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**This is a Sample field write up - 7 Pages - from our Iraq
Oil and Gas Strategic Report Showing Key elements:
Field Description, Structural Map
Key Field Data Table
Annual Production History Table
Commercial Data
Field Development Planning Assessment
Capital Investment Assessment**

Most fields reach the level of data definition shown in this sample. The data sets associated with a considerable number of fields are more extensive than this - the larger producing fields and those currently being developed by International Oil Companies

3.1.1.4.2.29. Tuba

Different sources quote Tuba as having been discovered in 1959 by the Basra Petroleum Company, or between 1974 and 1977 by ONGC Videsh of India.

The field was reported as having between 500 and 1,600 million barrels of recoverable reserves of oil. Our view is that the field contains 1,590 million barrels of recoverable reserves.

Key Field Data

Below we present the key data we have gathered on Tuba. The field is currently not producing.

Tuba is a large anticline and contains oil in several intervals: Lower Fars carbonates (also called Fatha) [Miocene], Mishrif carbonates (Cenomanian, Upper Cretaceous), Nahr Umr sands (Albian, Lower Cretaceous), Zubair sands (Barremian-Aptian, Lower Cretaceous) and Yamama carbonates (Lower Cretaceous).

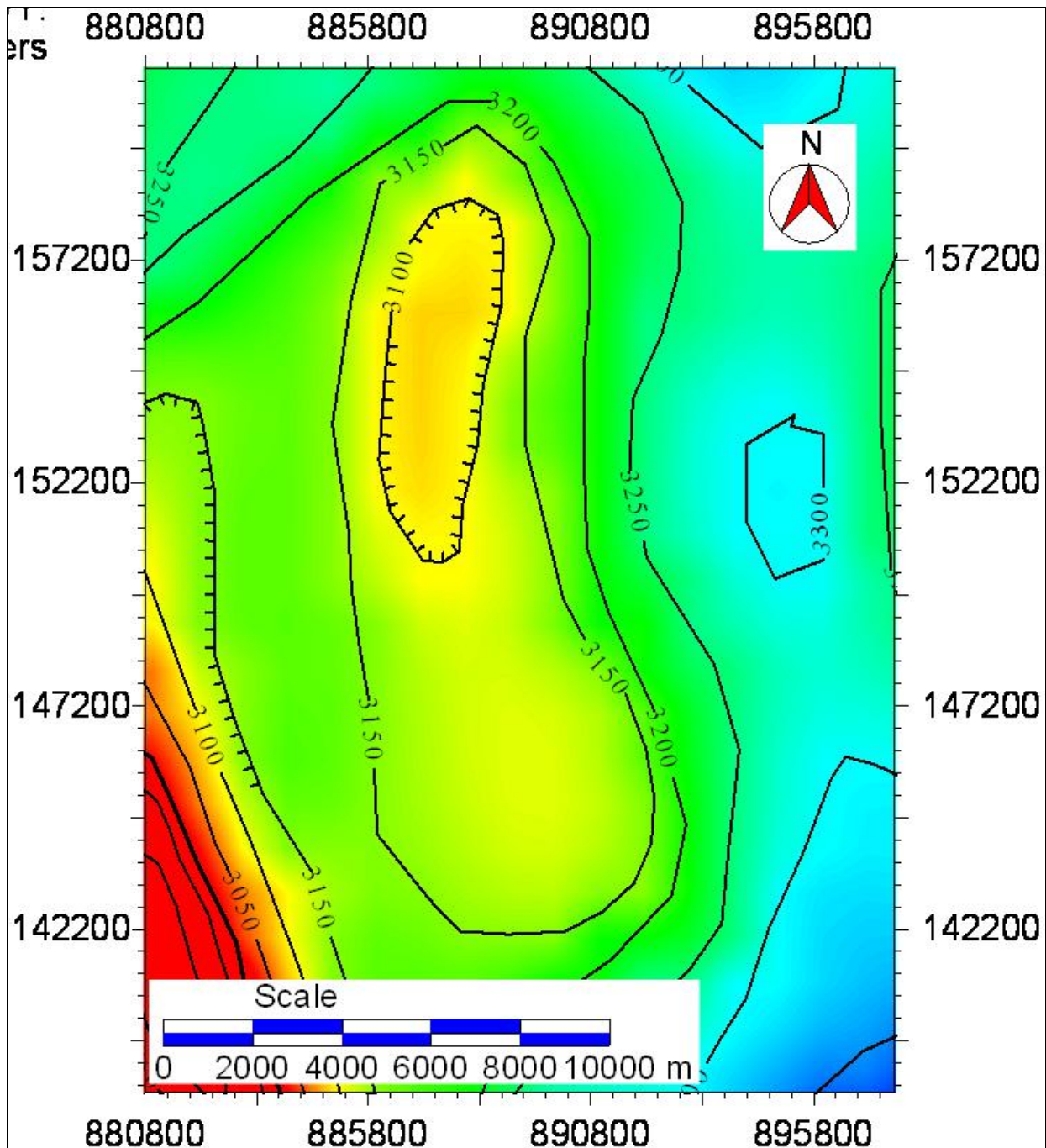
Tuba has been partly developed in the past by South Oil Company (SOC) and ONGC Videsh of India and came on stream in February 1990, producing 20,000 barrels of oil per day and 14 million standard cubic feet of associated gas per day.

