



**SECTION 3**

**TECHNICAL REQUIREMENTS AND SPECIFICATIONS**

**FOR**

**GEOLOGY & WELL LOGGING SUPERVISOR SERVICE**

**TENDER No. : CMIT-PRT-10.30-230061**

August, 2023

Dubai, U.A.E.

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## 1. FIELD INTRODUCTION

### 1.1 Geographic Location of the Oilfield

Missan oilfields are located in Missan province, southeastern Iraq, and near the Iran border. It is about 175km north to Basra and about 350km southeast to Baghdad, (Figure 1-1). The weather is hot and dry, with highest temperature of 55°C in July, the lowest temperature of 1 °C in January, average annual rainfall of 165mm. Most of this area is desert, relatively flat, but some hills in the north of Abu Ghirab (Figure 1).

Missan province consist of three oilfields, inclusive of Abu Ghirab, Buzurgan and Fauqi oilfields. Among them, Abu Ghirab and Fauqi oilfields are located across the border between Iraq and Iran. Abu Ghirab oilfield contract area is 30km × 6km, Buzurgan oilfield contract area is 40km × 7km, and Fauqi oilfield contract area is 23km × 6km.



Figure 1: Location Map of Missan Oil Fields

### 1.2 Project Introduction

CNOOC Iraq Ltd entered into a Technical Service Contract for the Missan oilfields, and the contract term will last 20 years.

According to the regional data of Missan oilfields, several risks and difficulties during the drilling operation exist in these oilfields as follows:

- The Lower Fars formation mainly consist of anhydrite, salt and shale with abnormal high pressure with a gradient as high as 2.20-2.23., the Upper Fars overlapping formation and underlying formations have a normal pressure

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gradient, so accurate casing shoe depth precision is a very important part of the Geological Supervisor duties.

- Lost circulation and shale collapse might occur during the drilling of the reservoir formation.

Geological Supervisors are required to have a rich experience in dealing with emergency situations and have the ability to evaluate complex situations and avoid accidents.

Several risks and difficulties exist according to the wireline logging operation experiences in Missan oilfields, for instance:

- Well control risks when logging the salt-anhydrite formation (high pressure formation).
- Wireline logging tools getting stuck during the logging operation;

COMPANY will invite bidding for the Geological Supervisor to ensure a continuous and successful work and meet the requirements of the daily drilling operation.

### **1.3 Geology & Reservoir Summary**

The Missan oilfields predicted formation and well structure are shown in Figure 1-2,

The predicted formation of Missan oilfields is as follows:

- Quaternary and Tertiary Upper Fars are over 2000m thick and mainly sand and shale.
- Lower Fars group is the regional cap rock, consisting mainly of anhydrite, salt and shale and about 800m thick.
- The thickness from the Tertiary Jeribe group to the Cretaceous Nahr Umer group is about 1700m, consisting mainly of carbonate rocks.

### **1.4 Pressure and Temperature Prediction**

#### **1.4.1 Reservoir Temperature**

Asmari reservoir is approximately 2820m TVDSS depth, it has a normal temperature system with a geothermal gradient of 2.35 °C / 100m, and a reservoir temperature of 85°C.

Mishrif reservoirs are approximately 3840m TVDSS depth, with reservoir temperature of 120°C and a temperature gradient of 2.15, the reservoir belongs to a normal temperature system.

#### **1.4.2 Expected Depth, Pressure and Lithology of Formation**

Expected depth, pressure and lithology of formation in the Missan oilfields are as follow:

