Reconnaissance Energy Namibia (REN) (Pty) Ltd

Final Environmental Impact Assessment (EIA) Report for Drilling of the Proposed Multiple Exploration and Appraisal Wells with Supporting Infrastructures such as Borrow Pits, Access Roads, and related Services in the Areas of Interest (AOI), Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73,
Kavango East and West Regions, Northern Namibia

March 2023

PROPONENT ADDRESS

Reconnaissance Energy Namibia (REN) (Pty) Ltd
Erf No. 08 AMTA Building
Industrial Area
P. O. Box 2992
RUNDU, KAVANGO EAST REGION

OPERATOR
Reconnaissance Energy Namibia (REN) (Pty) Ltd Subsidiary of
Reconnaissance Energy Africa Ltd (ReconAfrica)

NEW ECC APP REFERENCE No.
APP- 00459

LICENSE PEL 73
Covering Parts of the Degree Square Blocks Nos. 1819, 1820, 1821, 1719, 1720, and 1721

WORKING INTERESTS
Reconnaissance Energy Namibia owns 90%
National Petroleum Corporation of Namibia (Namcor)
(A State-Owned Company) 10% with costs carried to the development stage

TYPE OF PETROLEUM EXPLORATION ACTIVITIES
Drilling of Multiple Exploration and Appraisal Wells in the Area of Interest (AOI)
with Supporting Infrastructures such as Borrow Pits, Access Roads
and related services, Kavango Sedimentary Basin (KSB),
Petroleum Exploration License (PEL) No. 73,
Kavango West and East Regions, Northern Namibia

PROPONENT NAMIBIAN ADDRESS
Erf No. 08 AMTA Building, Industrial Area
P.O. Box 299,
Rundu, Kavango East Regions

PROPONENT OVERSEAS ADDRESS
Berkeley Square House, Berkeley Square
London UK W1J 6BD
UNITED KINGDOM

ENVIRONMENTAL / PERMITTING DE-RISKING CONSULTANTS
Risk-Based Solutions (RBS) CC
10 Schützen Street, Sivieda House,
Windhoek Central Business District (CBD)
P. O. Box 1839, **WINDHOEK**, **NAMIBIA**
Tel: +264 - 61- 306058/224780/236598; Fax: +264-61-245001
Mobile: +264-811413229; **Email**: smwiya@rbs.com.na
Global Office / URL: www.rbs.com.na

ENVIRONMENTAL ASSESSMENT PRACTITIONERS (EAPs)

Dr Sindila Mwiya (Lead EAP / Technical Permitting Advisor / International Resources Consultant, Email: frontdesk@rbs.com.na

Ms Emerita Ashipala (EAP/ Risk-Based Solutions Independent Senior Technical Consultant), Email: emerita.ashipala@gmail.com

Mr Samison Mulonga (EAP/ Risk-Based Solutions Independent Senior Technical Consultant), Email: mulongas@gmail.com

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CONSULTING TEAM LEADERS AND CONTRIBUTORS

Name of Key Specialist/ Team Leaders Excluding Sub Teams	Project Role / Position / Specialisation	Affiliation / Company
1. Dr Sindila Mwiya	Project Environmental Assessment Practitioner (**EAP**) Team Leader, Engineering Geology / Geotechnical / Geoenvironmental / Environmental Engineering, Artificial Intelligence and Knowledge-Based Systems with special focus on EIAs, EMPs, EMSs, SEAs and SEMPs with respect to subsurface resources (minerals, petroleum, water) and energy in Arid and Semiarid Environments (**Engineering and Environmental Geologist**).	Risk-Based Solutions (RBS) CC
2. Dr Vita Stankevica	Quality Control Manager and Socioeconomic Project Specialist Consultant	
3. Ms Emerita L. Ashipala	Project Environmental Assessment Practitioner (EAP) / Senior Consultant / Environmental Assessment Practitioner /ESG/ Stakeholders and Community Consultations and Engagement	
4. Mr Samison Mulonga	Project Environmental Assessment Practitioner (EAP) / Senior Consultant / PEL 73 Wildlife and Biodiversity Monitoring Specialist/ Environmental Assessment Practitioner /In-house Biodiversity Specialist/ ESG/ Stakeholders and Community Consultations and Engagement	
5. Ms Ilta Velasia Asser	GIS Senior Specialist Consultant / Stakeholders and Community Consultations and Engagement	
6. Mrs Jolanda Fortunato	Senior Consultants / Environmental Assessment, Management and Monitoring Specialist/ Stakeholders and Community Consultations and Engagement	
7. Ms Maria Magdalena Isabela Namutenya Mufenda		
8. Mr Don Nyambe	Senior Consultant / Industrial Engineer/ Quality Control /ESG/ Stakeholders and Community Consultations and Engagement	
9. Mr Ernesto K. Katongo	Environmental Engineer and Local Field-Based Specialist Support Consultant / Environmental Assessment, Management and Monitoring Specialist/ Stakeholders and Community Consultations and Engagement	
10. Mr Lucas Mbanze Vandalika	IT and Local Field-Based Community Specialist Support Consultants / Advisors for Environmental Assessment, Management and Monitoring, Stakeholders and Community Consultations and Engagement	
11. Mr Alois Gende		
12. Prof. Onjefu Sylvanus Ameh	Environmental, Aerosol, Noise, Radiation and Occupation and Safety Project Specialist Consultant	
13. Ms. Veronika Siyemo	Socioeconomic Field-Based Community Specialist Data Collection Consultants for Environmental Assessment, Management and Monitoring	
14. Shirungu Clothilde		
15. Ms Meriam Kauyama	Logistic, Administration, Quality Control, Project Support Consultants covering Environmental Assessment, Management and Monitoring, Stakeholders and Community Consultations and Engagement	
16. Ms Christine K. Links		
17. Ms. Helena Elago		
18. Mr Peter Cunningham	External Flora, Fauna and Habitats Project Specialist Consultant	Environment and Wildlife Consulting Namibia
19. Dr Alma Nankela	Archaeologist- Quaternary and Prehistorian Project Specialist Consultant	Research Culture Heritage Services (RCHS) CC
20. Mr Ashley Julius	Water, Geology, Hydrology, Groundwater and Water Supply Project Specialist Consultant for Pioneer Minerals and Mining Consulting Team	Pioneer Minerals and Mining Consulting

DR SINDILA MWIYA, TEAM LEADER / ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP) DECLARATION

I, Dr Sindila Mwiya, the Team Leader / EAP for this Environmental Impact Assessment (EIA) study report for the proposed multiple exploration and appraisal wells with supporting infrastructures such as borrow pits, access roads, and related services in the Areas of Interest (AOI), Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73, Kavango West and East Regions, Northern Namibia, for Reconnaissance Energy Namibia (REN) (Pty) Ltd (the Proponent), hereby declares that:

1. This Environmental Impact Assessment (EIA) 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 a Team Leader and 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, SEMPs 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** with extensive technical knowledge and experience in conducting environmental assessments, management, and monitoring for subsurface resources (petroleum, solid state minerals, water, geothermal), and have undertaken more than 200 projects since 2004, including more than sixty (60) 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 co-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 Government.

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Dr Sindila MWIYA
Environmental Assessment Practitioners (EAPs) Team Leader
RISK-BASED SOLUTIONS (RBS) CC

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Non-Technical Summary

Reconnaissance Energy Namibia (REN) (Pty) Ltd, (the **"Proponent"**) is proposing to drill several seismically defined prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 falling in the Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73, Kavango East and West Regions. The proposed exploration and appraisal drilling operations are inclusive of the supporting infrastructures such as borrow pits and access roads. The objectives of the proposed exploration and appraisal wells drilling programme is to continue with the search for oil and gas in the KSB and the associated subbasins and to identify potentially commercial petroleum systems.

The Proponent is a subsidiary of Reconnaissance Energy Africa Ltd (**ReconAfrica**), a Canadian publicly listed company focused on the exploration and development of oil and gas resources in Namibia and Botswana. The Proponent holds petroleum exploration rights under the PEL No. 73 covering parts of the Degree Square Blocks Nos. 1819, 1820, 1821, 1719, 1720, and 1721 over the newly discovered KSB in Kavango West and East Regions in northern Namibia. PEL 73 was granted by the Ministry of Mines and Energy (MME) under Section 29-38 of the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991). The Ministry of Mines and Energy (MME) is the Competent Authority with respect to all petroleum exploration and production operations in Namibia. REN is the Operator of PEL 73 holding 90% interests and the remaining 10% is held by National Petroleum Corporation of Namibia (Namcor), a State-owned (Republic of Namibia) company. The costs of Namcor are carried by REN to the development stage.

The proposed drilling of the prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6, forms part of the ongoing petroleum exploration work programme for PEL No. 73 as agreed in the Petroleum Agreement signed between the Ministry of Mines and Energy (MME) and REN. The results of the 6-1 Mbambi, and 6-2 Kawe, 8-2 Makandina stratigraphic test wells drilled by REN in 2021 and 2022 respectively, and the subsequent 2D seismic survey data acquired in the Kavango Sedimentary Basin (KSB), have established a significant rift basin similar to other major petroleum provinces / rift basins in other parts of World. Thus far, the integrated interpretation has established the following three (3) groups of hydrocarbon opportunities ("Plays"), Primary: Karoo Rift Fill (Light Oil), Secondary: Intra-Rift Fault Blocks (Light Oil), and Secondary: Damara Fold Belt (New Play, Gas/Gas Condensate). A new petroleum system ("Play") for KSB, the Damara Fold Belt, has been established based on the interpretation of the seismic data acquired since 2021. The Damara Fold Belt was not anticipated in the original studies of the KSB.

The drilled stratigraphic wells have been designed to confirm and map the KSB, associated subbasins and petroleum systems with well targets, prospects and leads as part of a de-risking process based on regional data sets including airborne geophysics, initial 2D seismic and regional geological mapping results. As this de-risking progresses, the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 are designed to confirm the existence of economic oil and / or gas resources with the delineated targets / prospects and leads process based on additional 2D seismic survey data acquisition and interpretation, airborne geophysical surveys and the stratigraphic well data sets.

The proposed exploration and appraisal wells drilling activities cannot be undertaken without an Environmental Clearance Certificate (ECC) as required by the Environmental Management Act, 2007, (Act No. 7 of 2007) and the Environmental Impact Assessment (EIA) Regulations 30 of 2012. In fulfilment of the environmental requirements, the Proponent has appointed Risk-Based Solutions (RBS) CC as the environmental / permitting de-risking Consultant, led by Dr Sindila Mwiya and supported by Ms Emerita Ashipala and Mr Samison Mulonga as the Environmental Assessment Practitioners (EAPs) to prepare EIA and Environmental Management Plan (EMP) Reports to support the application for ECC.

The drilling of the proposed exploration and appraisal wells will be undertaken using the Crown 750 truck mounted drill rig used by REN to drill the stratigraphic wells and will apply the same drilling technology with the addition of well testing in an event of a commercial discovery. Each of the proposed well sites to be drilled will be conventional and will affect a surface area measuring less than 3Ha. It is important to note that, not all the proposed twelve (12) prioritised exploration and appraisal wells sites will be drilled. Based on the current priority list, it is highly likely that only six (6) wells may be drilled and subject to the positive outcomes of the initial drilling to be undertaken. Even if all the twelve (12)

wells were to be drilled, the total ground footprint of the operations will be around 36 Ha of the 2534133 Ha size of the Kavango Sedimentary Basin.

Each well site to be drilled will hold the drilling rig and additional equipment along with the administrative containerised area and material storage and handling areas. To prepare for the drilling operations, access roads to each site will be created and vegetation around the proposed well sites will be selectively cleared and ground levelled. A grader, and bulldozer combined with labour-based workforce where it exists will be required to grade, level, and resurface the access tracks and drill sites to accommodate for the transportation of the heavy truck-mounted drill rig as well as other supply trucks that will be used to service each of the operational sites.

The likely key sources of negative environmental (physical, biological, and socioeconomic/cultural/ archaeological) impacts that may be associated with onshore oil and gas exploration drilling operations can be divided into two (2) main categories and these are:

(1) Routine and physical presence operational activities:

(i) Permitting and planning.

(ii) Site preparation, preconstruction and construction stages.

(iii) Spudding, drilling, logging / well testing, casing, and cementing process to Total Depth (TD).

(iv) Well testing, drilling completion, well plug / seal of porous horizons and abandon hole / re-enter for side tracking / well testing, and.

(v) Rehabilitation, site closure, restoration, and handover to community / land owner.

(2) Unplanned accidental events:

(i) Major land accidental incidence such as diesel / oil spill / fire / explosion.

The drilling fluid system to be used for the proposed drilling operations comprises the following three (3) main components, namely: The drilling fluid system, the circulating/cleaning system, and the reserve pits. REN will be using a water-based Partially-hydrolyzed polyacrylamide (PHPA) mud system which uses freshwater as the base fluid. PHPA is a functional additive that will control wellbore shales and extends bentonite clay in low-solids mud. As a shale-control mud, PHPA is believed to seal microfractures and coat shale surfaces with a film that retards dispersion and disintegration. The plant-based products added to the base fluid are created through organic processes and are biodegradable. The reserve pit to be situated adjacent to the drilling rig and, along with storage tanks, is where the excess fluids and cuttings will be managed. The reserve pit will be sealed using an organic gel/clay barrier that will be sprayed at the bottom and side walls to prevent seepage of the reserve pit water into groundwater and surrounding soils. This approach is better than polyurethane pit linings, which are easy to install but challenging to remove during reclamation, which can lead to shredding and leakages.

During the drilling process various tests and activities may be undertaken subject to the outcomes of the drilling process. Test that may be undertaken are inclusive of the following: Drill Stem Testing (DST) in open hole during drilling phase, DST in cased hole after well is drilled, cased and cemented and other general tests that may be considered or routinely undertaken such as sample collection / sampling at appropriate depths, logging operations, Modular Formation Dynamics (MDT), wireline formation testing and formation fluid sampling, formation evaluation test that may allow fluids in the formation being evaluated to flow into the drill stem and to the surface and pressure-recording devices tool measure and record pressure in the well while it is both flowing and not flowing (shut in), as well as any additional tests as may be applicable and agreed with / requested by the Partners and / or MME.

Once exploration drilling activities are completed, and the well is dry, with no requirements for possible re-entry, the affected 3Ha drilling site and all the associated supporting infrastructures areas such as borrow pits, access roads and related services will be rehabilitated to minimise surface disturbances. The rehabilitation of each of the proposed drilling locations shall be focused on establishing common

local community sites with supporting facilities as may be applicable or requested by the local communities or land owner/s. As part of the rehabilitation and restoration process, each of the drilling sites will already have supporting infrastructure such as the road access and fully fitted water boreholes. The following is the summary of the local community site usages that shall be considered, evaluated and implemented in consultation with the various local communities, Village Development Committees (VDCs), Community Headperson (Foreman/Forewoman), Traditional Authority and Local Councillor representing the Regional Council: Common local community meeting centre with shade, handling pen / facilities for cattle and small stock, community garden and nursery centre and other additional supporting site infrastructures that could support common community facilities.

The key Areas of Interest (AOI) (Kavango Sedimentary Basin and the associated sub-basins) and the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6, inclusive of the supporting infrastructures such as the new access roads to each of the proposed wells sites, borrow pits owned by the traditional authority where construction materials will be purchased from and other associated services in PEL 73, falls within the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA). The KAZA TFCA area boundary does not represent an international formally proclaimed park area but a multiple land use international transboundary conservation initiative with a common vision of promoting and supporting sustainable livelihoods through coexistence and utilisation of the multiple resources and resources areas for the greater benefits of the local communities of the member states (www.meft.gov.na). KAZA TFCA is a transboundary initiative covering portions of Angola, Botswana, Namibia, Zambia, and Zimbabwe.

The key multiple surface resource areas found within the Namibian KAZA TFCA area are: National parks, game reserves, forest reserves, conservancies, game/wildlife management areas and communal lands. Additionally, however, the KAZA TFCA area also holds highly important and national strategic subsurface resources such as water, minerals, geothermal energy, and petroleum (oil and gas) that unfortunately are not mentioned in the initiative. Key targeted beneficiaries of the KAZA TFCA initiative are the local people, especially the local indigenous rural communities whose livelihoods are dependent on seasonal subsistence agriculture, animal husbandry, fishing, natural resource harvesting, tourism, trading, and hunting. In Namibia and in other KAZA TFCA member states, the exploration and utilisation of potential subsurface resources found under KAZA TFCA are allowed, except in the formally proclaimed national park areas of Namibia. The AOI as well as the proposed exploration and appraisal wells locations Nos. D1-D6 and G1-G6 do not fall in a formally proclaimed national park.

The well locations Nos. D1-D6 and G1-G6, and, supporting infrastructures such as the new access roads to each of the proposed wells sites, borrow pits owned by the traditional authority where construction materials will be purchased and other associated services, and the AOI do not fall within an active catchment area of the Okavango River Basin linked to the Okavango Delta in Botswana. The fossilised channel of the Omatako–Omuramba Ephemeral River and its ephemeral tributaries cut across the Kavango Sedimentary Basin. The Omatako–Omuramba Fossilised Ephemeral River channels are not seasonal surface or subsurface continuous flowing Ephemeral Rivers. According to Oldeland *et. al.,* (2013), the Omatako Ephemeral River has not contributed to runoff from the Okavango for over 50 years. Overall, the proposed exploration and appraisal well location Nos. D1-D6 and G1-G6 in Kavango Sedimentary Basin are situated more than 50 km in a straight line from the Okavango River, more than 260 km from the Okavango Delta in Botswana and not related to the Angolan Highlands active catchment area of the Okavango River Basin. The license area excludes all the formally proclaimed national parks in the regions including: Khaudum and Mangetti National Parks.

The proposed exploration and appraisal wells locations Nos. D1-D6 and G1-G6 fall in the Ncamangoro, and Ncuncuni Constituencies of Kavango West Region and Mashare Constituency of the Kavango East Region and within the boundaries of the Mbunza and Sambyu Traditional Authorities. The local land uses and livelihood in the general area are depended on communal / subsistence farming comprising cattle, donkeys, seasonal crop farming, grass, and wood / timber harvesting, conservancies and forestry conservation and natural resources harvesting, and very limited to no local tourism products within the area of interest. The following is the summary of some of the current common general threats to the natural environment and habitats of the general project area inclusive of the drilling sites and the areas surrounding the well locations Nos. D1-D6 and G1-G6:

(i) Accelerated allocation of communal leaseholds resulting in increasing forest clearing.

(ii) Subsistence communal crop farming centred on forest clearing, slash and burn practices.

(iii) Wild fires linked to local human activities such clearing of the forest for agricultures or simulation of fresh grass growths for animal grazing.

(iv) Timber and wood harvesting.

(v) Overgrazing due to increased number of animals, and.

(vi) Natural land and forest degradation due to climate change.

The proposed oil and gas exploration activities can be undertaken in community forestry and conservancies. However, undertaking of oil and gas exploration activities in community forestry or conservancy areas shall be done in line with the provisions of a given Community Forestry and Conservancy zone management plan. Consent to undertake oil and gas exploration activities shall always be obtained from a given Community Forestry and Conservancy Management Teams. None of the proposed wells locations fall within a Conservancy. The D1 and the D2 wells locations, which are one of the least priority wells to be drilled, fall within the Ncamagoro and Mbeyo Community Forests. The D5 which is one of the key priority wells locations likely to be drilled falls inside the southern margin / boundary of the Gcwatjinga Community Forest.

It is estimated that at least 67 species of reptile, 32 amphibian, 116 mammal and 210 bird species (breeding residents) are known to or expected to occur in the general Kavango East and West Regions of the proposed project area. It is estimated that at least 107 species of larger trees and shrubs (>1m in height) and up to 111 species of grasses are known to or expected to occur in the general project area inclusive of the proposed drilling sites and the areas surrounding the well locations Nos. D1-D6 and G1-G6, and supporting infrastructure areas.

The most important reptile species are viewed as the endemics (Ichnotropis grandiceps and Lygodactylus bradfieldi), species classified as rare (Lycophidion multimaculatum, Psammophis jallae, Causus rhombeatus) and species classified as vulnerable (Stigmochelys pardalis, Psammobates oculiferus, Kinixys spekii, Python natalensis, Varanus albigularis, Varanus niloticus) from the general area. Furthermore, Ichnotropis grandiceps, classified as data deficient (IUCN 2018) is also viewed as important.

The most important amphibian species from the area is the giant bullfrog (Pyxicephalus adspersus) with “population decreasing” according to the IUCN (2018) as it is consumed as food throughout its range.

The most important mammal species from the general area are probably those classified as rare (Nycteris hispida, Kerivoula argentata, Kerivoula lanosa, Mastomys shortridgei, Civittictis civetta, Paracynictis selousi) and endangered (Lycaon pictus, Lutra maculicollis, Equus (burchellii) quagga) under Namibian legislation and those classified by the IUCN (2018) as endangered (Lycaon pictus), vulnerable (Loxodonta africana, Smutsia (Manis) temminckii, Acinonyx jubatus, Panthera pardus, Panthera leo, Hippopotamus amphibious, Giraffa cemelopardalis) and near threatened (Hipposideros vittatus). However, some of the above species – e.g. other, hippo, etc. – are only associated with the Okavango River. The most important species expected to occur in the Ncaute-Karukuvisa area would be the African wild dog (Lycaon pictus) and pangolin (Smutsia (Manis) temminckii).

The most important bird species expected to occur in the general area are those classified as endangered (hooded vulture, white-backed vulture, tawny eagle, martial eagle, bateleur, southern ground-hornbill), vulnerable (secretarybird, white-headed vulture, lappet-faced vulture and) and near threatened (marabou stork, peregrine falcon, kori bustard) from Namibia (Simmons et al. 2015) as well as those classified by the IUCN (2018) as critically endangered (hooded vulture, white-headed vulture, white-backed vulture), endangered (lappet-faced vulture), 4 vulnerable (secretarybird, tawny eagle, martial eagle, southern ground-hornbil) and near threatened (bateleur, kori bustard).

Important larger tree/shrub species occurring on the proposed well locations Nos. D1-D6 and G1-G6, and supporting infrastructure areas area: Baikiaea plurijuga (Protected; LR-nt; Near Threatened [IUCN 2021]), Burkea africana (Protected), Guibourtia coleosperma (Protected), Dialium engleranum (Protected), Philenoptera violacea (Protected), Pterocarpus angolensis (Protected; LR-nt), Schinziophyton rautanenii (Protected), Sclerocarya birrea (Protected) and Strychnos species (Protected). All the key trees have been mapped and marked on each of the proposed well sites and supporting infrastructure areas such as the new access roads and borrow pits areas. A harvesting permit will be required before any marked tree is removed.

The most important habitats in the general wider area around D1-D6 and G1-G6 well locations but not necessary on actual proposed well sites are: Perennial Okavango River located more than 50 km away from the any of the proposed well locations, fossilised Ephemeral Omuramba Omatako, Ephemeral Pans, Khaudum National Park, Mangetti National Park, Undisturbed areas, Kapinga Kamwalye Conservancy, Community Forests. Due to the high density of protected tree species in the general area and to minimise the overall impact of the habitat destruction associated with the proposed wells drill sites developments, larger (parent trees) protected tree species have been marked to be protected during the process of developing each of the proposed well sites and supporting infrastructure areas. Overall, the general area has been heavily impacted in places, especially along the Fossilised Omuramba Omatako Ephemeral River Channel and areas close to towns and settlements due to subsistence farming and logging activities. The actual proposed development areas such as the D4 near communities are not pristine as there are extensive slash-and-burn agriculture activities, fire damage to large trees and trees felled for honey. The protected trees species occur widespread throughout the general area and not exclusively associated with the proposed D1-D6 and G1-G6 well locations.

The proposed exploration and appraisal wells drilling sites fall within the greater Kalahari Sedimentary Basin which was formed because of uplift of the Great Escarpment of Namibia and deposition of Kalahari Group Sediments in grabens which formed during various tectonic events that shaped the current landscapes of Southern Africa. The Kalahari Sedimentary Basin is a vast inland basin stretching over Angola, Namibia, Zambia, Botswana, and South Africa. Within the proposed drilling site areas, basement rocks below the top Kalahari Group of the Kavango Sedimentary Basin are expected to be of the Damara and Pre-Damara age.

A group of archaeological heritage sites are known to exist along the fossilised Omatako Ephemeral River basin between Ncaute and Taratara villages and south west of Omatako River basin. These sites fall outside the general areas of the proposed wells locations.

The source of water supply in the area is primary from the aquifers of the Kalahari Group sediments. The Kalahari sediments have variable yields and water qualities with groundwater potential of moderate to low. Aquifers present along the Ephemeral rivers including along the fossilised channel of the Omatako–Omuramba Ephemeral River are saline artesian aquifers overlain by alluvium aquifers of paleo-channels of the Okavango River. Hand dug wells and boreholes are the main sources of groundwater supply especially for the rural communities. Groundwater is located deeper in the western compared to the eastern parts of Kavango Sedimentary Basin. Groundwater flow in the area is controlled by regional and local faulting, with a low-gentle gradient. Borehole yields in the AOI on average, can supply approximately between 8-10 m^3/h or 192-240 m^3/day. The results of the ongoing groundwater analysis have determined that the average borehole yield in the AOI satisfies the required water demand per community water point. The required water demand for the proposed drilling of an oil and gas well has been given as approximately 7m^3/h, which is close to the average borehole yield for the region. Normal operational or safe yield is normally taken as 70-80% of sustainable yield. This indicates that a borehole must yield at least 9m^3/h to fulfil the water requirements of the drilling of the exploration and /or appraisal well. A detailed groundwater study has been implemented to provide more detailed site-specific data on water resources use, management and protection for the proposed exploration and appraisal drilling operations.

In addition to the initial public, stakeholder and community consultations conducted in 2019, 2021 and 2022 with respect to various 2D seismic survey phases and stratigraphic well drilling operations, regulatory consultations and engagement processes have been implemented starting in November 2022 with respect to the proposed exploration and appraisal well drilling operations inclusive of the

supporting infrastructures such as the new access roads to each of the proposed new wells sites, the use of existing borrow pits and other associated services. During the months of November and December 2022, and February 2023 public notices were published in the local newspapers as required by the Environmental Management Act, 2007, (Act No. 7 of 2007) and EIA Regulations, 2012 and as part of the notification process to the public, Interested and Affected Parties (I&APs).

The proposed project was registered with the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT) under the Application No. 00459 as listed on the MEFT Portal www.eia.meft.gov.na. A formal screening notice from the Environmental Commissioner in terms of assessment procedures as provided for in Section 35 (1)(a)(b) of the Environmental Management Act, 2007, (Act No. 7 of 2007) was received and used in the preparation of the Scoping, EIA and EMP Reports as well as all other required submittals in support of the application for the ECC. As part of the ongoing EIA process additional consultation activities were undertaken during the months of January and February 2023 focusing on the registered stakeholders, local communities including land owners and traditional authorities, and public awareness. Public, stakeholder and community consultations and engagements activities were aimed at supporting the processes of obtaining consents for land for each of the proposed drilling sites, local access routes, borrow pits areas and met the drilling ECC regulatory consultations requirements.

Building on the previous studies undertaken in the area since 2018, as well as the experiences, environmental monitoring and lessons learned from the drilling of the stratigraphic wells 6-2 Kawe, 6-1 Mbambi and 8-2 Makandina, assessment of the likely positive and negative impacts of the proposed drilling of the D1-D6 and G1-G6 exploration and appraisal wells operations has been undertaken in line with the Terms of Reference (TORs) as provided in the Scoping Report. The overall severity of potential environmental impacts of drilling the proposed prioritised exploration and appraisal wells locations Nos. D1-D6 and G1-G6 in PEL No. 73 on the receiving environment will be of low magnitude, temporal duration, localised extent (3Ha footprint), and low probability of occurrence due to the limited scope of the proposed activities, engineered surface and subsurface wells infrastructures, and the adoption of international well designs and drilling best practices. Overall, the assessment of significant impacts focused on the ecosystem-based approach that considered potential negative impacts to the local individual drilling sites, regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) and global interconnected ecosystems will be low.

All human induced activities, including the proposed petroleum exploration activities have potential negative environmental consequences, but identifying the most important fauna and flora species including high risk habitats beforehand, coupled with environmentally acceptable recommendations (mitigating factors), lessens the overall impact of such activities.

Based on the findings of this EIA Report, specialist assessments, and the mitigation measures contained in the EMP Report, it is hereby recommended that the drilling of the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 in PEL 73, shall be granted with an Environmental Clearance Certificate (ECC). The ECC shall be inclusive of the supporting infrastructures such as the new access roads, borrow pits owned by the relevant traditional authority where construction materials will be purchased from, and other associated services areas. The following is the summary of the key additional recommendations that may form part of the Record of the Decisions:

1) The Proponent shall adhere to the provisions of all the national legislation, regulations, policies, procedures, and all the required permits / authorisation / consents must be obtained before the start of the operations for each of the proposed well sites and supporting infrastructure areas.

2) Mitigation measures detailed in the EMP Report are based on the findings of this EIA Report, and have been modelled around two main concepts namely: best industry practices which are based on the Best Practicable Environmental Option (BPEO) and local Namibian requirements unique to the area of exploration.

3) All the provisions of the EMP and mitigation measures shall be implemented, adhered to and monitored and sites inspections by the external project specialist consultants and EMP monitoring teams shall be undertaken before, during and after the start of construction,

operational and closure, rehabilitation and restoration activities for each of the proposed well sites and supporting infrastructure areas.