Lower Fars reservoir is the shallowest and contains heavy oil. Mishrif carbonates contain another shallow accumulation which is the only one that has been developed.

However, the production from the field ceased in 1991, following the outbreak of the first Gulf War and appears to have not been resumed since. Like many other fields in Southern Iraq, it is likely that the equipment suffered extensive damage and looting and what remained may have been used as spares on other fields.

Below we present a structure depth map of the field. This has been extracted from our **"Iraq Kingdom Project"**; contact us for more details.

Figure 3.44: Structural Depth Map of the Top of the Zubair Formation – Tuba Field



The reserve figures we have developed cover a number of categories;

Original: Reserves in place prior to any production; figures are based on current production practices and the recovery factors that would result.

Remaining: These are original reserves less the production to date; these assume no significant improvement in recovery factor.

Enhanced Recovery Potential: Additional reserves that could be added to remaining reserves if higher production standards and enhanced recovery techniques are applied.

Upside Exploration Potential: Additional reserves that we believe are not being tapped but lie within the field boundary in horizons outside of the main producing horizons.

Table 3.288: Tuba Key Field Data

Parameter	Value
Discovery Date	1959

Parameter			Value	
On-stream Date			1990 (shut-in)	
Recoverable Reserves	Original	Oil (Million Barrels)	1,590	
		Gas (Billion Cubic Feet)	636	
	Remaining	Oil (Million Barrels)	1,590	
		Gas (Billion Cubic Feet)	636	
	Enhanced Recovery Potential	Oil (Million Barrels)	1,600	
		Gas (Billion Cubic Feet)	640	
	Upside Exploration Potential	Oil (Million Barrels)	179	
		Gas (Billion Cubic Feet)	-	
Production	Current	Oil (Barrels per day)	0	
		Gas (Million Standard Cubic Feet per day)	0	
	Potential	Oil (Barrels per day)	250,000	
		Gas (Million Standard Cubic Feet per day)	100	
Geology	Producing Horizon(s)		Lower Fars[Fatha] (Miocene)	
			Mishrif (Cenomanian)	
			Nahr Umr (Albian)	
			Zubair (Lower Cretaceous)	
			Yamama (L Cretaceous)	
	Rock Type(s)		Lower Fars, Mishrif, Yamama – Carbonates	
			Nahr Umr, Zubair – Sandstone	
	Reservoir Depth (Feet)		Lower Fars – 670	
			Mishrif – 7,585	
			Nahr Umr – 9,000	
			Zubair – 10,660	
			Yamama – 12,792	
	Porosity (%)		7.3 – 20	
	Permeability (mD)		4 – 390	
Fluid Properties	Oil	Gravity (° API)	Mishrif (28.6)	
			Nahr Umr (25.8)	
			Zubair (26.7)	
			Yamama (35.5)	
	Sulphur Content (wt %)		Mishrif (2.9 - 3.6)	
			Nahr Umr (1.9 - 2.3)	
			Zubair (2.0 - 2.7)	
	Gas	Gas-Oil Ratio (standard cubic feet/ barrel)	400	
		Hydrogen Sulphide Content (mol %)		
		Carbon Dioxide Content (mol %)		
		Molecular Weight		
Existing Facilities	Subsurface		Total Now	Total in Future

Parameter			Value	
		Number of Producers	4 ⁴¹⁴	56
		Number of Gas Injectors	-	2
		Number of Water Injectors	-	28
		Total Number of Wells	4	86
	Surface	Separation Capacity (bpd)	20,000	
		Compression Capacity (MMscfd)	-	
		Acid Gas Treatment Capacity (MMscfd)	-	

A further piece of key data we have been able to establish based on in country research and production data gathered from a number of sources is the field's production history. This is presented in the table below on an average daily production basis; the table has been established on a best efforts basis.

