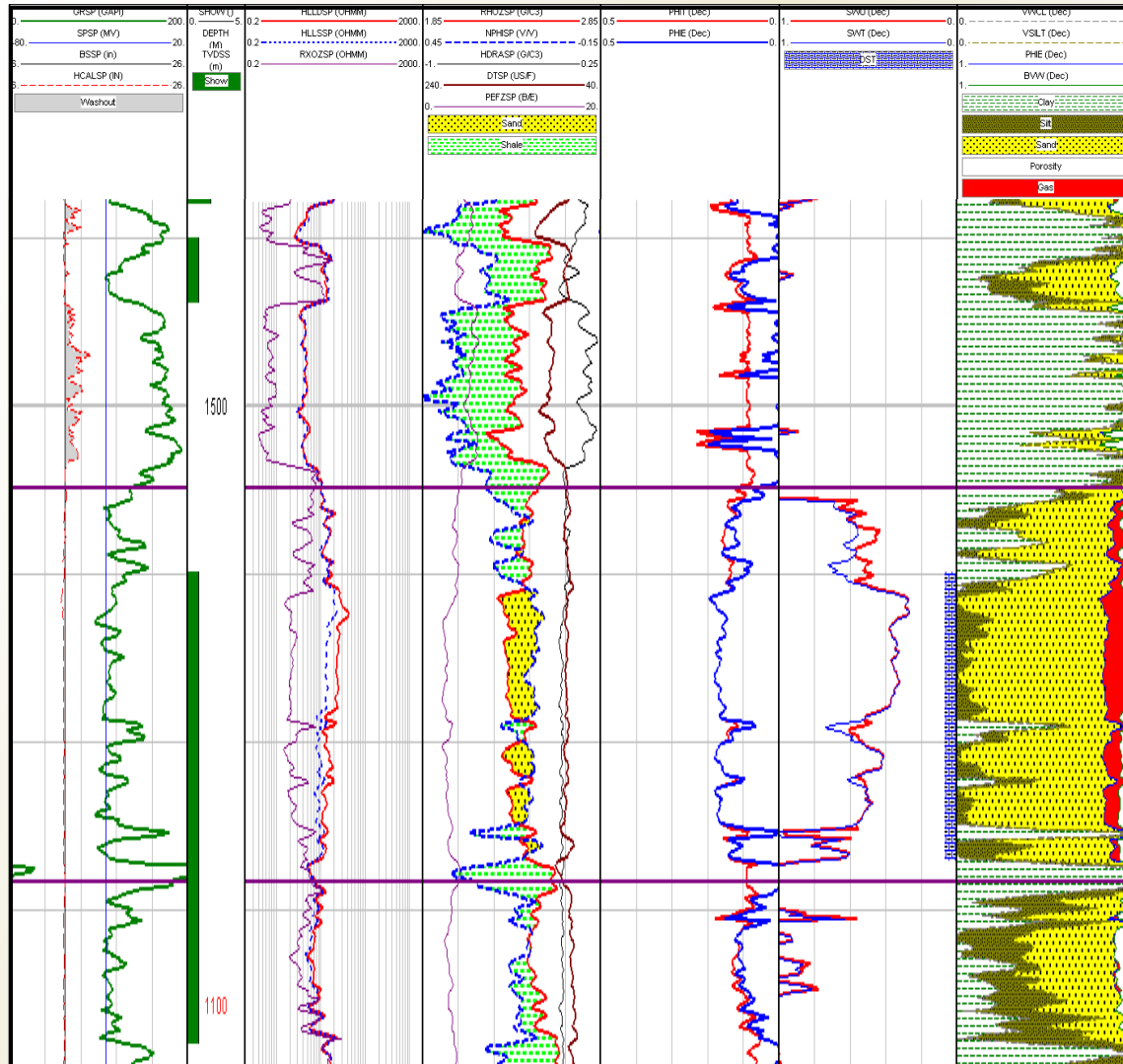
Eastern Area Blocks (8 & 10)



Block Name	Area (sq.km)	Gravity & Magnetic	2D Seismic	Wells
Block-8	60,513.3354	Covered the whole block	7523 Km	11 (3 discoveries)
Block-10	77,736.11	Covered the whole block	225 Km	-



Hydrocarbon Prospectivity



DST #3

Perforation Interval: 1510 - 1527 mMDRTE

Res. Properties:

- Good sand development
- Average Phi ~ 15%bv
- Average Sw ~ 45 %pv,
- Net Pay ~ 19 m
- Test Result :

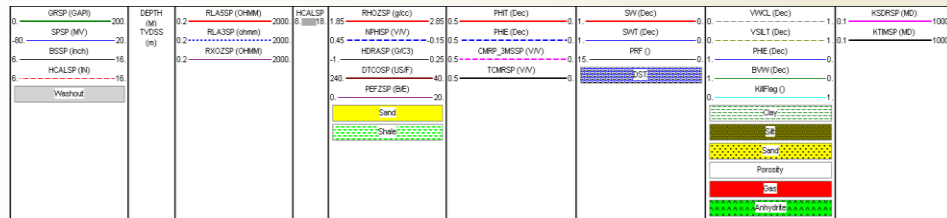
MIT	Choke Size	Gas Rate (mmscf/d)
1	16/64"	2.4
2	32/64"	7.7
3	64/64"	12.6
4	128/64"	16.9

Gas Composition	%
C1	97.7
C2	1.58
C3	0.54
IC4	0
NC4	0
IC5	0
NC5	0.06
CO2	0.12
Total	100

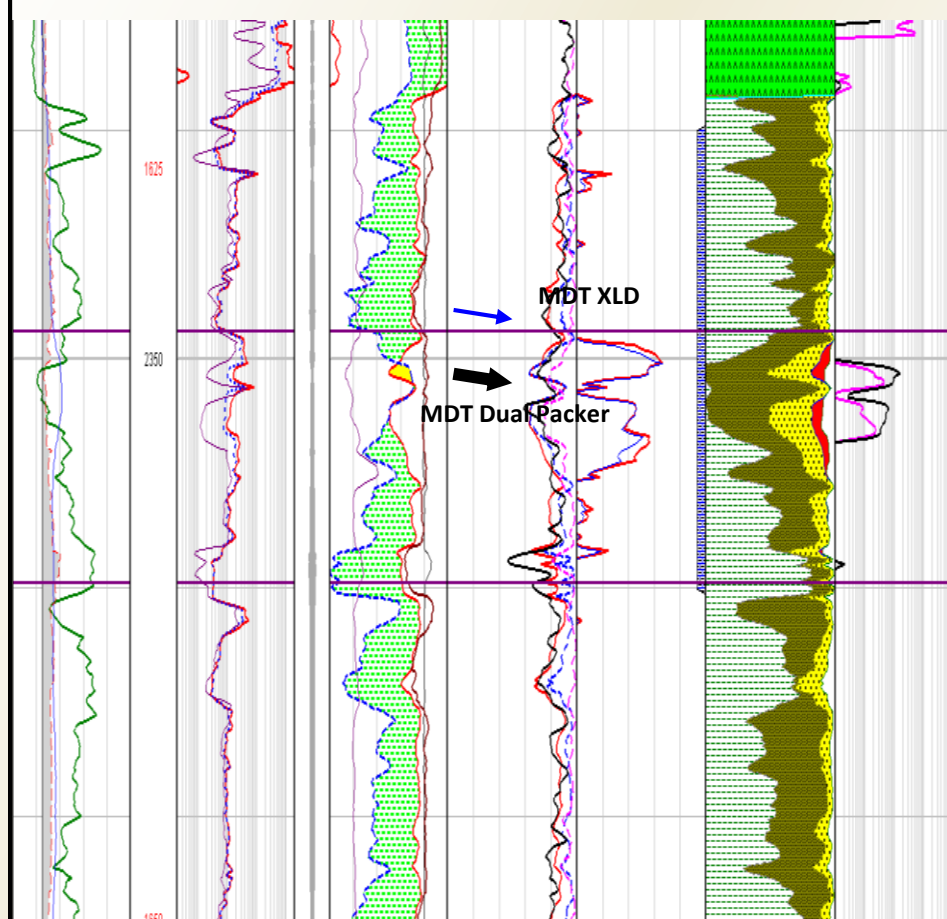
Hosan – 1 Well Testing (DST #3) – Dinder II Fm.



Hydrocarbon Prospectivity



DST No. 2a @ Dinder II



Tawakul – 1 Well Testing (DST No.2a) – Dinder II Fm.

DST #2a

Perforation Interval:

2340.0 – 2360.0 mMD

Reservoir Properties:

- Very poor sand development (Silty)
- Ave. Phie ~ 13 %bv
- Ave. Sw ~ 56 %pv
- Fluid Type – Gas and condensate
- Net Pay ~ 4.1 mTVD (phie cutoff 10 %bv)

Test Results :

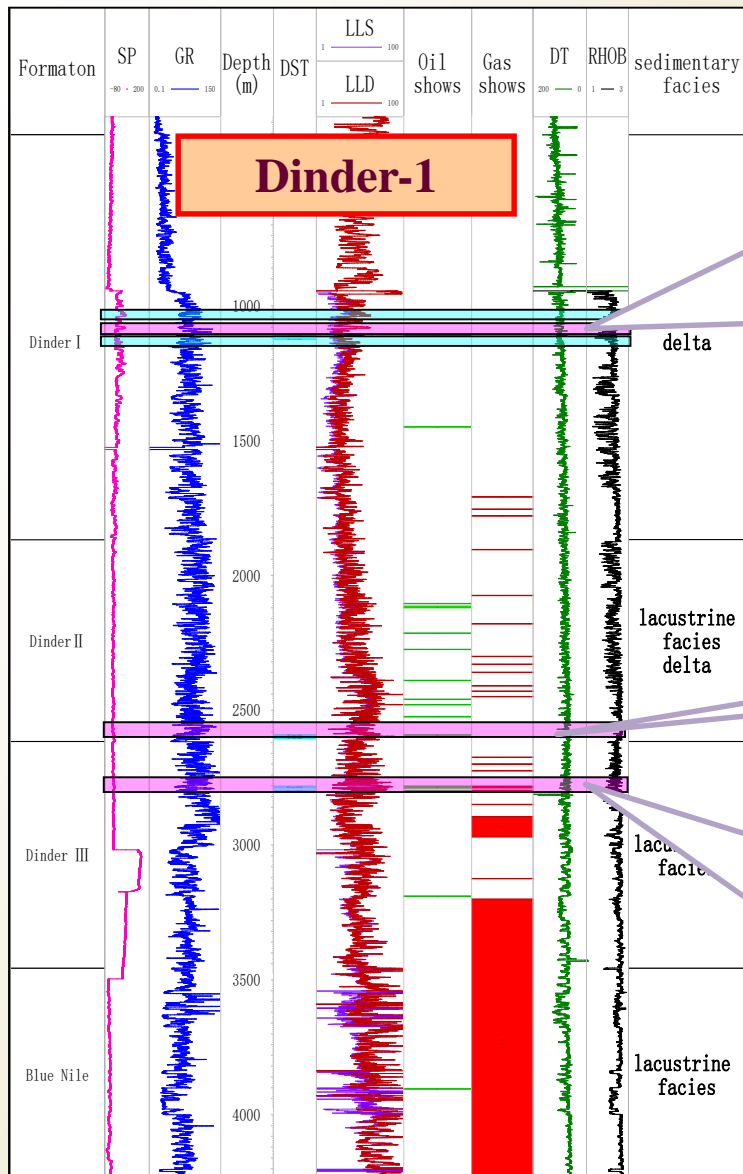
MIT (Modified Isochronal Test)

MI T	Choke Size	Gas Rate (mmscf /d)	Oil (52.4 API)Rate (stb/d)	CGR (stb/mm scf)
1	16/64"	1	-	-
2	32/64"	1.7	37.2	21.8
3	64/64"	1.7	16.4	9.9
4	128/64"	3.5	11.9	3.3

Gas Composition	%
C1	83.42
C2	7.58
C3	4.02
IC4	0.65
NC4	1.37
IC5	0.32
NC5	0.4
CO2	2.24
Total	100



Hydrocarbon Prospectivity



DST-3(1107-1111.3m+1122.6-1124.1m) recovered 161bbls fluid comprising the diesel cushion of 31 bbls,46.75bbls formation water trace Oil (0.5 bbls) and the rest was a mixture of rat hole mud.

DST2(2603-2605.7m+2590.8-2597.5m bottom of the Dinder II) produced gas

DST1(2796m-2803m+2781m-2788m Dinder III), blow gas and acquired a total of 21.66 bbls formation fluid by swabbing and the interval was concluded to be very tight gas/water bearing zone.

