OPENHOLE LOGGING SERVICES

1. SCOPE OF WORK

Wireline logging, Alternative Conveyance Logging and data processing/interpretation services are required on "CALL OUT" basis for a period of 2 (two) years for Exploratory, Appraisal and Development wells of Turkiye.

Contractor shall provide a complete range of 6", 7", 8.5", 12.25" Open hole Sections Logging Work. The operations will be performed conventional wireline. Depending on well conditions, Company wishes to have the Alternative Conveyance (through drill pipe systems) ready in Turkiye. It may require run with unconventional method instead of wireline. If needed HPHT tools may be requested with 2 months notice.

The team will be supported by highly experienced logging crews/technical support. The crew also includes a local maintenance focal point to ensure the package is in full working condition.

Company makes no guarantees that any minimum number of logs/logging runs will be made on any of the wells.

2. ELIGIBILITY REQUIREMENTS

The bidder:

- 2.1 must have minimum 10 years international experience of providing above mentioned services
- 2.2 must have an operation base located in Turkiye for providing required services
- 2.3 must be capable of providing logging services wells located in Batman/Adıyaman/Şırnak/Thrace regions

3. TOOLS AND EQUIPMENTS

- 3.1 Tools specified in Annexure-1 should be suitable to perform services within temperature range up to 300 F or 350 F.
- 3.2 The bidder should provide the latest tools/surface acquisition and allied equipment for performing wireline and Alternative Conveyance logging
- 3.3 The bidder will ensure the availability of sufficient tools and equipment with backup support to locations without rig time loss.
- 3.4 Provision of equipment for logging with through drill pipe should also be available when required. Alternative conveyance logging services can be deployed in horizontal, highly deviated, hole collapse, fluid losses and high dogleg severity while well control can be managed with the Through Drill Pipe Conveyance Logging System bottom hole logging assembly (BHA).
- 3.5 Alternative Conveyance Logging System must have capable of wireline logging through drill pipe and optional method without wireline cable (memory type logging) that allows rotation and sirculation in taugh conditions, in order to run in horizontal or high deviated wells, or wells with complicated geometry, wells prone to bridging, wells with losses or that need for improved well control.
- 3.6 All types of permits, security clearances required for operations especially radioactive sources import, storage, transportation etc. to any location of Turkiye will be the responsibility of the bidder
- 3.7 The bidder must have its suitably equipped base facilities for repair / maintenance, data processing / interpretation etc. and back up equipment/system support for smooth execution of logging.
- 3.8 Contractor shall provide the following surface equipment to perform logging jobs

- a) At minimum 2 (two) open hole Logging unit (equipped with a digital data acquisition system) with 7 conductor cable, min.
 6000 meters cable & no previous H2S exposure & no splices, and alternator and spare generator, depth and tension measuring system. 2 Unit
- b) Standard fishing equipment 1 set
- c) Standard rig-up & surface equipment 2 set

4. PERSONNEL

The bidder shall provide professionals to perform Wireline Logging, Through Drill Pipe Logging/Alternative conveyance logging and data processing services. CVs to be submitted with the bid to appraise the competency level. Wireline engineer must be university graduate and minimum 3 (three) years of experience, wireline operators must have a minimum 5 (five) years of experience

5. PREPERATION OF BIDS

- 5.1 The bidders shall prepare their bid in two parts i.e. Technical proposal (Annexure-1) one original & one copy accompanied by soft copy on USB memory and Financial proposal (Annexure-2 and Annexure-3 COST SHEET) original
- 5.2 Technical proposal shall contain the details as per Annexure-1
- 5.3 The financial proposal should indicate all prices/rates as specified in Annexure-2 Any hi-tech/new technology service, which can be used to achieve the objective and not part of the financial model, may also be quoted separately. However financial evaluation will be strictly based on given financial model (Annexure-3 COST SHEET)

6. EVALUATION OF PROPOSALS

- 6.1 The technical proposal shall be reviewed first to determine the responsiveness according to the information required, vide Annexure-1. Technical proposals not conforming to and deviating materially from specifications and conditions laid down in the Tender Documents shall be determined to be non-responsive and shall be rejected by the Company.
- 6.2 After completion of Technical Evaluation, the financial of technically qualified bidders will only be examined to determine the lowest evaluated bid.
- 6.3 For the purpose of determining the lowest evaluated bid, cost as per financial model at Annexure-3 will be taken into consideration. Conditional prices or rebates will not be considered for evaluations. Bidders are required to quote all items as per Annexure-3. Incomplete bids will be rejected and not considered for the financial evaluation.

