

MEL Oil and Gas Exploration (Namibia) (Pty) Ltd

Final Environmental Management Plan (EMP) Report for
the Proposed 2D Seismic Survey Operations covering
the Areas of Interest (AOI) in the Petroleum Exploration
License (PEL) No. 93, Owambo (Etosha) Basin,
Oshikoto and Ohangwena Regions, Northern Namibia

MEL Oil and Gas Exploration (Namibia) (Pty) Ltd
c/o Pioneer Oil and Gas Consulting
City View Building Unit 13
Corner of Pasteur and Freud Street
WINDHOEK, NAMIBIA



APRIL 2022

OPERATOR

Mel Oil and Gas Exploration (Namibia) (Pty) Ltd

MEFT ECC APPLICATION REFERENCE No.

APP-003664

PETROLEUM EXPLORATION LICENSE (PEL)

PEL No. 93 covering Blocks 1718 and 1818

WORKING INTERESTS

MEL Oil and Gas Exploration (Namibia) (Pty) Ltd owns 90%
National Petroleum Corporation of Namibia (Namcor)
(A State-Owned Company) 10% with costs carried to the development stage

TYPE OF PETROLEUM EXPLORATION OPERATIONS

2D Seismic Survey Operations

PROPONENT NAMIBIAN ADDRESS

c/o Pioneer Oil and Gas Consulting
City View Building Unit 13
Corner of Pasteur and Freud Street
WINDHOEK, NAMIBIA

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MSc Env. Mag, BSc (Hons) Envi Bio

ASS. EAP / PROJECTS DIRECTOR PROJECT / PERMITTING DE-RISKING ADVISOR

Dr Sindila Mwiya
(PhD, PG Cert, MPhil, BEng (Hons), Pr Eng)

CITATION: *Risk-Based Solutions (RBS), 2022. Final Environmental Management Plan (EMP) Report for the Proposed 2D seismic survey covering the Area of Interest (AOI) in the Petroleum Exploration License (PEL) No. 93, Owambo (Etosha) Sedimentary Basin, Oshikoto and Ohangwena Regions, Northern Namibia.*

ENVIRONMENTAL MANAGEMENT PLAN (EMP) REPORT CONSULTING TEAM LEADERS

Name of Key Team Leaders	Project Role / Position / Specialisation	Affiliation / Company
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Dr Sindila Mwiya	Assistant EAP / Permitting De-Risking Advisor specialised in Engineering Geology / Geotechnical / Geoenvironmental / Environmental Engineering, Artificial Intelligence and Knowledge-Based Systems with special focus on EIAs, EMPs, EMSs, SEAs and SEMP's with respect to subsurface resources (minerals, petroleum, water) and energy in Arid and Semiarid Environments (Engineering and Environmental Geologist).	Risk-Based Solutions (RBS) CC
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Ms. Christine K. Links		

**Ms EMERITA L. ASHIPALA, ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)
DECLARATION**

I, Emerita ASHIPALA, the Environmental Assessment Practitioner (EAP) for this Environmental Assessment process for the proposed 2D seismic survey covering the Areas of Interest (AOI) in the Petroleum Exploration License (PEL) No. 93, Oshikoto and Ohangwena Regions, Northern Namibia for MEL Oil and Gas Exploration (Namibia) (Pty) Ltd (Proponent), hereby declares that:

1. This Environmental Management Plan (EMP) Report has been prepared in accordance with the provisions of the Environmental Protection Clause 11 of the Model Petroleum Agreement, Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), Petroleum Laws Amendment Act, 1998, (Act 24 of 1998), the Environmental Management Act, 2007, (Act No. 7 of 2007), all other applicable national laws and Regulations.
2. As the EAP for this Project, I am qualified and experienced oil and gas exploration and hold a MSc Environmental Management (Oil and Gas pathway) and Hons. Degree in Environmental Biology. I have undertaken environmental impact assessments and management plans for various resources companies, Maps compilation for various projects using Google Earth and ArcGIS, Data entry, data organisation with quality control, Liaise and communicate with clients and relevant stakeholders, enforce Environmental compliance, Health, Safety, Security, and Environment as required by certain policies and standards.
3. I have been an Environmental Assessment Practitioner (EAP) for various projects and I have extensive technical knowledge and experience in conducting environmental assessments, management, and monitoring, and have in the past undertaken projects in oil and gas exploration related environmental assessments, management, and monitoring projects.
4. I have performed the work relating to this project in an objective manner, even if the outcomes will result in views or Records of Decision that may not be favourable to the Stakeholders or the Proponent, and.
5. I am an independent consultant not related to the Proponent and work as an independent senior consultant associated with Risk-Based Solutions CC not related to the Proponent. Except for the fees payable for professional consulting services rendered to the Proponent through Risk-Based Solutions CC, I have no shares, interests, or involvement in the license, financial or other affairs or business or operational decisions of either the Proponent or the decision-making structures of the relevant Government institutions.

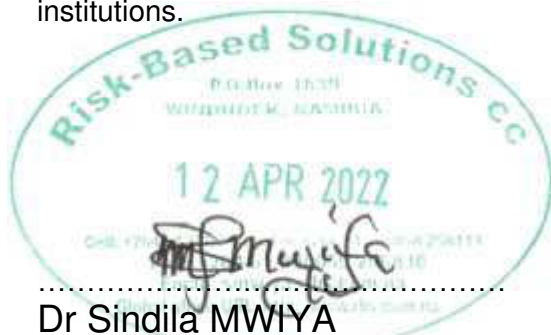


.....
Ms Emerita L. Ashipala
Environmental Assessment Practitioner (EAP)
RISK-BASED SOLUTIONS (RBS) CC

**DR SINDILA MWIYA, ASSISTANT ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)/
PERMITTING DE-RISKING ADVISOR DECLARATION**

I, Dr Sindila Mwiya, the Project Permitting De-Risking Advisor and Assistant EAP for this Environmental Assessment process for the proposed 2D seismic survey covering the Areas of Interest (AOI) in the Petroleum Exploration License (PEL) No. 93, Oshikoto and Ohangwena Regions, Northern Namibia for MEL Oil and Gas Exploration (Namibia) (Pty) Ltd (Proponent), hereby declares that:

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2. As the Project Permitting and De-Risking Advisor and Assistant EAP for this Project, I am highly qualified and experienced in onshore oil and gas exploration and production operations and hold a PhD with research interests, academic training, and technical knowledge in Engineering Geology, Geotechnical, Geoenvironmental and Environmental Engineering, Artificial Intelligence and Knowledge-Based Systems with special focus on EIAs, EMPs, EMSs, SEAs, SEMP and ESG with respect to subsurface resources (minerals, petroleum, water) and energy in Arid and Semiarid Environments.
3. I am an **Engineering and Environmental Geologist** and I have extensive technical knowledge and experience in conducting environmental assessments, management, and monitoring, and have undertaken more than 200 projects since 2004, including more than 55 oil and gas exploration and production related environmental assessments, management, and monitoring projects in different parts of the World.
4. I have performed the work relating to this project in an objective manner, even if the outcomes will result in views or Records of Decision that may not be favourable to the Stakeholders or the Proponent, and.
5. I am an independent consultant not related to the Proponent, I own and operate an independent company (Risk-Based Solutions CC) which is not related to the Proponent. Except for the fees payable for professional consulting services rendered to the Proponent, I have no shares, interests, or involvement in the license, financial or other affairs or business or operational decisions of either the Proponent or the decision-making structures of the relevant Government institutions.



Dr Sindila MWIYA
Assistant EAP / Permitting De-Risking Advisor
RISK-BASED SOLUTIONS (RBS) CC

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NON-TECHNICAL SUMMARY

MEL Oil and Gas Exploration (Namibia) (Pty) Ltd herein referred as “**MEL**” holds petroleum exploration rights under the Petroleum Exploration License (PEL) No. 93 covering Degree Square Blocks 1717 and 1817, in the Owambo Sedimentary Basin, Oshikoto and Ohangwena Regions, in the northern Namibia. MEL Oil and Gas Exploration (Namibia) (Proprietary) Limited, is a subsidiary of Monitor Exploration Limited. MEL is the Operator of PEL 93 holding 75% of the license interests, National Petroleum Corporation of Namibia (Namcor), a Namibian State-owned company (Parastatal) holds the 10% interest in the Licence with its costs carried to the development stage, and 15% is held by local partners.

The Proponent and Operator intends to conduct approximately 576 km long 2D seismic survey operations as part of the ongoing petroleum exploration operation in PEL 93. Seismic surveys are not only used for oil and gas exploration onshore and offshore but also used in the search for ground water, investigation of suitable locations for landfills and other industrials developmental facilities, and can be used to characterise how an area will shake during an earthquake.

The proposed 2D seismic survey operations will allow the Proponent to collect key subsurface data sets that will be processed and interpreted to show what is underneath the ground in terms of oil, gas, water, faults, folds etc without having to drill multiple wells blindly. The results from the proposed 2D seismic survey will assist the Proponent to make decisions about where to drill a well within the three (3) identified Areas of Interest (AOI). The following is summary of the key AOI within PEL 93:

- (i) AOI-01 Northeast of Oshivelo, covers 151 km of seismic over a large structure identified from gravity data. The objective is to acquire seismic data to define the structure within AOI01, specifically where Geochem shows encouraging anomalies.
- (ii) AOI-02 North of Oshivelo cover about 108 km, this will be defined and mapped out the closure of one of the structures within AOI02. The new seismic together with the existing seismic should be able to generate a prospect with positive Geochemical and Passive Seismic Surveys (PSS), and.
- (iii) AOI-00 large anticlinal structures south of Oshivelo, covers 317km. The objective is to acquire seismic data to be able to generate a potential drillable target on AOI00, specifically where Geochemical and Passive Seismic Surveys have shown encouraging results.

Most of the proposed survey lines will be conducted along existing roads, tracks, and farm boundary fences. A total of 105 km survey lines comprising lines 5, 8, 12 and 15 will require new cutlines to be created subject to the approval or request of the land owners and implementation of the mitigation measures as detailed in this EMP Report. The Proponent intends to use either the Explorer 860 Accelerated Weight Drop (AWD) or vibroseis trucks such as the Nomad 65 Vibrator as the energy source with wireless receivers to allow for greater lines offset. The rear mounted weight-drop from the Explorer 860 or the centred vibrating metal plate from a Nomad 65 will each generates acoustic / sound waves that will penetrate deep into the ground below each of the proposed survey lines and will bounced off the various subsurface rock layers. Receivers installed along the survey lines at between 5–10 m station intervals will measure the returning sound / acoustic waves. The resultant product following complex computer-based processing, is a vertical sonic cross-section of the subsurface beneath each of the surveyed lines showing the geological materials (de-risked geological sub-model) with respect to the presence of oil or gas and other subsurface resources such as water.

The following is the summary of the key sources of positive and negative impacts likely to be associated with the proposed 2D seismic survey operations with mitigation measures provided in this EMP Report:

- (i) Planning and mobilisation (Pre-survey preparation, field scouting and mapping of buffers and offsets along proposed survey lines).
- (ii) Base camp and fly-camps site setups and operations.
- (iii) Widening of tracks by pruning vegetation overgrowth and tracks levelling as may be applicable.

- (iv) Creation of new access especially cutting of new cutlines to be used for data acquisition.
- (v) Actual survey operation (data acquisition).
- (vi) Demobilisation and closure (Survey Completion), and.
- (vii) Any accidental event that may be associated with the routine and physical presence operational activities.

Onshore seismic is a nonintrusive high-tech survey method that can be used in sensitive and urban locations without damaging buildings or affecting any receiving environmental components because the level of ground displacement due to the 2D seismic wave is insignificant compared to the familiar earthquake generated seismic wave which sometimes results in significant damage to the receiving environment and especially the old and poorly engineered infrastructures. It is very important to note that the waves generated by a 2D seismic survey are different from the earthquake created seismic waves. Earthquake generated seismic waves have periods, and wavelengths that are in minutes and kilometres, respectively, while the 2D seismic survey operations produces waves with periods, and wavelengths of tenths of a second and tens of a meter, respectively. Therefore, the level of ground displacement associated with the type of waves generated by an onshore seismic survey operation compared to an earthquake event, differs considerably. Earthquake ground displacement are in meters and can result in weak buildings collapsing while the millimetre / few centimetres onshore seismic survey operations ground displacement will generally have negligible effect on the buildings. Ground motion caused by an onshore seismic survey vibration is generally barely perceivable. The further away one is from the source, the less vibration will be felt. Studies have shown that common household activities such as hammering a nail into a wall or construction site soil compactions or rock breaking processes would cause more vibration to a house than a typical seismic truck operating in the area.

Studies have shown that noise and vibration may interfere with elephant's vocalisation only when the noise and vibration have the same frequencies as that of the elephant resulting in frequencies interferences. Interference is defined as the effect produced when two waves of the same frequency, amplitude and wavelength travelling in the same direction in a medium are superposed (i.e as they simultaneously pass-through a given point). When the crest of two waves of equal wavelength is together, the waves are said to be in phase, that is, they have a phase difference of zero. In this case, according to the principle of linear superposition, the waves will reinforce each other, or add up and will undergo constructive interference and thus affect elephant vocalisation. On the other hand, if two waves superimpose with each other in opposite phase, the amplitude of the resultant is equal to the difference in amplitude of individual waves, resulting in the minimum intensity of the wave. This is known as destructive interference and thus will produce a negligible effect on elephant vocalisations.

The rear mounted weight-drop from the Explorer 860 will generate acoustics or sound waves with frequency of between 150 to 300 Hz depending on peak force used. A vibroseis truck such as the Nomad 65 has 0-250Hz wider ranges of frequencies to choose from based on the sensitivity of the receiving environment. The operational frequencies can be pre-set to avoid any interferences with the receiving local environment such as the elephants known to have communication frequency ranges of between 15-35Hz, far below the survey frequencies. Hence, an insignificant interference.

Based on the results of the EIA, the proposed 2D seismic survey by MEL is unlikely to cause significant negative environmental impacts on the various components of the receiving environment. Mitigation measures have been developed and are contained in this EMP Report to be implemented and monitored by the Proponent during the implementation of the proposed 2D seismic survey in PEL 93. The Proponent shall incorporate the provisions of this EMP in the Environmental Management System (EMS) in line with the Environmental Policy of the company. The Proponent must implement precautionary measures / approach to environmental management. All the responsibilities to ensure that the recommendations are executed accordingly, rest with the Proponent. Reconnaissance Energy Namibia (Pty) Ltd as the Proponent and operator shall provide all appropriate human and financial resources necessary for the effective implementation and monitoring of this EMP. It is the responsibility of the Proponent to make sure that all members of the workforce including contractors and subcontractors are aware of the EMP provisions and its overall objectives.

1. BACKGROUND TO THE PROJECT

1.1 Introduction

MEL Oil and Gas Exploration (Namibia) (Pty) Ltd herein referred as “**MEL**” or “**Proponent**” holds petroleum exploration rights under the Petroleum Exploration License (PEL) No. 93 covering Degree Square Blocks 1717 and 1817, in the Owambo (Etosha) Sedimentary Basin, Oshikoto and Ohangwena Regions, in the Northern Namibia (Figs. 1.1-1.3).

PEL 93 is granted under Section 29-38 of the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991) administered by the Ministry of Mines and Energy (MME) as the Competent Authority. MEL Oil and Gas Exploration (Namibia) (Proprietary) Limited, is a subsidiary of Monitor Exploration Limited.

MEL is the Operator of PEL 93 holding 75% of the license interests whereas the National Petroleum Corporation of Namibia (Namcor), a Namibian State-owned company (Parastatal) holds the 10% interest in the Licence with its costs carried to the development stage, and 15% is held by local partners.

1.2 Overview of MEL Exploration Activities

The company is currently in their initial exploration phase with all commitments met up until this stage. The first renewal exploration period of two (2) years is subject to one (1) well with U\$10 million commitment carrying local partners expected to commence in October 2022. The second renewal exploration period of two (2) years with 2D seismic or 1 well (U\$ 10million).

This year the company is committed to conduct an EIA and seismic, covering 200-400 km 2D seismic acquisition and commence drilling of 2-3 wells. The target raise is to approximately U\$20-30 million through: Private Placement, or merger with suitable partner, or Farm-in by a qualified operator.

After the grant in October 2018, MEL purchased additional high resolution aeromagnetic data covering the Licensed Property and conducted a detailed analysis of the resulting data and other available data related to the block, including reprocessing and reinterpretation of all existing geological and geophysical data. Passive seismic has been completed over the AOI, the main objective was to identify the zones with the highest hydrocarbon potential, by means of passive seismic spectroscopy anomalies.

The Passive seismic was designed based on the existing geological and geophysical data, remote sensing and gas soil sample analysis which supports the interpretation of oil accumulations in several large structures mapped on legacy gravity, seismic and magnetic data. The interpretation of existing geological and geophysical data allowed the identification of three (3) key Areas of Interest (AOI) with high potential for oil and gas exploration. The Proponent and Operator intends to conduct approximately 576 km long 2D seismic survey operations as part of its exploration commitments with the Namibian Government.

Most of the proposed 576 km long 2D seismic survey lines will be conducted along existing roads, tracks, and farm boundary fences with 105km long survey lines requiring new cutlines to be created subject to a request or approval of the land owners and implementation of the mitigation measures as detailed in this EMP Report. The request or approval by the land owners to create new cutlines for the proposed survey may be based on the need to support the existing land management strategies such as a firebreak for wildfire management or new access connecting areas that were inaccessible. The Proponent intend to use either the Explorer 860 or Vibroseis as the surface energy source and wireless receivers or geophones.

The overall aims and objectives of conducting the proposed 2D seismic survey operations over the AOI, is to generate drillable prospects/leads and confirm the closure to the west of the northernmost structure of AOI02, and confirm and map the structures within AOI00 and AOI01. Depending on the outcomes of the proposed 2D seismic survey operations, exploratory drilling operations over the delineated potential hydrocarbon structural reservoirs may be undertaken followed by appraisal well drilling operations if there is a commercial oil or gas discovery.

1.3 Area of Interest (AOI) Within PEL 93

The Area of Interest (AOI) within PEL 93 delineated from the interpretation of the aerial geophysical data covers the Oshikoto and Ohangwena Regions. The proposed 2D seismic survey will cover the AOI and not the entire PEL 93 (Figs. 1.2-1.6).

Extension of the survey lines beyond the AOI will be undertaken only to fully understand the possible subsurface structural closures and search for potential reservoirs that may be associated with the basin margins (Figs. 1.2-1.6).

The following is the summary of the detailed locations of the proposed 2D seismic survey lines shown in Figs. 1.2-1.6:

- (i) **AOI-01 Northeast of Oshivelo**, covers 151 km of seismic over a large structure identified from gravity data. The objective is to acquire seismic data to define the structure within AOI01, specifically where Geochem shows encouraging anomalies.
- (ii) **AOI-02 North of Oshivelo** covers about 108km, this will be defined and mapped out the closure of one of the structures within AOI02. The new seismic together with the existing seismic should be able to generate a prospect with positive Geochemical and Passive Seismic Surveys, and.
- (iii) **AOI-00 large anticlinal structures South of Oshivelo**, covers 317km. The objective is to acquire seismic data to be able to generate a potential drillable target on AOI00, specifically where Geochemical and Passive Seismic Surveys have shown encouraging results.

Oshikoto Region borders the following regions: Ohangwena in the north, Kavango West in the east, Otjozondjupa in the south east, Kunene in the south west, and Oshana in the west. Within the key areas of interest, the following constituencies fall within the Oshikoto Region:

- ❖ Guinas.
- ❖ Nehale LyaMpingana, and.
- ❖ Eengondi.

The detailed locations of the proposed 2D seismic survey lines with respect to the regional and traditional authorities administrative / governance boundaries are shown in (Fig. 1.6).

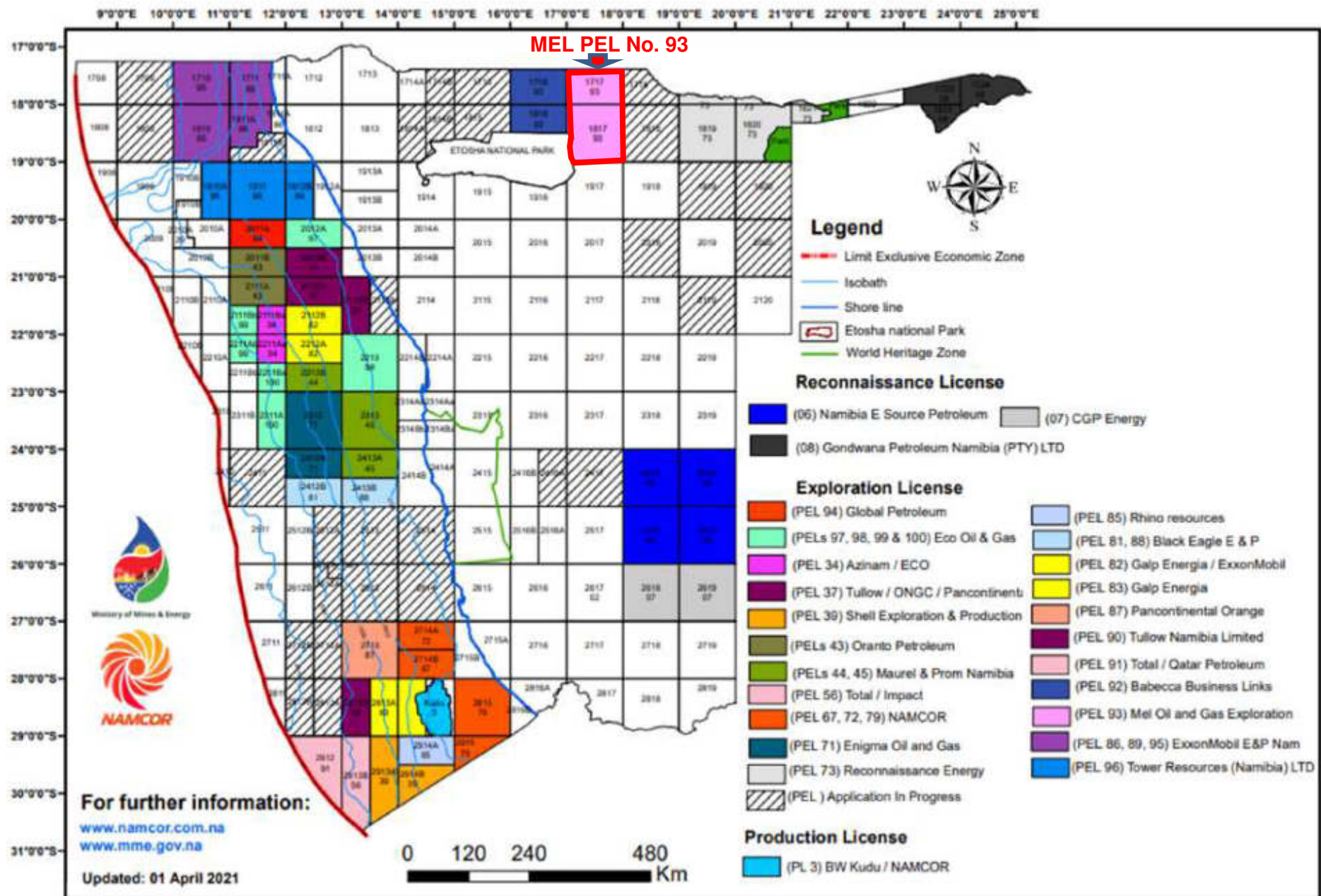


Figure 1.1: Hydrocarbon Map of Namibia showing the location of PEL 93 (Source: www.namcor.com.na or www.mme.gov.na). Petroleum Licenses are granted as degree (Latitude and Longitude) Square Blocks and several such licenses have been granted both in the offshore and onshore environments.

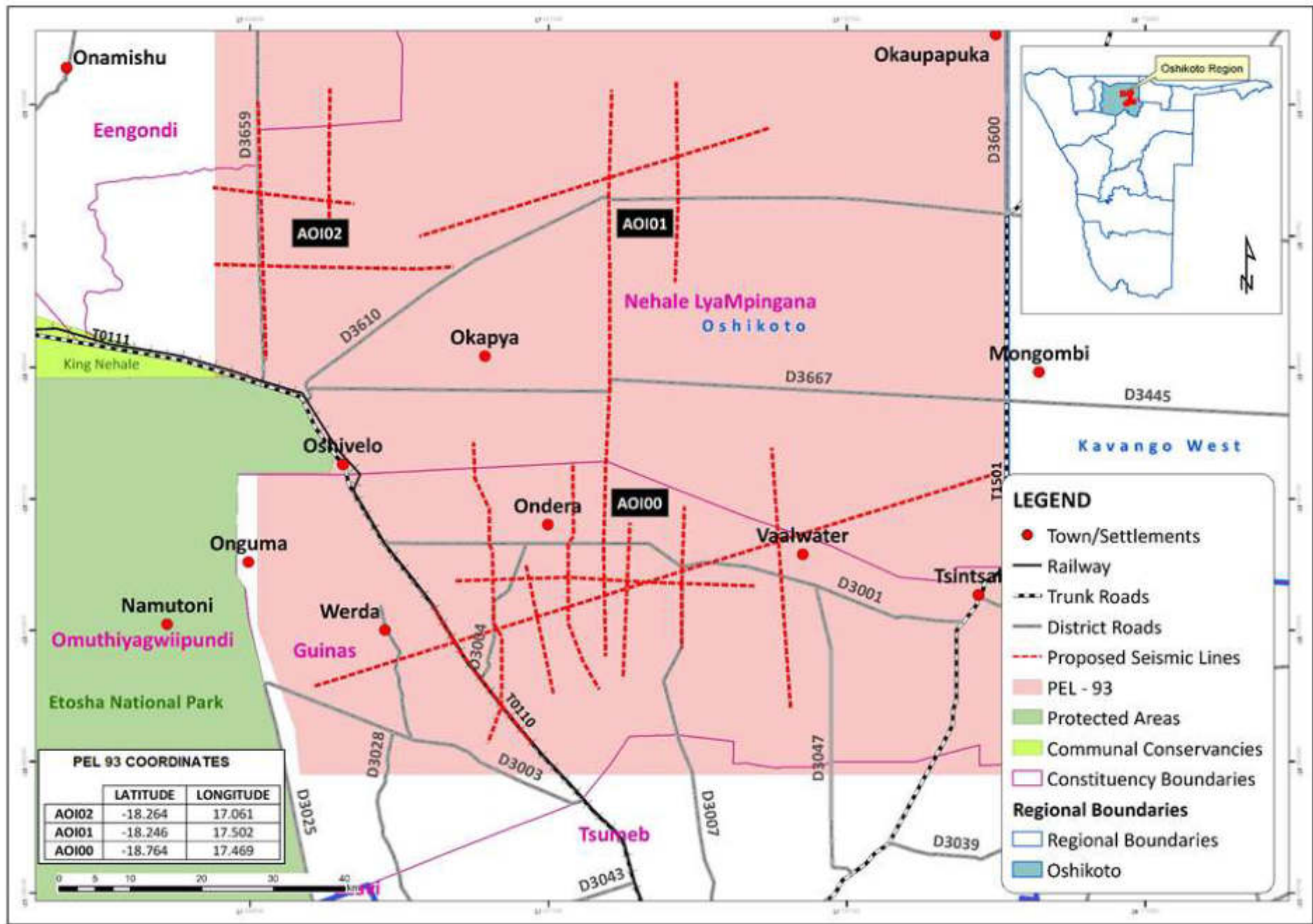


Figure 1.2: Regional location of PEL No. 93 covering degree square Blocks 1817 and 1717 showing the Areas of Interest (AOI), the proposed 2D seismic survey lines, regional council constituencies and traditional authorities' boundaries.

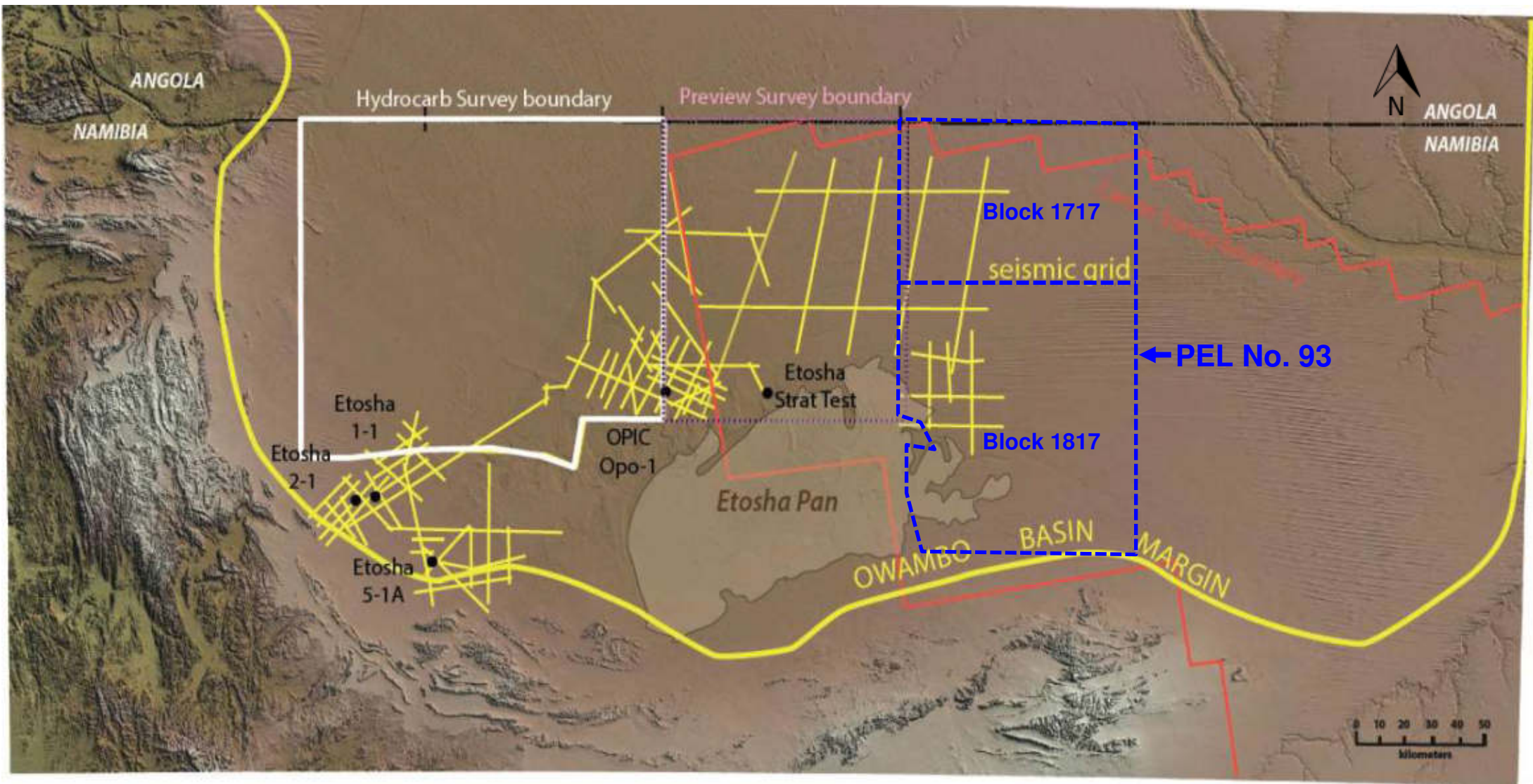


Figure 1.3: Digital elevation model of Owambo (Etosha) Basin showing the historical magnetic/gravity survey boundaries, seismic grid, and well locations with respect to MEL PEL No. 93 covering degree square Blocks 1817 and 1717. Multiple seismic survey operations have been successfully undertaken in the Owambo Basin and the proposed 2D seismic survey operations by MEL is not the first to be undertaken in the general area (Updated from base map Source: Hoak, *et. al.*, 2014).