Strata		Top Depth (m,RTKB)	Formation pressure index	Lithology description	
Tertiary	Upper Fars		1.04	Upper mainly clay, lower mainly shale interbed sand	
	Lower Fars(mb5)	2023	Transition zone	Alternation of anhydrite, shale	
	Lower Fars(mb4)	2422	2.20-2.23	Alternation of anhydrite, shale and salt	
	Lower Fars(mb3)	2733	2.20-2.23	Thick bed of anhydrite, interbedded with salt and shale with rare limestone	
	Lower Fars(mb2)	2945	2.20-2.23	Massive salt	
	Lower Fars(mb1)	2970	Transition zone	Anhydrite with thin intercalation of shale and shaly dolomite	
	Jeribe-Euphrate	3002	0.9-1.1	Massive dolomite, locally limestonic anhydritic interbed reddish brown shale	
	Upper Kirkuk	3048	0.9-1.1	Mainly dolomite interbeds of sandstone, limestone and mudstone	
	Middle-LowKirkuk	3190	1.1	Mainly sandstone, shale and limestone	
	Jaddala	3385	1.1	Argillaceous Limestone, Marl, Shale and Chert	
	Aaliji		1.1	Limestone	
Cretaceous	Shiranish	3577	1.1	Argillaceous limestone	
	Hartha	3611	1.1	Chalky and argillaceous Limestone	
	Sadi	3673	1.1	Argillaceous Limestone and Marl with thin shale.	
	Tanuma	3790	1.1	Shale, Limestone with marl	
	Khasib	3808	1.1	Compact limestone	
	Mishrif.	MA+MB11+MB12	3884	1.1	Mainly mudstone
		MB21	4001	0.7-1.1	grainstone and packstone
		MC1	4085	0.7-1.1	grainstone and packstone
		MC2	4183	0.8-1.1	grainstone and packstone
Rumaila		1.1	Limestone crystalline		
TD	4262				