7. LOG QUALITY CHECKS

The CONTRACTOR shall be responsible for checking the quality and the accuracy of logging data based on the related QC parameters listed below:

7.1 DEPTH ACCURACY

- Total Depth (TD) and casing shoe depth from logger and driller shall be checked.
- All data (log curves, samples, cores, surveys, etc) shall be on depth with one another.
- Depth matching between the various logging runs shall be checked so that all runs remain on depth. Repeat log shall also be on depth with the main log.

7.2 LOG CURVE ACCURACY

• Log responses shall be within the limits of specified API standards.

- Log responses shall be correct in known formations without spikes or any flat interval.
- Curves shall repeat within the specific tolerance under identical environmental conditions.
- Accuracy of caliper readings shall be also checked within the cased hole section.

7.3 SHOP CALIBRATION

- Shop calibration for each tool shall be performed on time based on the tool type and characteristics.
- Shop calibration results shall fall within the prescribed limits for each tool.
- Shop calibration results shall be attached to the related log prints.

7.4 LOGGING SPEED

- Logging speed shall be correct for the design criteria of the tool, desired repeatability, accuracy, formation characteristics and borehole/environmental conditions.
- If tools are combined, the logging speed shall be lowered to the lowest speed of the combined tools.
- Logging speed shall be kept constant during the operation, but slower speeds might be used in the intervals with unusual borehole/environmental conditions.
- The precise logging speed chosen for each logging tool shall be confirmed by the COMPANY.

7.5 PARAMETER SELECTION

- For the petrophysical analysis, a proper matrix shall be selected to correct porosity logs.
- Proper environment parameters shall be selected to correct the effects.
- Proper parameters with accurate values shall be selected for interpretation.
- Adequate mud sample shall be available for the logging engineer. A second (reserve) sample shall be set aside in case of problems with the first.
- Rm, Rmc and Rmf values shall be reported on the header at their measured temperature. Rm should also be reported at BHT.

7.6 FIELD CALIBRATION

- Before/After field calibration shall be in the tolerance.
- Field calibration results shall be attached to the log prints.

7.7 TOOL POSITION

• The well trajectory shall be designed properly for logging operations, and log measurements shall not be affected because of the well trajectory related problems.

7.8 TENSION

• The tension curve shall be available on the screen through the logging operation and on the log prints.

8. DATA PROCESSING

General Requirements

- a) All data processing and reporting shall be performed to fulfill both the COMPANY and applicable government requirements relevant for the area of operation. If the CONTRACTOR supplies data in a form or format that do not meet the requirements, the CONTRACTOR shall on the COMPANY request, reprocess the data to meet the applicable requirements at the time of processing.
- b) The COMPANY may return Data Processing products that are incorrectly completed. Such products shall immediately after return to the CONTRACTOR, be corrected to meet the specified requirements. The CONTRACTOR shall complete such corrections at the soonest, and at its own expense.
- c) The CONTRACTOR shall provide all well data processing and interpretation results within two (2) days. The COMPANY shall not pay any fees to the CONTRACTOR for the Basic Processing defined in this article

The CONTRACTOR shall apply "Basic Processing" to the data, which covers applying required environmental corrections as well as processing to the data such that the resulting output should be directly usable for standard interpretation without further processing. Further, Basic Processing shall also include:

- (i) Any processing that can be performed on the CONTRACTOR's acquisition software on the worksite;
- (ii) Any further processing required (for instance at the CONTRACTOR's geoscience centre) in order to reach the quality level specified by the COMPANY service requirements;
- (iii) Any further processing required (for instance at the CONTRACTOR's geoscience centre) in order to recover/compensate degraded data (including but not limited to correcting data for spikes or other artefacts) from insufficient software capabilities, the effects poor setup/toolstring configuration, running procedures or tool failure;
- (iv) Speed corrections;
- (v) Merging of multiple-pass log data;
- (vi) Tool size, position (centred or eccentred) and tool standoff corrections;
- (vii) Borehole temperature and pressure corrections;
- (viii) Neutron matrix conversion (transform a neutron measured porosity from one matrix type to another between sandstone, limestone and dolomite);
- (ix) Borehole potassium concentration and barite corrections for gamma ray operations;
- (x) Depth correction/shifting;
- (xi) Inclinometry data correction and true vertical depth (TVD) calculation: results are presented as a table of measured depths, true vertical depths, deviation, hole azimuth, NS-EW distances and supported by a polar plot and vertical section plots showing North-South and East-West projections.