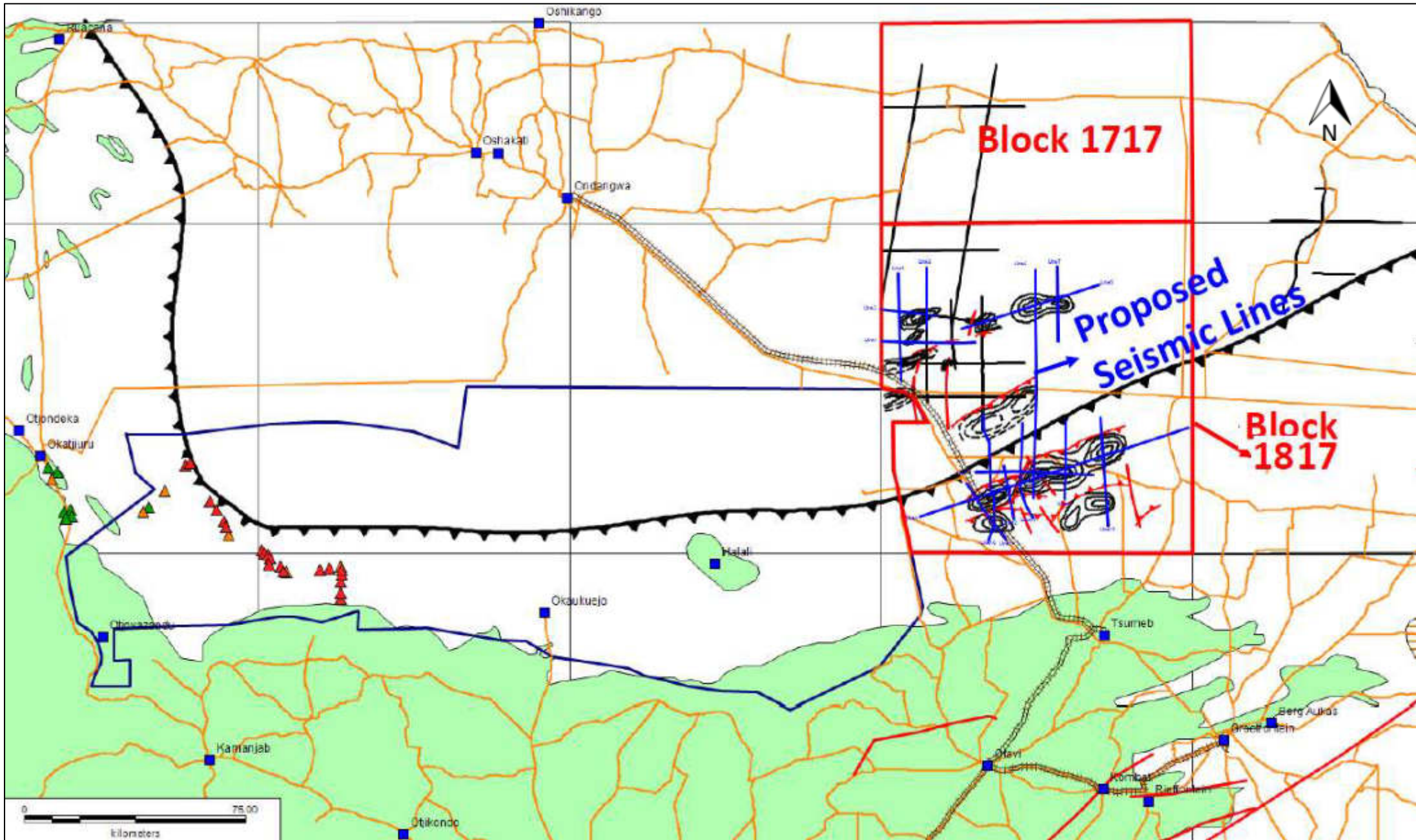


Figure 1.4: Regional overview of the License Area (PEL) 93, Blocks 1717 and 1817 license areas that make up PEL 93, (Areas of Interest (AOI) / prospect areas, proposed seismic survey lines (blue line) and existing / historical seismic survey lines (black lines).

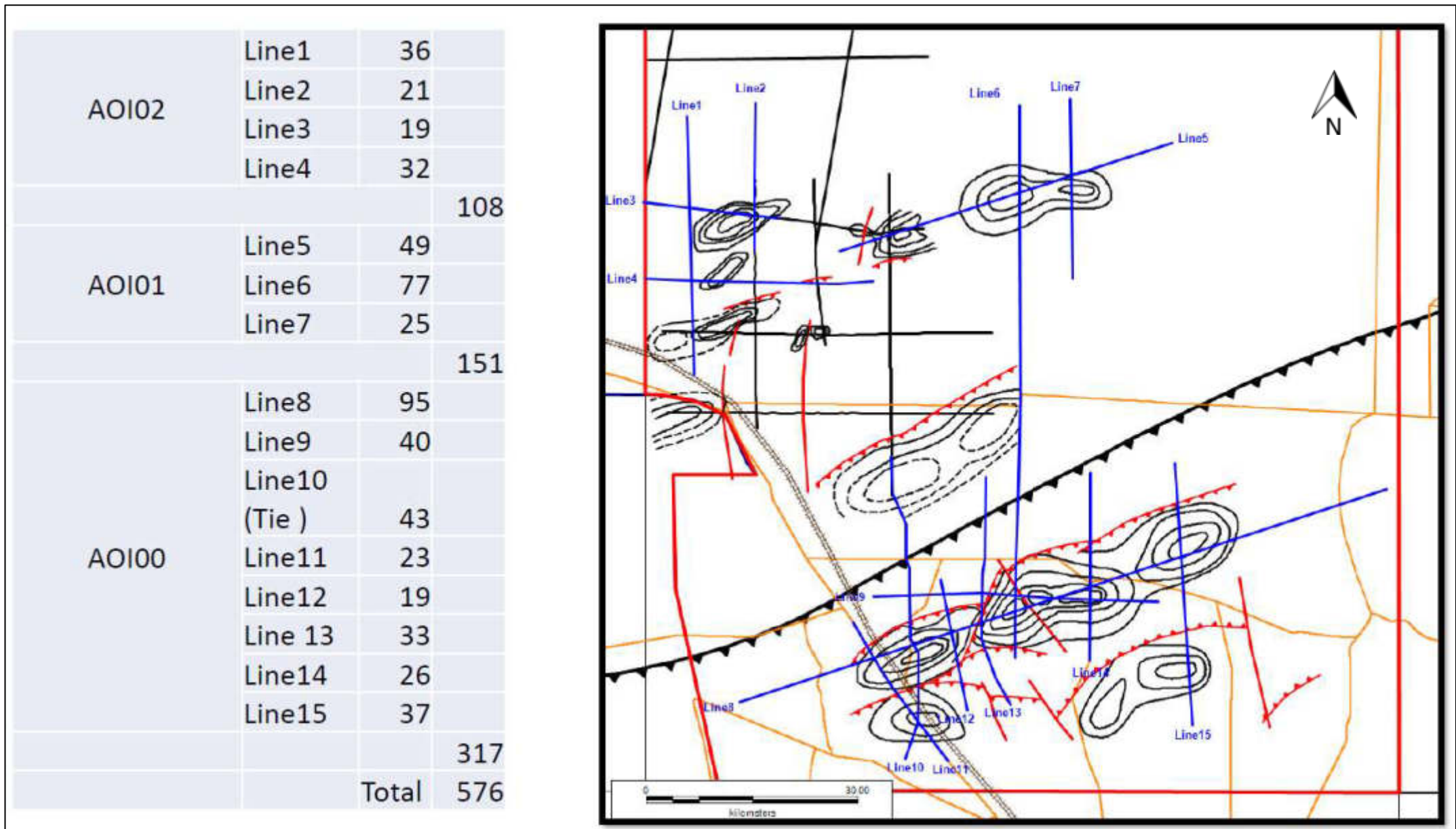


Figure 1.5: Detailed overview of the Block 1817 (part of PEL 93), Areas of Interest (AOI) / prospect areas AO102, AO101 and AO100, proposed seismic survey lines (blue line) and existing / historical seismic survey lines (black lines).

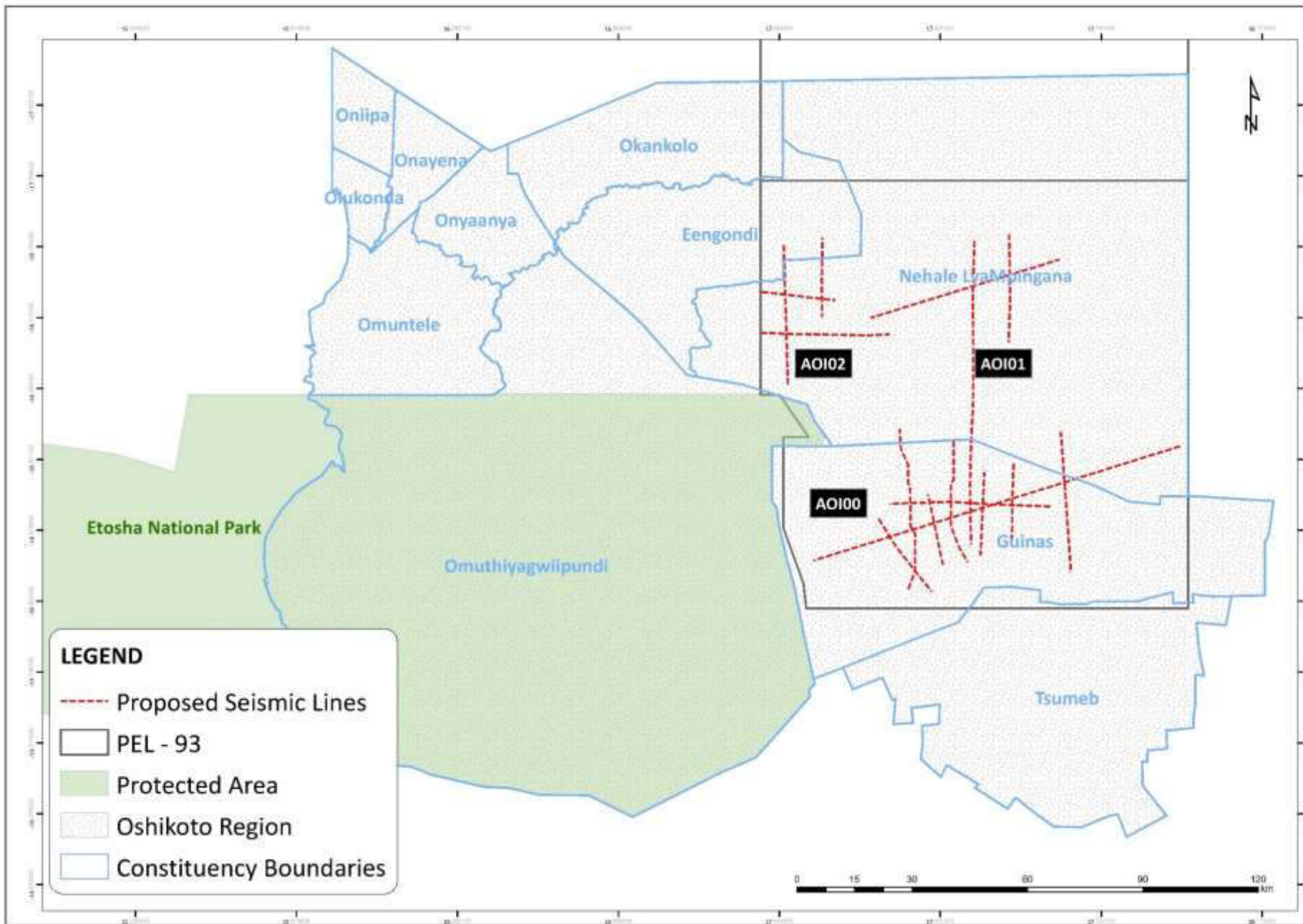


Figure 1.6: Detailed location of the Areas of Interest (AOI) - AOI01 and AOI02 and AOI00 and proposed 2D seismic survey lines with respect to the various regional boundaries.

1.4 Detailed Location of the Proposed Survey Lines

1.4.1 Survey Lines Access

The main access to the survey area can be undertaken by 4x4 vehicles either through the already existing gravel roads, sandy roads and tracks connecting small settlements (Figs. 1.5 -1.7). Except for Lines 5, 2, 8, and 15, totalling 105 km long, all the other proposed profiles / survey lines follow the existing roads or tracks and farm boundary fences (Figs. 1.5 - 1.7 and Plates 1.1 -1.40). Very few areas along the survey lines will require the widening of the existing sandy access resulting in cutting of the local bushes.

No big or protected trees shall be cut unnecessarily during the widening of existing access or creation of new cut lines if approved or requested by the land owners. The survey will be conducted towards the end of the 2nd quarter or the beginning of the 3rd quarter subject to the granting of authorisation or permits as may be required.

1.4.2 Location of the Proposed Survey Lines

The following is the summary of the proposed seismic survey lines based on the results of the field-based scouting and verification undertaken by Risk-Based Solutions team during the months of January and February 2022 (Fig. 1.4-1.7 and Plates 1.1 -1.40):

- 1) Line 1 running along existing track, with drone images shown in Plates 1.1 -1.3.
- 2) Line 2 running along existing track, with drone images shown in Plates 1.4 and 1.5.
- 3) Line 3 running along existing track, with drone images shown in Plates 1.6 and 1.7.
- 4) Line 4 running along existing track, with drone images shown in Plates 1.8 – 1.11.
- 5) Line 5, no track exists, the line will have to be cut through pristine communal forest land, with drone images shown in Plates 1.12 and 1.13.
- 6) Line 6 running along existing track, with drone images shown in Plates 1.14 – 1.17.
- 7) Line 7 running along existing track, with drone images shown in Plates 1.18 and 1.19.
- 8) Line 8 no track exists, the line will have to be cut through pristine communal forest land, drone images shown in Plates 1.20 – 1.22.
- 9) Line 9 running along existing track, with drone images shown in Plates 1.23 – 1.26.
- 10) Line 10 running along existing track, with drone images shown in Plates 1.27 – 1.29.
- 11) Line 11 running along existing track, with drone images shown in Plates 1.30 – 1.32.
- 12) Line 12, no track exists, the line will have to be cut through pristine commercial farmlands, with drone image shown in Plate 1.33.
- 13) Line 13 running along existing track, with drone images shown in Plates 1.34 – 1.35.
- 14) Line 14 running along existing track, with drone images shown in Plates 1.36 and 1.37.
- 15) Line 15, no track exists, the line will have to be cut through pristine commercial farmlands, with drone images shown in Plate 1.38, and.
- 16) Line 16 running along existing track, with drone images shown in Plates 1.39 and 1.40.

1.4.3 New Cut Lines if Approved or Requested by the Land Owners

The creation of new cut lines for the proposed lines 5, 8, 12 and 15 will only be undertaken if such a proposal has been approved or requested by the affected land owner/s as part of the existing land management strategies such as wildfire management or needed for new access. The total length of the lines that may be created is 105 km.

The creation of the possible new cutlines shall be undertaken with great care. Key mitigation measures as detailed in this EMP including selective clearing of vegetation, integration of protected and mature trees in within the cleared survey lines and field-based supervision of the line clearing process shall always be implemented.

1.4.4 Need for Access Consent / Agreement

The following guidance on the need for access consents / agreements shall be observed:

- 1) In line with the provisions of all the national legislation, regulations, policies, procedures, permits / authorisations requirements and before the implementation of the proposed 2D seismic survey operations, the Proponent shall consult and engage the local communities / owners of commercial farms, communal fields and villages that may be affected or likely to be disturbed by the proposed project activities. All the consultations and engagements shall be undertaken through the existing regional and local structures starting with the Office of the Governor, Councillors, Traditional Authorities, Village Headpersons, communal / freehold land owners, and Village Development Committees (VDCs) and local community levels as may be applicable.
- 2) Before any form of field-based activities are started in a local area, written consent shall always be obtained from the land owners for private farmlands and through the village headperson, traditional authorities, and regional council / land board for communal land as may be applicable to avoid misunderstanding and unnecessary conflicts.
- 3) Appropriate setback distances (exclusion zones) shall be provided around sensitive structures such as villages, boreholes, water wells, dams, pipelines, burial grounds, cultural sites, irrigation canals and monuments / archaeological resources sites in line with the International Association of Geophysical Contractors (IAGC) and the Distance Requirements Exploration Directive 2006-15, Alberta Government, Canada guidelines, and.
- 4) Precautionary principles / approaches shall always be exercised especially in situations where specific mitigations, regulatory guidelines, standards, or appropriate setback distances (exclusion zones) around sensitive local cultural resources such as burial or cultural sites have not been provided. Local communities shall always be consulted on matters related to sensitive local cultural resources not provided for in the international or national guidelines / standards/ EMP.



Plate 1.1: Central part of Line 1 along existing track, drone image view to the north at the junction with western section of Line 4.
MEL 2D Seismic Survey Operations - 11 - EMP Report for PEL 93-APR 2022



Plate 1.2: Central part of Line 1 along existing track, drone image view to the south at the junction with the western section Line 4.
MEL 2D Seismic Survey Operations - 12 - EMP Report for PEL 93-APR 2022



Plate 1.3: Northern part of Line 1 along existing track, drone image view to the north at the junction with the western section Line 3.
MEL 2D Seismic Survey Operations - 13 - EMP Report for PEL 93-APR 2022



Plate 1.4: Southern part of Line 2 along existing track, drone image view to the north at the junction with the eastern section of Line 3.
MEL 2D Seismic Survey Operations - 14 - EMP Report for PEL 93-APR 2022



Plate 1.5: Southern part of Line 2 along existing track, drone image view to the south at the junction with the eastern section of Line 3.
MEL 2D Seismic Survey Operations - 15 - EMP Report for PEL 93-APR 2022



Plate 1.6: Western part of Line 3 along existing track, drone image view to the east at the junction with the northern section of Line 1.
MEL 2D Seismic Survey Operations - 16 - EMP Report for PEL 93-APR 2022



Plate 1.7: Southern part of Line 3 along existing track, drone image view to the east at the junction with the southern section of Line 2.
MEL 2D Seismic Survey Operations - 17 - EMP Report for PEL 93-APR 2022



Plate 1.8: Western part of Line 4 along existing track, drone image view to the east at the junction with the southcentral section of Line 1.
MEL 2D Seismic Survey Operations - 18 - EMP Report for PEL 93-APR 2022



Plate 1.9: Western part of Line 4 along existing track, drone image view to the west at the junction with Line 1.
MEL 2D Seismic Survey Operations - 19 - EMP Report for PEL 93-APR 2022



Plate 1.10: Western part of Line 4 along existing track, drone image view to the west at the junction with Line 1.
MEL 2D Seismic Survey Operations - 20 - EMP Report for PEL 93-APR 2022



Plate 1.11: Eastern section of Line 4 along existing track, drone image view to the west from the D3610 Road.
MEL 2D Seismic Survey Operations - 21 - EMP Report for PEL 93-APR 2022

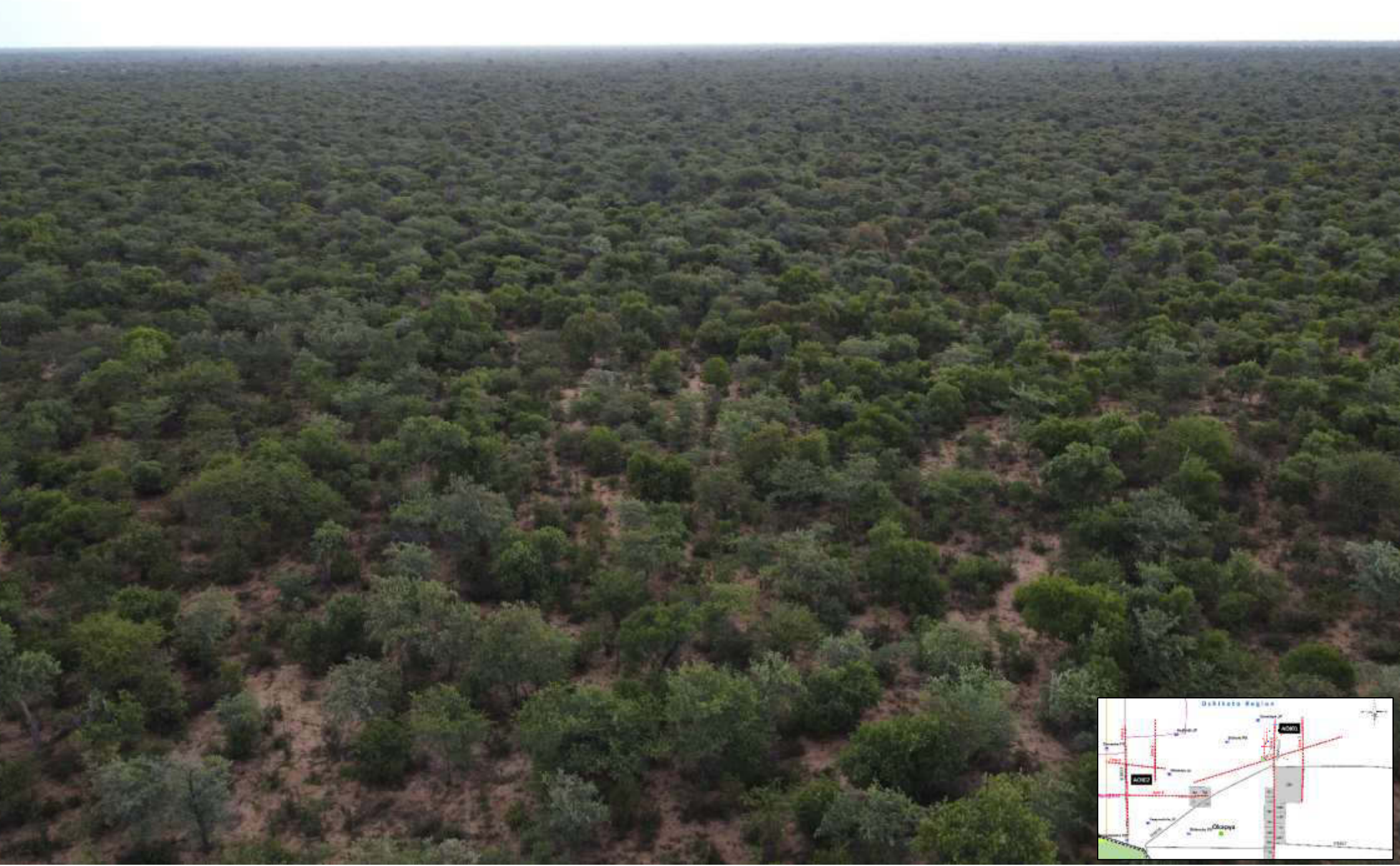


Plate 1.12: Northeast central section of Line 5, drone image view to the southwest at the junction with the northern section of Line 6, no track exists, the line will have to be cut through pristine communal forest land.



Plate 1.13: Northeast central section of Line 5, drone image view to the northeast at the junction with the northern section of Line 6, no track exists, the line will have to be cut through pristine communal forest land.



Plate 1.14: Northern section of Line 6, drone image view to the north along the exiting track at the junction with the northeast central section of Line 5 that does not have an existing track, pristine forest.



Plate 1.15: Northern section of Line 6, drone image view to the south along the exiting track at the junction with the northeast central section of Line 5 that does not have an existing track, pristine forest.



Plate 1.16: Southern section of Line 6 along existing track, drone image view to the north along the D3001 road linking Oshwelo to Tsintsabis.



Plate 1.17: Southern section of Line 6 along existing track, drone image view to the south along the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.18: Eastern section of Line 7 along existing track, drone image view to the south from the D3610 Road.
MEL 2D Seismic Survey Operations - 28 - EMP Report for PEL 93-APR 2022



Plate 1.19: Eastern section of Line 7 along existing track, drone image view to the north from the D3610 Road.
MEL 2D Seismic Survey Operations - 29 - EMP Report for PEL 93-APR 2022



Plate 1.20: South western section of Line 8 running in pristine commercial farmlands with no existing track or farm fence access and the proposed line runs through the sensitive Onguma Game Reserve. Drone image view to the southwest taken at a junction with Line 11 along the B1 Road from Tsumeb to Oshivelo.



Plate 1.21: North eastern section of Line 8, no track exists and the proposed line runs through pristine commercial farmlands. Drone image view to the northeast taken at a junction with Line 11 along the B1 Road from Tsumeb to Oshivelo.



Plate 1.22: North-eastern section of Line 8, running along existing track, drone image view to the east taken at the junction of Line 14 running along the D3007 Road to Tsumeb and the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.23: Western section of Line 9, running along existing track, drone image view to the west taken along the D3004 connecting the B1 Road from Tsumeb to Oshivelo to the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.24: Western section of Line 9, running along existing track, drone image view to the east taken along the D3004 connecting the B1 Road from Tsumeb to Oshivelo to the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.25: Eastern section of Line 9, running along existing track, drone image view to the east taken along the D3007 to Tsumeb and comes off the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.26: Eastern section of Line 9, running along existing track, drone image view to the west taken along the D3007 to Tsumeb and comes off the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.27: Northern section of Line 10, running along existing track, drone image view to the north taken along the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.28: Central section of Line 10, running along existing track, drone image view to the north taken at a junction with Line 11 along the B1 Road from Tsumeb to Oshivelo.



Plate 1.29: Southern section of Line 10, running along existing track, drone image view to the south taken at a junction with Line 11 along the B1 Road from Tsumeb to Oshivelo.



Plate 1.30: Southern section of Line 11, running along the B1 Road from Tsumeb to Oshivelo, drone image view to the north.
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Plate 1.31: Central section of Line 11, running along the B1 Road from Tsumeb to Oshivelo, drone image view to the north taken at the junction of Line 11 and Line 10.



Plate 1.32: Northern section of Line 11, running along the B1 Road from Tsumeb to Oshivelo, drone image view to the north taken at the junction between Line 11 and 8.

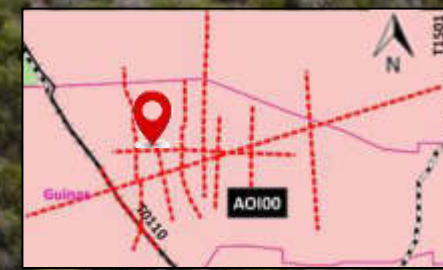


Plate 1.33: Central section of Line 12, running in pristine commercial farmlands with no existing track or farm fence access, drone image view to the east taken along a track that comes of the D3004 Road.



Plate 1.34: Northern section of Line 13, running along existing track, drone image view to the north taken along the D3001 road linking Oshivelo to Tsintsabis

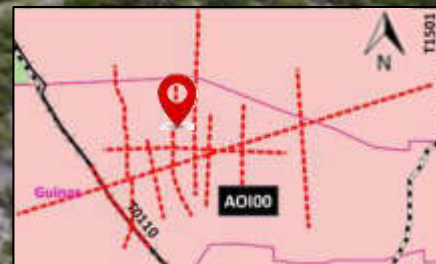


Plate 1.35: Southern section of Line 13, running along existing track, drone image view to the north taken along the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.36: Southern section of Line 14, running along existing road D3007 to Tsumeb, drone image view to the south taken at the junction of the D3001 road linking Oshivelo to Tsintsabis and the D3007.

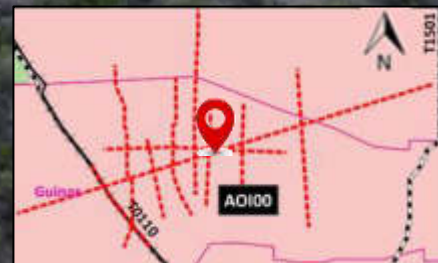


Plate 1.37: Northern section of Line 14, running along existing track, drone image view to the north taken at the junction of the D3001 road linking Oshivelo to Tsintsabis and the D3007.



Plate 1.38: Line 15, running in pristine commercial farmlands with no existing track or farm fence access.
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Plate 1.39: Northern section of Line 16, running along existing track, drone image view to the north taken along the D3001 road linking Oshivelo to Tsintsabis.



Plate 1.40: Northern section of Line 16, running along existing track, drone image view to the north taken along the D3001 road linking Oshivelo to Tsintsabis.

2. SUMMARY OF THE RECEIVING ENVIRONMENT

2.1 Climatic and Topographic Settings

The climate of the project area is warm – hot for most parts of the year. Summer temperatures on average range between a minimum temperature of 20°C to maximum day temperatures of 30-35°C for the months October to March. Winter temperatures on average, range between minimums of 6-10°C to a maximum day time temperature of 26°C. Winters are from June to August. Temperatures below freezing point seldom occur, but are mostly prevalent in topographically lower lying areas along the ephemeral rivers.

Rainfall decreases generally from east to west, with an even gradient across the flat landscape. Rainfall mostly falls during summer with no rainfall of significance between May to August. Most rain occurs between December to March, with the highest rainfall peaking in January (Plate 2.1). Annual rainfall figures are quite variable with the lowest rainfall recorded at 221mm/annum and the highest rainfall of 1204mm/annum. The highest rainfall in one day was a 190mm, measured at Rupara. Rainfall patterns in the region vary considerably and drought cycles are also common. The mean annual rainfall ranges from 400 and 600 mm per year (Fig. 2.1). The distribution of rainfall is extremely seasonal with all the rain falling in summer from October to April and characterised by heavy occasional thunderstorms. The mean annual gross evaporation is between 2600-2800 mm (Fig. 2.1).

2.2 Regional Physical Geography and Land Use

The landscape of PEL No. 93 covering Oshikoto and Ohangwena Regions and according to Agro-Ecological zones of the country are Kalahari Sand plateau with deep sands on the northern area and Kalkveld on the southern and western area (Tsumeb and Etosha). There are two major drainage systems in northern Namibia namely Cuvelai at the north west stretched from Angola to Etosha pan and the Omuramba which is stretched from Otavi highlands and drainage to Etosha pan (Namibia Population and Housing Census, 2011). The license area is drained by the Omuthiya and Omuramba Owambo Ephemeral River Channels that flows into the Etosha Pan.

The land use in the general area is mainly large to small-scale communal / subsistence farming comprising cattle, goats, seasonal crop farming, particularly to the north of the region. To the south of the proposed survey area much of the land is used for agriculture, conservation, and tourism freehold land, with resettlements, and government or parastatal (Figs. 2.2-2.5). Freehold (commercial) conservation and tourism related land uses such as the Onguma Game Reserve are common around the commercial farms found to the southwest and southern parts of the proposed survey area (Fig. 2.5). Commercial cattle and small stock agriculture with irrigated crop farming operations are among the key activities undertaken in both freehold and communal commercial farmlands. Bush thickening or encroachment is viewed as an economic problem in the general area.

No communal conservancies occur within the proposed survey area with the closest being the King Nehale Conservancy located to the northwest bordering the Etosha National Park with the major wildlife resource listed as gemsbok, springbok, kudu, blue wildebeest and giraffe (NACSO 2009, 2011). The closest Government protected area is the Etosha National Park. The Onguma Game Reserve is the closest freehold (commercial) conservation area consisting of farms bordering the Etosha National Park southwest of Oshivelo. The villages in communal areas are centred around communal water points or near schools or rural clinics (Figs. (Figs. 2.2-2.5). The following is the summary of some of the common general threats to the natural environment and habitats of the general project area especially in communal farmland (Plates 2.1 and 2.2):

- (i) Accelerated allocation of communal leaseholds resulting in extensive fencing and forestry clearing in some places.
- (ii) Subsistence communal crop farming centred on forestry clearing, and.
- (iii) Wildfires and overgrazing due to increased number of animals.

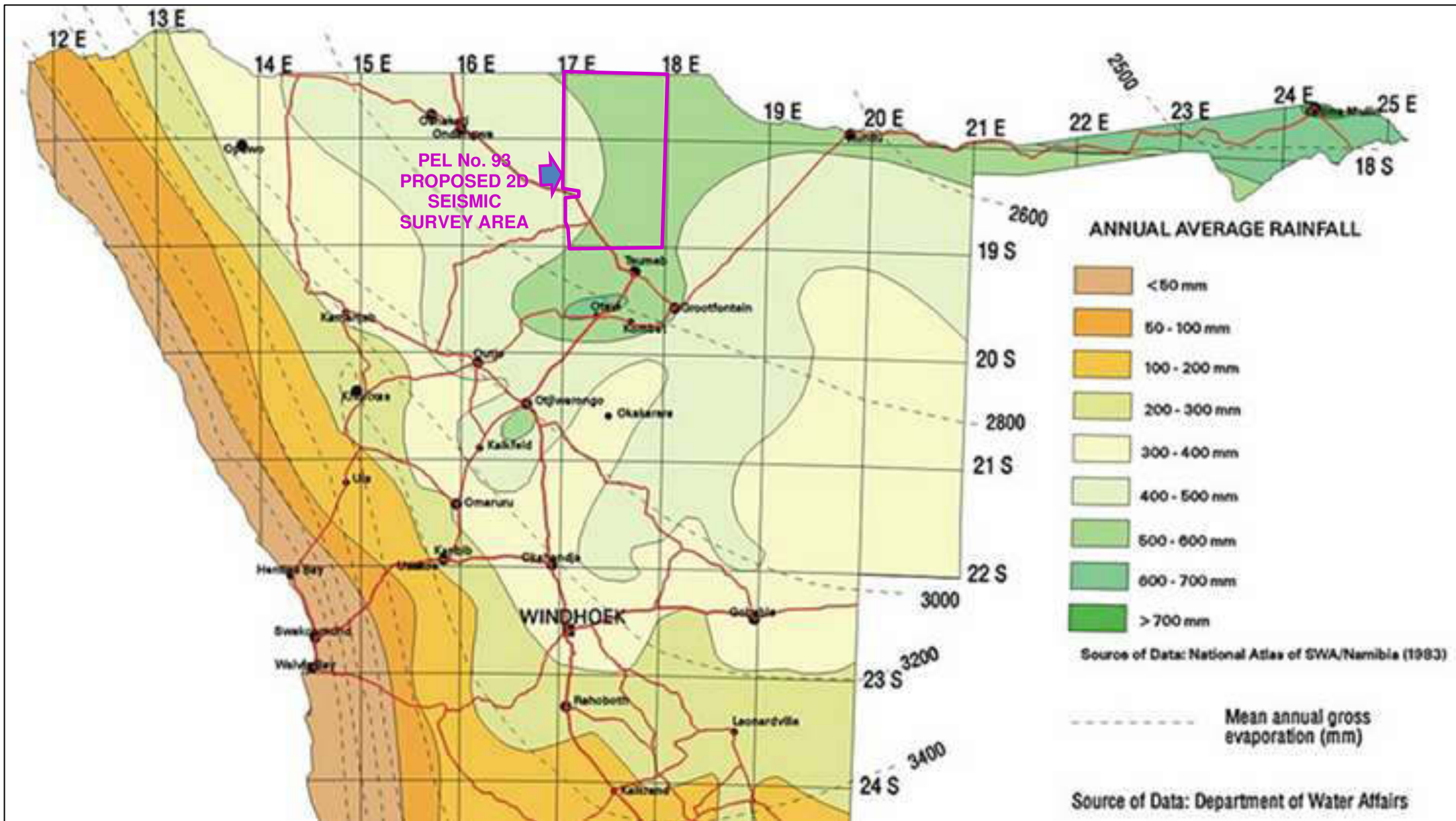


Figure 2.1: Climatic patterns of Namibia showing the location of the proposed 2D seismic survey operations in Oshikoto and Ohangwena Regions.