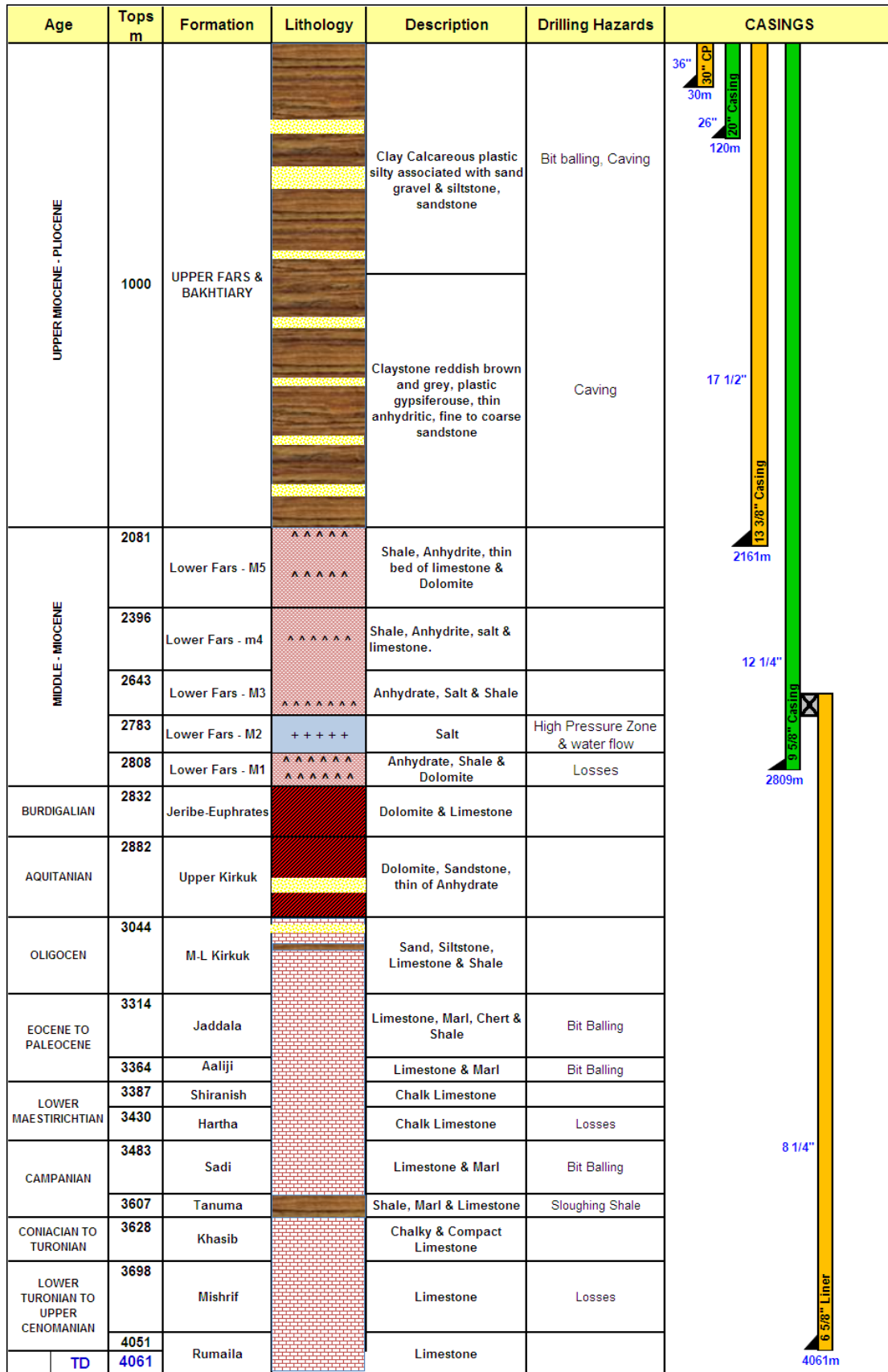


Figure 2: Missan Oilfield Stratigraphic column.

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## 1.5 Geological Drilling Risk

### 1.5.1 Anticipated drilling risk

#### a. Over Pressure

Yes No

##### If Yes,

Name of zone : mb4-mb2, Lower Fars

Depth of zone : 2489-3004 m RTKB

Expected reservoir pressure index : 2.20-2.23

#### b. Unconformity (Lost Circulation)

Yes No

##### If Yes,

Name of zone : Top Upper Kirkuk, Top Middle-Lower Kirkuk, Top Jaddala, Top Hartha, Top Khasib and Top Mishrif

Depth of zone : 3087/3218/3340/3590/3775/3839m RTKB

#### c. Depleted Zone (Lost Circulation)

Yes No

##### If Yes,

Name of zone : Asmari and MB21 of Mishrif reservoir

Depth of zone : 3033-3218, 3839-3900 m RTKB

Expected reservoir pressure coefficient: 1.00, 0.80

#### d. Sloughing shale

Yes No

##### If Yes,

Name of zone : Hartha, Sadi, Tanuma, Khasib/Upper MA

Depth of zone : 3590-3644/3644-3759  
/3759-3775/3839-3880m RTKB

### 1.5.2 Notes for Drilling Operations

1) During the drilling process, close attention should be paid to formation pressure changes and mud weight adjustments to prevent downhole accidents.

2) Asmari and Mishrif may present micro-fracture, it is therefore important to make sure of the high cementing quality.

3) Asmari reservoir gas composition: CO<sub>2</sub> content of 0.1-1.52%; H<sub>2</sub>S content of 0-0.4%. Mishrif reservoir gas composition: CO<sub>2</sub> content of 3.4-7.2%; H<sub>2</sub>S content of 0.6-2.5%. It is necessary to guard against the risks of H<sub>2</sub>S and CO<sub>2</sub>.

4) During the drilling process, the requirements for data acquirement should be followed

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strictly to take the various kinds of specifications and regulations of geological reservoir data completely and accurately.