4) Before the implementation of the individual well drilling operations, the Proponent shall consult with the land owners / land rightsholder / local community / owners of the communal fields and villages that may be affected or likely to be disturbed by the proposed project activities including access to the well locations and sources of construction materials covering the existing borrow pits areas. All the consultations and engagements shall be undertaken through the existing regional and local structures covering the Office of the Governors for Kavango West and West Regions, Councillors, Traditional Authorities, Farmers Associations, Village Headpersons, and Village Development Committees (VDCs) and local community levels.

5) 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 surface user rights conflicts.

6) All borrow pits belong to the traditional authorities and construction materials must be purchased from the relevant traditional authority having jurisdiction over a given borrow pit area and a purchase agreement must be signed before construction materials can be obtained from any given borrow pit in Kavango East and West Regions.

7) Appropriate setback distances (exclusion zones) around sensitive structures such protected areas and human settlements shall always be observed. Such exclusion zone shall be for example be in the ranges of between 400m-500m from an exploration well site to a nearest settlement\ village, and.

8) 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 traditional houses, 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.

Through the effective implementation of the mitigation measures and performance monitoring by the Proponent, the overall likely negative impacts of the proposed prioritised exploration and appraisal wells locations Nos. D1-D6 and G1-G6 and supporting infrastructures such as the new access roads to each of the proposed new well sites, the use of existing borrow pits and other associated services on the receiving environment (physical, socioeconomic, and biological) will be low and localised with medium to low significant negative impacts. The process of clearing the drilling sites, access tracks, and use of existing borrow pits areas as well as actual drilling operations will have localised medium significant negative impacts on the local environment without mitigation. Direct supervision, involvement, and continuous monitoring of the process of clearing of all the drilling sites, access tracks, and borrow pits areas, and actual drilling operations will reduce any likely medium significant negative impacts to localised low.

This EIA Report has been prepared in line with the contractual provisions of the Environmental Protection Clause 11 of the Petroleum Agreement and the legal provisions of the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), and the Petroleum Laws Amendment Act, 1998, (Act 24 of 1998), the Environmental Management Act, 2007, (Act No. 7 of 2007) and Environmental Impact Assessment (EIA) Regulations, 2012 as well as the corporate requirements of the Proponent.

1. PROJECT BACKGROUND

1.1 Introduction

Reconnaissance Energy Namibia (Pty) Ltd, the Proponent, and herein referred to as "**REN**" holds petroleum exploration rights under the PEL No. 73 covering parts of the Degree Square Blocks Nos. 1819, 1820, 1821, 1719, 1720, and 1721 in the Kavango Sedimentary Basin, Kavango West and East Regions, northern Namibia (Figs. 1.1 and 1.2). PEL 73 was 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. REN is a subsidiary of Reconnaissance Energy Africa Ltd (ReconAfrica), a Canadian public listed company.

REN is the Operator of PEL 73 holding 90% of the license interests. The National Petroleum Corporation of Namibia (Namcor), a Namibian State-owned company (Parastatal) holds the remaining 10% interest in the Licence, with its costs carried to the development stage. The license was granted in January 2015 and exploration period continues to January 2024 with the rights to extend to January 2026 (Figs. 1.1 and 1.2). Following declaration of a commercial discovery, the Petroleum Agreement entitles REN to apply for a production licence having a 25-year term. The fiscal terms of the Petroleum Agreement call for a corporate income tax of 35%, royalty of 5%, and an additional profits tax that applies late in the life of a producing field.

1.2 REN Petroleum (Oil and Gas) 2022 Exploration Updates

1.2.1 Overview of an Oil and Gas Exploration Steps

Petroleum exploration involves the implementation of multiple exploration steps over many years. The following is the summary of the key steps:

1. **Step 1**: An applicant develops a theoretical hydrocarbon model and apply for a Petroleum Exploration License (PEL) and once the license is granted there is no requirement for undertaking environmental assessment and obtaining the Environmental Clearance Certificate (ECC) over the entire license area. The environmental assessment and all other applicable permits are only required once the PEL holder decides to implement exploration activities such as drilling or seismic survey that requires an ECC to be granted before implementation.

2. **Step 2**: Collection of the existing key historical data sets pertaining to petroleum geology, regional sedimentary basin frameworks, aerial gravity, magnetics and if the sedimentary basin is unknown, a site-specific stratigraphic well/s drilling operation is undertaken to confirm the existence of sedimentary basin / petroleum system as delineated from the analysis of the aerial geophysical data and other exiting geological data sets.

3. **Step 3:** Once the sedimentary basin and petroleum system have been confirmed and potential target area (Area of Interest-AOI), defined, geophysical survey methods such as airborne gravity, 2D or 3D seismic surveys are used in the search for potential geological structures that could hold economic oil or gas called reservoirs. An ECC is required for this step, and.

4. **Step 4**: Exploration and appraisal drilling operations well drilling is undertaken on the identified geological structure (potential reservoir) based on the interpreted results of the seismic survey. The objective is to test and confirm if the seismic survey delineated geological structure/s contains any oil or gas resources. If the drilled exploration well is dry, the drilled well will be capped and abandoned safely. If there is potential commercial oil or gas discovered during the exploration well drilling operations, then an appraisal programme may be undertaken to test the size, economics of the discovered oil or gas and define the extent of the potential production field. An ECC is required for the exploration and appraisal drilling operations. This Environmental Scoping Report, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) to be prepared are all intended at supporting the application for ECC for this step.

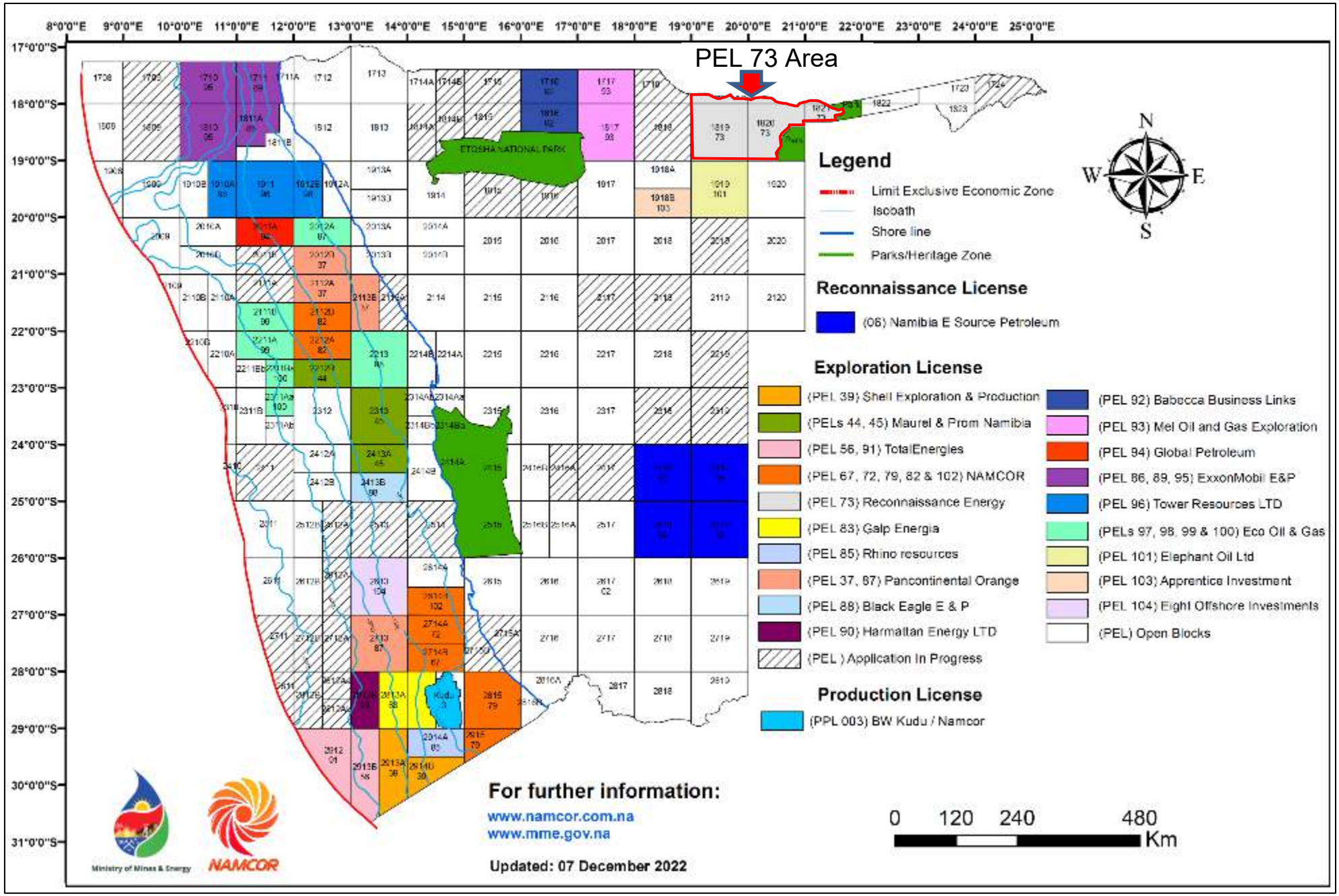


Figure 1.1: Hydrocarbon Map of Namibia showing Petroleum Exploration License (PEL) No. 73 covering parts of the Degree (Latitude and Longitude) Square Blocks Nos. 1719, 1720, 1721, 1819, 1820 and 1821 in the Kavango Sedimentary Basin, Kavango West and East Regions, northern Namibia (Source: www.namcor.com).

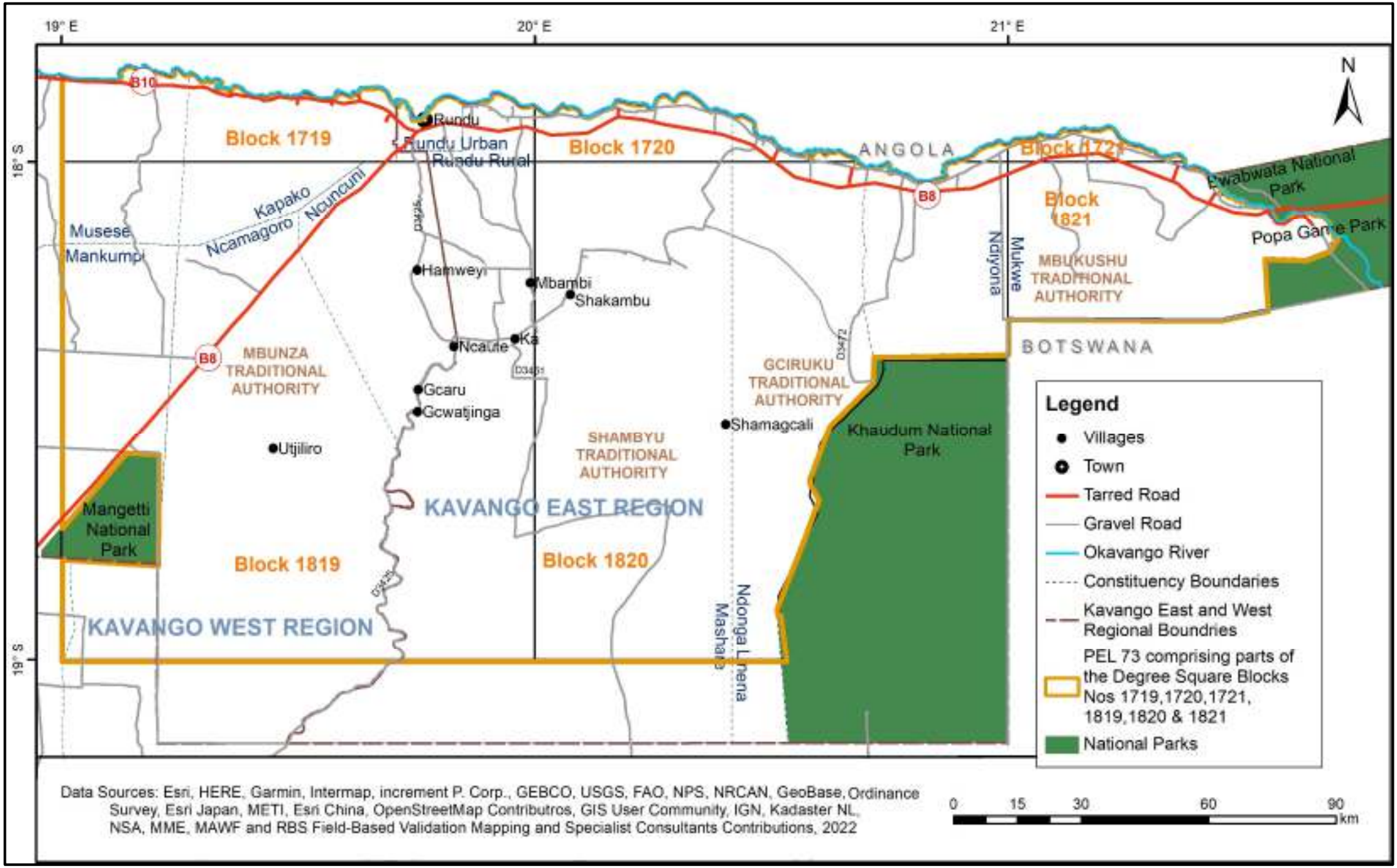


Figure 1.2: Regional location of PEL No. 73 covering parts of the Degree Square Blocks Nos. 1819, 1820, 1821, 1719, 1720, and 1721 falling within the KSB covering multiple traditional authorities in Kavango East and West Regions.

1.2.2 Stratigraphic Wells Drilled in 2021 and 2022

To date, REN has delineated the Kavango Sedimentary Basin and associated sub-basin and has defined the key exploration Areas of Interest (AOI) based on the interpretation of the available Government high resolution airborne geophysical data, regional structural geological mapping, and onshore historical for Namibia. Stratigraphic wells currently being drilled are designed to confirm and map the KSB, associated subbasins and petroleum systems with well targets, prospects and leads as part of a de-risking process based on regional data sets including airborne geophysics, initial 2D seismic and regional geological mapping results. The first well to have been drilled is the 6-2 well situated at Kawe Village, in Kavango East Region followed by the 2nd well No. 6-1 situated north of the village of Mbambi in Kavango East Region (Fig. 1.3).

The results of the 6-1 Mbambi, and 6-2 Kawe, 8-2 Makandina stratigraphic test wells drilled by REN in 2021 and 2022, respectively, and subsequent 2D seismic data acquired in the Kavango Sedimentary Basin (KSB) since 2021, have established a significant rift basin similar to the other major petroleum provinces/rift basins including onshore Africa, and areas of the North Sea (Figs. 1.4-1.6). Thus far, the integrated interpretation has established the following three (3) groups of hydrocarbon opportunities ("Plays"), illustrated in Figs. 1.4-1.6:

(i) Primary: Karoo Rift Fill (Light Oil).

(ii) Secondary: Intra-Rift Fault Blocks (Light Oil), and.

(iii) Secondary: Damara Fold Belt (New Play, Gas/Gas Condensate).

Pre-Karoo formations have been penetrated in each of the three (3) stratigraphic wells drilled in PEL 73 (Figs. 1.3-1.6 and Table 1.1). In the 6-2 Kawe well, two (2) geological intervals with significant oil shows and reservoir porosity have been reported by REN in 2021. A new petroleum system (play) for KSB, the Damara Fold Belt, has been established based on the interpretation of the first phase of seismic data. The Damara Fold Belt was not anticipated in the original studies of the KSB.

According to REN, (2022), results of additional seismic data show an extensive area of compressional folded and faulted anticlines in the Pre Karoo, Damara Fold Belt, which extends across northern Namibia (Figs. 1.4-1.6).

As shown in Figs. 1.4-1.6, there is a whole spectrum of play types, not only structurally diverse, but in highly varied stratigraphic and depositional settings. These structures are exceptionally well imaged in the southwestern part of the greater Kavango Sedimentary Basin which is not overlayed by the Karoo Rift Basin (Figs. 1.4-1.6).

1.2.3 Proposed Exploration and Appraisal Wells

As part of the progressive processes of de-risking the KSB, REN is proposing to drill the prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 designed to confirm the existence of economic oil and / or gas resources with the delineated targets / prospects and leads process based on additional 2D seismic survey data acquisition and interpretation, airborne geophysical surveys and the stratigraphic well data sets (Table 1.1).

The objectives of the proposed exploration and appraisal wells drilling programme is to continue with the search for oil and gas in the KSB and the associated subbasins and to identify potentially commercial petroleum systems.

The drilling of the proposed exploration and appraisal wells will be undertaken using the Crown 750 truck mounted drill rig currently being used by REN to drill the stratigraphic wells and will apply the same drilling technology with the addition of well testing in an event of a discovery. REN will continue with the drilling of the stratigraphic wells programme for 2022-2023 based on the current granted permits until all the required permits, consents and authorisations to drill the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 have been granted by the Government.

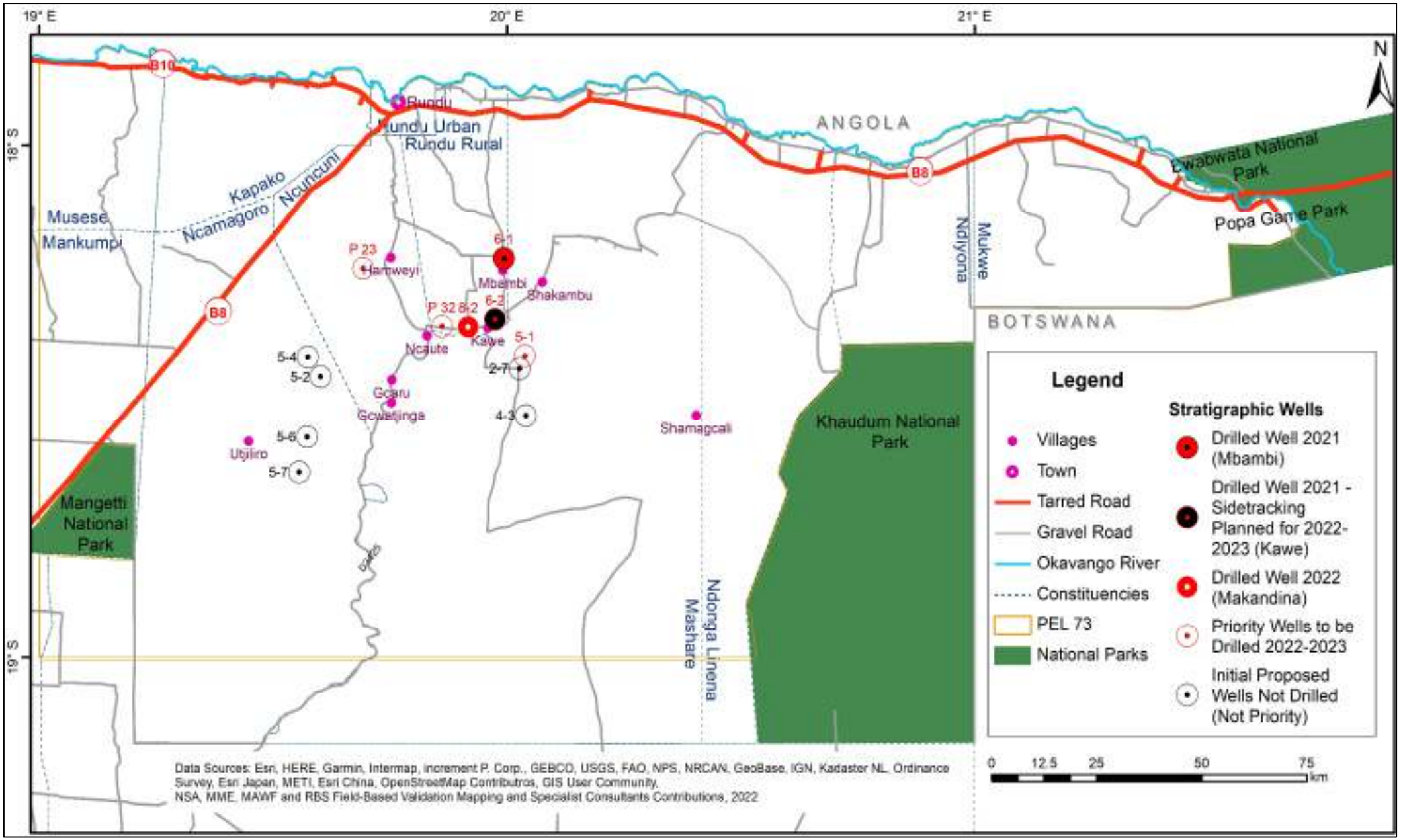


Figure 1.3: Stratigraphic well map showing the regional location of PEL No. 73 covering parts of the Degree Square Blocks Nos. 1819, 1820, 1821, 1719, 1720, and 1721, the 2021 drilled stratigraphic wells Nos. 6-1 and 6-2, initially proposed stratigraphic well sites Nos. 2-7, 4-3, 5-2, 5-4, 5-6, and 5-7 not drilled and new proposed priority stratigraphic wells Nos. P23, P32, 8-2 Makandina (P33) and 5-1 Wisdom (P2-7Ga) locations to be drilled in 2022-2023 in addition to the 6-2 well sidetracking.

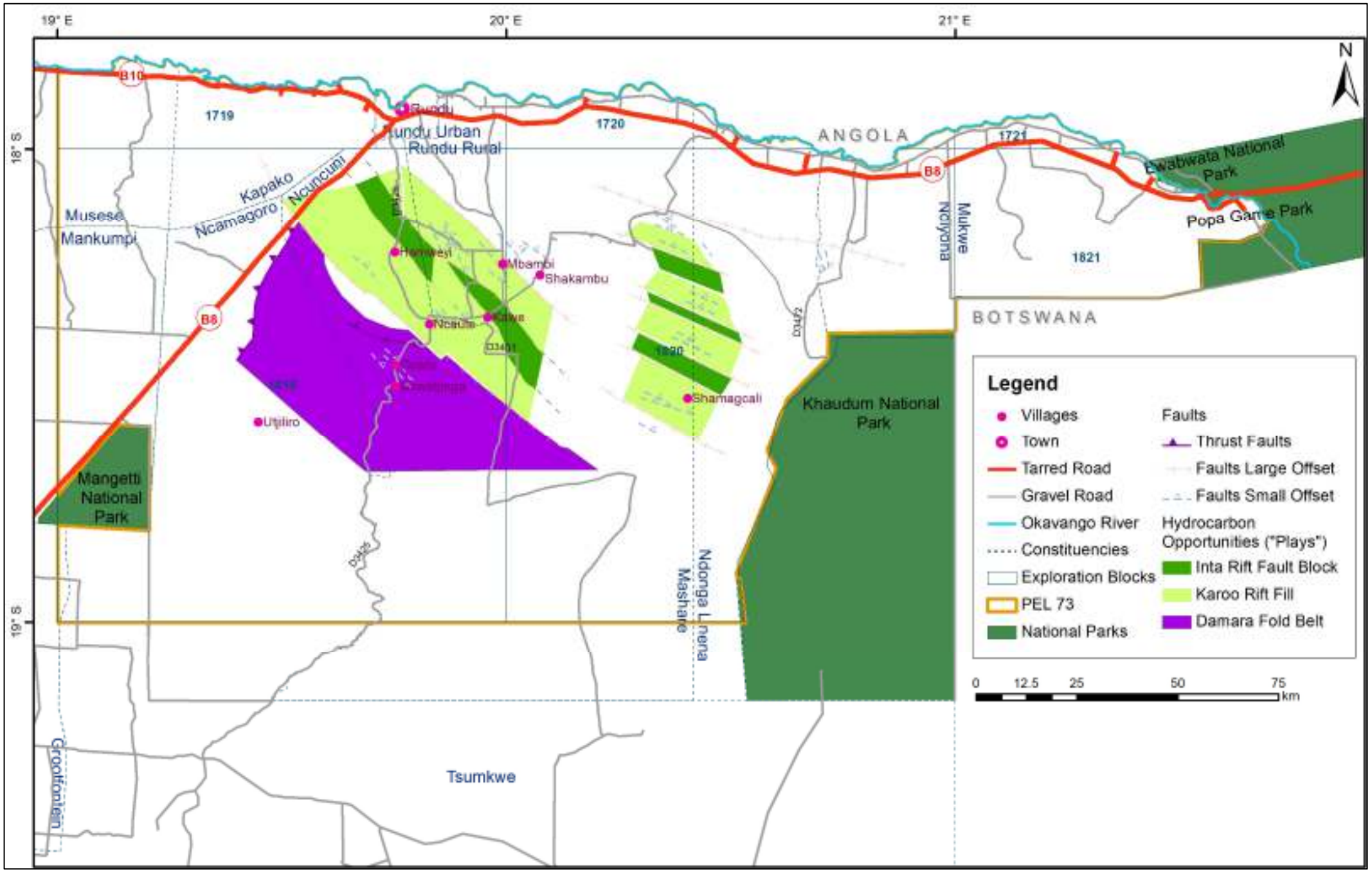


Figure 1.4: REN established hydrocarbon Plays of the Kavango Sedimentary Basin showing the Primary: Karoo Rift Fill (Light Oil), Secondary: Intra-Rift Fault Blocks (Light Oil), and Secondary: Damara Fold Belt (New Play, Gas/Gas Condensate), (Data Source: REN, 2022).

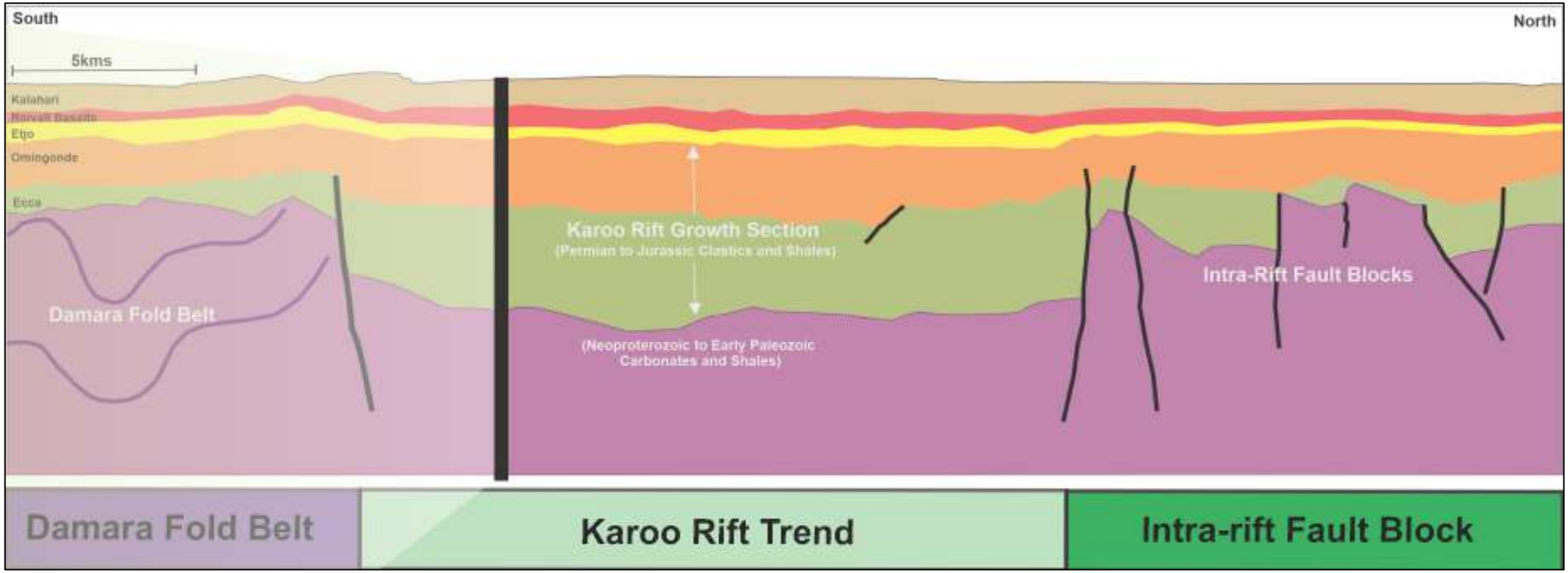


Figure 1.5 REN delineated Kavango Sedimentary Basin (KSB) hydrocarbon plays showing the Primary Karoo Rift Fill (light oil), Secondary Intra-Rift Fault Blocks (light oil), and Secondary Damara Fold Belt (new play, gas/gas condensate). Karoo Rift Basin showing the main and perched grabens (rift valleys); note the series of normal faults controlling the rift basin architecture and depositional stratigraphy (Source: REN, 2022).

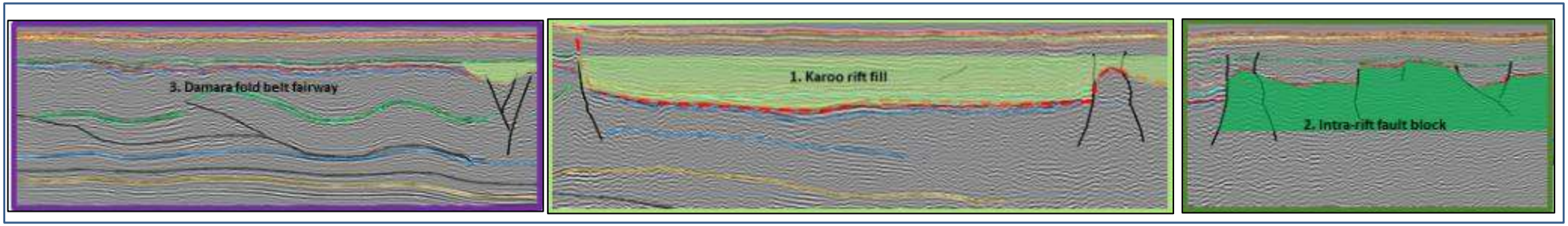


Figure 1.6: REN preliminary seismic interpretation sections showing the Damara Fold Belt, current priority exploration focal area and note the train of anticlinal folds developed above the basal thrust detachment (Black horizontal line) and intersected by reverse faults, Karoo Rift Fill and Intra-Rift Fault Blocks hydrocarbon plays (Source: REN, 2022).