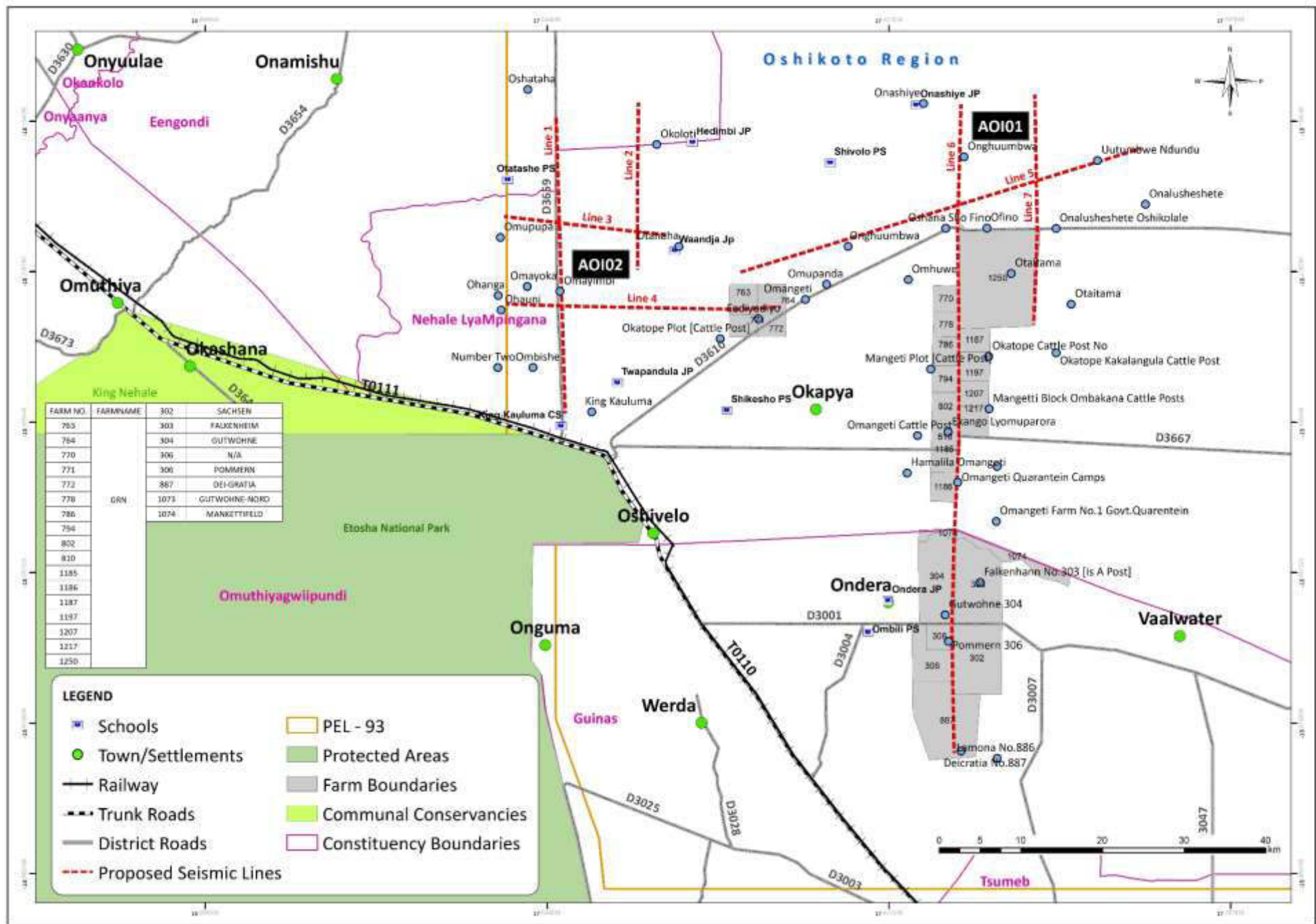


Figure 2.3: Zoomed in location of the Areas of Interest (AOI) 01 and 02 and proposed 2D seismic survey lines with respect to the various regional and settlements, schools, and farms.

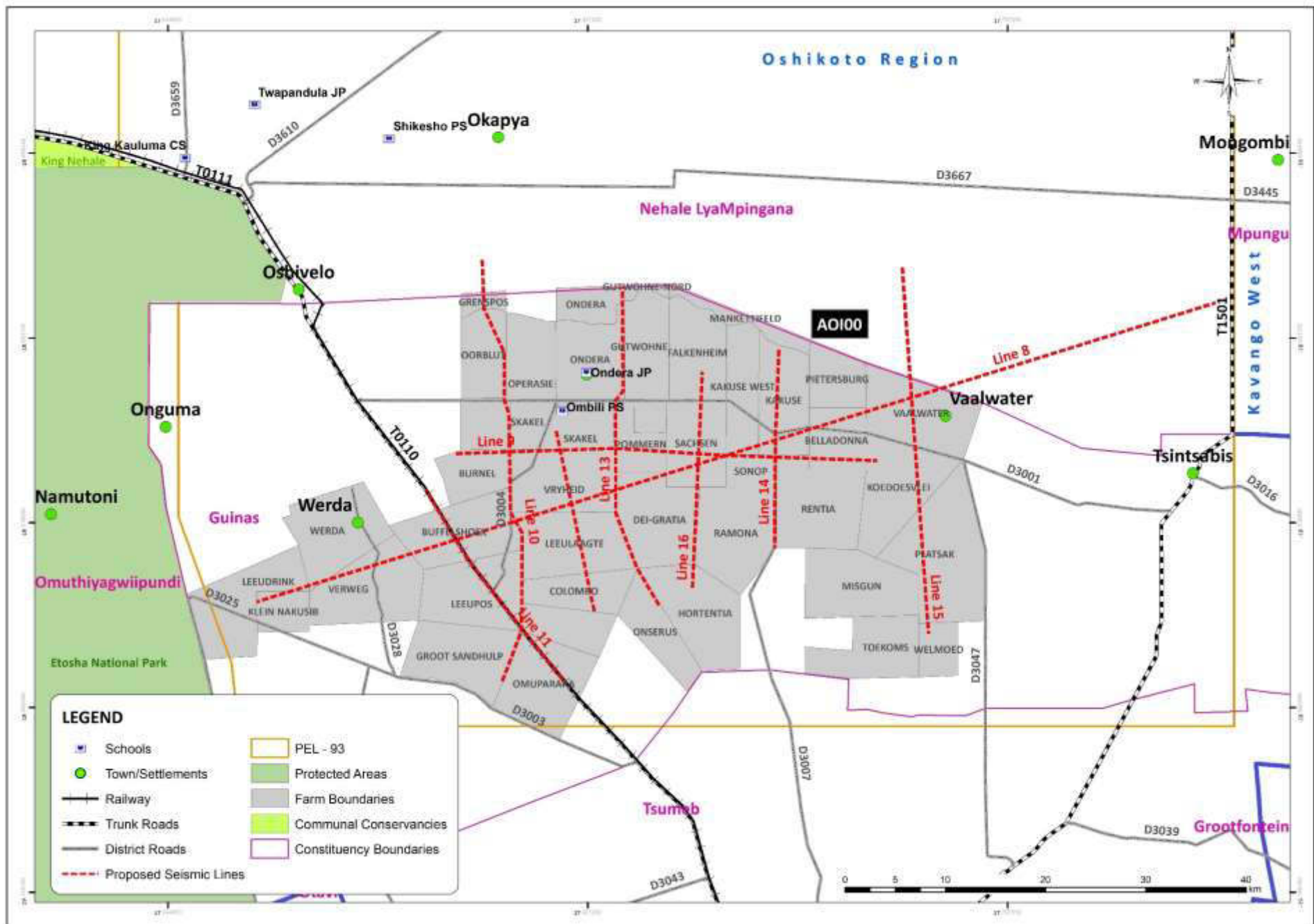


Figure 2.4: Zoomed in location of the Areas of Interest (AOI) – **AOI00** and proposed 2D seismic survey lines with respect to the various regional and settlements, schools, and farms.



Plate 2.1: Example of extensive land clearing activities in the AO102 north of Oshivelo affects the presence and abundance of mammals throughout the general area.

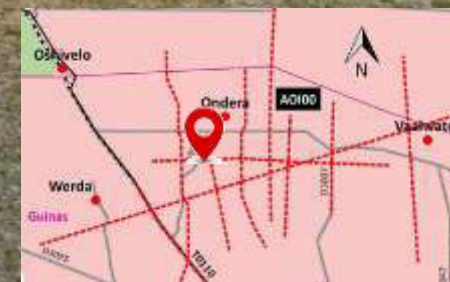


Plate 2.2: Example of extensive land clearing activities in the AO100 southeast of Oshivelo affects the presence and abundance of mammals throughout the general area.

2.3 Proposed Survey Area Flora, Fauna, and Habitats

2.3.1 Overview

PEL No. 93 and the AOI falls within the Tree Savanna and Woodlands (Northern Kalahari) (Giess 1971) or a combination of North-eastern Kalahari Woodland; Eastern Drainage; Northern Kalahari and Omatako Drainage, with the North-eastern Kalahari Woodland being the dominant vegetation type (Mendelsohn et al. 2002) (Figs. 2.5 and 2.6). The vegetation structure is classified as broadleaved woodlands (Figs. 2.5 and 2.6 and Mendelsohn *et al.*, 2002).

It is estimated that at least 65 species of reptile, 17 amphibian, 97 mammal and 250 bird species (breeding residents) are known to or expected to occur in the general area (Annex 2). It is estimated that at least 95 species of larger trees and shrubs (>1m in height) and up to 116 species of grasses are known to or expected to occur in the general area, none of which are viewed as endemic species.

2.3.2 Reptiles

The most important species know/expected to occur in the general area would be the 2 species classified as rare (*Gonionotophis (Mehelya) vernayi*, *Sepsina angolensis*); 4 species classified as vulnerable (*Stigmochelys pardalis*, *Psammobates oculiferus*, *Python natalensis*, *Varanus albigularis*); 4 species classified as protected game (*Stigmochelys pardalis*, *Psammobates oculiferus*, *Python natalensis*, *Varanus albigularis*); 1 species classified as insufficiently known (*Gonionotophis (Mehelya) vernayi*) and 1 species classified as indeterminate (*Sepsina angolensis*).

Amphibians

The most important species from the area is the giant bullfrog (*Pyxicephalus adspersus*) with “populations are decreasing” according to the IUCN (2021) as it is consumed as food throughout its range (Griffin *pers. com.*). Most amphibians are expected to be associated with the ephemeral Omuramba Owambo and Omuthiya and various smaller pans throughout the general area.

2.3.3 Mammals

The most important species from the general area are probably those classified as rare (*Kerivoula lanosa*, *Zelotomys woosnami*, *Atelerix frontalis angolae*, *Civittictis civetta*), endangered (*Lycaon pictus*, *Equus (burchellii) quagga*) and vulnerable, under Namibian legislation and those classified by the IUCN (2021) as endangered (*Loxodonta africana*, *Lycaon pictus*), vulnerable (*Smutsia (Manis) temminckii*, *Acinonyx jubatus*, *Panthera pardus*, *Panthera leo*, *Aepyceros melampus petersi*) and near threatened (*Macronycteris (Hipposideros) vittatus*, *Parahyaena (Hyaena) brunnea*).

However, some of the above species – e.g. elephant, wild dog, etc. – only pass through the area – or are associated with game farms – zebra, black-faced impala – (i.e. introduced onto farms in the AOI00). The most important species expected to occur in the general area would be the African wild dog (*Lycaon pictus*) and pangolin (*Smutsia (Manis) temminckii*).

2.3.4 Birds

The most important species are viewed as the 7 endemics and those classified as critically endangered (grey crowned crane, blue crane), endangered (southern ground-hornbill, Ludwig’s bustard, wattled crane, hooded vulture, white-backed vulture, bateleur, tawny eagle, booted eagle, martial eagle, yellow-billed oxpecker), vulnerable (lappet-faced vulture, white-headed vulture, secretarybird) and near threatened (Rüppell’s Parrot, kori bustard, Verreauxs’ Eagle, peregrine falcon, marabou stork) from Namibia (Simmons *et al.* 2015) and those classified by the IUCN (2021) as critically endangered (hooded vulture, white-headed vulture, white-backed vulture), endangered (Ludwig’s bustard, grey crowned crane, lappet-faced vulture, bateleur, martial eagle, secretarybird), vulnerable (southern ground-hornbill, blue crane, wattled crane, tawny eagle) and near threatened (kori bustard). An important species confirmed from the general area is the yellow-billed oxpecker. Although oxpecker numbers have increased in communal areas in northern Namibia (Robertson and Jarvis 2000), elsewhere they have been negatively affected due to arsenic-based cattle dips.

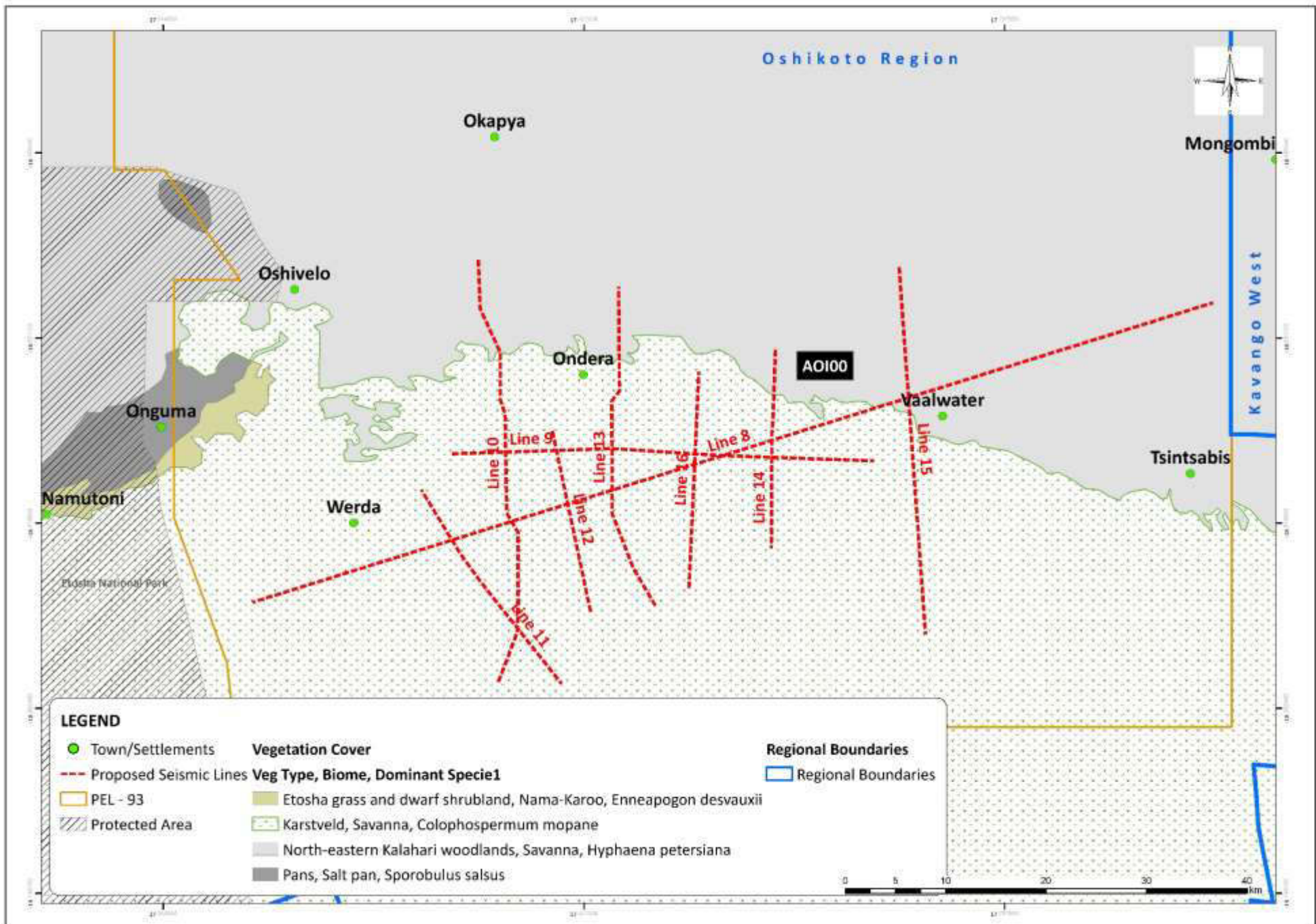


Figure 2.5: Vegetation characteristics around the AOI00 within PEL No. 93, southeast of Oshivelo.

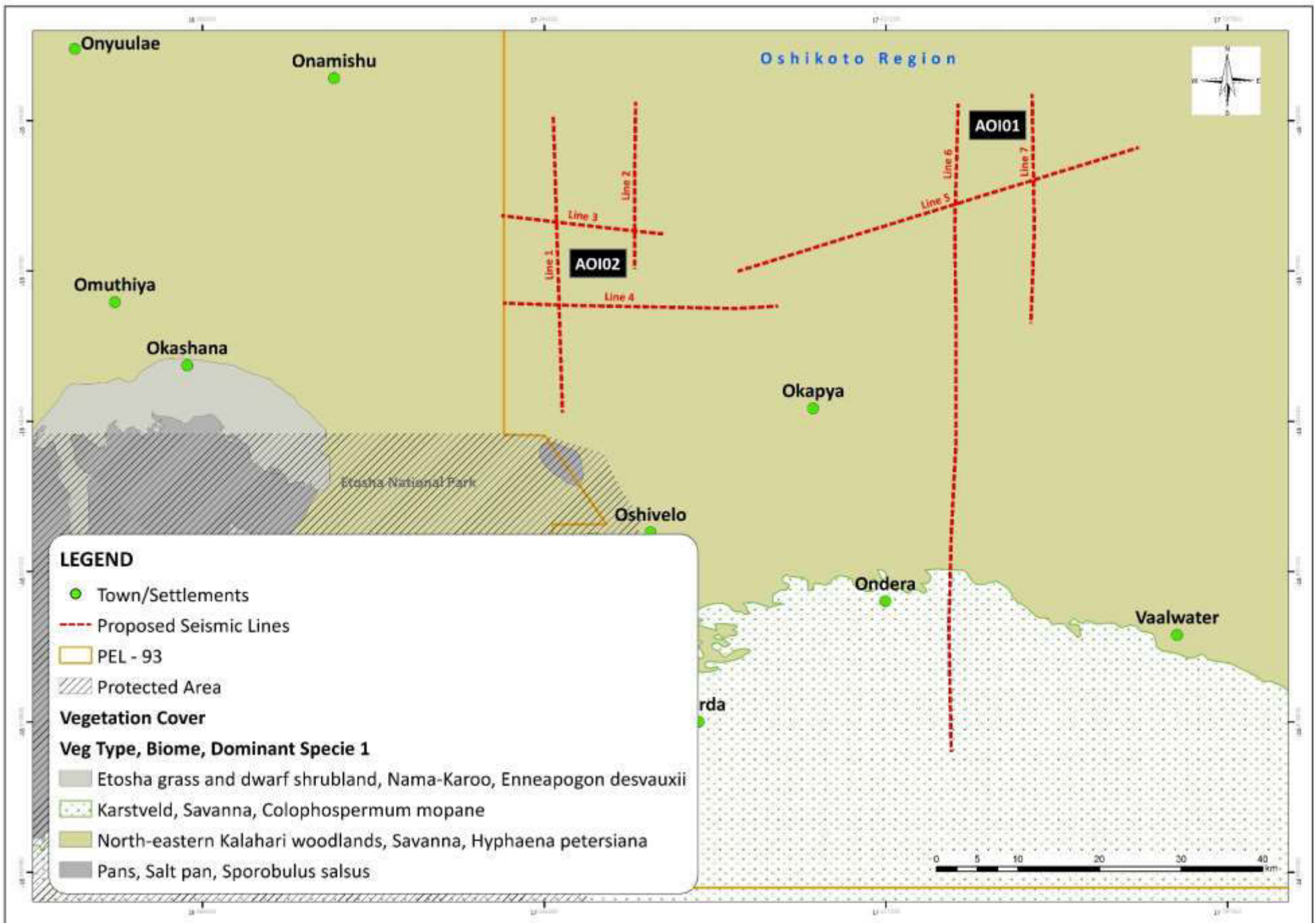


Figure 2.6: Vegetation characteristics around the AOI01 and AOI02 within PEL No. 93, north of Oshivelo.

2.3.5 Trees/shrubs

At least 95 species of larger trees/shrubs are expected to occur in the general area of which none are viewed as endemics species to the area. Eighteen species (18.9%) are protected by the Forest Act No. 12 of 2001 while 1 species is protected by the Nature Conservation Ordinance No. 4 of 1975 (1.1%) (Mannheimer and Curtis 2018). Two species are classified as Lower Risk (Near Threatened) (2.1%) (Loots 2005). Species with the most diversity expected from the general area are *Acacia* (16 species) and *Combretum* (12 species) and followed by *Grewia* (10 species).

During the fieldwork a total of 51 larger trees and shrubs was confirmed from the various AOI with the AOI00 (40spp.), AOI01 (26spp.) and AOI02 (24spp.) declining in species composition from south to north. Of these 51 species, 7 species are protected by the Forest Act No12. of 2001 – i.e. 13.7%. The actual vegetation survey points varied between 7 and 16 species, respectively (Plates 2.3-2.12). The most important larger tree and shrub species expected to occur in the general area include all those formally protected with the most important species viewed as *Baikiaea plurijuga*, *Burkea africana* and *Sclerocarya birrea* (Plates 2.3-2.12).

Another important species, classified as Lower Risk/Near Threatened by the IUCN (2021), is *Pterocarpus angolensis* (African teak or Kiaat) (De Cauwer *et al.* 2014) while *Baikiaea plurijuga* (Zambezi/Rhodesian Teak) is viewed as the most important in the general area due to numbers having decreased due to overutilization for wood production; elephant damage and unseasonal human induced fires.

Of these, the most important species is *Baikiaea plurijuga* (Zambezi/Rhodesian Teak) due to numbers having decreased due to overutilisation for wood production; elephant damage and unseasonal human induced fires. The following is the summary of the most dominant tree and shrub species around AOI00, AOI01 and AOI02 (Plates 2.3-2.12).:

1. The most dominant tree and shrub species throughout the AOI00 are *Acacia mellifera* (black thorn), *Acacia reficiens* (red-bark Acacia), *Combretum apiculatum* (kudu bush), *Combretum hereroense* (mouse-eared Combretum), *Dichrostachys cinerea* (sicklebush), *Spirostachys africana* (tamboti) and *Terminalia sericea* (silver cluster leaf).
2. The most dominant tree and shrub species throughout the AOI01 are *Acacia erioloba* (camel thorn), *Acacia mellifera* (black thorn), *Baphia massaiensis* (sand camwood), *Combretum hereroense* (mouse-eared Combretum) and *Terminalia sericea* (silver cluster leaf), and.
3. The most dominant tree and shrub species throughout the AOI02 are *Acacia ataxacantha* (flame thorn), *Baikiaea plurijuga* (Zambezi teak), *Baphia massaiensis* (sand camwood), *Combretum collinum* (variable Combretum), *Dichrostachys cinerea* (sicklebush) and *Terminalia sericea* (silver cluster leaf).

2.3.6 Grass

During the fieldwork a total of 33 grasses were confirmed from the various AOI with the AOI00 (28spp.) having the highest species diversity followed by the AOI01 (17spp.) and the AOI02 (10spp.). The AOI02 is heavily overgrazed throughout with the D3659 serving as a cattle thoroughfare between fields and communal farms. Dense stands of grass occur in open areas and/or along road verges in the AOI00 and AOI01 (Plates 2.13 and 2.14).

The most dominant grass species throughout the AOI00 (dependent on soil, grazing regime, fire frequency, bush densities, etc.) are *Aristida adscensionis* (annual bristle-grass), *Aristida meridionalis* (giant bristle-grass), *Enneapogon cenchroides* (common nine-awned grass), *Eragrostis superba* (heartseed love-grass), *Eragrostis trichophora* (smooth love-grass), *Heteropogon contortus* (spear grass), *Stipagrostis uniplumis* (silky Bushman-grass) and *Urochloa brachyura*. *Dactyloctenium giganteum* (giant crowfoot), *Eragrostis trichophora* (smooth love-grass) and *Tragus berteronianus* (small carrotseed grass) are dominant in the AOI01 while *Digitaria seriata* (Kuruman finger grass) and *Urochloa brachyura* are dominant in the AOI02.



Plate 2.3: *Albizia anthelmintica* (worm cure Albizia) – protected – are important medicinal and fodder trees in the general area (AOI01) (Cunningham, 2022).

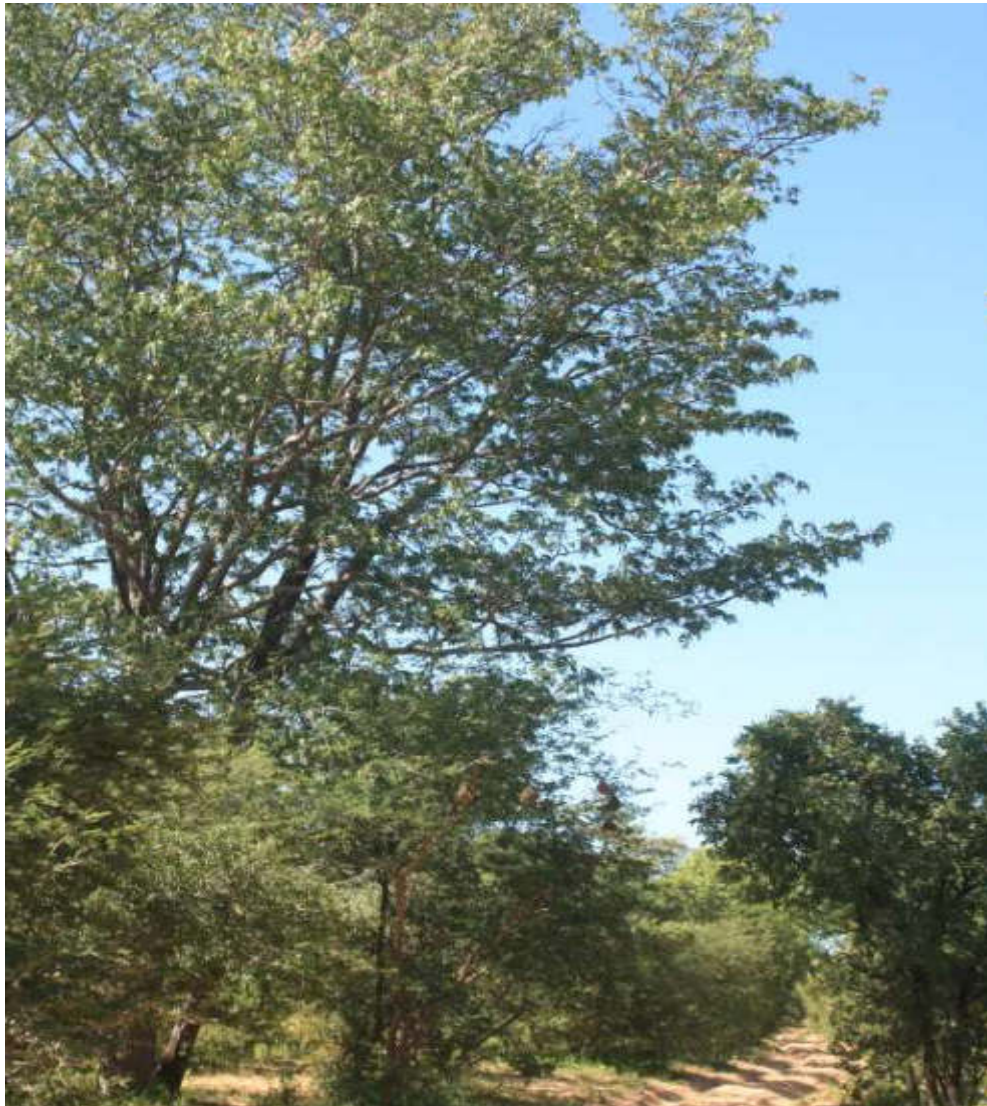


Plate 2.4: *Baikiaea plurijuga* (Zambezi teak – Near Threatened, IUCN 2021) – protected – has been targeted extensively for illegal logging purposes (AOI01) (Cunningham, 2022).



Plate 2.5: *Burkea africana* (burkea) – protected – are some of the taller trees in the area and are targeted for timber and firewood production (AOI02) (Cunningham, 2022).



Plate 2.6: *Combretum imberbe* (leadwood) – protected – are some of the larger and more important protected tree species in the area (AOI00) (Cunningham, 2022).



Plate 2.7: *Hyphaene petersiana* (makalani) – protected – stands are often nesting sites for vultures and other large raptors in the general area (AOI00) (Cunningham, 2022).



Plate 2.8: *Sclerocarya birrea* (maroela) – protected – are important fruit trees (Cunningham, 2022).



Plate 2.9: *Spirostachys africana* (tamboti) – protected – are important trees for fence poles and droppers as they are termite resistant (Cunningham, 2022).



Plate 2.10: Dense impenetrable stands of *Dichrostachys cinerea* (sicklebush) are dominant in large parts of the AOI00 (Cunningham, 2022).



Plate 2.11: *Terminalia sericea* (silver cluster leaf) is dominant in the AOI01 (Cunningham, 2022).



Plate 2.12: *Acacia ataxacantha* (flame thorn) and *Combretum collinum* (variable Combretum) are some of the dominant species in die sandy AOI02 (Cunningham, 2022).



Plate 2.13: A large variety of perennial grass species are found in the AOI00 (Cunningham, 2022).



Plate 2.14: *Dactyloctenium giganteum* (giant crowfoot) are dominant in open areas in the AOI02 (Cunningham, 2022).

5.3.7 Important Habitats

Important habitats in the general area are: Omuramba Owambo, Omuramba Omuthiya, Etosha National Park and the Mangetti Block which is an important elephant movement between the Etosha National Park and the Mangetti farms (Fig. 2.7).

The general PEL 93 area has been heavily impacted in places, especially close to towns, villages, and settlements such as Oshivelo, etc.; crop production and land clearing on freehold farms; subsistence farming activities in communal areas, etc (Plates 2.1 and 2.2).

The most important habitat areas in the general PEL 93 and surrounding areas are:

1. Ephemeral Omuramba Owambo and Omuthiya: Ephemeral rivers are viewed as sites of special ecological importance in Namibia due to its biotic richness, large mammals, high value for human subsistence and tourism (Curtis and Barnard 1998). In a sandy area with very little surface water, these rivers are seasonal lifelines and habitat to numerous vertebrates.
2. Ephemeral Pans: Ephemeral pans are viewed as sites of special ecological importance in Namibia due to its biotic richness, endemic crustacean, Red Data birds, habitat and resource for humans and wildlife (Curtis and Barnard 1998). The Etosha pans and various other smaller pans in the greater Omudhiya Lakes area are also viewed as important habitat to a variety of aquatic birds and the critically endangered cranes.
3. Etosha National Park: The Etosha NP on the western boundary of the AOI is the flagship of the parks in Namibia with hundreds of species of mammals, birds and reptiles, including several [threatened](#) and [endangered](#) species such as black rhino, cheetah, elephant, lion, white rhino, etc. as well as a breeding site for the critically endangered blue crane (Ntinda *et al.* 2012; www.met.gov.na and Annex 2).
4. Mangetti Block: The Mangetti Block is located to the immediate east of the AOI and is important as an elephant migration route between the Etosha NP and the Okavango River (and Angola) and the Mangetti and Kaudum NP's including a small wild dog population which also occurs in this area (Fig. 2.7), and.
5. Undisturbed areas: The general area is not pristine anymore due to prolonged human impact (e.g. settlements, slash-and-burn farming practices, unseasonal fires, etc.), north of the Veterinary Cordon (i.e. communal area) and more recently along the various tracks and roads throughout the area, including long term farming impacts on freehold farms south of Oshivelo (Plates 2.1 and 2.2). However, there are some areas far from the tracks/roads which have less human impact (albeit not pristine), and viewed as more important. Creating new tracks in these areas would result in the destruction of numerous protected tree species as well as result in access to these areas leading to further settlements as well as illegal harvesting and poaching and overall environmental destruction. However, the seismic surveying will mostly be conducted on existing access routes throughout the area.