### **1.6 Operating Challenge**

- 1.6.1 Casing point selection.
- 1.6.2 Lost circulation, well kick and blow out in reservoir.
- 1.6.3 Cuttings sample, side wall core and core description.
- 1.6.4 Hydrocarbon shows description and evaluation in carbonate rock and clastic rocks.
- 1.6.5 Salt-anhydrite layer depth in 12-1/4" interval is from 2000m to 3000m, about 800m thickness, including high-pressure salt water layer, and easy to kick, especially during the logging time.
- 1.6.6 Shale, it is prone to collapsing, causing tight hole condition and eventually gets the drilling and logging tools stuck.
- 1.6.7 Depth of landing point in the horizontal wells is determined with a lot of uncertainties and needs to be monitored very closely during the drilling.
- 1.6.8 Partial pressure of H<sub>2</sub>S in Mishrif is abnormal, and it will make the wireline cable fragile.
- 1.6.9 Logging tools stuck and Side track occur frequently in 8-1/4" or 8.5" open hole due to formation instability.

### **1.7 Working Environment**

- 1.7.1 The oilfields are located in the desert, the climate is hot and dry. Maximum air temperature in summer may reach 55°C with a maximum surface temperature of 70°C. Minimum temperature in winter may reach -1°C. The average temperature yearlong is rounding 31°C.
- 1.7.2 Employees, who work in Iraq, are required to respect local religious beliefs and habits.
- 1.7.3 Considering the security situation, Company depends on OPF (Oilfield Protection Force, from Iraqi government) for security and escort. The security situation should be taken into consideration.
- 1.7.4 The border Iran / Iraq at the location of the oil fields is riddled with mine fields which quantity cannot be estimated. Demining work will be performed in the working area, and some harmful radioactive war wastes may exist in the area.
- 1.7.5 Venomous snakes and other dangerous animals exist in the area and the contractor is required to prepare insurance and SOS services for his employees.

## **2 GEOLOGICAL SUPERVISOR WORK SCOPE**

CONTRACTOR is required to clarify whether he can meet the requirements or not in the technical tender proposal which list as follows.

The number of Geological Supervisor in the following table does not include the person in shift rotation means contractor must keep the number of geological supervisor at well site as company actually requires. The personnel will be mobilized according to the actual drilling schedule as required by the COMPANY.

No.	Personnel	Estimated Number	Working Place	Contractor Response
1	International Geological Supervisor	4	Wellsite	

The Geological Supervisor should be in charge of wellsite supervisions work of 3-4 rigs in a specified oil field within four aspects such as management, procedure, technology and information. The Geological supervisor should have at least ten (10) years' experience in wellsite geological supervision.

The Geological Supervisor is required to monitor vital operations during the course of the well drilling, make sure that all COMPANY requirements are carried out, and perform formation evaluation activities to ensure the well is drilled and evaluated in the safest, efficient, and cost-effective manner.

Some geology supervisors may have to work in the office as per the requirements of COMPANY.

## 2.1 Job Description

- 2.1.1. Familiar with the Geological Program and mud logging contract; familiar with the drilling objectives formation; familiar with the deviated, horizontal and sidetrack well operations. Familiar with the regional stratigraphy, lithology, oil & gas & water distribution, formation pressure and mud logging items requirement, especially the formation of adjacent well which are easy to blow out, well kick and lost circulation, etc, and complex well interval treatment progress, result and experience, etc.
- 2.1.2. Checking preparation before drilling operation, including mud logging instrument, mud logging material, qualifications of mud logging crew, etc.
- 2.1.3. According to the Geological Program requirement, make mud logging implementation plan, including data collection and technical measure. Attend pre-spud meeting, report the geological information to the related personnel.
- 2.1.4. Providing relevant correlation and well data to mud logging during their operations.
- 2.1.5. Monitoring and supervising the collecting, processing and dispatching of formation evaluation samples.
- 2.1.6. Quality control of all evaluation results and logs before accepting the data or logs from mud logging crew.
- 2.1.7. Checking all reports and logs from the mud logging crew before sending them to COMPANY offices.
- 2.1.8. When hydrocarbon shows are found or other abnormal situation (such as lost circulation, well kick and blow out) occur, put forward monitoring, sampling and analysis requirements to the mud logging crew in time, and supervise the implementation.