Table 3.289 Tuba's Average Daily Oil Production History.

Year	Average Daily Oil Production (Barrels per day)	Year	Average Daily Oil Production (Barrels per day)	Year	Average Daily Oil Production (Barrels per day)
1990	20,000	1997	0	2004	0
1991	0	1998	0	2005	0
1992	0	1999	0	2006	0
1993	0	2000	0	2007	0
1994	0	2001	0	2008	0
1995	0	2002	0	2009	0
1996	0	2003	0	2010 (est)	0

Commercial Data

South Oil Company is the operator of this field.

Tuba was listed as one of the 25 fields available for negotiation by a foreign operator under the new model Production Development Contract developed by Saddam Hussein's regime.

A number of companies have actively considered this field in the past:

- JAPEX is thought to have conducted study work on this field as part of a Memorandum of Understanding signed with the Ministry of Oil on 27 April 2005 which is thought to also have included work on East Baghdad and Gharraf.
- Pertamina was reported in September 2003 to be about to start exploration operations in its Western Desert blocks see section 3.1.2.4.2; coincident with this Pertamina expressed a strong desire to get re-engaged in the Tuba field. Pertamina originally held negotiations with Iraq on Tuba in 1997-1998. Latest position appears to be that these negotiations are being revived.

Sonatrach, ONGC Videsh and Reliance Industries are also thought to have held discussions with respect to developing the field. Latest known talks with members of this group were held during 2001 with Sonatrach. ONGC Videsh was reportedly looking to develop the field to produce 280,000-300,000 barrels of oil per day.

⁴¹⁴ Estimated number, given the field's reported production capacity in 1990.

Investment Opportunity

There is no clear development timing for Tuba at the time of writing.

Full field development incorporating a full technical appraisal and development programme, combined with the installation of infield gathering, processing plant and export to regional gathering facilities will be required; along with refurbishment of existing facilities.

In our view full field development will consist of a number of stages, these are listed below in rough chronological order:

- Implement 3D seismic acquisition on the field; analyse this data and assess it to establish a firm basis for development planning.
- Drill new appraisal wells.
- Drill new development wells including new producers, water injectors and gas injectors.
- Install surface production facilities; based on the remaining reserve base and the reservoir type. We would expect this to be implemented in two stages to reach a plateau capacity of 250,000 barrels of oil per day. The production scheme itself would consist of:
 - *Gathering*: flow lines and pipelines designed to feed oil to the production facilities.
 - *Separation*: production separators designed to separate oil/water/gas to produce export quality crude.
 - *Water Injection*: all produced water would be treated and re-injected to provide reservoir support; it has also been assumed that aquifer water will be used to supplement this.

Table 3.290: Tuba Development Cost Summary

Project	Rationale	Time Frame (Years) ⁴¹⁵	Cost Estimate (Million \$) ⁴¹⁶	
			Low	High
Subsurface:				
Acquire seismic data and perform field assessment.	Acquisition is warranted for the effective reservoir and production management of this large field. Acquisition and processing services will be needed, along with professional technical analysis to provide a firm basis for development planning.	1 – 2	10	15
Log existing wells	Log and interpret 2 to 3 existing wells.	1 – 2	1	3
Appraisal drilling	Drill 1 – 3 wells in structure to conduct logging, sampling and reservoir analysis.	1 – 2	12	42
Work over existing wells	Plan and implement key well work over programme (2 – 4 wells)	1 – 2	5	5

⁴¹⁵ Time frame is our expectation of the time that will be required from making a decision to implement the full work scope through to completion. Fundamentally we have assumed that this follows a normal construction path without consideration of constraints - political, economic or other - that may act to restrain the schedule.