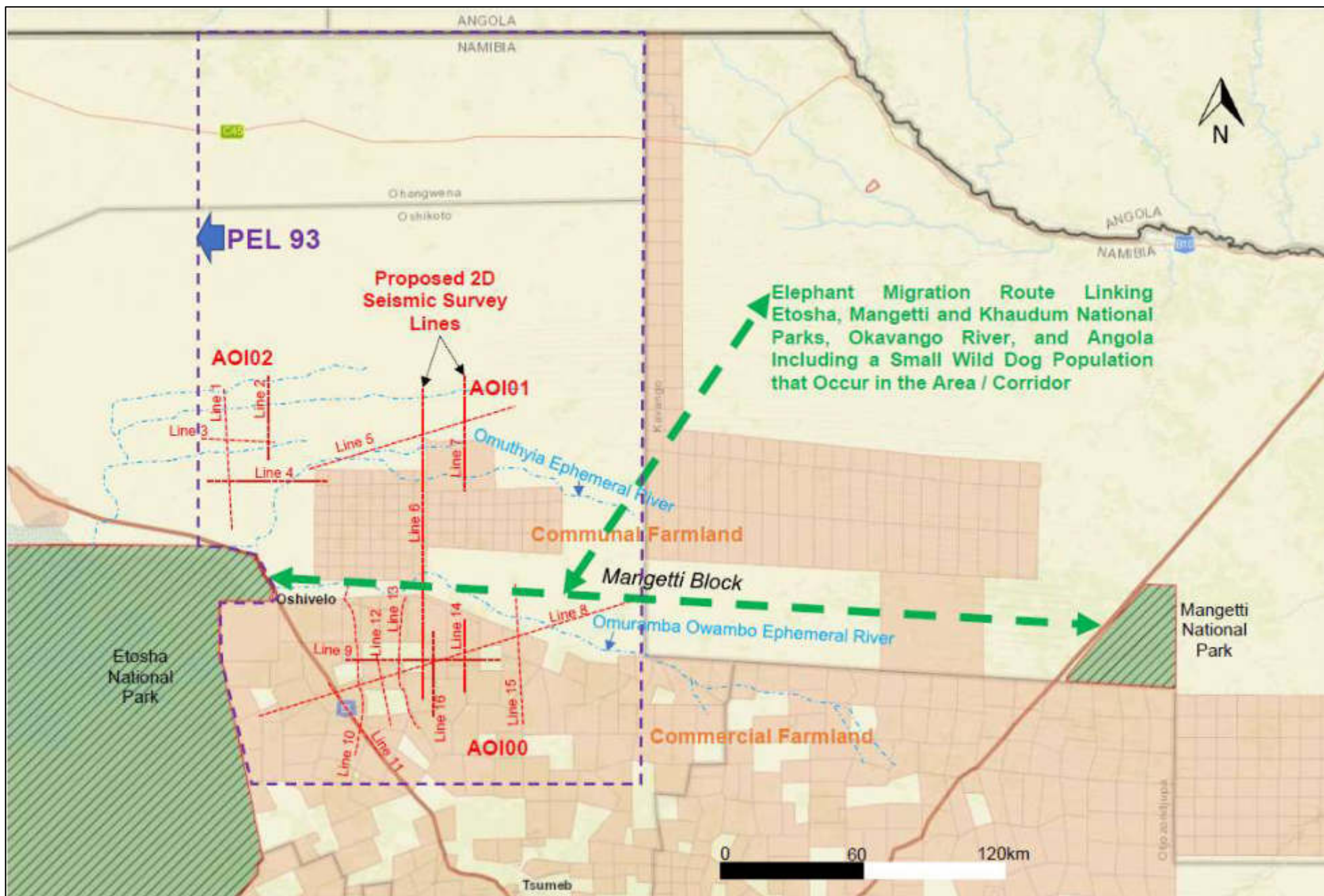


Figure 2.7: Important habitats in the general area are: Omuramba Owambo; Omuramba Omuthiya, Etosha National Park, and the Mangetti Block. Elephant movement between the Etosha National Park and the Mangetti farms are indicated (broken green arrows). The red dotted lines are the seismic lines over AOI00, AOI01 and AOI02 (Base map Source: <https://maps.landfolio.com/Namibia/>).

2.4 Socioeconomic Summary of PEL 93 and AOI

The following is the summary of the socioeconomic information covering PEL 93 in Oshikoto Region and the AOI:

- ❖ The area of interest is populated with around 31 660 people, this includes 3 constituencies - Guinas, Eengodi and Nehale LyaMpingana (Table 2.1).
- ❖ There are more females than males, 51.8% and 48.1% accordingly.
- ❖ Eengodi and Nehale LyaMpingana constituencies has more youthful population than Guinas constituency. Though Guinas has highest percentage of working age population among the three affected constituencies and which is above the average for Namibia (57.3%).
- ❖ Approximately 62% of population aged 15 years and above in Oshikoto Region were never married, while 22.7% of the population were married with certificate.
- ❖ There are more single males in Nehale LyaMpingana and Eengodi constituencies, while Guinas constituency has more single females.
- ❖ Oshikoto teenage pregnancy rate stands at 1.4% of all children ever born to females younger than 20 years of age.
- ❖ 6.7% of the total population of Oshikoto Region has some kind of disability. The proportion of people living with disabilities is higher in rural areas (6.9%) than in urban areas (5.4%).
- ❖ The physical impairment of lower limbs is the most common type of disability affecting about 24% of the population with disabilities in Oshikoto Region.
- ❖ Oshikoto Region's life expectancy is at 61.8 years for females and 52.2 years for males. This is a considerable improvement in comparison to the earlier Census 2001 when female's life expectancy was only 49.8 years and 50 years for males.
- ❖ Population of Oshikoto Region has been growing steadily, yet at a slightly slower paste than average for Namibia. In a period between 2001 and 2011 the annual growth rate for Oshikoto was 1.2% and then it slightly picked up to 1.4% in 2016.
- ❖ The projected population of Oshikoto Region for 2030 is 235153 people, with 48.4% being male and 51.6% female.
- ❖ The area is sparsely populated in east, south and south east part (Etosha National Park) of the Oshikoto Region and densely population in northwest part of region.
- ❖ There is a noticeable movement of people from rural to urban areas. The long-term migration for Oshikoto Region is negative. There were more people leaving the area than coming in.
- ❖ The literacy rates in Oshikoto Region are 84%, with females scoring higher rate of 87% and males lower 81%.
- ❖ The literacy rates for affected constituencies had lower rates than the rest of the Oshikoto Region. Particularly low literacy rates were in Guinas constituency where only 64% of males and 56% of females were literate.
- ❖ Oshikoto Region's unemployment rate is 36.2% which is above the unemployment rate for Namibia - 33.4%.
- ❖ The large unemployment rate could be attributed to the limited formal employment within the region as the majority of households still obtain income from subsistence activities.

- ❖ Largest share of employed people work as skilled agricultural workers, in elementary occupations, service workers and craft and related trade workers. Nehale LyaMpingana Constituency has a significant number of employed who work in armed forces.
- ❖ Dependency on old-age pensions, cash remittances, retirement fund, orphan or disability grants is high and indicates dependency from income that is coming from social services or monies that are not generated by themselves. Around 15% of Eengodi households, 13.5% Guinas households and 9.1% Eengodi households depend on old-age pensions.
- ❖ In 2011, the incidence of poverty in Oshikoto Region was 43 % and it represented a 15-percentage point reduction from the 2001 figure of 57 %. Though there was an improvement since 2001, Oshikoto Region is among the three poorest regions in Namibia.
- ❖ Oshikoto household consists of 4.3 persons on average. There are more female headed households than male headed households.
- ❖ Around 2% of households are headed by children who were 18 years and younger. Oshikoto Region has one of the highest number of households headed by children! Furthermore 0.7% of households are headed by orphaned children.
- ❖ Traditional dwellings are the most common type of housing unit, making up 69.7 % of all households in Oshikoto Region, followed by detached houses (14.2%) and semidetached houses (6.1%).
- ❖ Household's main source of energy for cooking was fire wood, 70.9% of all households using fire wood for cooking. The main source of energy for lighting is battery lamps, torches and cell phones - 56.6% of Oshikoto households.
- ❖ 93% of households have safe drinking water, with 30.3 % of the households having access to piped water inside the house and 38.2% of households having piped water outside.
- ❖ Oshikoto Region has traditionally been occupied by San groups, mainly Hai||om and with a smaller proportion of !Xun – living mostly in the freehold areas, with just a few groups living in the communal areas. After Independence many Hai||om farmworkers were dismissed and moved to towns or newly established resettlement farms, such as Tsintsabis. In 2012 the Hai//Om San community living at Oshivelo was resettled to Ondera. In 2018 Ondera had already 500 households.
- ❖ Oshikoto Region's economic environment is largely made up by farming, tourism and mining. Agriculture is one of the key sectors in the Oshikoto Region. Region is 'divided' into two different land tenure regimes. The southern part of the Region consists of large-scale farming areas under freehold title, while the north-western parts remain under communal land.
- ❖ Most of the households in the communal area engage in the subsistence farming. Commercial farming is mostly practiced beyond the veterinary cordon fence popularly known as the red line.
- ❖ Tourism is often cited as one of the major contributors to the regional economy. Etosha National Park is the biggest and most famous tourist attraction area in the Region. Other tourist attraction sites are: Otjikoto Lake, Guinas Lake, the Nakambale and Helvi Kondombolo Cultural Villages and Tsumeb museum.
- ❖ Trade in Oshikoto Region is represented by formal and informal traders ranging from multinational retail businesses to vendors selling home-made food (fat cakes, cooked meat, fish etc) home-made drink (Oshikundu) and many others. Apart from the informal traders, most of the businesses are liquor wholesalers and outlets as well as small shops, selling basic amenities and foodstuff.
- ❖ Tsumeb is well known for its copper mine, which was built in 1961-1962 and houses one of the few commercial smelter plants in Africa. Dundee Precious Metals' copper smelter is one of only

a few in the world that can treat complex copper concentrates and employs approximately 800 people. The estimated life of mine is until 2038.

- ❖ According to the government officials the Oshikoto Region has an enormous economic potential, specifically in the areas of mining, tourism, livestock and crop farming, and.
- ❖ Impact of Covid-19 pandemic on the local economy was huge. All sectors from shebeens, SMEs and tourism and hospitality establishments were severely affected in Oshikoto, and many have failed to revive themselves despite regulations having been relaxed.

Table 2.1: Population size by area and density (Source of data: Oshikoto Regional Council, 2020; NSA, 2014a).

Constituency	Population	Area in sq.km
Guinas	5 460	4569.91
Eengodi	15 490	2107.77
Nehale LyaMpingana	10 710	9934.99

2.5 Subsurface Ground Components

2.5.1 Regional Geology

The landscape of PEL No. 93 covering Oshikoto and Ohangwena Regions and according to Agro-Ecological zones of the country are Kalahari Sand plateau with deep sands on the northern area and Kalkveld on the southern and western area (Tsumeb and Etosha). The regional landscape of PEL 93 form part of the lowland greater Kalahari Basin covering most of Botswana and Namibia, as well as parts of Angola, South Africa, Zambia, and Zimbabwe (Fig. 2.8).

The present-day Kalahari Basin owes its origin to the uplift of the Southern Africa continental margin during the break-up of African proto-type continent known as Gondwanaland (Summerfield, 1985, Figs. 2.9 and 2.10).

This tectonic event created what is now known as the “The Great Escarpment” by uplifting the Southern African continental margin followed by the down-warping of the continental interior – creating the Kalahari Basin comprising the Kalahari Group sediments extending over much of Southern Africa inclusive of the proposed project area (Fig. 2.8, De Swardt and Bennet, 1974 and Figs. 2.8 -2.10). According to Summerfield (1985), further local tectonic activities associated with reactivation of D3 deformation events of the Damara Orogen and the Eastern African Rift System caused further subsidence along graben systems of the central basin favouring thick sediment accumulations and creation of sub-basins.

In the Etosha Basin the Nosib, Otavi and Mulden Groups of the late Precambrian Damara Sequence rest on a basement of mid Proterozoic gneisses, granites, volcanic and metasedimentary rocks (Miller, 1992 and 2008). According the Miller, (1992), these are overlain by up to 6000 m of extensive platform carbonates of the Otavi Group, which were laid down on the shallow and relatively stable Northern Platform of the Orogen as rifting evolved to spreading and ocean formation to the south and west between 730 and 700 million years (Figs. 2.8 -2.10).

Mulden Group and Karoo Sequence rocks in the Etosha Basin are covered entirely by sands, clays and calcretes of the Kalahari Sequence which exceed 400 m in thickness in the northeast (Figs. 2.10-2.14).

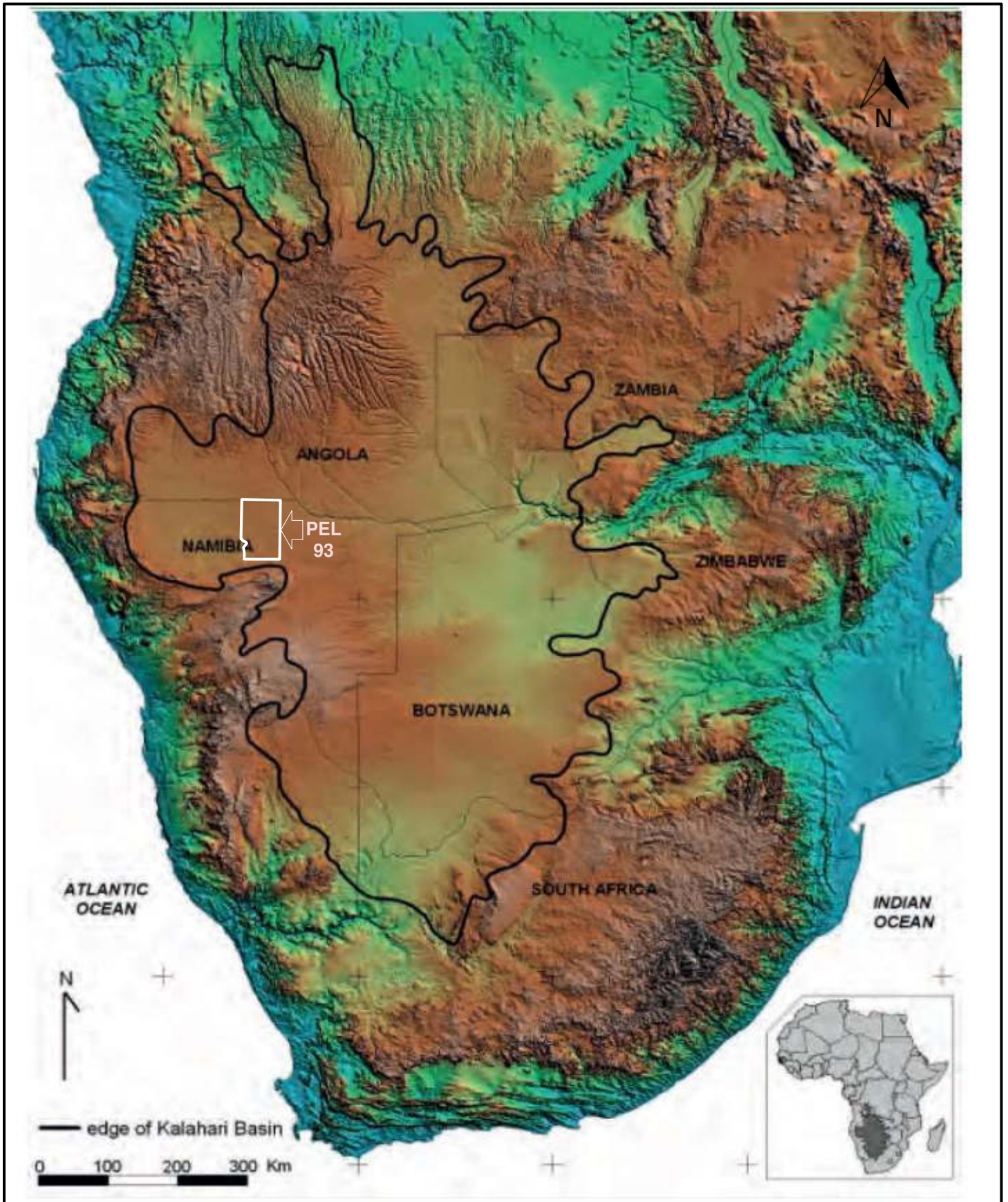


Figure 2.8: Lateral extent of Kalahari Group sediments (Source: Haddon, 2005).

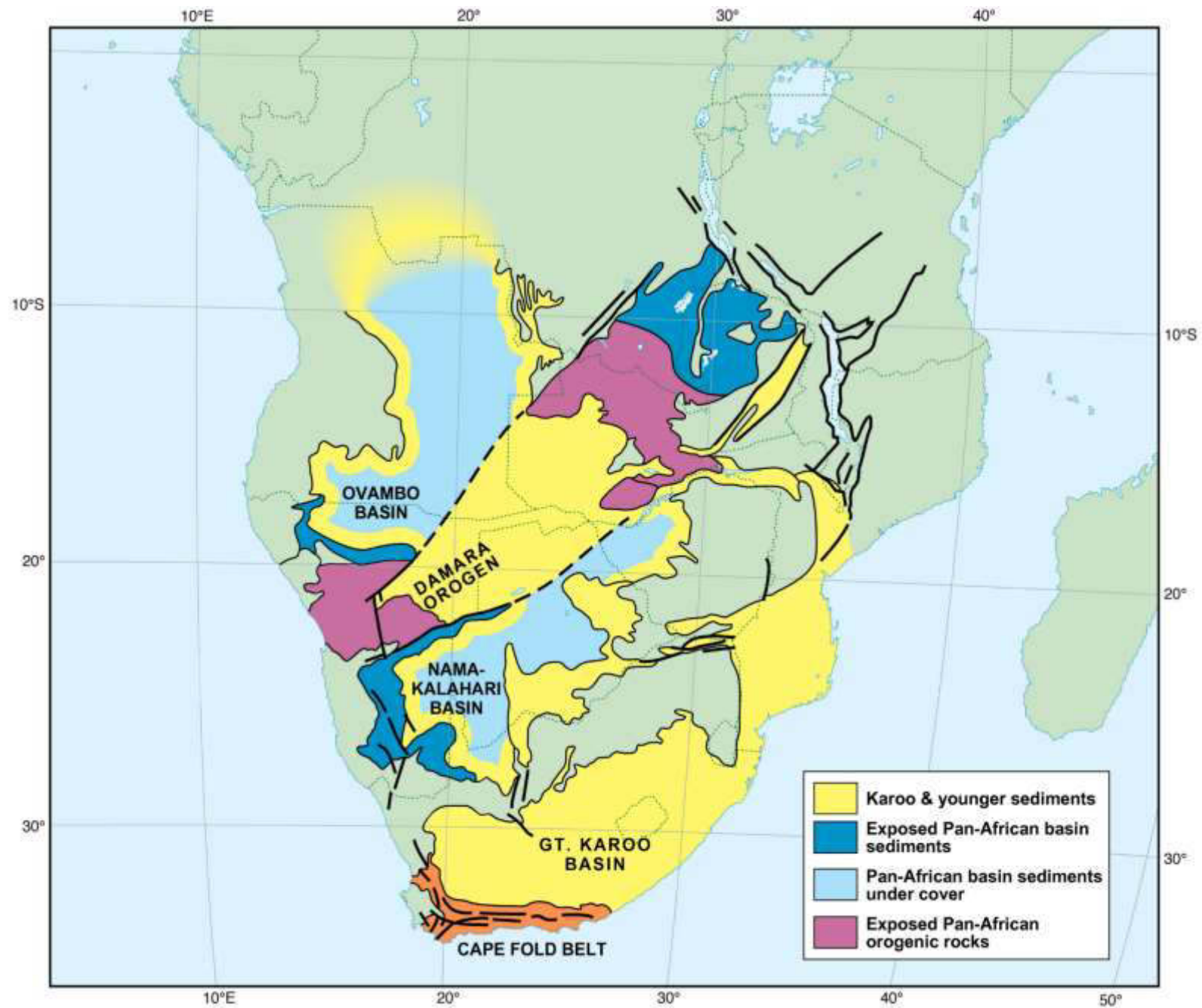


Figure 2.9: The Owambo (Etosha) Basin, location of PEL 93 within the context of the late Proterozoic/Early Palaeozoic and Karoo basins of Central and Southern Africa (Source: Lawrence, *et. al.*, 2014).

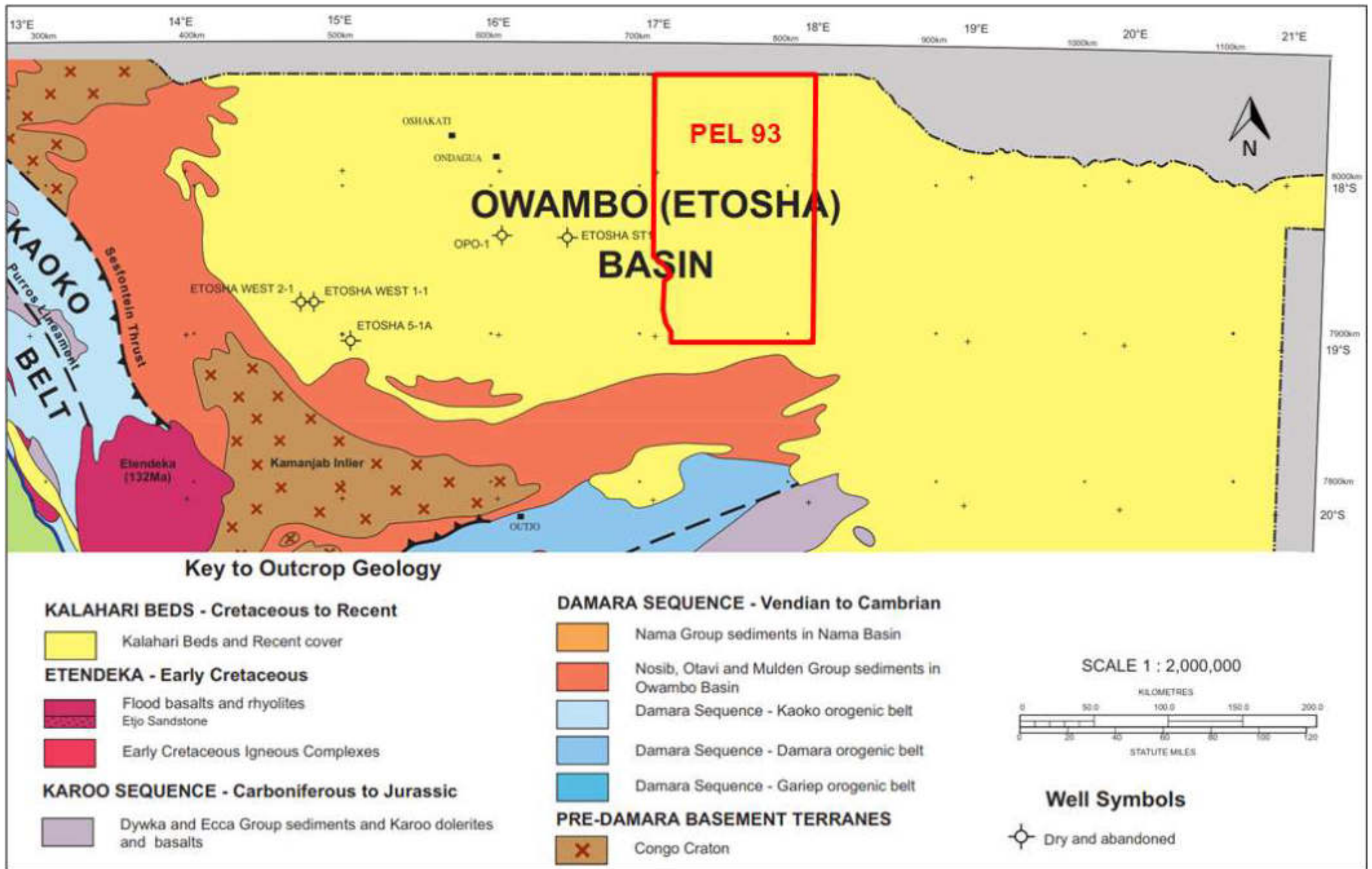


Figure 2.10: Geological map of northern Namibia showing Owambo (Etosha) Basin and the associated regional structural elements (Extract from Namcor, Ministry of Mines and Energy, 1998).

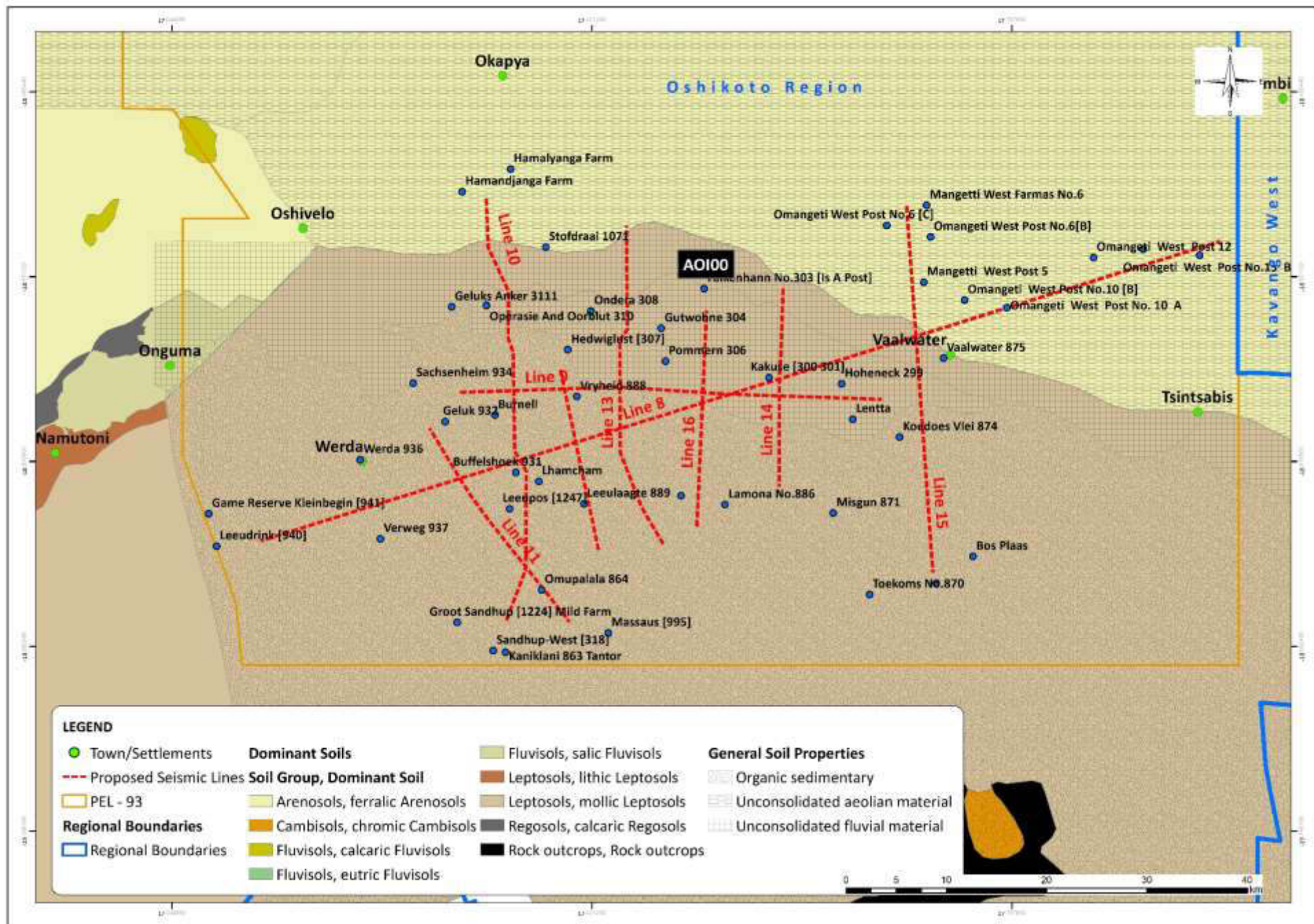


Figure 2.11: Surficial geology of PEL 93 and the proposed survey area showing the Prospect AOI00.
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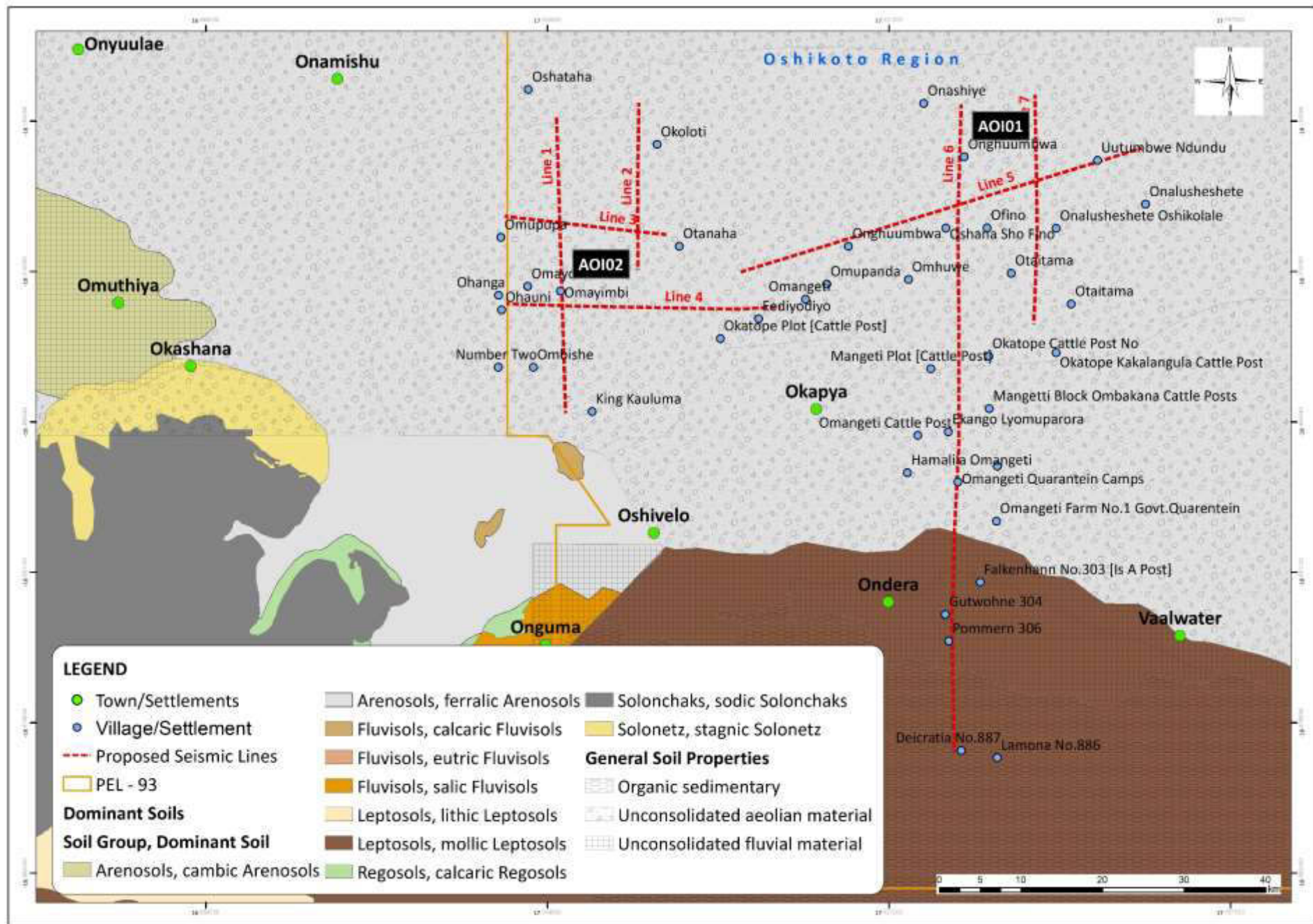


Figure 2.12: Surficial geology of PEL 93 and the proposed survey area showing the Prospects AOI01 and AOI02.

