FORMS

Form 1

REPUBLIC OF NAMIBIA

ENVIRONMENTAL MANAGEMENT ACT, 2007

(Section 32)

APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE

ECC Reference Application No.
APP-00687

PART A: DETAILS OF APPLICANT

1. Name (person or business) – **TGS Geophysical Company (UK) Limited**

   Application for Environmental Clearance Certificate (ECC) for the Proposed Multiclient or Proprietary 3D Seismic Survey covering Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, Orange and Lüderitz Basins, Offshore Southern Namibia.

2. Business Registration/Identity No. 05731700 (UK)
   (if applicable)

3. Correspondence address: Dukes Court, Duke Street,
   Woking, GU21 5BH,
   UNITED KINGDOM

4. Name of Contact Person: Dr Sindila Mwiya

5. Position of Contact Person: Environmental Assessment Practitioner (EAP)

6. Telephone No.: +264-61-306058 / 224780 / 236598

7. Mobile No.: +264811413229

8. Fax No.: +264-61-245001

9. E-mail Address: (if any): frondesk@rbs.com.na

☐ Tick (☐) the appropriate box

PART B: SCOPE OF THE ENVIRONMENTAL CLEARANCE CERTIFICATE

The environmental clearance certificate is for:

☑ Environmental Clearance Certificate for the Proposed 3D Seismic Survey covering Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, Orange and Lüderitz Basins, Offshore Southern Namibia.

Details of the activity(s) covered by the environmental clearance certificate.

The Proposed Multiclient or Proprietary 3D Seismic Survey covering Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, Orange and Lüderitz Basins, Offshore Southern Namibia. The proposed survey area falls in water depths ranging from ca-200 m to ca-2500 m from east to west, respectively. The proposed 3D seismic survey activities are planned to start from January / February 2023, if the Environmental Clearance Certificate (ECC) is granted by the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism.The following is the general summary specifications of the proposed 3D seismic survey activities by TGS:

- **Proposed activities** – Multiclient or Proprietary (Exclusive) 3D seismic survey.
- **Summary of the 3D seismic survey layout:**
  - Streamer Spread: 10 x 150 m x 8100 m
  - Streamer Depth: 15 m flat tow
  - Number of Channels: 648 per streamer
  - Fan Mode: 25% max.
  - Source Volume: ~ 3000 cu.in.
  - Source Depth: 8 m
  - Shot Point Interval: 12.5 m triple source fired sequentially
  - Sail Line Interval: 750 m
  - Record Length: 14 s cont. rec. (extracted and deblended)
  - Fold: 122, and.
  - Bin Size: 6.25 m x 25 m.
- **Nearest Namibian Port** –Port of Lüderitz or Walvis Bay.
- **Estimated survey duration**–Seventy (70) days per survey event and multiple survey events will be undertaken over the next three (3) years.

[**Note:** Please attach plans to show the location and scope of the designated activity(s), and use additional sheets if necessary: The EIA and EMP Reports and Annexes are attached to this application.

Title of Activity: Proposed 3D Seismic Survey covering Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, Orange and Lüderitz Basins, Offshore Southern Namibia.

Nature of Activity:

Seismic survey is a key tool that resources companies exploring for hydrocarbons (oil and natural gas) use to map the subsurface and kilometres below the ground either on land (onshore) on in the sea (offshore). The basic principle of seismic survey method is the application of controlled generation of sound / acoustic waves by a seismic source to obtain an image of the subsurface. The generated acoustic wave that travels deep into the earth, is reflected by the various rock formations of the earth and returns to the surface where it is recorded and measured by receiving devices called hydrophones (Fig. 1).

Airguns are the most common sound source used in modern offshore seismic surveys (Fig. 1). An airgun is an underwater pneumatic device from which high-pressure air is released suddenly into the surrounding water. On release of pressure the resulting bubble pulsates rapidly producing an acoustic signal that is proportional to the rate of change of the volume of the bubble. The frequency of the signal depends on the energy of the compressed air prior to discharge. Arrays of airguns are made up of towed parallel strings. A single airgun could typically produce sound levels of the order of 220 - 230 dB re 1 mPa @ 1 m, while arrays produce sounds typically in the region of 250 dB re 1 mPa @ 1 m. Most of the energy produced is in the range of between 0 - 120 Hz bandwidth, although energy at much higher frequencies is also produced and recorded. High-resolution surveys and shallow penetration surveys require relatively high frequencies of between 100 – 1, 000 Hz, while the optimum wavelength for deep seismic work is in the 10 - 80 Hz range.

