

# OIL & GAS DEVELOPMENT COMPANY LIMITED



**TENDER ENQUIRY NO. PROC-SERVICES/CB/EXPL-5036/2021**

**2D SEISMIC DATA ACQUISITION**

**SAMANDAR**

## **Note:**

Bid bond of **USD 132,500/- (US Dollar One Hundred Thirty Two Thousand Five Hundred Only)** must be submitted with the technical bid. Please see tender documents for further detail.

The master set of tender documents (services) uploaded on OGDCL website ([www.ogdcl.com](http://www.ogdcl.com)) is the integral part of this TOR.

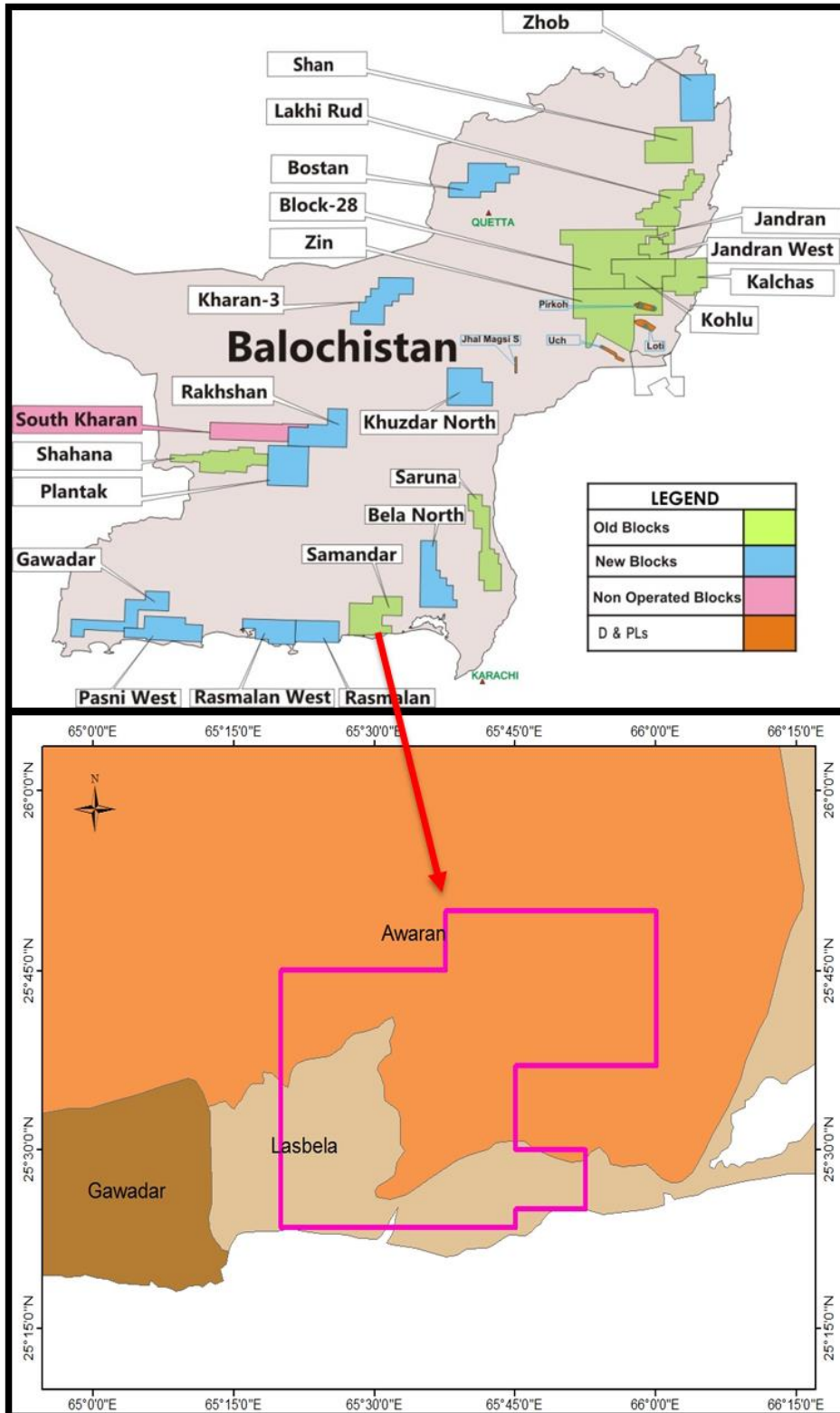
## **LIST OF SCHEDULE**

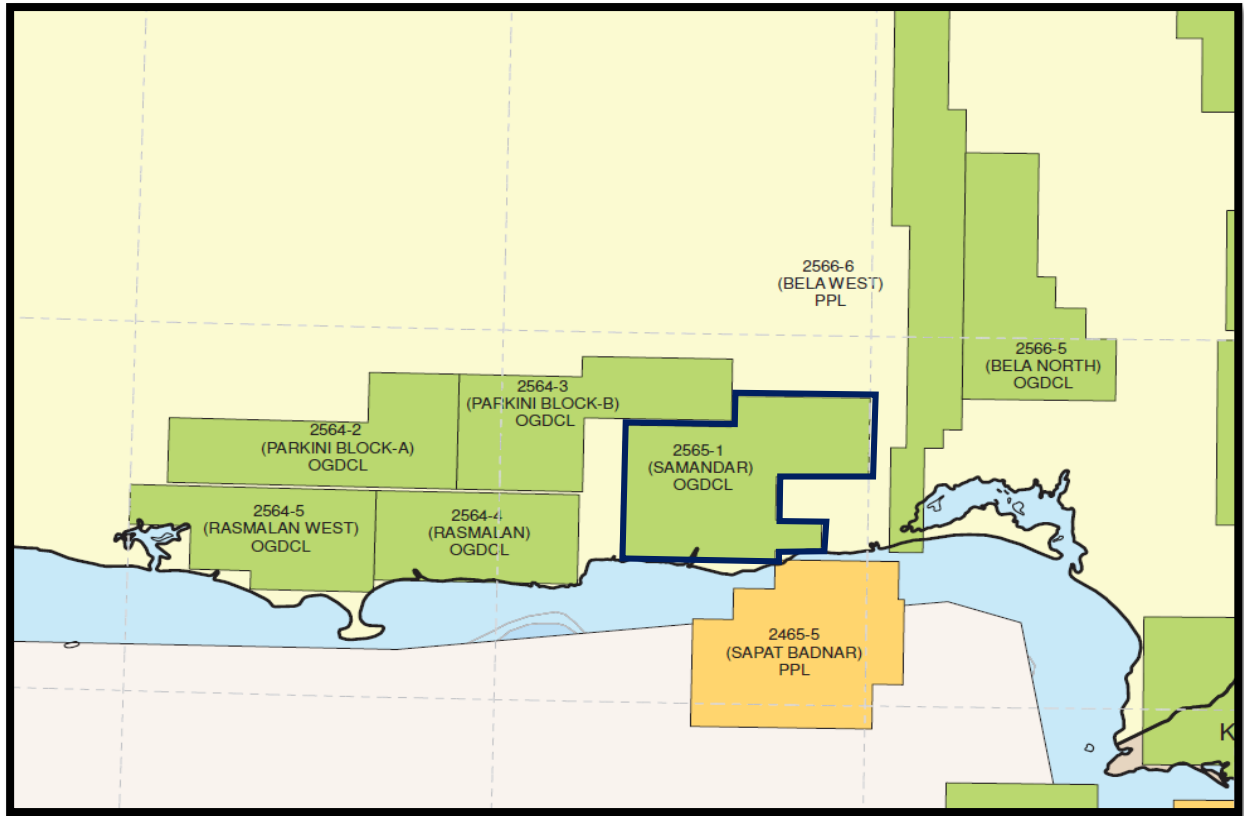
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## SCOPE OF WORK

SAMANDAR block lies in Districts Lasbela and Awaran of Baluchistan Province. The Block covers an area of 2495.33 Sq. Kms and is located in prospective zone I. Currently OGDCL is operator of the Block with 100% working interest.