⁴¹⁶ The cost ranges reflect the uncertainty associated with the actual work scope that will have to be implemented. At this stage, not enough is known about the existing facilities to fully define the costs

Project	Rationale	Time Frame (Years) ⁴¹⁵	Cost Estimate (Million \$) ⁴¹⁶	
			Low	High
Drill new development wells	80 new development wells including production, water injection; mixture of vertical and horizontal wells assumed. We anticipate that these will be drilled in two stages, assuming a development start date of 2010: Stage 1 – 45 wells by end 2014. Stage 2 – 35 wells by end 2017.	4 – 7	720	1,030
Rounded Subtotal			750	1,095
Surface:				
Field development	Install production facilities to capacity of 250,000 barrels per day, total in a two stage development of field to include gathering, separation, oil export facilities, water injection and gas reinjection. Assuming that development is awarded in 2010: Stage 1 – Capacity to 150,000 barrels per day by end 2014. Stage 2 – Capacity to 250,000 barrels per day by end 2017.	4 – 7	1,010	1,680
Rounded Subtotal			1,010	1,680
Rounded Total			1,760	2,775

The minimum cost presented in the table above is the absolute minimum expected cost to develop the field. We have also used our NetCo\$ter software to evaluate the work scope we believe will be required to achieve the production plateau targets associated with the service contract; our figures are presented as the maximum cost.

Assuming an agreement can be reached in 2010 then first production could be achieved by 2014.

In addition to development cost any consortium developing this field will spend a very significant amount on operating costs. We have used our NetCo\$ter cost estimating system to estimate what these will be and these estimates are provided below:

Table 3.291: Tuba Operating Cost Summary

Project	Rationale	Start Date (Year)	Cost Estimate (Million\$/year) ⁴¹⁷	
			Low	High
Subsurface:				
work over development wells	Phase 1 – 45 Wells by end 2014	2014	6	11
	Phase 2 – 35 Wells by end 2017	2017	4	9
Rounded Subtotal at Peak Production Year			10	20

⁴¹⁷ The cost ranges reflect the uncertainty associated with the actual work scope that will have to be implemented. At this stage, not enough is known about the existing facilities to fully define the costs. Each element of operating cost is additive, so as units are brought into production their operating cost is added to the existing base.

Surface:				
Operation of New Facilities	Phase 1 - Capacity of 150,000 barrels per day by end 2014.	2014	20	35
	Phase 2 - Capacity of 250,000 barrels per day by end 2017.	2017	15	20
Rounded Subtotal at Peak Production Year			35	55
Rounded Total at Peak Production Year			45	75

This then is the technical basis for the addition of the facilities required to achieve the production at this field. We have also conducted a full economic assessment of this plan for which we have assumed that the following commercial terms would apply to the Technical Service Contract adopted:

- The development contract for Tuba is a 20-year Technical Service Contract.
- The target plateau production for Tuba will be 250,000 barrels per day.
- A non-refundable signature bonus of US \$100 million would be paid by the contractor(s).
- 25% of the Technical Service Contract would be awarded to an Iraqi state entity.
- A service fee of US \$3 per barrel would be received by the contractor(s) for incremental production above a set production threshold.

Details of the full economic assessment can be found in our **Iraq Fields Financial Report**. This is the sister publication to this report and it uses these costs as the basis for its analysis.

This is a Sample field write up - 7 Pages - from our Iraq Oil and Gas Strategic Report Showing Key elements:

Field Description
Structural Map
Key Field Data Table
Annual Production History Table
Commercial Data
Field Development Planning Assessment
Capital Investment Assessment

Most fields reach the level of data definition shown in this sample. The data sets associated with a considerable number of fields are more extensive than this - the larger producing fields and those currently being developed by International Oil Companies