(xii) Basic image processing; image plots showing GR, Caliper, Static and Dynamic Images and Dip Analysis (shoving tedpole and roseplots). DLIS for Image data (speed corrected static and dynamic images shall be included), LAS for dip process shall be provided

The CONTRACTOR shall apply corrections to the measured data to ensure that the measurements are correct and within specifications. Upon request, the CONTRACTOR shall provide the COMPANY with detailed information regarding calibration standards, routines and tolerances, charts and/or algorithms for the application of corrections to the data.

(xiii) The CONTRACTOR shall present algorithms and procedures for environmental corrections to the COMPANY. In addition the CONTRACTOR shall make available processing software allowing the COMPANY to perform environmental corrections to acquired data. In cases where corrections are given in form of charts, an algorithm representing the chart shall also be forwarded. The CONTRACTOR shall offer updates to the COMPANY when they become available. If the algorithms are not available, the CONTRACTOR shall, in addition to measured data, supply environmentally corrected logs at the worksite in real time

Acoustic Data Processing

The services that the Company may require include, but are not limited to:

Service		Type of Processing
•	Compressional, Shear, Stoneley	Basic Processing
• •	Fast and slow shear Anisotropy Analysis Stoneley wave reflectivity analysis	Advanced Processing

Image Data Processing

The services that the Company may require include, but are not limited to:

Service		Type of Processing
•	Speed correction	Basic Processing
•	Pad Resistivity Images	
•	Static and Dynamic Wellbore Images	
•	Determining structural dip	
٠	Defining crossbeds, thin beds	Advanced Processing
•	Identifying faults, fractures, and their	
	orientation	
•	Evaluating secondary porosity	
•	Structural and breakout analysis	

Nuclear Magnetic Resonance (NMR) Data Processing

The services that the COMPANY may require include, but are not limited to:

Service	Type of Processing
Preliminary works	Pre-job
 Processing of the spin echo includ inversion processing T2 Domain data processing includ defining T2 cutoffs/variable cutoff Total and effective porosity Permeability estimation Determine fluid volumes; Bound & 	ing T2 Standard NMR Basic Processing ing is. & Free fluid
 Determine hydrocarbon type and (So, Sg) Pore size distribution Determine in-situ oil viscosity Identify low contrast/low resistivity complex formations Capillary pressure 	saturation Advanced NMR

Elemental Spectroscopy Data Processing

The services that the Company may require include, but are not limited to:

Service		Type of Processing
•	Elemental concentrations including Al, Ca, C,	Field Deliverables
	Fe, Gd, K*, Mg, S, Si, Th*, Ti, U*	
•	Formation sigma	
•	Dominant lithology	
•	Qualitative elements (H, Cl, O)	
•	Formation mineralogy (in dry weights and	Basic Processing
	volumes)	
•	Detailed lithology (lithofacies)	
•	Matrix density C	
•	lay types and volumes	
•	Organic carbon	
•	Matrix-corrected porosity	
•	Saturation	Advanced Processing
•	TOC/kerogen volume	
•	Integrated answer products	

Formation Evaluation Data Processing

The services that the Company may require include, but are not limited to:

Service	Type of Processing

•	Basic mineralogy with clay volume	Quicklook interpretation
•	Porosity total and effective corrected for	Advanced Processing
	mineralogy	
٠	Water Saturation	
•	ТОС	Formation evaluation
•	Advanced mineralogy	Advanced Processing
•	Permeability total and phase	

VSP Survey Basic Processing shall includes:

Geometry loading

Data timing and edit: First break picking

DATUM, DF and GL calculations.