The area is bounded by latitudes and longitudes as shown below.





Location on Activity Map.

Coordinates of SAMANDAR E.L.

A	25° 50' 00.00"N	65° 37' 30.00"E
B	25° 50' 00.00"N	66° 00' 00.00"E
C	25° 37' 00.00"N	66° 00' 00.00"E
D	25° 37' 00.00"N	65° 45' 00.00"E
E	25° 30' 00.00"N	65° 45' 00.00"E
F	25° 30' 00.00"N	65° 52' 30.00"E
G	25° 25' 00.00"N	65° 52' 30.00"E
H	25° 25' 00.00"N	65° 45' 00.00"E
I	25° 23' 30.00"N	65° 45' 00.00"E
J	25° 23' 30.00"N	65° 20' 00.00"E
K	25° 45' 00.00"N	65° 20' 00.00"E
L	25° 45' 00.00"N	65° 37' 30.00"E

## A- **GEOLOGICAL FRAMEWORK**

The history of petroleum exploration in Balochistan begins in 1916 when Burmah Oil Company drilled its first exploratory well named Chandragup # 1 over Sarpai Anticline near a major mud volcano along the coastal area of Makran just in the immediate south of the Samander E.L. Though the well, received several gas shows but it as a whole was not successful and was abandoned at the total depth of 810 m. In 1955, Hunt Oil Company conducted photogeological and geological field studies and drilled two wells Dhak-1 (2606 m) and Dhak-2 (4530 m) during 1956-57, near Dhak Village. Both the wells were also declared abandoned due to drilling problems before reaching the target zone. All of these three wells i.e., Chandragup-1, Dhak-1 & 2 were drilled on the same structure (Sarpai Anticline) but none penetrated strata deeper than Miocene.

## B- **TECTONICS**

The Samandar E.L falls in the southern extremity of the Panjgur-Makran Accretionary Prism in Balochistan Arc Trench System which on the whole forms a part of continental margin of the Iran-Afghan block in the southern limits of Eurasian Plate. The Panjgur Accretionary Prism borders in the north with Kharan Fore Arc Basin also known as Mashkhel Depression, in the east it is separated from axial belt by Ornachnal Transform Fault System, in the west it extends into Iran (borders oil producing Zagros region of Oman) and in the south it enters into a trench where Arabian Plate is subducting under the Eurasian Plate.

Generally, the major structures are east-west oriented parallel to the trend of the trench. Makran Coastal Zone has numerous anticlinal features ranging from very simple to complex and are mostly very broad synclines, relatively narrow and faulted anticlines. Almost all the structures are breached at their axis and have eruptive mud of several meters thick

## C- **STRATIGRAPHY**

The geological map of the area indicates that Miocene to recent rocks are exposed in the block area. Stratigraphic succession from Miocene to recent is exposed in the area. The oldest formation exposed in the area is Parkini Formation of Miocene age and mainly consists of shale with intercalations of mudstone/ siltstone/clay and thin bands of fine grained sandstone. The Talar/Hingol formations are of Pliocene age and composed of sandstone with alternations of claystone and thin bands of Siltstone. The Ormara formation is of Pleistocene to recent age and composed of Clay/Claystone with intercalations of sandstone/siltstone. The generalized stratigraphic column is given in the table below:

## GENERALIZED STRATIGRAPHIC COLUMN OF SAMMANDAR AREA

AGE	FORMATION	LITHOLOGY	SOURCE	RESERVOIR	SEAL	DESCRIPTION
RECENT	ALLUVIUM					
HOLOCENE	JIWANI					
PLEISTOCENE	ORMARA					OUTERSHELF MUDSTONE WITH SUBORDINATE SANDSTONE / SILT
	CHATTI					INNER SHELF TO SLOPE MUDSTONE / SILTSTONE
PLIOCENE	TALAR / HINGLAJ					SLOPE TO SHELF SANDSTONE AND MUDSTONE
MIOCENE	PARKINI					LOWER TO UPPER SLOPE MUDSTONE WITH THIN INTRABEDDED SANDSTONE
	PANJGUR					ABYSSAL TO LOWER SLOPE SHALE WITH TURBIDITE SANDSTONE
	HOSHAB / SIAHAN					ABYSSAL TO LOWER SLOPE SHALE WITH TURBIDITE SANDSTONE
OLIGOCENE	ABYSSAL MUDS / OCEANIC CRUST ?					ABYSSAL SHALE

### 2- SEISMIC OBJECTIVES

The aim of the 2D seismic program is to delineate the existing Geological based Structures after 2D seismic acquisition. This seismic reflection survey will help to further delineate the structural configurations and shall be used:

1. To acquire good quality seismic data by optimizing acquisition parameters.
2. To enhance image on reservoir levels for better drilling locations and development of the field.
3. To Identify and map major and minor faults at shallow / deep exploration targets.
4. To seek reservoir characterization, Reservoir Monitoring.

### 3- SEISMIC WORK PLAN

- The seismic work plan includes acquisition of 265 (firm) L.km 2D data.
- Orientation of strike lines can be changed after the acquisition of dip lines subject to the requirement.
- The dip lines location can be changed subject to the requirement.

- The completion period of the project is 6 months after signing of the contract.