Table 1.1: List of the stratigraphic and exploration and appraisal wells status for PEL 73.

No.	Type of Well	Well Reference No.	Latitude	Longitude	Description	Status and Priority Rating
1.	**STRATIGRAPHIC WELLS:** Designed to confirm and map the KSB, associated subbasins and petroleum systems with well targets, prospects and leads as part of a de-risking process based on regional data sets including airborne geophysics, initial 2D seismic and regional geological mapping results.	Prospect (P) 23	18°14'29.2256"S	19°41'33.1983"E	Hamweyi Village Well Site Not Drilled	**Not a Priority at Present**
2.		Prospect (P) 32	18°21'15.9030"S	19°51'40.3686"E	Cumezao Village Well Site, Not Drilled	
3.		8-2 Makandina (Prospect (P) 33)	18°21'18.9137"S	19°55'01.9628"E	Makandina Village Stratigraphic Well drilled in 2022	Completed and Site to be Rehabilitated
4.		Wisdom 5-1 Well (Prospect (P) P2-7)	18°24'42.6361"S	20°02'18.2718"E	Farm Wisdom Stratigraphic Well	To be Drilled Starting December 2022
5.		6-2	18°20'25.7"S	19°58'29.0"E	Kawe Village Well Drilled in 2021	Proposed for Sidetracked in 2022-2023 Work Programme
6.		6-1	18°13'18.0"S	19°59'37.5"E	Mbambi Village Stratigraphic Well Drilled in 2021	Completed and Site to be Rehabilitated
7.		2-7	18°26'11.23"S	20° 1'37.47"E	Initial identified wells aimed at confirming the existence of a Sedimentary Basin not drilled and not priority	**Not a Priority at Present**
8.		4-3	18°31'41.76"S	20° 2'26.86"E		
9.		5-2	18°27'7.60"S	19°36'6.70"E		
10.		5-4	18°24'50.12"S	19°34'27.76"E		
11.		5-6	18°34'10.34"S	19°34'21.34"E		
12.		5-7	18°38'19.61"S	19°33'20.95"E		
13.	**Exploration and Appraisal Wells:** Designed to Confirm the Existence of Economic Oil and / or Gas Resources with the Delineated Targets / Leads De-Risking Approach Based on 2D Seismic Survey, Airborne Surveys and Stratigraphic Wells Data Sets	D1	18°16'44.8394"S	19°31'53.6353"E	Ncamagoro Community Forest	Proposed Well Priority No. 3
14.		D2	18°19'36.1605"S	19°33'25.2871"E	Mbeyo Community Forest	
15.		D3	18°26'12.2958"S	19°41'37.2901"E	Gcaru Village Well Site	Proposed Well Priority No. 2
16.		D4 Original	18°33'19.6969"S	19°42'43.7835"E	Naingopo Village Well Site	Proposed Well Priority No. 3 Alternative to D5 (Priority No. 1)
		D4-1 Alternative	18°33'20.2392"S	19°42'39.5532"E		
17.		D5	18°35'54.6514"S	19°44'37.8243"E	Gcwatjinga Community Forest	Proposed Well Priority No. 1
18.		D6	18°35'32.4710"S	19°54'10.1501"E	Farm 1529	
19.		G1	18°14'37.5326"S	19°44'30.2843"E	Hamweyi Village Well Site	Proposed Well Priority No. 3
20.		G2	18°27'14.7688"S	19°57'25.2756"E	Farm 1562	
21.		G3	18°24'18.2999"S	20°0'39.7775"E	Farm 1564	Proposed Well Priority No. 2
22.		G4	18°26'37.2785"S	20°4'52.2771"E	Farm 1565	Proposed Well Priority No. 3
23.		G5	18°26'35.5441"S	20°10'27.7691"E	Farm 1567	Proposed Well Priority No. 1
24.		G6	18°26'24.1417"S	20°18'33.8072"E	Farm 1572	

1.2.4 Location of the Proposed Exploration and Appraisal Wells and Land Access

1.2.4.1 Overview of the Proposed Exploration and Appraisal Wells

The proposed exploration and appraisal wells locations are based on the interpretation of the processed 2D seismic survey and drilled stratigraphic wells data sets (Table 1.1 and Figs. 1.7-1.11). According to REN, 2022, the acquired 2D seismic survey data show that the Karoo Rift Basin is composed of several sub-basins that should open new plays within the context of the original exploration concepts (Fig. 1.9).

In addition, the 2D seismic survey and drilled stratigraphic wells data sets also identified targets in the "Damara Fold Belt", an extensive area of folded and faulted anticlines to the southwest of the Karoo Rift Basin, potentially serving as excellent structural and stratigraphic traps in the Pre-Karoo stratigraphy (Fig. 1.9). Table 1.1 and Figs. 1.7-1.11 shows the locations of the proposed prioritised new exploration and appraisal wells to be drilled in 2023-2024.

Based on the stratigraphic wells data and interpretation of the 2D seismic surveys conducted to date, the proposed and prioritised twelve (12) exploration and appraisal wells programme has been grouped into Damara Fold Belt Leads ("D" numbered Wells) and Graben ("G" numbered Wells) covering the primary Karoo Rift Fill and secondary Intra-Rift Fault Blocks Leads (Table 1.1 and Fig. 1.9).

1.2.4.2 Priority Exploration and Appraisal Wells List of the Damara Fold Belt Leads

The following is the summary of the prioritised Damara Fold Belt Leads ("D" numbered Wells) exploration and appraisal wells locations (Table 1.1 and Figs. 1.7-1.23 and Plates 1.2 -1.7):

(i) The Damara Fold Belt Leads priority group No. 1 covers the D5 (Figs. 1.12 and 1.13 and Plate 1.2) and D6 (Figs. 1.14 and 1.15 and Plate 1.3), with D4 (original Well site) and D4_1 (Alternative site moved away from the communal farmland) (Figs. 1.16 and 1.17 and Plate 1.4) being an alternative to the D5.

The D5 well location falls inside the southern margin / boundary of the Gcwatjinga Community Forest, accessible along the D3425 Road. The well site is about 100 km from Rundu, 45 km from Ncaute and 5km off the D3425, along the existing community fire cut line. A new 70m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access will need to be created. If the need to drill this well location arises, the current well location may be moved outside the Community Forestry boundary, if applicable.

The D6 well location is situated on a commercial Farm 1529 on Communal land accessible along the D3425 Road. It is located about 17 km to the east of D5 and accessible along an existing fire cut line which turns into local farm boundary access. A new 175 m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access will need to be created to access this site.

The D4 well location is situated at Naingopo Village which is about 32 km and 92 km from Ncaute and Rundu, respectively, and accessible along the D3425 gravel road. This well location (D4) has been shifted to D_4 away from the local settlement and subsistence farmlands. A new 490m long, 10 m wide with a curve radius of less than 22m access road from the D3425 will need to be created.

(ii) Priority group No. 2 covers the D3 well site situated about 7km to the west of the village of Gcaru and accessible along an existing track linked to the D3425 road through Ncaute to Rundu (Figs. 1.18 and 1.19 and Plate 1.5). The proposed well site is about 22 km from Ncaute and 82 km from Rundu. A new 260m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access from Gcaru will need to be created linking to the D3425 Road at Gcaru, and.

(iii) Priority group No. 3 cover the D1 (Figs. 1.20 and 1.21 and Plate 1.6) and the D2 (Figs. 1.22 and 1.23 and Plate 1.7) well locations fall within the Ncamagoro and Mbeyo Community Forests, respectively. Both wells are accessible along the B8 (11 km from Rundu) east turnoff into an

existing fire cut line through the Community Forest. The D1 and D2 well sites are about 11 km and 20 km respectively from the B8 turnoff.

D1 well location will require a new 360m long access road from the existing upgraded access to be created linking to the B8 Road. The D2 well location will require a new 20m long access road from the existing upgraded access to be created linking to the B8 Road.

1.2.4.3 Priority Exploration and Appraisal Wells List of the Graben Leads

The following is the summary of the prioritised leads of the Graben Play ("G" numbered Wells) covering the Karoo Rift Fill and Intra-Rift Fault Blocks exploration and appraisal wells locations (Table 1.1 and Figs. 1.7, 1.24-1.35 and Plates 1.8-1.13):

(i) The Graben (G) priority group No. 1 covers the G5 (Figs. 1.24 and 1.25 and Plate 1.8) and G6 (Figs. 1.26 and 1.27 and Plate 1.9) well locations are located on commercial farms on communal land, Farms Nos. 1567 and 1672, respectively. The well sites are located to the south southeast of Mutweghombahe and Kawe settlements. From Mutweghombahe the proposed well sites G5 and G6 are situated about 30 km and 45km, respectively, along the large-scale agricultural commercial farming units on communal land existing access road network (Plate 1.1). The G5 and G6 well locations will require new 130m and 430m long access roads respectively, from the existing upgraded accesses to be created. The new access roads to be upgraded and created will need to be 10m wide with a curve radius of less than 22m.

(ii) Graben (G) priority group No. 2 covers: The proposed G3 well site is situated to the south of Mutweghombahe and south southeast of Kawe settlements. The location of the G3 well site falls on privately owned large-scale agricultural commercial farming units on communal land (Figs. 1.28 and 1.29 and Plate 1.10). Specifically, G3 falls on Farm No. 1564 named Wisdom owned by Mr. Hannes Balzar. From Mutweghombahe the proposed well site G3 is situated about 13km along the large-scale agricultural commercial farming units on communal land existing access road network. A new 420m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access will need be created, and.

(iii) Graben (G) priority group No. 3 cover the G1 (Figs. 1.30 and 1.31 and Plate 1.11), G2 (Figs. 1.32 and 1.33 and Plate 1.12), and G4 (Figs. 1.34 and 1.35 and Plate 1.13) well locations. G1 well site is located at Hamweyi Village along the eastern side of the D3425 road linking Rundu to Ncaute (Fig. 1.21).

The G1 well site is about 43km from Rundu and 18km from Ncaute and will require a new 810m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access to be created.

The G2 and G4 well locations both falls on privately owned large-scale agricultural commercial farming units on communal land Farm Nos. 1562 and 1565, respectively. The well sites are located south southeast of Mutweghombahe and Kawe settlements. From Mutweghombahe the proposed well sites G2 and G4 are situated about 22 km and 20km, respectively, along the large-scale agricultural commercial farming units on communal land existing access road network. The G2 and G4 well locations will require new 250m and 810m long access roads respectively, from the existing upgraded accesses to be created. The new access roads to be upgraded and created will need to be 10m wide with a curve radius of less than 22m.

1.2.4.4 Access to Surface Land Rights Only with Consent

Although the ownership of communal land is vested in the State with the traditional authorities in Namibia having custodianship, access to surface land rights by REN to exercise its subsurface petroleum exploration rights may require one of the following temporary consents or long-term leaseholders as may be applicable or required:

(i) Obtain consent from a leaseholder/s for temporary use for the duration of the drilling period only with no need for long-term usage.

(ii) In the absence of leaseholder, REN shall obtain consent by approaching a local village headman / headwoman, with surface land rights ownership confirmed by the traditional authority before approaching the Communal Land Board either Kavango West or East Regional Council for endorsement of the temporary consent as may be required, and.

(iii) To obtain a leaseholder for a longer period to support the drilling operations locally or elsewhere within the PEL 73, REN shall approach the leaseholder or a local village headman / headwoman, with surface land rights ownership confirmed by the traditional authority before approaching the Communal Land Board either Kavango West or East Regional Council for a leasehold.

At the end of the drilling operations, the portion of the land offered for the drilling activities shall be rehabilitated and given back to the owner. Note that each of the wellheads that will remain on each of the drilling sites are a property of the State and shall be secured and not to be tampered by the land owner or local community.

1.2.4.5 Local Communities Not Going to be Relocated / Lose Land / Displaced

During any oil and gas exploration programme (seismic survey or drilling of stratigraphic or exploration / appraisal wells), no community relocation whatsoever takes place and no one will be relocated, lose their land, or displaced during the proposed exploration and appraisal wells drilling operations. No community relocations are undertaken during oil and gas exploration operations and rarely undertaken even during the oil or gas field development stages following a commercial discovery.

Instances of community relocations may only affect a community settlement that may be located too close to a critical oil and gas supporting infrastructure that cannot be situated anywhere within the discovered oil or gas field.

Such infrastructure may include a production well/s, pipeline, power station, refinery or any other supporting infrastructure to the oil or gas field development and operational safety requirements. Such issues will indeed be addressed in a separate environmental assessment that may be implemented for the production phase of any commercially discovered oil or gas resources within PEL 73.

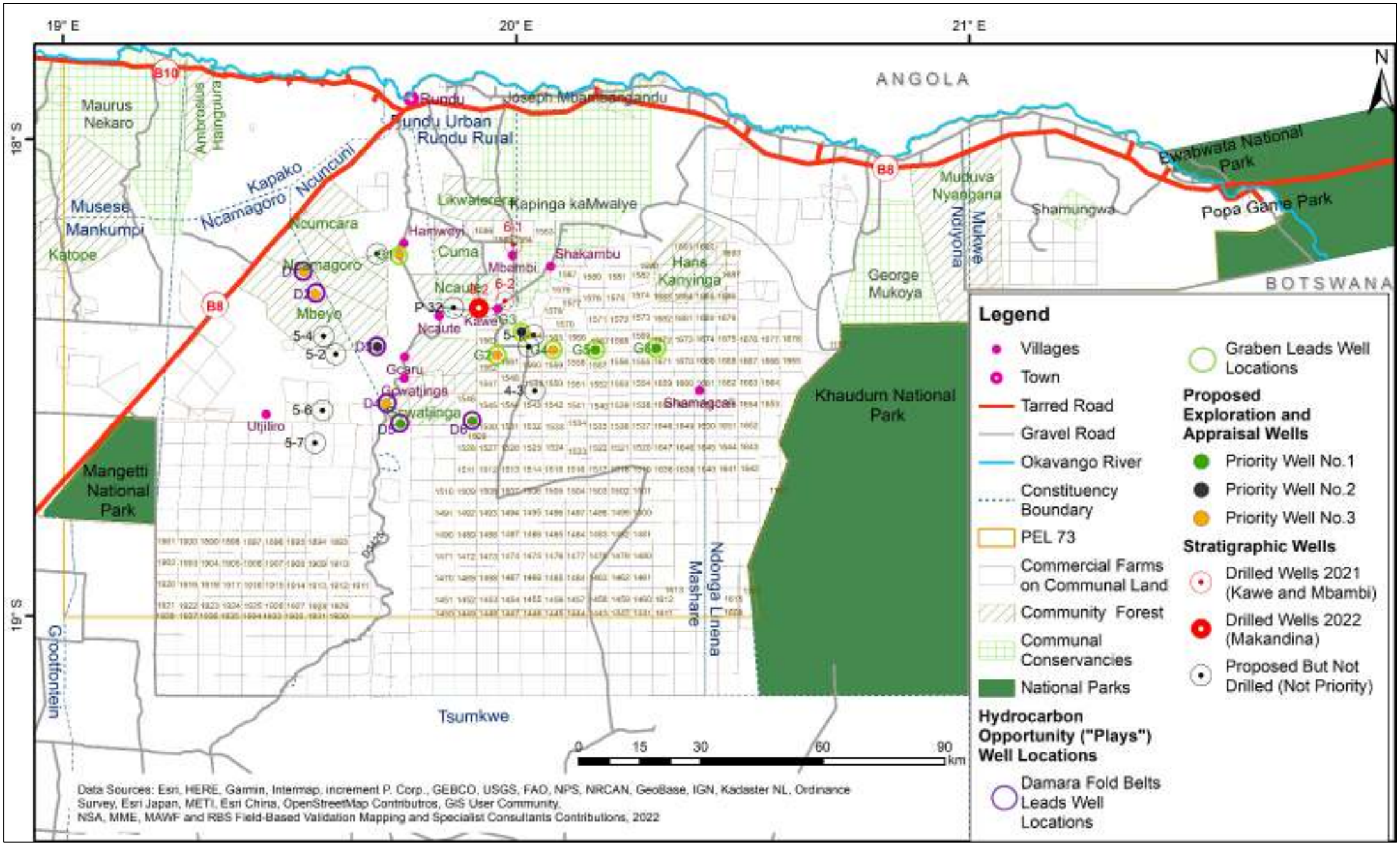


Figure 1.7: PEL No. 73 regional map showing the stratigraphic well locations with respect to the proposed exploration and appraisal wells locations, and other land uses such as commercial farms on communal land, community forest, community conservancies and national parks.

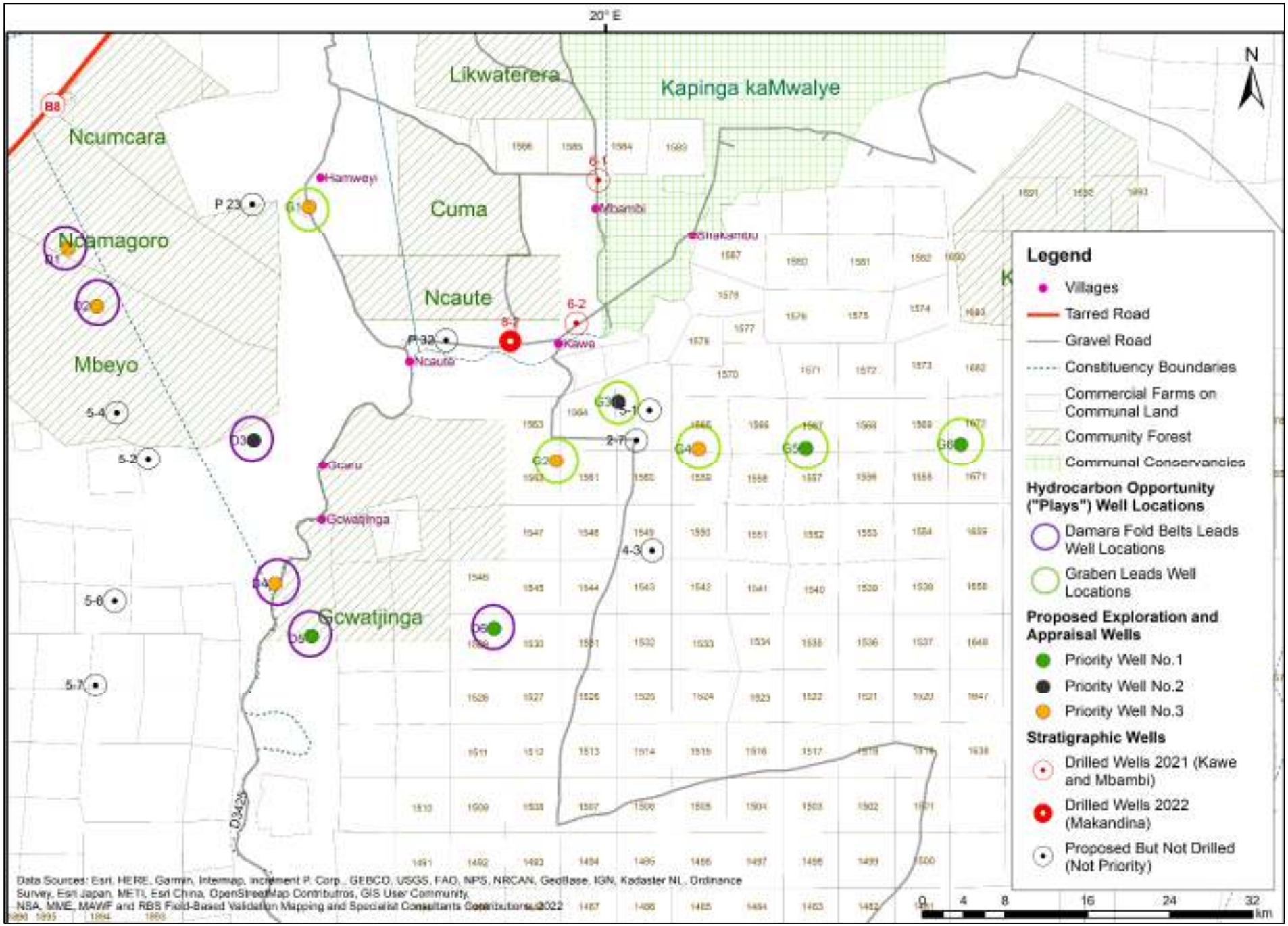


Figure 1.8: Local AOI map showing all the stratigraphic well locations with respect to the new proposed exploration and appraisal wells locations, and other land uses such as commercial farms on communal land, community forest and community conservancies.

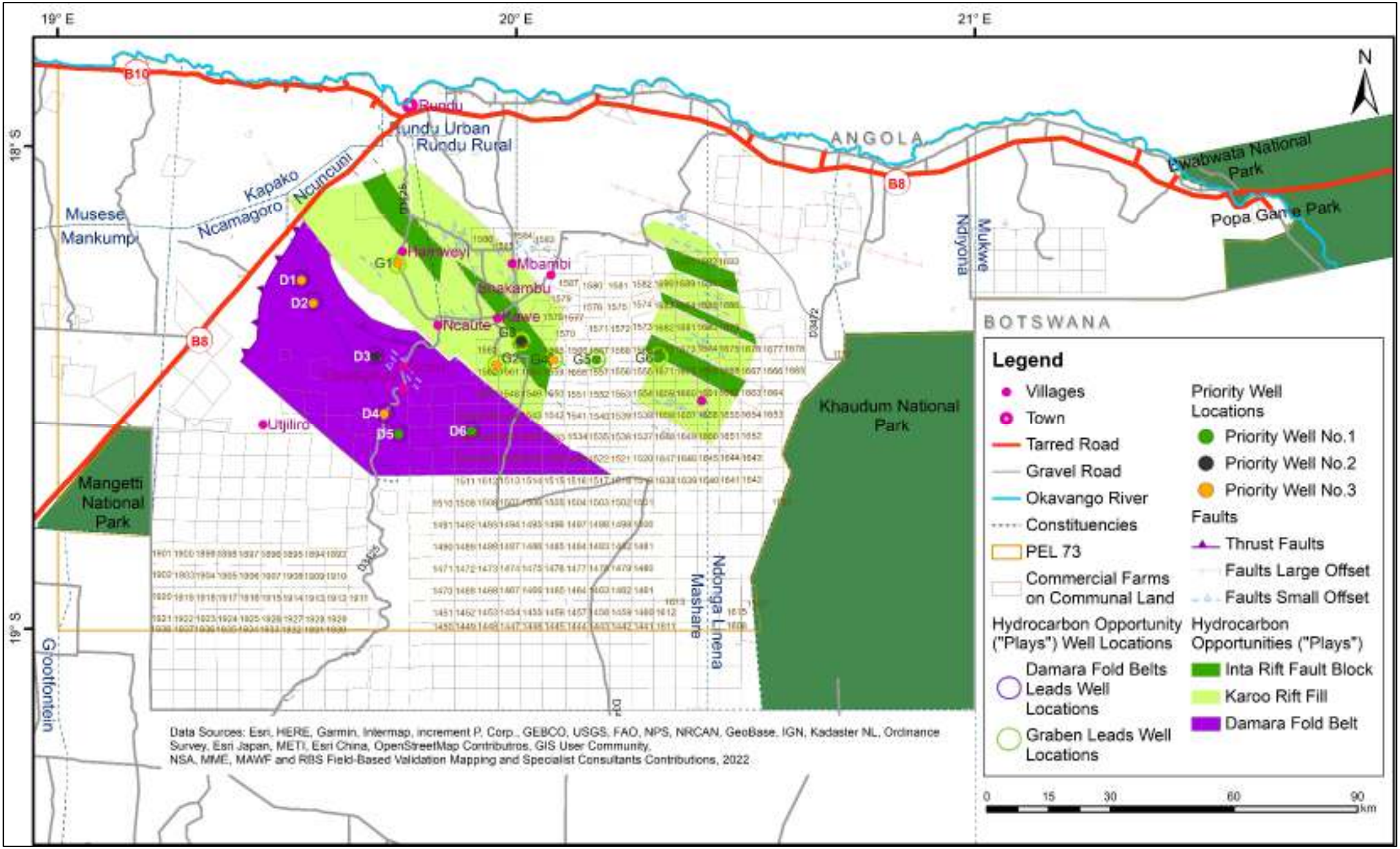


Figure 1.9: PEL No. 73, Kavango Sedimentary Basin regional hydrocarbon subsurface opportunities (“Plays”) map based on 2D seismic survey interpretation and showing the locations of the proposed new exploration and appraisal wells locations aimed at validating the commerciality of the established hydrocarbon plays (Data Source: REN, 2022).

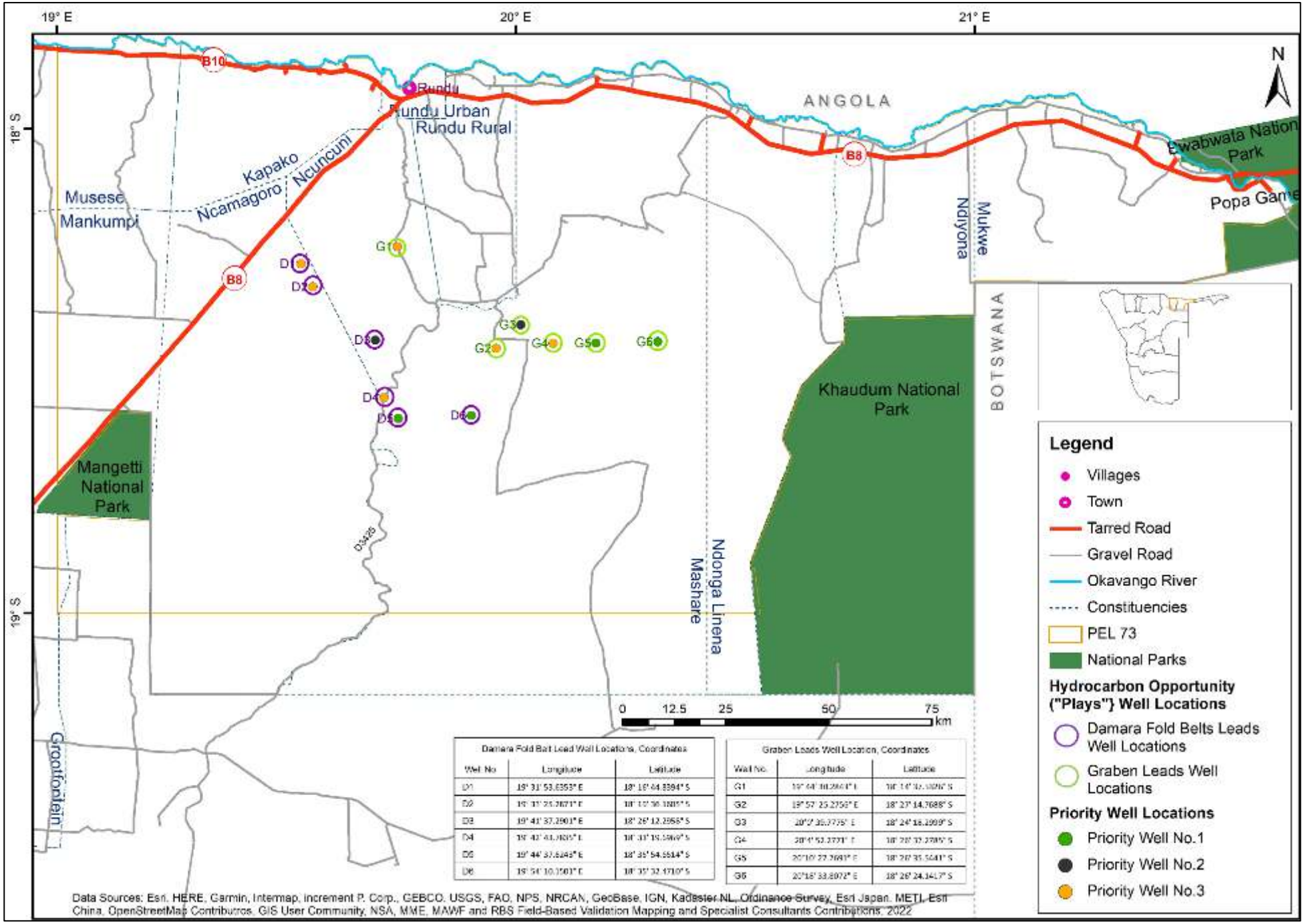
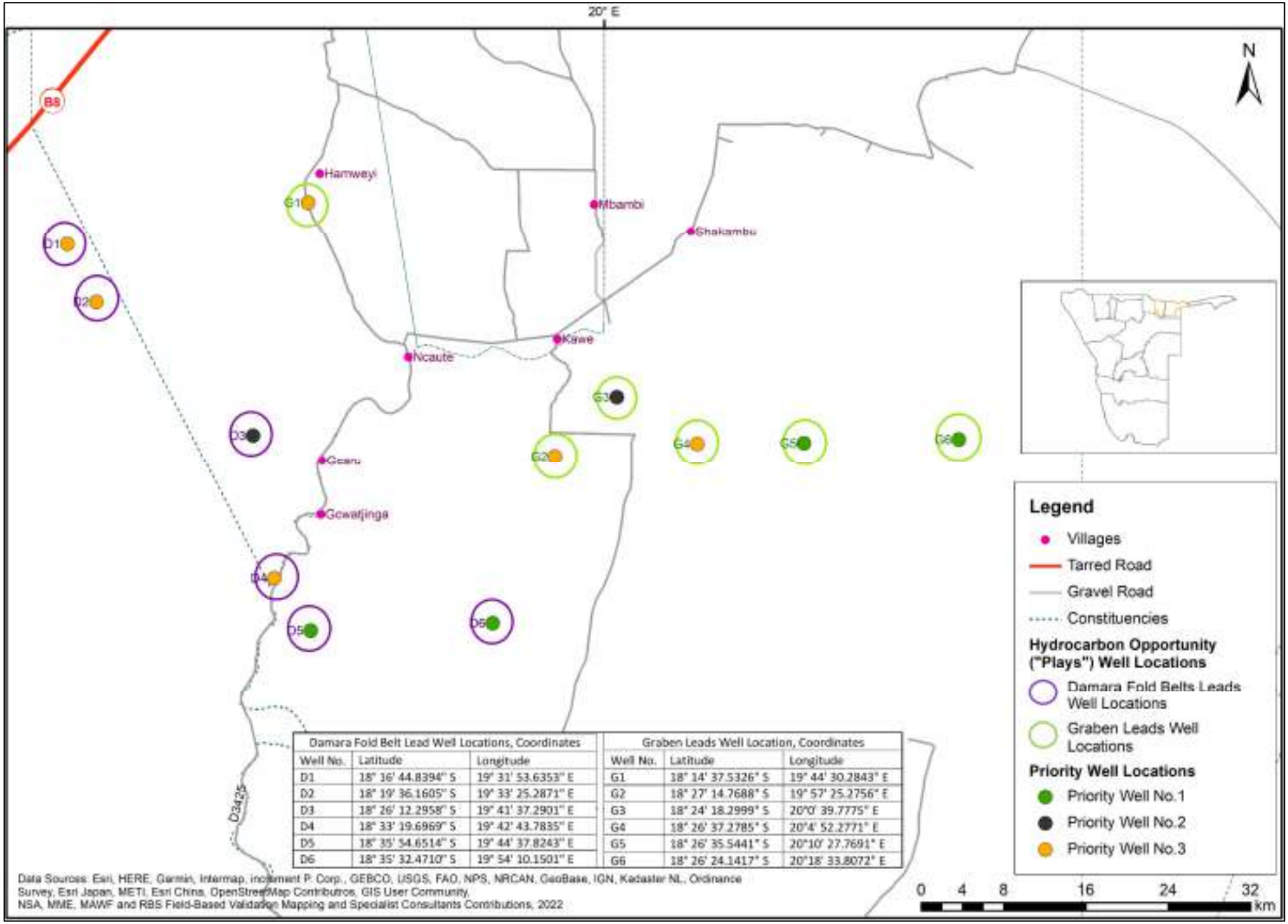


Figure 1.10: PEL No. 73 regional map showing the new proposed exploration and appraisal wells locations coordinates.