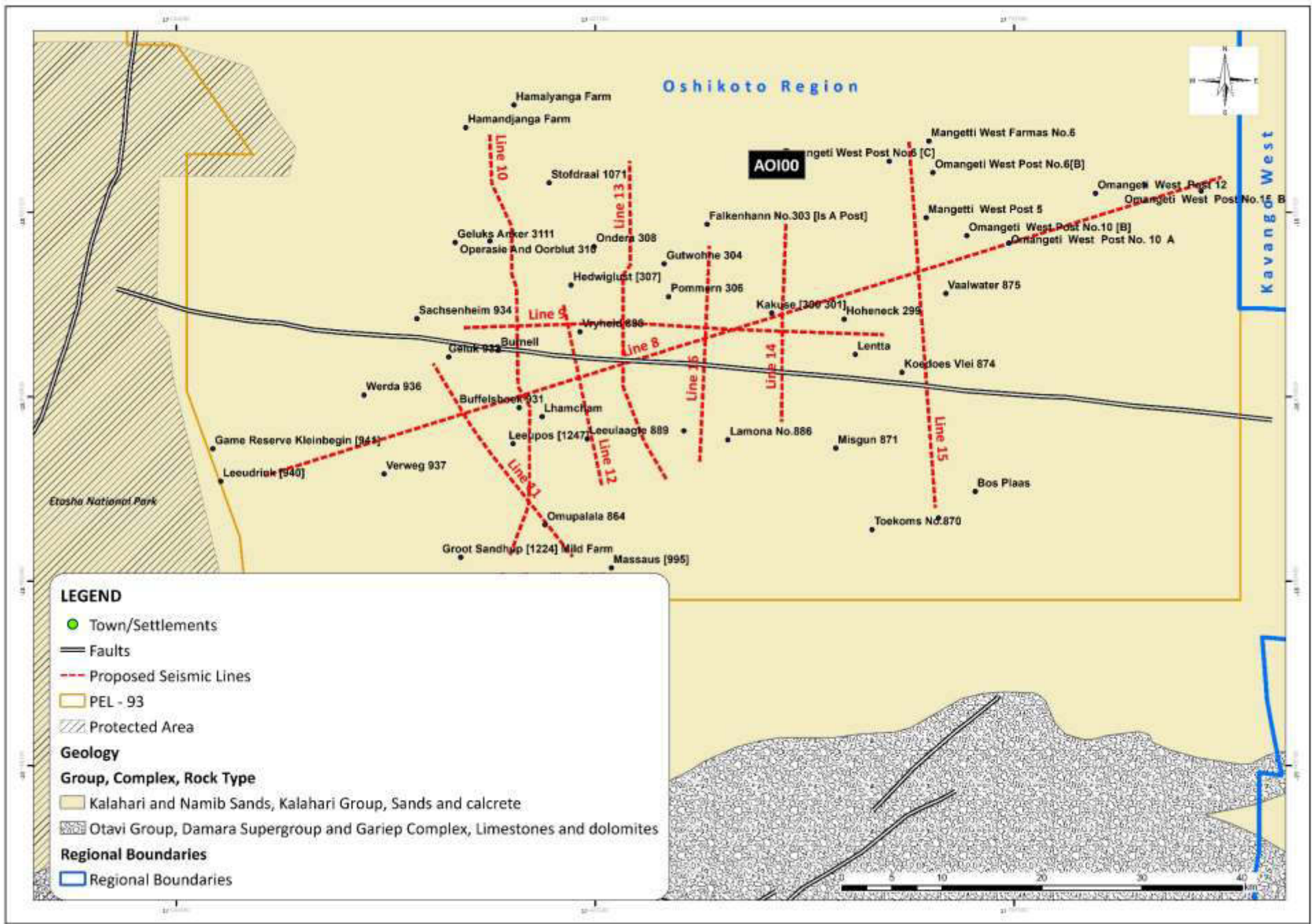


Figure 2.13: Solid geology of PEL 93 and the proposed survey area showing the Prospect AOI00.
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2.5.2 Petroleum System

The source rocks with favourable generation potential are associated with the Otavi Group carbonates of the Otavi Mountainland (Figs. 2.15 and 2.16, www.monitorexploration.com and MEL, 2022). Potential reservoir rocks in the Owambo basin include Proterozoic carbonates of Otavi and sandstones of the Mulden group. Intra-Damara paleokarst structures may have lost of their porosity but various post-Damara episodes of karsting have produced cavernous porosity which is a major source of groundwater in the basin margins (Figs. 2.15 and 2.16). The exploration targeting traps likely to be associated with the antiformal structures, carbonate mounds and tectonic inversion anticlines (www.monitorexploration.com and MEL, 2022).

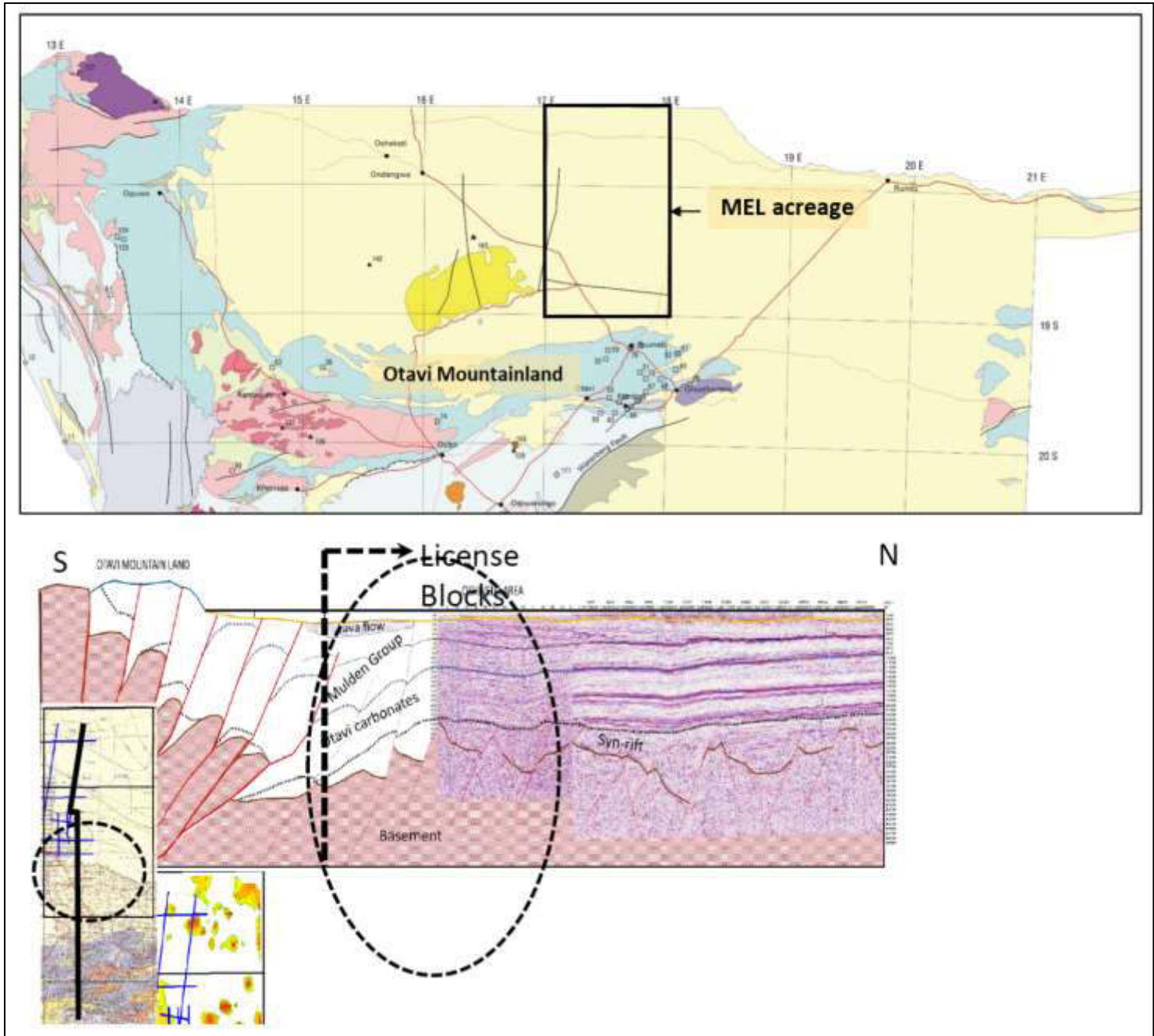


Figure 2.15: Geological map and subsurface geological and structural model that suggests the existence of large structural traps towards the southern portion of the block 1817 (Source: MEL, 2022).

2.5.3 Groundwater Resources

2.5.3.1 Aquifers of the Etosha Cuvelai Basin and PEL 93

The Cuvelai Etosha Basin (CEB) is made up of six (6) aquifers namely: Otavi Dolomite Aquifer (DO), Etosha Limestone Aquifer (KEL), the Oshivelo Multi-layered Aquifer (KOV), the Ohangwena Multi-layered Aquifer (KOH), the Oshana Multi-layered Aquifer (KOS) and the Omusati Multi-zoned Aquifer (KOM) (Fig. 2.17, BGR-DWAF., 2006, 1999, 2010, and Raison, 2011). According to Fig. 2.17, the proposed 2D seismic survey operations cover the Etosha Limestone Aquifer (KEL), the Oshivelo Multi-layered Aquifer (KOV) and the Ohangwena Multi-layered Aquifer (KOH). Fig. 5.17 shows the type of rocks, general water depth, quality, and yield for each of the six (6) Etosha Cuvelai Basins including the three (3) Basins covered by the proposed 2D seismic survey operations.

2.5.3.2 Groundwater of Depth, Flow and Recharge

The deepest groundwater is in the northeast where most boreholes are deeper than 100 metres (Figs. 2.17 and 2.18). All groundwater flows towards the centre of the Basin. In the south and west, the flows are from the high-lying areas along the margins towards and below Etosha Pan (Figs. 2.19 and 2.20). Flows of groundwater from the north into the centre are due to the higher elevations along the northern border and in Angola. Just as on the surface, water at higher altitudes flows to lower levels. The Otavi Mountains, located to the south of the project area, are considered the most important groundwater recharge area in northern Namibia (BGR-DWAF., 2006, 1999, 2010, and Raison, 2011). Groundwater recharged in the fractured dolomites of the Damara Sequence, which form the southern and western rim of the Cuvelai Etosha Basin, flows north- and eastwards and feeds the aquifer system of the Karoo and Kalahari sequences. However, a major part of this north/eastbound groundwater flow is shallow, and discharges through numerous springs along the southern margin of the Etosha Pan, where it rapidly evaporates. A deep-seated multi-layered Kalahari Aquifer is recharged in Angola and groundwater flows in a southern direction towards the Etosha Pan and the Okavango River. A shallow Kalahari Aquifer (formerly described as the brine lake area) superimposes both previously described aquifer systems in the central part of the Cuvelai Etosha Basin. The mainly saline groundwater originates from regular floods in the Cuvelai drainage, which has its headwaters in central Angola.

2.5.3.3 Groundwater Quality and Vulnerability

According to BGR-DWAF., (2010), the best borehole water within the Cuvelai Etosha Basin is in the eastern and far western areas and south and east of Etosha Pan. By contrast, water of poorest quality is in the central areas of the Basin which is where the great majority of people live. However, most of these people use piped water or fresh water from shallow hand-dug wells. Figs. 2.21 and 2.22 show the chemical properties of deep water pumped from boreholes. People may suffer detrimental effects from high concentrations of fluorides (which affect teeth and the development of children's bones), sulphates (act as a laxative) and nitrates (affect oxygen transport in the body) (Figs. 2.21 and 2.22). Etosha Limestone Aquifer (KEL), the Oshivelo Multi-layered Aquifer (KOV) and the Ohangwena Multi-layered Aquifer (KOH) are three aquifers covered by the proposed 2D seismic survey. The three-aquifers supply water to the local communities and are all vulnerable to various humane related activities. The proposed 2D seismic survey will not threaten groundwater resources. Data from the proposed 2D seismic survey will provide greater undertaking to the local groundwater resources around Oshivelo. As shown in Figs. 2.23 and 2.24, some of the water supply schemes found in the AOI are situated close to the proposed 2D seismic survey lines. Appropriate buffers will be provided around each of the water supply infrastructures situated along the proposed survey lines.

2.5.3.4 Groundwater Recommendations

It is hereby recommended that a hydrocensus survey be undertaken prior to the implementation of the proposed 2D seismic survey operations in PEL 93 to have accurate locations of water wells and boreholes along the proposed 2D seismic survey lines. Based on the outcomes of the hydrocensus survey, accurate offset / setback distances shall be applied around each of the water wells, boreholes, and associated water infrastructure along the proposed seismic survey lines. Guidance offset / setback distances are provided in this EMP Report under Chapter 4: Table 4.1.

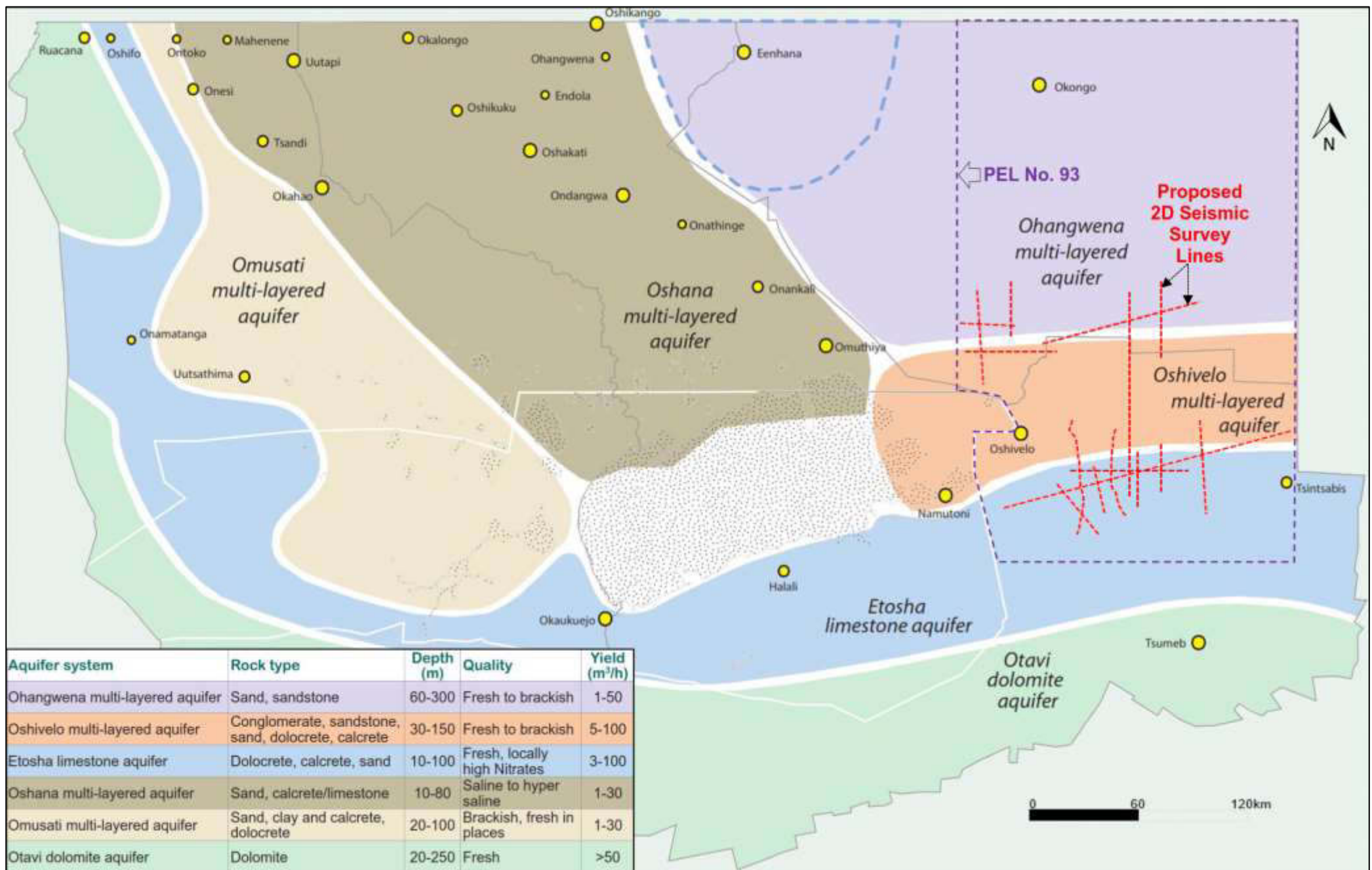


Figure 2.17: The Etosha Cuvelai Basin aquifers with respect to the proposed 2D seismic survey lines in PEL 93 (Base map Source and modified from: Raison, 2011, www.bgr.bund.de).

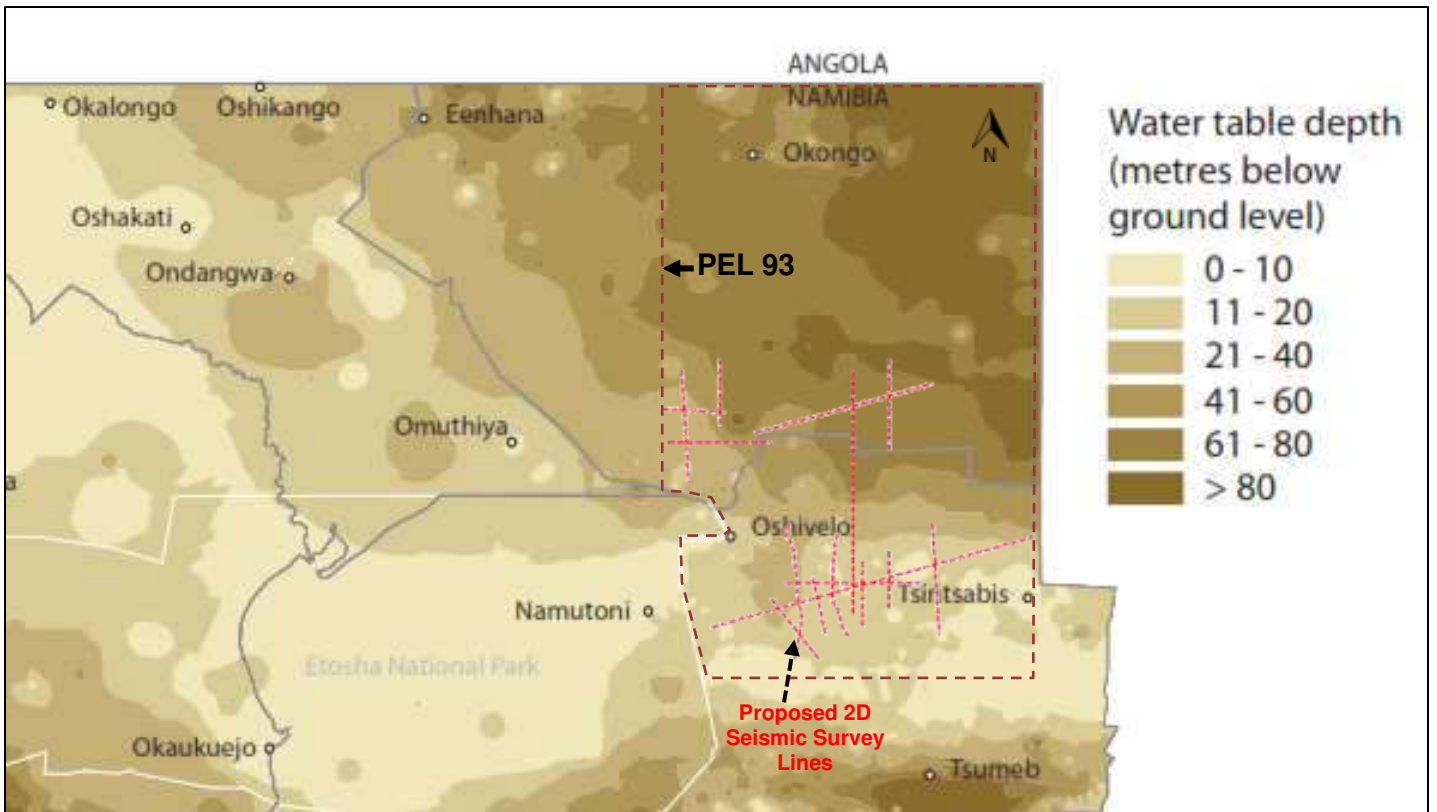


Figure 2.18: Water table depth around the Etosha Cuvelai Basin aquifers with respect to the proposed 2D seismic survey lines in PEL 93 (Base map Source and modified from: Raison, 2011, www.bgr.bund.de).

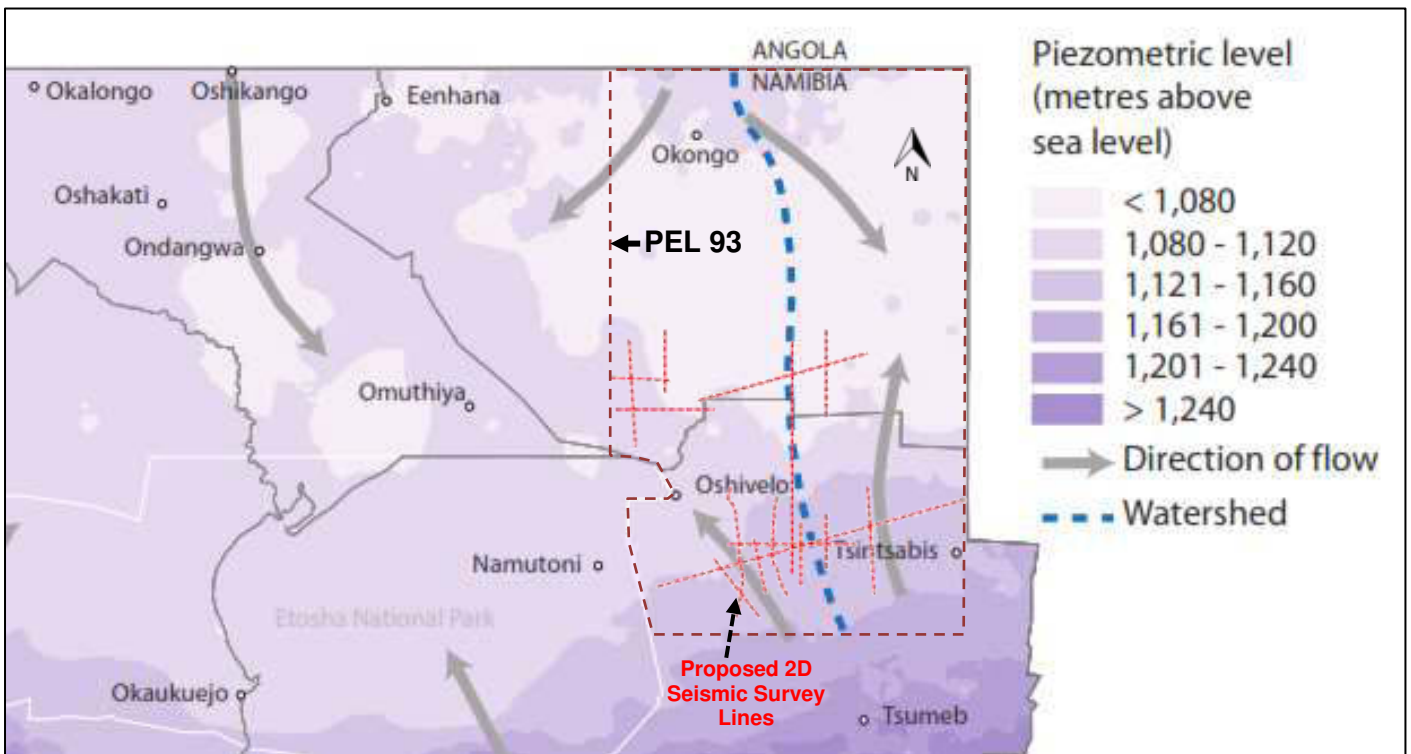


Figure 2.19: Piezometric levels around the Etosha Cuvelai Basin aquifers with respect to the proposed 2D seismic survey lines in PEL 93 (Base map Source and modified from: Raison, 2011, www.bgr.bund.de).

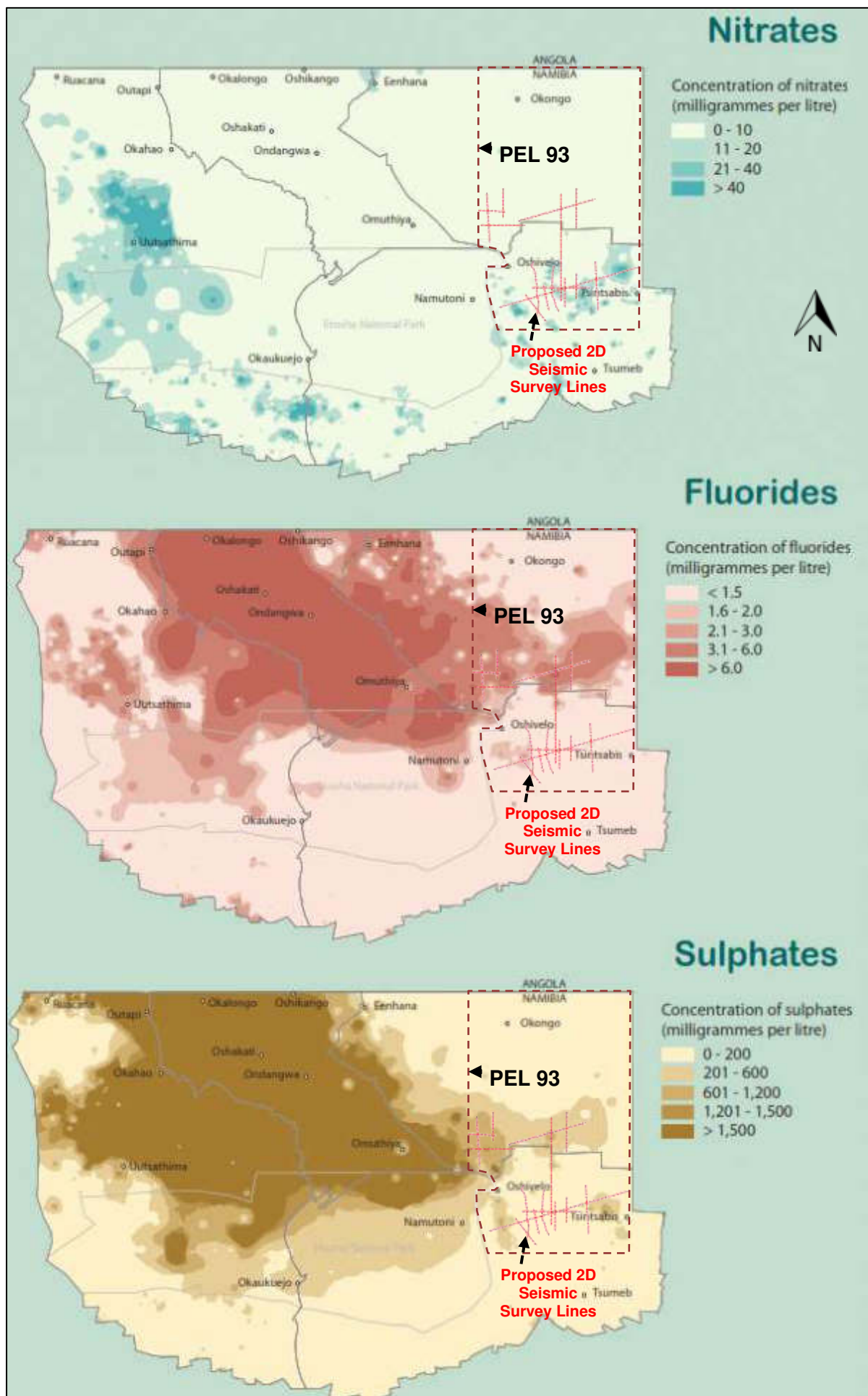


Figure 2.22: Groundwater quality (sulphates, fluorides, and nitrates), around the Etosha Cuvelai Basin aquifers with respect to the proposed 2D seismic survey lines in PEL 93 (Base map Source and modified from: Raison, 2011, www.bgr.bund.de).

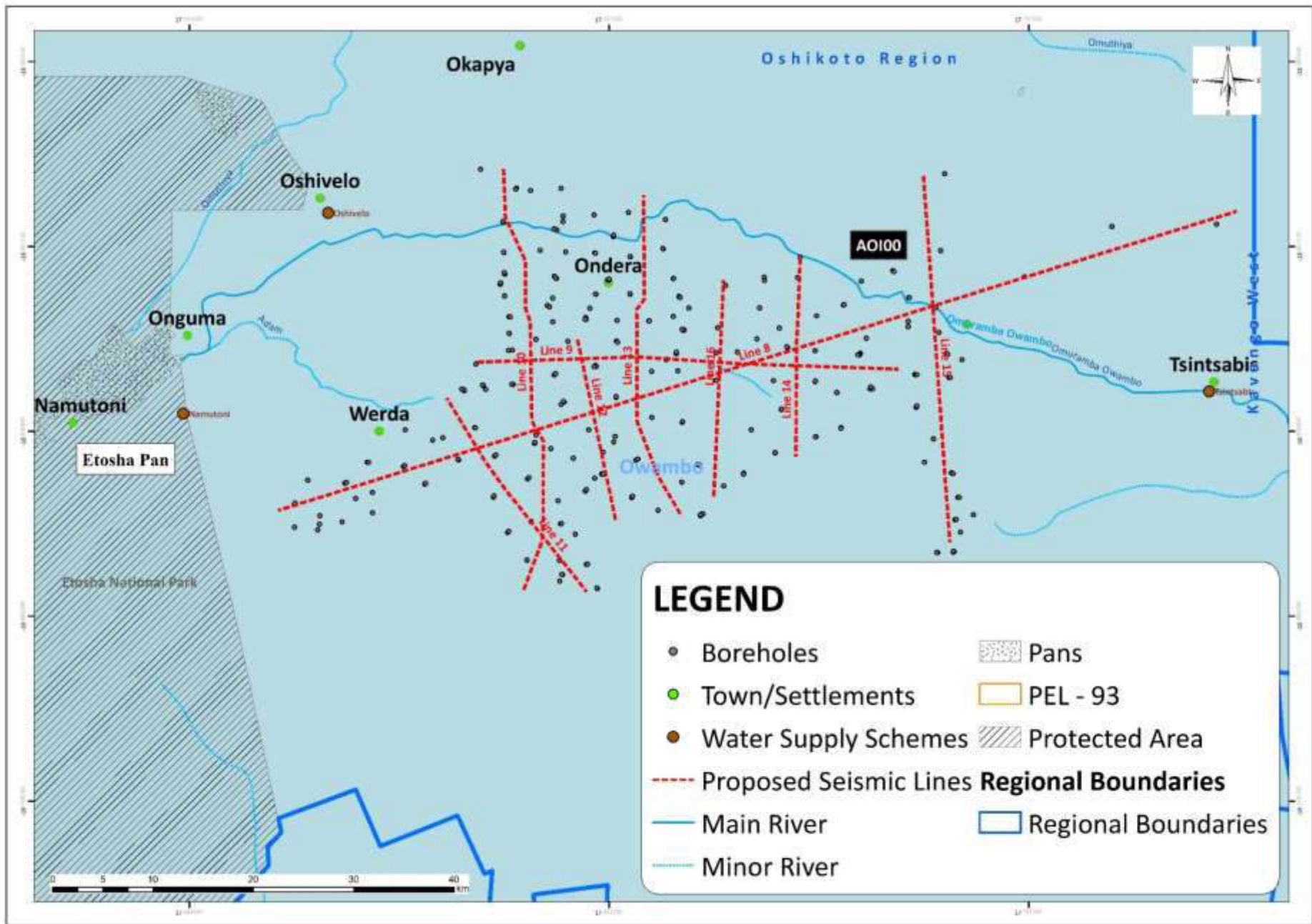


Figure 2.23: Water supply infrastructure with respect to the proposed 2D seismic survey lines around the AOI00. Appropriate buffers will be provided around each of the water supply infrastructures situated along the proposed survey lines.