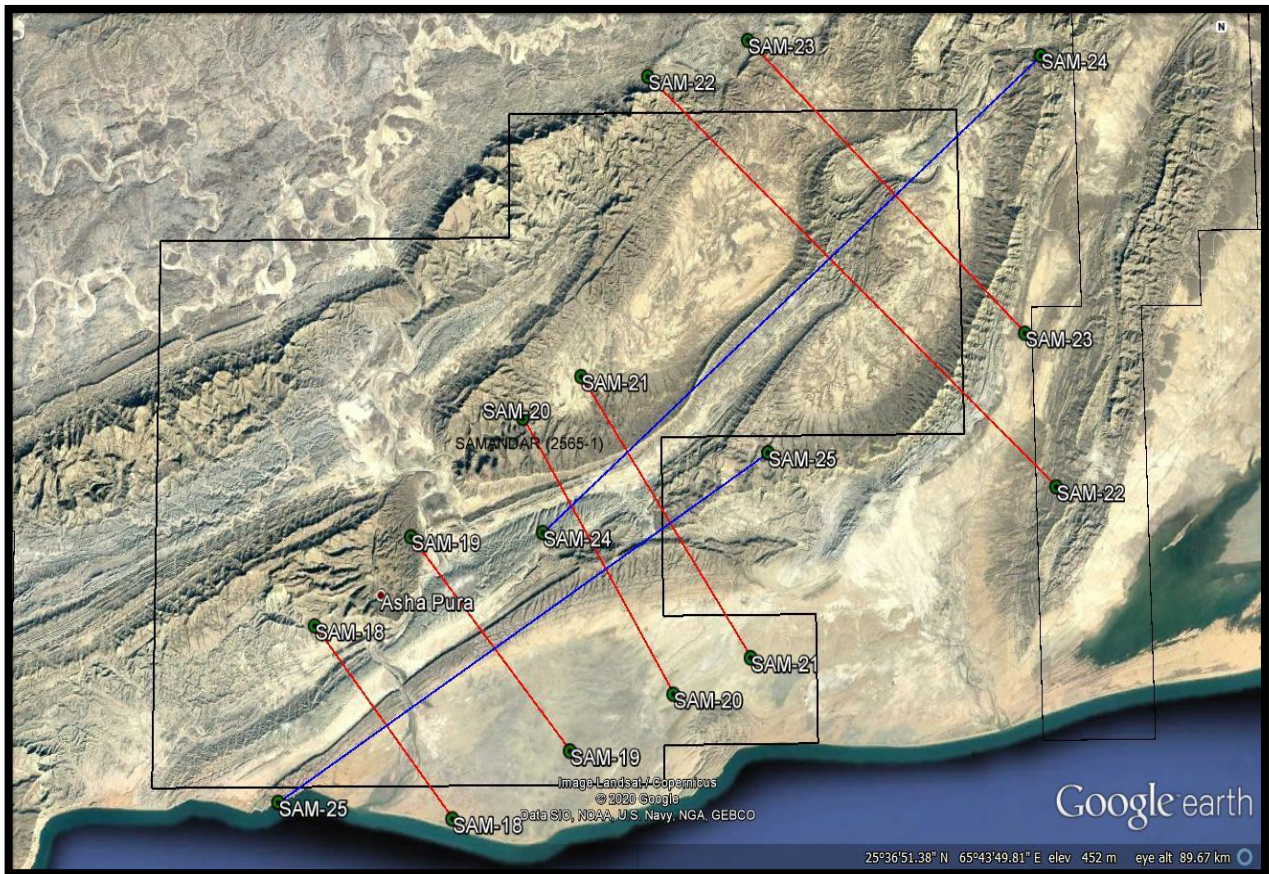
The Detailed 2D seismic work program is given below.

**SAMANDAR 2D (UTM-42 Everest 1830 PROJECTION)**

<b>Seismic Data Acquisition work program (SAMANDAR E.L.)</b>					
<b>Sr. No.</b>	<b>Line Name</b>	<b>Point</b>	<b>X:COORD(approx.)</b>	<b>Y:COORD(approx.)</b>	<b>L. Kms</b>
1	SAM-18	1	155672.6	2810185.99	18
	SAM-18	2	144694.05	2824319.18	
2	SAM-19	1	152758.48	2830476.37	20
	SAM-19	2	165411.36	2814680.68	
3	SAM-20	1	174019.23	2818440.56	23
	SAM-20	2	162258.36	2838761.74	
4	SAM-21	1	167173.98	2841666.43	25
	SAM-21	2	180460.86	2820832.06	
5	SAM-22	1	206218.73	2832290.81	45
	SAM-22	2	173488.36	2863782.49	
6	SAM-23	1	182020.36	2866236.31	32
	SAM-23	2	204249.98	2843610.93	
7	SAM-24	1	163665.11	2830410.37	55
	SAM-24	2	206690.11	2864248.68	
8	SAM-25	1	182467.92	2835571.37	47
	SAM-25	2	141470.67	2811819.37	
<b>Total</b>					<b>265</b>



**Note: Orientation of strike lines will be firmed after the acquisition of dip lines.**



#### **SCOUTING OF THE SURVEY AREA**

The Company requires that the Contractor is fully aware of all local conditions in relation to seismic operations. Bidder should conduct a detailed scouting trip prior to submission of technical & financial Bid proposal of the Project area to address, amongst others, the following issues:

- Sufficient base station locations for the survey system, as required.
- Hazard Maps.
- Operational Risk Assessment
- Baseline Environmental assessment of the survey area
- Evaluate effects and disturbance of the operation on the local habitats.
- Road Maps and location of airstrips
- Location of proposed base camp
- Local logistics and infrastructure.
- Local legal frame work, in particular for labor and safety regulations.
- Licensing permits and tax requirements,
- Explosive magazines requirements etc.

#### **4- GENERAL TERMS AND CONDITONS**

Bidder will prepare their bid in two parts i.e. technical proposal (Part-I) and financial proposal (part-II) strictly in line with the instructions given in the TOR.



The contractor shall be required to comply with and conduct all operations in accordance with all applicable laws and Government orders, rules and regulations of Pakistan and of the Political Sub-Division in which work is to be performed including, but not limited to income tax laws and regulations, and working hours' laws, safety rules and any regulations pertaining to the conduct of seismic operations in Pakistan.

## **5- TECHNICAL PROPOSAL**

- The Technical Proposal of bidder should include the following documents/ information, as the contractor shall have to meet the minimum technical eligibility criteria as per details provided in Schedule B, C & D.
- List and detail CV of Technical personnel's, Expatriate and local proposed to be included in basic operating unit as per Schedule C.
- Technical details and list of equipment and quantities as per Schedule C.
- List of test and quality standards as detailed in Schedule D.
- Complete/comprehensive schedule of work program.
- Detailed reconnaissance report (Scouting Report of the Survey area).
- Documented Experience in similar type of survey areas.
- A copy of their current safety manual, HSE Organization and sample of accident /incident reporting forms, together with details of their safety record for the past two years.
- EHS exceptions e.g. Emergency Response Plan, Medical arrangements, camp clinics, field magazine and security etc.
- Copy of all crew operational procedures for land.
- The Checklist at Annexure-I must be provided in the Technical proposal.
- Technical Performa to be filled by the bidder in Annexure –II.
- Technical Evaluation criteria are mentioned in Annexure –III.

## **6- FINANCIAL PROPOSAL**

Bidder should quote their charges in the financial bid strictly in accordance with the Schedule E.

**TECHNICAL SPECIFICATION AND PARAMETERS**

**1- INTRODUCTION**

The Company requires that all seismic equipment supplied for the survey to be in new or nearly new condition in particular the spread cable and geophone strings. Geophone receiver elements should not be more than three years old.

All equipment proposed for the survey will be subject to audit for technical and safety before acceptance by the Company.

Specifications of all seismic, equipment and positioning equipment should also be provided with the Bid Proposal.

**2- ACQUISITIONPARAMETERS**

Following are the tentative recording parameters for 2D seismic data acquisition work to be tested.