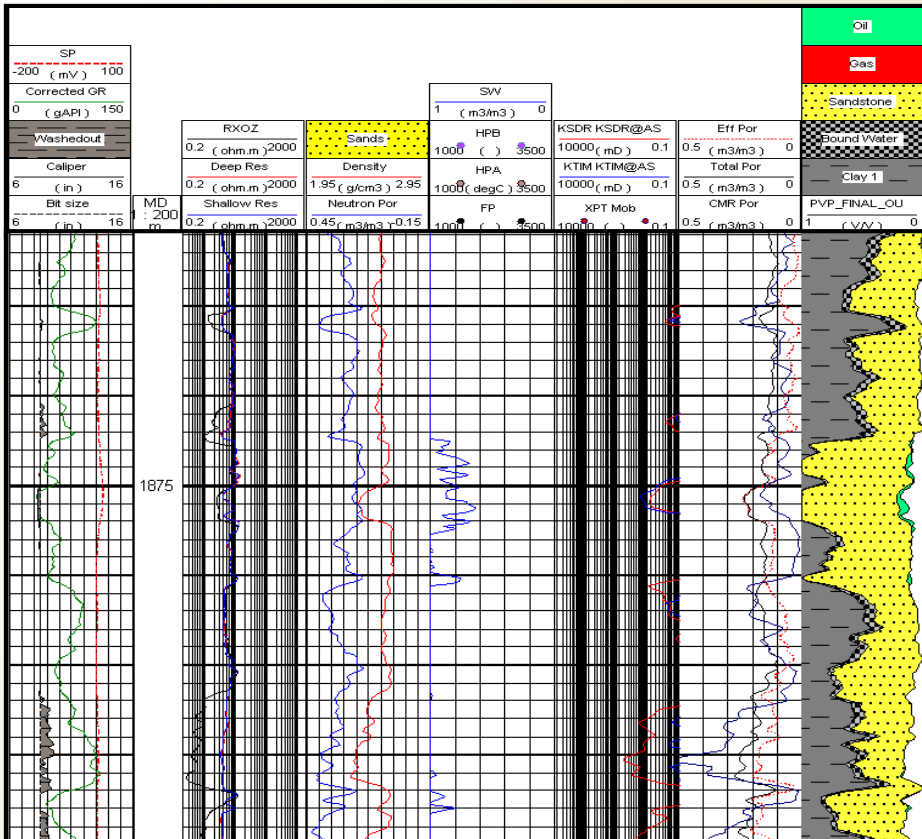
Dinder-1 Testing Results, Chevron Report



Hydrocarbon Prospectivity



West Dinder-1



Oil While Drilling



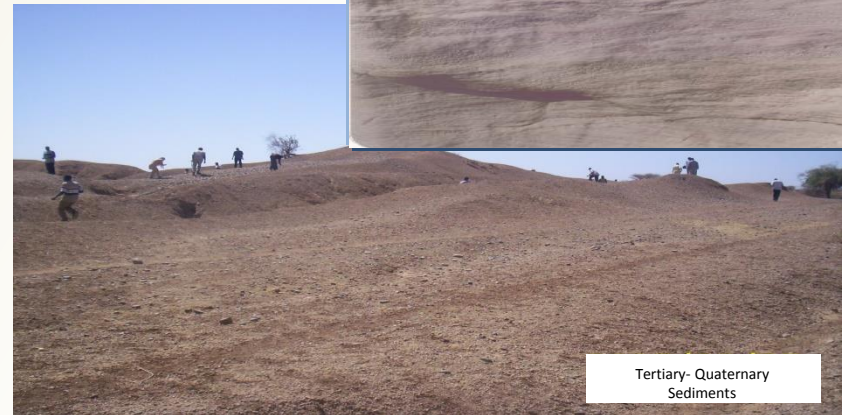
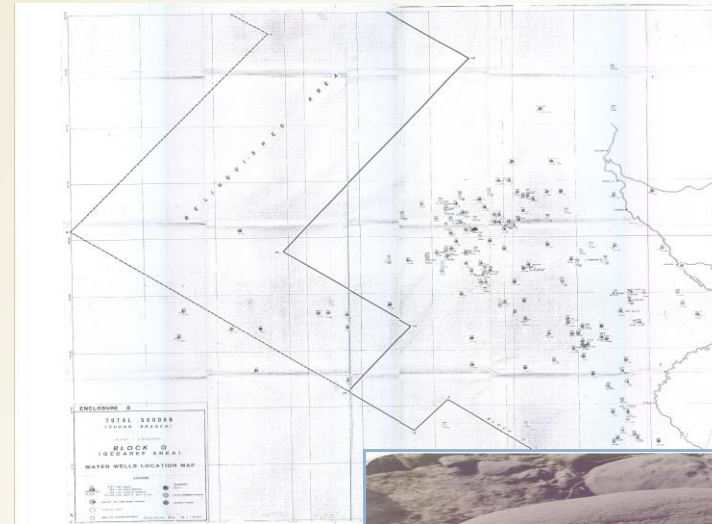
Drilling Bit



Introduction (Block 10)



- ❑ A Considerable number (~ 200) of water wells were drilled throughout the Gedaref area providing to some extent shallow geological information.
- ❑ Scattered few sedimentary outcrop consist of Nubian Sandstone or locally called Gedaref Formation.
- ❑ Dating of the Gedaref Formation come from Eisawi and Schrank (2009) who proposed a Masstrichtian age for Gedaref Formation base on pollen /spore assemblage recovered from shallow borehole near the Gedaref town.
- ❑ The depositional environment of Gedaref Formation is dominated by braided channels, bars and floodplain deposits.



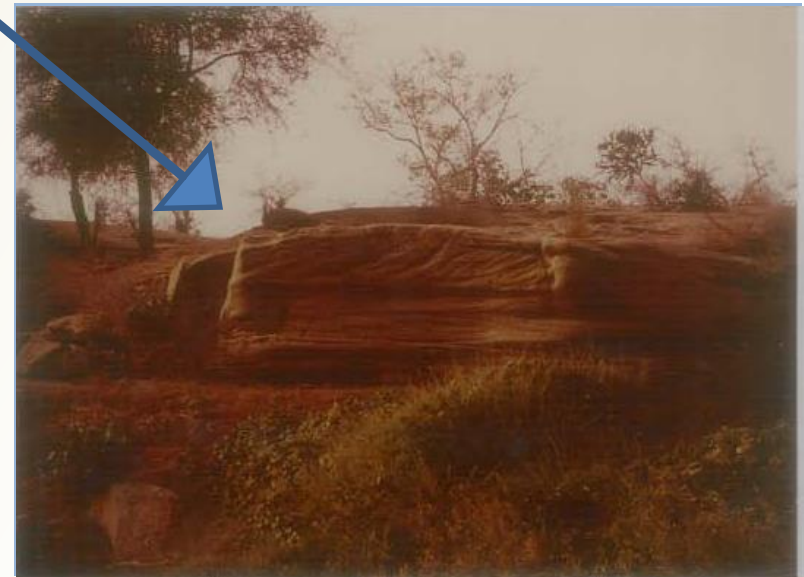
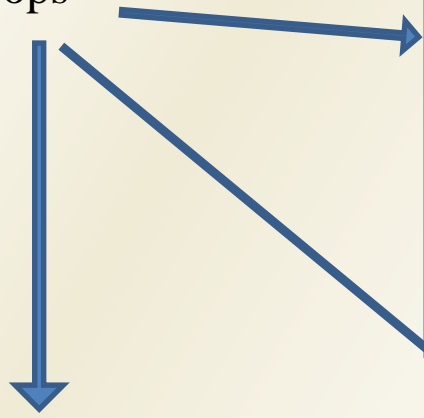
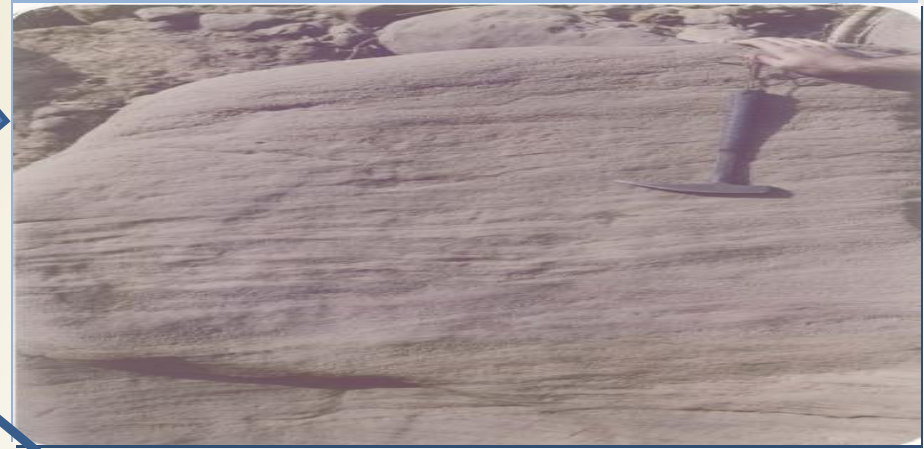
Tertiary- Quaternary Sediments



Introduction Cont. (Block 10)



There are many sedimentary features & structure in the outcrops





Central Area Blocks (9, 11 & 24)



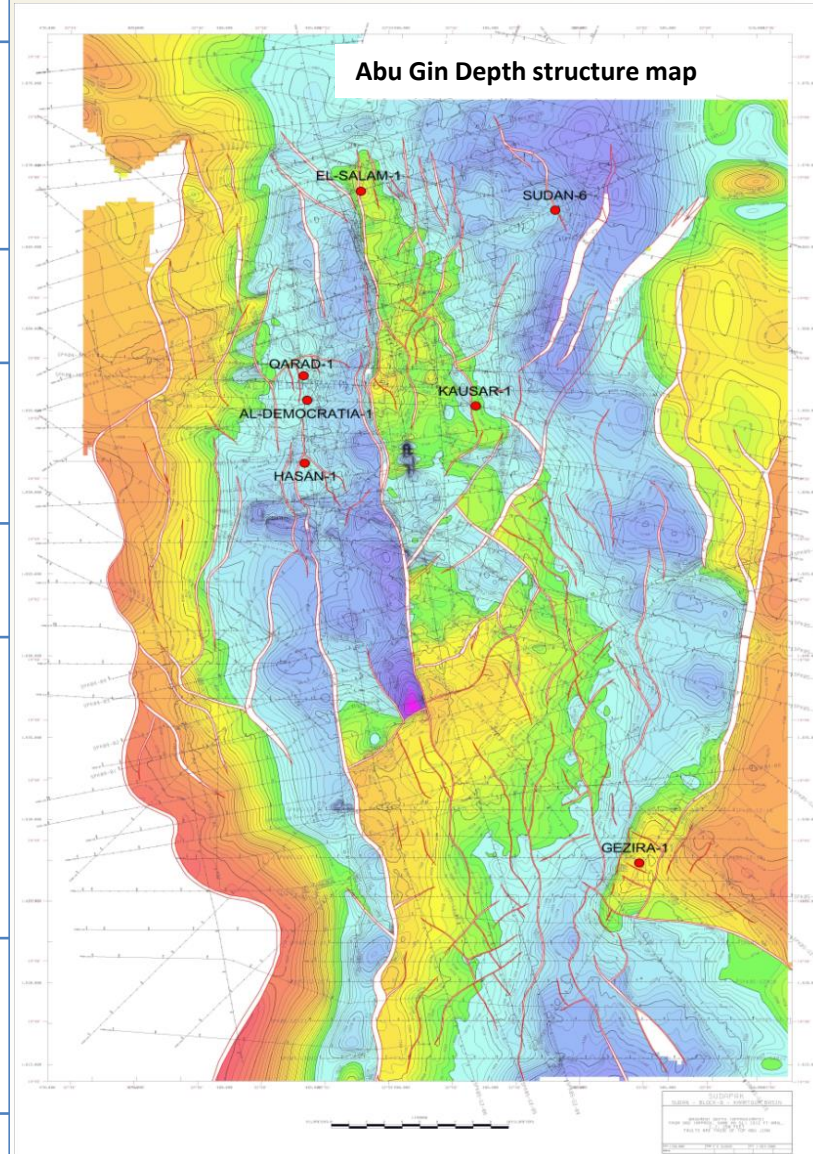
Block Name	Area (sq.km)	Gravity & Magnetic	2D Seismic	Wells
Block-9	141,937	Covered the whole block	7,400 km	8 (2 discoveries + 1 well with good oil & gas shows)
Block-11	124,237.96	Covered the whole block	92 Km	0
Block-24	66,589.6	Covered the whole block	4600.16 Km	5 (1 well with trace of oil and 1 well with oil & gas shows)



Khartoum Basin Drilled Wells Results (Block 9)



Well	Operator	Year Drilled	TD	Status
Al Democratia -1	SUNOCO	1987	3275 m	Good Oil & Gas shows. 5.5 bbls oil (35° API)
El Salam -1	SUNOCO	1989	2732 m	Oil & Gas shows
Sudan-6	SUNOCO	1989	3680 m	Traces of Oil & Gas shows
Gezira -1	SudaPak	2005	1773 m	~ve Oil & Gas shows.
Hasan -1	SudaPak	2006	2401m	Significant Oil & Gas shows. 1.5 bbls of oil sample (25° API)
Kausar -1	SudaPak	2007	2397m	~ve Oil & Gas shows.
Qarad-1	SudaPak	2011	2300m	Significant Oil & Gas shows.