Northern Folded Zone Province, Producing Oil Fields																			
Field	Reserves Category	Formation	Area (km²)	Thickness (m)	Net to Gross (fraction)	Porosity (fraction)	Oil Saturation (fraction)	Formation Volume Factor	STOIIP (Million barrels)	RF	Initial Reserves (Million stock tank barrels)	Reservoir/Seal Presence Uncertainty (Fraction)	Reservoir Quality Uncertainty (Fraction)	Horizon Drilled (fraction)	Total Risk (Fraction)	Risked STOIIP (Million barrels)	Risked Reserves (Million stock tank barrels)	Enhanced Recovery Factor	Enhanced Recovery Reserves (Million stock tank barrels)
Abu Ghirab (3 horizons)	Proven + Probable	Mishrif	100.73	210	0.45	0.18	0.65	1.2	5,837	0.2	1,167							0.15	876
		Asmari	100.73	170	0.3	0.15	0.65	1.2	1,313	0.2	263							0.15	197
		Mauddud	100.73	120	0.5	0.19	0.782	1.2	4,706	0.2	941							0.15	706
		Total							11,856		2,371								1,778
	Possible	Zubair	100.73	150	0.3	0.2	0.7677	1.5	2,918	0.45	1,313	0.3	0.8	0.5	0.12	350	158		
		Total							2,918		1,313				0.12	350	158		
Ain Zalah (3 known producing horizons)	Proven + Probable	Shiranish	43	240	0.3	0.18	0.65	1.2	1,898	0.22	418							0.13	247
		Mushorah	43	135	0.4	0.05	0.65	1.2	395	0.18	71							0.17	67
		Quamchuga	43	165	0.3	0.2	0.73	1.2	1,629	0.18	293							0.17	277
		Total							3,923		782								591
	Possible	Butmah	36	500	0.2	0.11	0.65	1.2	1,349	0.35	472	0.98	0.9	0.6	0.53	714	250		
		Kurra Chine	36	830	0.2	0.15	0.65	1.4	2,617	0.35	916	0.98	0.8	0.6	0.47	1,231	431		
Bai Hassan (7 known producing horizons)	Proven + Probable	Total							3,966		1,388				0.32	1,285	450		
		Kirkuk Group	115.4	220	0.5	0.15	0.65	1.2	8,649	0.2	1,730							0.15	1,297
		Euphrates	115.4	50	0.6	0.16	0.65	1.2	1,887	0.18	340							0.17	321
		Jeribe	115.4	85	0.5	0.15	0.65	1.2	2,506	0.18	451							0.17	426
		Shiranish	115.4	140	0.3	0.15	0.65	1.2	2,477	0.18	446							0.17	421
		Quamchuga	115.4	260	0.2	0.14	0.65	1.2	2,862	0.18	515							0.17	487
		Garagu	115.4	90	0.2	0.13	0.65	1.2	460	0.18	83							0.17	78
		Dokan	Believed not to be volumetrically important																
		Total							18,840		3,564								3,030
	Possible	Butmah	115.4	500	0.2	0.11	0.65	1.2	4,324	0.35	1,513	0.8	0.3	0.8	0.19	830	291		
		Total							4,324		1,513				0.19	830	291		
Butmah (produces from 2 known horizons)	Proven + Probable	Kurra Chine	42.6	230	0.1	0.14	0.65	1.4	401	0.17	68							0.18	72
		Shiranish	42.6	150	0.2	0.15	0.65	1.3	603	0.2	121							0.15	90
		Total							1,003		189								163
	Possible	Chia Zairi	42.6	800	0.2	0.15	0.65	1.4	2,985	0.35	1,045	0.5	0.3	0.8	0.12	358	125		
		Total							2,985		1,045				0.08	358	125		
		Total																	
Jambur (4 known)	Proven + Probable	Jeribe	204.15	70	0.5	0.15	0.65	1.2	3,651	0.18	657							0.17	621
		Quamchuga	204.15	500	0.2	0.14	0.65	1.3	8,987	0.18	1,618							0.17	1,528
		Euphrates	204.15	30	0.5	0.16	0.65	1.2	1,669	0.2	334							0.15	250
		Total							14,307		2,609								2,399
		Pilaspi / Jaddala (BSCF)	204.15	65	0.2	0.15	0.75	0.005	527	0.75	395								
		Dokan (BSCF)	204.15	10	0.6	0.17	0.75	0.0025	552	0.75	414								
		Total Non-Associated Gas (Billion SCF)							1,079		809								
		Total							3,825		1,339								
	Possible	Butmah	204.15	500	0.2	0.11	0.65	1.2	3,825	0.35	1,339	0.4	0.3	1	0.12	459	161		
		Total							3,825		1,339				0.12	459	161		
Khabbaz (3 known)	Proven + Probable	Quamchuga (upper+Lower)	104.3	500	0.25	0.14	0.65	1.2	6,218	0.18	1,119							0.17	1,057
		Jeribe	104.3	140	0.6	0.15	0.65	1.3	4,132	0.2	826							0.15	620
		Total							10,350		1,946								1,677
	Possible	Butmah	104.3	500	0.2	0.11	0.65	1.2	1,954	0.35	684	0.5	0.3	0.8	0.12	234	82		
		Total							1,954		684				0.12	234	82		

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