**A- Receiver Parameters**

<b>Receiver Parameters</b>	<b>Option-I</b>	<b>Option-II</b>
No of Channels	300	480
Spread	Symmetric Split	Symmetric Split
Station Interval	40 m	25 m
Source Interval	40 m	50 m
No of geophones	24 (02 strings)	24 (02 strings)
Geophone array	linear	linear
Group Base	38.33 m	23.95 m
Geophone interval	1.66 m	1.04 m
Fold	150	120
Record Length	6 sec	6 sec
Sampling	2 m sec	2 m sec
Near Offset	+/- 60 m	+/- 37.5 m
Far offset	+/- 6020 m	+/- 6012.5 m

*Final parameters will be selected after experimentation in the field.*

## B- Source Parameters:

<b>Deep hole drilling</b>	
No. of holes	01
Hole Depth	12m, 15m, 18m, 21m, 24m, 27m, 30m
Charge size	4, 6, 8,10, 12 kg
<b>Pattern shots</b>	
i) Shallow hole Shot:	
No. of holes	03
Hole Depth	6m, 9m
Charge size	1kg, 2kg, 3kg
ii) POP Shot:	
No of holes	8,10,12,14
Hole Depth	1.8 m
Charge / hole	0.5 kg, 01 kg
<b>Vibroseis</b>	
No. of vibrators	04 + 01 spare
Peak force	minimum 60,000 lbs
Sweep length	10,12,14,16, 18 sec
Sweep frequency	8-96 Hz to be tested
No of sweeps	4, 6, 8,10,12

*Final parameters will be selected after experimentation in the field.*

**PERSONNEL AND FIELD EQUIPMENT****1- PERSONNEL**

Following is the list of minimum personnel to be made a part of the agreement for seismic data acquisition, between the Company and Contractor for 2D seismic reflection data acquisition in SAMANDAR-2D Project

1	Party Chief	01
2	Data Acquisition Engineers ( 05 to 15 years' experience )	05
3	QC Geophysicists ( 05 to 15years experience )	02
4.	On-site seismic data processor ( 05 to 15 years' experience )	02
5.	HSE Advisor (one for base and one for fly camp)	02
6.	Medical Doctor	02
7.	Accounts / Admin Assistants	02
7	Surveyors	07
8	Radio Operator	02
9	Recording Field Assistant	02
10	Recording men	08
11	Drilling Technicians	04
12	Shooting Supervisor	03
13	Vibrator Technicians	03
14	Vibrator Operators	06
15	Plant Attendant / Electrician	02
16	Mechanics	05
17	Drillers	08
18	Shooters and technician	05
19	Carpenter	01
20	Dozer Operators	As required
21	Any other as per requirement	

**2- FIELD EQUIPMENT**

Following is the basic field equipment which will be provided by the Contractor to perform the 2D seismic reflection data Project.

<b>A.</b>	<b>RECORDING EQUIPMENT (Type / Make / Model)</b> 24-bit latest telemetry system (Like 428XL, 508XT & G3i) or better with details as under.	
	1	Recording/ Instrument/ Specification/ maximum Number of active channels available/ channel capability with dynamite mode /online data quality control system.
	2	Detail of Ground Electronics/ cables with year of purchase Number of available Geophone strings / (SM-24/ SG-10 or equivalent / better), Technical Literature.
	3	12 Nos. of Geophone per string (Configuration, 06 series +06 series & both series in parallel).
	4	Detail of auxiliary / test equipment for ground electronics and geophone groups.
	5	Encoder / Decoder (Shooting Equipment) Equipped with GPS.
<b>B.</b>	<b>SOURCE EQUIPMENT (Dynamite / Vibroseis), number, Type</b>	
	1	Drilling Rigs (Capacity 30m).
	2	Portable Rigs/ Jack hammers / No. of units available.
	3	Truck Mounted Rigs /No. of units available
	4	Vibrators (At least 05 Nos.), Peak force not less than 60000 lbs equipped with DGPS System.
<b>C.</b>	<b>REFRACTION / UPHOLE LOGGING UNITS</b>	
	1	24-bit Instrument with Specification, type of geophones & numbers, Uphole drilling Rig (Capacity 100m).
	2	LVL / Refraction Survey Unit, type of geophones & numbers, Instrument Specification / Spread Length / Channels.
	3	LVL processing & Statics calculation software.
<b>D.</b>	<b>ON-SITE SEISMIC DATA PROCESSING UNIT AND 2D PLANNING AND DESIGNING SOFTWARE</b> Make / Model of Hardware / Plotter & cartridge drive Detail of 2D Processing Software	
<b>E.</b>	<b>GPS AND SURVEYEQUIPMENT</b> Make /Model of GPS equipment, Survey Computation Software	
<b>F.</b>	Detail of vehicles and other machinery like dozers, tractors and Generators in the crew.	
<b>G.</b>	Radio and Communication equipment & facilities	
<b>H.</b>	Miscellaneous equipment etc.	

## **TEST AND QUALITY CONTROL STANDARDS**

### **A. FIELD PROCESSING SYSTEM**

An on-site data processing system will be required for monitoring quality control of seismic data acquisition and a complete set of a state-of-the-art 2D basic and advanced seismic data processing software package.

#### **MAIN FUNCTIONS OF THE SYSTEM WILL BE:**

- Daily quality control of the data.
- Optimization of the processing parameters.
- Data processing to the final/migrated stack level.
- Instrument test analysis.
- 

#### **FOLLOWING BASIC PROCESSING FLOW WILL BE FOLLOWED:**

- Demultiplexing
- Building of geometry
- Editing of bad & noisy traces
- Mute application
- Processing parameters analysis & application
- Trace balancing
- Application of field static / Refraction static
- 1<sup>st</sup> Velocity analysis & application
- Preliminary stack
- Compute residual statics & application
- 2<sup>nd</sup> Velocity analysis
- Final stack
- Migration Stack/PreSTM

A report should be prepared after the completion of each line. This report should contain a summary of all kinds check done (geometry, coordinates, traces, records etc), results and observation during processing of final / Migrated stack.

A CD/DVD should be attached to the report with the following data.

- Updated SPS files.
- Interpreted uphole result in Pdf or excel format
- Seismic section in SEG-Y format with XY coordinates in the headers.
- Seismic velocities (NMO, migration) in any standard format compatible with Geoframe /Petrel.
- Any other data related to on-site processing.



## **B. TEST AND QUALITY CONTROL**

### **1. DAILY TESTS**

According to instrument specifications and tolerances given by manufacture, the following tests should be recorded daily on tapes.

- i. Noise and offset of all channel units lay to start production.
- ii. Internal pulse test.
- lii External geophone pulse test.
- iv. Short dynamite range determination.
- v. Ambient noise (line noise). The test may be repeated whenever there is increase in noise.

### **2. MONTHLY TESTS**

- i. Noise and offset.
- ii. Internal pulse test.
- iii. Dynamic range determination.
- iv. Cross feed test.
- v. A-D Non Linear test.
- vi. Geophone tap test.

### **3. PARITY AND SYNC ERROR**

The system should be maintained in good mechanical and electromagnetic condition to ensure minimum parity and sync error within published specifications.

### **4. RECORDING SYSTEM POLARITY**

SEG Standard, a positive signal at the amplifier input produce positive numbers recorded on magnetic tape and upward reflection of field monitor.

### **5. PAPER RECORD**

Data traces and timing should be clearly visible with constant paper speed (within 1% error).

### **6. NOISE SPECIFICATION**

Noise specification will be based on fixed gain monitors to maintain a signal to noise ratio of 1.5:1 or improved. A fixed gain monitor of spread noise recorded will be taken on field tape and will be displayed on paper monitor daily prior to start seismic recording and any time requested by company representative.

The spread noise will be recorded with normal recording filters and recording setting. A record with all the channels will be analyzed by the seismic QC system.

### **7. CABLE AND GEOPHONES**

Contractor will continually check the faulty groups with proper geophone group tester. All the significant noise, dead traces and groups with low response will be repaired or removed from the line.