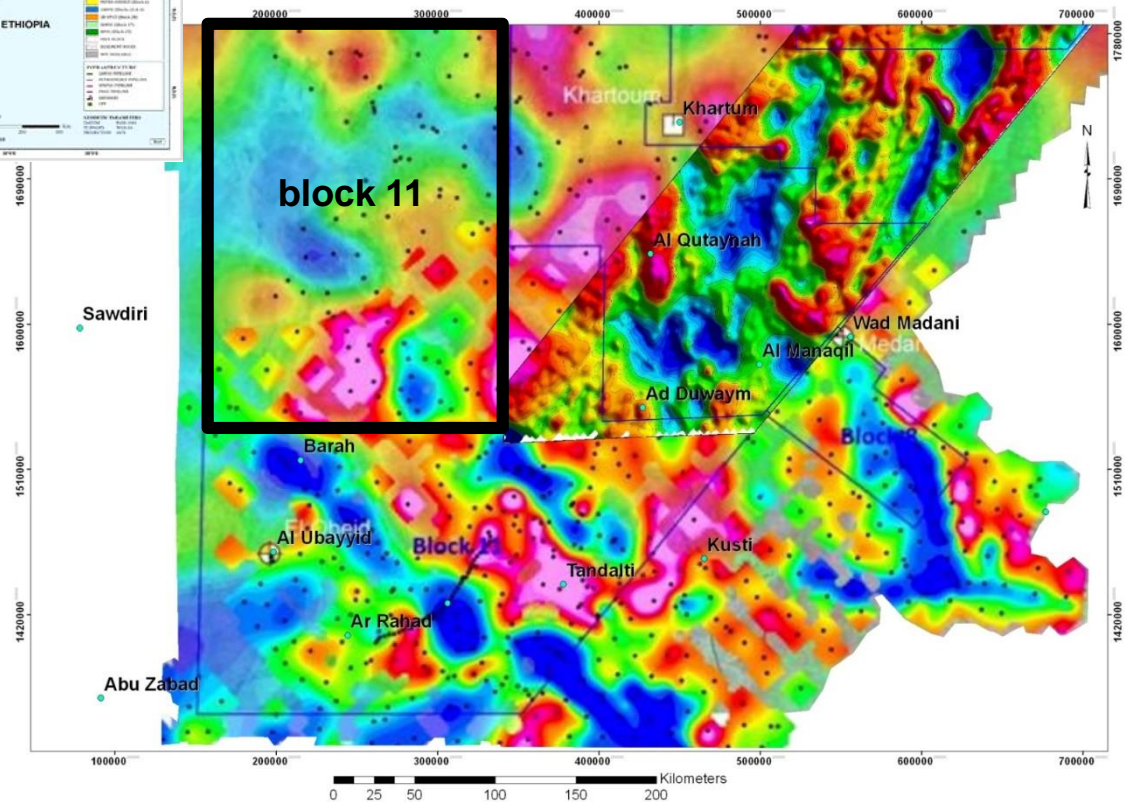
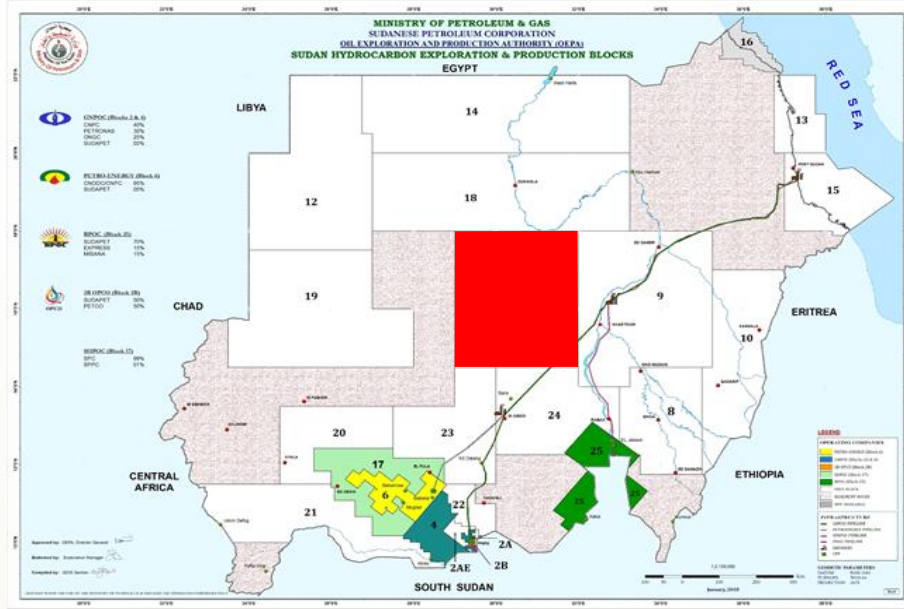
Conclusions (Block 9)



- Past Exploration activities proved the existence of 4 potential basins in Block 9; namely Atbara, Khartoum, En Niger and Um Asala. All these basins belongs to the Sudanese Rift System which developed South of the Central African Shear Zone.
- The Khartoum basin represents the North extension of the larger Blue Nile Rift, and it lies around 500km north of the productive oil province of the Melut Basin. It is up to 175km long and 50km wide and locally contains up to 5000m of Late Jurassic to Tertiary sediments.
- 7 wells were drilled between 1987 & 2011; Hydrocarbon shows were encountered in 4 wells in the Early Cretaceous interval.
- An active petroleum system is proven in Block 9 as indicated by oil/gas shows in two wells and the DST results over Democratia-1 and Hassan-1 & Qarad-1 wells. In the Khartoum basin



Block- 11 Old Gravity Data4

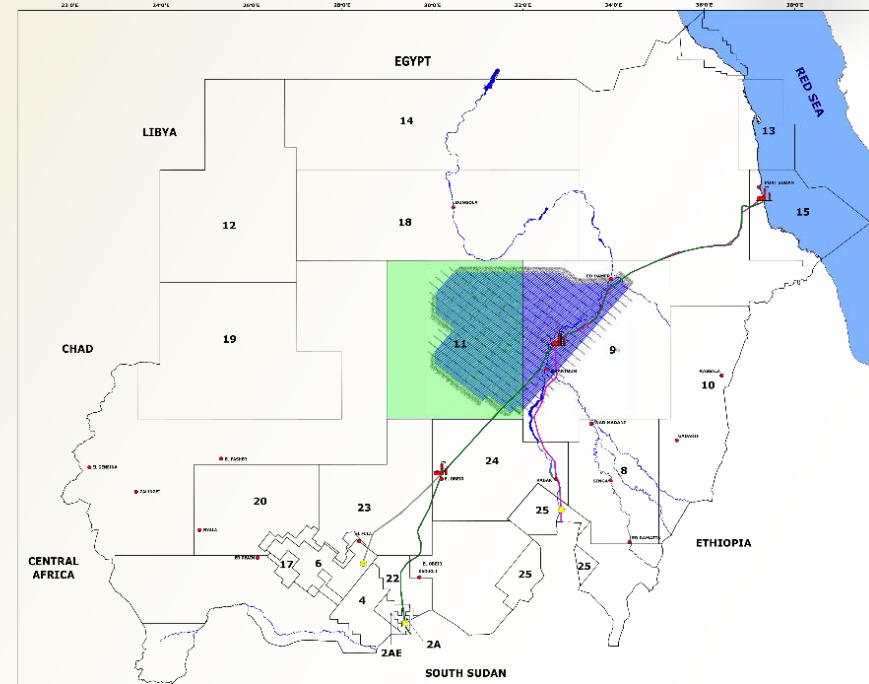
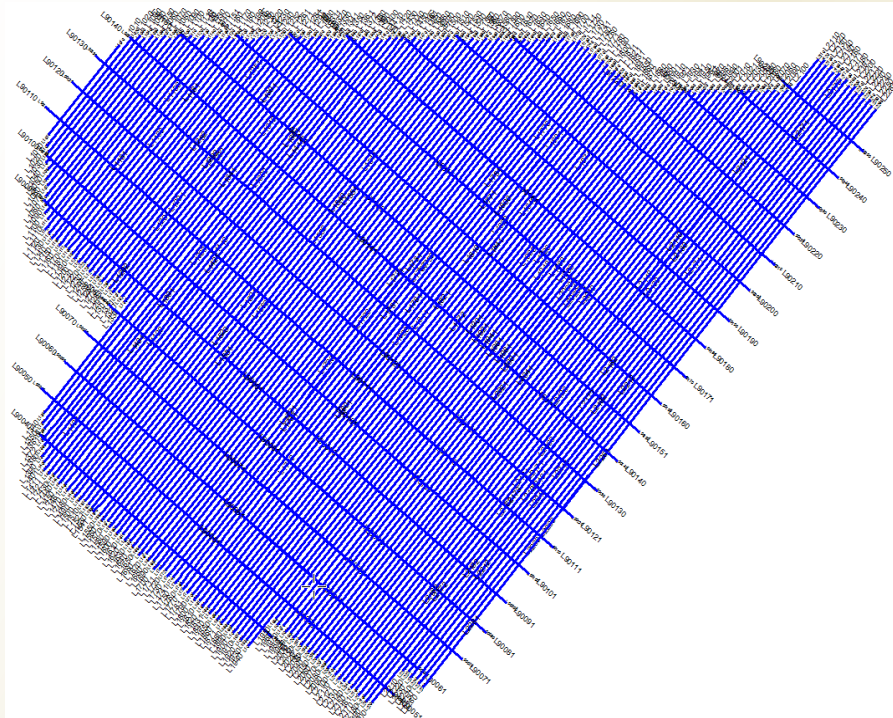




Exploration History (Block 11)



Block 11 High Resolution Gravity & Magnetic



Acquired by ASE 2013

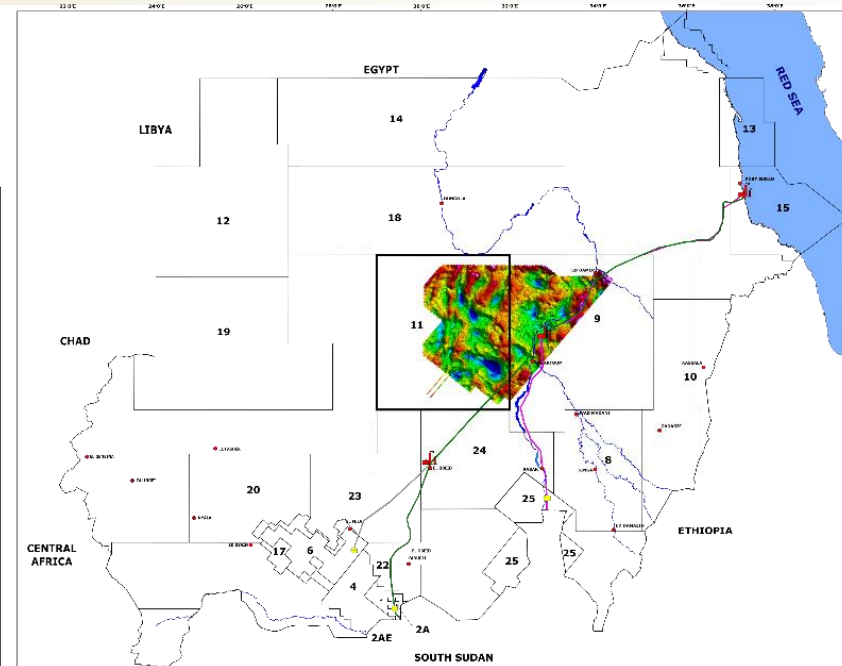
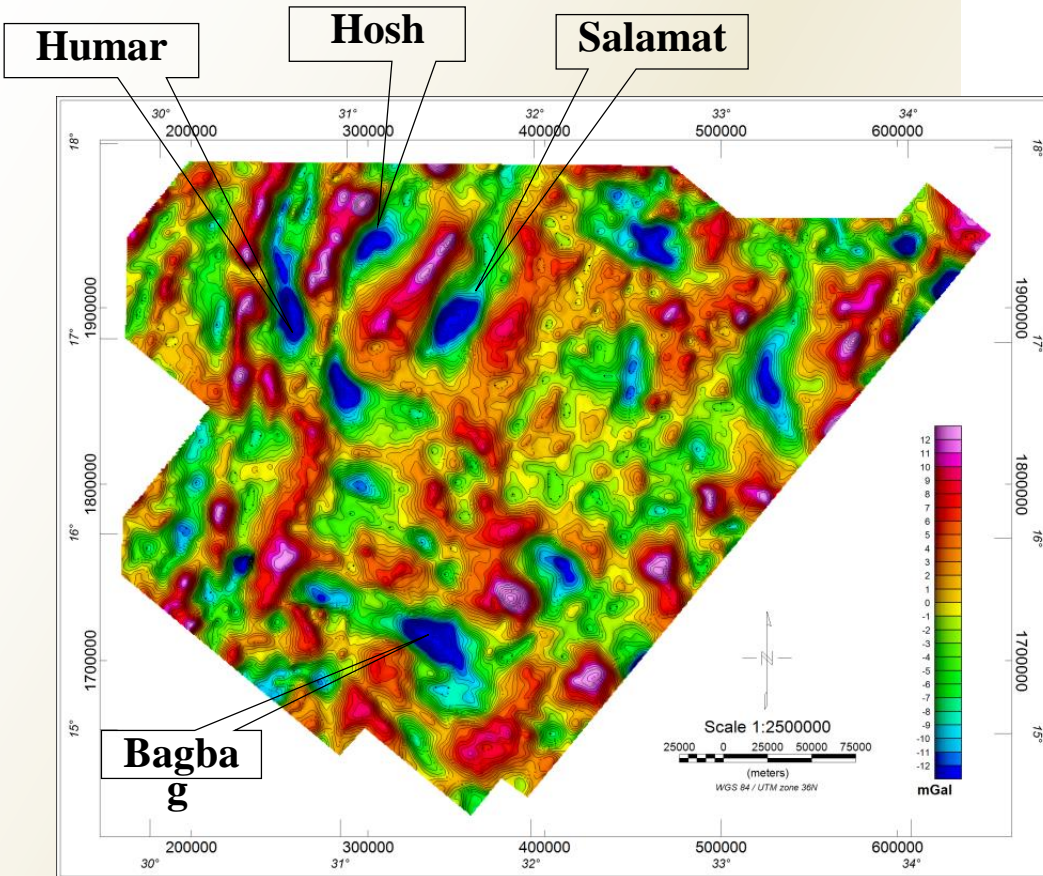
The program between Block 11 & 9:

- Total acquisition: 470001km
- Acquisition parameters: 3x21 km line spacing





Potential Basins (Block 11)



The newly acquired Gravity & Magnetic data helps to:

- Clearly outlines Block 11 sub-basins and depth to basement estimations
- Map faults, structures and volcanic intrusions



Conclusion (Block 11)