The outputs:

Single Shots(.sgy),

Stacks (.sgy-.dat),

Final Plot (.sgy-.dat-.set-.tvd),

Time Depth Plot: **TVD (must be SRD Corrected) vs One way time** (includes corrected transit time) - pdf graphically, csv and excel files

Velocity Plot: **TVD (must be SRD Corrected) vs Velocity** (includes interval, average and RMS velocity) - pdf graphically, csv and excel files

Q-VSP Survey Report

Advanced Data Processing

- a) Any processing work other than "Basic Processing" shall be considered to be "Advanced Processing;
- b) The CONTRACTOR shall perform Advanced Processing and reporting in house, using its own staff and equipment for, but not limited to, Acoustic and Wellbore Image (WBI). The CONTRACTOR must clearly state the format of the deliverable data prior to the performance of the work to the COMPANY.
- c) Any Advanced Processing shall be identified together with a clear identification of the additional curves and outputs which are generated from such processing.

DETAILS OF WELL LOGGING SERVICES WITH WIRELINE IN SLIM HOLE (6-7") AND 8.5"-12.25" OPENHOLE

Slim Tools	
Slim tools utility is not limited to sli	m holes only. They can also be utilized in bigger hole sizes
depending on borehole conditions.	
Equipmens/Tools	Specifications/Features
Logging Unit	Truck Wireline Logging Unit for carrying out all type of Open Hole
	Logging Services on TPAO wells
Reservoir Section	
Resistivity Tool	High Resolution Dual (or Array) Laterolog Tool with
(Maximum tool OD: 2.75")	minimum shallow and deep curves
	Minimum depth of Investigation deep: 48 inch
	Minimum depth of investigation shallow: 16 inch
	 Range of measurement:0.2-40000 ohm-m
	Vertical Resolution: 24 inch
Micro Resistivity Tool	Micro Spherical/Cylindirical Focused Tool
(Maximum tool OD: 4.0 inch)	 Minimum depth of Investigation: 3 inch
	 Range of measurement: 0.2-2000 ohm-m
	Vertical Resolution: 3 inch
Borehole Geometry	 Caliper (4-6 Arms) is required for 6"- 7"- 8.5"- 12,25"-
(Maximum tool OD: 2.75")	17,5" hole
	Minimum depth of Investigation: Hole Diameter
Navigation Tool	Navigation is required For Deviation & Azimuth Survey
(Maximum tool OD: 2.75")	
Neutron Porosity	 Minimum depth of Investigation: 6 inch
(Maximum tool OD: 2.75")	Range of measurement: 0-80 pu
Spectral Gamma Ray	Spectral Gamma Ray is required for Potassium, Thorium
(Maximum tool OD: 4.0")	and Uranium measurements.
	Range of measurement: 0- 1000 API
	Vertical Resolution: 15 inch
	Depth of investigation: 9.5 inch
Density Log	High resolution litho-density with Photoelectric
(Maximum tool OD: 2.75")	Absorption Coefficient Tool
Dipole Sonic	 Mono/Dipole Sonic, P and S, Stoneley, Full wave array
(Maximum tool OD: 2.75")	sonic tool are required
	 Minimum depth of investigation: 1 feet
	Accuracy: 3 us/ft
Image tool	Electric Micro Imager with navigation
	 Minimum depth of Investigation: 0.9 inch
	Vertical Resolution: 0.2 inch
Nuclear Magnetic Resonance tool	 For wide range of T2(T1 optional), diffusion application
	along with conventional bound/free and total porosity
Elemental Analysis Tool	Measures elemental consentration in rock and estimate
	the matrix properties
	 Provides Dry Elemets (Si, Ca, Fe, S, Ti, Gd, Na, Al, K, Mg)
	 Provide quantify of major mineral groups (Clay, QFM,
	Carbonates and pyrites)
Oil Based Mud Reservoir Resistivity	The tool has at least four independent arms, making it
Imager Tool	possible to acquire quality image data
Induction Tool	Must have SP sub or electrode to obtain SP curve
	 Induction measurements must be provided involving