If the recording spread does not fulfill the operation specification as listed in the contract, the company representative has the authority to suspend the operation at any time.

## 8. RECEIVERS

The contractor will ensure the vertical plantation of geophones with good ground coupling. In case of wind noise the geophones should be completely buried in the ground to reduce the effect of wind on geophones where ground condition does not permit the burying the geophones and spread noise is outside normal acceptable standards, the company representative must be informed the situation.

All the geophones will be planted at correct spacing to ensure the validity of recommended array.

To avoid effect of noise from pipelines, the change in lay out plan source and receiver may be required at places.

## 9. SEISMICSOURCE

### 9.1 DYNAMITE

- i- Charge in the shot holes will be loaded with poles to ensure its placing at recommended depth.
- ii- Time break confirmation and up-hole time should be systematically recorded for each shot point.
- iii- All the charges must be properly tamped with small graded crushed stone to avoid blowouts.
- iv- Any charge that is loaded at shallower depth must be reported to Company Representative who will decide to take it as production shot point or to re-drill/ re-load.
- v- Extra care must be taken while drilling source points, loading & shooting explosive close to the pipe lines& populated areas. Standard Operating Procedures will be adhered while handling explosive.

### 9.2 Shooting System

- i- Shooting system should be equipped with GPS system.
  - ii- Timing test is performed by blasting of a detonator cap, which breaks a low voltage DC electric circuit wound around the cap. The following signals have to be recorded using the auxiliary and data traces of the equipment:
    - The voltage of the DC circuit,
    - Clock time break (TB) supplied by the encoder,
    - Confirmation TB supplied by the decoder (shooting box)
  - iii- Up-hole time test  
First breaks from the two single geophones planted close to each other are used for the test. The sources have to be located far enough from the geophones so that the difference in the direct arrival time to geophones is below one millisecond.
  - iv- Data of one of the geophones have to be recorded on an auxiliary trace, while data from the other geophone on a data trace. Time break has to be recorded on both, an auxiliary and a data trace.
  - v- Up-hole time read out from the auxiliary and the data traces have to be corresponding within one millisecond. Up-hole time read out from the auxiliary traces and the shooting box has to correspond within 2milliseconds.
  - vi- Prior to the commencement of the acquisition, Contractor shall perform both, timing and up-hole tests for each shooting box at the crew.
  - vii- Additional tests have to be performed if,
    - Any part of the shooting system (shooting box or radio, cables) has been changed,
    - The type of detonator caps changed
    - The equipment newly joined the crew
    - When the accuracy or stability of the system becomes doubtful.
- vi- Up-hole or shallow refraction Equipment  
The tests prescribed by the manufacturer have to be run first at start-up and later every time before the start of acquisition of a new up-hole or shallow refraction point. The time break

has to be recorded and must correspond to the zero time of recording.

### 9.3 VIBROSEIS

- Vibrators should be equipped with DGPS for GPS positioning and navigation and latest model of vibrator control electronics, real time quality control and data monitoring.
- The following signals have to be recorded on the auxiliary and data traces of the seismic recorder (All traces polarities have to meet SEG standards).
  - i) Mass accelerator
  - ii) Baseplate accelerator
  - iii) Ground force
  - iv) True reference sweep
  - v) Pilot sweep (pilot sweep generated by sweep encoder)
  - vi) Sweep time break
- All the polarities have to meet the SEG Standards. Polarity has to be checked in pulse mode when downward moving base plate (positive number on the tape and upward signal on camera display).
- The ground force signal has to be used for phase-locking.
- The phase shift between the reference sweep and the ground force signal has to be set to 180degrees.
- The periodic tests have to be accomplished to each vibrator,

periodicity	Tests	Remarks
Start-up	Hardwire and Radio similarity GPS	To be recorded on separate magnetic tape
Daily	Daily Radio Similarity	To be Recorded on a production Tape
Weekly	Hardwire-wire similarity	To be Recorded on a production Tape

- Additional wire line and radio similarity has to be performed when vibrator newly joined the crew. e vibrator has been repaired The sweep has changed
- The vibrator GPS test has to be logged and the results have to be handed over to Company Representative.
- During production a continuous quality control will be performed through the real time vibrator QC system in the Recorder.
- Average and peak phase, distortion and force of each operating vibrator on every sweep will be recorded on diskette and delivered to company representative on daily basis.
- Tolerances for vibrator performance, with the exception of the tapered zones.

Parameter	Tolerance
Avg. phase error	Less than two (2) degree
Peak phase error	Less than ten (10) degree
Avg. force	Not less than 80% of nominal drive level
Avg. distortion	Less than 25%
Start time difference	Less than 0.5 m sec between two vibrators
Tolerance for GPS	
Horizontal	2 meters
Vertical	2 meters

- On normal areas, the actual position of any vibrator shall not differ from its theoretical position by 3meters.
- In case of discrepancy the source point can be repeated or actual position is surveys depending on the Company representative advice.

## 10. RECORDING EQUIPMENT.

- i- Recording equipment has to be tested as it is prescribed in the standard seismic equipment tests.
- ii- The recording parameters;
  - Are either set in geophysical data acquisition contract /agreement or
  - Given by company representative in writing before the start of the project.
- iii- During the recording the seismic data all events, which may be important from the point of view of any later check-up, processing or interpretation of recorded data, are recorded on automatic and/or manual log (observer log). The seismic crew is responsible for the completeness, exactness and unanimity of data logged.
- iv- The observer log (s) have to contain at least the following Information:

i) Company	ii) Contractor	iii) Block, Country
iv) Recorder type & Serial No.		v)Parameter settings
vi) 2D line name,	vii) Date	viii) recorder position
ix) Source type	x) Reel No.	xi) Record No.
xii) Source position	xiii) Up-hole time	xiv) Recording time
xv)Spread description	xvi) weather conditions	xvii) Remarks

- v- The ambient noise has to be checked permanently during recording. Every reasonable effort shall be made to minimize the ambient noise. Company representative has to be informed on the increase of noise level.
- vi- During the recording, the recording truck shall be offset from the receiver lines at least 150 meters. Any switch settings or modification in the recording electronics, blasting units or the related equipment including their driving software that can result in the change of the value or format or the control of the digital data recorded, can only be changed or done after company's approval or instruction.
- vii- There shall be no bad traces on the spread at the beginning of the day. During the normal day of operations, a maximum of 1% of the traces may be bad (except for surface restrictions).
- viii- Playback of records shall be produces at a scale agreed by company representative. Monitor record of every 5<sup>th</sup> shot point will be provided to Company Representative. Each monitor must be annotated to show line number, shot point number etc. and signature of the observer. However, if required by the Company QC / representative monitor record of any shot point will be provided to him.
- ix- Auxiliary channels have to contain at least the following signals:
  - Clock time break
  - Dynamite Recording
  - Up-hole foremen coder
- x- Dynamite shooting will be controlled by radio shooting system. The transmitted time break must be synchronized to recording within 0.250 milliseconds.
- xi- **Minimum safety distance** from any deep shot hole to the local main pipe lines (buries or surface fixed), water or oil wells, permanent buildings at normal conditions will be maintained. However, an increased safety distance has to be kept to avoid excessive damages in case of increased charge, unstable structures, gas/oil/water pipelines of overriding importance, sensitive environments etc.