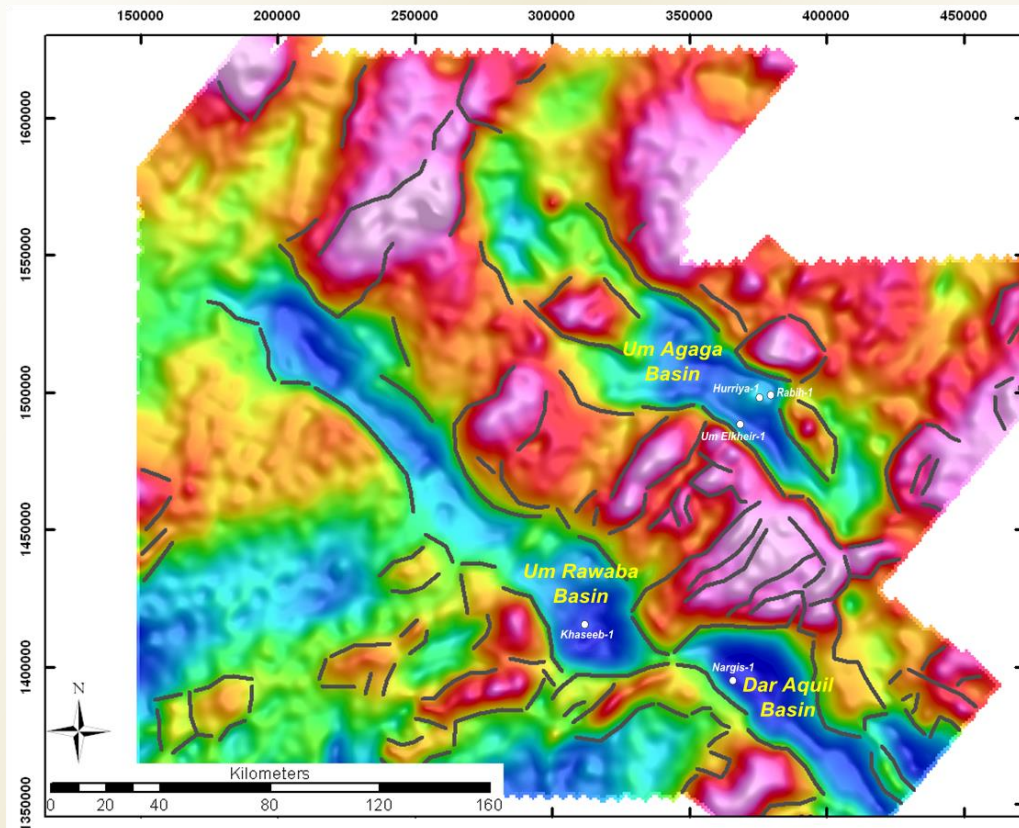
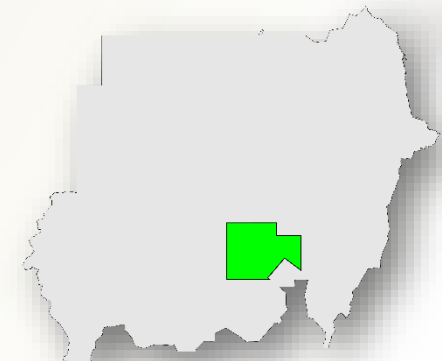
- ❑ Geological and Geophysical investigation confirm the existence of four extensional sub-basins in block 11 named as Humar, Bagbag, Salamat and Hosh. There are no wells drilled in these basins
- ❑ (Goelectric & Magnetotelluric) investigation over the Humar Basin resulted in deep (>3.5 km) NNW-Striking graben structure of approximately 250 km northwest of Khartoum.
- ❑ Humar Basin is compared with known half-graben geometries of the central and southern Sudanese rift system, In addition to similarities, differences in the structural evolution of the Humar Basin are emphasized.



Wells Drilled During The Past Exploration Activities (Block 24)



Well Name	Year	Basin	TD	Status
Hurriya-1	1985	Umm Agaga	8,640 Ft	Oil & Gas shows
Khaseeb-1	1985	Umm Rawaba	11,400 Ft	P & A as Dry
Nargis-1	1985	Dar Aqil	11,050 Ft	P & A as Dry
Rabih-1	2005	Umm Agaga	2550 m	No oil shows
Um Elkheir-1	2009	Umm Agaga	3710 m	Oil shows, MDT & DST



Total of 5 wells were drilled in Block 24. Three of them (Hurriya-1, Rabih-1 & Um Elkheir-1) are located in Umm Agaga Basin, one (Khaseeb-1) in Umm Rawaba sub-basin and one (Nargis-1) in Dar Aqil sub-basin.



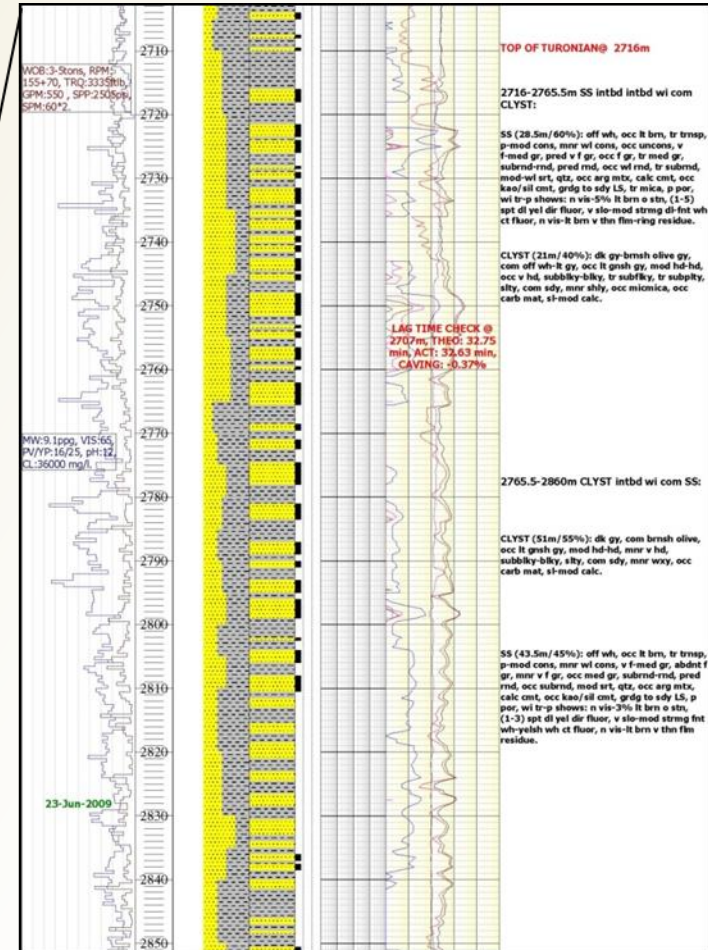
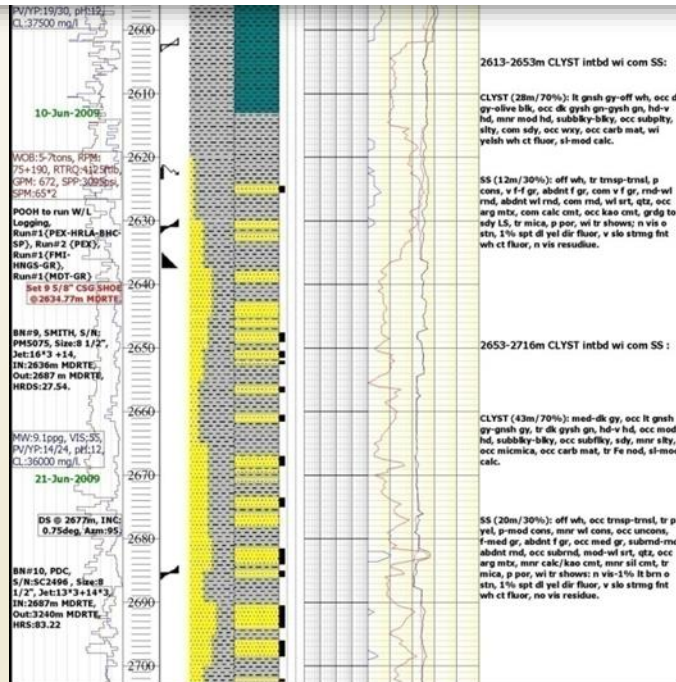


Um El Khier-1 Oil Shows



Summary of the oil shows, encountered 142.5m

NO.	DEPTH(m)		Thick (m)	FORMATION	LITHOLOGY	Shows Quality
	from	to				
1	2624.5	2625.5	1	Senonian	Sandstone	Trace
2	2647.5	2649.0	1.5	Senonian	Sandstone	Trace
3	2650.5	2651.5	1	Senonian	Sandstone	Trace
4	2652.0	2652.5	0.5	Senonian	Sandstone	Trace
5	2656.0	2657.0	1	Senonian	Sandstone	Trace
6	2660.5	2661.5	1	Senonian	Sandstone	Trace
7	2667.0	2668.5	1.5	Senonian	Sandstone	Trace
8	3009.0	3013.0	4	Turonian	Sandstone	Poor
9	3034.0	3036.0	2	Turonian	Sandstone	Poor
10	3040.5	3044.0	3.5	Turonian	Sandstone	Poor





Hydrocarbon Prospectivity



Um Elkheir-1 test results

INTERVAL		Gross Sand (m)	NET SAND (m)	Average Porosity	NET PAY (m)	Average Sw %	Remarks
TOP (m)	BASE (m)						
900.00	1047.50	147.50	118.41	30.00	0.00	100.00	Water
1047.50	1550.00	502.50	326.75	25.00	0.00	100.00	Water
1550.00	2013.00	463.00	282.40	25.00	0.00	100.00	Water
2114.00	2144.00	30.00	13.41	15.00	0.00	100.00	Water
2229.00	2239.00	10.00	8.84	18.00	0.00	100.00	Water
2298.00	2308.00	10.00	9.45	17.00	4.96	80.00	Possible Oil
2345.50	2351.00	5.50	4.57	15.00	2.74	78.00	Possible Oil
2456.50	2462.50	6.00	6.00	17.00	0.00	100.00	Water
2576.50	2583.50	7.00	4.88	9.00	2.44	79.00	Possible Oil
2631.00	2643.50	12.50	7.62	12.00	6.00	75.00	Possible Oil
2737.50	2748.00	10.50	2.44	10.00	0.46	90.00	Water
2769.00	2775.00	6.00	3.00	18.00	0.00	100.00	Water
2794.50	2796.50	2.00	1.20	13.00	1.20	78.00	Possible Oil
2937.50	2940.50	3.00	1.22	11.00	1.22	73.00	Possible Oil
3012.50	3021.00	8.50	6.50	11.00	6.00	75.00	Possible Oil
3040.00	3044.00	4.00	3.10	17.00	0.00	100.00	Water
3215.00	3219.00	4.00	1.22	9.00	0.00	98.00	Water
3391.00	3398.00	7.00	2.00	8.00	0.00	100.00	Water
3679.00	3686.00	7.00	2.90	9.00	0.50	90.00	Water

❑ Reservoir quality looks good down to 2500 mKB (Upper Cretaceous) and start getting poor to the total depth of this well.

❑ Total of seven (7) possible hydrocarbon zones were evaluated in this well (three (3) in the 12 ¼” hole and four (4) in the 8 ½” hole), at least five (5) will be testing zones.

Interval 3013.0 – 3020.0 mKB (Turonian)

Por. = 11 %

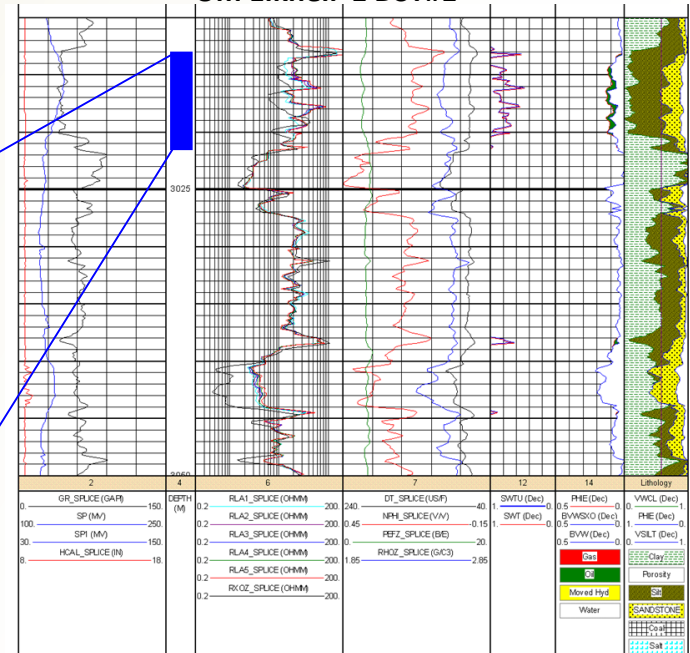
SW = 75%,

NP 6 m

DST#1, swabbed traces of heavy oil crude ,API :21.8 and pour point 60 deg C.

The test result is inconclusive?.

Um Elkheir-1 DST#1





Conclusion (Block 24)



- **Block 24 is located in close proximity to the well established infrastructures.**
- **Um Agaga Basin has a proven petroleum system manifested by the Trace to poor oil shows dominate the Taba and Dasis Formations in the mud log, which reflects a migration pass way rather than accumulation.**
- **Proven oil prone source rocks with high TOC values confirmed by the drilling results.**
- **The newly acquired and processed seismic data revealed that the three wells drilled in Um Agaga basin are rather down dip or off structure.**
- **Although Dar Aqil sub-basin is considered as the NW extension of Rawat Northern sub-basin, There is an obvious discrepancy between bio-strat correlation and seismic correlation between the two sub-basins (Narjis well vs. Rawat N-1).**



Western Area Blocks (12 & 19)



Block Name	Area (sq.km)	Gravity & Magnetic	2D Seismic	3D Seismic	Wells
Block -12	128,780.21	Covered the whole block	5204 km	-	3
Block 19	132,023.9	Covered the whole block	-	-	-



Exploration History & Data availability (Block 19)



This area is quite virgin with little data but there are many regional surveys have been done:

- A regional hydrogeological survey, Hunting geology & geophysics, 1970.
- Reconnaissance gravity survey of the NW Sudan, Robertson Research Intl. (RRI), 1985-86.
- The Geology & Petroleum potential of the NW Sudan, RRI, 1985.