Damara Fold Belt Lead Well Locations, Coordinates		
Well No.	Latitude	Longitude
D1	18° 16' 44.8394" S	19° 31' 53.6353" E
D2	18° 19' 36.1605" S	19° 33' 25.2871" E
D3	18° 26' 12.2958" S	19° 41' 37.2901" E
D4	18° 33' 19.6969" S	19° 42' 43.7835" E
D5	18° 35' 54.6514" S	19° 44' 37.8243" E
D6	18° 35' 32.4710" S	19° 54' 10.1501" E

Graben Leads Well Location, Coordinates		
Well No.	Latitude	Longitude
G1	18° 14' 37.5326" S	19° 44' 30.2843" E
G2	18° 27' 14.7688" S	19° 57' 25.2756" E
G3	18° 24' 18.2999" S	20°0' 39.7775" E
G4	18° 26' 37.2785" S	20°4' 52.2771" E
G5	18° 26' 35.5441" S	20°10' 27.7691" E
G6	18° 26' 24.1417" S	20°18' 33.8072" E

Data Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China, OpenStreetMap Contributros, GIS User Community,
NSA, MME, MAWF and RBS Field-Based Validation Mapping and Specialist Consultants Contributions, 2022

Figure 1.11: Detailed Area of Interest (AOI) map showing the new proposed exploration and appraisal wells locations coordinates.

Plate 1.1: Drone image showing the example of the types of existing accesses that will be upgraded to a 10 m wide with a curve radius of less than 22m to be linked to the new access road to be created for the proposed well locations.

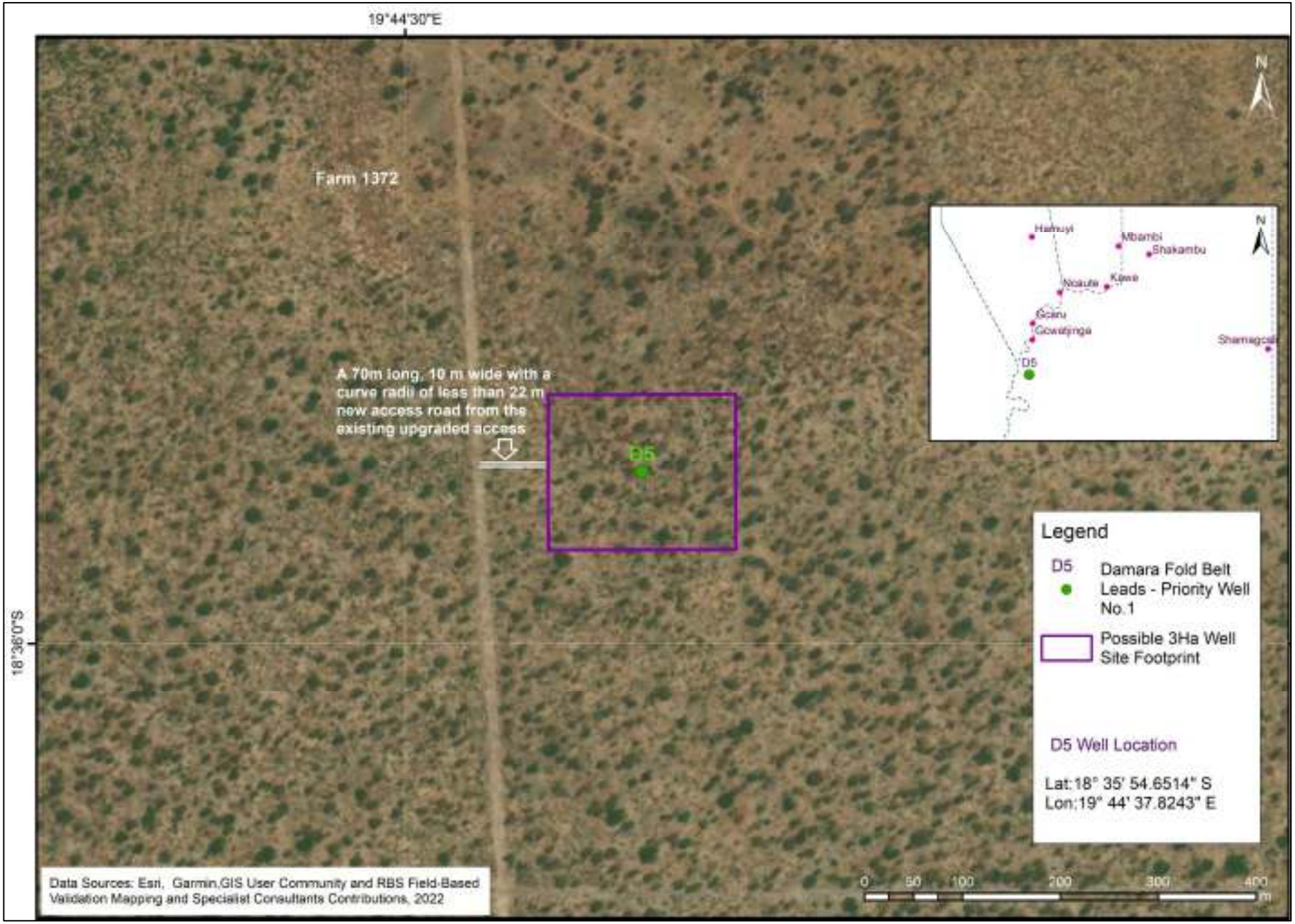


Figure 1.12: Detailed location of the priority 1 Damara Fold Belt Leads No. D5 exploration and appraisal well location falling within Gcwatjinga Community Forest boundary. The D4 well location is an alternative site to the D5 well location. A new 70m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

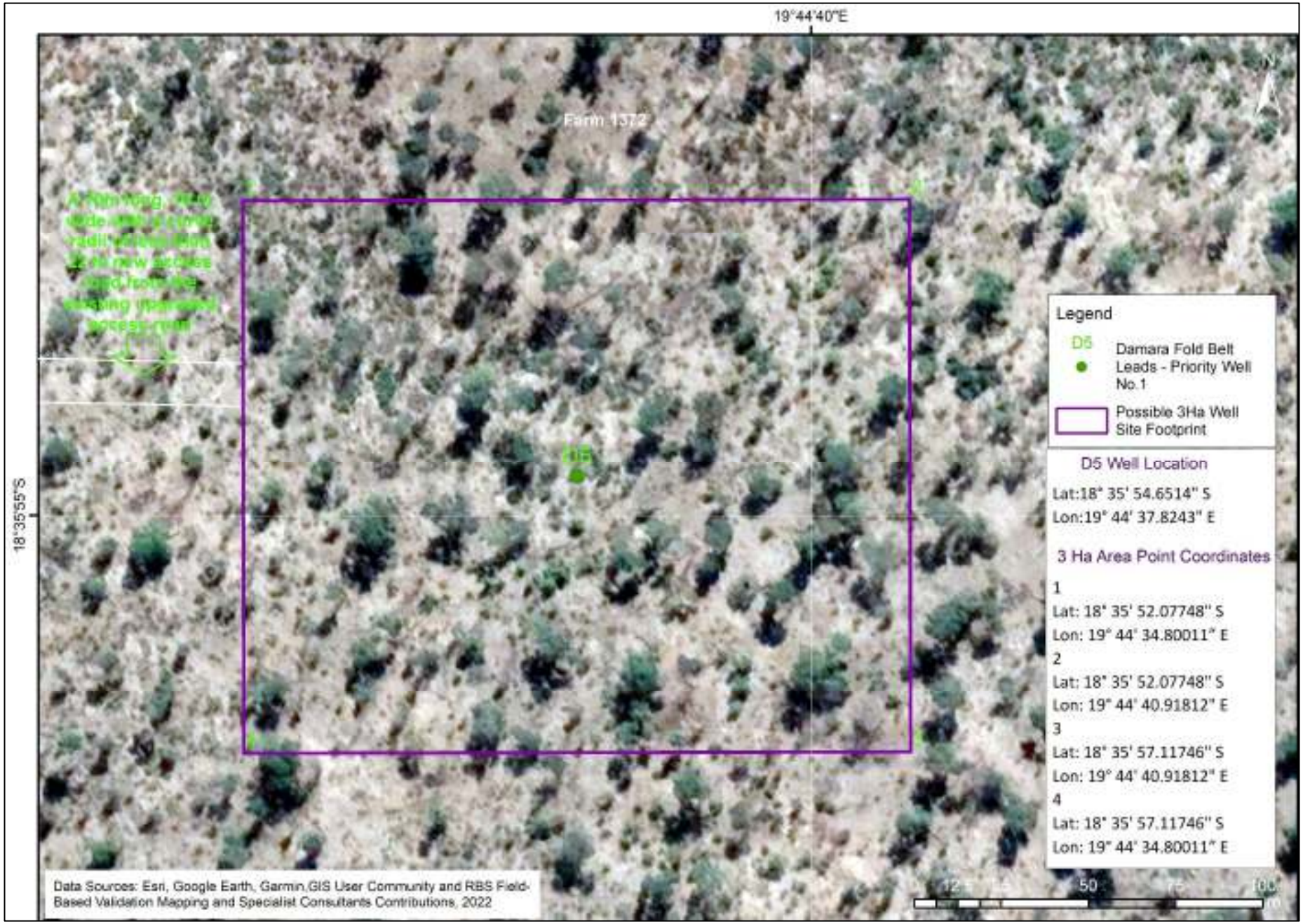


Figure 1.13: Detailed outline of the 3Ha area of the priority 1 Damara Fold Belt Leads No. D5 exploration and appraisal well location falling within Gcwatjinga Community Forest boundary. The D4 well location is an alternative site to the D5 well location. A new 70m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Plate 1.2: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. D5.

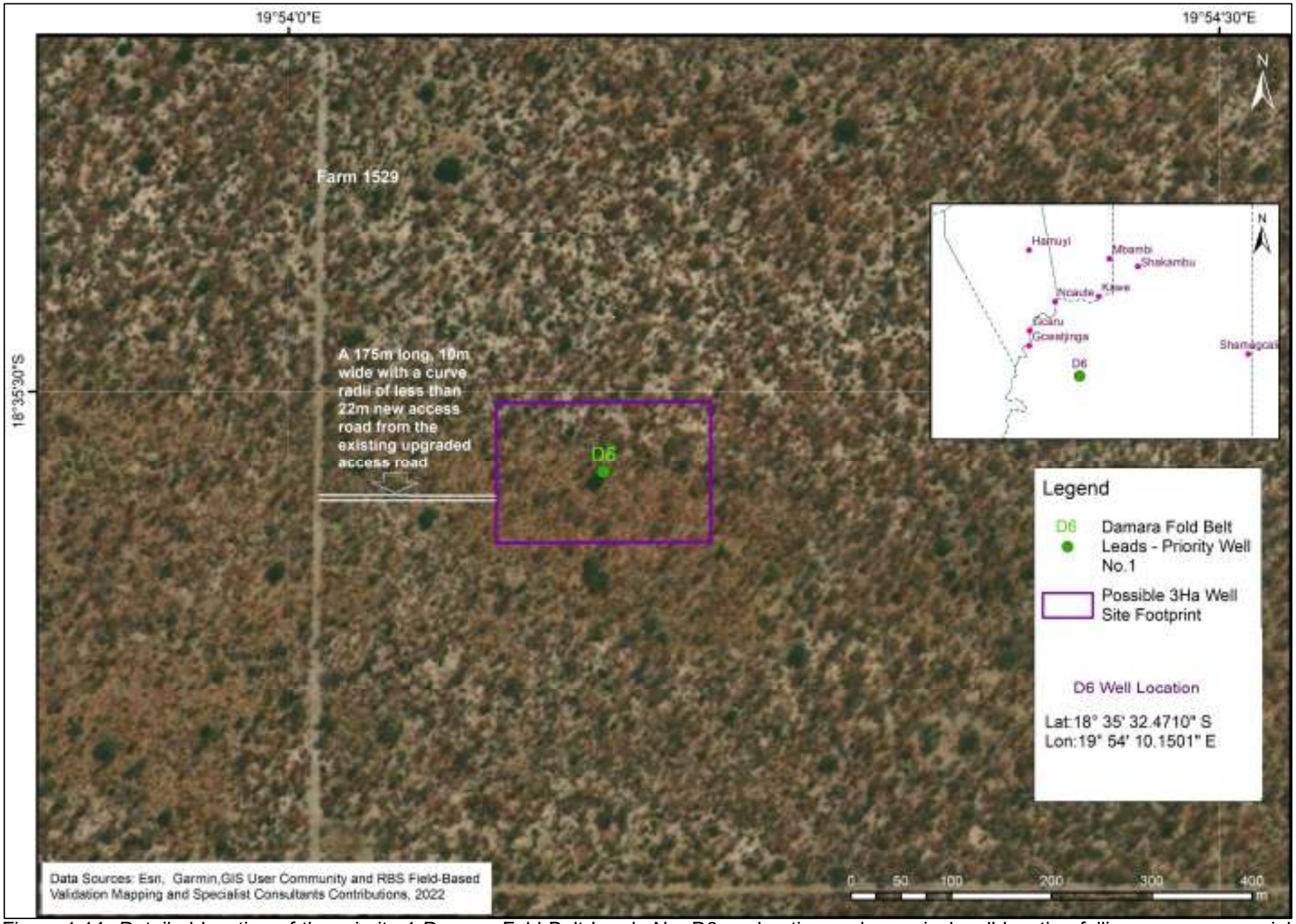


Figure 1.14: Detailed location of the priority 1 Damara Fold Belt Leads No. D6 exploration and appraisal well location falling on a commercial farm on communal land, Farm No. 1529. A new 175m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Figure 1.15: Detailed outline of the 3Ha area of the priority 1 Damara Fold Belt Leads No. D6 exploration and appraisal well location falling on a commercial farm on communal land, Farm No. 1529. A new 175m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Plate 1.3: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. D6.

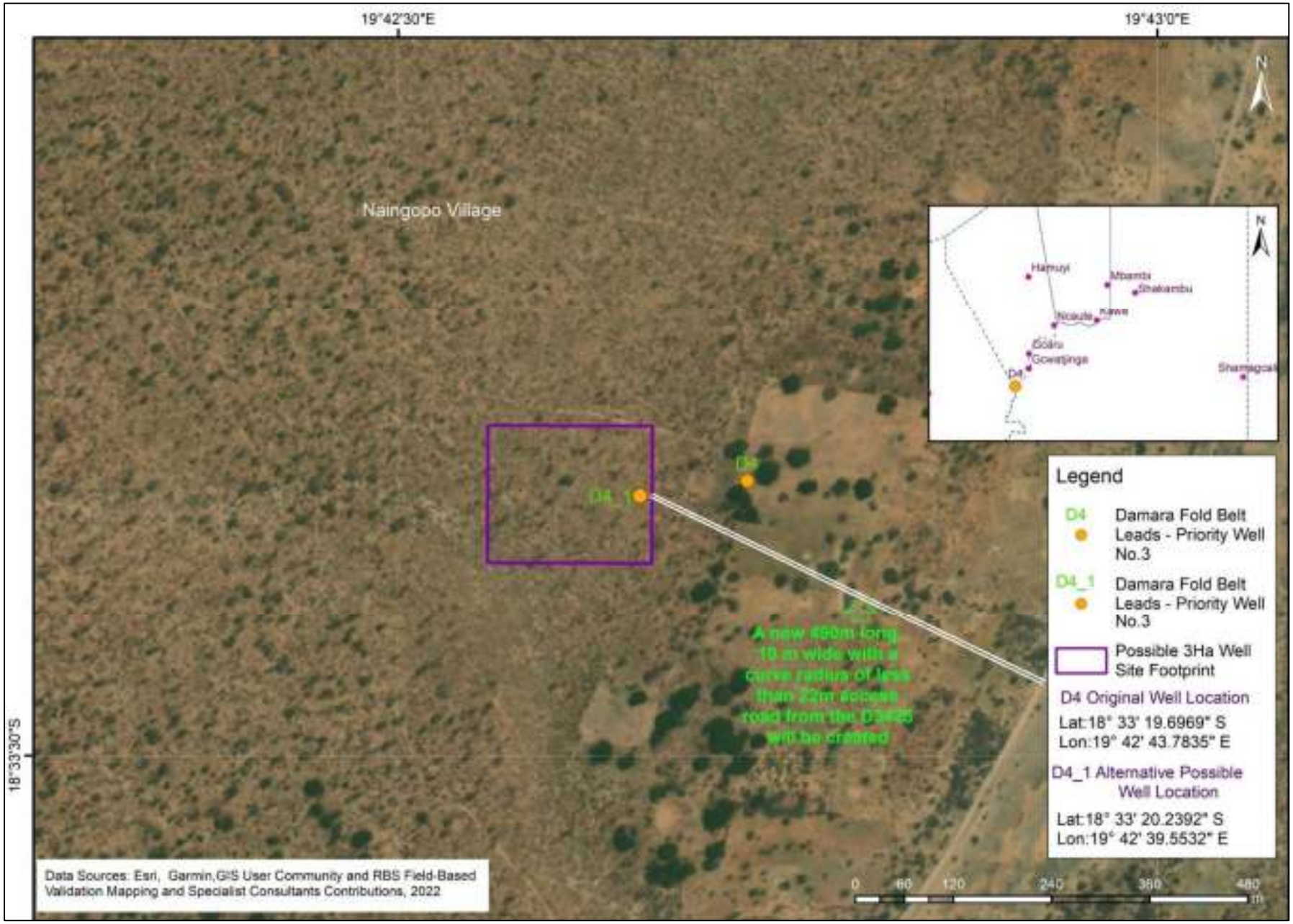


Figure 1.16: Detailed location of the priority 1 Damara Fold Belt Leads proposed exploration and appraisal well location No. D4 at Naingopo Village with the original location D4 moved west to D4_1 out of the communal fields. This well location is an alternative to the D5 well site, has been shifted away from the local settlement and subsistence farmlands. A new 490m long, 10 m wide with a curve radius of less than 22m access road from the D3425 will be created.

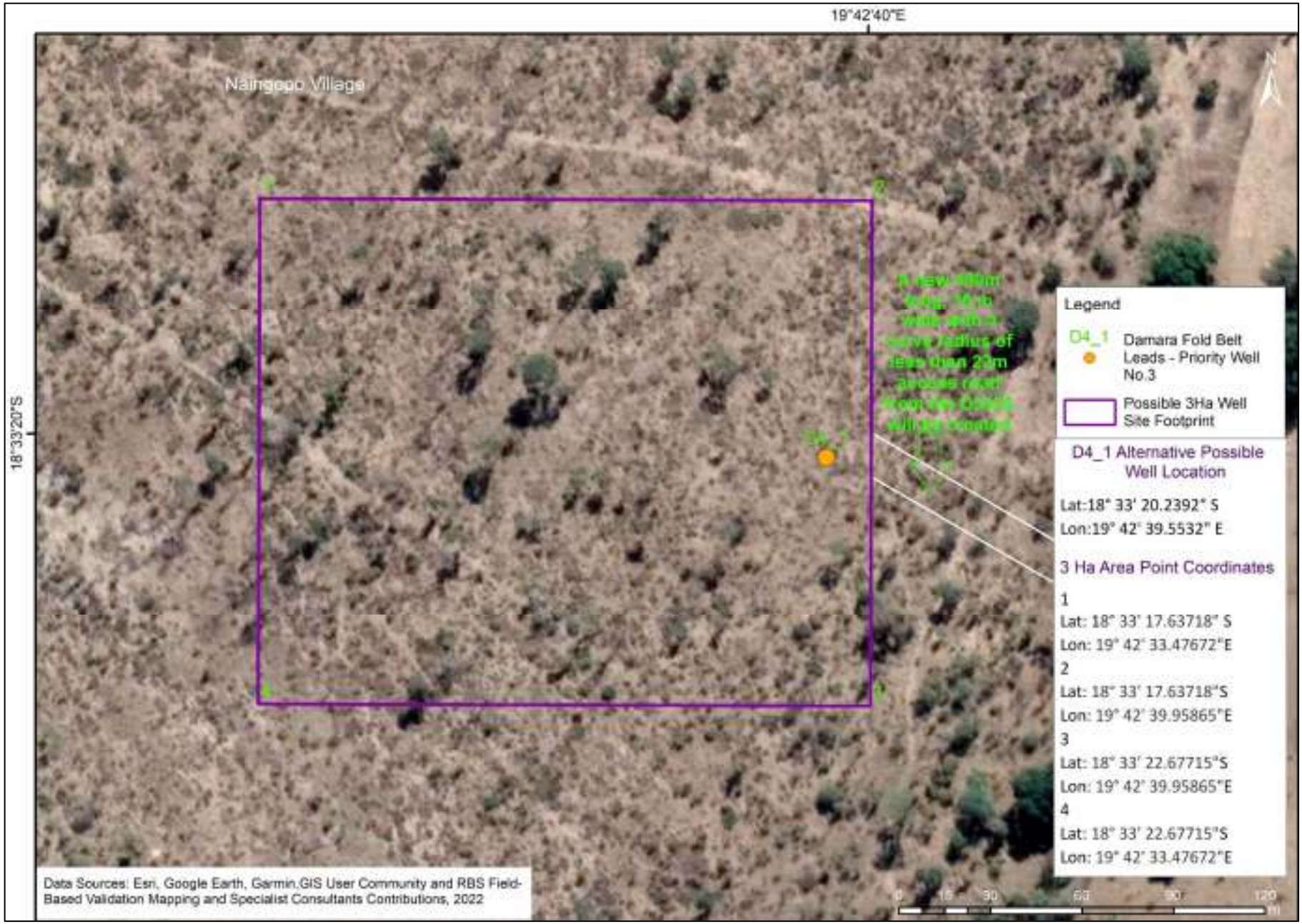


Figure 1.17: Detailed outline of the 3Ha area of the priority 1 Damara Fold Belt Leads proposed exploration and appraisal well location No. D4 at Naingopo Village with the original locationD4 moved west to D4_1 out of the communal fields. This priority 1 alternative well location to the D5 well site, has been shifted away from the local settlement and subsistence farmlands. A new 490m long, 10 m wide with a curve radius of less than 22m access road from the D3425 will be created.

Plate 1.4: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. D4_1 at Naingopo Village with the original location D4 moved west to D4_1 out of the communal fields.

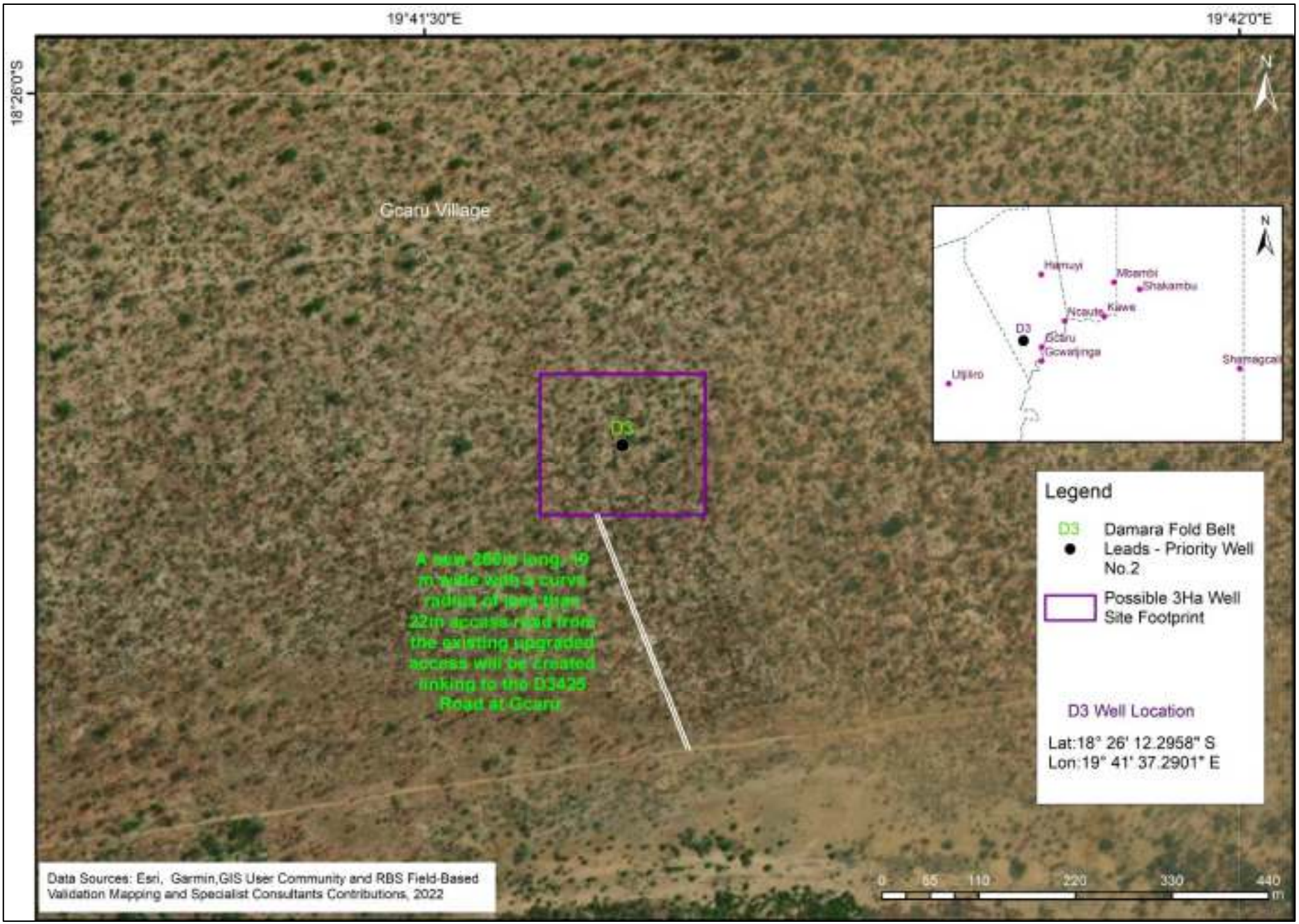


Figure 1.18: Detailed location of the priority 2 Damara Fold Belt Leads proposed exploration and appraisal well location No. D3 with current location situated about 7km west of Gcaru Village. A new 260m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created linking to the D3425 Road at Gcaru.