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- 2.1.9. Monitoring and supervising the mud logging crew to describe and evaluate hydrocarbon shows, to describe cutting samples, and confirm the formation.
  - 2.1.10. Interpreting and Analysis while drilling, particular attention should be paid prior to drilling primary objective. Some decision should be made, include: if comply with the Geological Program or not; the primary objective depth shallower or deeper than prediction, etc.
  - 2.1.11. Familiar with Geo-steering Job, determining depth of landing point in the horizontal wells under the conditions of LWD data, samples, gas data, seismic data interpretation and offset wells correlation analysis.
  - 2.1.12. Using LWD data, offset wells correlation analysis, samples and gas data to ensure the right location of horizontal trajectory during drilling operation.
  - 2.1.13. Monitoring drilling fluid density, especially in primary objective. When need to adjust the drilling fluid property due to lost circulation, well kick and blow out, record treating processes and result to stop lost circulation and kill the well.
  - 2.1.14. Selecting coring points, monitoring mud logging crew and coring crew to calibrate the depth and footage when coring barrel is nearing the bottom of hole and while the core is being cut. Supervising the catching of the core, hydrocarbon shows description, lithology description, core packing and shipping to the laboratory quickly, conveniently, and in good condition.
  - 2.1.15. Teamwork is required, and the Geological Supervisor must work closely with the drilling team (Company Man, Drilling Engineer, Tool pusher and Rig Crew) providing advice when necessary to assist in safe, cost-effective drilling and non-drilling operations.
  - 2.1.16. Geological Supervisor is required to report to Operations Geologist every day, include: depth, footage, stratigraphy, lithology, hydrocarbon shows, drilling fluid property, drilling summary, current operation, operation forecast, etc.
  - 2.1.17. Special situation report, include:
    - If need to adjust drill fluid property significantly while drilling operation, Geological supervisor should inform Operations Geologist, must have approval of Operations Geologist.
    - Geological Supervisor should report to Operations Geologist depth, stratigraphy, lithology, Gas data and fluorescence grade timely when hydrocarbon shows is founded.
    - Geological Supervisor should report to Operations Geologist core recovery, lithology and hydrocarbon shows timely.
    - According to the actual situation and finish drilling principle, Geological Supervisor should make finish drilling suggestions to the Operations Geologist when penetrated through primary objective, and finish drilling must have approval of Operations Geologist.
  - 2.1.18. The Geological Supervisor should be completely familiar with all aspects of the drilling prognosis. Particular attention should be paid to any sections which may require geological decisions. These include: wireline logging interval, sidewall coring, casing and cement job, etc.

- 2.1.19. Monitoring and supervising the mud logging crew describe side wall core as COMPANY required.
- 2.1.20. Quality control of all original mud logging data. Checking cuttings sample and core statistic list, transport to camp as COMPANY required.
- 2.1.21. Complete other work assigned by the COMPANY.

**2.2 Responsibility and Right**

- 2.2.1 Geological Supervisor is the representative of COMPANY; Quality control of all mud logging data.
- 2.2.2 Strictly perform Geological Program during drilling progress. If there is some difficulty to perform, Geological Supervisor should inform the Operations Geologist of any modifications at the earliest opportunity, Geological program modifications must get approval of Operations Geologist. In an emergency situation, Geological Supervisor can handle firstly and then inform the Operations Geologist.
- 2.2.3 Have right to change unqualified mud logging personnel.

**3 LOCAL SUPERVISOR (GEOLOGICAL) WORK SCOPE**

CONTRACTOR is required to provide local Iraqi nationals candidates in the following table if available. The personnel will be mobilized according to the actual drilling schedule as required by the COMPANY. The local supervisors numbers accounts for 50 % of total number of international geological supervisors.

No.	Personnel	Estimated Number	Working Place	Contractor Response
1	Local supervisor (geological)	2	Wellsite	

The Local Supervisor should basically meet the position requirement, and will be in charge of well site geological job on behalf of COMPANY. They are required to monitor vital operations during the course of the mud logging, make sure that all COMPANY requirements are carried out, and ensure the well is drilled in safe, efficient and cost-effective way. The Local supervisor should propose good suggestion to Company’s department according to wellsite situation.