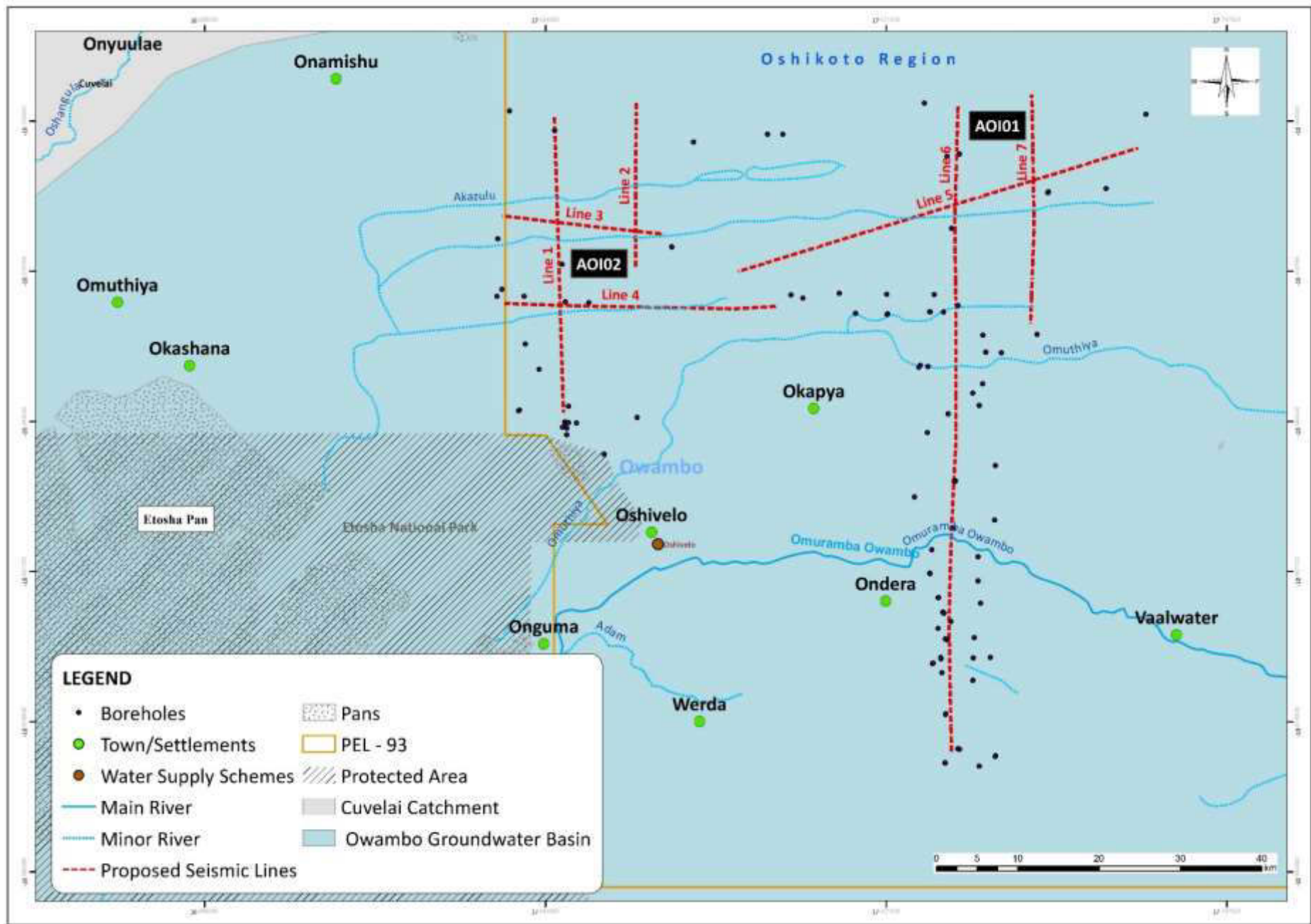


Figure 2.24: Water supply infrastructure with respect to the proposed 2D seismic survey lines around the AOI01 and AOI02. Appropriate buffers will be provided around each of the water supply infrastructures situated along the proposed survey lines.

2.6 Heritage and Archaeological Findings and Recommendations

Heritage and archaeological field survey has located several historic and ethnographic sites found within the proposed area for 2D seismic survey considered to be significant and sensitive (Tables 2.2 -2.4). Such sites require special mitigation measures including the application of the appropriate offset distance as may be applicable. Sensitive heritage localities within 1km of the proposed 2D seismic survey and within PEL 93 have been identified as listed in Table 2.4.

The typology of these resources is both ethnographical and historical. It is recommended that the project adopt the recommended mitigation measures as detailed in Annex 4 and this EMP Reports. Appropriate offset distance from the no-go areas and heritage localities situated about 1km from the proposed 2D seismic survey lines shall be adopted at all times.

As international operator, MEL shall adopt the Alberta Government of Canada Distance Requirements Exploration Directive 2006-15 as shown in Chapter 4: Table 4.1 of this EMP report and with additional guidelines as provided by the International Association of Geophysical Contractors (IAGC).

According to the recommended setback distance of 50m from the sensitive heritage localities as shown in Chapter 4: Table 4.1 of this report, even the 1km nearest sites are still far away from the planned 2D seismic survey lines operations and are unlikely to be negatively impacted by the proposed once-off drive through 2D seismic survey operations.

Table 2.2: List of registered and known heritage sites within ±40km radius of PEL 93 area.

Number	Site name	GPS Coordinates	Description	Vulnerability
142	Lake Otjikoto	19°11'42.35"S / 17°32'59.27"E	Repository of WWI ammunition by German Forces & Sacred site for pre-colonial population.	No, site located over 30km from PEL 93
013/1951	Baobab Tree (No. 1063)	18°53'10.54"S/ 18°19'37.84"E	Sacred site associated with San tradition.	No, site located over 50km from PEL 93
OSHI 64	Ndonga Trading Tree	19°1'44.53" S 17°33'02.90" E	Ndonga traders would walk a distance of around 280km to Otjikoto Lake and then light a fire next to the tree to inform the Hai//kom of their arrival. They would then trade for copper ore and ostrich eggs. The copper ore would be smelted near the tree (as it was heavy to carry) and copper rods produced. Thick ones that would be used to make anklets and more narrow ones for arrow and spearheads cast. The rods would then be carried back to Ondonga in baskets.	No, site located 18km from PEL 93
OSHI 057	Lake Guinas	19°13'58.25"S/ 17°21'9.61"E	Natural Site	No, site located over 30km from PEL 93
OSHI 2	Onyayia	18°21'52"S/ 16°35'44"E	Area inhabited by San Communities who worked as messengers for Ndonga King.	No, site located 40km from PEL 93
OSHI 15 /1950	Namutoni Fort	18°48'34.29"S/ 16°56'24.52"E	Fort Namutoni presents a romantic image of German colonial power, even though this is not the original fort that was involved in the Battle of Namutoni in January, 1904 (which was abandoned by the Germans and then destroyed by the Ndonga forces).	No, site located 18km from PEL 93

Table 2.3: List of potential archaeological sites registered in surrounding areas of Oshivelo and within the PEL 93 area ±14km radius of 2D Seismic Survey Line.

Site No	GPS Coordinates	Name	Description	Geology	Vulnerability	Recommendation
1	18°37'2.24"S 17°38'11.50"E	Old Farm/Settlement	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	7km from 2D Seismic Line	Detailed assessment required
2	18°36'54.04"S/17°37'55.98"E	Lines of trees	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	7km from 2D Seismic Line	Detailed assessment required
3	18°37'54.53"S 17°23'42.05"E	Old Farm / Settlement	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	6km from 2D Seismic Line	Detailed assessment required
4	18°34'7.25"S/17°12'29.71"E	Old Settlement	Porous aquifer in Kalahari sandveld	Triassic	12km from 2D Seismic Line	Detailed assessment required
5	18°32'12.08"S/17°14'18.27"E	Old Settlement	Porous aquifer in Kalahari sandveld	Triassic	10km from 2D Seismic Line	Detailed assessment required
6	18°34'28.54"S/ 17°18'20.75"E	Old Settlement	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	10km from 2D Seismic Line	Detailed assessment required (No-Go)
7	18°31'57.29"S/17°14'30.88"E	Old Settlement	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	10km from 2D Seismic Line	Detailed assessment required (No-Go)
8	18°30'58.80"S/17°9'0.54"E	Old Settlement	Porous aquifer in Kalahari sandveld	Triassic	9km from 2D Seismic Line	Detailed assessment required (No-Go)
9	18°29'29.91"S/17°13'38.09"E	Old Settlement	Porous aquifer in Kalahari sandveld	Triassic	14km from 2D Seismic Line	Detailed assessment required
10	18°28'25.11"S/17°17'15.43"E	Old Settlement	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	12km from 2D Seismic Line	Detailed assessment required
11	18°29'55.89"S/ 17°15'31.10"E	Old Settlement	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	11km from 2D Seismic Line	Detailed assessment required
12	18°30'5.83"S/17°25'2.95"E	Old Settlement	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	7km from 2D Seismic Line	Detailed assessment required
13	18°26'51.69"S/17°25'48.29"E	Old Settlement	Porous aquifer in Kalahari sandveld	Quaternary and Tertiary periods	7km from 2D Seismic Line	Detailed assessment required

Table 2.4: Present heritage sites/areas within 1km radius of the proposed 2D seismic survey lines.

GPS Coordinates	Name /Area	Description	Recommendation
18°30'38.11"S 17° 4'27.65"E	King Kauluma village	The site was founded in 1990 shortly after independence after the King of Ondonga, King Immanuel Kauluma gave farm land to the Namibian returnee who initially based at the former army base used by SADF soldiers. Due to unemployment the site became small projects to help returnees who had a bakery and a small designated agriculture (Field Crop).	Highly sensitive No Go/ Avoid
18°29'59.14"S 17° 3'55.00"E	King Kauluma Cemetery	Burial ground for Namibian heroes and heroines	Highly sensitive No Go/ Avoid
18°29'20.67"S 17° 3'51.01"E	King Kauluma School	Former South West Africa Territorial Force (SWATF) Military Base. The entire area is still suspected to have unexploded ammunition including those recently de-mined in the school. Otherwise, further de-mining exercise is required. The area might also have buried historical ammunition including graves.	Highly sensitive and dangerous No Go/ Avoid Detailed Assessment
18°12'7.32"S 17° 8'32.09"E Or 18°11'60.00"S 17°12'60.00"E	Akazulu / Akadhulu	Sacred site / intermittent stream	Highly sensitive No Go/ Avoid
18°46'11.25"S 17°57'59.37"E	Tsintsabis Settlement	Former South West Africa Territorial Force (SWATF) Military Base. The entire settlement is still suspected to have unexploded ammunition including those recently de-mined. The settlement (30km radius) is also suspected to have burial grounds and old settlements for the San people.	Highly sensitive No Go/ Avoid Detailed Assessment
18.643720"S 17.177336"E	Alignment of Omuramba/ Owambo banks between Oshivelo and Tsintsabis	Likelihood of archaeological remains in form of burial grounds in or near old settlement in unmarked graves, sacred sites, ruins where a large population of Hai om lives today and near Mangetti West area populated mainly by //Khausis San	Highly sensitive Detailed Assessment

3. IMPACT ASSESSMENT RESULTS AND EMP FRAMEWORK

3.1 Likely Sources Impacts

The Environmental Assessment process undertaken for the proposed 2D seismic survey operations has taken into consideration the sensitivity of the receiving environment (physical, biological, socioeconomic and ecosystem) with respect to proposed activities associated with each implementation stage / step. The following is the summary of the likely sources of negative impacts on the receiving environment that have been evaluated during the EIA process with mitigation measures provided in this EMP Report:

- (i) Planning and mobilisation (Pre-survey preparation, field scouting and mapping of buffers and offsets along proposed survey lines).
- (ii) Base camp and fly-camps site setups and operations.
- (iii) Widening of existing tracks and farm fences access by pruning vegetation overgrowth and tracks levelling as may be applicable.
- (iv) Creating access across various farm fences and fixing of affected fences immediately after the survey / data acquisition drive through.
- (v) Creation of new access for current and possible future infill survey.
- (vi) Actual survey operation (data acquisition).
- (vii) Demobilisation and closure (Survey Completion), and.
- (viii) Any accidental event that may be associated with the routine and physical presence operational activities.

3.2 Likely Positive Impacts

Based on the results of the EIA report, the following is the summary of the key positive impacts that the proposed 2D seismic survey will have:

1. Payment of the annual license rental fees to the Central Government averaging N\$ 1.2 million per year and this is vital revenue streams for the State paid by all petroleum exploration companies in Namibia and for the benefit of all Namibians.
2. USD 50, 000.00 annual contributions to the Petroleum Training and Education Fund (PETROFUND) paid by all petroleum exploration companies in Namibia. The PetroFund provides local, regional, and international bursaries and scholarships to seventy (70) Namibians annually.
3. Expansion of the subsurface knowledge-base: The seismic survey data to be generated will be highly useful in the search for other subsurface resources such as minerals, water, geothermal and general geoscience research, and development.
4. The need for pruning and opening-up of some of the inaccessible sections of the tracks and roads to be used for the proposed 2D seismic survey operations will provide temporary employment opportunities for the local people for periods of between 3-4 months.
5. The pruning and opening-up of some of the inaccessible sections of the tracks and roads to be used for the proposed 2D seismic survey operations will improve access and connect local communities.
6. The pruning and levelling of the tracks and roads for the survey lines running along existing tracks oriented in the north-south and east-west directions along the boundaries of the large-

scale agricultural commercial farming units on communal land and along commercial farms will improve access to the farming units and greatly benefit the local farmers in their quest to reach markets for their livestock and produce, and.

7. Although forest fire kills diseases and insects that prey on trees and keeps the forest healthy and provides valuable nutrients that enrich the soils, uncontrolled wildfires are enormously destructive to the rural livelihoods, the creation of new cutting lines with the approval of the local farmers / land owners may positively contribute to forest and local farm management strategies that will prevent uncontrolled wildfires and will protect the natural resources base of the local people. Such rural resources base include: Wild fruits, timber, firewood, building logs, thatch grass, crop fields and crop production as well as pasture and livestock production areas. However, the creation of the new cutlines along the large-scale agricultural commercial farming units on communal land and commercial farms shall take into consideration the concerns, priorities and existing knowledge and practices of the local people / land owners.

Chapter 6, Tables 6.3- 6.11 of the EIA Report summarises the impact assessment results associated with positive impacts linked to the socioeconomic benefits covering payment of license fees, training contribution to the PetroFund employment, improved social services, training and skills transfer and boost to local economies.

3.3 Likely Negative Positive Impacts

3.3.1 Summary Overview

Based on the findings of the EIA Process, the following is the summary of the key likely negative environmental impacts that the proposed 2D seismic survey operations may have on the receiving environment with mitigation measures provided in this EMP Report:

1. Disruption / disturbance of the habitats.
2. Reptiles.
3. Amphibian.
4. Mammals.
5. Avian.
6. Tree and shrub species.
7. Grass.
8. Socioeconomic environment.
9. Existing infrastructure, current and future land uses.
10. Ecosystem functions, services, use values and non-use or passive use.
11. Physiography and geology.
12. Visual and land degradation.
13. Surface and groundwater quality.
14. Increased water consumption / depletion of water resources.
15. Existing local community water supply infrastructure along the proposed survey lines (existing roads and tracks).

16. Community and workers security, public safety, Occupational Health, and Safety.
17. Noise and vibrations.
18. Dust and air quality.
19. Waste (solid and liquid) management.
20. Accidental events.
21. Archaeological, paleontological, and historical resources.
22. Contributions to global Climate Change, and.
23. Cumulative impacts.

The above list of receptors of the receiving environment likely to be negatively impacted by the activities of the proposed 2D seismic survey operations in PEL 93 have been reevaluated during the EIA process of preparing the EIA Report (Chapter 6, Tables 6.12-6.23, and Tables 6.25-6.35 with mitigation measures for significant negative impacts provided in this EMP Report.

3.3.2 Overall Impact Individual Components Assessment Results

The overall impact assessment of the individual components of the receiving environment covered the magnitude, duration, extent, and probability of the potential impacts due to the proposed 2D seismic survey activities interacting with the various components of the receiving environment as presented in the form of a matrix table shown in Table 3.1. The overall assessment is based on the grading of the impact assessment results of the individual positive and negative components of the receiving environment as shown in the EIA Report Chapter 6, Tables 6.3- 6.11 (positive impacts) and Tables 6.12-6.23 and Tables 6.25-6.35 (negative impacts).

The overall severity of potential environmental impacts of the proposed 2D seismic survey activities on the receiving environment will be of low magnitude, temporally duration, localised extent, and low probability of occurrence due to the limited scope of the proposed activities and the use of step progression approach in advancing exploration process with each major step requiring a new environmental assessment process. The standard resources step by step approach to exploration represented by the proposed 2D seismic survey operations will allow the Proponent to continuously review and update the various components of the receiving environment as may be applicable against the results of the exploration success. The implementation of the subsequent stage/s of exploration will be subject to the positive outcomes of previous exploration efforts.

3.3.3 Assessment Results of the Overall Significant Impacts

The results of the overall significant impacts depended upon the degree to which the proposed 2D seismic survey activities are likely to result in unwanted consequences on the receptors. Overall, the assessment of significant impacts has focused on the ecosystem-based approach that considers potential impacts to the overall ecosystem. The main key sources of impacts that have been used in the determination of significant impacts are all the activities associated with the proposed 2D seismic survey operations covering the following key areas:

- ❖ Positive impacts are classified under a single category; they are then evaluated qualitatively with a view to their enhancement, if practical.
- ❖ Negligible or low impacts will require little or no additional management or mitigation measures (on the basis that the magnitude of the impact is sufficiently small, or that the receptor is of low sensitivity), and.

- ❖ Medium or high impacts require the adoption of management or mitigation measures to limit or reduce the impact to an acceptable level.

Overall, the results of the significant impacts assessment summary for the proposed 2D seismic survey are shown in Tables 3.2 and based on the results of detailed assessments presented in the EIA Report Chapter 6, Tables 6.12-6.23, and Tables 6.25-6.35. It is important to note that the assessment of the likely impacts as shown in Tables 6.3-6.34 in the EIA Report, have been considered without the implementation of mitigation measures detailed in EMP Report. The need for implementation of the appropriate mitigation measures as presented in this EMP Report have been determined based on the significance of the identified impacts as detailed in the EIA Report Chapter 6, Tables 6.12-6.23, and Tables 6.25-6.35 and the results of the significant impacts summary are provided in Table 3.2.

3.3.4 Summary of the EIA Conclusions

The findings of the EIA Report concluded that, all human induced activities including the current land uses such as subsistence agriculture, animal husbandry, natural resource harvesting, conservation, and tourism and the proposed 2D seismic survey operations, have the potential to cause negative consequences on the receiving physical, biological, socioeconomic, cultural, and archaeological environments. By identifying the most important sensitivity components of the receiving environment including high risk habitats beforehand, coupled with environmentally acceptable recommendations (mitigating measures as detailed in this EMP), the overall negative impacts are likely to be minimised, while the positive impacts may be enhanced.

Receptors likely to be negatively impacted at a local scale and especially during the creation any new cutlines as may be approved or requested by the land owners are: Habitats, reptiles, amphibians, mammals, avian, tree, shrub species and grass. The actual sites where expansion of the new cutlines are envisaged would be permanently altered. This however, would be relatively small area(s) with localised implications. The areas adjacent the routes and other associated infrastructure should not be significantly affected. The likely limited negative impacts would include dust, noise, light, and other associated disturbances in the area, but be limited to the access clearing and seismic activity periods. This however, would depend on control over the contractors during the process of cutting the cutlines, but should be limited to localised implications.

A typical weight drop would have a peak force output of 860,000lbs (~430,000kg) at baseplate with an impulse frequency of 300Hz and a maximum cycle time of 10 seconds (Explorer 860 technical overview). A vibroseis truck such as a Nomad will have a wide range of frequency bands ranging from 0-250 Hz. The use of either the Explorer 860 or Vibroseis as the source of energy is unlikely to affect the local fauna. The operational frequencies can be pre-set to avoid any interferences with the receiving local environment such as the elephants known to have communication frequency ranges of between 15-35Hz, far below the survey frequencies. Hence, an insignificant interference (Fig. 3.1). Ground motion caused by an onshore seismic survey vibration is generally barely perceivable (Teasdale et, al., 2006). The further away one is from the source, the less one would feel the vibration. Studies have shown that common household activities such as hammering a nail into a wall or construction site soil compactions or rock breaking processes would cause more vibration to a house than a typical seismic truck operating in the area. Studies have shown that noise and vibration may interfere with elephant's vocalisation only when the noise and vibration have the same frequencies as that of the elephant.

Overall, the Proposed 2D seismic survey will have limited high positive impacts on the socioeconomic environment at national, regional and community levels. The overall severity of potential negative environmental impacts of the proposed 2D seismic survey activities on the receiving environment will likely be of low magnitude, temporally duration, localised extent, and low probability of occurrence due to the limited scope of the proposed activities to be conducted along existing roads, farm fence boundaries and tracks with new cutlines to be created only on request or approval by the land owners. Mitigation measures have been recommended and are contained in a separate EMP Report for the proposed project. Through the effective implementation and monitoring of the recommended mitigation measures, the overall likely negative impacts of the proposed 2D seismic survey activities on the receiving environment (physical, socioeconomic, and biological) will likely be low and localised with negligible significant impact.

Energy Source

Energy Wave

Receiving Environment

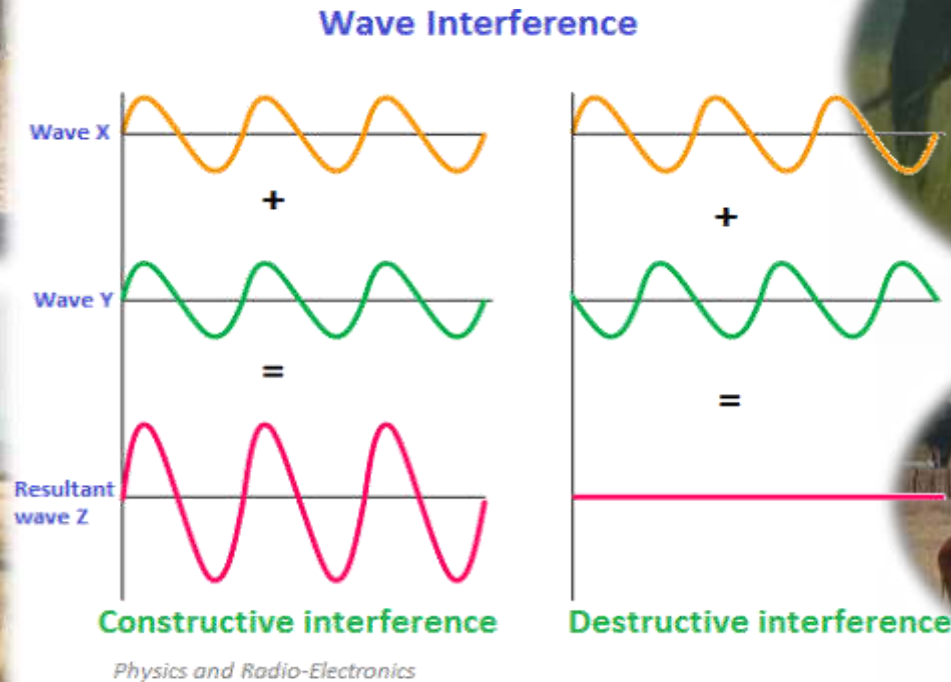


Figure 3.1: Illustration of the principle of linear superposition, the waves will reinforce each other, or add up and will undergo constructive interference and thus affect elephant vocalisation. On the other hand, if two waves superimpose with each other in opposite phase, the amplitude of the resultant is equal to the difference in amplitude of individual waves, resulting in the minimum intensity of the wave. This is known as destructive interference and thus will produce a negligible effect on elephant vocalisations. It is very important to note that the waves generated by a 2D seismic survey are different from the earthquake created seismic waves. Earthquake generated seismic waves have periods, and wavelength that are in minutes and kilometres, respectively, while the 2D seismic survey operations produces waves with periods, and wavelength of tenths of a second and tens of a meter respectively.

Table 3.1: Summary results of the overall likely impacts of the proposed 2D seismic survey activities on the individual components of the receiving environment with respect to duration, geographical extent, and probability occurrence.

RECEIVING ENVIRONMENT SENSITIVITY			PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT							
			Water Quality	Physical Infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Subsistence Agriculture	Community forest	Tourism and Recreation	Cultural, Biological and Archaeological Resources			
SENSITIVITY RATING	CRITERIA																				
1	Negligible	The receptor or resource is resistant to change or is of little environmental value.																			
2	Low	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance.																			
3	Medium	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance.																			
4	High	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental or social value, or is of district/regional importance.																			
5	Very High	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance.																			
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	1.	Planning and mobilisation (Pre-survey preparation, field scouting and mapping of buffers and offsets along proposed survey lines)	2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	1	1	
		2.	Base camp and fly-camps site setups and operations	2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	1	1
		3.	Widening of tracks by pruning vegetation overgrowth and tracks levelling as may be applicable	2	2	2	2	2	1	2	1	3	2	2	2	2	2	2	2	1	1
		4.	Creation of new access especially cutting of new cutlines to be used for data acquisition	2	2	2	2	2	1	3	3	3	2	2	2	2	2	2	2	1	1
		5.	Actual survey operation (data acquisition).	2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	1	1
		6.	Demobilisation and closure (Survey Completion)	2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	2	1	1
	UNPLANNED ACCIDENTAL EVENTS	7.	Any accidental event that may be associated with the routine and physical presence operational activities	2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	1	1	

Table 3.2: Summary results of the overall likely significant impacts that the proposed 2D seismic survey activities will have on the components of the receiving environment with respect to duration, geographical extent, and probability occurrence.

IMPACT SEVERITY <small>Magnitude, Duration, Extent, Probability</small>		RECEPTOR CHARACTERISTICS (SENSITIVITY)					PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT							
		Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)	Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional, and national socioeconomic settings	Subsistence Agriculture	Community forest	Tourism and Recreation	Cultural, Biological and Archaeological Resources		
Very High (5)		Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2 /5]	Minor 1/5																		
High (4)		Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]																		
Medium (3)		Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]																		
Low (2)		Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]																		
Negligible (1)		Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]																		
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	1.	Planning and mobilisation (Pre-survey preparation, field scouting and mapping of buffers and offsets along proposed survey lines)	2/2	2/2	2/2	2/2	2/2	2/2	1/2	2/2	1/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/2	1/2			
		2.	Base camp and fly-camps site setups and operations	2/2	2/2	2/2	2/2	2/2	2/2	1/2	2/2	1/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/2	1/2		
		3.	Widening of tracks by pruning vegetation overgrowth and tracks levelling as may be applicable	2/2	2/2	2/2	2/2	2/2	2/2	1/2	2/2	1/2	3/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/2	1/2		
		4.	Creation of new access especially cutting of new cutlines to be used for data acquisition	2/2	2/2	2/2	2/2	2/2	2/2	1/2	2/2	3/2	3/3	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/2	1/2		
		5.	Actual survey operation (data acquisition).	2/2	2/2	2/2	2/2	2/2	2/2	1/2	2/2	1/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/2	1/2		
		6.	Demobilisation and closure (Survey Completion)	2/2	2/2	2/2	2/2	2/2	2/2	1/2	2/2	1/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/2	1/2		
	UNPLANNED ACCIDENTAL EVENTS	7.	Any accidental event that may be associated with the routine and physical presence operational activities	2/2	2/2	2/2	2/2	2/2	1/2	2/2	1/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/2	1/2			

3.4 Implementation of EMP

3.4.1 Objectives of this EMP

This EMP provides a detailed plan of action required in the implementation of the mitigation measures for minimising and maximising the identified negative and positive impacts, respectively. This EMP gives commitments including financial and human resources provisions for effective management of the likely environmental liabilities during and after the exploration. Regular assessments and evaluation of the environmental liabilities before, during and after the implementation of the proposed 2D infill seismic survey operations will need to be undertaken and will ensure adequate provision of the necessary resources towards good environmental management and improve local community and stakeholders relations.

3.4.2 Supporting Documents

The Contractor who will be undertaking the proposed 2D seismic survey operation will be required to prepare a comprehensive Health, Safety and Environment (HSE) operational standards, manuals, and policies for approval by Proponent. The following HSE Contractor documentations will be required and will link directly to this EMP framework as well as the sustainability, health, safety, environment, and social governance documentations of the Proponent:

1. Bridging Document.
2. HSE Management Manual.
3. Project HSE Plan.
4. Waste Management Plan.
5. Journey Management Plan.
6. Working with local communities guideline.
7. Grievance Mechanism, and.
8. Cultural Heritage Procedure.

3.4.3 Roles and Responsibilities

3.4.3.1 Overview

This EMP report identifies the activity groups / environmental elements, the aspects / targets, the indicators, the schedule for implementation and who should be responsible for the management to prevent major impacts that the different exploration activities may have on the receiving environment (physical, biological, and socioeconomic, cultural, and archaeological).

3.4.3.2 Proponent's Representative (PR) / Project Manager (PM)

The Proponent is to appoint a **Proponent's Representative (PR) / Project Manager (PM)** with the following responsibilities with respect to the EMP implementation:

- ❖ Act as the site project manager and implementing agent.
- ❖ Ensure that the Proponent's responsibilities are executed in compliance with the relevant legislation.

- ❖ Ensure that all the necessary environmental authorizations and permits have been obtained.
- ❖ Assist the exploration contractor/s in finding environmentally responsible solutions to challenges that may arise.
- ❖ Should the PR believe a serious threat to, or impact on the environment may be caused by the exploration activities, he/she may stop work. the Proponent shall be informed of the reasons for the stoppage as soon as possible.
- ❖ The PR has the authority to issue fines / contractual penalties / disciplinary proceedings in accordance with the national laws for transgressions of basic conduct rules and/or contravention of this EMP.
- ❖ Should the Contractor or his/her employees fail to show adequate consideration for the environmental aspects related to the EMP, the PR can have person(s) and/or equipment removed from the site or work suspended until the matter is remedied.
- ❖ Maintain open and direct lines of communication between the landowners and Proponent, as well as any other identified Interested and Affected Parties (I&APs) with regards to environmental matters, and.
- ❖ Attend regular site meetings and inspections as may be required for the proposed exploration programme.

3.4.3.3 Project Health, Safety and Environment (Project HSE)

The Proponent is to appoint a Project Health, Safety and Environment (Project HSE) with the following responsibilities with respect to the EMP implementation:

- ❖ Assist the PR in ensuring that the necessary environmental authorizations and permits have been obtained.
- ❖ Assist the PR and Contractor in finding environmentally responsible solutions to challenges that may arise.
- ❖ Conduct environmental monitoring as per EMP requirements.
- ❖ Carry out regular site inspections (on average once per week) of all exploration areas with regards to compliance with the EMP Report and report any non-compliance(s) to the PR as soon as possible.
- ❖ Organize for an independent internal audit on the implementation of and compliance to the EMP to be carried out half way through each field-based exploration activity. Audit reports to be submitted to the PR.
- ❖ Continuously review the EMP and recommend additions and/or changes to the EMP document.
- ❖ Monitor the Contractor's environmental awareness training for all new personnel coming onto site.
- ❖ Keep records of all activities related to environmental control and monitoring. The latter to include a photographic records of the exploration activities, rehabilitation process, and a register of all major incidents, and.
- ❖ Attend regular site meetings.

3.4.3.4 Contractors and Subcontractors

The responsibilities of the **Contractors and Subcontractors** that may be appointed by the Proponent to undertake certain field-based activities of the proposed 2D seismic survey operations include:

- ❖ Comply with the relevant legislation and the EMP provision.
- ❖ Preparation and submission to the Proponent through the Project HSE of the following Management Plans:
 - Environmental Awareness Training and Inductions.
 - Emergency Preparedness and Response.
 - Waste Management, and.
 - Health and Safety.
- ❖ Ensure adequate environmental awareness training for senior site personnel.
- ❖ Environmental awareness presentations (inductions) to be given to all site personnel prior to work commencement. the Project HSE is to provide the course content and the following topics, at least but not limited to, should be covered:
 - The importance of complying with the EMP provisions.
 - Roles and Responsibilities, including emergency preparedness.
 - Basic Rules of Conduct (Do's and Don'ts).
 - EMP: aspects, impacts and mitigation.
 - Fines for Failure to Adhere to the EMP, and.
 - Health and Safety Requirements.
- ❖ Record keeping of all environmental awareness training and induction presentations, and.
- ❖ Attend regular site meetings and environmental inspections.

4. SPECIFIC MITIGATION MEASURES

4.1 Hierarchy of Mitigation Measures Implementation

A hierarchy of methods for mitigating significant adverse effects has been adopted in order of preference and as follows:

- (i) Enhancement, e.g. provision of new habitats.
- (ii) Avoidance, e.g. sensitive design to avoid effects on ecological receptors.
- (iii) Reduction, e.g. limitation of effects on receptors through design changes, and.
- (iv) Compensation, e.g. community benefits.

4.2 Survey Setback Distances / Exclusion Zones (Buffers)

Namibia does not have specific regulations or guidelines on setback distances from specified infrastructures or sensitive environment with respect to onshore seismic survey operations. As international operator, Proponent shall adopt the Alberta Government of Canada Distance Requirements Exploration Directive 2006-15 as shown in Table 4.1 as well as additional guidelines as provided by the International Association of Geophysical Contractors (IAGC).

The setback distances as shown in Table 4.1 were used for the completed Phase I 2D seismic survey with examples of the pre-survey field-based mapped setback distances shown Fig. 4.1. The setback distance guidelines as shown in Table 4.1 will be used for the proposed 2D seismic survey with respect to the non-explosive column guidance shown in red because the Proponent is going to use the Explorer 860 as the energy source.

In addition to the setback distances as shown in Table 4.1, the precautionary principles / approaches shall always be exercised especially in situations where specific mitigations, regulatory guidelines, standards, or appropriate setback distances (exclusion zones) around mud houses or sensitive local cultural resources such as burial or cultural sites have not been provided.

Local communities shall always be consulted on matters related to sensitive local cultural resources not provided for in the international guidelines / standards.