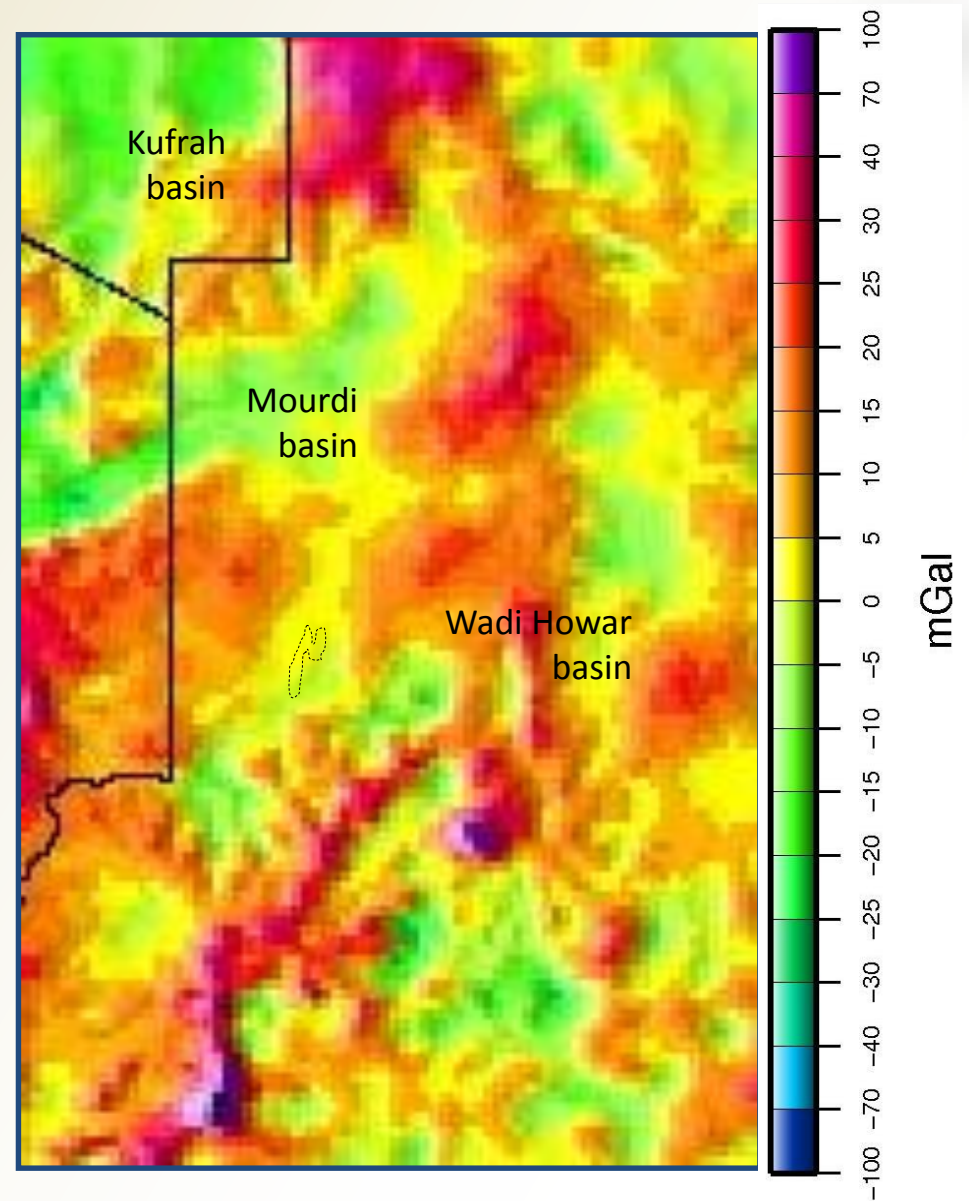
The data of this surveys available in reports and maps



Geological Background cont...



In general, it's analogous to the geology of the neighboring Kufra (SE Libya) and Murdi (Chad).





Conclusion (Block 19)



- ❑ Distinct sedimentary basin has been identified, namely; the South Wadi Howar as potential for hydrocarbon exploration.
- ❑ This basin is quite virgin with very little data, however the similarities in its origin, geology, and tectonic history render it a tremendous chance for HC occurrence.
- ❑ The indications from recent gravity data that the S. Wadi Howar basin could reach more than 5 km depth.



Southern Area Blocks (2AE, 20, 21, 22 & 23)



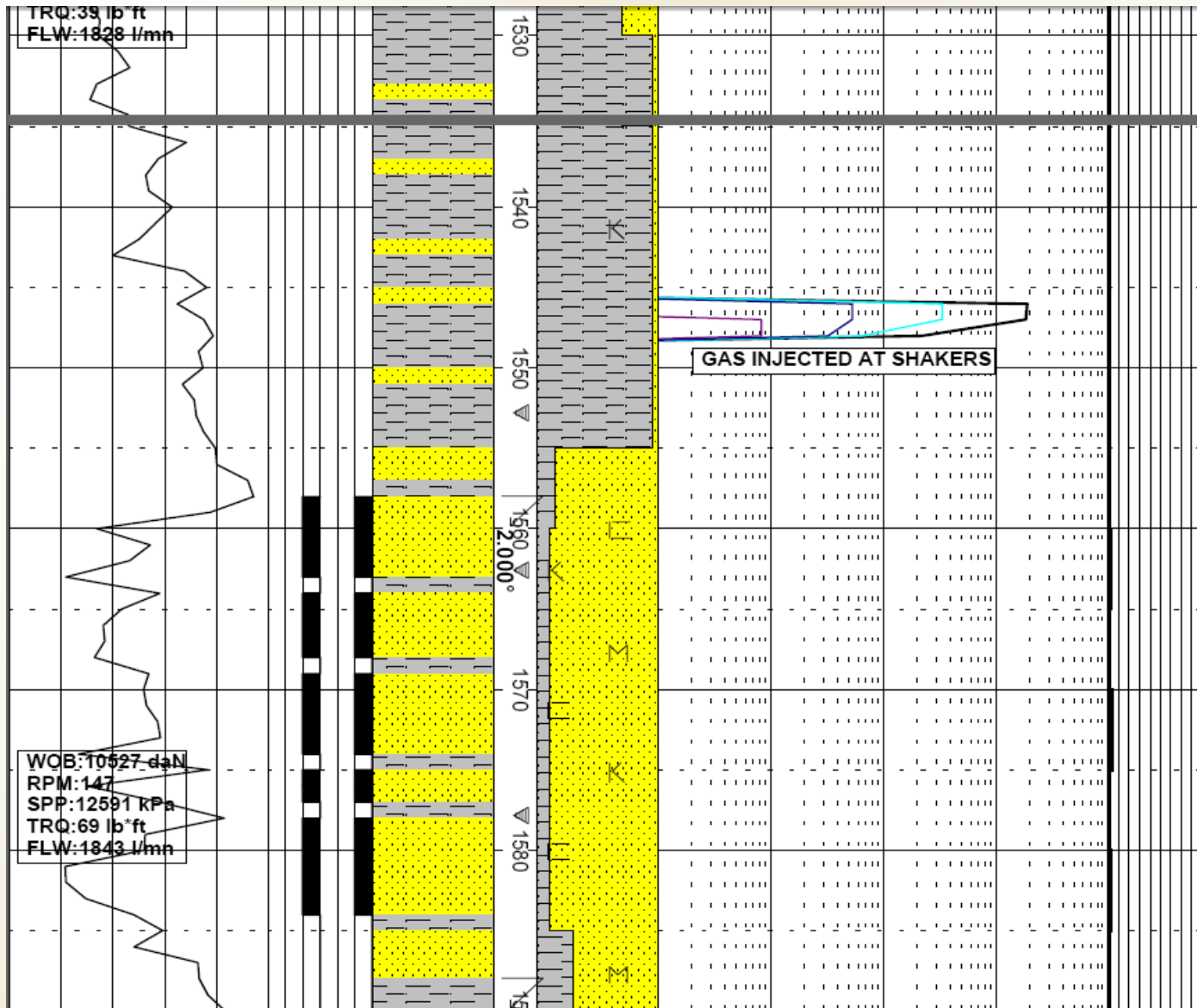
Block Name	Area (sq.km)	Gravity & Magnetic	2D Seismic	Wells
Block-2AE	3,503	Covered the whole block	10,345 km	13 (7 with oil & gas shows)
Block-20	46,670.58	Covered the whole block	-	-
Block-21	81,217	Covered the whole block	11,984 km + 174 km ²	10 (6 with oil & gas shows)
Block-22	12,478.5	Covered the whole block	1,529 km	2
Block-23	62,037.27	Covered the whole block	-	-



Wells with Oil Shows in Block2AE



Marage-1



mnr f gr,subang-subrnd,wl srt,
qtz,mnr kao mtx,tr calct,tr mica
fr-p por,n shows

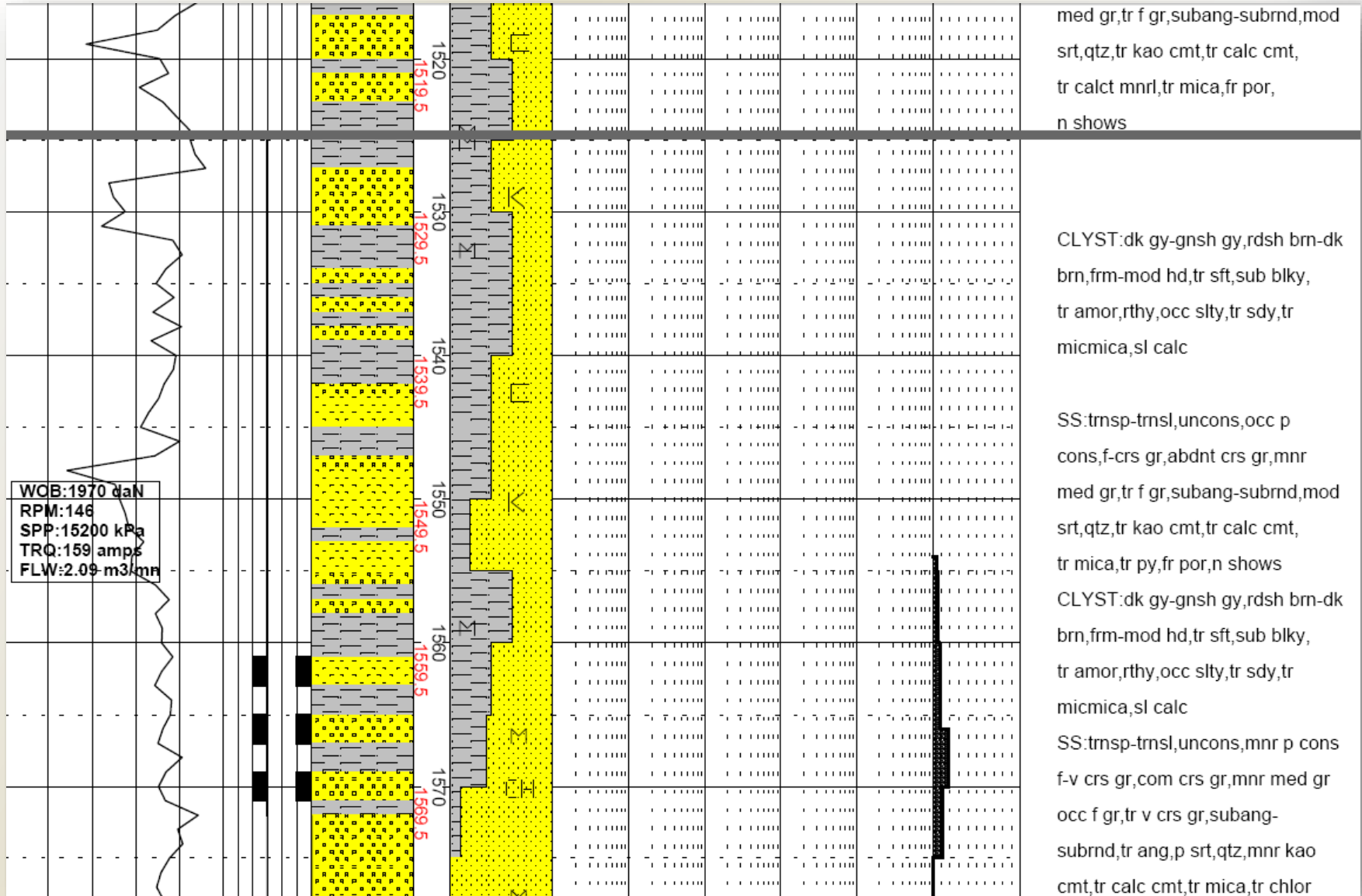
CLYST:brn-dk brn,mnr lt gy,frm-
mod hd,subblky-blky,rr subfis,
rthy,sly i/p,tr micmica,com
calc,wi occ intbd SS:trnsI,
uncons,com p cons,abdnt f-med gr
mnr crs gr,subang-subrnd,mod srt
qtz,com kao mtx,tr mica,p por,n
shows

BENTIU 1 SAND AT 1558 mKB

SS:trnsP-trnsI,uncons,mnr p cons
abdnt med-crs gr,mnr f gr,subrnd
rnd,mod srt,qtz,mnr kao mtx,tr
calc cmt,tr calct,rr mica,fr por
n vis o stn,occ spt bri pl yel
flour,v slo strmg dl mky ct
flour,n resd o
SS:trnsP-trnsI,uncons,mnr p cons
abdnt med-crs gr,mnr f gr,subrnd
rnd,mod srt,qtz,mnr calc cmt,tr
kao mtx,tr calct,rr mica,fr por,
n vis o stn,rr spt dl yel flour,
v slo strma dl mky ct flour.n