The Local supervisor may have to work in the office as per the requirements of COMPANY.

**4 QUALIFICATIONS AND REQUIREMENTS**

CONTRACTOR is required to clarify if they could meet the requirements, in their technical tender proposal which list as follows:

**4.1 Requirements for CONTRACTOR**

- 4.1.1 CONTRACTOR supervisors should have at least ten (10) years’ experience in

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overseeing supervisor's service in drilling operations, with supervisors' track of relevant work.

- 4.1.2 CONTRACTOR should provide sufficient justifications and records to prove its experience for similar projects/work and/or its project execution team has the experience for similar projects/work scope in Iraq or Middle East for at least 2 years.
- 4.1.3 With certificates in English model, CONTRACTOR should have completed similar kind of projects.
- 4.1.4 CONTRACTOR should have a good comprehensive evaluation which includes reputation, business level, service attitude, effectiveness.
- 4.1.5 CONTRACTOR should submit qualified organizational structure, international emergency system, related necessary insurance for employees, QHSE management system and training system in their tender.
- 4.1.6 CONTRACTOR should have the enough human resource for qualified Geological Supervisors which are mentioned above in order to meet the requirements of the Company's drilling operation. During Y2023-2024, maximum six (6) supervisors will be needed to work at well site. The exact number of supervisors will be mobilized according to the actual drilling schedule as per the requirement of the COMPANY, the mobilization period of the first time for each supervisor shall be within four (4) months after Company written notice.
- 4.1.7 The Company only provides security for the supervisors who work on wellsite. Additionally, the company shall provide accommodation for living at the well site, with catering services provided by the company's drilling contractor.
- 4.1.8 CONTRACTOR is required to provide the communication for working on the well site and home leave travel.
- 4.1.9 If CONTRACTOR needs to construct a work base, the area will be appointed in the COMPANY base. The COMPANY will supply water and electricity, however, the construction and connection work needs to be done by contractor. Contractor need to be equipped with Emergency generator, diesel fuel will be supplied to contractor by company and will be charged by company to contractor in commercial price and transportation fee. Transportation of goods or personnel needs to be supplied by contractor itself and fuel to vehicles of contractor is contractor's responsibility.
- 4.1.10 Details of this working base shall be described in the technical proposal.
- 4.1.11 CONTRACTOR is required to submit the services records (with stamped and authorized signature) in the tender.
- 4.1.12 CONTRACTOR should submit personnel shift plan for the supervisors proposed in the tender.
- 4.1.13 CONTRACTOR should submit qualified QHSE management system in their tender.
- 4.1.14 CONTRACTOR should submit the resumes in English, authorized certificates, health

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certificates, H<sub>2</sub>S training certificates or other related certificates for the supervisors proposed in their tender. Only English models will be accepted.

- 4.1.15 CONTRACTOR at its own cost should be able to transfer their personnel if any war, natural disaster or other unforeseeable situation happens.
- 4.1.16 CONTRACTOR should at its own cost demobilize the supervisor that would be disqualified evaluated incompetent by the COMPANY when performing his job at the wellsite and send other qualified supervisor replacing him as per COMPANY requirements.
- 4.1.17 CONTRACTOR should provide the computers to their own supervisors to meet the job requirements.
- 4.1.18 Company shall have the right to interview all candidates, before their arrival in Iraq, they must be fluent (oral and writing) in English before contract signing with the Company.
- 4.1.19 CONTRACTOR should have valid ISO Certificates (9001, 14001 and 18001) in English belonging to the contractor himself, not borrowed nor rented but owned by the contractor himself. Any documents from sister or mother subsidiary and no documents for certificate progress guarantee shall disqualify the bidder

## **4.2 Requirements for Geological Supervisor**

### **A. Certificate**

- Geological Supervisor certificate and above.
- H<sub>2</sub>S" certificate.
- Health certificate, no heart disease or any other sudden illness, HIV or Communicable diseases (hepatitis B), age range from 30 to 55.

