	<b>National Oil Corporation of Kenya</b>  <b>EXPRESSION OF INTEREST (EOI) FOR CONSULTANCY SERVICES (CONSULTING FIRMS) IN SUBJECT MATTER EXPERTISE (SME) FOR INTEGRATION OF DATA ACQUIRED IN BLOCK 14T KAJIADO KENYA</b>	<b>Ref:</b> <b>NOCK/PRC/03(1719)</b> <b>2023-2024</b>
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## **1.0 INTRODUCTION**

National Oil Corporation of Kenya (National Oil) operates exploration acreage in Block 14T, located within the Southern Tertiary Rift Basin where ground gravity and magnetics, airborne gravity and magnetics, Magnetotellurics and 2D seismic data have been acquired.

National Oil Invites Expressions of Interest (EOI) for a Subject Matter Expertise (SME) consultancy services for the integration of data acquired in Block 14T. The program is funded by Government of Kenya (GOK) through State Department of Petroleum (SDP) and executed by National Oil Corporation of Kenya (NOC).

## **2.0 BACKGROUND TO BLOCK 14T 3D DATA INTEGRATION MODELLING AND JOINT INVERSION**

National Oil Corporation of Kenya (NOC), has been acquiring data in Block 14T, Magadi Basin, since 2010 when a PSC for the Block was awarded to NOC. The data sets include Geological, Geophysics (Ground Gravity and Magnetics, FTG, MT-TEM, 2D Seismic) and Geochemistry.


Data sets available:

- Legacy geological and geochemical reports
- Full Tensor Gradiometry (Airborne gravity and magnetics) covering entire Magadi Basin in standard Geosoft Oasis Montaj database(s)
- Ground gravity and Magnetics data
- Magnetotellurics (MT) and Transient Electromagnetic (TEM) data
- 2D Seismic reflection (215 km) and refraction data

Every phase of exploration for hydrocarbons in Block 14T, represented by the above-listed data sets and analyses, is documented by large volumes of discipline-specific data i.e., geological, geophysical and geochemical. While each data type has been independently evaluated to provide increasing confidence in the possible existence of a functional Petroleum System in Block 14T, a full integration of the diverse data is required to leverage aspects of their congruent multi-physics to generate a derisked 3D model of the subsurface and thus inform optimal locations(s) for drilling of stratigraphic and / or exploratory well(s).

The most effective way therefore to develop a derisked model of the subsurface in Block 14T is to conduct a comprehensive joint inversion of all the available data using a premium data integration, analysis and visualization platform, supported by Subject Matter Expertise.

Such platform must capture all scales of structured and unstructured data types so that the data can be fully visualized, cross-correlated and further interpreted within a single flexible 3D / 4D environment.

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### 3.0 OBJECTIVES OF THE ASSIGNMENT

#### Overall Objective

The Subject Matter Expert (SME) consultant will be tasked to perform a full integration of the diverse available geoscientific data to leverage aspects of their congruent multi-physics to generate a derisked 3D model of the subsurface and thus inform optimal locations for drilling of stratigraphic and /or exploratory well(s).

#### Specific Objectives

- (i) To reprocess available geophysical data sets (seismic & non-seismic) in Block 14T (Magadi Basin)
- (ii) To perform 3D integrated data modelling and joint inversion
- (iii) To capacity build the technical upstream staff through on-job training for 3D data integration modelling and joint inversion

### 4.0 SCOPE OF ASSIGNMENT


The SME consultancy will cover reprocessing of available geophysical datasets (seismic & non-seismic) in Block 14T, 3D data integration modelling & joint inversion and capacity building as outlined in the specific objectives. The technical details include;

#### QC Data:

- Comprehensive seismic and non-seismic data review, and masking of low S/N data
- Check for non-geological data distortion of the MT and TEM data caused by low signal/noise levels, galvanic distortion, infrastructure, or inconsistent with the data at adjacent soundings, or otherwise inconsistent with the geological and / or topographic setting
- Check ground gravity and MT/TEM for too close overlap, discarding the weaker of adjacent ones
- Maps of data attributes (all data), on shaded topography and prospect maps, checking for consistency, pre-modelling.

#### Reprocessing of seismic and non-seismic data:

- Reprocessing of 9 lines (215 km) of 2D seismic reflection data in depth.
- Reprocessing of Magnetotellurics (300 points) and TEM (300 points) approximately 288 km.
- Reprocessing of Ground Gravity and Magnetics data.