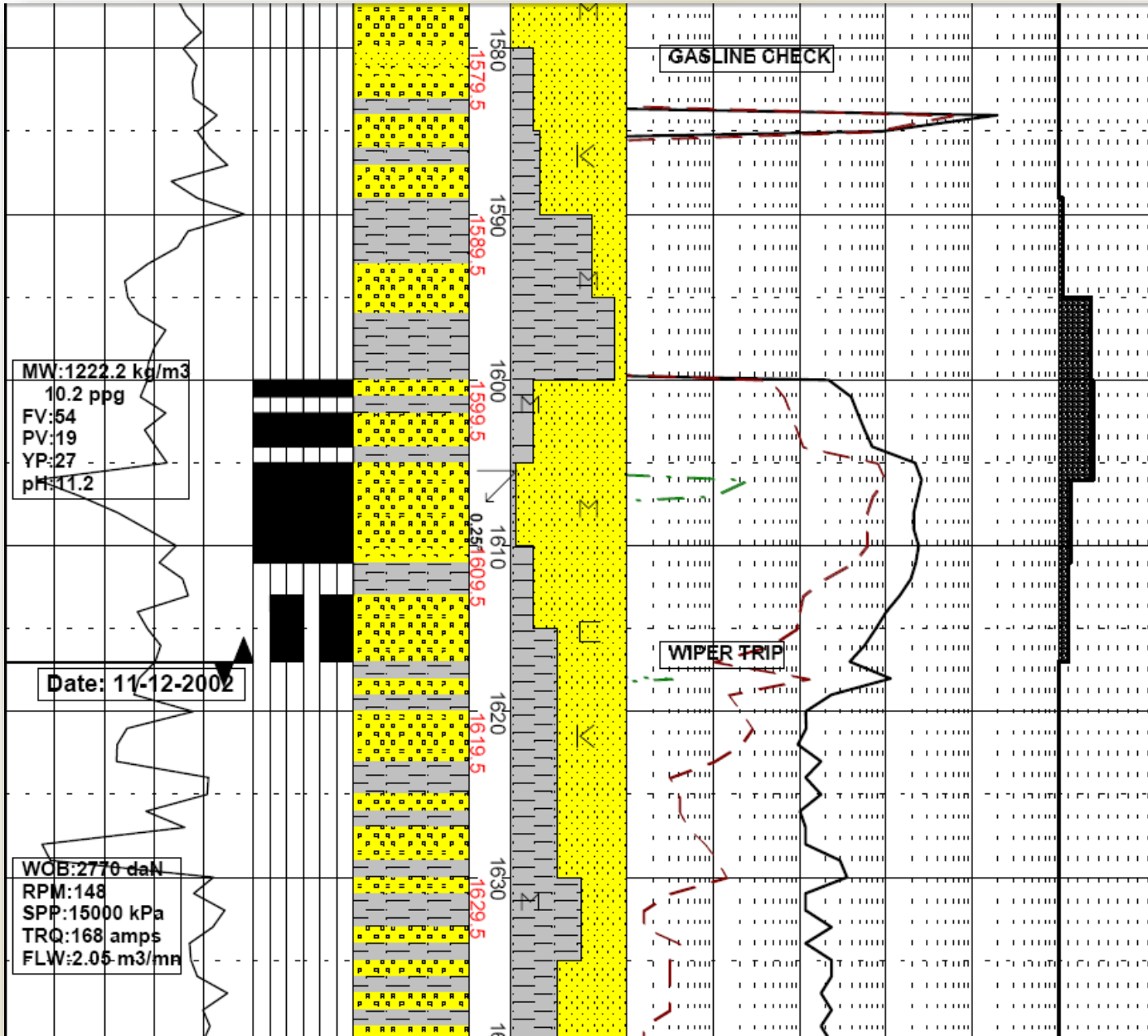


Zarzoor-1





Zaroor-1



fr por, tr lt brn o stn, mnr spt
 fnt yel fluor, tr slo strmg bri
 lt yel ct fluor, n resd o

CLYST: lt gy, off wh, gnsh gy, occ
 brn-rdsh brn, sft frm, amor-
 sub blk, rthy, occ slty, tr sdy,
 tr micmica

BENTIU-2 SS @ 1600 m

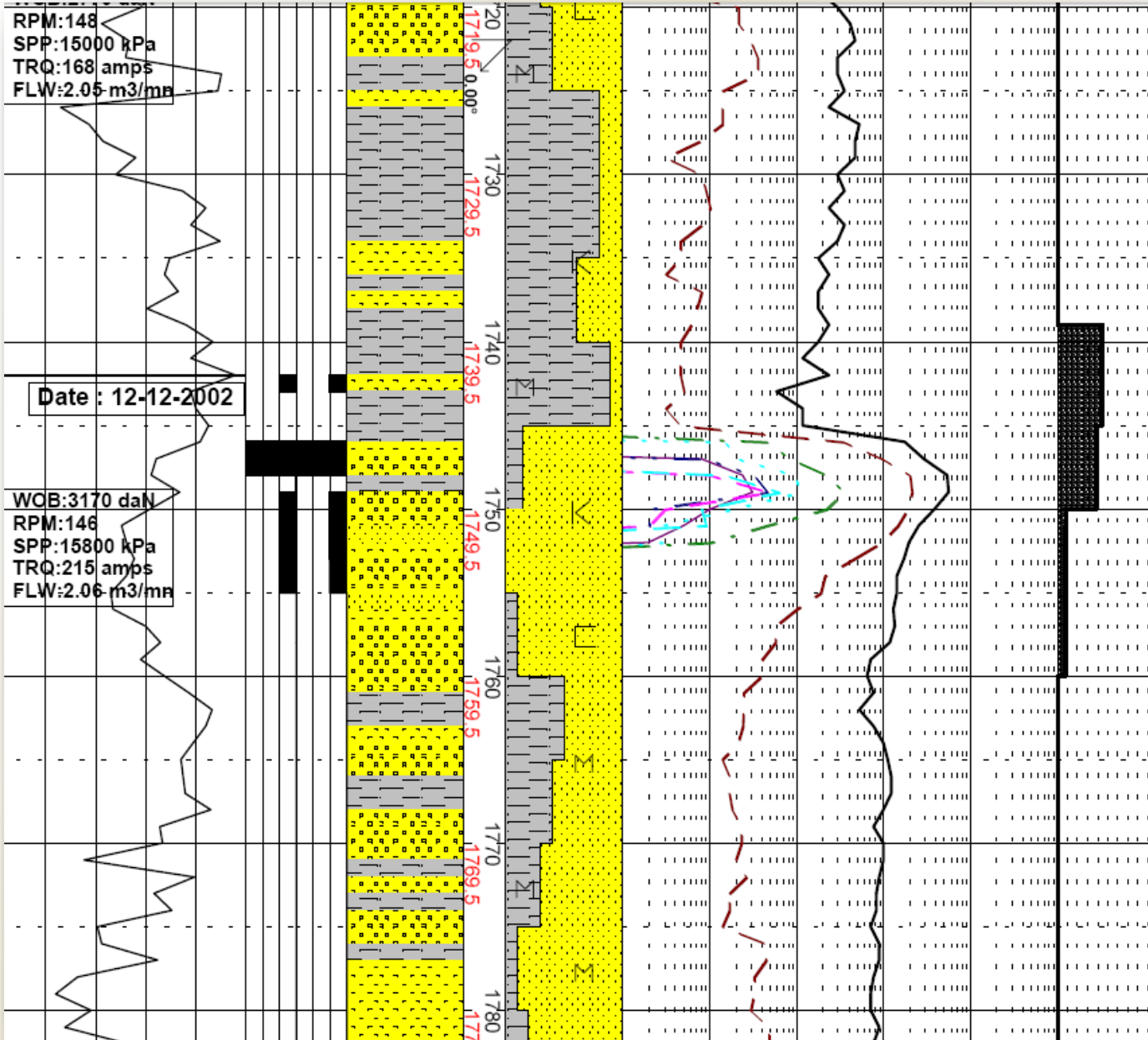
SS: trnsp-trnsl, uncons, tr p cons,
 med-v crs gr, abdnt crs gr, tr med
 gr, tr v crs gr, subang-subrnd,
 mod-wl srt, qtz, tr kao cmt, tr
 calc cmt, tr mica, rr py, g por,
 abdnt lt brn o stn, abdnt even
 bri yel fluor, abdnt fst blmg bri
 mky ct fluor, tr lt brn resd o

CLYST: rdsh brn-dk brn, lt gy-dk
 gy, frm-mod hd, sub blk-y blk,
 rthy, tr slty, tr sdy, tr micmica,
 sl calc

SS: trnsp-trnsl, uncons, occ p
 cons, f crs gr abdnt crs gr mnr



Zarzoor-1



occ calc cmt, tr mica, tr Fe mnrl,
fr por, n shows

CLYST: dk bm, off wh, rdsh bm,
sft frm, amor-sub blk, rthy,
tr slty, tr sdy, tr micmica,
sl calc

BENTIU-3 SS @ 1746 m

SS: trnsp-trnsl, uncon, mnrl p cons
v f-crs gr, abdnt crs gr, mnrl med
gr, occ v f gr, occ f gr, subang-
subrnd, tr ang, p srt, qtz, occ kao
cmt, occ calc cmt, rr mica, fr por,
abdnt lt brn o stn, abdnt even
bri yel fluor, abdnt fst blmg
bri mky wh ct fluor, n resd o

CLYST: dk bm, off wh, tr rdsh bm,
sft frm, amor-sub blk, rthy, tr
slty, tr sdy, tr micmica, sl calc