	different formation volumes with flushed and unflushed
	zones
Acoustic Image Tool	 Acoustic bore hole image tool with inclinometer tool
	 Depth of investigation: borehole wall
	Combinable with electrical image tool
Pulsed Neutron Elemental	 In environments where the salinities and porosities are
Spectroscopy and Multiphase	very low the tool must differentiate water/oil/gas contacs
Reservoir Saturation tool	 Tool must be capable of working inside open and cased hole
	Provide Carbon/Oxygen measurement
	Provide openhole and cased hole formation evaluation.
	reservoir saturation to measure porosity, sigma, water
	velocity, phase velocity and borehole holdup
	Determine minerology including total organic Carbon.
	lithology and fluid content profile
Ultrasonic Imager- Cement and	Must have rotating head transducer dedicated to casing
Casing Inspection tool	and cement inspection
	 Provides ultrasonic cement and casing evaluation in
	minimum 5 inch through 9-5/8 inch casing
Formation Dynamics Testing and	Wireline Formation Tester including (but not limited to)
Sampling Tool	Pressure & Temperature recording
	Single and dual Probe for pressure points and sampling
	with standard/large/extra large diameter probe.
	• capable of taking multiple samples of fluids and pressure
	measurements in the borehole without withdrawal
	 capable of taking minimum 3 separate samples in one trip and keep them separate
	 capable of measuring flow resistivity, oil/water fraction.
	fluid typing
	 must have capable of running with two inflatable packer
	elements that seal against the borehole wall to isolate an
	interval of the borehole
	 live fluid analyzer module for real time (HC composition.
	live oil density, resistivity, oil ratio)
	• probe contains the pressure gauges, fluid resistivity,
	temperature sensors
	Pump out module for sampling (including high pressure
	displacement unit)
Vertical Seismic Profile /Imager	Borehole tool has to be a compatible of performing
	services with air guns as well as vibrators, providing tight
	coupling between tool and casing. VSP tool with up to 4
	shuttles required

Annexure-2

*Please fill in the unit prices in blue cells

	PRICIN	G TABLE		
	Mobilization Fee			
	Fixed Service Charge Fee			
	Wireline Crew (Wireline Engineer and Operators)			
	LOGGING SERVICES	Depth Charge (USD/m)	Survey Charge (USD/m)	Standby Charge (\$/Day)
	Gamma Ray			
	Caliper (min. 4 arm)			
	Directional Log			
	Accoustic Porosity			
	Dipole Sonic Log (Compressional and Shear deltaT)			
	Spectral Gamma Ray			
	Neutron Porosity			
	Litho Density, PEF			
Р	Resistivity (Dual Laterolog)			
R	MicroSpherically Focused Log			
I C	SP (Spontaneous Potential)			
l I	Induction Log			
N	Elemental Anlysis Log			
G	Magnetic Resonance Log			
	Imager (Borehole image, formation dip and resistivity)			
	Oil Based Mud Reservoir Imager			
	Acoustic Image			
	Ultrasonic Imager- Cement and Casing Inspection tool			
	Pulsed Neutron Sigma			
	Pulsed Neutron C/O			
	Pulsed Neutron Elemental Spectroscopy and Multiphase Reservoir Saturation			
	ALTERNATIVE CONVEYANCE (for slim tools) mobilization charge			

ALTERNATIVE CONVEYANCE (for slim tools) SURCHARGE			
ALTERNATIVE CONVEYANCE (for slim tools) MEMORY&BATTERY/BHA CHARGE			
Zero Offset VSP (4 Shuttle Minimum)			
Additiona	l Operational Requ	uirements	
Cancelled Operational Fee			
Incomplete Operational Fee			
LIH INSURANCE PRICE (USD)			

 FORMATION DYNAMICS	5 TESTING AND SAMPLING
Mobilization Charge	Included in Fixed Service Charge
Fixed Service Charge	
Wireline Crew (Wireline Engineer and Operators)	Included in Fixed Service Charge
Description	Unit Price USD
Single Probe Depth Charge	
Multisample Depth Charge	
Fluid Analyzer Depth Charge	
Fluid Analyzer Station Charge	
Dual Packer Depth Charge	
Pressure Test Point Station Charge (per point attempted)	
Fluid Sample Station Station Charge (per sample attempted)	
Real Time Domain Support	
Final Testing and Sampling Report	

ΕΤΑ	ETA For Equipments and Personnel on location (After received call out e-	el e-	
	mail in hours/days)		