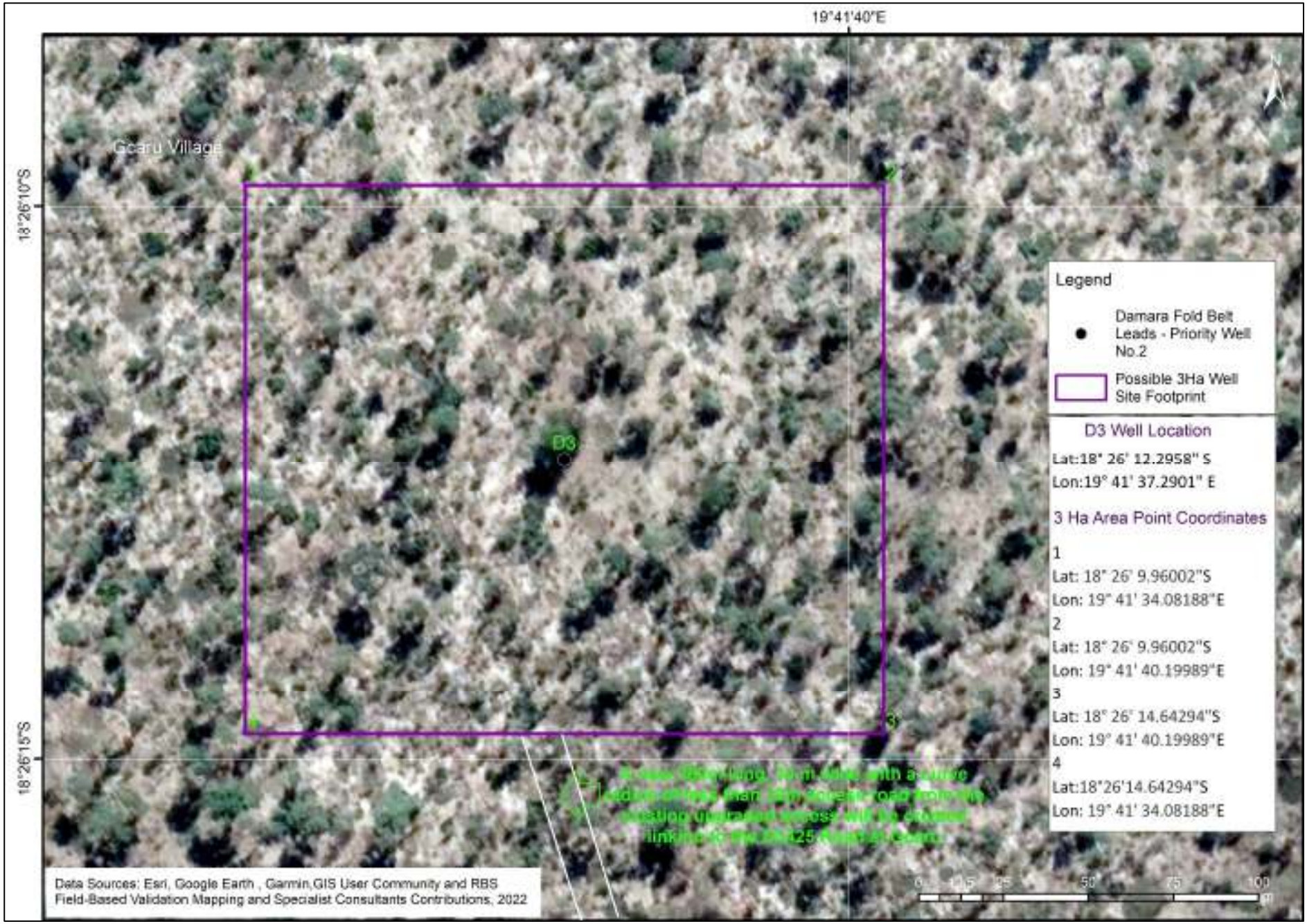


Figure 1.19: Detailed outline of the 3Ha area of the priority 2 Damara Fold Belt Leads proposed exploration and appraisal well location No. D3 with current location situated about 7km west of Gcaru Village. A new 260m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created linking to the D3425 Road at Gcaru.

Plate 1.5: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. D3 with existing access.

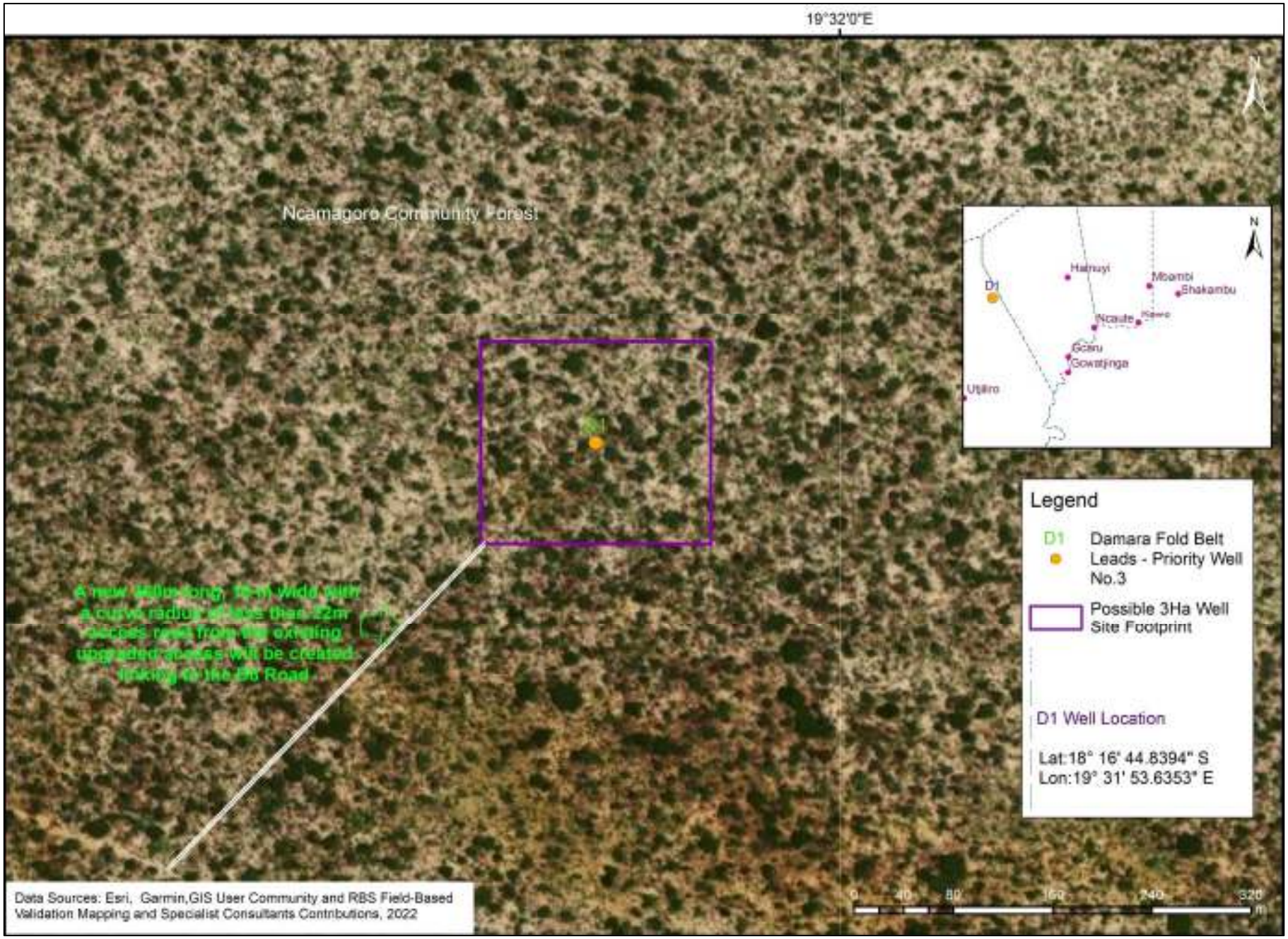


Figure 1.20: Detailed location of the priority 3 Damara Fold Belt Leads proposed exploration and appraisal well location No. D1 with current location falling within the Ncamagoro Community Forest boundary. A new 360m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created linking to the B8 Road.

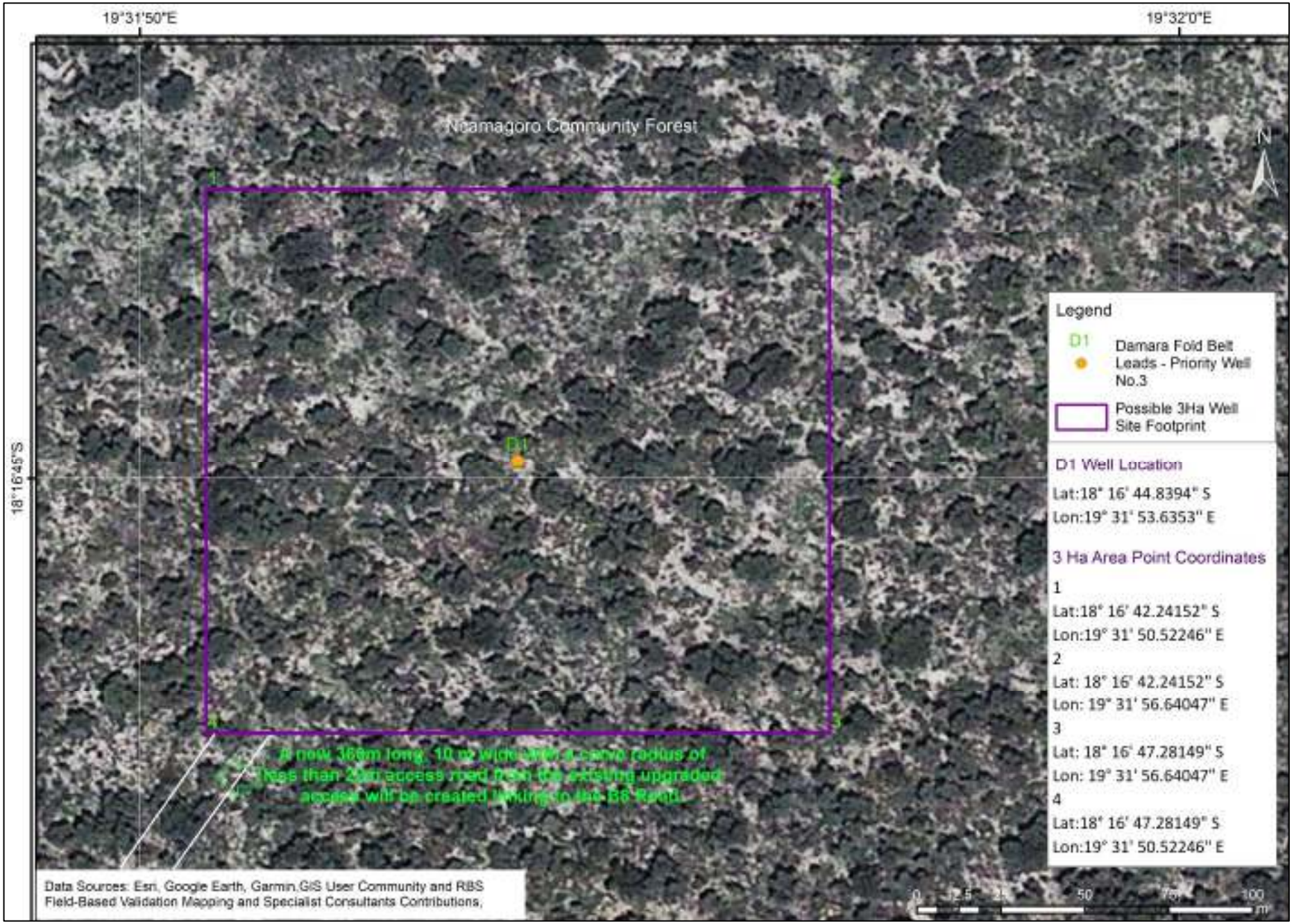


Figure 1.21: Detailed outline of the 3Ha area of the priority 3 Damara Fold Belt Leads proposed exploration and appraisal well location No. D1 with current location falling within the Ncamagoro Community Forest boundary. A new 360m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created linking to the B8 Road.

Plate 1.6: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. D1.

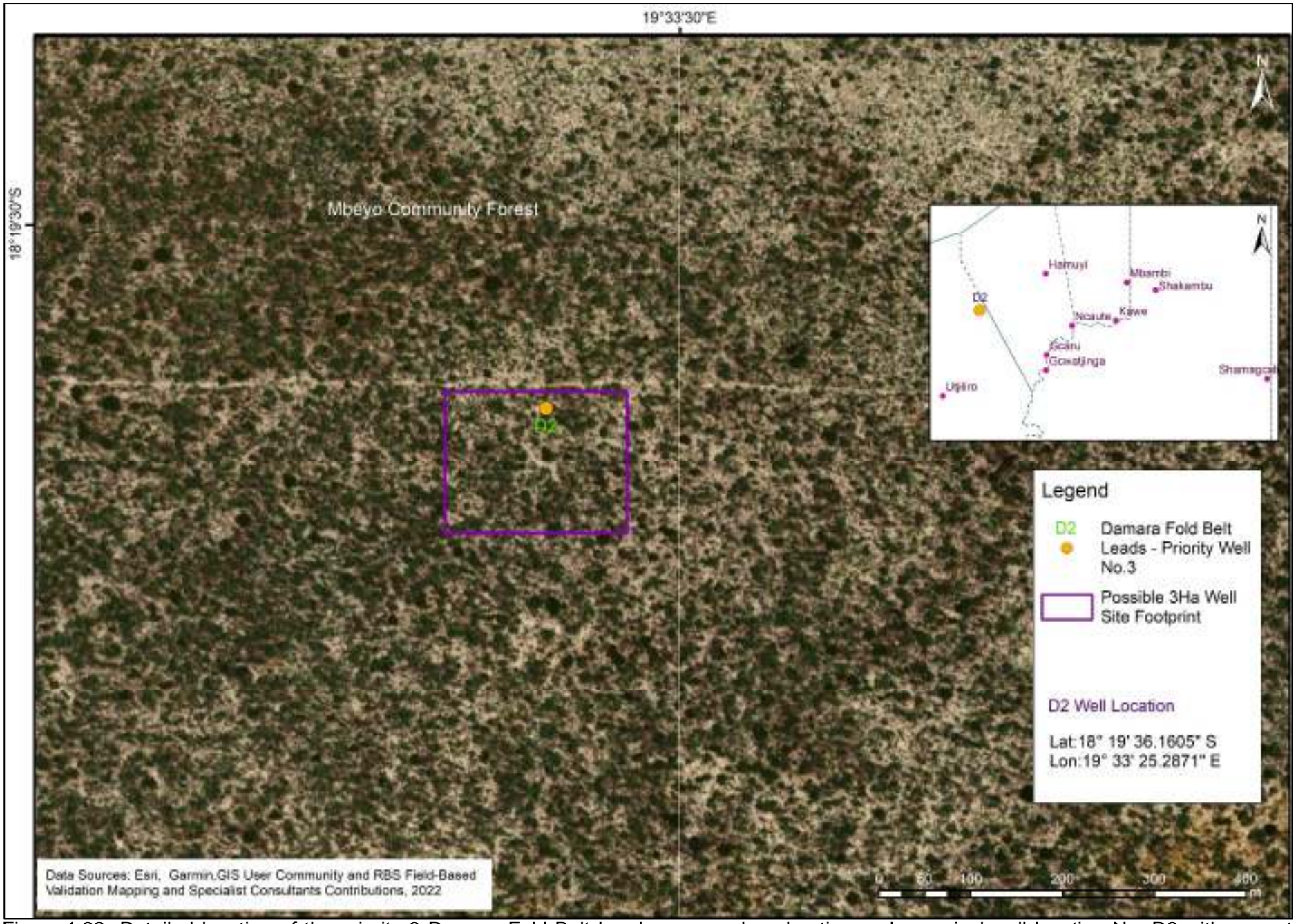


Figure 1.22: Detailed location of the priority 3 Damara Fold Belt Leads proposed exploration and appraisal well location No. D2 with current location falling within the Mbeyo Community Forest boundary. A new 20m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created linking to the B8 Road.

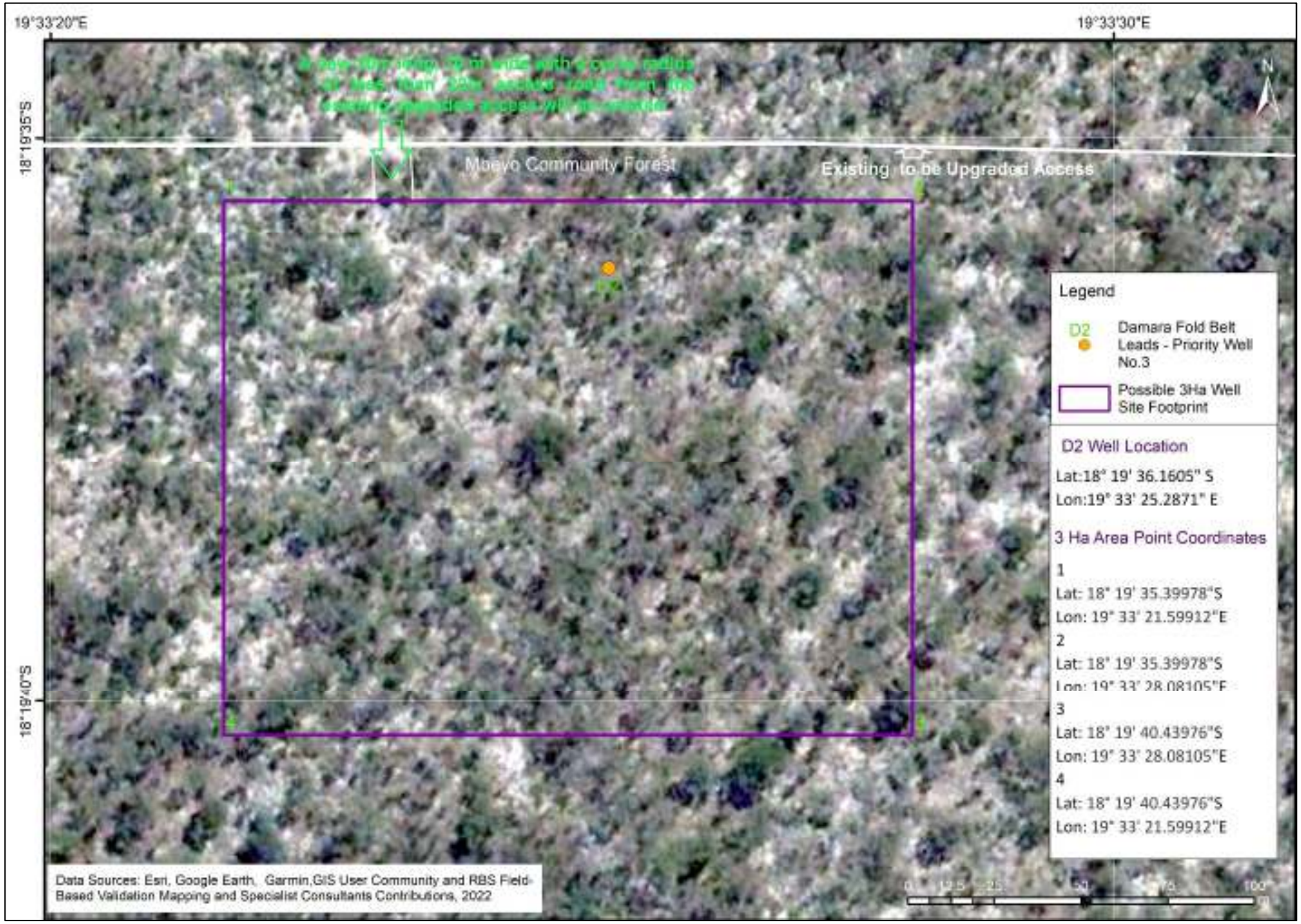


Figure 1.23 Detailed outline of the 3Ha area of the priority 3 Damara Fold Belt Leads proposed exploration and appraisal well location No. D2 with current location falling within the Mbeyo Community Forest boundary. A new 20m long, 10 m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created linking to the B8 Road.

Plate 1.7: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. D2 and existing access.

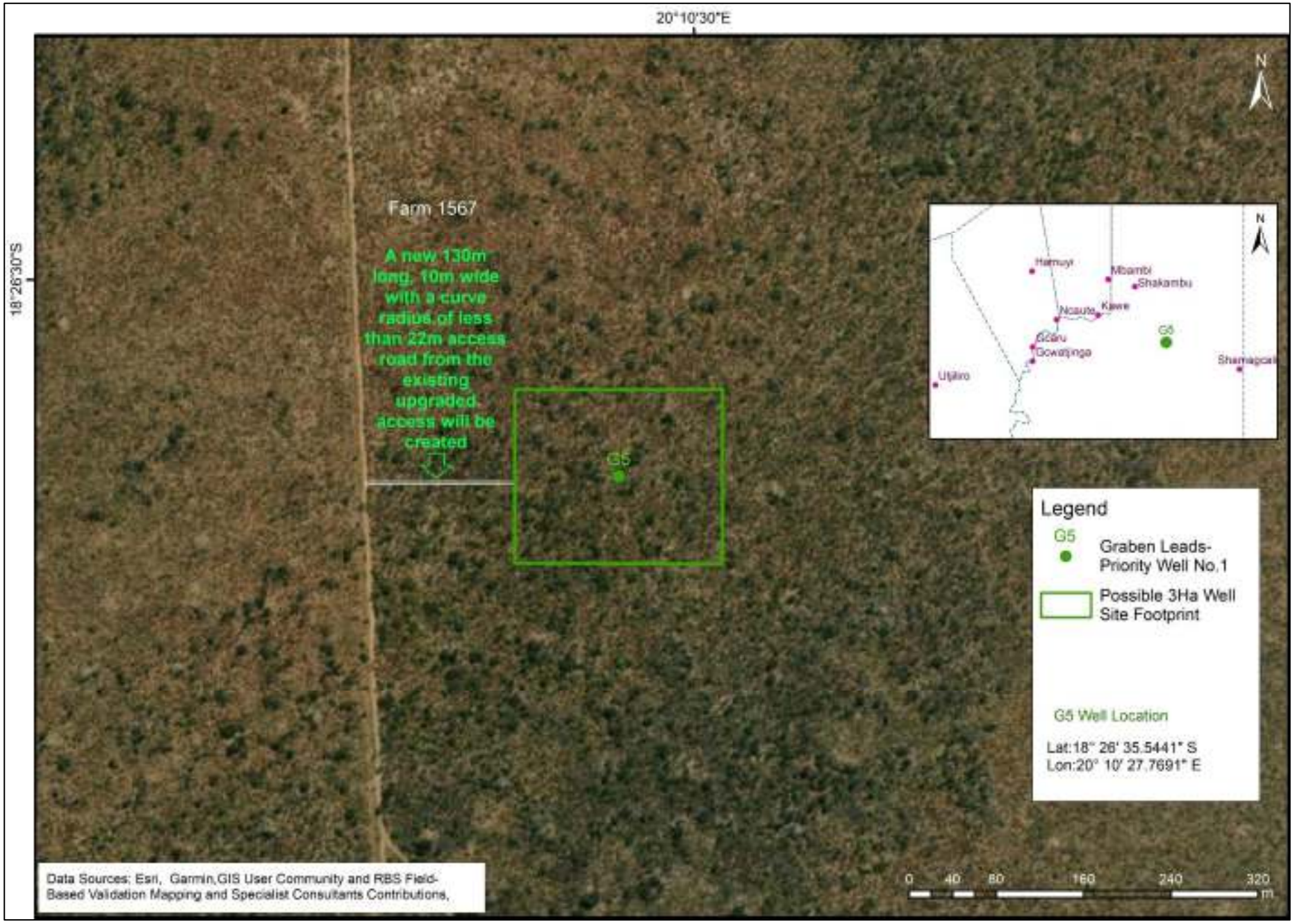


Figure 1.24: Detailed location of the priority 1 for the Graben Play covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G5 located on commercial farms on communal land, Farm No. 1567. A new 130m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Figure 1.25: Detailed outline of the 3Ha area of the priority 1 covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G5 located on commercial farms on communal land, Farm No. 1567. A new 130m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Plate 1.8: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. G5 and existing access.

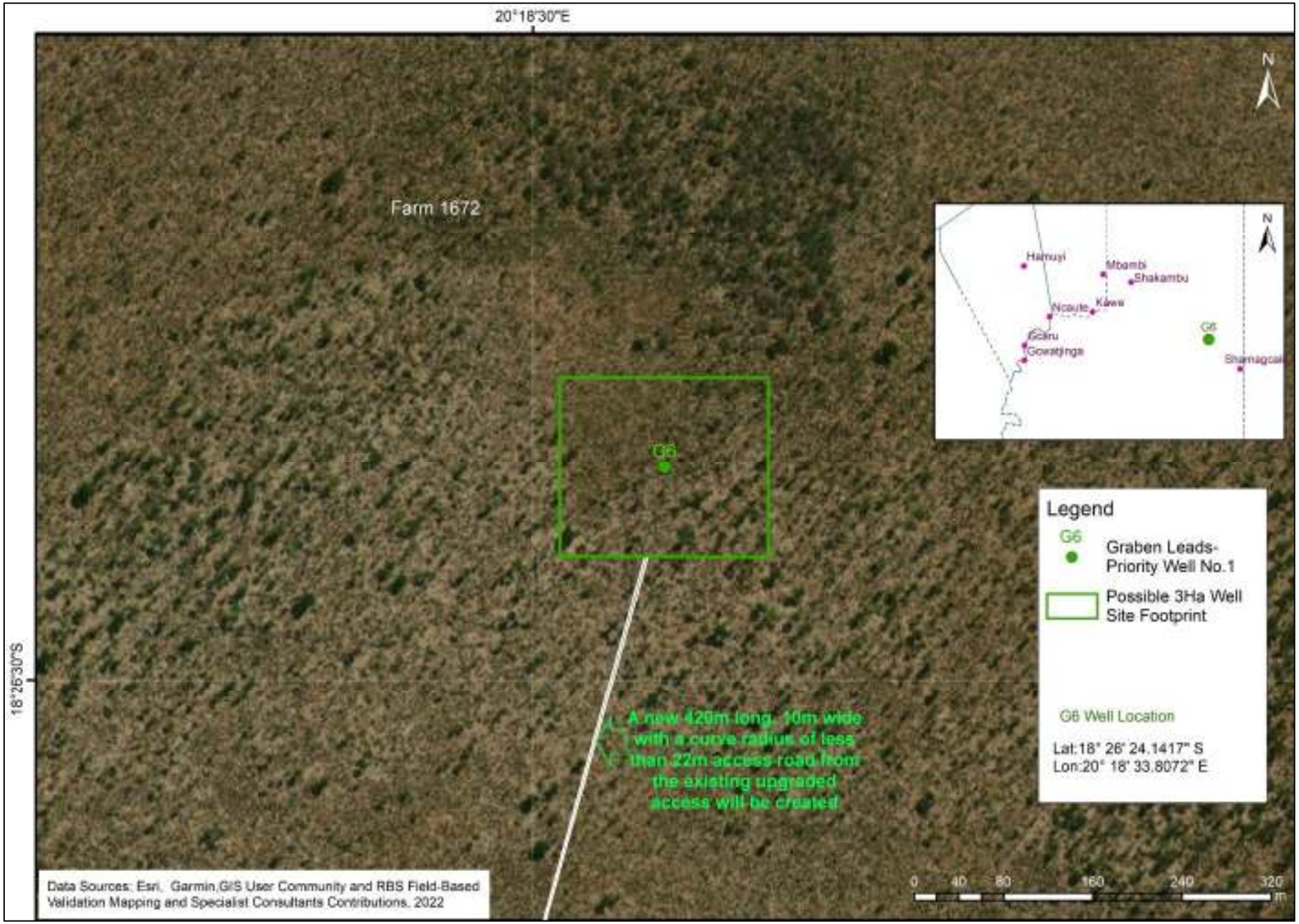


Figure 1.26: Detailed location of the priority 1 for the Graben Play covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G6 located on commercial farms on communal land, Farm No. 1672. A new 430m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Figure 1.27: Detailed outline of the 3Ha area of the priority 1 covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G6 located on commercial farms on communal land, Farm No. 1672. A new 430m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Plate 1.9: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. G6 and existing access.

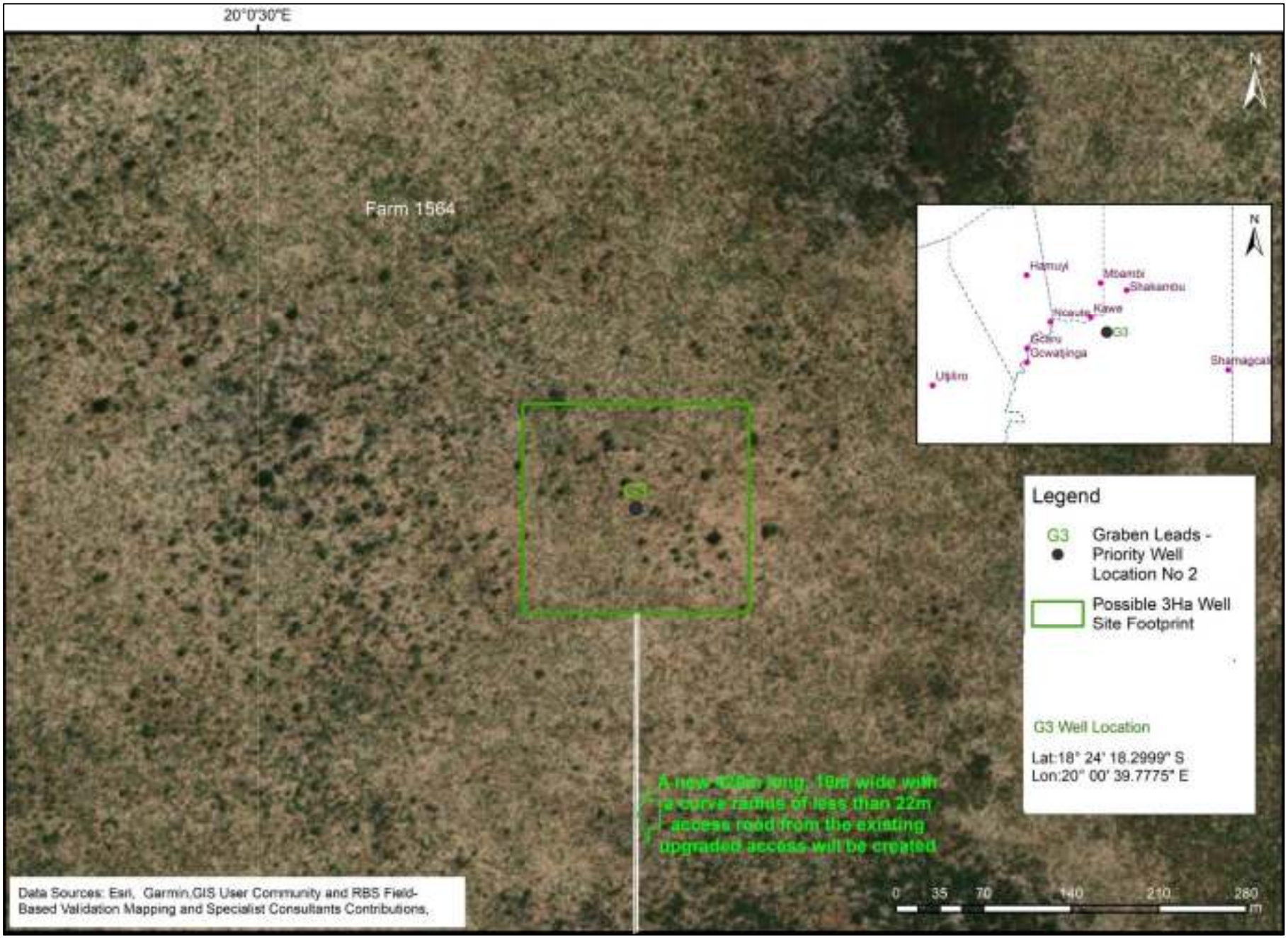


Figure 1.28: Detailed location of the priority 2 for the Graben Play covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G3 located on commercial farms on communal land, Farm No. 1564. A new 420m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Figure 1.29: Detailed outline of the 3Ha area of the priority 2 covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G3 located on commercial farms on communal land, Farm No. 1564. A new 420m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Plate 1.10: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. G3.