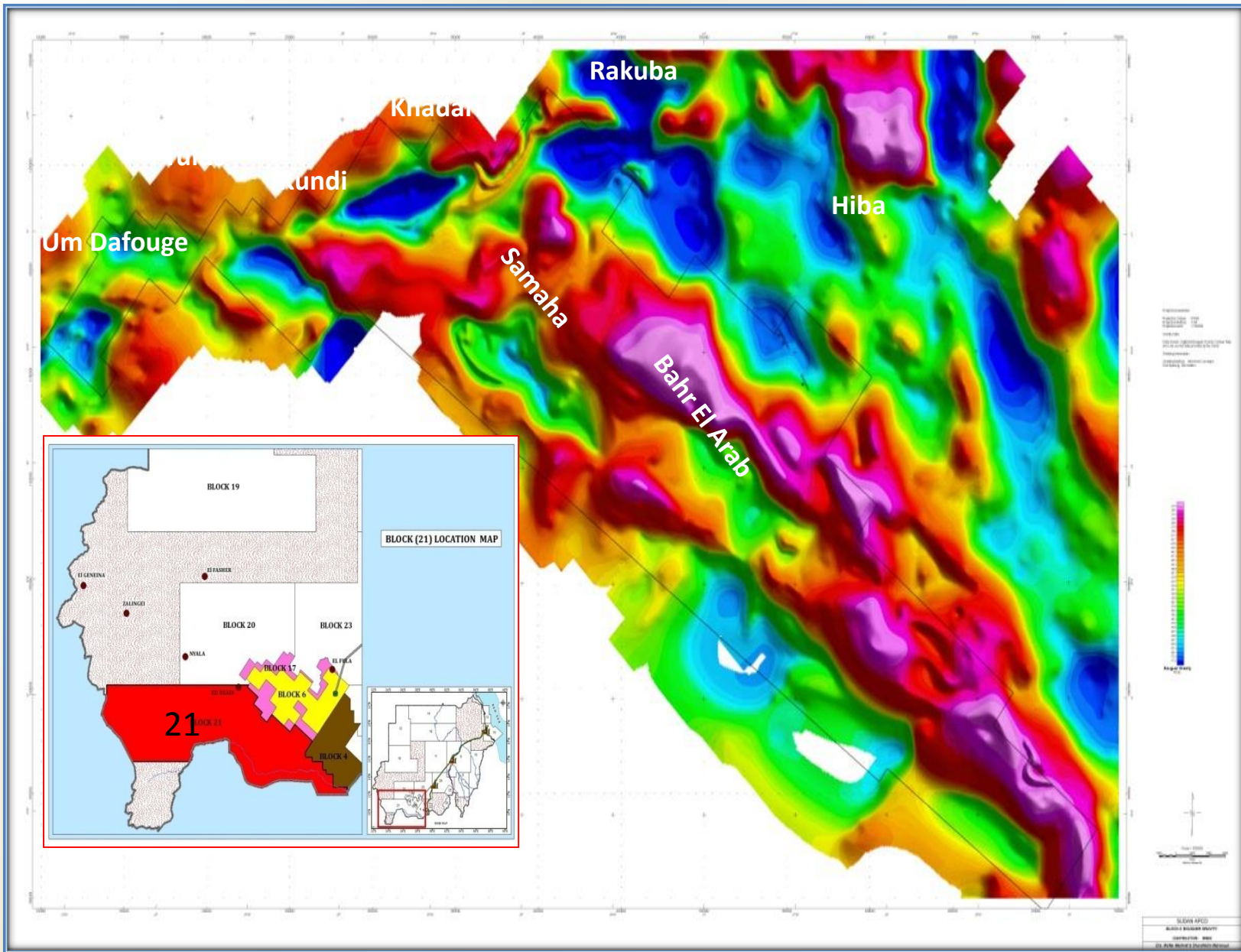
SS: trnsp-trnsl p cons mnrl med



~ ~ The best place to find oil is the place that
where you already found it ~ ~



Block 21 Gravity Map



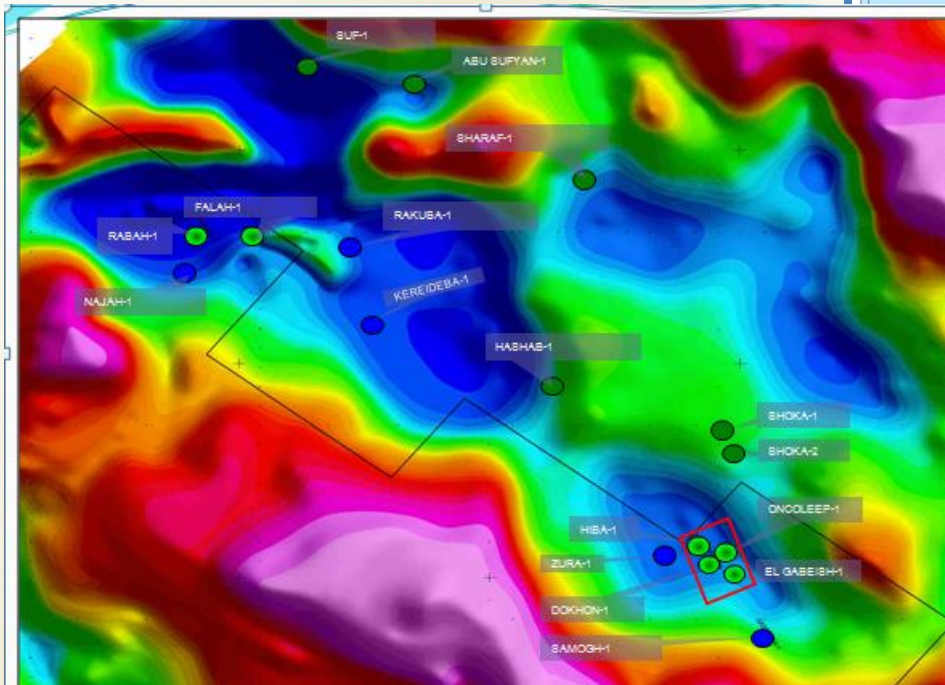
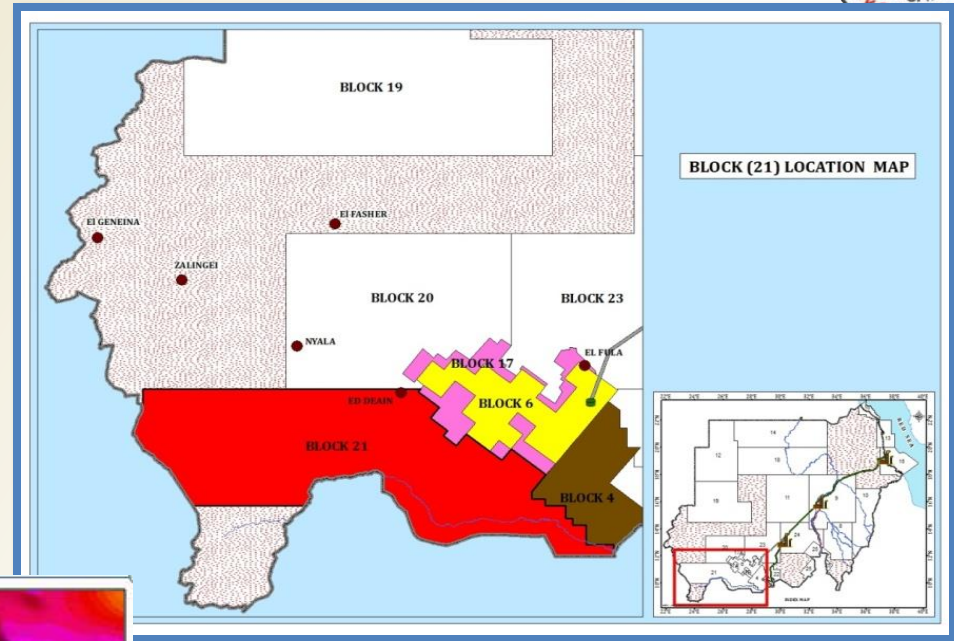


Drilled Wells



Total of the drilled wells in Block 21 are 10 , and there are **6** wells with **oil shows** in the different formations.

Block 21 Drilled wells with Surrounding Produced Wells



Well	Oil Shows	Well	Oil Shows
ALGEBASH-1	Intra-Darfur	RABAH-1	Tendi
	Bent		Nayil
	AG-3		Amal
	AG-4		Baraka
DOKHON-1	Bent		Intra-Darfur
	AG-1		Bent
	AG-2		AG-1
	AG-1		AG-2
	AG-2	Falah-1	Tendi
Hiba-1	Intra-Darfur		Amal
	Bent		Intra-Darfur
	AG-2		Bent
ONCOLEEP-1	AG-2		AG-1
			AG-2



Conclusion (Block 19)



- Hiba, Rakuba and Khdari are considered the main sub-basins for block 21.*
- More than 11,000 km of 2D and 174 sq km of 3D had been conducted in the block and there are 10 exploration wells had been drilled .*
- Six Out of ten wells drilled in the block 21 encountered good oil shows, this confirm the existence of petroleum system in this area.*



General Background Block (22)

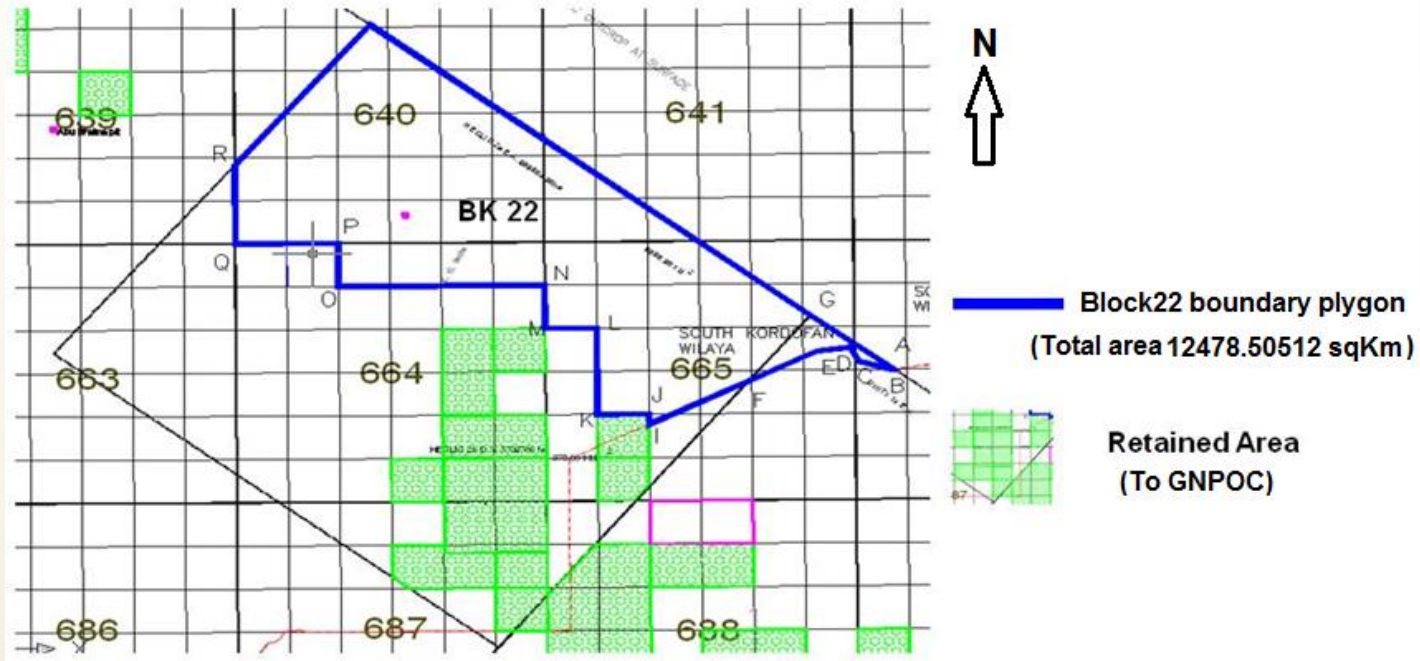
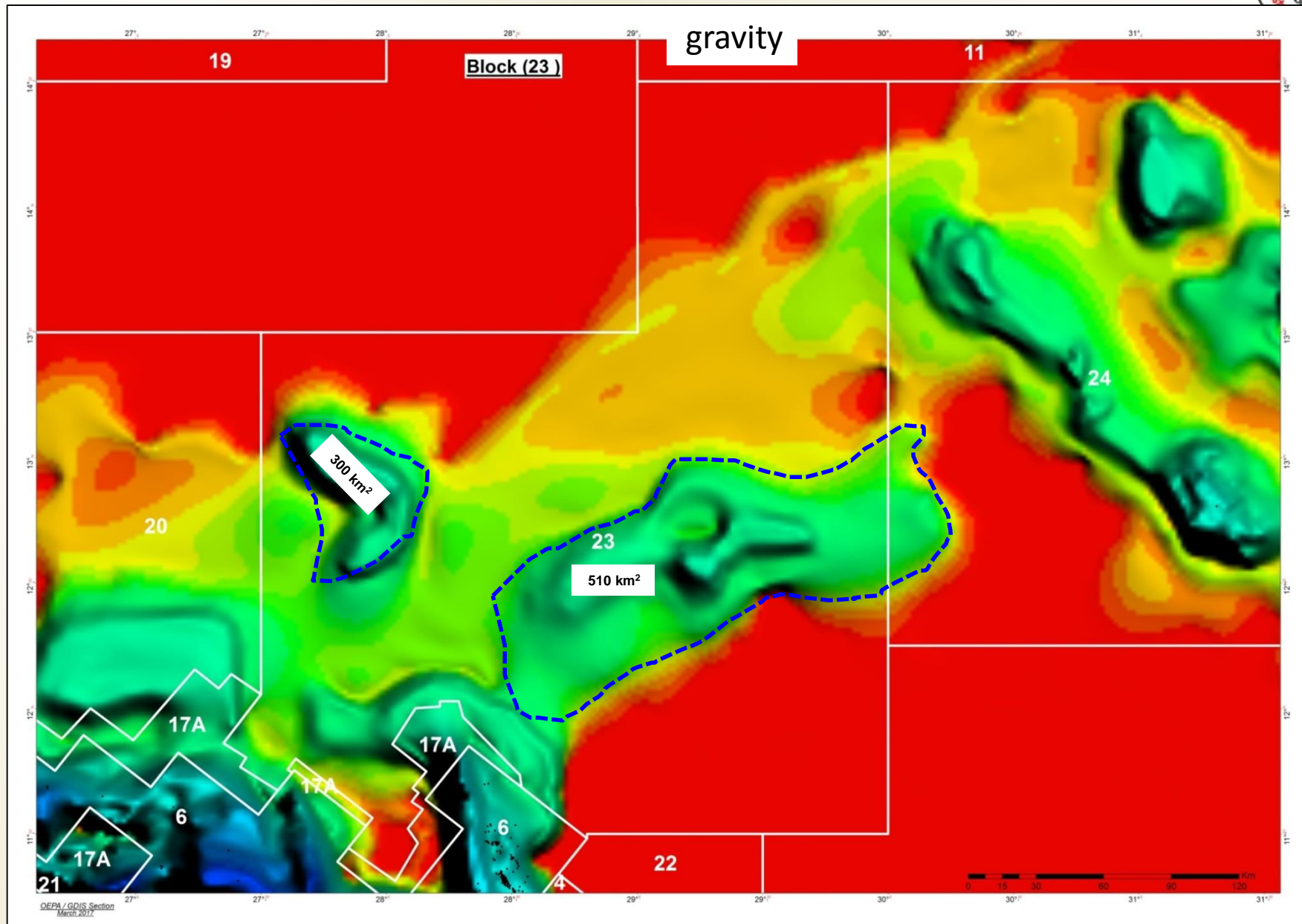