## 11. MAGNETIC RECORDING TAPES:

The seismic data will be recorded on new magnetic Tapes/HD/ NAS/SAS of branded acceptable company.

Proper precautions would be observed in recording, sealing, storing and transportation of magnetic tapes.

Tapes will be labeled showing line number, file number, shot point numbers, calendar date, Prospect Area, Client's name and Contractor's name etc. Recorded tapes will be numbered in a serial order.

## **12. SEISMIC DATA RECORDING DELIVERABLES:**

Contractor shall be responsible and bear the cost of surveying consumables for the 2D Seismic Data recording including field tapes and explosives, caps and firing line. The Contractor shall provide the field data on LTO3/LTO4 cartridge tapes in SEG-D as following three sets:

- i- Original field dataset
- ii- A second copy of field data set
- iii- A third copy of field dataset

## **13. MISFIRE AND SKIPPED SHOTS (Dynamite/ Vibroseis)**

A misfire is any seismic record not correctly recorded. The following are examples of misfire.

- Loss of magnetic recording.
- Loss of time break.
- Time break is not synchronized to the system cycle delay time.
- Explosive in shot point does not detonate.
- Explosive partially detonate resulting unacceptable data quality.
- SP is unnecessarily recorded at offset not recommended by company representative.
- Dead/ noisy channels should not be more than 1%, however in extreme field conditions i.e terrain of the area, populated area, the noisy/dead/skip channels may vary and company representative will decide accordingly.
- Company representative will also decide the re-shot schedule for misfire and skipped shots.

## **14. SURVEYING AND POSITIONING**

All the survey equipment shall be calibrated and tested prior to the start of operations and later, during the operations according to the manufacturer's specification and good survey practice.

Contractor shall be responsible for the construction and installation of permanent markers. Position, coordinates and access to the permanent markers should be logged and reported in the final operations report.

Based on the primary network points, Contractor will survey a secondary control network from which the seismic lines will be set out.

All the control points will be permanently marked and clearly described to allow recovery in the future.

Generally, Observations with less than five satellites are not allowed. Check shots will be made on 5% of the surveys stations, evenly distributed during the observation period.

All the necessary computations will be completed on site. Final coordinates and elevations will be produced in SPS format.

The final survey report will be a part of the final operation report and will include at least the following information.

- Co-ordinates and elevation of the receiver and source points of seismic lines including deviated points.
- List of key survey personnel.
- List of equipment used (types and versions)
- List and description of software used (types and versions)
- Description of processing method/Surveying parameter used (spheroid, projection, datum shift etc.)
- Listing of coordinates, elevations and description of permanent markers.
- Listing of coordinates and elevations of seismic lines crossing.
- Listing of coordinates and elevations of control points.
- Kml files of recorded data.
- Field notes with line description.

**NOTE: Any other data relevant to project, if required by client should be provided.**



SCHEDULE -E

**RATES FOR 2D SEISMIC DATA ACQUISITION**

- The Bidder shall provide rates for the 2D seismic data Acquisition in SAMANDAR 2D Project for the performance of work according to the parameters proposed by the Company in Schedule –B of Term of Reference in the format given below.
- All the rates should be quoted on a production basis.
- Financial evaluation will be carried out on lump sum basis.
- The quoted prices will be utilized for the financial evaluation purpose only, however payments will be made through cross cheque in 100% equivalent Pak Rupee at actual against verified invoices at the official exchange rate prevalent on the date of payment.

S.N	RATE FORMAT	(US\$)
1	<p><b>MOBILIZATION</b> (Lump Sum) The Lump Sum shall include all cost related to entire project for mobilizing and transporting Contractor’s Personnel, equipment, and supplies to the location where service will be performed.</p>	
2	<p><b>DEMOBILIZATION</b> No Charges will be paid for demobilization.</p>	Nil
3.	<b>DAY RATES (12 hours per day)</b>	
3.1	<p><b>Field Experimentation Rate</b> (12 hours per Day rate/hour rate) (about 4 days) Field experimentation for selection of acquisition parameters.</p>	
3.2	<p><b>Standby Rate</b> (12 hours per Day rate/hour rate) (Maximum 5 days)  Contractor shall be paid daily standby rate for each day when the Contractor’s crew is ready and available to perform services, but is prevented from doing so due to.</p>	
a.	<p><b>Force Majeure.</b> No production due to weather or safety reasons. When the contractor is unable to move between the base camp / fly camp and the work site due to law and order situation, or if the movement of the contractor’s personnel and equipment is prevented in the program area but not relating to land permitting.  The standby Rate shall not be applicable prior to commencement of recording on the 2D seismic program lines. The Standby Rate shall not apply during any period of time when delay is caused by something for which Contractor is responsible.</p>	

b. No standby will be applicable against Gazetted / Public Holidays when crew is not working.

**4. TURNKEY RATES FOR SEISMIC DATA ACQUISITION**

Rates for 2D seismic data acquisition (per Line km) will be provided for 265 L.Km (dynamite & Vibroseis mode) and must be inclusive of Security cost & Land crop compensation otherwise, the bids will be declared non-responsive.

**Note: Rates will be provided as per Schedule-B for dynamite & vibroseis (area about 60% dynamite & 40%vibroseis).**

**For financial evaluation purpose average rate of dynamite will be taken by multiplying with 159 L.kms (60% of the area)**

**and the average rate of vibroseis will be taken by multiplying with 106 L.kms (40% of the area)**

Rates for 2D seismic data acquisition will be provided on separate sheets for dynamite and Vibroseis mode.

Rates will be provided for Option-I & option-II separately as per Schedule-B for dynamite & Vibroseis (area about 60% dynamite & 40% vibroseis).

**A. Deep hole shot (single hole)**

Depth (m)	Charge (kg/hole)				
	4	6	8	10	12
12					
15					
18					
21					
24					
27					
30					

**B. Pattern Shot**

i)

No. of holes	Depth (m)	Charge (kg/hole)		
		1	2	3
3	6			
3	9			

ii)

No. of holes	Depth (m)	Charge (kg/hole)	
		0.5	1
8	1.8		
10	1.8		
12	1.8		
14	1.8		

**C. Vibroseis Source**

**Peak force 60,000 lbs. minimum**

No. of Vibrators = 04 + 1		Sweep frequency will be selected after experiment.				
	No. of sweeps	Sweep length (sec)				
		10	12	14	16	18
	4					
	6					
	8					
	10					
	12					

5.	<b>REFRACTION (WZ) RECORDING</b> Approximate 60 WZ points for the project.
6.	<b>UPHOLE LOGGING UPTO 100 M DEPTH</b> Logging of approximate 80 Upholes with detonator or hammer as a source and their data processing.  About 4 upholes will be recorded prior to parameter testing to help in finalizing the charge depth.  Up-hole depth will be finalized after experimentation.
7.	<b>CABLE POINT CHARGES</b> Approximate 300 cable points for the project.

- All the shot holes will be drilled to its required depth and loaded with required charge sizes then all loaded charges in shot holes will be securely tamped with gravel so that energy from the detonation is contained at the base of shot holes.
- Vibrators sweeps must not be missed. Coupling of the base plate (100%) should be firm with the ground. Shots with weak energy due to poor coupling/ missed sweeps will be repeated.
- **No charges will be paid for misfire or skipped shots.**
- **The Contractor will be responsible** for obtaining all permits from land owners prior to start of surveying for Seismic Data Acquisition program areas and pay all cost incurred for permitting, land surface and sub-surface (shot holes) damage caused by Seismic Data Acquisition and negligent damage caused by Contractor.
- **Contractor shall be fully responsible for arrangement of security** including transportation, accommodation and food etc. for the security agencies that will provide security cover to the Contractor's Crew/ employees, company Representative, all crew's equipment and consumables.