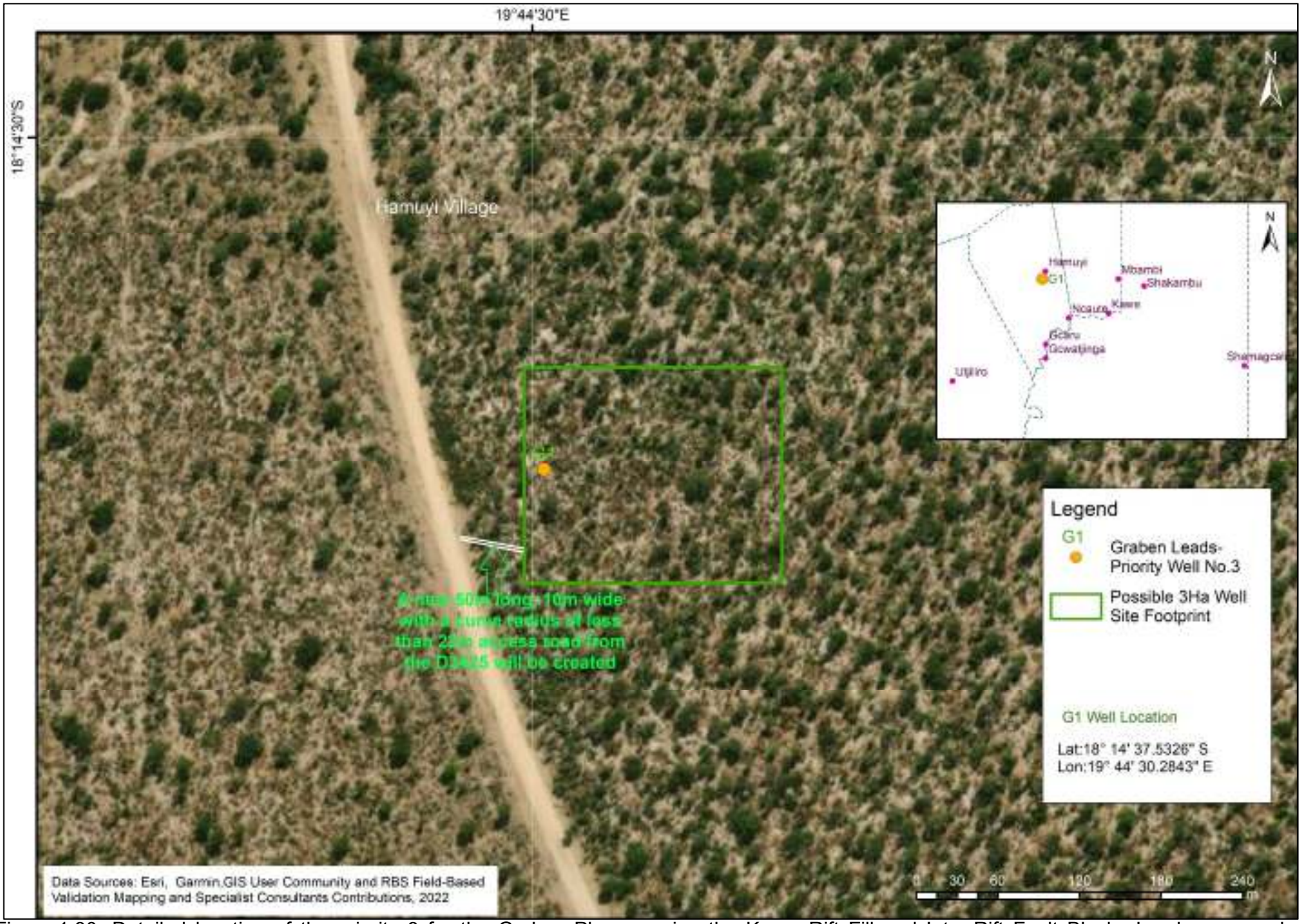


Figure 1.30 Detailed location of the priority 3 for the Graben Play covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G1 located at Hamweyi Village along the eastern side of the D3425 road linking Rundu to Ncaute. A new 50m long, 10m wide with a curve radius of less than 22m access road from D3425 will be created.

Figure 1.31 Detailed outline of the 3Ha area of the priority 3 for the Graben Play covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G1 located at Hamweyi Village along the eastern side of the D3425 road linking Rundu to Ncaute. A new 50m long, 10m wide with a curve radius of less than 22m access road from the D3425 will be created.

Plate 1.11: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. G1 and the D3425 Road.

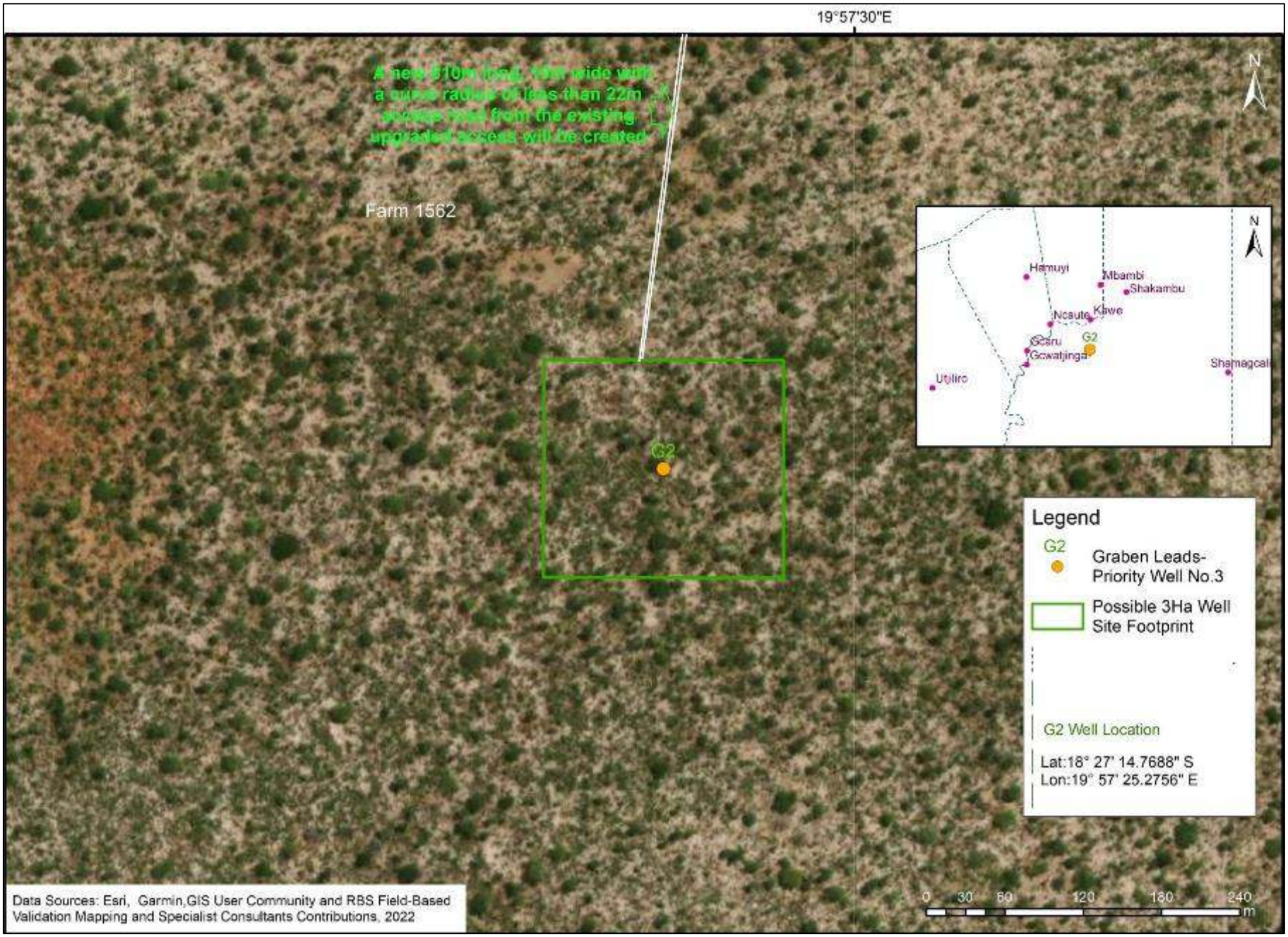


Figure 1.32: Detailed location of the priority 3 for the Graben Play covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G2 located on commercial farms on communal land, Farm No. 1562. A new 810m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

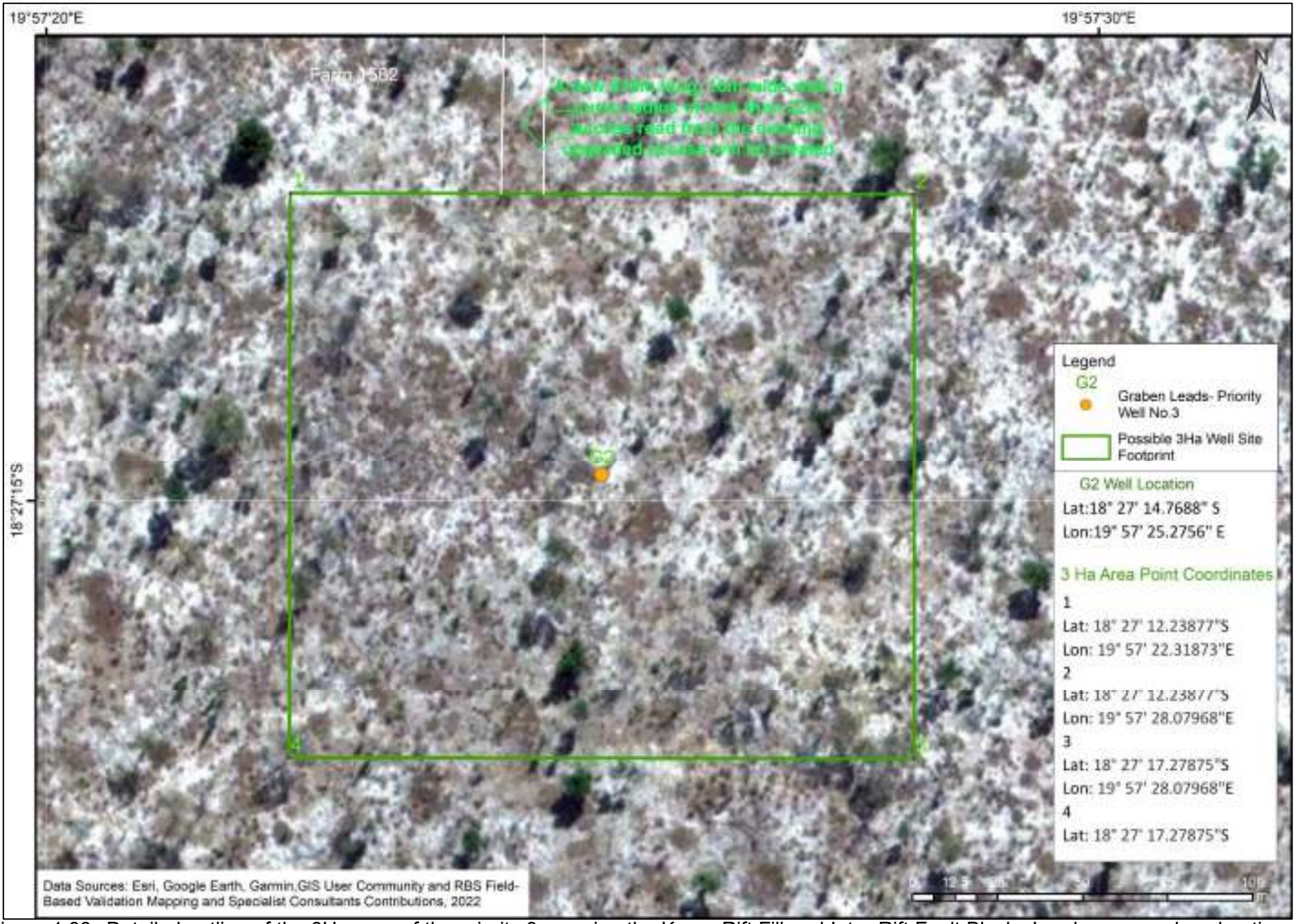


Figure 1.33: Detailed outline of the 3Ha area of the priority 3 covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G2 located on commercial farms on communal land, Farm No. 1562. A new 810m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Plate 1.12: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. G2 and existing access.

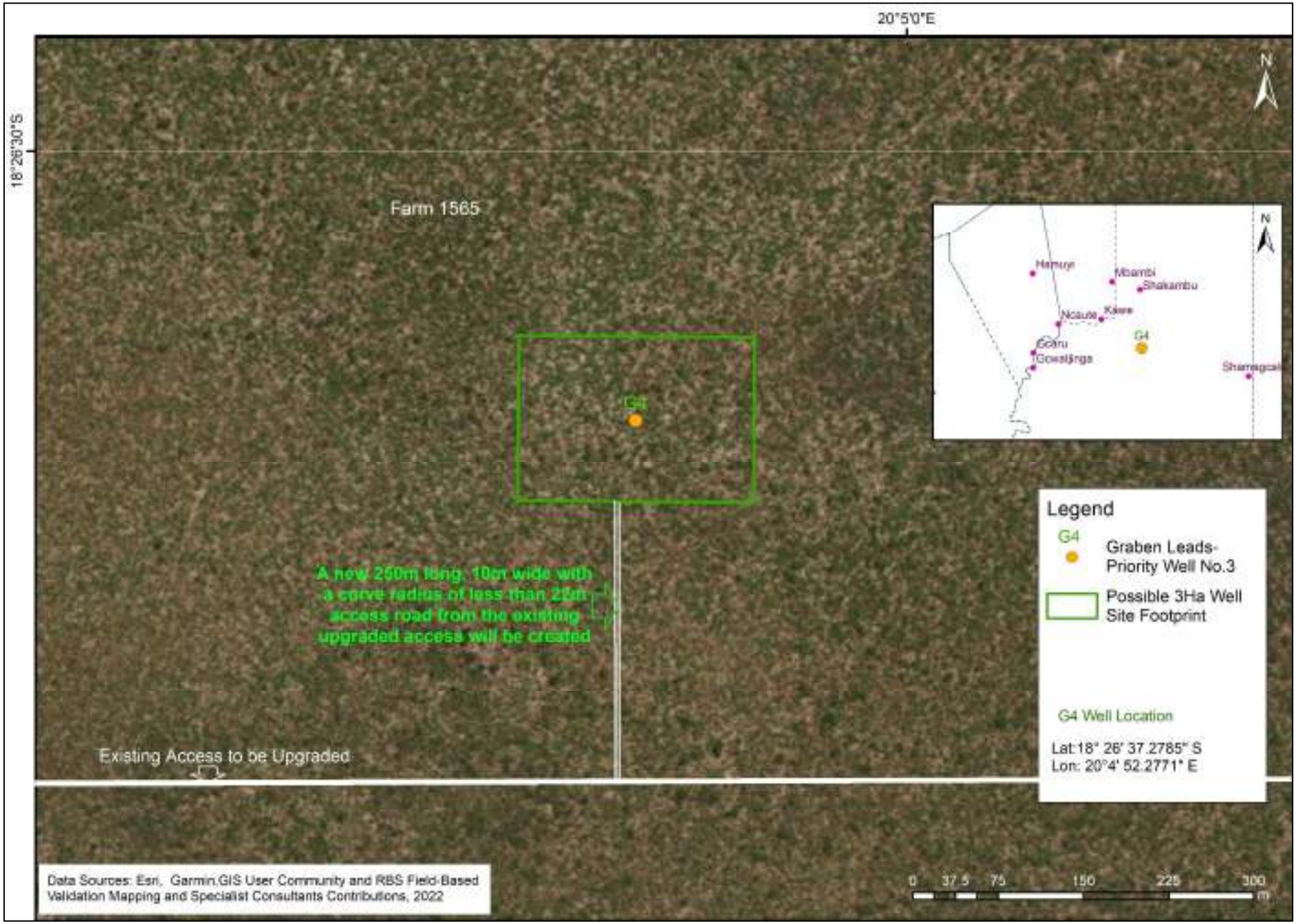


Figure 1.34: Detailed location of the priority 3 for the Graben Play covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G4 located on commercial farms on communal land, Farm No. 1565. A new 250m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Figure 1.35: Detailed outline of the 3Ha area of the priority 3 covering the Karoo Rift Fill and Intra-Rift Fault Blocks Leads proposed exploration and appraisal well location No. G4 located on commercial farms on communal land, Farm No. 1565. A new 250m long, 10m wide with a curve radius of less than 22m access road from the existing upgraded access road will need to be created.

Plate 1.13: Drone image of the general surrounding area at the Damara Fold Belt Leads well location No. G4 and existing access.

1.3 Regulatory Requirements and this EIA Report

1.3.1 Regulatory Requirements for Drilling Exploration and Appraisal Wells

Regulatory requirements and in particular environmental assessment processes for the proposed exploration and appraisal wells operations by REN are provided for in Environmental Protection Clause 11 of the 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) and all other applicable national laws and Regulations of the Republic of Namibia.

Prior to the implementation of the proposed exploration and appraisal wells operations, the Proponent is required to have prepared Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) Reports to support the application for ECC.

In fulfilment of the environmental requirements, the Proponent appointed Risk-Based Solutions (RBS) CC as the environmental / permitting de-risking Consultant, led by Dr Sindila Mwiya, and supported by Ms Emerita Ashipala and Mr Samison Mulonga as the Environmental Assessment Practitioners (EAPs) to prepare the EIA and EMP Reports to support the application for ECC.

1.3.2 Spatial Scope, Purpose and Objectives of this EIA Report

The spatial scope of the proposed drilling operations and impact assessment and management thereof covers the following:

(i) Current 3Ha indicated D1-D6 and G1-G1 exploration and appraisal wells sites, access roads, borrow pits and other associated supporting infrastructure areas as the immediate impact zones. The receiving environments around this area likely to be directly influenced by the proposed activities and will include a surrounding 5km^2 broader impact area around each of the proposed operational and the surrounding areas, and.

(ii) Broader impact zone including all the surrounding areas likely to be affected by the proposed exploration and appraisal drilling operations at each of the identified wells sites, inclusive of the supporting infrastructure areas such as the access roads, and borrow pits.

The following is the summary of the key guiding principles and objectives of the Environmental Assessment (EA) process and, this EIA Report:

- Define and assess the main key issues identified during the Scoping Report Phase including the stakeholder concerns, and values (Define the proposed project Knowledge Base).
- Assess and define the reasonable and practical alternatives to the proposed project activities.
- Assess the nature, intensity and duration of impact of proposed lifecycle project activities.
- Provide for local community and public participation in the EIA process of this project.
- Identify potential significant impacts on the receiving environment and prepare mitigation measures to be contained in the EMP Report.
- The outcomes of the EIA and Emp Reports to contribute to the sustainable utilisation of natural resources, protection and enhancement of the quality of all life forms and promote the integration of environmental considerations in the development planning processes in order to promote coexistence of multiple sectors and land uses for the benefits all Namibians.

This report has been prepared in accordance with the provisions of the EIA Regulations, 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007).

1.4 Area of Interest (AOI), Land Access and Consents

1.4.1 Petroleum Exploration (PEL) No. 73

The PEL 73 comprises Degree Square Blocks granted as provided for in the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991). PEL 73 covers an area of approximately 25,341.33 km^2 (6.3 million acres) (Figs. 1.1-1.9). PEL 73 covering parts of Blocks Nos. 1719, 1720, 1721, 1819, 1820 and 1821. Although a PEL may be a very large area defined by the Latitude and Longitude Degree Square Licensed Blocks which is good for the State in terms of having a larger subsurface area annual license rental income. However, the key area of interest (Sedimentary Basin) is usually highly localised and controlled by the regional and local geology as well as the petroleum system, not the boundary of the license area and its proximity to a sensitive resource such as the Okavango River (Fig. 1.36). It is the proximity of the AIO boundary and a well location to a sensitive area that is of importance in environmental assessment process. Within a PEL area, an exploration AOI and well locations are delineated from the interpretation of a variety of technical data sets. In an event of a commercial oil, or gas discovery, then the gas or oil field (production) AOI becomes even much smaller and highly localised compared to the exploration AOI (Fig. 1.36). An exploration or appraisal AOI will affect localised areas around a given well site and supporting infrastructure areas and linked to where the actual exploration or appraisal activities are taking place that defines the actual surface footprint of the operation effort. An oil or gas field AOI can only be delineated following a commercial discovery and completion of an appraisal well drilling and testing operation before actual field development can be contemplated (Fig. 1.36).

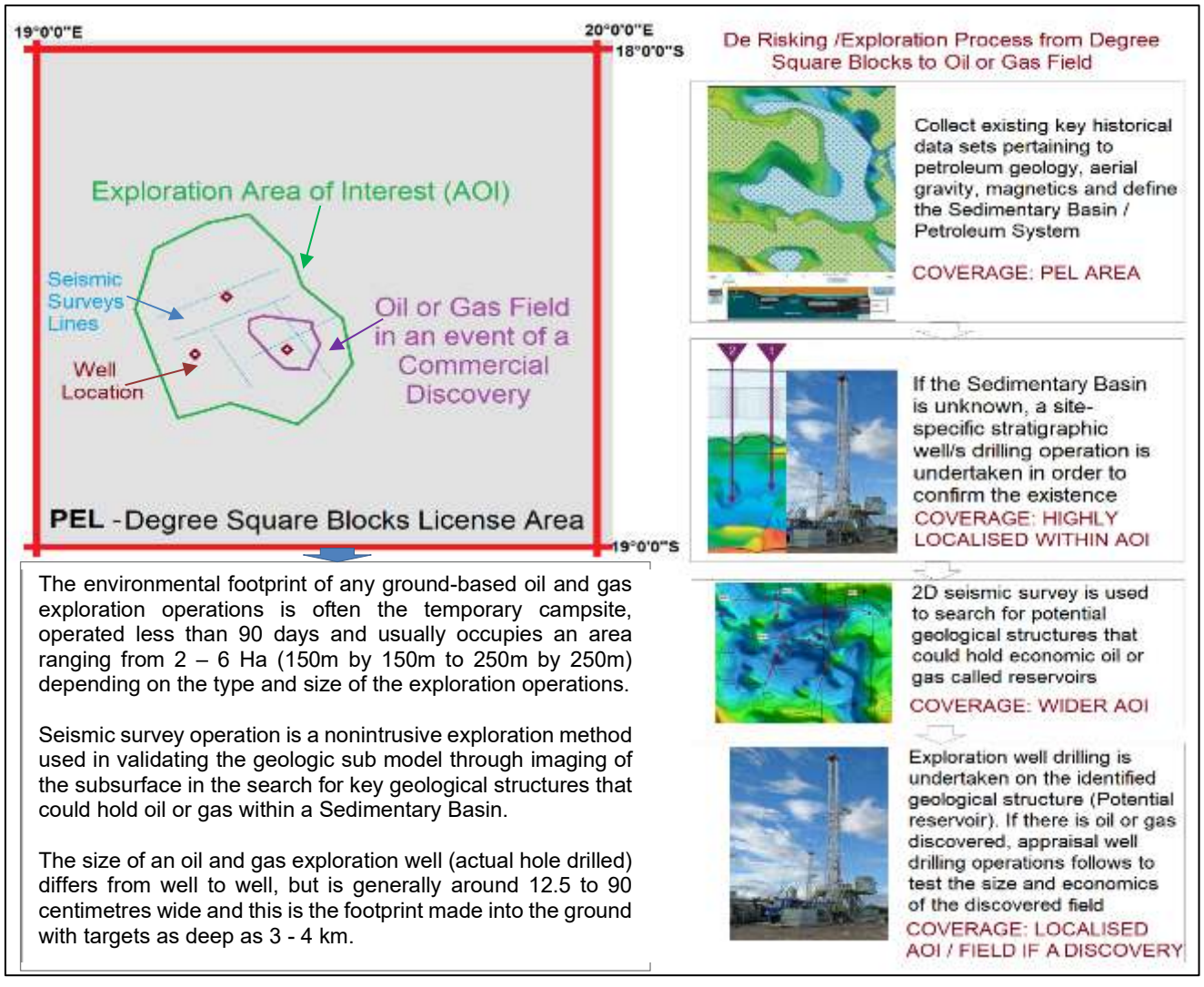


Figure 1.36: Illustration of the size and exploration footprint (drilling site), License Area (PEL), a Sedimentary Basin (AOI) and eventual an oil or gas field in an event of a commercial discovery.

1.4.2 Area of Interest (AOI) Within PEL 73

The AOI called the Kavango Sedimentary Basin within PEL 73 delineated from the interpretation of the airborne geophysical data sets comprises of several sub-basins. The Kavango Sedimentary Basin and all the delineated sub-basins fall within the Kavango West and East Regions communal lands and not on the banks of the Okavango River, not related to the Okavango Delta, do not cover the archaeological sites of the Tsodilo Hills which are in Botswana and do not fall in the legally proclaimed national parks within the Republic of Namibia (Fig. 1.37). The key main central exploration AOI covering the various sub-basins of the Kavango Sedimentary Basin are situated south of Rundu and the Okavango River, more than 260 km from the Okavango Delta in Botswana and not related to the Delta whatsoever, more than 40 km from the boundary of the Khaudum National Park and more than 70 km from the Mangetti National Park (Fig. 1.37). The overall AOI and the proposed exploration and appraisal wells locations Nos. D1-D6 and G1-G6 all fall within the communal areas of the Ncamangoro, and Ncuncuni Constituencies of Kavango West Region and Mashare Constituency of Kavango East Region (Fig. 1.38). Ncamangoro, and Ncuncuni Constituencies fall within the boundaries of the Mbunza traditional authority while the Mashare Constituency falls in the Sambyu Traditional Authority (Fig. 1.38). The proposed drilling operations only covers specific locations of about 3Ha within the AOI and not the entire PEL 73. The continuation of the drilling programme is aimed at searching for potential oil and gas reservoirs delineated from seismic survey data interpretation. Proposed new exploration and appraisal wells locations with respect to the local settlements, traditional authority, constituency boundaries of the portions of the Kavango East and West Regions covered by PEL No. 73 are shown in Fig. 1.38.

1.5 Structure of this EIA Report

The following is the summary structure outline of this Environmental Scoping Report with respect to the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 drilling operations:

- **Section 1: Project Background** covering Introduction, REN petroleum (oil and gas) 2022 exploration updates, priority exploration and appraisal wells locations and sites descriptions, regulatory requirements, AOI, PEL 73, and structure of this EIA Report .

- **Section 2: EIA Approach and Methodology** covering summary of the Terms of Reference (ToR), environmental assessment process and step, public and stakeholder consultation approach, impact assessment and mitigation measures.

- **Section 3: Description of the Proposed Project** covering origin of oil and gas and description of the site layouts, design, engineering and process of drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73, ESG and CSR Programmes.

- **Section 4: Regulatory Framework** providing detailed description of the applicable legislations and permitting requirements for drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73.

- **Section 5: Receiving Environment** covering physical environment (climate, water, air quality, and geology), Biological environment (flora, fauna and ecosystem services and functions) and socioeconomic environment around the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 with special focus around the Area of Interest (AOI).

- **Section 6: Assessment of Likely Impact** covering Knowledge-Based System Model Methodology (KBSMM) and matrix impact assessment procedure, likely and overall summary of impacts associated with drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 on the receiving environment, and.

- **Section 7: EIA Conclusions and Recommendations** covering the key issues identified and summarised recommendations with respect to the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73.