4.3 Creation of New Cutlines

Although forest fire kills diseases and insects that prey on trees and keeps the forest healthy and provides valuable nutrients that enrich the soils, uncontrolled wildfires can also be enormously destructive to the rural livelihoods.

The cutting of the possible 105 km long of new cutlines through the commercial and communal farmland may contribute to the local land management strategies that prevents uncontrolled wildfires and will protect the natural resource base of the rural communities in region. Such natural resource base likely to be protected include: Livestock production, crop fields, pasture areas, timber, firewood, building logs, thatch grass, biodiversity, and wild fruits.

However, the integration of possible new cutlines as one of the fire management strategies or need for new access for inaccessible areas shall take into consideration the concerns, priorities and existing knowledge and practices of the local people and farmers. Such new cutlines may only be created on approval of the local land owners / community. MEL, land owners and local communities shall all be fully involved in creation of any new cutlines and use as survey lines thereof.

Table 4.1: Red column setback distances to specified structures to be applied and used for the proposed 2D seismic survey operations (Source: Distance Requirements Exploration Directive 2006-15, Alberta Government, Canada).

Table of Required Setback Distances to Specified Structures		Explosive		Non-Explosive
Specified Structure	Charge Size	Distance	Distance	
Residence, barn, or any building(s) with a concrete base, concrete irrigation structures (e.g., drop structures, head works); concrete lined irrigation canals, and concrete water pipelines.	Up to and including 12 kg	180 m	50 m	
	> 12 kg <= 20	200 m		
Water wells, developed spring, observation well, or piezometer.	Up to and including 12 kg	180 m	100 m	
	> 12 kg <= 20	200 m		
High Pressure Pipelines High pressure pipelines are pipelines that operate at, or are intended to operate at a pressure in excess of 700 kilo pascals or less. Note: All distances are measured from the centre of the pipeline.	<= 2 kg	32 m	15 m	
	> 2 & < 4 kg	45 m		
	>= 4 & < 6 kg	55m		
	>= 6 & < 8 kg	64 m		
	>= 8 kg & < 10 kg	70 m		
	>= 10 & < 12 kg	78 m		
	>= 12 kg <= 20 kg	100 m		
Low Pressure Pipelines Low pressure pipelines are pipelines that operate at, or are intended to operate at a pressure of 700 kilo pascals or less. Note: All distances are measured from the centre of the pipeline.	Up to and including 20 kg	3 m	3 m	
Dugouts Measured from the inside edge of high water mark.		50 m	25 m	
Irrigation Canal (other than concrete lined) Irrigation canals that are more than 4 m wide.		10 m	10 m	
Buried Water Pipelines (other than concrete lined)		3 m	3 m	
Dams Dam means a barrier constructed and having a storage reservoir capacity of at least 30,000 m ³ , and which is at least 2.5 m in height when measured vertically to the top of the barrier.		180 m	50 m	
Cemetery Distance to the energy source is measured to the surveyed boundary of the cemetery.		100 m	50 m	
Buried Lines and Survey Monuments Telephone lines and telecommunications lines.		2 m	2 m	
Domestic Septic Tank or Mound A septic tank is defined as a tank that is used as septic storage device. A mound is a septic storage device that is located above ground surface.		15 m	15 m	

Table of Reduced Setback Distance to Specified Structures with Written Consent of the Owner of the Structures		Explosive		Non-Explosive
Specified Structure	Charge Size	Distance	Distance	
Residence, barn, or any building(s) with a concrete base, concrete irrigation structure (e.g., drop structures, head works), concrete-lined irrigation canals, and concrete water pipelines.	<= 2 kg	64 m	50 m	
	> 2 & 4 kg	90 m		
Water wells, developed springs, observation wells, or piezometer.	>= 4 & < 6 kg	110 m		
	>= 6 & < 8 kg	128 m		
	>= 8 & < 10 kg	142 m		
	>= 10 & 12 kg	156 m		

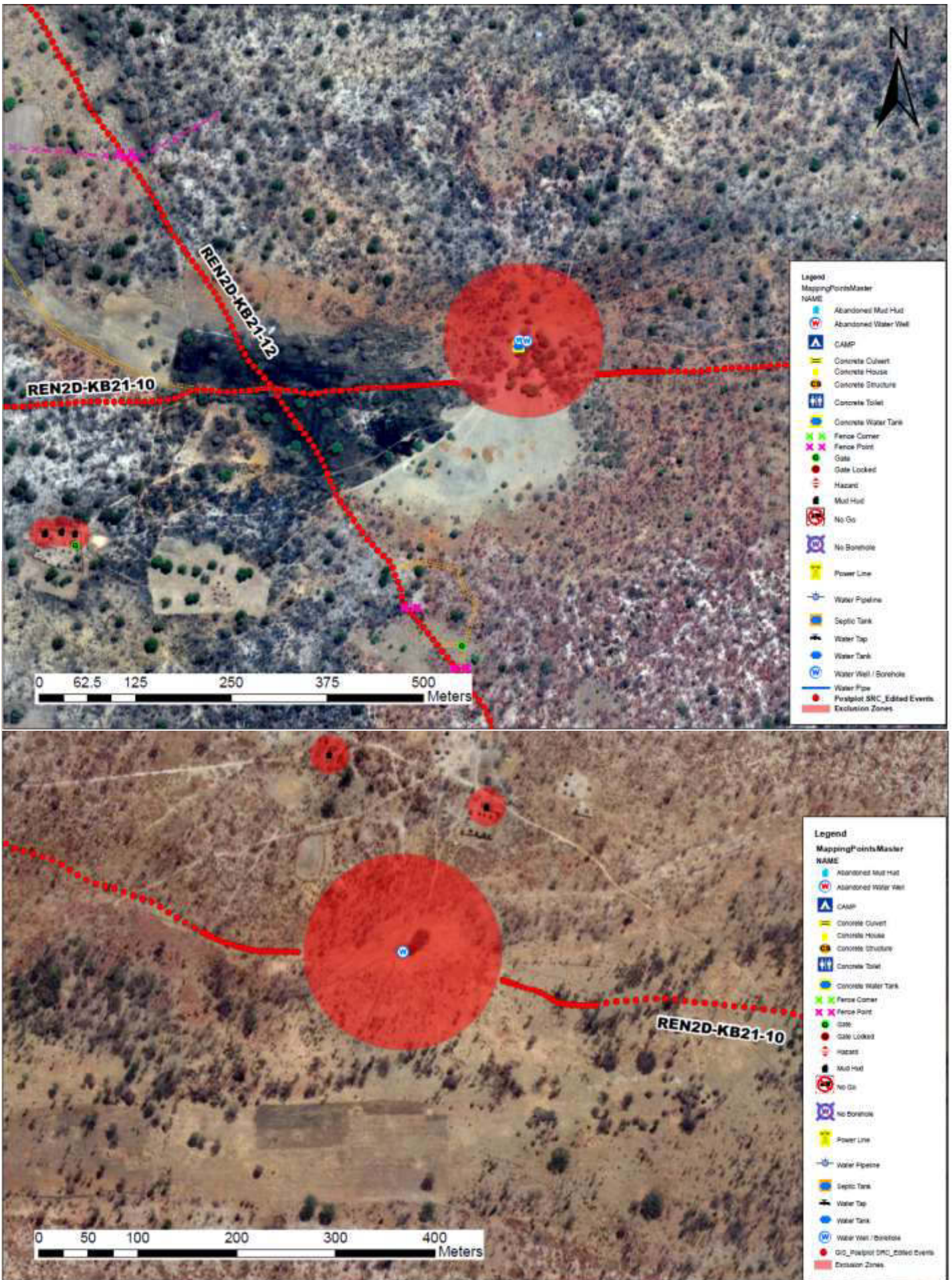


Figure 4.1: Example of the pre-survey field-mapped setback distances / buffer zones used for the Phase I 2D seismic survey operations (Source: REN, 2021).

4.4 Specific Mitigation Measures

Based on the findings of the impact assessment process as described in the EIA Report, Table 4.2–4.25 provides the detailed specific mitigation measures to be implemented by the Proponent with respect to the proposed 2D seismic survey operations. The following is the summary of the key areas of the migration measures provided in Tables 4.2-4.25 with respect to survey area, campsites, layover sites, survey locations and along the survey lines:

1. Project planning and implementation.
2. Implementation of the EMP, roles and responsibilities with resources allocation.
3. Management of public and stakeholders relations and continuous community engagements.
4. Enhance positive socioeconomic impacts.
5. Environmental awareness briefing and training.
6. Erection of infrastructure to support the proposed 2D seismic survey operations.
7. Use of existing access roads, tracks, and general vehicle movements with respect to fauna, flora, and habitat protection.
8. Proposed new cutlines through communal and commercial farmlands.
9. Preventing flora and ecosystem destruction and promotion of conservation.
10. Preventing faunal and ecosystem destruction and promotion of conservation.
11. Preservation of the receiving environment through effective environmental management practices.
12. Protection of surface and groundwater and water supply infrastructure protection.
13. Promotion of effective general water usage.
14. Minimise negative socioeconomic impacts.
15. Minimise negative health and safety impacts.
16. Minimise visual impacts.
17. Management of sites and surrounding traffic and equipment movements.
18. Protection of sensitive receptors through setback distances and the precautionary principles.
19. Equipment / vehicles noise, vibrations, emissions influence on air quality and climate change.
20. Management of dust and influence on air quality / health receiving environment.
21. Spillages and accidental products or fuel leaks.
22. Waste (solid and liquid) management.
23. Rehabilitation plan, and.
24. Environmental performance monitoring and data collection.

Table 4.2: Project planning and implementation.

OBJECTIVE	INDICATOR	SCHEDULE	RESPONSIBILITY
<p>Establish a strong environmental awareness protocol from project implementation to final closure in order to ensure the least possible impact to the receiving environment.</p>	<ol style="list-style-type: none"> Resources (Human and Financial) are provided for the Environmental Awareness and Training, Regular Safety, Health and Environment meetings and for internal and external environmental monitoring costs as well as for any rehabilitation costs that may arise. Appointment of senior and experienced persons as Proponent's Representative (PR), Project Manager (PM) and Project HSE to assume responsibility for environmental issues. All individuals including sub-contractors who work on, or visit, the sites are aware of the contents of the Environmental Policy and the EMP. The EMP and Environmental Policy will be included in Tender Documents. Field visit will take place during which main access tracks will be discussed in cooperation with the land owner/s 	<ol style="list-style-type: none"> During planning and mobilisation (Pre-survey preparation) During setup and operation of camp sites setups During process of widening of tracks and creation of limited new access as may be applicable During actual data acquisition along the individual profiles / survey lines Demobilisation and Closure (Survey Completion) During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> Proponent's Representative (PR) Project Manager (PM) Project HSE Contractor Subcontractors

Table 4.3: Implementation of the EMP, roles and responsibilities with resources allocation.

IMPLEMENTATION STRATEGY	INDICATOR	SCHEDULE	RESPONSIBILITY
<ol style="list-style-type: none"> Define roles and responsibilities in terms of the EMP implementation and monitoring to make sure all personnel, contractors and subcontractors are aware of their roles and responsibilities to ensure compliance with the EMP provisions. Implement environmental management that is preventative and proactive. Establish the resources, skills, etc. required for effective environmental management and monitoring. 	<ol style="list-style-type: none"> Senior staff and senior contractors are aware of, EMP provisions and requirements. These persons shall be expected to know and understand the objectives of the EMP and will, by example, encourage suitable environmentally friendly behaviour to be always adopted at the campsites and along the survey lines Recognition will be given to appropriate environmentally acceptable behaviour. Inappropriate behaviour will be corrected. An explanation to why the behaviour is unacceptable shall be given, and, if necessary, the person will be disciplined. e.g., disciplinary procedure initiated for non-compliance 	<ol style="list-style-type: none"> During planning and mobilisation (Pre-survey preparation) During setup and operation of camp sites setups During process of widening of tracks and creation of limited new access as may be applicable During actual data acquisition along the individual profiles / survey lines Demobilisation and Closure (Survey Completion) During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> Proponent's Representative (PR) Project Manager (PM) Project HSE Contractor Subcontractors

Table 4.4: Management of public and stakeholders relations and continuous community engagements.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Maintain sound local community relationships and other stakeholders / public / Interested and Affected Parties (I&APs)	<ol style="list-style-type: none"> 1. Prior to the project team going to the field as part of the preparatory, implementation, operation, closure of the proposed 2D seismic survey operations, the local community shall be informed through the Governors and local Councillors or traditional leaders. 2. Project implementation updates shall be provided to the Competent Authority (MME) (Petroleum Commissioner), MEFT, Oshikoto Regional Governor and Councillors as well as Traditional Authority and local community as may be applicable 3. All applicable permits, certifications and consents shall be obtained before project implementations. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.5: Enhance positive socioeconomic impacts through Environment Social Governance (ESG).

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Effective management of socioeconomic benefits of the proposed project activities with direct links to Environment Social Governance (ESG)	<ol style="list-style-type: none"> 1. Proponent continues to pay license rental fees and contributions to the PeteoFund as well as delivering on ESG support to the local communities 2. Stipulate a preference for local contractors in its tender policy. Preference to local contractors should be based on competitive business principles and salaries and payment to local service providers should still be competitive. 3. Develop a database of local businesses that qualify as potential service providers and invite them to the tender process. 4. Stipulate that residents from the villages along the survey lines should be employed for temporary unskilled/skilled positions and where possible in permanent unskilled/skilled positions as they would reinvest in the local economy. 5. Must ensure that potential employees are from the area by recruiting with the help of the traditional authority 6. Must ensure that contractors adhere to Namibian Affirmative Action, Labour and Social Security, Health and Safety laws. This could be accomplished with a contractual requirement stipulating that monthly proof should be submitted indicating payment of minimum wages to workers, against their ID numbers, payment of social security and submission of affirmative action data. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.6: Environmental awareness briefing and training.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Promote effective environmental management through environmental awareness at the campsite and along the survey lines	<ol style="list-style-type: none"> 1. Conduct regular environmental awareness debriefing and training to all the camp site and field survey workers. 2. All visitors to the campsite or along the survey lines shall always be given environmental awareness debriefing 3. Every senior/supervisory member of the team shall familiarise themselves with the contents of the EMP. They shall understand their roles and responsibilities regarding personnel and project compliance with the EMP. 4. Subject to agreement of the parties, the Environmental Coordinator will hold an Environmental Awareness Briefing meeting, which shall be attended by all contractors before the start of the proposed 2D seismic survey operations. 5. Briefings on the EMP and Environmental Policy shall discuss the potential dangers to the environment of the following activities: public relations, littering, off-road driving, waste management, poaching and plant theft etc. The need to preserve soil, conserve water and implement water saving measures shall be presented. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.7: Creation of infrastructure to support the proposed 2D seismic survey.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
All proposed 2D seismic survey operations supporting infrastructure such as the camp site and other infrastructure as may be required along the survey lines to be installed in harmony with the receiving environment	<ol style="list-style-type: none"> 1. Adhere to the conditions of the Environmental Clearance Certificate (ECC) and any other additional permits 2. Obtain consent from the local land owner / surface rights holder/s 3. Always develop structures on already disturbed areas and with least disturbance to the environment and within the non-sensitive areas such as unused cleared fields for campsite and old tracks and wide paths for survey lines / tracks extensions 4. All on site exploration infrastructure (e.g. water tanks, sewage tanks, waste disposal) chemical toilets along survey lines are not situated on environmental sensitive area. 5. Put-up no littering signage around the campsites or along the survey lines 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.8: Use of existing access roads, tracks, and general vehicle movements with respect to fauna, flora, and habitat protection.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promote effective management of the receiving environment especially the habitats, fauna, flora, and overall ecosystem</p>	<ol style="list-style-type: none"> 1. Avoid unnecessarily affecting areas viewed as important habitat – i.e. Omuramba Owambo, Omuramba Omuthiya and other ephemeral drainage lines and pans, undeveloped areas and clumps of protected tree species 2. Avoid placing tracks/roads through sensitive areas – e.g. along ephemeral drainage lines and pans. Use existing access routes. This would minimise the effect on localised potentially sensitive habitats/fauna in the area. 3. Avoid felling protected tree species (especially large specimens and indigenous fruit trees – i.e. follow a meandering approach which avoids such species rather than straight lines). avoid dead trees (habitat to a variety of cavity dwellers – e.g. bats, geckos, hornbills, red-billed oxpeckers, etc.). avoid ephemeral pan areas. avoid vehicle activity within the ephemeral drainage lines, etc. as much as possible. 4. Prune overhanging branches, that may affect vehicle access, rather than removing the entire tree, especially for protected and fruit tree species. 5. Avoid driving randomly through the area (i.e. “track discipline”), but rather stick to permanently placed tracks/roads. This would minimise the effect on localised potentially sensitive habitats/fauna in the area. 6. Stick to speed limits of maximum 30km/h as this would result in fewer faunal road mortalities. Lower speeds would also minimise dust pollution. 7. Implement erosion control. – i.e. avoid constructing tracks within ephemeral drainage lines and pans. incorporate erosion furrows (runoff sites) and humps along tracks to channel water off the tracks to minimise erosion problems. cross drainage lines at right angles, etc. The area(s) towards & adjacent the drainage line(s) are easily eroded and further development may exacerbate this problem. Avoid construction within 100m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated flora and fauna. 8. Use of "3-point-turns" rather than "U-turns". 9. Where tracks have to be made to potential exploration sites off the main routes, the routes should be selected causing minimal damage to the environment – e.g. use the same tracks. cross drainage lines at right angles. avoid placing tracks within drainage lines. avoid collateral damage (i.e. select routes that do not require the unnecessary removal of trees/shrubs, especially protected species). 10. Before any trees or vegetation are removed protected species shall be identified and must not be removed. 11. Removal of protected flora will require permission form the Department of Forestry in the Ministry of Environment, Forestry and Tourism 12. Leave vehicles on tracks and walk to point of interest, when possible. 13. Rehabilitate all new tracks created. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent’s Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors 6. New cutlines: Local Community and / or Land Owners

Table 4.9: Proposed new cutlines through communal and commercial farmlands.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Creation of the proposed new cutlines through communal and commercial farmlands</p>	<ol style="list-style-type: none"> 1. Shall only be undertaken if approved by the land owner/s / local communities 2. The new cutlines shall be created if they contribute to the local land management strategies such as serving as firebreak or needed new access to connect inaccessible areas 3. Limit the development to actual new cutlines surveyed 3m wide area to be cleared and avoid affecting adjacent areas, protected and mature trees. 4. Do not remove unique and sensitive flora (e.g., <i>Baikiaea plurijuga</i> (Zambezi teak), <i>Burkea africana</i> (burkea), <i>Guibourtia coleosperma</i> (false mopane), <i>Pterocarpus angolensis</i> (kiaat), <i>Schinziophyton rautanenii</i> (manketti) and <i>Strychnos</i> species (monkey orange spp.). 5. Prevent and discourage the collecting of firewood as dead wood has an important ecological role – especially during the creation of the cutlines. Such collecting of firewood, especially for economic reasons, often leads to abuses – e.g., chopping down of live and/or protected tree species such as <i>Baikiaea plurijuga</i> (Zambezi teak), <i>Burkea africana</i> (burkea), <i>Guibourtia coleosperma</i> (false mopane), <i>Pterocarpus angolensis</i> (kiaat), <i>Schinziophyton rautanenii</i> (manketti) and <i>Strychnos</i> species (monkey orange spp.). 6. Attempt to avoid the removal of any bigger trees even if they are not part of the protected species during the new cutlines clearing phase(s) as these serve as habitat for a myriad of fauna. 7. Prevent and discourage fires – especially during the new cutlines clearing phase(s) – as this could easily cause runaway veld fires causing problems (e.g., loss of grazing & domestic stock mortalities, etc.) for the neighbouring communities. 8. Rehabilitation of the disturbed areas – i.e., initial development access route “scars” and associated tracks as well as temporary camp sites. Preferably workers should be transported in/out to the new cutlines clearing sites daily to avoid excess damage to the local environment (e.g., fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity, but also show true local commitment to the environment. 9. Eradicate – destroy – all invasive alien plants encountered on site – e.g., <i>Eucalyptus</i>, <i>Opuntia</i> & <i>Sisal</i> spp., etc. This would ensure that the spread is limited and show environmental commitment. 10. Educate/inform contractors and staff on protected species to avoid and the consequences of illegal collection of such species. 11. Investigate the idea of employing an Environmental Officer during the creation of the new cutlines to ensure compliance and minimise the overall impact on the flora and the environment. 12. Liaise with MEFT officials responsible for wildlife whilst working close to the national parks. 	<ol style="list-style-type: none"> 1. During planning and mobilisation 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of new cutlines 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent’s Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors 6. New cutlines: Local Community and / or land owners

Table 4.10: Preventing flora and ecosystem destruction and promotion of conservation.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Prevent flora and ecosystem destruction and promote conservation	<ol style="list-style-type: none"> 1. Limit the development to actual tracks/roads to be cleared and avoid affecting adjacent areas, especially the Omuramba Owambo, Omuramba Omuthiya and other ephemeral drainage lines and pans, throughout the entire area. 2. Avoid development and associated infrastructure in sensitive areas – e.g. Omuramba Owambo, Omuramba Omuthiya and other ephemeral drainage lines and pans and undeveloped areas. This would minimise the negative effect on the local environment especially unique features serving as habitat to various flora species. 3. Do not remove unique and sensitive flora (e.g. all <i>Aloe</i> spp., etc.) 4. Prevent and discourage the collecting of firewood as dead wood has an important ecological role – especially during the during the track/road building phase(s). Such collecting of firewood, especially for economic reasons, often leads to abuses – e.g. chopping down of live and/or protected tree species such as <i>Baikiaea plurijuga</i> (Zambezi teak), <i>Burkea africana</i> (burkea), <i>Guibourtia coleosperma</i> (false mopane), <i>Pterocarpus angolensis</i> (kiaat), <i>Schinziophyton rautanenii</i> (manketti) and <i>Strychnos</i> species (monkey orange spp.). 5. Do not remove bigger trees during the track/road clearing phase(s) as these serve as habitat for a myriad of fauna. Avoid the destruction of larger trees associated with the ephemeral drainage lines. 6. Prevent and discourage fires – especially during the track/road clearing phase(s) – as this could easily cause runaway veld fires causing problems (e.g. loss of grazing & domestic stock mortalities, etc.) for the neighbouring communities. 7. Rehabilitation of the disturbed areas – i.e. initial development access route “scars” and associated tracks as well as temporary camp sites. Preferably workers should be transported in/out to the track/road clearing sites on a daily basis to avoid excess damage to the local environment (e.g., fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity, but also show true local commitment to the environment. 8. Eradicate – destroy – all invasive alien plants encountered on site – e.g. <i>Eucalyptus</i>, <i>Opuntia</i> & <i>Sisal</i> spp., etc. This would ensure that the spread is limited and show environmental commitment. 9. Educate/inform contractors and staff on protected species to avoid and the consequences of illegal collection of such species. 10. Investigate the idea of employing an Environmental Officer during the track/road building phase(s) to ensure compliance and minimise the overall impact on the flora and the environment. 11. Liaise with MEFT officials whilst working close to the national parks. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent’s Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors 6. New cutlines: Local Community and / or Land Owners

Table 4.11: Preventing faunal and ecosystem destruction and promotion of conservation.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Prevent faunal and ecosystem destruction and promote conservation	<ol style="list-style-type: none"> 1. Limit the development to actual tracks/roads to be cleared and avoid affecting adjacent areas, especially the Omuramba Owambo, Omuramba Omuthiya and other ephemeral drainage lines and pans and undeveloped areas. 2. Avoid development and associated infrastructure in sensitive areas – e.g. Omuramba Owambo, Omuramba Omuthiya and other ephemeral drainage lines and pans and undeveloped areas. This would minimise the negative effect on the local environment especially unique features serving as habitat to various vertebrate fauna species. 3. Remove (e.g. capture) unique fauna and sensitive fauna (e.g. tortoises, monitor lizard) before commencing with the development activities and/or species serendipitously located during this period and relocate to undisturbed sites in the immediate area. 4. Prevent and discourage the setting of snares (poaching), illegal collecting of veld foods (e.g. tortoises, etc.), indiscriminate killing of perceived dangerous species (e.g. snakes, etc.) and collecting of wood as this would diminish and negatively affect the local fauna – especially during the fieldwork phase(s). 5. Attempt to avoid the removal of bigger trees during the track clearing phase(s) as these serve as habitat for a myriad of fauna. Rather prune branches affecting access only. 6. Prevent and discourage fires – especially during the track clearing phase(s) – as this could easily cause runaway veld fires affecting the local fauna, but also causing problems (e.g. loss of grazing & domestic stock mortalities, etc.) for the neighbouring communities. 7. Rehabilitation of the disturbed areas – i.e. initial development access route “scars” and associated tracks as well as temporary camp sites. Preferably workers should be transported in/out to the track clearing sites on a daily basis to avoid excess damage to the local environment (e.g. fires, wood collection, poaching, etc.). Such rehabilitation would not only confirm the company’s environmental integrity, but also show true local commitment to the environment. 8. Prevent domestic pets – e.g. cats and dogs – accompanying the workers during the track clearing phase(s) as cats decimate the local fauna and interbreed & transmit diseases to the indigenous African wildcat found in the area. Dogs often cause problems when bonding on hunting expeditions thus negatively affecting the local fauna. The indiscriminate and wanton killing of the local fauna by such pets should be avoided at all costs. 9. Initiate a suitable waste removal system (i.e. remove to waste disposal site of safe storage site and not store on site) as this often attracts wildlife – e.g. jackals, crows, etc. – which may result in human-wildlife conflict issues. 10. Educate/inform contractors and staff on protected species to avoid and the consequences of illegal collection of such species. 11. Investigate the idea of employing an Environmental Officer during the track clearing phase(s) to ensure compliance and minimise the overall impact on the fauna and the environment. 12. Liaise with MEFT officials whilst working close to the national parks. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent’s Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.12: Preservation of the receiving environment through effective environmental management practices.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of conservation and effective environmental management through preservation of the receiving environment around the campsites, temporary layover sites and along each of the survey lines</p>	<ol style="list-style-type: none"> 1. Select camp sites and other temporary layover sites along the survey lines with care – i.e. avoid important habitats (e.g. raptor breeding sites, pans). 2. Use portable chemical toilets or suitable portable system to avoid faecal pollution at the temporary campsites. 3. Use portable chemical toilets to avoid faecal pollution at temporary layover sites and along each of the proposed 2D seismic survey lines. 4. Initiate a suitable and appropriate refuse removal policy at the campsite and along the survey lines as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios for the local community and visitors– e.g. baboon, black-backed jackal, crows, etc.. 5. Avoid and/or limit the use of unnecessary extremely brighter spot lights at the campsites as this could influence and/or affect various nocturnal species – e.g. bats and owls, etc. Use focused lighting for least effect. 6. Prevent the killing of species viewed as dangerous – e.g. various snakes – when found around the campsites or along the survey lines. 7. Prevent the setting of snares for ungulates (i.e. poaching) or collection of veld foods (e.g. tortoises, monitor lizard) and unique plants (e.g. <i>Harpagophytum procumbens</i>) or any form of illegal hunting activities. 8. Avoid introducing dogs and cats as pets to camp sites or along the survey lines as these can cause significant mortalities to local fauna (cats) and even stock losses (dogs). 9. Remove and relocate slow moving vertebrate fauna (e.g. tortoises, chameleon, snakes, etc.) to suitable habitat elsewhere in the general area. 10. Avoid the removal and/or damaging of protected flora potentially occurring in the general area – e.g. various <i>Baikiaea plurijuga</i>, <i>Pterocarpus angolensis</i>, etc. Removal of protected plants can only be done with permission from the Department of Forestry in the MEFT 11. Avoid introducing ornamental plants, especially potential invasive alien species, as part of the landscaping of the camp sites, etc., but rather use localised indigenous species, should landscaping be attempted, which would also require less maintenance (e.g. water). 12. Remove all invasive alien species wherever encountered – e.g. <i>Prosopis</i> spp. This would not only indicate environmental commitment, but actively contribute to a better landscape. 13. Rehabilitate all areas disturbed by the exploration activities – i.e. campsites, tracks and layover sites along the survey lines etc.. 14. Ensure that adequate firefighting equipment (e.g. fire beaters, extinguishers, etc.) is available at camp sites, layover sites and along the survey lines to manage any accidental fires . 15. Liaises with MEFT officials whilst working close to national parks 16. Employ an independent environmental auditor to ensure compliance, especially of the rehabilitation of all the affected areas. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.13: Protection of surface and groundwater and water supply infrastructure protection.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Effective management / protection of surface, groundwater resources and water supply infrastructure</p>	<ol style="list-style-type: none"> 1. Review the groundwater hydrocensus baseline data sets prior to the implementation of the proposed survey. Typical groundwater information collected includes rest water levels, pumping regimes, water demand, rate of abstraction and of course water quality. To have greater transparency on the water monitoring activities, the affected landowners / farmers/ local community shall be given access to the results of the water monitoring analyses. 2. Select strategic boreholes for groundwater monitoring network. These boreholes shall be monitored over time to determine the impact of operations surrounding the exploration activities. 3. Limit the operation to a specific site and avoid sensitive areas and in particular the Ephemeral River Channel along the survey lines. This would sacrifice the actual area for other adjacent Ephemeral River areas and thus minimise any likely negative effect on water resources. 4. Disposal of wastewater into any public stream is prohibited. 5. Pits for disposal of domestic and sanitary effluents should be sited with knowledge of the geological and soil characteristics of the area and not too close to the water supply borehole/s 6. Buffer zone between seismic lines and water sources / supply locations shall be established through extensive in-field ground vibration testing in addition to the guidance provided in Table 4.1. Distances may vary between seismic source types, as per International Association of Geophysical Contractors (IAGC) Guidelines. 7. Spill kits to be carried by service and refuelling vehicles along the survey lines and the survey crew shall be trained and debriefed regularly on the use of spill kits. 8. Ensure that all vehicles and machinery operating in the field (and in the campsite) are properly maintained so as not to have any oil leaks that could contaminate the soils. 9. Ensure that all drivers and technicians are familiar with drip-tray and spill kit use through daily tool-box talks. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.14: Promotion of effective general water usage.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promote effective use and management of local water resources</p>	<ol style="list-style-type: none"> 1. The Proponent shall obtain permission from the land owner/s / community before utilising any water resources or any associated water infrastructure near the campsites, layover sites or along the survey lines. 2. Always use as little water as possible. 3. Reduce, Reuse and Re-Cycle (3Rs) water where possible. 4. All leaking pipes / taps shall be repaired immediately when they are noticed. 5. Never leave taps running. 6. Close taps after you have finished using them. 7. Immediately report to your Contractor or Environmental Control Officer / Site Manager when you notice overflowing water or unhygienic conditions at the ablution facilities. 8. No washing of vehicles, equipment and machinery, containers, and other surfaces. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.15: Minimise negative socioeconomic impacts.

IMPLEMENTATION STRATEGY	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Manage unrealistic employment expectations, in-flux of job seekers, social friction with local people, increase in crime, protect family structures, reduce Covid-19 and other diseases, and reduce pressure on local resources (land, water etc),</p>	<ol style="list-style-type: none"> 1. Address unrealistic expectations about large number of jobs that would be created before project implementation. 2. Providing information such as the number and types of jobs available 3. The employment of local residents and local companies should be a priority. To ensure that potential employees are from the area through working with the traditional authorities and village headmen/ women / foremen/ ladies. 4. Campsites, layover sites and implementation of the surveys in community tracks should be done after consultation with the land owners and affected local community to avoid any conflicts. 5. When contracts of employees outside the local survey area are terminated or not renewed, contractors should transport the employees out of the local area to their hometowns within two days of their contracts ending. 6. Tender documents could stipulate that contractors have COVID-19 and HIV/AIDS workplace policies and programmes in place and proof of implementation should be submitted with invoicing to the Proponent. 7. Develop strategies in coordination with local health officers and NGO's to protect the local communities, especially young girls. 8. Contract companies could submit a code of conduct, stipulating disciplinary actions where employees are guilty of criminal activities in and around the vicinity of the campsite, layover areas or along the survey lines. Disciplinary actions should be in accordance with Namibian legislation. 9. Contract companies could implement a no-tolerance policy regarding the use of alcohol and workers should submit to a breathalyser test upon reporting for duty daily as may be applicable and especially for all drivers. 10. Ensure that drivers adhere to speed limits and that speed limits are strictly enforced. 11. Ensure that vehicles are road worthy and drivers are qualified. 12. Train drivers in potential safety issues to avoid accidents that may create conflicts with the local communities. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.16: Minimise negative health and safety impacts including the impact of COVID-19.