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### **Enhanced Gravity, Airborne Gravity and Magnetics:**


- Calibrate the airborne gravity with ground gravity to ensure reliable long wavelengths
- The enhancements of the gravity and magnetics data will include:
  - For the gravity data, selecting a range of densities appropriate for the target area geology, calculating Bouguer anomalies and comparing to the 3D topographic response to choose a density with minimum correlation.
  - For the magnetic data, applying a Reduction to Pole transformation to attempt to place the anomalies over their causative source. The magnetic data would also have a Total Gradient or Analytical signal transformation applied.
  - Filters that use vertical and horizontal derivatives and gradients, high - low- and band-pass. Match filtering of the datasets to be done using radial power spectrum to better tune the filtering of the data to the frequency content of the data.
  - Regional and Residual Bouguer Gravity Anomaly
  - Total Horizontal Gravity Gradient
  - First and second Vertical Derivative of Residual Bouguer Gravity
  - Total Magnetic Intensity (TMI) and 1<sup>st</sup> Vertical Gradient of TMI
  - Reduced –to-pole (RTP) Magnetic Anomaly
  - Horizontal gradient (in two directions if deemed valuable) of Magnetic Anomaly
  - Analytical Signal
  - Tilt Derivative
  - Depth to dominant density contrast (Euler)
  - Depth to magnetic basement (Euler, Tilt derivative)
- A series of images that emphasize subtle information that may not be apparent from the initial region grid. These additional, interpretation focused images may include application of various filters and sun illumination in several directions.

### **2D Gravity, FTG and Magnetic modelling along 2D seismic dip lines:**

To evaluate the main structures and tectonics across the Magadi Basin which is in the rift system, the ground and airborne gravity/FTG datasets to be interpreted in conjunction with the magnetic data, constrained by the reprocessed seismic data in depth and geological information. To develop gross depositional environments (GDE) maps, 2D conceptual geological model with depth heat flow scenarios and potential compaction. To perform basin analysis and stratigraphy constrained by resistivity, density and seismic velocities information. To develop play(s) fairway analysis and risk segment mapping (regional risk mapping) including prospect(s) focus imaging and analysis. To use analogues to identify exploration uncertainties, gaps and risks for petroleum system modeling and resource assessment and volumetrics.

### **3D single domain inversion – MT+TEM, Gravity, FTG, Magnetics:**

- Build detailed 3D MT inversion meshes

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- 1D TEM models to populate the near surface resistivity, followed by joint 3D MT inversions
- Run initial 3D MT inversion runs as a final QC on data suitability/ consistency
- Suite of unconstrained inversion runs, starting from homogeneous half space resistivity to test model mesh suitability, regularization parameters, etc.
- For Gravity, FTG, Magnetics, use same 3D meshes as MT-TEM, and a suite of inversion runs, but using gradient starting models where required (e.g. density).

### **3D Joint Inversion MT+ Gravity + Magnetics + FTG, incorporating 2D seismic:**

- From the 2D interpreted seismic, in particular the seismic constraints on top basement and related cover structure, the 2D GravMag models and the Magnetic depth estimates, update the 3D starting models for density and magnetics, and re-run, applying constrain where needed.
- To test end member structural models, run a suite of 3D modeling and inversion runs to ensure the main attribute volumes (resistivity, density and magnetic susceptibility) are geologically-consistent; i.e. a single earth model that is consistent with the geophysics data and ancillary control.


### **Seismic – guided 2D and 3D Multiphysics inversions:**

- Structural similarity to be achieved by promoting a cross gradient constraint between (external) seismic derived gradient fields and the inversion resistivity model. The gradient fields to come from coherency weighted structure tensors computed directly from the seismic data.
- Each resistivity model cell to be assigned with the principal direction of change from the seismic, and a cross - gradient operator to steer the inversion. The derivation if the structural tensor to be a fully data-driven image processing.

## **5.0 DELIVERABLES AND TIMING**

An illustrated report will be delivered in digital form (pdf), covering the data analysis and inversion modeling results, and documentation on data formats:

- A summary of data quality, site-to-site consistency, noise, distortion and dimensionality
- Reprocessing report for each data set
- 2D and 3D modeling results, with resistivity, density and magnetic susceptibility depth maps and cross-sections, including supplied ancillary information.
- The observed (input) data, and the 2D and 3D model response (output) data
- Maps, sections and plots comparing the observed to 3D model response data misfits
- Geological conceptual models and cross-sections of the Magadi Basin
- Gross depositional environments (GDE) maps of Magadi Basin
- Composite common risk segment (CCRS) maps of Magadi Basin

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- Petroleum system models of Magadi Basin
- Prospects inventory report of Magadi Basin
- A summary of exploration uncertainties, gaps and risks of Magadi Basin
- Volumetrics report of the Magadi Basin

Bi-weekly updates with deliverables to be discussed through videoconferencing  
The estimated timeline to complete the project is 4-6 months, from receipt of input data.