During the survey operation, the seismic vessel records the data from all the hydrophones, including accurate coordinates of the vessel and its hydrophones. As shown in Tables 2.1 and 2.2, the proposed 3D seismic survey operations will employ numerous streamers and many hydrophones, providing enough data to give a detailed subsurface profile of the rock layers.

The depths of the reflecting layers are calculated from the time taken for the sound to reach the hydrophones via the reflector. this is known as the two-way travel time. The pulse of sound from the guns radiates out as a hemispherical wave front, a portion is reflected towards the hydrophones from rock interfaces. The path of the minute portion of the reflected wave-front intercepted by a hydrophone group is called a ray path. Hydrophone groups spaced along the streamer pick out ray paths that can be related to specific points on the reflector surface.

Graphs of the intensity of the recorded sound plotted against the two-way time are displayed as wiggle traces. Seismic recording at sea always uses the Common Depth Point (CDP) method. A sequence of regularly spaced seismic shots is made as the survey vessel accurately navigates its course. Shots are usually timed to occur at distances equal to the separation of the hydrophone groups. In this way up to 120 recordings of the echoes from any one of 240 reflecting points can be collected. Each represents sound, which has followed a slightly different ray path, but has all been reflected from the same common depth point.

By analysing the time, it takes for the seismic waves to travel between the rock formations and the surface, geophysicists, geologists, and petroleum engineers use sophisticated software to create subsurface images /maps showing potential drill-ready subsurface geological structures called reservoirs that may contain hydrocarbons.

Location of Activity: Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, Orange and Lüderitz Basins, Offshore Southern Namibia (Fig. 2).