## **COMMUNICATIONS AND REPORTS**

Following reports shall be supplied by the Contractor.

- Daily Progress Report and HSE Report.
- Monthly progress reports and HSE Statistics
- Final seismic Operational report including Filed processing, Survey and HSE reports (4 Hard & 6 softcopies)

It is mentioning to Note that,

- All reports shall preferably be in Microsoft Word/Excel format.
- LVL/ Up-hole data will be submitted in Microsoft Excel format on CD/DVD.
- All survey data will be submitted in both UKOOA and Excel formats on a CD's/DVD's.
- Any other data relevant to project, if required by client should be provided.

**HEALTH, SAFETY AND ENVIRONMENT PROTECTION**

1. General HSE regulations to be observed:
  - 1.1 CONTRACTOR in the conduct of its operations should adhere to, at a minimum, the safety regulations published in the Safety Manual of the International Association of Geophysical Contractors.
  - 1.2 A safety meeting should be carried out in the Crew at least twice a month, or more often if deemed necessary, with all members of the crew in which hazards of the operation are analyzed and safety measures discussed. Special attention will be given to safe driving methods and proper handling of explosives. A copy of these meetings should be forwarded to the Company.
  - 1.3 Sufficient hygienic facilities shall be provided for all employees and shall be well maintained.
  - 1.4 CONTRACTOR shall provide adequate supply of drinking water for all employees at campsites and in the area where crews are working.
  - 1.5 One full time medical specialist and a Safety Officer with sufficient infrastructure shall be providing in the base camp and fly camps if any.
  - 1.6 All vehicles will be equipped with seat belts for all passengers and driver, and first aid kits and five extinguishers shall be provided.
  - 1.7 Any accident in the crew which may result in personnel injuries and /or work-days lost should be reported in writing to Company, explaining cause of accident and measures taken to prevent similar one in the future.
  - 1.8 CONTRACTOR shall exercise all due diligence to conduct the work in a manner that will prevent pollution and shall comply with the applicable laws, rules and regulations. No trash, waste oil, fuel bilge water or other pollutants shall be purposely discharged or otherwise allowed to escape from Contractor's equipment, cars, trucks etc. and CONTRACTOR shall promptly clean up all and any discharge of such pollutants whether discharged purposely or accidentally as required by applicable law.
  - 1.9 CONTRACTOR shall collect all non-permanent markers set at any phase of operation soon after the completion of the data acquisition on the area.
  - 1.10 CONTRACTOR shall comply with, and shall cause its personnel and any other person (s) acting under the direction of Contractor, or acting for or on behalf of Contractor to so comply with all applicable laws, orders and rules & regulations pertaining to the safety, health and environment prevention standards under Pakistan law and with all standards / procedures formulated by Safety Health and Environment Division of the Operator's Company.
  - 1.11 All operations are to be conducted in accordance with the International safety and environmental protection standards. Every effort should be made to prevent environmental damage during the course of the survey and to fulfill any conditions stipulated in the final Contract Agreement.
  - 1.12 CONTRACTOR shall be liable for and shall save, defend indemnify and hold COMPANY harmless from and against any and all claims resulting from any such pollution.
2. CONTRACTOR shall comply with all the Company's HSE regulations that are available with its Environment Protection and Safety Department for reference and strict compliance on request.

**ANNEXURE- I**

		<b>Check List</b> (The bidder will quote the rates item wise in their commercial offer)					
Sr. No		Item Description					Please tick item wise for the rates quoted
1		<b>Mobilization cost</b>					
2		<b>Demobilization</b> No Charges will be paid for demobilization of crew.					Nil
3		<b>Experimentation</b> Day Rates / Hourly Rates (12 hours per day/ hour rate)					
4		<b>Standby Rate</b> Day Rates / Hourly Rates (12 hours per day / hour rate)					
5		<b>Turnkey Rates of 2D Seismic Data Acquisition as Dynamite &amp; Vibroseis Mode inclusive of security charges &amp; Land crop compensation.</b>					
<b>Deep hole shot (single hole)</b>	Depth (m)	Charge (Kg/hole)					
		4	6	8	10	12	
	12						
	15						
	18						
	21						
	24						
	30						
<b>B. Pattern shot</b>	No. of holes	Depth (m)	Charge (kg/hole)				
			1	2	3		
	3	6					
	3	9					
<b>ii)</b>	No. of holes	Depth (m)	Charge (kg/hole)				
			0.5		1		
	8	1.8					
	10	1.8					
	12	1.8					
14	1.8						
<b>C: Vibroseis Source</b>	No of sweeps	Sweep Length (sec)					
		10	12	14	16	18	
	4						
	6						
	8						
	10						
	12						
6		<b>LVL REFRACTION (WZ) RECORDING PER POINT</b>					
7		<b>UPHOLE LOGGING (UPTO 100 M DEPTH) PER METER</b>					
8		<b>CABLE POINT CHARGES PER POINT</b>					

Note: Checklist must be filled by the Bidders.



**ANNEXURE - II**

**Technical Performa to Be Filled By the Bidder**

Category No.	Description of Technical Information
1	<p><b>Company History &amp; Profile</b></p> <p>No. of years Since establishment. Experience in similar project areas. List / No. of 2D/3D Seismic surveys. 2D/3D seismic coverage for last 5 years. No. of Seismic Crews.</p>
2	<p><b>RECONNAISSANCE OF THE AREA</b> Area information including environmental characteristics is important to understand before starting seismic acquisition work. Therefore, the bidder must conduct a detailed reconnaissance of the area physically prior to submission of the bid and submit reconnaissance report with the technical bid proposal.</p>
3	<p><b>Specific technical information of equipment detailed for the job.</b></p> <p><b>RECORDING EQUIPMENT</b> (Type / Make / Model) 24-bit latest telemetry system (like 428XL/508XT/G3i) or better with details as under: Maximum capability of recording system capable of dynamite/ Vibroseis operation and available ground electronics. Type of data storage and on-site real time quality control system.</p> <p><b>Type of geophones (10 Hz) Make/ type and manufacturing year.</b> Total no. of geophone strings available with 12 geophones per string (SM- 24/SG-10 or equivalent. (06 series+06 series both series in parallel, length 110-130m)</p> <p><b>Detail of laboratory equipment</b> (make/model) Type of geophone tester, Ground electronic tester and repair system etc.</p> <p><b>Shooting equipment</b> Total available number and detail of Encoder / Decoder / Shooting Equipment/ equipped with GPS.</p> <p><b>SOURCE EQUIPMENT</b> (make/type / model). Total No. of truck mounted mud pump/ duel system rigs with drilling capacity. Total no. of air compressor rigs/ dual system rigs with drilling Capacity with make type/ model and Portable rigs (Capacity30m). No. of jack hammer with capacity to drill up to 1.8m. Vibrators (At least 05 Nos), Peak force not less than 60000 lbs. Equipped with DGPS.</p> <p><b>REFRACTION / UPHOLE LOGGING UNITS</b> (Make/ type / Model) 24-bit recorder with at least 24 recording channels to record a spread of 220 to 260m. No. of LVL geophones. Type of source with description to record refraction survey to determine LVL if other than dynamite. Details of rig to drill a hole up to 100 m depth to record up-hole logging survey. Up/hole / LVL processing and calculation static correction software.</p>