## 6.0 SME CONSULTANT'S QUALIFICATIONS AND EXPERIENCE

The SME Consultant should be able to demonstrate relevant experience in all aspects of the assignment. This should include:

- Completion of similar assignments
- Experience in seismic and non-seismic data processing
- Wide knowledge in 3D data integration especially frontier basins and rift basins
- Experience in 3D joint inversions
- Experience in capacity building particularly on-job trainings

It is preferable for the qualifying consultant to have the following Key Expertise with related post graduate qualifications in geosciences disciplines.

- At least 10 years' experience working on geoscientific data integration
- Knowledgeable on the rift basins geological transformations
- Have significant international capacity building track record


## 7.0 RESPONSIBILITY FOR ADMINISTRATION AND COORDINATION OF THE ASSIGNMENT PROCESS:

The committee for the implementation of the contract will be set by NOC at the beginning of the SME consultancy contract. The committee will support the SME consultant during the period in:

- Provide the SME Consultant with all datasets and information requested.
  - Approve the reports submitted by the SME consultant.
- The SME consultant shall forward all the reports to the NOC Manager Exploration.

## 8.0 PRELIMINARY MANDATORY REQUIREMENTS:

- a) Copy of Business Registration/ Certificate of Incorporation from the country of domicile

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- b) Copy of valid Tax Compliance Certificate from Kenya or equivalent from the country in which the SME is based.
- c) Copy of CR12 or CR 13 for limited companies, detailing the list of Directors and Shareholding & copies of identification for the listed Directors or equivalent.
- d) Submission of one physical original tender document and one copy or by email
- e) Three (3) years certified audited accounts, 2020, 2021, 2022
- f) Evidence of capacity to undertake the assignment. Evidences of similar assignments undertaken.

## 9.0 TECHNICAL EVALUATION CRITERIA

The evaluation criteria below will be used to ascertain the responsiveness of the SMEs to the EOI:

No.	EVALUATION CRITERIA FOR THE EOI FOR SUBJECT MATTER EXPERTISE (SME) CONSULTANCY SERVICES FOR INTEGRATION OF DATA ACQUIRED IN BLOCK 14T	Score (Marks)
1.	List of similar 3D data integration work undertaken successfully in the last 10 years and projects currently under execution Each successful data integration work done (5 marks) <b>Documentary evidence must be provided in line with clause 2.12 and 2.13 of the tender document</b>	20
2.	Management structure of the company	10
3.	Details of key personnel to be involved in the project including their qualifications (Resumes to be provided)	10
4.	Description of the methodology in response to the scope of work including software to be used. (i) Reprocessing of seismic and non-seismic data sets (20 marks) (ii) 3D integrated data modelling and joint inversion (20 marks) (iii) Capacity building of technical upstream staff (10 marks)	50
5.	List of policies, procedures and quality assurance practices currently in place for the execution of similar work	10
	<b>TOTAL</b>	<b>100</b>

To be considered responsive, candidates are to score a minimum of 80% of the total score above. Those who score the pass mark of 80% and above will be invited to submit proposals and will be sent the Requests for Proposals.

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Interested candidates can view/obtain/download more details of the Expression of Interest (EOI) at [www.nationaloil.co.ke](http://www.nationaloil.co.ke) on the tenders link or Public Procurement Portal PPIP Portal [www.tenders.co.ke](http://www.tenders.co.ke).

### **SUBMISSION OF THE EOI**

National Oil requests interested SMEs who can fulfill the scope of work listed above to submit their EOI along with associated documents (including the details and references stated above) to submit their EOs as below:

Expressions of Interest (EOI) in plain sealed envelopes clearly marked **“EXPRESSION OF INTEREST (EOI) FOR CONSULTANCY SERVICES (CONSULTING FIRMS) IN SUBJECT MATTER EXPERTISE (SME) FOR INTEGRATION OF DATA ACQUIRED IN BLOCK 14T KAJIADO KENYA** with the instructions **“Do not open before 17th April 2024 at 1000hrs (East Africa Time)”**, should be addressed to:

**CHIEF EXECUTIVE OFFICER**  
**NATIONAL OIL CORPORATION OF KENYA**  
**KAWI COMPLEX BLOCK D, RED CROSS LANE OFF POPO LANE, SOUTH C**  
**P O BOX 58567 – 00200, NAIROBI**

and deposited in the **Tender Box** located at **Kawi Complex Block D** between 0800hrs and 1700hrs (East Africa Time), so as to be received **on or before 17th April 2024 at 1000hrs (East Africa Time)**. *Late submissions shall automatically be disqualified whatever the circumstances.*

Expressions of Interest will be opened soon thereafter at **National Oil Head Office – Kawi House**, in the presence of tenderers and/or their representatives who may wish to attend.

The EOI documents are not transferable.

**CHIEF EXECUTIVE OFFICER**