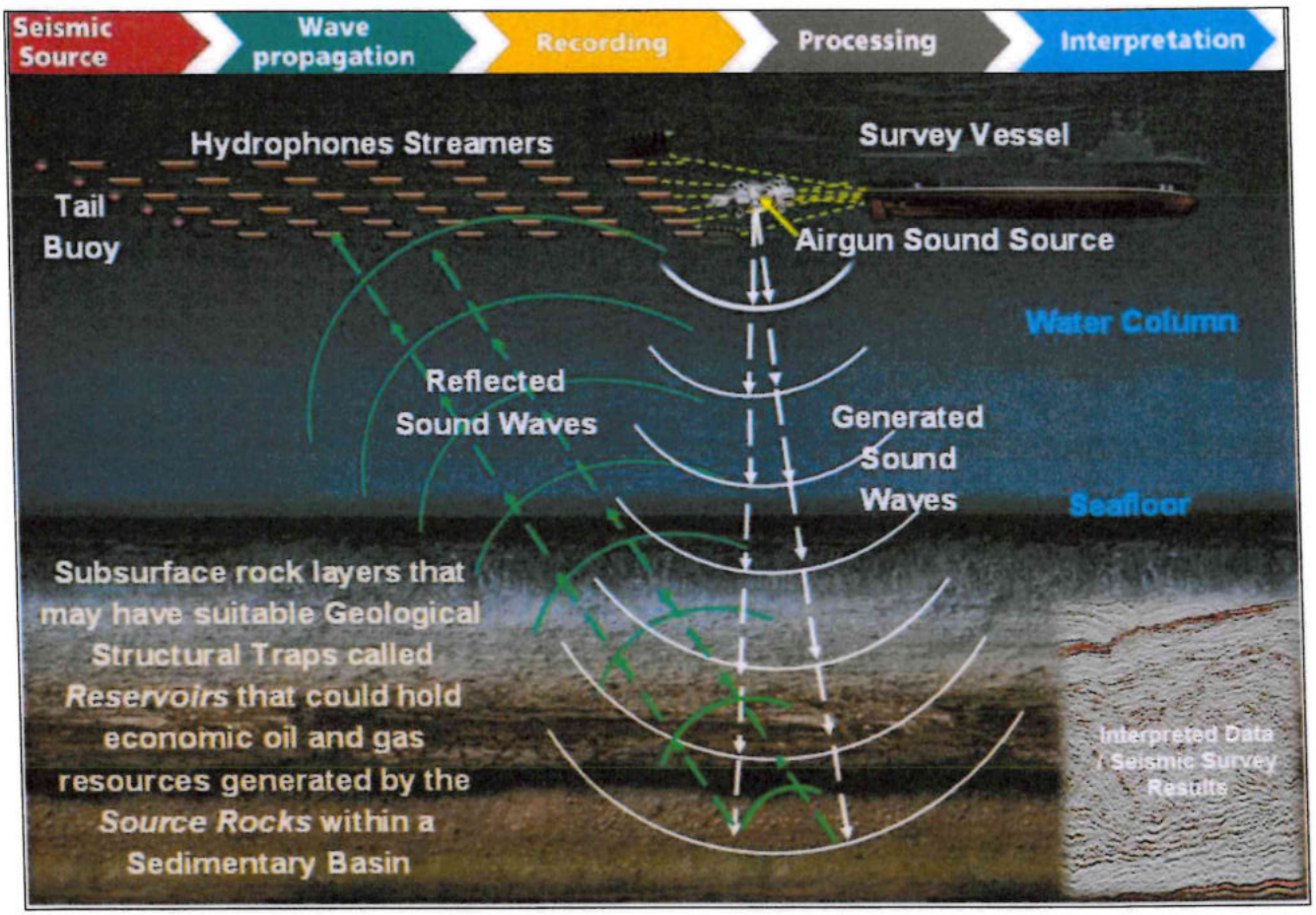


Figure 1: Illustration of the application of marine seismic survey method involving data collection and analyses of the times for seismic waves to travel between the various subsurface rock formations. Geophysicists, geologists, and petroleum engineers use sophisticated software to create subsurface images /maps showing potential drill-ready subsurface geological structures called reservoirs that may contain commercial hydrocarbons (Image Source: www.youtube.com/watch?v=FN8IAb0rG9A).