	<p><b>QC AND ONSITE PROCESSING FACILITIES</b> (make/ type/ model). Detail of 2D on-site seismic Processing hardware &amp; Software.</p>
	<p><b>GPS/ SURVEY EQUIPMENT AND PROCESSING SOFTWARE</b> (Make/type/ Model). No of units available and detail of survey equipment with specifications equivalent or better than dual frequency GPS-1200 RTK/TrimbleR-8 Detail of Survey Processing Software with specification equivalent or better to Leica Geo Office/TBC.</p>
	<p><b>MISCELLANEOUS EQUIPMENT</b> (make/ type/ model) <b>EARTH MOVING MACHINES:</b> No. of Dozers, tractors etc. <b>RADIO EQUIPMENTS</b> Total Nos. and detail of VHF radios for field operation. Total No. and details of walki talki set for field operation. Fax and satellite facility. <b>VEHICLES</b> No. of LT vehicles No of HT vehicles/Trucks (4*2 &amp; 4*4) Cable Buggies etc. <b>CAMP KIT</b> No. of electric generators). No. of living caravans with living capacity and accessories. Messing/dining facilities. Description of workshop, data acquisition lab, medical unit, water purification facility, security, POL and explosive storage and any detail the bidder want to give.</p>
4	<p><b>Human Resource deputed for the job</b> <u>List of crew Professionals.</u> Qualification &amp; Experience of key personnel. All professionals/ technical staff should have the experience more than five years in their relevant field. <u>Back-up &amp; replacement options.</u> List of additional staff to meet any replacement of professionals in the crew due to leave or on recommendations of representative of client on performance basis.</p>
5	<p><b>Execution plan/Completion of Survey</b> Availability of crew. Schedule of work, survey, line clearance, drilling, recording etc. in the form of bar chart. Confirmation of date to commence operation.</p>
6	<p><b>HSE POLICY</b> Detail of HSE policy. Procedures to implement HSE Policy. Crew HSE plan and Operational Procedures Detail of Accidents if any Detail of emergency response plan, Medivac arrangements, camp clinics etc. Provision of a field magazine and security etc.</p>
7	<p><b>Check List Check list to be filled by the bidder</b></p>

**ANNEXURE –III**

**Technical Evaluation Criteria**

**(Qualifying Marks 80%)**

- Technical proposal of the bid shall be reviewed first to determine/check its responsiveness and conformity with the requirement of bid.
- The technical evaluation will be carried out on the basis of information supplied by the bidders in their technical proposals and the criteria spelled out at Annexure-A/ITB provided with this document.
- The bidders securing 80 % or more marks will qualify.

*The detail breakup of the relevant information to be provided by the bidder and the comprehensive marking criteria are tabulated below.*

- There are six (6) categories and various sub categories. Zero marks in any category or in sub Category will lead to disqualification.
- Technically responsive and financially lowest bidder will be considered for award of job.
- Further, any information related to seismic operation will be provided by bidder if required.

<b>Cat. No.</b>	<b>Description of Technical Information</b>	<b>Qualifying Criteria</b>	<b>Max. Marks</b>
<b>1</b>	<b>COMPANY HISTORY &amp; PROFILE</b>		<b>18</b>
	No. of years since establishment	Less than 5 years: 0 marks 5-7 Years: 2 marks More than 7 years: 4 marks	4
	No. of 2D/3D Seismic land surveys completed in last 5 years.	Less than 3 surveys: 0 marks 3 to 6 surveys: 2 marks 7 to 10 surveys: 4 marks More than 10 surveys : 6 marks	6
	2D/3D land seismic surveys coverage completed in last 5 years.	Less than 1000 kms: 0 marks 1001 to 3000 kms: 2 marks 3001 to 5000 kms: 4 marks More than 5000 kms: 6 marks	6
	No. of Crews	One seismic crew: 1 mark Two or more seismic crew: 2 marks	2
<b>2</b>	<b>RECONNAISSANCE OF THE AREA</b> (Mandatory) (Physically conducted Reconnaissance)	Report submitted: 5 marks	<b>5</b>
<b>3</b>	<b>SPECIFIC TECHNICAL INFORMATION OF EQUIPMENT DETAILED FOR THE JOB.</b>		<b>48</b>
	<b>RECORDING EQUIPMENT (make / type/ model)</b> 24-bit latest telemetry system (like 428XL /508XT/ G3i or better). Maximum number of active channels available. Available Ground Electronics: Cables, Geophone strings (12 No. of geophones per string SM-24/ SG-10 equivalent or better). Ground electronics for water bodies if required.  Detail of auxiliary/ test equipment, Encoder / Decoder etc. Type of data storage and onsite real time QC system.		16

	<p><b>SOURCE EQUIPMENT (make / type/ model)</b>  <b>Dynamite</b>  Rigs with Drilling Capacity &amp; Number of units available (Minimum 30 Rigs)  Portable Rigs/ Jack hammers etc.  Air compressor rigs/Truck Mounted Mud Rigs/ duel system Rigs.  <b>Vibrators</b> (At least 05 Nos), Peak force not less than 60000 lbs. Equipped with DGPS.</p>	16
	<p><b>REFRACTION / UPHOLE LOGGING UNITS (make / type/ model)</b>  24 Bit Up-hole Logging Unit Instrument with Specification, type of geophones &amp; numbers, Rig with Capacity LVL / Refraction Survey Unit, type of geophones &amp; numbers, Instrument Specification / Spread Length / Channels,  Source type if other than dynamite.  LVL processing &amp; Statics calculation software.</p>	4
	<p><b>QC &amp; ONSITE PROCESSING (make / type/ model)</b>  Detail of hardware for on-site seismic data processing Make / type and model  Detail of 2D Processing Software</p>	4
	<p><b>GPS/SURVEY EQUIPMENT AND PROCESSING SOFTWARE (make / type/ model)</b>  Detail of survey equipment,  Detail of GPS/ survey processing software.</p>	5
	<p><b>MISCELLANEOUS EQUIPMENT</b>  <b>Earth moving machinery:</b> Bulldozers and supporting vehicles etc.  / HF Radio Equipment, Walki Talki, Internet, Fax, Satellite phone facility.  <b>Camp kit:</b> Detail of all facilities and vehicles.</p>	3
<b>4</b>	<b>HUMAN RESOURCE DEPUTED FOR THE JOB</b>	<b>12</b>
	Total no. of Professionals, Give detailed list	4
	Qualification & Experience of Key professionals (minimum 5 year experience)	4
	Back-up & replacement options	4
<b>5</b>	<b>EXECUTION OF SEISMIC SURVEY</b>	<b>12</b>
	Availability of crew in Pakistan	3
	Schedule of work, Confirmation of date to commence survey.	9
<b>6</b>	<b>HEALTH SAFTY ENVIRONMENT (Mandatory)</b>	<b>5</b>
	Compliance to HSE policy	5
<b>TOTAL MARKS (Qualifying Marks 80 %)</b>		<b>100</b>