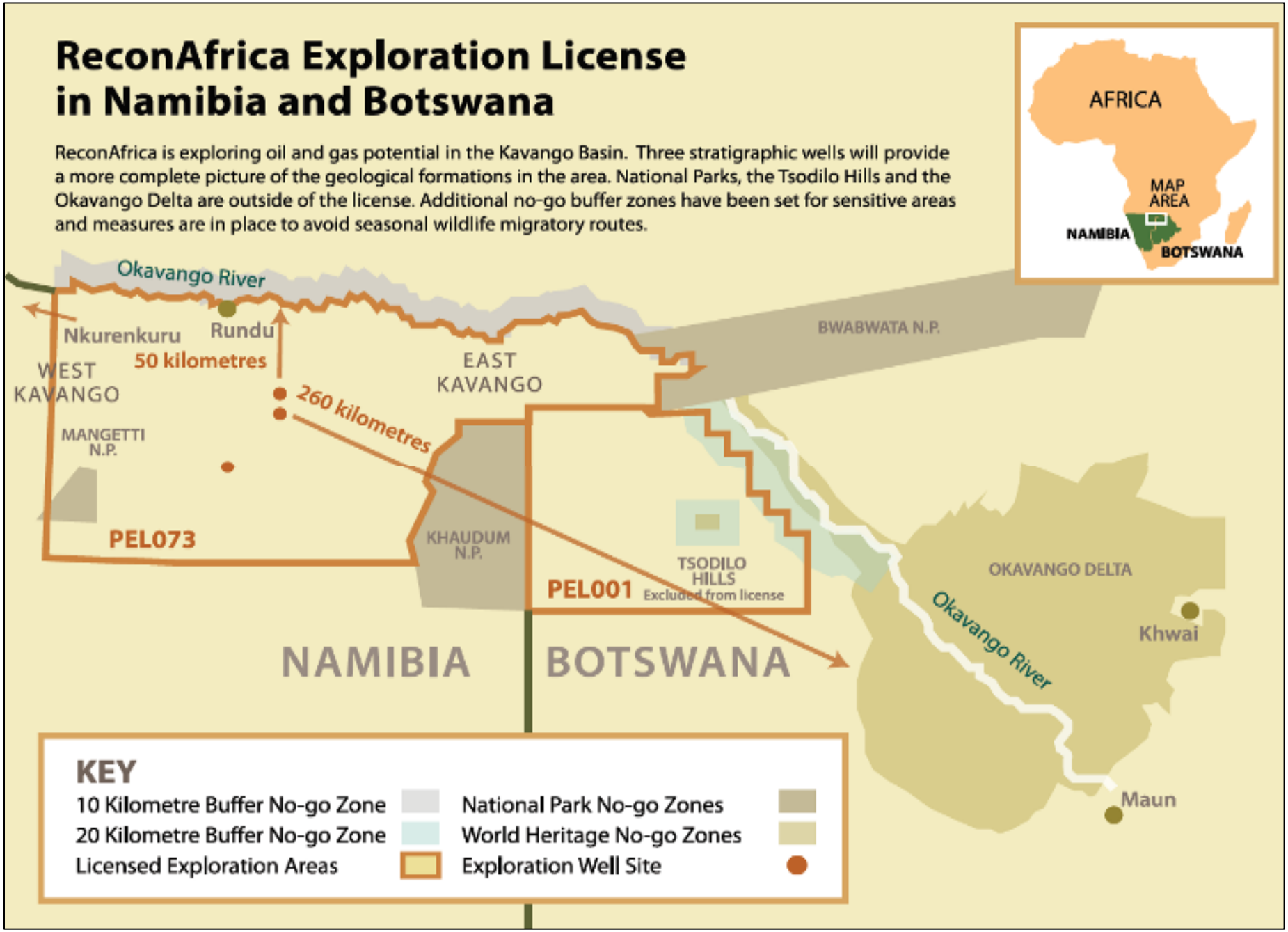


Figure 1.37: REN exploration license in Namibia with respect to key sensitive areas and neighbouring Botswana (Source: https://reconafrica.com).

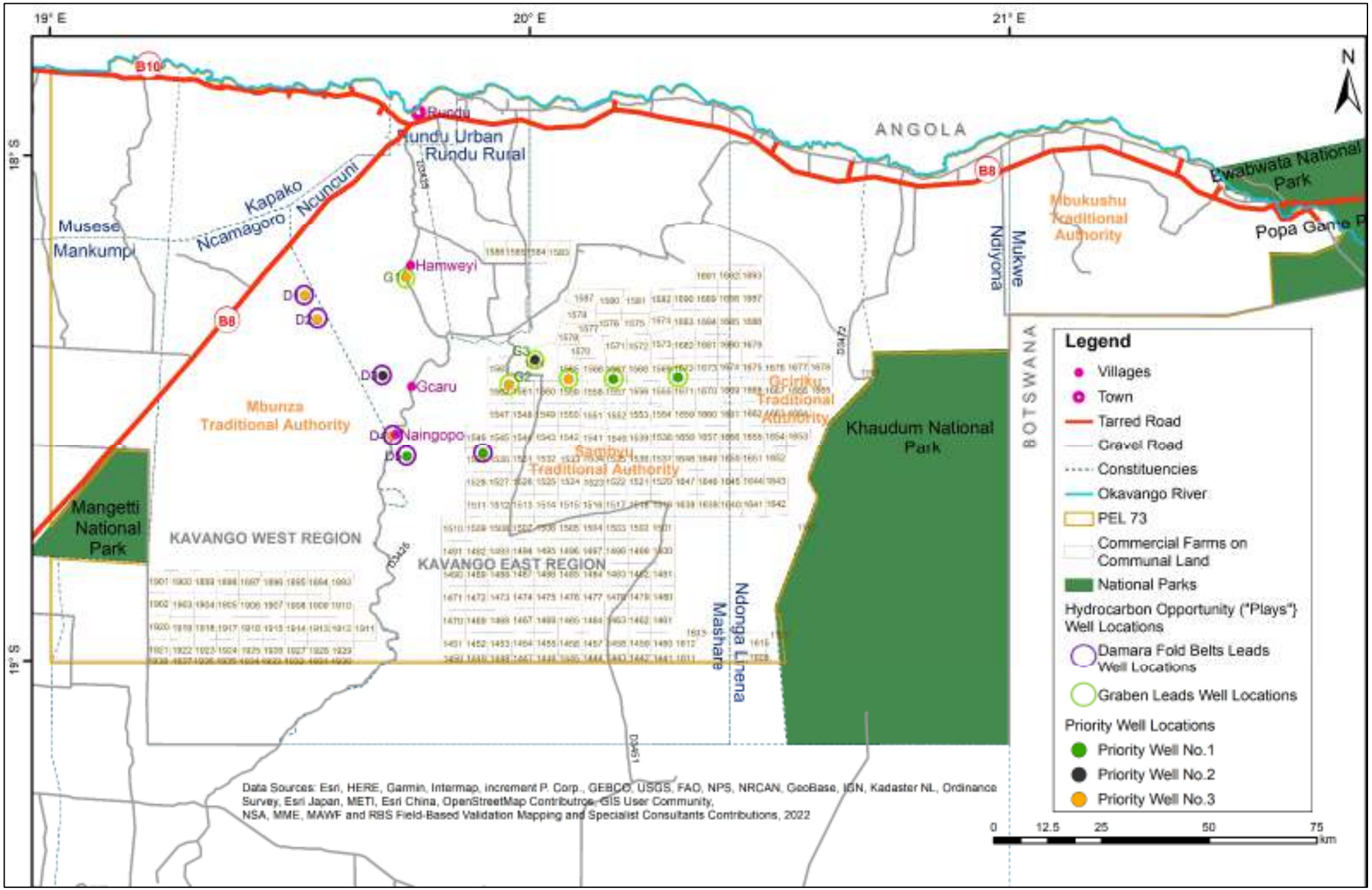


Figure 1.38: Proposed new exploration and appraisal wells locations with respect to the local settlements, traditional authority, constituency boundaries with respect to the portions of the Kavango East and West Regions covered by PEL No. 73.

2. EIA APPROACH AND METHODOLOGY

2.1 Summary EIA Terms of Reference (ToR)

Summary of the proposed activities, alternatives and key issues considered during the Environmental Assessment (EA) process are summarised in Table 2.1. The EIA process was performed by a qualified and experienced team, with objectivity and reasonable skill, care and diligence in accordance with professional standards and practices existing at the date of performance of the assessment and that the guidelines, methods and techniques used and applied in this study conformed to the national regulatory requirements, process and specifications in Namibia and in particular as required by Ministry of Mines and Energy (MME), Ministry of Environment, Forestry, and Tourism (MEFT) and the client (Proponent). The preparation of this EIA report was undertaken in line with the January 2015 MEFT Environmental Assessment Reporting Guideline.

Table 2.1: Summary of the proposed activities, alternatives and key issues considered during the environmental assessment process conducted from October 2022 to February 2023.

<table>
<tr><th>ACTIVITIES OF THE EXPLORATION APPRAISAL WELLS DRILLING OPERATIONS</th><th>ALTERNATIVES CONSIDERED</th><th colspan="2">KEY ISSUES IDENTIFIED, EVALUATED AND ASSESSED DURING THE SCOPING, EIA AND EMP STUDY PHASES</th></tr>
<tr><td rowspan="5">1. Pre-construction and onsite assessment of the drilling requirements.
2. Site construction and preparation including clearing, ground levelling and compactions.
3. Mobilisation, equipment installation and testing.
4. Spudding and conductor casing.
5. Drilling surface / intermediate and setting casing and cementing process through up 900 m or top section of the well as per the well design.
6. Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234') or as per the specific well design.
7. Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202') or as per the specific well design.
8. Well testing / appraisal and equip the well for possible production support if a commercial discovery.
9. Plug and abandon hole if dry.
10. Rehabilitate all surface disturbances and clear the site of any debris, and.
11. Camp removal, site closure / abandonment, and.
12. Site restoration into a local community site equipped with water supply and associated supporting infrastructure as may be applicable.
13. Major land accidental incidence such as diesel / oil spill / fire / explosion.</td><td rowspan="5">(i) Drilling locations: Regional location of PEL No. 73 covering degree squares Blocks 1719, 1720, 1721, 1819, 1820 and 1821 and showing the Areas of Interest (AOI) (Kavango Sedimentary Basin, regional council constituencies and traditional authority boundaries, villages, land owners and coordinates of each exploration and appraisal wells Nos. D1-D6 and G1-G6.
(ii) Well locations could also be moved around in an event that the site-specific location is not environmentally favourable.
(iii) Other alternative considered are: Water supply options including the use of existing boreholes, drilling of new boreholes that can later be handed over to the local communities, and drilling of community boreholes and then purchasing water from the communities. Considerations for other land uses opportunities such as agriculture, tourism, timber harvesting, conservation and tourism have also been evaluated.
(iv) No-Action alternative, all proposed wells not going ahead, not drilled.
(v) Other alternative sites
(vi) Ecosystem Function (What the Ecosystem Does, and
(vii) Ecosystem Services, Use Values, Non-Use, or Passive Use.</td><td colspan="2">Potential land use conflicts / opportunities for coexistence between proposed exploration and appraisal well drilling operations and other existing land uses such as agriculture, community forestry, timber harvesting conservation and tourism</td></tr>
<tr><td>Physical Environment</td><td>1. Water quality
2. Physical infrastructure and resources
3. Air quality, noise, and dust
4. Landscape and topography
5. Soil quality
6. Climate change influences.</td></tr>
<tr><td>Biological Environment</td><td>1. Habitat
2. Protected areas and resources
3. Flora
4. Fauna
5. Ecosystem functions, services, use values and non-use or passive use.</td></tr>
<tr><td>Socioeconomic, cultural, and archaeological environment</td><td>1. Local, regional, and national socioeconomic settings
2. Subsistence agriculture
3. Community forestry
4. Tourism and recreation
5. Cultural, biological, and archaeological resources</td></tr>
<tr><td>Environmental Management Plan (EMP) Providing Mitigation Measures and Monitoring Plan</td><td>Mitigation measures are focused on the following in order of preference:
1. Enhancement, e.g. provision of new habitats and local additional infrastructure for local communities.
2. Avoidance, e.g. use of only existing roads, tracks and disturbed areas and use of alternative materials avoid effects on ecological receptors
3. Reduction, e.g. limitation of effects on receptors through sites layouts and design changes; and
4. Compensation, e.g. Payments for water, land, and local resources use in order to improve the lives and livelihood of the local communities.</td></tr>
</table>

2.2 Assumptions and Limitations

The following assumptions and limitations that underpins the methodological approaches adopted, overall outcomes and recommendations of the Scoping Report, Terms of Reference and environmental assessment process with respect to the preparation of this EIA Report and the separate EMP Report:

- The proposed drilling of the priority list of exploration and appraisal wells D1-D6 and G1-G6, inclusive of the supporting infrastructures such as borrow pits and access roads overall drilling plan, equipment, consumables / drilling materials, maps, PEL, well area, site locations / coordinates, and appropriate data sets received from the Proponent, project partners, regulators, Competent Authority, and specialist consultants are assumed to be current and valid at the time of preparing the Scoping Report and conducting the desktop and field-based studies and preparation of EIA and EMP Reports.

- This EIA Report covers the entire proposed oil and gas exploration and appraisal wells drilling project lifecycle including the well testing in an event of a commercial discovery, but excludes production stage falling under a separate Production License regime.

- The contractual provisions of the Petroleum Agreement signed between REN and MME and the legal provisions of the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), and the Petroleum Laws Amendment Act, 1998, (Act 24 of 1998) are assumed to be valid and legally binding at the time of preparing the Scoping Report and conducting the desktop and field-based studies and preparation of this EIA and the separate EMP Reports.

- The impact assessment outcomes, and mitigation measures provided are valid for the proposed exploration and appraisal well drilling sites and surrounding areas as evaluated for the site-specific 3Ha wells sites footprints and the surrounding 5km^2 broader impact areas.

- A precautionary approach has been adopted in instances where baseline and project specific information and impact assessment guidelines are insufficient or unavailable or site-specific project activities were not yet available at the time of undertaking the impact assessment process, and.

- Principles of environmental management and mandatory timeframes as provided for in the EIA Regulations No. 30 of 2012 and the EMA, 2007, (Act No. 7 of 2007) have been observed in the preparation of the EIA and EMP reports.

2.3 Environmental Assessment Process

2.3.1 Project Screening and Summary of the Assessment Steps

The environmental assessment process of preparing the Scoping Report for this EIA and the EMP Reports with respect to the proposed drilling of the exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 took into consideration the provisions of the Environmental Impact Assessment (EIA) Regulations, 2012 and the Environmental Management Act (EMA), 2007, (Act No. 7 of 2007) as outlined in Fig. 2.1.

The following is the summary of the key environmental assessment steps with respect to the environmental assessment for the proposed drilling of the exploration and appraisal wells Nos. D1-D6 and G1-G6 inclusive of the supporting infrastructures such as the new access roads to each of the proposed new well sites within the AOI in PEL No. 73:

1) Project screening process was undertaken in October 2022.

2) A Draft Scoping Report prepared in October- November 2022.

3) Public and stakeholder consultation materials such as public notices, Background Information Document (BID), posters, and maps prepared in November 2022.

4) Registered for screening, the proposed project activities with the with Environmental Commissioner by uploading the relevant documentation on the MEFT Portal http://www.eia.meft.gov.na/, under the ECC Reference Application No. APP- 00459, undertaken in November 2022.

5) A confirmation of screening notice from the Environmental Commissioner in terms of assessment procedures (Section 35 (1)(a)(b) of the Environmental Management Act, 2007 (Act No 7 of 2007) was received through email on 25th November 2022. The screening notice received from the Environmental Commissioner provided for the following documents to be uploaded on the MEFT Portal http://www.eia.meft.gov.na/ as part of the ECC application requirement process with the hardcopies of the same documents submitted to MEFT via the Competent Authority, the MME:

   (i) EIA Report.

   (ii) EMP Report.

   (iii) Consent letter or support doc from relevant Authority.

   (iv) Proof of Consultation (Minutes, Newspaper adverts, etc).

   (v) Confirmation of screening notice received (through email) in terms of assessment procedures (Section 35 (1)(a)(b) of the Environmental Management Act, No 7 of 2007).

   (vi) Preliminary Site Map with coordinates (decimal degrees) and a Legend, and.

   (vii) CV of Environmental Assessment Practitioner (EAP).

6) Implemented the field-based assessments including specialist studies such as the dry season study on flora and fauna as well as water, socioeconomic, noise and dust assessments and archaeology, undertaken in November 2022.

7) Implemented public and stakeholder consultations process through publishing of notices in local newspapers and contacting of key stakeholders, undertaken in November 2022.

8) Implemented public, local community, traditional authorities and regional leadership consultations and engagements meetings with respect to the proposed drilling of the D1-D6 and G1-G6 exploration and appraisal wells, Scoping Report and implementation of the EIA and EMP processes, undertaken in November to mid December 2022.

9) Conducted additional field sites verifications and field-based assessments including specialist studies such as wet season flora and fauna wet season study, as well as water, socioeconomic, noise and dust assessments and archaeology, undertaken in January 2023.

10) Prepared Final Scoping, Final Draft EIA and EMP Reports, undertaken in January 2023.

11) Conducted additional public, stakeholder, local community, traditional authorities and regional leadership consultations and engagements activities with respect to the proposed drilling of the D1-D6 and G1-G6 exploration and appraisal wells, and results of the environmental assessment covering Final Draft EIA and EMP Reports, undertaken in January and February 2023.

12) Conducted further consultation / clarifications meetings with the key regulators such as Ministry of Mines and Energy (MME), Ministry of Environment, Forestry and Tourism (MEFT), Ministry of Agriculture, Water and Land Reform (MAWLR), Ministry of Urban and Rural Development (MURD), Ministry of Home Affairs, Immigration, Safety and Security (MHASS), Ministry of Health and Social Services (MHSS), Ministry of Works and Transport

(MWT), and Ministry of Labour, Industrial Relations and Employment Creation (MLIREC), undertaken in February 2023, and.

13) Finalised the EIA and EMP Reports to support the application for ECC for the proposed drilling of the D1-D6 and G1-G6 submitted to the Environmental Commissioner in MEFT through the Office of the Petroleum Commissioner in the MME (Competent Authority), undertaken in February 2023.

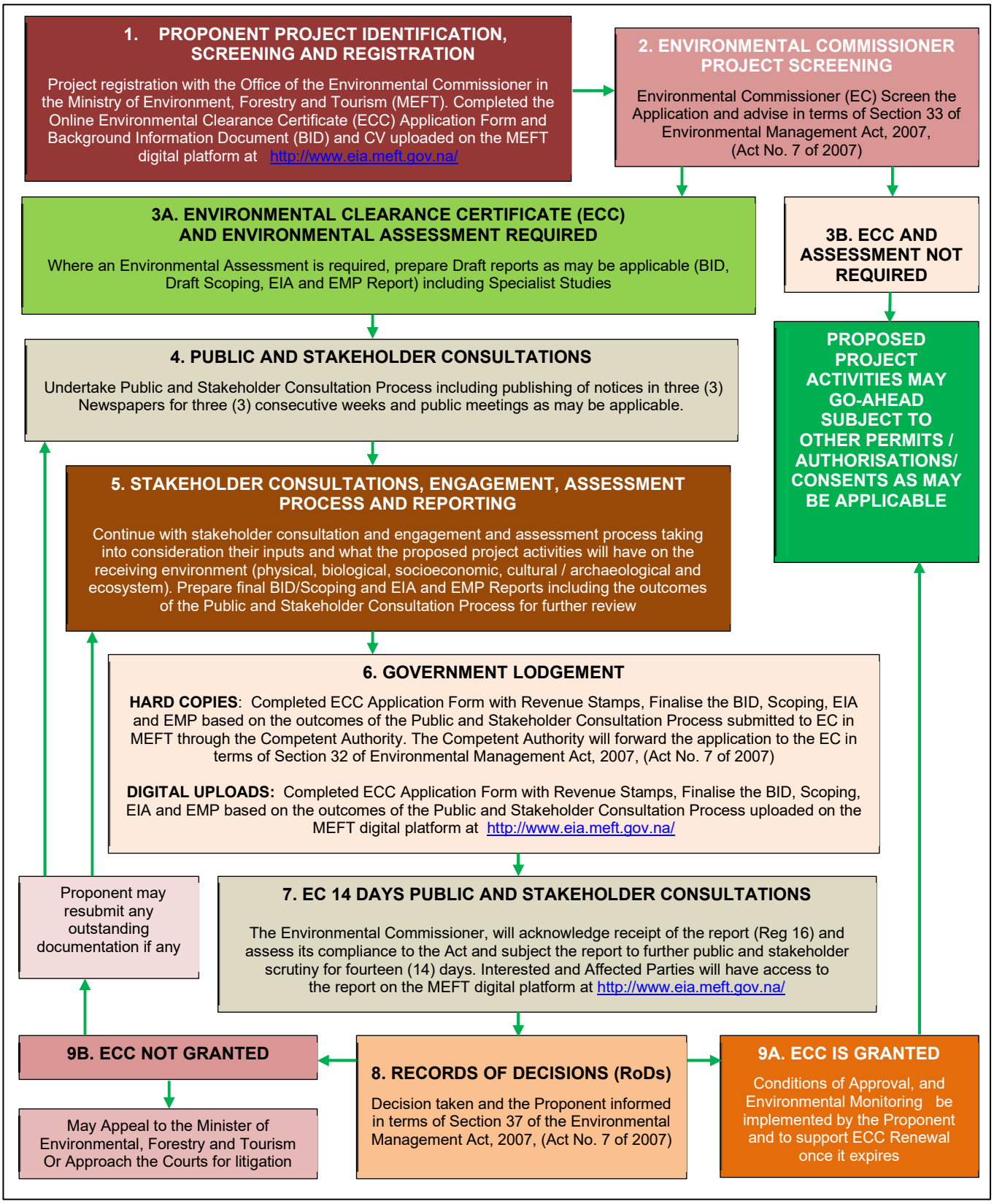


Figure 2.1: RBS Schematic presentation of Namibia's Environmental Assessment Procedure.

2.3.2 Desktop Studies for EIA and EMP Reporting

The EIA and EMP assessment process covering desktop assessments, took into consideration the corporate governance requirements of the Proponent as well as all other relevant Namibian laws, regional (Southern Africa Development Community–SADC) and international environmental and petroleum exploration protocols, standards, and practices applicable to onshore exploration and appraisal oil and gas well drilling operations. The general framework that governed the desktop baseline data collection process, covered the following aspects of the Scoping, EIA and EMP stages:

- Scoping (determination of geographical and other boundaries; preliminary assessment).
- Review of existing regulatory framework and institutional arrangements.
- Desktop review of the proposed project specifications and activities and receiving biophysical and socioeconomic baseline environment.
- Local community and stakeholder mapping and pre-consultation for the local community and regional leadership.
- Public and stakeholder consultation process.
- Field verifications and detailed field-based environmental assessments.
- Reporting, impact identification and development of suggested mitigation measures, and.
- Reporting for EIA and EMP.

Prior to the implementation of the field-based studies, desktop studies have been conducted to review the available data sets, and to design plans and maps, to compile relevant baseline climatic, environmental, and ground model data sets of the project area. The desktop work included the review of the drilling technologies, environmental baseline such as physiography, climate, hydrology, drainage, soils, geology/hydrogeology, land use, vegetation, fauna, flora, habitats, ecosystems, and socioeconomic environment data sets to grouped into climatic, environmental, and ground model components. Field-based studies have been used to validate the data compiled during the desktop study phase.

2.3.3 Field-Based for EIA and EMP Reporting

Field-based assessments, especially for fauna and flora have been conducted in two (2) phases covering October-December 2022 (dry season) and January-February 2023 (wet season / rainy season). The determination of the actual faunal diversity included the following:

- Small mammal transects to determine small mammal diversity in the area.
- Assessment of larger mammal presence in the area.
- Reptile and amphibian transects to determine reptile and amphibian diversity in the area.
- Bird transects to determine avian diversity in the area.
- Tree/shrub transects to determine diversity in the area, and.
- Grass transects to determine diversity in the area.

Fieldwork to determine the actual floral diversity included the following:

- Trees and shrubs – species composition, and.
- Grasses – species composition.

Vegetation composition has been assessed along various transects at each of the proposed exploration and appraisal wells sites D1-D6 and G1-G6 while a rapid assessment of all the trees and shrubs were also conducted at each site. The Phase 2 field-based wet season fauna and flora study provided a detailed inventory of the specific and number of tree species likely to be destroyed on each of the proposed well sites.

The likely number of trees to be lost has been linked to the ESG reforestation projects for each proposed drill sites as well as to the required Forestry Harvesting Permits to be issued by the Ministry of Environment, Forestry and Tourism before the start of the site clearing process. Other field-based studies undertaken as part of the EIA and EMP process included the following:

(i) Water (surface and groundwater assessments) including results of the monitoring undertaken since 2021.

(ii) Socioeconomic.

(iii) Archaeology.

(iv) Noise and vibration assessments, and.

(v) Land surveys and access to surface user rights for the Proponent.

2.4 Alternatives Considered in the Environmental Assessment Process

The following is the summary of the key alternatives that have been considered in the EIA and EMP environmental assessment process and focused specifically on the onshore oil and gas exploration process (not production) with respect to the proposed drilling of the priority multiple exploration and appraisal wells D1-D6 and G1-G6, inclusive of the supporting infrastructures such as the new access roads within the AOI in PEL No. 73:

(i) **Locations of the PEL, Areas of Interest (AOI) and exploration and appraisal wells sites**: The targeted areas of interest (Kavango Sedimentary Basin and the associated subbasin areas and the proposed exploration and appraisal wells locations) are site-specific and related to the regional and local geology and petroleum system of a specific area of interest within the KSB. The priority ranking of the D1-D6 and G1-G6 wells sites as developed by the Proponent, provides for a prioritised alternative list of well locations to be drilled. This means that not all the listed well Nos. D1-D6 and G1-G6 are going to be drilled. Based on the results of the ongoing exploration efforts, the proposed exploration and appraisal wells sites will continuously be evaluated and ranked accordingly, with respect to the ongoing exploration efforts and results thereof, against the sensitivity of the various components of the receiving environment. The location of each of the proposed exploration and appraisal wells sites may be moved around within the study area radius of 500m from the original well site to avoid sensitive environmental resources and allows for additional alternative well site placement opportunities for each of the proposed well sites.

(ii) **Drilling Rig:** There are several sophisticated onshore drilling units available on the market today and that may be used for the drilling of the proposed wells. However, REN has chosen to use the Crown 750 drilling rig because it is a relatively small rig designed for mobility and drilling conventional wells only. The rig is truck mounted and designed for light impact and mobility across desert conditions. With 1000 HP the Crown 750 can drill to about 4000m depth which restricts operations to vertically drilled conventional formations only. The Crown 750 rig will be used to drill the proposed exploration and appraisal wells sites.

(iii) **Drilling Fluid (Mud):** Variety of drilling muds are available for onshore oil and gas drilling operations. REN has chosen to use the most expensive water-based Polyamine/ Polymer/PHPA which is engineered organic and biodegradable water-based drilling fluid systems that minimise environmental impacts. The plant-based products added to the base fluid are created through organic processes and are biodegradable.

(iv) **The No-Action Alternative**: A comparative assessment of the environmental impacts of the 'no-action' alternative, a future in which the drilling of multiple exploration and appraisal wells does not take place has been undertaken. An assessment of the environmental impacts of a future, in which the drilling of multiple exploration and appraisal wells does not take place, may be good for the receiving environment because there will be no negative environmental impacts due to proposed activities that will take place in the area. The environmental benefits will include no negative environmental impacts on the receiving environment due to the proposed oil and gas exploration drilling operations. However, it is important to understand that even if the proposed exploration activities do not take place, to which the likely negative environmental impacts are likely to be low and localised, the current and other future land uses will still have some negative impacts on the receiving environment that may be higher than those associated with the drilling of multiple exploration and appraisal wells in the AOI within PEL No. 73.

The likely negative environmental impacts of other current and future land use that may still happen in the absence of the drilling of multiple exploration and appraisal wells includes: Land degradation due to drought, deforestation due to poor land management practices (slash and burn farming practices), timber harvesting, new communal land allocations, new homesteads and field clearing due to increasing population, wild and manmade fires, erosion, and overgrazing and natural Climate Change. Furthermore, it is also important to understand what benefits might be lost if the drilling of multiple exploration and appraisal wells do not take place. Key loses that may never be realised if the drilling of multiple exploration and appraisal wells operations do not go-ahead include: Loss of potential added value to the unknown underground potential subsurface resources such as petroleum (oil of gas), minerals, water, geothermal potential, socioeconomic benefits derived from current and future exploration capital investments, current license rental fees, current contributions to training of Namibians, direct and indirect contracts and employment opportunities to the people of Kavango West and East Regions and Namibia as a whole, foreign direct investments and various taxes payable to the Government of Namibia.

(v) **Land Uses and Conflicts**: The proposed wells locations fall within the sparsely populated communal land of the Kavango West and East Regions with communal subsistence agricultural land uses area dominated by stock and seasonal crop farming practices. Conservancies and several community forests exist in the area. The environmental assessment assessed the potential for coexistence of the current and future local and regional land uses in PEL No. 73, AOI and proposed wells locations. The assessment process took into considerations the limited footprint of less than 3Ha land surface required for an exploration and appraisal wells site, use of the existing supporting infrastructure such as access and the overall temporary nature of the proposed oil and gas exploration activities that will last for only 2-3 month of drilling per well location.

(vi) **Ecosystem Function** (**What the Ecosystem Does**): Ecosystem functions such as wildlife habitats, carbon cycling or the trapping of nutrients and characterised by the physical, chemical, and biological processes or attributes that contribute to the self-maintenance of an ecosystem in this area are vital components of the receiving environment has been considered. The environmental assessment process assessed the potential for coexistence of the proposed exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to the ecosystem function in PEL No. 73, AOI and wells locations. The assessment process took into considerations the limited scope and duration of the proposed exploration and appraisal wells drilling operations centred around 3Ha footprint of each well site.