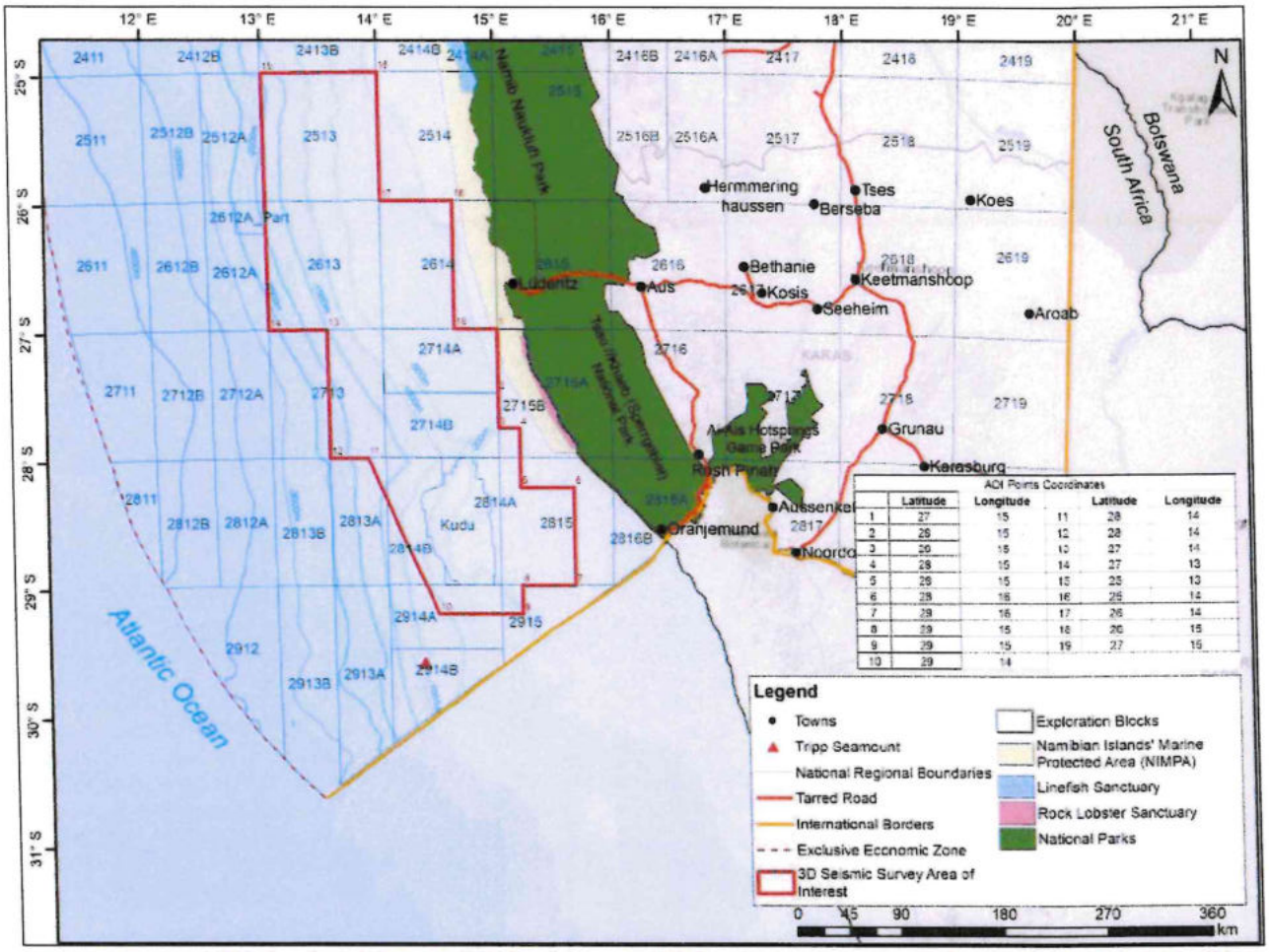


Figure 2: Location of TGS Geophysical Company (UK) Limited proposed 3D Seismic Survey covering Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, Orange and Lüderitz Basins, Offshore Southern Namibia.

Scale and Scope of Activity: Scale and scope of activity of the proposed multiclient 3D Seismic Survey will cover Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, Orange and Lüderitz Basins, Offshore Southern Namibia. The activities associated with proposed project have been grouped as follows:

(i) Routine and physical presence of the survey and support vessels in the area including the Port of Walvis Bay, physical presence of survey and support vessels, Physical disturbance of the survey operations., sound generation from proposed 3D seismic survey airguns including sound of the survey and support vessels engines, increased light levels from routine vessels operations, atmospheric emissions from routine operations of the survey and support vessels, and planned marine discharges, and.

(ii) Accidental events covering: Unplanned marine discharges (e.g., minor spillages of fuel, lubricants / maintenance oils, loss of vessel, equipment or material, collision with marine wildlife during vessel operations, and, loss of Marine Gasoline Oil (MGO) containment on the survey or support vessels due to ship collision or another major event.

The following is the summary of the proposed project implementation stages as assessed in this Environmental Impact Assessment (EIA) Report with mitigation measures provided in the Environmental Management Plan (EMP) Report:

(i) Mobilisation and pre-survey preparations.
(ii) Actual survey operations.
(iii) Post survey operations, and.
(iv) Non-routine or accidental events.

Both the survey and support vessels will use existing facilities in the Port of Walvis Bay for supplies, fueling and crew changeover as may be required and if required. No helicopter crew transfer support is anticipated except in event of an emergency.

PART C: DECLARATION BY APPLICANT

I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief. I understand the environmental clearance certificate may be suspended, amended or cancelled if any information given above is false, misleading, wrong or incomplete.