	PROCESSING		PRICE (USD)
DATA PROCESSING PRICING	Acoustic	Compressional, Shear, Stoneley	
		Fast and Slow Shear	
		Anisotropy Analysis	
		Stoneley wave reflectivity analysis	
	Image	Speed Correction	
		Pad Resistivity Image	
		Static and Dynamic Wellbore Images	
		Determining Structural Dip	
		Defining Crossbeds, Thin beds	
		Identifying faults, Fractures and their orientation	
		Evaluating secondary porosity	
		Structural and breakout analysis	
	Magnetic Resonance	Processing of the spin echo including T2 inversion processing	
		T2 Domain data processing including defining T2 cutoffs/variable cutoffs	
		Total and effective porosity	
		Permeability estimation	
		Bound&Free fluid	
		Determine hydrocarbon type and saturation (So, Sg)	
		Pore size distribution	
		Determine in-situ oil Viscosity	
		Identify low contrast/low resistivity or complex formations	
		Capillary pressure	
	Elemental Spectroscopy	Elemental Concentrations including Al, Ca, C, Fe, Gd, K, Mg, S, Si, Th, Ti, U	

		Formation Sigma	
		Dominant Lithology	
		Qualitative elements (H, Cl, O)	
		Formation minerology (in dry weights and volumes)	
		Detailed lithology (lithofacies)	
		Matrix density C	
		lay types and volumes	
		Organic carbon	
		Matrix-corrected porosity	
		Saturation	
		TOC/kerogen volume	
		Integrated answer products	
	Formation Evaluation	Basic minerology with clay volume	
		Porosity total and effective corrected for minerology	
		Water Saturation	
	ТОС		
		Advanced minerology	
		Permaibility total and phase	

NOTES:

Cost of the above mentioned services or equivalent may be quoted.

Fixed Service Charge will be applied only once under one MOB/DEMOB

Any other service / technology not covered above may be mentioned separately as per above format as optional

No deviation charge will be applicable.

When a Natural Gamma Ray Spectroscopy is recorded, no Gamma Ray "survey charge" will be applied for Gamma Ray recorded in combination with several different services under same MOB/DEMOB

Resistivity data will be inclusive of SP curve

All tools mentioned in the table above should be the latest generation, and price quoted above will be inclusive of all modes pertaining to that tool.

Survey charges are the applicable price per meter charge where a successful recording is made from the depth of the shallowest reading (or the casing shoe in open hole), whichever is deeper, to the deepest reading

If a Dipole Sonic Log (Compressional and Shear Delta-T) survey is performed only one price per meter depth and survey charge shall apply

Personnel rates shall only apply when Contractor Personnel are on the working site to perform Work at the request of Company if the equipment is operational.

The incomplete operation fee shall apply when logging operations are attempted but can not be completed due to well conditions. This fee shall be in addition to the equipment and personnel rates, but will not include the service charge fee. The rate shall be applied to each tool string for each unsuccessful descent. The incomplete operation fee shall not apply for any incomplete operation due to Contractor fault

A canceled operation fee shall apply if operations are cancelled by TPAO after Contractor Personnel and Equipment have left Contractor's mobilization point for the drill site.

Standby charges apply per day for non-operational days only. Standby fee shall not apply up to 24 hours non-operational time.

Contractor shall provide all services and equipment necessary to perform the Work. If Contractor fails to provide equipment as specified in this Contract or if the failure of a Contractor supplied equipment item results in any lost time, 500.00 USD discount per lost hour shall be applied. The total lost time penalty cost will not exceed %10 of the total invoice cost

Contractor shall furnish their Standard Price List, with any applicable discounts: To cover any additional tools or equipment, not covered in this contract, but that may be requested.

Contractor shall make insurance for all the downhole tools, relevant needing equipment for wireline/pipe conveyed logging tools if required. Insurance documents shall be furnished to the COMPANY.

ATTACHMENTS

- 1. CONTRACTOR'S TECHNICAL PROPOSAL
- 2. PRICING TABLES (Annexure-2),
- 3. COST SHEET (Financial Model)
- 4. CONTRACTOR'S TERMS AND CONTIDIONS
- 5. LIH PRICELIST
- 6. STANDARD WIRELINE SERVICE PRICELIST
- 7. PERSONNEL CURRICULUM VITAE