IMPLEMENTATION STRATEGY	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of health and safe working environment in line with national Labour, Health and Safety Regulations and international best practices for conducting the 2D seismic survey operations</p>	<ol style="list-style-type: none"> 1. Request the Roads Authority for permission to erect warning signs of heavy/ survey vehicles on affected public roads. 2. An onsite ambulance, qualified medical practitioner and essential medical kits shall always be available around the campsite, layover sites and along the survey lines. 3. Physical hazards: Follow national and international regulatory and guidelines provisions, always make use of correct Personal Proactive Equipment (PPE), training programme, as well as the implementation of Health and Safety Programmes in accordance with the Labour Act. 4. All exploration equipment shall be in good working condition and serviced accordingly. 5. Ensure that all workers can be identified by staff uniform and badges where applicable. 6. Restrict access to the campsites, layover sites and survey locations along the survey lines as may be required. 7. The campsites shall be temporally secured as required and the type of fencing to be used would, however, be dependent on the impact on the visual resources and/or cost. 8. Notice or information boards relating to COVID-19 requirements, public safety hazards and emergency contact details to be put-up at the campsite gate(s) and on key support field vehicles. 9. Rubber gloves and masks always be used in case of an accident to reduce the risk of contracting HIV/AIDS or COVID-19 10. All workers shall be made aware and given instructions concerning the dangers of dehydration or hyperthermia. Encourage all to drink plenty of clean water not directly from the surface water bodies or unknow water wells. 11. No person under the influence of alcohol or drugs shall be allowed at the campsites, layover sites or survey locations along the survey lines. 12. Ensures compliance with the requirements of the relevant Namibian Labour, Health and Safety Regulations always. 13. Dangerous or protected / sensitive areas shall be clearly marked and access to these areas shall be controlled or restricted. 14. Due care shall be taken when driving any vehicles on any roads particularly the gravel roads. ALL Drivers must drive with their headlights switched on when travelling on the gravel roads (day and night). 15. Persons driving a vehicle shall be in possession of a valid driver's license 16. Awareness on HIV/AIDS and COVID-19 among workers is raised 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.17: Minimise visual impacts.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Preserve the landscape character in the development of supporting infrastructure and choice of visual screening</p>	<ol style="list-style-type: none"> 1. Consider the landscape character and the visual impacts of the survey area, campsites, layover sites, survey locations and along the survey lines from all relevant viewing angles, particularly from public roads. 2. Always use the existing roads, tracks, paths, disturbed cleared fields / areas for creation of new access, campsite, or layover sites 3. Always use vegetation screening when selecting a campsites or layover sites along the survey lines. 4. DO NOT cut down vegetation unnecessarily around the survey area, campsites, layover sites, and along the survey lines use it for site screening as may be applicable. 5. Avoid the use of very high fencing around the campsites. 6. Minimise the creation or widening of access roads and no off-road that could result in land scarring. 7. Minimise the presence of secondary structures: remove inoperative support structures. 8. Littering along the survey area, campsites, layover sites, survey locations and along the survey lines is strictly prohibited 9. Remove all infrastructure and reclaim, or rehabilitate and clean the survey area, campsites, layover sites, survey locations and areas along the survey lines on completion of the operations. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.18: Management of sites, surrounding traffic and equipment movements.

ASPECTS	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Management of any likely increase traffic and equipment movements around the survey area, campsites, layover sites, survey locations and along the survey lines	<ol style="list-style-type: none"> 1. All drivers must undergo defensive driving training. 2. Adhere to the site and national public roads speed limits. 3. Adhere to all the Road Authority Road restrictions requirements 4. Adhere to site equipment / vehicles movement procedures and protocols / operational manuals. 5. Ensure safety of traffic movement, trip schedule should be advised for all scheduled heavy-duty vehicles, all drivers should be in possession of valid driver's licence, speed limits should be adhered to. 6. The use of traffic and safety warning signs and flag persons to warn and control traffic should be advised where required. 7. Always drivers and support teams shall be on a lookout for people on roads / tracks, wild animals, domestic animals, and other obstacles such as fallen trees 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.19: Protection of sensitive receptors through setback distances and the precautionary principles / approaches.

ASPECTS	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Protection of sensitive receptors through setback distances and the precautionary principles / approaches	<ol style="list-style-type: none"> 1. Conduct field tests on appropriate setback distances not provided in Table 4.1 2. Always apply setback distances as shown in Table 4.1 3. Always apply the precautionary principles in situations where specific mitigations, regulatory guidelines, standards, or appropriate setback distances (exclusion zones) around mud houses or sensitive local cultural resources such as burial or cultural sites have not been provided. 4. Always consult local communities on matters related to sensitive local cultural resources such as burial grounds, sacred trees, or sites, as well as all other cultural and traditional norms not provided for in the international guidelines / standards 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractor

Table 4.20: Equipment / vehicles noise, vibrations, emissions influence on air quality and climate change.

ASPECTS	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Minimise the noise, vibrations, and other emissions associated with equipment / vehicles movements	<ol style="list-style-type: none"> All seismic operations should be carried out only during daylight hours. Campsite's delivery of materials and equipment to sites shall be scheduled to avoid peak traffic hours around the public roads to minimise congestion Always adhere to equipment / vehicles noise and other emissions management procedures Adhere to the project buffer zones established for the campsites (500m) from the nearest village and along the survey lines 500m to 1km from the school, clinic or sensitive infrastructure as may be applicable. Equipment / vehicles engines must be well maintained to minimise the noise. At campsite, use silent generators where possible Use noise screens if required Neighbours shall be alerted of operations that are likely to produce excessive noise, vibrations, and other emissions Personal Protective Equipment shall be always use. Clean fuels such as Liquefied Petroleum Gas (LPG) and electric vehicles / equipment should be used. LPG is non-toxic, non-corrosive, and free of tetra-ethyl lead or additives, it burns more cleanly than petrol. 	<ol style="list-style-type: none"> During planning and mobilisation (Pre-survey preparation) During setup and operation of camp sites setups During process of widening of tracks and creation of limited new access as may be applicable During actual data acquisition along the individual profiles / survey lines Demobilisation and Closure (Survey Completion) During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> Proponent's Representative (PR) Project Manager (PM) Project HSE Contractor Subcontractors

Table 4.21: Management of dust and influence on air quality / health receiving environment.

ASPECTS	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
Management of any likely site dust that may be generated around the survey area, campsites, layover sites, survey locations and along the survey lines	<ol style="list-style-type: none"> Adhere to the site / public roads and as per Road Authority road restrictions requirements speed limits. Adhere to the survey operations speed limit of between 30-60km/h Temporary measure: Use high pressure water dust control spray system with manual or automated, high frequency, light watering of materials to prevent dust lift off around the campsite. Workers must always use Personal Protective Clothing / Equipment. If there is excessive dust being generated along a specific survey line with nearby villages / communities or sensitives environment or infrastructure likely to be negatively impacted, the use a water tanker to wet the specific section of road surface may be undertaken 	<ol style="list-style-type: none"> During planning and mobilisation (Pre-survey preparation) During setup and operation of camp sites setups During process of widening of tracks and creation of limited new access as may be applicable During actual data acquisition along the individual profiles / survey lines Demobilisation and Closure (Survey Completion) During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> Proponent's Representative (PR) Project Manager (PM) Project HSE Contractor Subcontractors

Table 4.22: Spillages and accidental products or fuel leaks.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Contaminant spill management with respect to survey vehicles, trucks, and earthmoving equipment</p>	<ol style="list-style-type: none"> 1. Always adhere to site management procedures to prevent spillages. 2. Ensure that any in-field refuelling or maintenance is performed in a bunded area or while using a drip tray with a spill-kit available. 3. Refuelling areas shall be underlain with spill-proof hardstanding or bund, with spill kits readily available and operatives trained in their use only. 4. All fuels and other non-aqueous fluids to be stored in suitable bunded enclosures. 5. All refuelling operations to be carefully overseen and managed. 6. Ensure that the integrity of any storage medium and its associated delivery point are inspected on a regular basis. 7. The personnel designated to receive deliveries of materials/fuel/ should receive practical training on how to prevent and respond to a spill 8. The designated personnel should also be aware of any potential areas in their vicinity that are at risk of contamination, such as fauna, flora, Ephemeral River Channels, or water supply borehole. 9. Clean up any site spillages and no spills shall be allowed to enter the environment / soak into the ground 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.23: Waste (solid and liquid) management.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Promotion of effective waste (solid and liquid) management through the adoption of sound and hierarchical approach to waste management, which would include waste minimisation, re-use, recovery, recycling, treatment, and proper disposal.</p>	<ol style="list-style-type: none"> 1. Burial of waste anywhere within the PEL area, campsites, layoff areas or survey lines is not allowed and all generated solid waste shall be disposed at an approved municipal waste disposal site in Oshivelo. A MEL designated cell shall be created for easy auditing of all the waste transferred from the project to Oshivelo waste disposal site. 2. Toilet and ablution facilities shall be provided at the campsites and along the survey lines and should not be located close to Ephemeral Rivers or water supply borehole. 3. Provide site information on the difference between the two main types of waste with clearly marked containers for: <ul style="list-style-type: none"> • General Waste. and • Hazardous Waste. 4. Sealed containers, bins, drums, or bags for the different types of wastes shall be provided. Never dispose of hazardous waste in the bins or skips intended for general waste. 5. All solid and liquid wastes generated from the proposed project activities shall be reduced, reused, or recycled to the maximum extent practicable. 6. Trash may not be burned or buried, except at approved sites under controlled conditions in accordance with the national and municipal regulations. 7. Never overfill any waste container, drum, bin, or bag. Inform your Contractor or the Environmental Control Officer / Site Manager if the containers, drums, bins, or skips are nearly full. 8. Never litter or throwaway any waste on the site, in the field or along any road. No illegal dumping. 9. Littering is prohibited. 10. Latrines and French drains built >100m from watercourses or pans to avoid pollution of primary and secondary aquifers. 11. Chemical toilets or suitable waste water management system shall be provided on site and around the camp as may be required. 12. A waste management plan documenting the waste strategy, storage (including facilities and locations), handling procedures and means of disposal should be developed and should include a clear waste-tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location in compliance with the national and municipal regulations. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.24: Rehabilitation plan.

ASPECT	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<p>Contributions toward environmental preservation and sustainability through rehabilitation of disturbed areas such as campsites, layover sites and survey locations along the survey lines by removing all unwanted parts of the fixtures and restore the sites to as close an approximation of the pristine state as is technically, environmentally, financially and reasonably possible.</p>	<ol style="list-style-type: none"> 1. The following rehabilitation actions are practiced: <ul style="list-style-type: none"> • Rehabilitate all site scars. • Litter from the site has been taken to the appropriate disposal site. • Debris, scrap metal, etc is removed before moving to a new site or closure of the operations. • Water tanks are dismantled and removed if not needed for after use. • Tracks on site and the access road are rehabilitated by smoothing the 'middle mannetjie' (middle ridge between the tracks) and raking the surface. 2. The following should be undertaken at all disturbed areas that require further rehabilitation <ul style="list-style-type: none"> • if applicable the stockpiled subsoil to be replaced (spread) and/or the site is neatly contoured to establish effective wind supported landscape patterns. • Replace the stored topsoil seed bank layer. • Five (5) years after rehabilitation the sites are not visible from 500 m away. 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

Table 4.25: Environmental performance monitoring and data collection.

OBJECTIVES	MITIGATION MEASURES	SCHEDULE	RESPONSIBILITY
<ol style="list-style-type: none"> 1. Collect data that will add value to environmental monitoring and reporting to the regulators 2. Collect data that will add to the general scientific and geographic knowledge of the environment in which the exploration process takes place. 3. Acknowledge that the required skills and knowledge to collect all the suggested data may not be available within the exploration team, however, as much data as is practical should be collected. 	<ol style="list-style-type: none"> 1. Environmental Monitoring Report compiled and submitted by the Environmental Coordinator to the regulators 2. The following types of information should be gathered: <ul style="list-style-type: none"> • Fauna. What tracks or signs of animal activity have been seen or affected onsite? (Photographs and GPS recording) What animals, birds etc were identified? Alternatively provide a description and/ or photo if unidentified. • Unusual weather conditions, e.g. records of the prevailing wind direction and the direction from which storm events come. Was there rain or intense heat? Preferably have a thermometer and rain gauge on site. • Vegetation. Record trees, shrubs, grass, etc. that are affected. Some plants do only occur after rainfall and might not have been seen for decades. • Any archaeological, cultural or historical sites that may be found and reported the project archaeologist. GPS co-ordinates, photograph and plot the position on a 1: 50 000 map. • Other-including surface water, large scale geological features etc 	<ol style="list-style-type: none"> 1. During planning and mobilisation (Pre-survey preparation) 2. During setup and operation of camp sites setups 3. During process of widening of tracks and creation of limited new access as may be applicable 4. During actual data acquisition along the individual profiles / survey lines 5. Demobilisation and Closure (Survey Completion) 6. During an accidental event that may be associated with the campsite and survey lines routine and physical presence operational activities 	<ol style="list-style-type: none"> 1. Proponent's Representative (PR) 2. Project Manager (PM) 3. Project HSE 4. Contractor 5. Subcontractors

4.5 General Awareness and Training Guidance

4.5.1 Overview

The following is the summary of the general mitigation references and training guidance covering the proposed 2D seismic survey operations planning and mobilisation (Pre-survey preparation), setup and operation of campsites setups, the process of widening of tracks and creation of limited new access as may be applicable, actual data acquisition along the individual profiles / survey lines, demobilisation and closure (Survey Completion) and management of accidental event that may be associated with the campsite and survey lines routine and physical presence related operational activities:

1. General mitigation guidance.
2. Natural environmental management guidance.
3. Vehicle use and access guidance.
4. Control of dust guidance.
5. Health and safety guidance.
6. Preventing pollution and dangerous working conditions guidance.
7. Saving water guidance.
8. Disposal of waste guidance.
9. Religious, cultural, historical, and archaeological objects guidance, and.
10. Dealing with environmental complaints guidance.

4.5.2 General Mitigation Guidance

Based on the Environmental Assessment undertaken, the following is the summary of the general mitigation measures in terms of applicability of the EMP, disciplinary process, meaning of environment and procedures if one does not understand the provisions of this EMP:

- (i) The Environmental Rules apply to everybody. This includes all permanent, contract, or temporary workers as well as any other person who visits the operations base. Any person who visits the operations base will be required to adhere to the Environmental Code of Conduct of the Proponent.
- (ii) The Site Manager will issue warnings and will discipline any person who breaks any of the environmental rules and procedures. Repeated and continued breaking of the Rules and Procedures will result in a disciplinary hearing and which may result in that person being asked to leave the site permanently.
- (iii) The environment means the whole surroundings around us. The environment is made-up of the soil, water, air, plants, and animals. and those characteristics of the soil, water, air, plant, and animal life that influence human health and wellbeing.
- (iv) If any member of the work force does not understand, or does not know how to keep any of the environmental rules or procedures, that person must seek advice from the Environmental Control Officer (ECO), Site Manager or Contractor. The person that does not understand must keep asking until she/he is able to keep to the all the Environmental Rules and Procedures.

4.5.3 Natural Environmental Management Guidance

1. Never feed, tease, or play with, hunt, kill, destroy, or set devices to trap any wild animal (including birds, reptiles, and mammals), livestock or pets. Do not bring any wild animal or pet to the area.
2. Do not pick any plant or take any animal out of the areas. You will be prosecuted and asked to leave the project area.
3. Never leave rubbish where it will attract animals, birds, or insects. Rubbish must be thrown into the correct rubbish bins or bags provided.
4. Protect the surface material by not driving over it unnecessarily.
5. Do not drive over sensitive habitats for plants and animals.
6. Do not cut down any part of living trees / bushes for firewood.
7. Do not destroy bird nest, dens, burrow pits, termite hills etc or any other natural objects in the area.

4.5.4 Vehicle Use and Access Guidance

1. Never drive any vehicle without a valid licence for that vehicle and do not drive any vehicle that appears not to be road-worthy.
2. Never drive any vehicle when under the influence of alcohol or drugs.
3. Do Not make any new routes or roads without permission. Stay within permitted routes.
4. Avoid U-Turns and large turning circles. 3-point turns are encouraged. Do not ever drive in communal fields / ephemeral rivers, stick to the existing roads.
5. Stay on the road, do not make a second set of tracks and do not cut corners.
6. Do Not Speed - keep to 30 km/h along the survey lines and campsite.
7. No off-road driving is allowed.
8. Vehicles may only drive on demarcated roads.
9. Adhere to speed limits and drive with headlights always switched on.

4.5.5 Control of Dust Guidance

1. Do not make new roads or clear any vegetation unless instructed to do so by your Contractor or the Environmental Control Officer / Site Manager.
2. Try to disturb the surface of the natural landscape as little as possible.

4.5.6 Health and Safety Guidance

1. Drink lots of water every day, but only from the fresh water supplies.
2. Take the necessary precautions to avoid contracting HIV/AIDS or COVID-19.
3. Only enter or exit the operations area at the demarcated areas.

4. Do not litter and always keep the access areas clean.
5. Any damage to any existing infrastructure in the area must be reported to the Environmental Control Officer / Project Manager who will then inform the owner of any damage with all the repairs done to the satisfaction of the owner or Environmental Control Officer.
6. Never enter any area that is out of bounds, or demarcated as dangerous or wander off without informing or permission of team leader.
7. Report to your Contractor or the Site Manager if you see a stranger or unauthorised person in the operations areas.
8. Do not remove any vehicle, machinery, equipment, or any other object from the operations areas /sites without permission of your Contractor or the Site Manager.
9. Wear protective clothing and equipment required and according to instructions from your Contractor or the Site Manager.
10. Never enter or work in the operations areas when under the influence of alcohol or drugs.

4.5.7 Preventing Pollution and Dangerous Working Conditions Guidance

1. Never throw any hazardous substance such as fuel, oil, solvents, etc. into streams or onto the ground.
2. Never allow any hazardous substance to soak into the soil.
3. Immediately tell your Contractor or Environmental Control Officer / Site Manager when you spill, or notice any hazardous substance being spilled anywhere in the operations areas.
4. Report to your Contractor or Environmental Control Officer / Site Manager when you notice any container, which may hold a hazardous substance, overflow, leak, or drip.
5. Immediately report to your Contractor or Environmental Control Officer / Site Manager when you notice overflowing problems or unhygienic conditions at the ablution facilities.
6. Vehicles, equipment and machinery, containers and other surfaces shall be washed at areas designated by the Contractor or Environmental Control Officer/ Site Manager.
7. If you are not sure how to transport, use, store or dispose any hazardous substance - Ask your Contractor or Environmental Control Officer / Site Manager for advice.

4.5.8 Saving Water Guidance

1. Always use as little water as possible. Reduce, reuse and re-cycle water where possible.
2. Report any dripping or leaking taps and pipes to your Contractor or Environmental Control Officer or Site Manager.
3. Never leave taps running. Close taps after you have finished using them.

4.5.9 Waste Management (Solid and Liquid Waste)

1. All generated solid waste must be disposed at the local municipal waste disposal site.
2. Use toilets and ablution facilities provided on site.
3. Learn to know the difference between the two main types of waste, namely:

- General Waste. and
 - Hazardous Waste.
4. Learn how to identify the containers, bins, drums, or bags for the different types of wastes. Never dispose of hazardous waste in the bins or skips intended for general waste or rubble / contaminated soil.
 5. Never burn or bury any waste around the operations areas.
 6. Never overfill any waste container, drum, bin, or bag. Inform your Contractor or the Environmental Control Officer / Site Manager if the containers, drums, bins, or skips are nearly full.
 7. Never litter or throwaway any waste on the site, in the field or along any road. No illegal dumping.
 8. Littering is prohibited.

4.5.10 Religious, Cultural, Historical and Archaeological Objects Guidance

1. If you find any suspected religious, cultural, historical, or archeologically object or site around the operations areas, you must immediately notify your Contractor or Environmental Control Officer / Site Manager.
2. Never remove, destroy, interfere with, or disturb any religious, cultural, historical, or archaeological object or site around the operations areas.

4.5.11 Dealing with Environmental Complaints Guidance

1. If you have any complaint about dangerous working conditions or potential pollution to the environment, immediately report this to your Contractor or the Environmental Control Officer / Site Manager.
2. If any person complains to you about vibrations, dust, noise, lights, littering, pollution, or any other harmful or dangerous condition, immediately report this to your Contractor or the Environmental Control Officer / the Site Manager.

5. REHABILITATION AND MONITORING

5.1 Rehabilitation Commitment and Process

The following is the summary of the key rehabilitation processes to be implemented by the Proponent with respect to the layover, fly-over or base sites and survey locations along each of the survey lines:

Step 1: Remove all layover, fly-over or base sites structures:

- ❖ Remove all the site supporting infrastructure such as housing container / tents.
- ❖ Disassemble all the structures and remove all materials from the layover, fly-over or base sites.
- ❖ Remove all machinery from the site and transport to a new site where it is to be used or stored or sold at an auction.
- ❖ Remove all signages and fences that have been constructed and either make the material available to the local persons/farmer, dispose at a suitable site or sell at an auction.
- ❖ Remove the generators from the sites and either transport to a new site for storage or sell it to the farmer or an auction.
- ❖ Seal all petrol, diesel, oil, and grease containers and remove from the site to a storage facility.
- ❖ Collect all scrap metal and dispose at a suitable site or sell at an auction.
- ❖ Break up all concrete slabs and structures on site and transport the fragments to a suitable municipal waste disposal or use a fill material along the sandy / slippery / muddy access road.
- ❖ The concrete reservoirs if created, can probably remain intact provided that the local people wish to utilise them at some stage - this will need to be negotiated.
- ❖ The future use of the water borehole/s and water pipelines as well as any additional infrastructures that has been added to the borehole shall be handed over to the Regional Council who will work with the local community on usage and maintenance of the infrastructure, and.
- ❖ Any unused pipes shall be removed, disassemble, and component parts transported to a storage site or sell at an auction.

Step 2: Remove all waste and unwanted materials:

- ❖ All campsite materials shall be removed and entire site rehabilitated.
- ❖ Clean the site, collect all the waste materials and transport to a suitable municipal waste disposal site, and.
- ❖ Manually remove all weedy species that are present at the site (the entire plant can easily be removed because the plants tend not to root deeply).

Step 3: Rehabilitate surrounding impacted areas

- ❖ Compaction of the substrate will result from utilisation of these areas or the pressure of overlying structures.

- ❖ Rip the surfaces to a depth of 40 cm to 50 cm using a multi-toothed ripper and tractor.
- ❖ Cover with a layer of topsoil to a depth of about 10 cm, and.
- ❖ Cap the topsoil containing the seedbank with a layer of gravel by manually spreading the fragments across the surface using a rake.

Step 4: Rehabilitate the affected tracks and roads

- ❖ All tracks impacted by the proposed 2D seismic survey operations shall be rehabilitated by smoothing the 'middle mannetjie' (middle ridge between the tracks) and raking the surface.

5.2 Environmental Performance Monitoring and Reporting

The monitoring of the environmental performances for the proposed 2D seismic survey operations is divided into two (2) parts and these are:

- (i) Routine daily monitoring activities to be undertaken by the Project HSE Officer with the support of the external specialist consultants such as the wildlife, water, flora, and local cultural knowledge experts as may be required, and.
- (ii) Preparation of the final Environmental Monitoring and Environmental Closure reports covering all activities related to the implementation of the Environmental Management Plan to be undertaken by the Project HSE Officer with the support of the external specialist consultants as may be required.

The Proponent will be required to report regularly (twice in a year or as the case may be) to the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT), the environmental performances as part of the ongoing environmental monitoring programme. Environmental monitoring programme is part of the EMP performance assessments and will need to be compiled and submitted as determined by the Environmental Commissioner. The process of undertaking appropriate monitoring as per specific topic (such as water, fauna, and flora) and tracking performances against the objectives and documenting all environmental activities shall be part of internal and external auditing to be coordinated by the Project HSE / EMP Compliance Officer (Tables 5.1- 5.9).

The creation new cutlines shall be monitored and supervised by MEL and local land owners with the support of an environmental coordinator. All big trees and protected trees including those shown in (Plates 2.3-2.12) shall be monitored not to be cut down and affected in any way during the proposed project implementation process including the creation of the possible new cutlines subject to the approval or request by the land owner. Big trees and protected species (Plates 2.3-2.12) shall be left along the possible new cutlines to be created on request or approval by the land owner.

The second part of the monitoring of the EMP performance will require a report outlining all the activities related to effectiveness of the EMP at the end of the proposed 2D seismic survey operations to be undertaken by the Project HSE Officer with the support of the external specialist consultants as may be required. The objective will be to ensure that corrective actions are reviewed and steps are taken to ensure compliance for future EIA and EMP implementation.

The monitoring report shall outline the status of the environment and any likely environmental liability after the completion of the proposed project activities. The report shall be submitted to the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism and will represent the final closure and fulfilment of the conditions of the Environmental Clearance Certificate (ECC) to be issued by the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT).

Table 5.1: Monitoring of environmental performance implementation / environmental awareness training.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Is there an Environmental awareness training programme?					
How many people have been given environmental awareness training?					
Is a copy of the EMP on site?					
How effective is the awareness training? Do people understand the contents of the EMP? Where are the weaknesses? Ask 3 people at random various questions about the EMP.					

Table 5.2: Monitoring of environmental performance for the temporal and permanent structures.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Are the temporal and permanent structures positioned to avoid sensitive or potentially sensitive sites?					
Has new infrastructure been created? If so, what, and how well planned / built with respect to environment?					
Have toilets been provided? Where are they situated?					
Do receptacles for waste have scavenging animal proof lids?					
What litter is there – who is littering?					
Are there facilities for the disposal of oils / etc and how often is it removed to an approved disposal site?					
Is there evidence of oil / diesel spills? Bunding or not?					
What fuel source is being provided for cooking?					
Housekeeping					

Table 5.3: Environmental data collection.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Are records being kept?					
Birds' mortality records as result of the project activities?					
Birds nesting activities around the operations area?					
Noise level?					
Air Quality?					
Vibrations?					
Have archaeological sites been found / disturbed / described?					
Other key environmental data sets?					

Table 5.4: Health and safety.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Is there First Aid Kit containing anti-histamines etc?					
Are dangerous areas clearly marked off?					
Do vehicles appear to maintain the recommended speed limits?					
Do vehicles always drive with headlights on?					

Table 5.5: Recruitment of labour.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
What labour source is used?					
How has the recruitment practice been done?					

Table 5.6: Management of the natural habitat and surficial materials management.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Has there been any development done on or very close sensitive areas?					
Has anyone been caught with plants or animals in their possession?					
Has there been wilful or malicious damage to the environment?					
Tracks and path widening been conducted through pruning of branches only?					
Are there big trees been cut down unnecessarily during the track widening or creation of new cutlines?					
Are protected trees such as <i>Baikiaea plurijuga</i> (Zambezi teak), <i>Burkea africana</i> (burkea), <i>Guibourtia coleosperma</i> (false mopane), <i>Pterocarpus angolensis</i> (kiaat), <i>Schinziophyton rautanenii</i> (manketti) and <i>Strychnos</i> species (monkey orange spp.) being protected and not removed or damaged (Plates 2.3-2.12)?					

Table 5.7: Roads and tracks driving.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Are existing tracks used and maintained?					
What new tracks have been developed and are they planned?					
What evidence is there of off-road driving? Who appears to be responsible?					
Are corners being cut, what type of turning circle are there? Three point turns vs. U turns?					
Have unnecessary tracks been rehabilitated and how well?					
Comments					
All tracks impacted by the proposed 2D seismic survey rehabilitated by smoothing the 'middle mannetjie' (middle ridge between the tracks) and raking the surface					

Table 5.8: Management of water resources.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
How is potable water supplied and how often?					
Is water being wasted?					
Is there any leakage from pipes or taps?					

Table 5.9: Public relations.

Mitigation	Compliance	Follow-up Action Required	By Whom	By When	Completed
Have any complaints been made about the project activities by the different I&APs? If so, what, and how was the issue resolved?					

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Based on the results of the EIA, the proposed 2D seismic survey by MEL is unlikely to cause significant negative environmental impacts on the various components of the receiving environment. Mitigation measures for both positive and negative impacts are provided in this covering the proposed 2D seismic survey operations in the Petroleum Exploration License (PEL) No. 93 covering Degree Square Blocks 1717 and 1817, in the Owambo (Etosha) Sedimentary Basin, Oshikoto and Ohangwena Regions, in the Northern Namibia. The proposed mitigation measures as detailed in this EMP cover the proposed survey planning and mobilisation (Pre-survey preparation), setup and operation of campsites setups, the process of widening of existing tracks and creation of new cutlines, actual data acquisition along the individual profiles / survey lines, demobilisation, and closure (Survey Completion) and management of accidental event that may be associated with the campsite and survey lines routine and physical presence related operational stages.

6.2 Recommendations

The following is the summary of the recommended actions to be implemented by the Proponent as part of the implementations of the EMP for campsites, layover sites, survey locations along the proposed survey lines:

1. The Proponent must adhere to the provisions of all the national legislation, regulations, policies, procedures, and permits / authorisation requirements.
2. The proponent shall adhere to all the provisions of this EMP and mitigation measures shall be implemented and monitored.
3. Before the implementation of the proposed 2D seismic survey operations, the Proponent shall consult with the local community / land owners and villages that may be affected or likely to be disturbed by the proposed project activities. All the consultations and engagements shall be undertaken through the existing regional and local structures starting with the Office of the Governor for Oshikoto Region, Councillors of the affected constituencies of Guinas, Nehale LyaMpingana, and Eengondi, Traditional Authorities, Village Headpersons, and Village Development Committees (VDCs) and local community levels.
4. Before any form of field-based activities are started in a local area, written consent shall always be obtained from the land owners / local community through the village headperson, traditional authorities, and regional council as may be applicable to avoid misunderstanding and unnecessary conflicts.
5. Appropriate setback distances (exclusion zones) around sensitive structures such as villages, water boreholes, water wells, dams, pipelines, burial grounds, cultural sites, irrigation canals and monuments / archaeological resources sites shall always be observed as provided for by the International Association of Geophysical Contractors (IAGC) the Distance Requirements Exploration Directive 2006-15, Alberta Government, Canada guidelines, and.
6. Precautionary principles / approaches shall always be exercised especially in situations where specific mitigations, regulatory guidelines, standards, or appropriate setback distances (exclusion zones) around sensitive local cultural resources such as burial or cultural sites have not been provided. Local communities shall always be consulted on matters related to sensitive local cultural resources not provided for in the international guidelines / standards.
7. New Cutlines: The creation of the proposed possible new cutlines to be used for data collections shall be created on approval of the land owner/ community.
8. Base Camp: Accommodation for the exploration team shall be provided at an established lodge within the project area.

9. Fly-camps: The fly-campsite shall be situated on already disturbed areas such as an unused previous agricultural field after obtaining written permission and signing of a formal Lease Agreement with the land owner.
10. Freshwater supply shall be provided from the existing infrastructures in the general areas and there will be no need of drilling a new water supply borehole/s specific for the proposed 2D seismic survey operations. The drilling locations within the survey area all have dedicated water supply boreholes for the project. Bottled drinking water shall be provided around the campsite and along the survey lines / profiles.
11. Source of energy shall be supplied from renewable solar installation or generator as may be required.
12. Waste water management must utilise mobile chemical toilet system around the fly-campsite and along the survey lines / profiles.
13. Solid Waste Management: Very small amount of solid waste is expected to be generated during the planning and mobilisation, data acquisition, demobilisation, and abandonment stages of the proposed 2D seismic survey operations. Waste disposal bags / containers must be provided and visible around the base and fly-campsites and along the survey lines / profiles. Solid waste collected at fly-camps and along the survey lines shall be recycled, reused and disposed safely Oshivelo Waste Disposal site facility. Littering around the base and fly-campsite and along the survey lines / profiles is strictly prohibited. Waste minimisation and reduction, re-use and recycling are highly encouraged and awareness raising must be undertaken on a continuous basis and the team must always be reminded of their obligations towards effective waste management practices and overall environmental management at each debriefing session.
14. Before detailed site-specific activities such as the campsite clearing or track widening or extensions activities, the Project HSE Officer with the support of the external specialist consultants as may be required, should consider the flora, fauna, and archaeological sensitivity of the area. Protected flora shall be identified and marked not to be accidentally cut down.
15. The Project HSE Officer shall lead, implement, and promote environmental protection culture through awareness raising of the workforce, contractors, and sub-contractors.
16. The Proponent shall provide all the necessary support including human and financial resources, for the implementation of the mitigations, effective environmental management, and monitoring throughout the proposed project duration.
17. Project HSE Officer with the support of the external specialist consultants shall develop simplified environmental induction and awareness materials for all the workforce, contractors, sub-contractors and visitors.
18. Where contracted service providers are likely to cause environmental impacts, these will need to be identified and contract agreements need to be developed with costing provisions for environmental liabilities.
19. A targeted and transparent local recruitment process must be put in place by the Proponent to avoid unnecessary high job expectation from the local community as well as manage potential job recruitment frauds targeting local communities.
20. Develop and implement a monitoring programme that will fit into the overall company's Environmental Management Systems (EMS) as well as for any future EIA as may be required, and.
21. Final Environmental Monitoring Closure report shall be prepared by the Project HSE Officer with the support of the external specialist consultants as may be required to be submitted to the regulators and to mark the completion and closure of the proposed 2D seismic survey operations.

END OF EMP