### **B. Work Experience**

- Geological Supervisor should have been involved in Geological Supervision for more than ten (10) years.
- Experience in Geological program preparation.
- Experience of contract and invoice management.

### **C. Skill Requirement**

- Fluent oral and written in English, effective communication in English.
- Skillful in correlating new well drilling and close drilled wells and recognize formation markers.
- Skillful in determining landing point depth in horizontal wells, with LWD data, samples, gas data, seismic data interpretation and offset wells correlation analysis, and take proper measures to solve problem with uncertainty in landing point depth (Shallower or deeper than estimated)
- Using LWD data, offset wells correlation analysis, samples and gas data to ensure the right location of horizontal trajectory during drilling operation.
- Master salt, anhydrite and carbonate rocks drilling operation.

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- Skillful in reparation of Daily Geological Report.
  - Skillful in calculating formation pressure co-efficient, lag time and gas channeling speed, etc.
  - Master cuttings description and stratigraphy divided.
  - Master oil & gas shows evaluation and description.
  - According to geological program requirements organize contractor complete conventional geologic logging operation, and perform the contract accurately.
  - Quality control of all mud logging data.
  - According to formation pressure prognosis and the actual situation, put forward reasonable drilling fluid density requirements.
  - According to the actual situation and requirements of the COMPANY, put forward amendment opinions about well trajectory.
  - According to the adjacent well data, mud logging data and drilling parameter, select coring point and casing point.
  - Master conventional core description and side wall core description.
  - Proficient in operating Microsoft Office software, such as excel, word, PPT, etc.

**D. Other Requirements**

- All Geological Supervisors should attend interview organized by COMPANY, The successful candidate will be accepted.
- All Geological Supervisors should be evaluated at all times, unqualified ones will be changed by COMPANY.
- All Geological Supervisors should be equipped with their own computer to perform their daily duties.
- The required shift regulation is 8/4 (8 weeks onsite and 4 weeks leave); CONTRACOTR is responsible for the staff mobilization and demobilization between their origin place and the camp, including accommodation and meals.
- The commencement of the shift for each supervisor shall start and end at Buzurgan, only one person and one day shall be charged for one shift.
- Company only provides PPE for Geological Supervisor and no other benefits, such as laptop, personnel's communication fees, training fees, and so on.
- Contractor must set up effective communication with Company.
- The Geological Supervisors are required to submit the health certificate to COMPANY before mobilization.
- Every Geological Supervisor is required to sign a "Confidential agreement" before starting his service.

### 4.3 Response to Requirements

CONTRACTOR's response to requirements from COMPANY as follows:

I. General-Requirements for Contractor			Response	
1)	Company Profile	1)	Qualified organizational structure	Provide related document
		2)	International emergency system	Provide related document
		3)	Necessary insurance	Provide related document
		4)	Training system	Provide related document
2)	Human Resource	1)	Human resource for qualified supervisor number	Provide related document
3)	Service Experience	1)	CONTRACTOR should submit services records-oversea (with stamped and authorized signature)	Provide related document
4)	Logistics Support	1)	Security service for the supervisors	Provide related document
		2)	Accommodation & catering for the supervisors	Provide related document
5)	Personnel Shift plan	1)	CONTRACTOR should submit the personnel shift plan for the supervisor proposed in the tender	Provide related document
6)	QHSE management system	1)	QHSE management system	Provide related document
II. Requirement to Geological Supervisors				
1)	Certificate	1)	Geological Supervisor certificate and other related certificate	Provide related document
2)	Work Experience	1)	Work as a Geological Supervisor and Geological Operation Experience (Score according to the lowest level of CONTRACTOR's personnel.)	Provide related document
3)	Skill	1)	Geological operation skills	Provide related document
4)	Language	1)	Language ability, especially for oral and written English	Provide related document