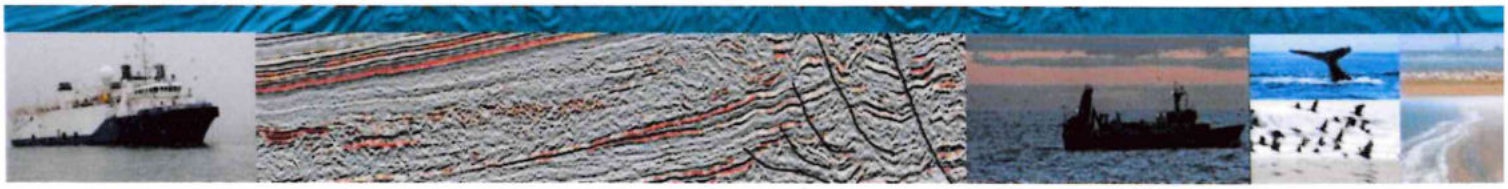
Risk-Based Solutions cc
14 DEC 2022

Signature of Applicant	DR SINDILA MWIYA	ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)
	Full Name in Block Letters	Position

on behalf of **TGS Geophysical Company (UK) Limited** Date: 14th December 2022

TGS Geophysical Company (UK) Limited

Final Environmental Impact Assessment (EIA) Report to Support the Application for Environmental Clearance Certificate (ECC) for the Proposed Multiclient or Proprietary 3D Seismic Survey covering Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, **Orange and Lüderitz Basins, Offshore Southern Namibia**

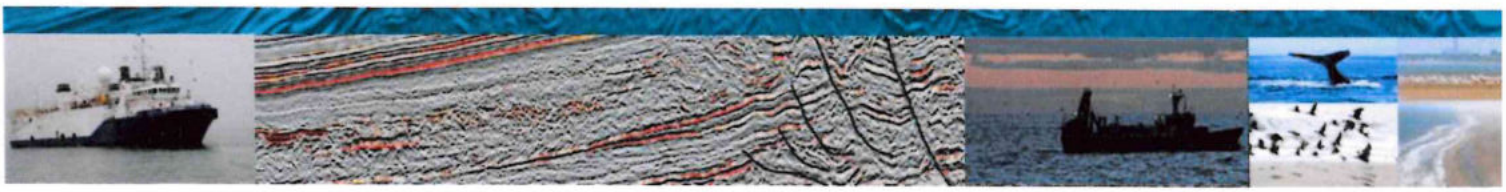


December 2022

Dukes Court, Duke Street,
Woking, GU21 5BH,
UNITED KINGDOM

TGS Geophysical Company (UK) Limited

Final Environmental Management Plan (EMP) Report to Support the Application for Environmental Clearance Certificate (ECC) for the Proposed Multiclient or Proprietary 3D Seismic Survey covering Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, **Orange and Lüderitz Basins, Offshore Southern Namibia**



December 2022

Dukes Court, Duke Street,
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TGS Geophysical Company (UK) Limited

Background Information Document (BID) for Public and Stakeholder Consultation Process for Environmental Assessment to Support the Application for Environmental Clearance Certificate (ECC) for the Proposed Multiclient or Proprietary 3D Seismic Survey covering Blocks 2513, 2613, 2614B, 2713, 2714A, 2714B, Kudu Gas Field 2814A, and 2814B and Portions of Blocks 2813A, 2814B, 2914A, 2915 and 2815, **Orange and Lüderitz Basins, Offshore Southern Namibia**

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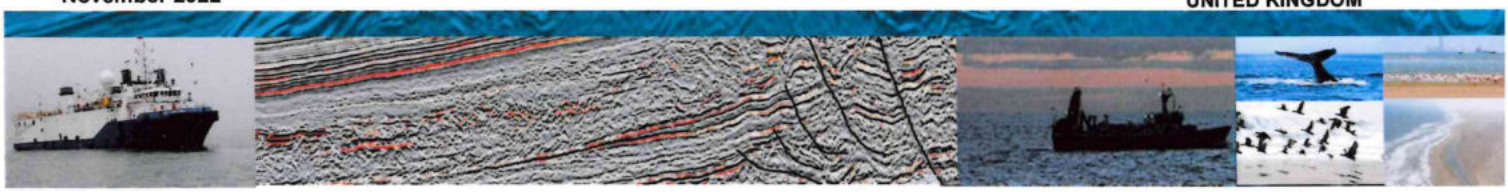
November 2022



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Proposed Seismic Survey – Orange Luderitz Basin

Underwater Acoustic Modelling