Fig (1): Location map of Block 22

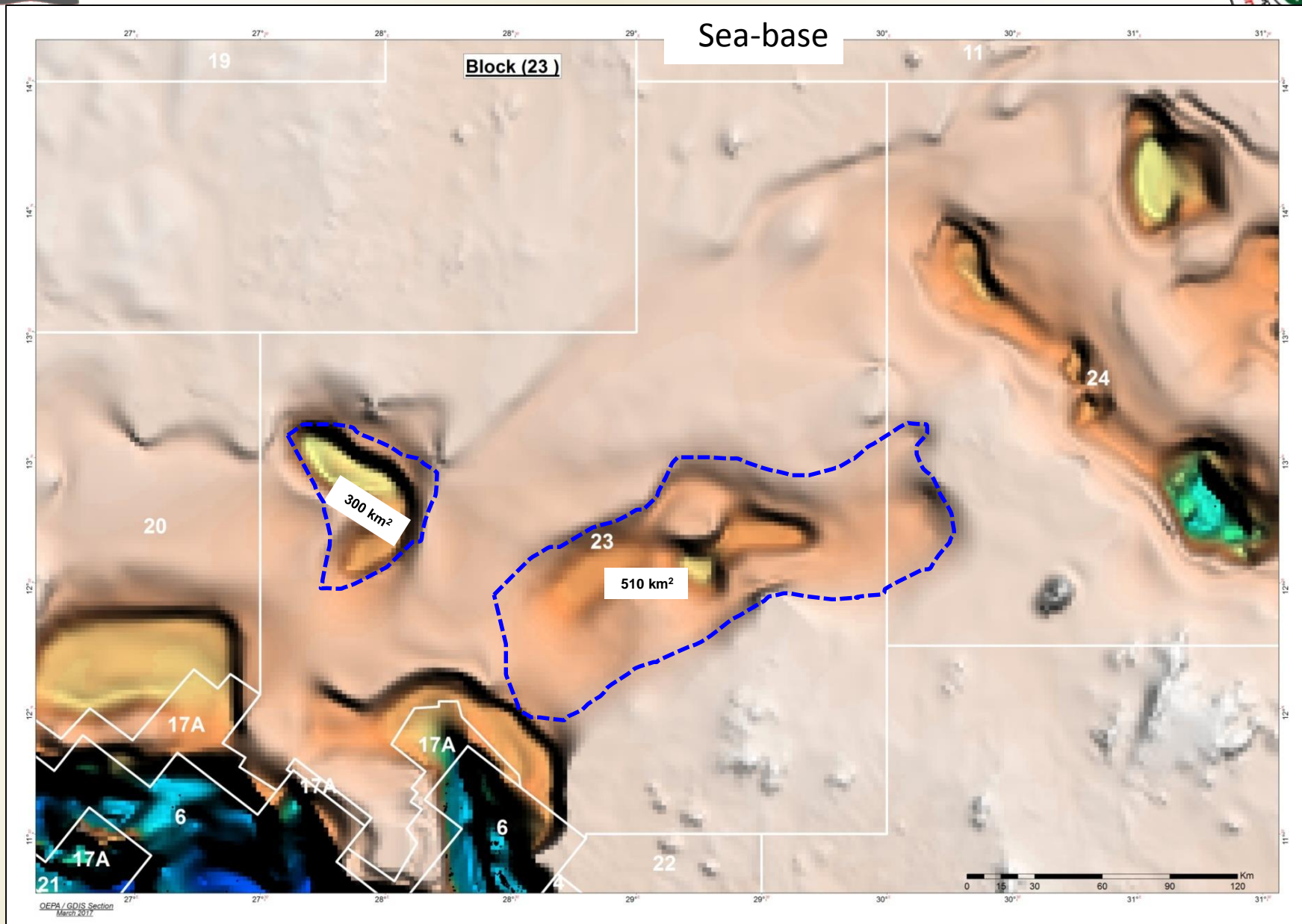


Gravity Map (Block 23)





Sea-base Map (Block 23)





Gas Utilization Projects





Neem LPG Extraction Project



Project Summary:

- Gather and treat around 12 MMSCFD to extract LPG from Associated Gas to produce around 300 Barrel of condensate and 72 tons of LPG per day.
- Project Cost Estimation is about 80 Million USD.



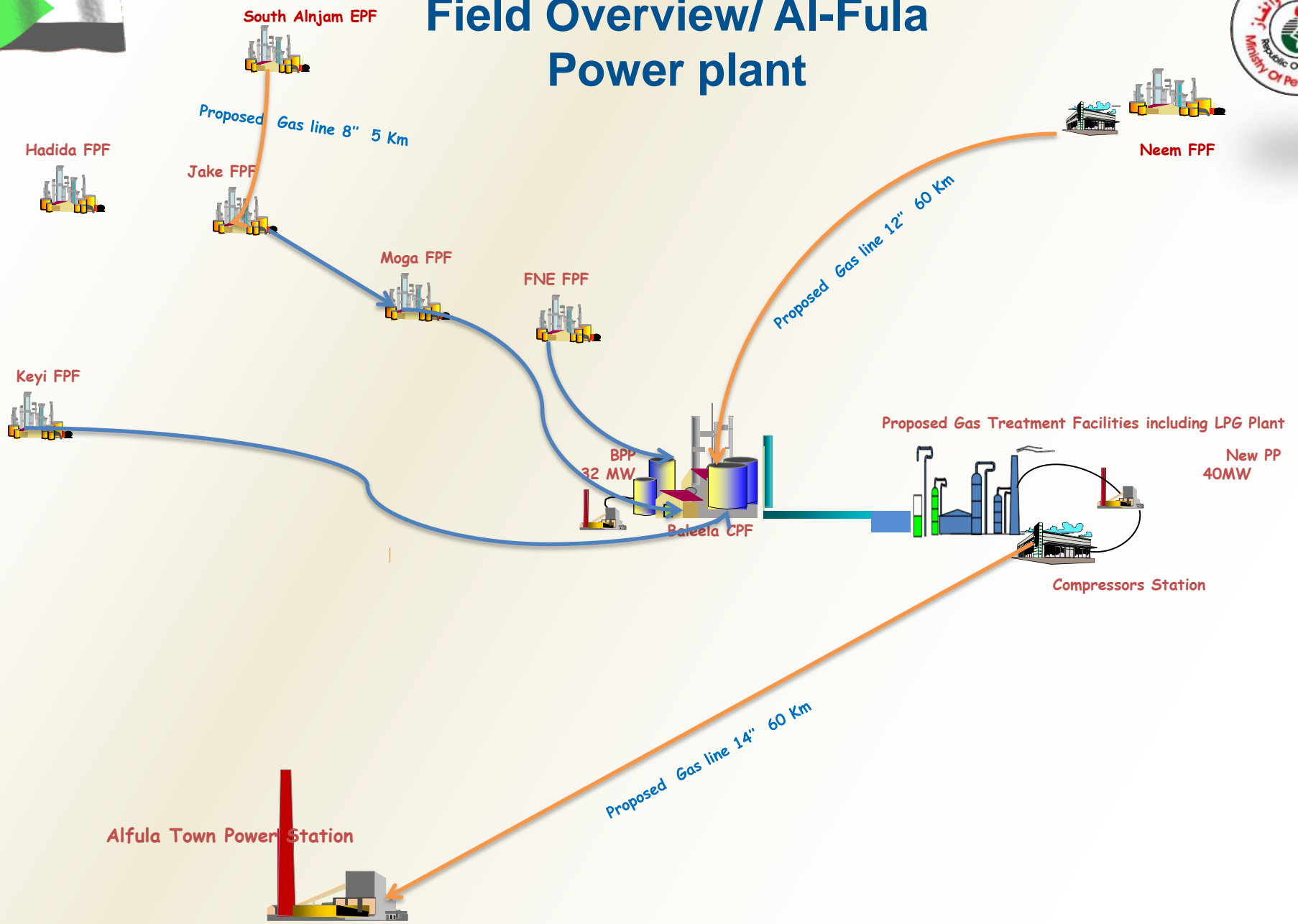
Gas Supply Project for Al-Fula Town Power Plant

Project Summary:

- MOPG plans to utilize around 100 MMSCF to supply Al-Fula Town Power Plant and to produce around 3,000 barrel of Condensate and 350 tons of LPG per day.
- The Gas Gathering & Processing facilities to be located at Block 6 to treat and process the gathered gas from the three Blocks (4, 6 & 17) for Al-Fula Power Plant and to produce LPG & condensate.
- Project Cost Estimation is 280 Million USD.



Field Overview/ Al-Fula Power plant





Downstream Investment Opportunities





Port Sudan Refinery Project



- **Building a new refinery and petrochemical complex (4 km² area is available adjacent to the old refinery)**
- **The designated area is 8 km south of Port Sudan City.**
- **Crude oil to be supplied by investor.**





Haya - Gadarif - Galabat Products Pipe line Project



- **Multi-products pipeline with a length of 600km**
- **Distributing domestically of the products to the cities of Kasala & Gadarif for next 20 years**
- **Export products carrier to Ethiopia with initially 144,000 ton/year (could be increased in the future)**





Import of Petroleum Products



Methods of importation

Open Import (Deferred payment), Terms and Conditions:

- Short listing of the company is not required.
- Signing Contract.
- Seller shall submit within twenty (20) days after signature of contract 2% of the total value of one cargo, which shall be returned to the seller after the execution of all the obligations of seller according to the contract conditions to satisfaction of buyer.



Import of Petroleum Products



Methods of importation

Open Import (Deferred payment), Terms and Conditions:

- The of price formula is (CFR Port Sudan price per barrel basis on bill of loading quantity in air shall be the average in Platt's of the month of delivery for Gasoil Arab Gulf as published in Platt's European Market scan under heading FOB Arab Gulf plus a premium of USD 30.75 % per barrel.
- Payment after 365 days from the average of the agreed lay can of each shipment by an irrevocable unconfirmed L/C opened by Central Bank of Sudan in a format acceptable to the seller within ten (10) days prior to the first day of the first day of the delivery lay can.



Import of Petroleum Products



Importation by Direct Payment

- Short listing of qualified companies through tenders is required.
- There are certain terms and conditions to be satisfied by a company in order to be registered in the short.
- Payment is through confirmed letter of credit established by Central Bank of Sudan effected after 15 days from Notice of Readiness (NOR) tendered by vessel at Port Sudan.



Import of Petroleum Products



Plan of petroleum products import (Ton):

year Product	2018	2019	2020
Gasoil	1,842,330	1,376,070	1,978,162
LPG	132,231	105,095	166,204
Mogas	458,860	337,965	563,075
Jet- A1	21,467	17,403	47,048
HCGO	426,974	332,390	360,767



Opportunities for Biofuel Investments



Jatropha Tree grows in South Kordofan Region



Opportunities for Biofuel investments



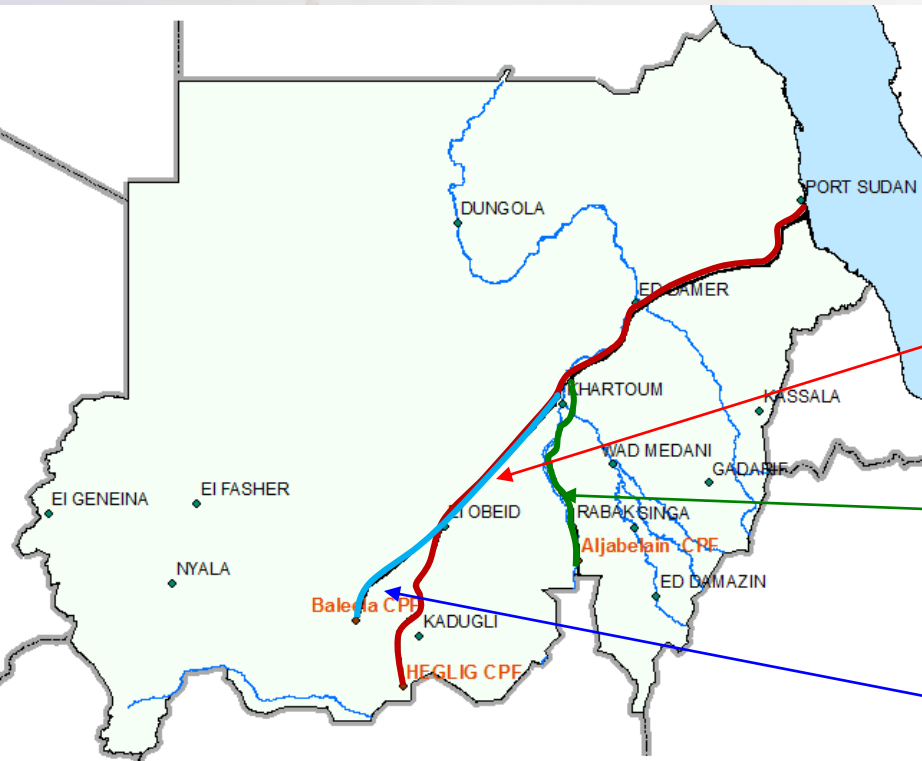
- Sudan has more than 60 million hectares of idle land, cultivable through modern or traditional irrigation.
- Jatropha, produced in deforested areas of the tropical forests, has great potential for the profitable production of biodiesel.
- Sudan has highly skilled human resources at low cost, which gives it a competitive advantage on an international level.
- Rapid increase in fuel consumption(1.4 M ton of diesel &1M ton of gasoline, opportunity for biofuel blending).



Petroleum Infrastructure



Export Crude Pipelines & Central Processing Facilities (CPF)



Pipeline	Length (km)	Diameter (inch)	Capacity (bbl/d)
Heglig-Marine Terminal	1505	28	450,000
Aljabalein-Marine Terminal	1131	32	500,000
El Fula-KRC	720	24	200,000

Heglig CPF : 350 kbb/d
 Jabelain CPF : 300 kbb/d
 Baleela CPF : 200 kbb/d



Petroleum Infrastructure

Crude Oil Refineries



Refineries	Capacity (bbl/d)
Khartoum Refinery (2000)	100,000
Obaid Refinery (1996)	15,000





Petroleum Infrastructure

Products Pipelines



Pipeline	Length (km)	Diameter (inch)	Capacity (m ³ /yr)
Khartoum – Port Alkhair Export	815	8	650,000
Alroyan – Port Alkhair Export	741	12	650,000



Petroleum Infrastructure Equipment & Facilities



Drilling Rigs

Work-Over Rigs

Seismic Crews

**Petroleum
Laboratories**

Processing Centers

Training Centers

**Petroleum Data
Center**



Investment Procedures in Oil & Gas Sector



- Submit a Letter of Intent (LOI) from the interested company to the Ministry of Petroleum and Gas along with the company profile & its Legal, Financial & Technical documents plus HSE records for evaluation.
- Invitation from the Ministry to the qualified company to present its capabilities & may obtain the detailed data under a Confidentiality Agreement.
- Draft of Legal Framework Agreement Model will be given upon the firm interest.
- Submission of the offers that include the technical program and financial terms to the relevant department.
- Invitation from the relevant department to the selected company to start a negotiation.



Why to invest in Sudan Oil & Gas Sector?



- Distinguished strategic location in the heart of the African continent open into the Red Sea coast .
- High hydrocarbon potentiality with a considerable amount of under-explored Sedimentary Basins.
- An encouraging and flexible investment legislations and petroleum agreements with win-win fiscal terms.
- We created conducive work environment to facilitate business activities.
- The availability of the associated service providers and skilled labours.
- The availability of a modern and developed petroleum infrastructure and human capital of oil industry in Sudan is capable and qualified to support and execute all kinds of projects.
- We adopt partnership approach in dealing with foreign invertors.



Thanks