(vii) **Ecosystem Services**: Food chain, harvesting of animals or plants, and the provision of clean water or scenic views are some of the local ecosystem services associated with each of the exploration and appraisal wells sites in the AOI within PEL No. 73 has been considered. Key Priority wells locations are not situated in sensitive ecosystem services areas that provide vital ecosystem services to the local communities. The assessment process has taken into considerations the limited scope and duration of the proposed exploration and appraisal wells drilling operations centred around 3Ha footprint of each proposed priority well site.

(viii) **Use Values**: PEL No. 73, Kavango Sedimentary Basin, AOI and the proposed exploration and appraisal wells sites areas all have direct values for other land uses such as agriculture, conservation, and tourism as well as indirect values which includes: Watching a television show about the general area and its wildlife, food chain linkages that sustains the complex life within this area and bequest value for local communities and future generations to enjoy. The environmental assessment process has assessed the potential for coexistence of the use values associated with the ecosystem around PEL No. 73, AOI and proposed wells locations. The assessment process has taken into consideration the limited footprint of less than 3Ha land surface required for an exploration and appraisal well site, use of the existing supporting infrastructure such as existing access and the overall temporary nature of the proposed oil and gas exploration activities that will last for only 2-3 months of drilling for each of the proposed priority well location, and.

(ix) **Non-Use or Passive Use**: PEL No. 73, Kavango Sedimentary Basin, AOI and the proposed exploration and appraisal wells sites areas all have non-use or passive use that is not linked to the direct community use / benefits to current or future generations. The environmental assessment process assessed the potential for regional and local ecosystem non-use or passive use benefits associated with the ecosystem around PEL No. 73, AOI and proposed wells locations. The environmental assessment process took into considerations the limited scope of the proposed activities that will occupy only 3Ha per well and leave much of the PEL No. 73, Kavango Sedimentary Basin and AOI areas untouched because the activities will likely be localised and targeting potential deep-seated (averaging 2 km deep) subsurface potential geological structures.

2.5 EMP and Mitigation Measures for Significance Impacts

2.5.1 EMP Recommendations

Based on the finding of the Scoping Report and this EIA Report, a separate EMP Report has been prepared detailing the mitigation measures that the Proponent shall implement in minimising and maximising the likely effects of negative and positive impacts that may be associated with the drilling of multiple exploration and appraisal wells within the AOI (Kavango Sedimentary Basin) in PEL No. 73.

2.5.2 Mitigation Measures Guiding Principles

A hierarchy of methods for mitigating significant adverse effects detailed in the EMP Report has adopted the following order of preference:

(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.

The EMP has also provided for an environmental monitoring plan and reporting each of the proposed exploration and appraisal wells to be drilled in the AOI in PEL No. 73. Mitigation measures for both significant positive and negative impacts have been proposed and management strategies are detailed in the EMP Report for drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73 covering the following:

(1) Routine and physical presence operational activities:

(i) Permitting and planning.

(ii) Site preparation, preconstruction and construction stages.

(iii) Spudding, drilling, logging / well testing, casing, and cementing process to Total Depth (TD).

(iv) Well testing, drilling completion, well plug / seal of porous horizons and abandon hole / re-enter for side tracking / well testing, and.

(v) Rehabilitation, site closure, restoration, and handover to community / land owner.

(2) Unplanned accidental events:

(i) Major land accidental incidence such as diesel / oil spill / fire / explosion.

The EMP Report has been based on the findings and recommendations of the EIA Report inclusive of the inputs from the specialists and best industry practices. The prepared EMP Report shall be implemented and monitored by the Proponent through the proposed project lifecycle.

The Proponent shall incorporate the provisions of the EMP Report in its Environmental Management System (EMS) in line with the Environmental Policy of the company. Overall, the EMP Report has provided for the precautionary measures / approach.

2.6 Closure, Rehabilitation and Restoration Considerations

2.6.1 Objectives of the Closure, Rehabilitation and Restoration Process

The objective of rehabilitation and restoration process with respect to the drilling of proposed D1-D6 and G1-G6 exploration and appraisal wells inclusive supporting infrastructures such as access roads and borrow pits is to provide the framework for the following:

- Ensuring compliance with all legislative requirements with respect to all the sites closures, rehabilitation and restoration process.

- Forms the basis for consulting with a variety of stakeholders to derive a widely acceptable social, economic and environmental closure, rehabilitation and restoration outcomes through the implementation of tools and practices to manage and minimise the impact of the receiving environment and nearby land owners.

- Describes a closure strategy based on envisaged final post-drilling / aftercare ecosystem (physical, biological, socioeconomic environments) conditions, stakeholder expectations, future potential use of disturbed areas, closure risks and preferred sustainable closure business plan alternatives.

- Ensure a final restored site landform is produced that is safe, stable and non-polluting, as well as free draining and compatible with the post construction phase land use as agreed with the landowner / local communities.

- Ensure topsoil and subsoil are managed to conserve the seedbank, nutrients, and to encourage the establishment of proposed revegetation.

- Ensure that disturbed areas are to be rehabilitated as close as reasonably practicable to their pre-disturbance condition or otherwise as agreed with the landowner / local communities.

- Ensure that rehabilitation works comply with and are undertaken as per relevant regulatory requirements.

- Establish a set of indicators and a rehabilitation monitoring program to ensure successful rehabilitation.

- Provide for all the necessary resources (financial and human) for the implementation and monitoring of a sustainable closure and aftercare business plan, and.

- ❖ Basis for formal relinquishment process in place releasing the REN from future obligations when closure outcomes have been accepted and achieved

2.6.2 Site Closures and Rehabilitation

As part of the EIA process, various options of rehabilitating all surface disturbances and clearing each of the disturbed drilling site have been assessed. The following is the summary of the key rehabilitation considerations that that have been assessed with respect to the drilling of proposed D1-D6 and G1-G6 exploration and appraisal wells inclusive of the other operational areas such as the new access roads to each of the proposed new well sites, the use of existing borrow pits and other associated services:

Step 1: Closure and rehabilitation of the borrow pits areas:

- ❖ Although borrow pit are a property of the traditional authority and all the material used in the construction process will be purchased from the traditional authority and rehabilitation of the operational area shall include levelling with no topographical high points present on the borrow pit floor.
- ❖ No walls or steps shall be left in or around the borrow pit.
- ❖ Borrow pit floor shall be free of any spoils, large rocks or any form of construction waste and all such material shall be deposited at the bottom of high walls and will thus be covered with material when cutting the slopes.
- ❖ Borrow pit slopes will have a gradient not steeper than 1:3 and shall be graded or bladed.
- ❖ Overburden, top-soil and any other material, removed when the borrow pit was opened and stockpiled on the outer sides of the borrow pit, shall be distributed on the slopes and floor of the borrow pit with a maximum thickness of 300 mm.
- ❖ Finishing of the slopes should be done in concentric circles, starting from the borrow pit floor and moving upwards towards ground level to prevent initial erosion induced by water and wind, and.
- ❖ Remaining material (overburden and topsoil) shall be shaped as a berm with a maximum slope 1:3, with a distance of at least 3.0 m from the edge of the borrow pit and not closer than 9.0 m to any structures (roads, buildings, etc.) - the berm will not be higher than 1.0 m.

Step 2: Drilling site closure and rehabilitation:

- ❖ Remove all the site supporting infrastructure such as housing container / tents.
- ❖ Disassemble all the structures.
- ❖ Remove all materials from the sites and either:
  - Transporting to a new site if it is to be used or stored elsewhere. or
  - Disposing at a suitable site. or
  - Making them available to the farmer or local persons. or
  - Selling at an auction.
- ❖ Remove all drilling equipment from the site and transport to a new site where it is to be used or stored or sell at an auction.

- ❖ Rehabilitate the cuttings pits as recommended by the engineering team.
- ❖ Remove the generators from the sites from site and either transport to a new site for storage or sell it to the farmer or an auction.
- ❖ Remove all 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.
- ❖ 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 rehabilitated sites as per the site closure plan and 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 transport the component parts to a storage site or sell at an auction.

Step 3: 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 4: 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 5: Rehabilitate the roads

- ❖ All access roads / tracks impacted by the drilling operations shall be rehabilitated by smoothing the 'middle mannetjie' (middle ridge between the tracks) and raking the surface.

2.6.3 Drilling and Reserve Pit Closure

As part of the overall drilling sites rehabilitation and restoration activities, special focus shall also be made with respect to the drilling and reserve pit closure. The following is the summary of the key considerations to be included with respect to the reserve pit closure and reclamation:

- ❖ Creation of the storm water erosion and sediment control.
- ❖ Cuttings and all the solid remains after the evaporation of the water including site walls liners removed before site backfilling with the original material stockpiled onsite.
- ❖ Surface soil contamination cleaned and removed from site and disposed off at Rundu Solid Waste Disposal facility.
- ❖ Reserve pit filled / backfilled with native materials and restored as close to the original contours as possible, and.
- ❖ Surface of the pit closure been graded to prevent future water accumulation in line with the planned after use of the area.

2.6.4 Site Restorations Options

The rehabilitation of each of the operational site shall focus on establishing common local community facilities that can support local community social activities such as meetings and local business / market areas. Each of the drilling sites will be equipped with supporting infrastructure such as road access, water supply boreholes and sanitation facilities.

The following is the summary of the examples of the local community site usages that shall be evaluated and implemented in consultation with the local community, Village Development Committees, Community Headperson (Foreman/Forewoman), Traditional Authority and Local Councillor representing the Regional Council:

(i) Common local community meeting and market centre to be equipped with a simple shade structure made up of zinc sheets and steel upright poles.

(ii) Handling pen / facilities for cattle and small stock to be equipped with handling facilities such as loading ramp, dip, scale, neck clamp, calf crush and other associated facilities as may be necessary and requested by the community.

(iii) Sanitation facilities.

(iv) Community garden and nursery centre.

(v) Other facilities as may be applicable and / or requested by the local community.

The following is the summary of the key specific rehabilitation approaches to be adopted for both the industrial and domestic waste water management areas:

(i) Industrial waste water management facilities covering the reserve-pit and supporting pipes will be rehabilitated by first allowing the waste water to evaporate and removing and stockpiling the remaining solids to be used for soil conditioning purposes for the ongoing community gardens and nursery projects. The reserve pit area will be backfilled with the original soil that was removed and stockpiled on site for the rehabilitation purposes, and.

(ii) The bulk of the domestic waste water infrastructure such as the holding tanks and pipes will be removed by the Contractor, Rent-a-Drum. Two or so holding tanks may be left onsite to support the two (2) toilet facilities that may be left onsite as part of the local community facility for effective hygiene support for the after use of the sites.

2.6.5 Monitoring and Reporting Guiding Principles

The environmental performance monitoring process provided for in the EMP shall be undertaken by the Proponent and shall include the preparation of the environmental monitoring reports and reporting thereof, as may be required by the various permits, certificates, consents, or authorisations as granted by the Government of the Republic of Namibia.

The following is summary of the key environment performance monitoring indicators linked to the closure, rehabilitation and restoration of the proposed D1-D6 and G1-G6 exploration and appraisal wells sites inclusive supporting infrastructures such as access roads and borrow pits:

- Ensure that disturbed areas are to be rehabilitated as close as reasonably practicable to their pre-disturbance condition or otherwise as agreed with the landholder.
- Ensure a final landform is produced that is safe, stable and non-polluting, as well as free draining and compatible with the post construction phase land use.
- Ensure topsoil and subsoil are managed to conserve the seedbank, nutrients, and to encourage the establishment of proposed revegetation.
- Ensure that rehabilitation works comply with and are undertaken as per relevant regulatory requirements from MME and MEFT.
- Establish a set of indicators and a rehabilitation monitoring program to ensure successful rehabilitation.
- Establish agreed criteria where rehabilitation is deemed successful by relevant authorities and key stakeholders.

In order to achieve the desired completion criteria, a monitoring programme consisting of an initial two-year maintenance and establishment period will be implemented at the conclusion of the rehabilitation and restoration works.

The monitoring programme shall track the progress of the above performance indicators. At the conclusion of the two-year maintenance and establishment period, the need for a further monitoring period shall be assessed, the duration of which shall be determined at that time.

If required, the further two-year monitoring period shall track the continuing progress of the performance indicators to ensure a positive trend, until the completion criteria are met as agreed with the regulators, traditional authority, landowner or local communities.

Following project approval, a detailed rehabilitation management plan shall be developed, in which administrative considerations that are key to the success of the monitoring programme. The administrative considerations shall include: roles and responsibilities, training, specification of success criteria, reporting and review, audit, adaptive management and financial provisioning.

3. PROPOSED PROJECT DESCRIPTION

3.1 Origin of Petroleum and Petroleum Exploration

Petroleum (oil and gas) is formed from the remains of ancient marine organisms, such as plants, algae, and bacteria in a geological environment called Sedimentary Basins (Fig. 3.1). A Sedimentary Basin is a region of the Earth where long-term depressional setting has allowed for the accumulation of thick layers of sediments with remains of ancient marine organisms. As the sediments continue building-up and are buried deeper within a Sedimentary Basin, the various bottom layers that were initially deposited, will be subjected to increasing pressure and temperature because for every 1km that one goes deeper into the earth's crust, the temperature on average increases by 25°C. The increase of temperature and pressure because of the weight of the overlaying materials, initiates the process of cooking. If the sedimentary rock has enough organic materials for generating oil and gas and if the subsurface conditions are favourable, oil or gas may be generated within the temperature window range of between 100°C - 120°C. The oil or gas that get deposited within the Sedimentary basin, if the conditions and geological structures favours its accumulation, will remain trapped until discovered or until the natural conditions within the basin changes and forces the oil or gas to leak or vaporise. Such changes in Sedimentary Basin conditions may be as a result of increasing temperature within the basins that cooks the oil or gas and forces it to vaporise or could also be the opening of the trap that allows the oil or gas to escape and leak out.

In simple terms, a license area for oil and gas and a sedimentary basin are like a plot with a built modern family home comprising a number of bedrooms, kitchen, dining and other rooms. A house, if built, often occupies a fraction of any given plot and is correspondingly to a Sedimentary Basin if present within a license area and only occupies a fraction of any given licensed area. In oil and gas terms, the key areas of interest for the entire house (Sedimentary Basin) are the kitchen and dining room equated to a source and reservoir rocks, respectively, forming part of the key petroleum system of a given AOI. Within a house environment, food is cooked in the kitchen and eaten in the dining room. Oil is formed in source rock (kitchen) and then it migrates and accumulates in a reservoir (dining room) which is often the key target area for any oil and gas exploration operations. A reservoir is similar to a dining room for anyone hoping to have a good meal, especially after noticing cooked food remains in the kitchen. However, even after noticing cooked food remains in the kitchen (source rock), there is no guarantee that the food will still be in the dining room because maybe someone was already in the dining room and has eaten all or much of the food and this is similar to the situation where oil or gas is formed and signs of it are detected in the source rock (kitchen) and a reservoir is found but it is empty or has some oil or gas but not economic.

The sedimentary rocks capable of generating oil or gas when subjected to high pressures and temperature are called source rocks e.g., limestone or shale. Once oil and gas resources are formed, they are flushed out of the source rock due to the high pressure created by the weight of the overlaying materials. Oil and / or gas often migrates to suitable area where accumulation takes places in rocks called oil or gas reservoirs.

A petroleum reservoir or oil and gas reservoir is a porous or fractured subsurface rock mass saturated with hydrocarbons and can be a sandstone, shale, limestone or salt dome. Pores space and permeability are key important rock properties in oil and gas exploration. Pore space being the void space in the rocks, while permeability defines the connection of the pore spaces (pores) to each other which then allows fluids to flow in a rock. Most shales have very low permeability, but relatively good porosity – reason for fracking to allow oil or gas to flow to hole if discovered in a shale rock.

Petroleum reservoirs are broadly classified as conventional (with natural pores and permeability) and unconventional (natural pores but limited permeability). It is important to know that fracking only comes into play after the discovery of economic vast oil or gas reserves found in a reservoir with natural storage (pores) but limited storage connectivity (permeability) abilities. At present, Namibia does not have any onshore oil or gas discovery and yet alone in a reservoir with limited connectivity abilities and requiring fracking to produce or pump it.

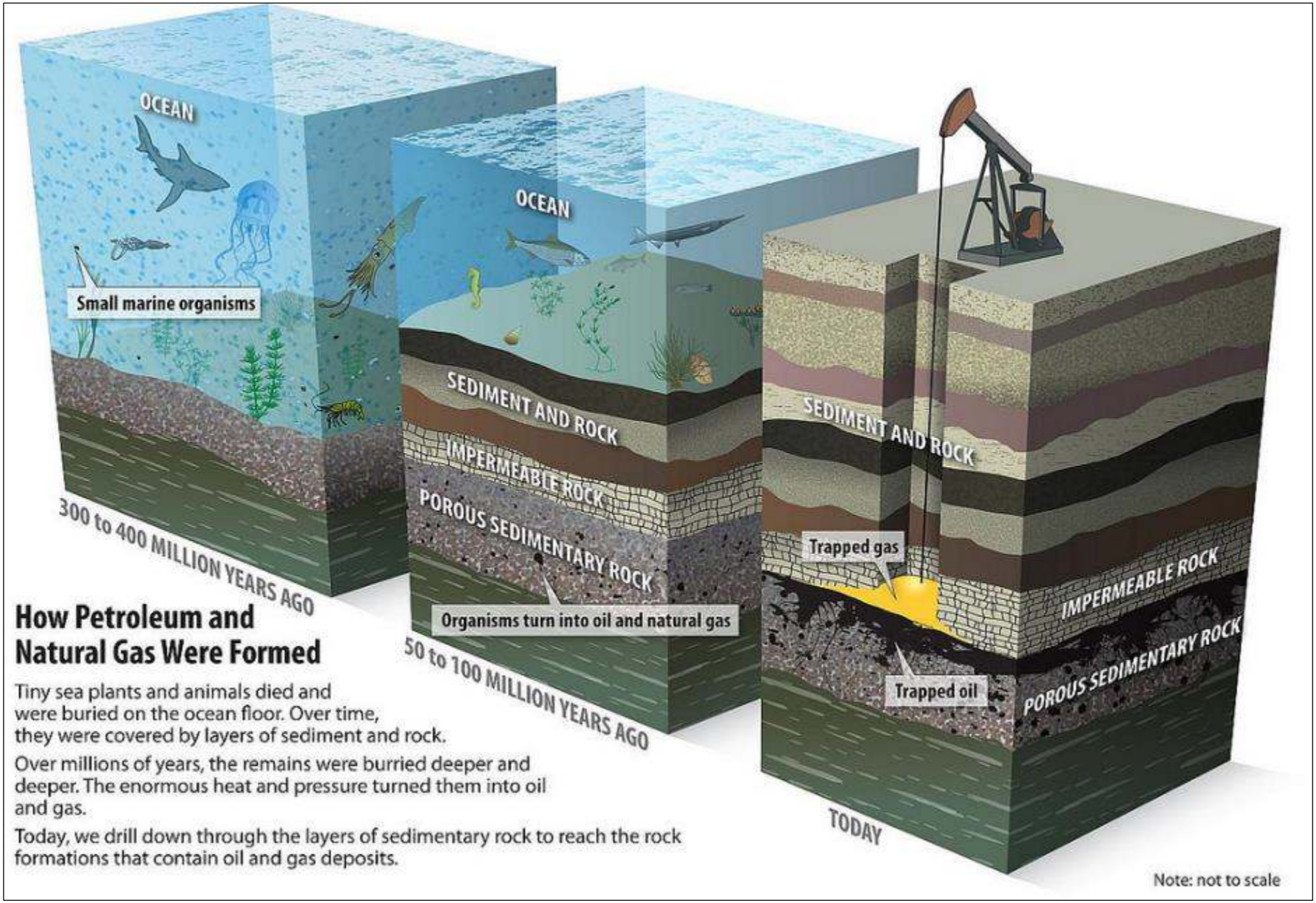


Figure 3.1: Illustration of how oil and gas are formed over millions of years ago (Source: https://letslearngeology.wordpress.com/oil-formation-petroleo/).

3.3 Oil and Gas Well Drilling Operations

3.3.1 Types of Oil and Gas Wells

The Proponent is proposing to drill the exploration and appraisal wells Nos. D1-D6 and G1-G6 as part of the ongoing oil and gas exploration programme for the period 2023-2024 inclusive of the supporting infrastructures such as the new access roads to each of the proposed new wells sites, the use of existing borrow pits and other associated services.

Oil and gas well drilling process involve creation of an engineered hole (well) in the ground for a given objective. The following is the summary of different type of wells that are drilled for different objectives:

(i) Stratigraphic well drilled to study the geology or confirm the presence of a petroleum system (Sedimentary Basin) such as the drilled 6-2 Kawe, 6-1 Mbambi, and 8-2 Makandina.

(ii) Exploration and Appraisal Wells. Exploration well such as the proposed D1-D6 and G1-G6 wells are drilled in new areas to confirm the presence of an oil or gas reservoir that may contain economic oil or gas based on the results of the seismic survey, airborne gravity, and stratigraphic well drilling data sets. Exploration wells (or wildcat wells) are drilled for exploration purposes in new areas. Appraisal wells such as the proposed D1-D6 and G1-G6 wells drilled within the same area where exploration wells were drilled and found oil or gas or both. Appraisal drilling operations are undertaken to determine the size and characteristics of a petroleum discovery made during the exploration drilling process. The appraisal drilling characteristics to be determined include the quantity of oil and/or gas present, the location of fluid contacts, the presence and distribution of baffles and barriers to fluid flow, and the quality of the reservoir, and.

(iii) Production wells are drilled for the extraction oil or gas from the subsurface reservoir.

3.3.2 Exploration and Appraisal Well/Operation Objectives

The following is the summary of the overall well/ operational objectives of drilling the proposed D1-D6 and G1-G6 exploration and appraisal wells:

- To evaluate the hydrocarbon potential safely and efficiently of the Kavango Sedimentary Basin.
- Geologically date the sediments and stratigraphy via post-well palynology and stratigraphic analysis of cuttings and sidewall cores.
- Obtain relevant and accurate petrophysical data via sample analysis, whole core, and wireline logging, and.
- Evaluate the economic / commercial opportunities of producing oil and gas within the Kavango Sedimentary Basin.

3.3.3 Oil and Gas Well Drilling Process and Drilling Rig

3.3.3.1 Drilling Process

Drilling itself occurs in two phases: Drilling down to below the water table and then encasing the well hole in cement to prevent groundwater and soil contamination, and then drilling to the required depth and taking the necessary steps to stimulate upward oil flow. To drill a well, a specialised piece of equipment called a drilling rig is used to bore a hole through many layers of rock into the subsurface to reach a targeted Total Depth (TD) (Fig. 3.2). REN will be using the Crown 750 truck mounted drill rig to drill the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 in AOI in PEL No. 73 (Plates 3.1 and 3.2). Most drilling rigs today utilise rotary drilling, with drilling mud/fluid powering the drill string (Fig. 3.2 and Plate 3.1). The size of the borehole differs from well to well, but is generally around 12.5 to 90 centimetres in circumference. To cut through this rock, the drill is pushed down by the weight of the piping above it. This piping is used to pump a thick fluid known as drilling mud into the well.

The mud assists in the drilling process by maintaining the pressure below ground in the well as well as by collecting rock cuttings from the bottom of the well and bringing it up to the surface (Fig. 3.2 and Plate 3.1). As the drill digs deeper, sections of drilling piping are attached to lengthen the well. After the well is drilled it is completed and cased. The well casing is the lining that is inserted between the edge of the well and the well itself that helps to structurally support the well (Fig. 3.2 and Plate 3.1). In a closed hole well, concrete is poured into the space between the pipe and the borehole for stability and to prevent groundwater contamination from seepage. Subject to the outcomes of the drilling operations, various types of well testing / appraisal activities may be undertaken and may include the extraction of oil and / or gas and the burning (flaring) of the gas being produced for testing purposes.

3.3.3.2 Drilling Rig: The Crown 750 1000 HP

The Proponent will be using the Crown 750 drilling rig to drill the proposed D1-D6 and G1-G6 exploration and appraisal wells (Plates 3.1 and 3.2). The Crown 750 drilling rig was used in 2021 and 2022 to drill the 6-1 Mbambi and 6-2 Kawe and 8-2 Makandina wells respectively. The same rig will also be used to drill the Wisdom 5-1 well to be spudded in February 2023. The Crown 750 drilling rig is a relatively small rig designed for mobility and drilling conventional wells only. The rig is truck mounted and designed for light impact and mobility across desert conditions. The Crown 750 was manufactured in the United States and is rated at 1,000 horsepower, equipped with two CAT 540 horsepower diesel engines. Combined with a 440,000-pound hook load, the rig is rated to drill 12,000 vertical feet. The following is general specifications of the Crown 750 as shown in Plates 3.1 and 3.2:

- HP Rating: 1,000 HP.
- Ambient Rating: 50ºC–55ºC.
- Powered By: 2 x C15 CAT Engines (540 BHP @ 2,100. RPM each); Allison 4700OFS Transmissions.
- Rig Type: Self-propelled, carrier mounted, 7-Axle (14 x 4), internally guyed Two Caterpillar model C15 ACERT packaged generator sets on three-point skid rated for 456/365 kVA, 365/292 kWe, 480/400 V, 0.8PF, 3-phase, 60 Hz prime power service.
- Generator building complete with MCC and generator synchronisation.
- Includes all necessary wiring and electrical rig-up from AC generators to MCC in generator/power control house.
- Lighting includes fluorescent, flood, and Crown lights for mast, carrier substructure, area lighting and S&S furnished building/equipment lighting.
- Rig intercom system includes 4 hazardous area telephones, one talk-back system and 2 wireless telephones, and.
- Lighting designed in accordance with API RP 500/505.

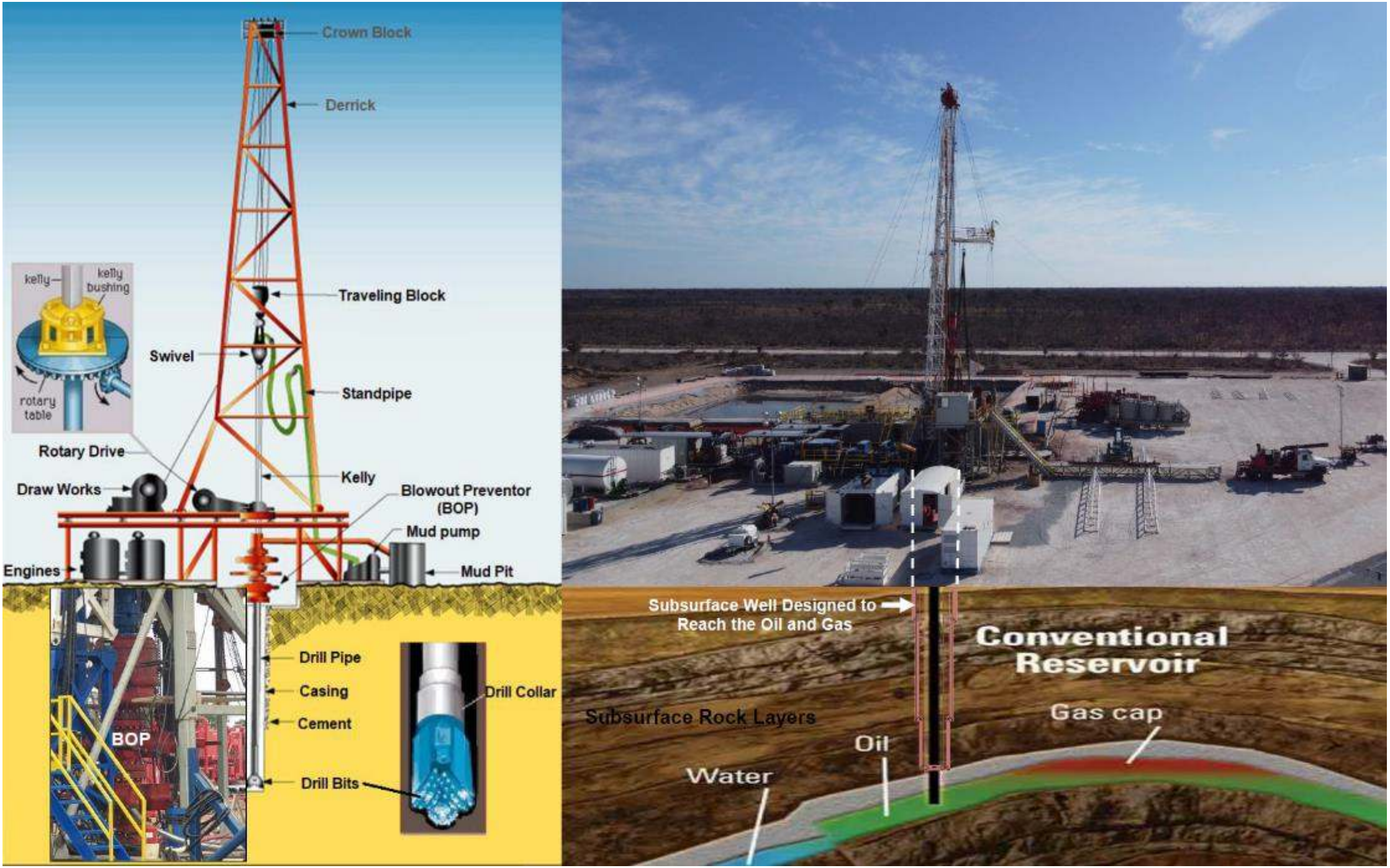


Figure 3.2: Illustration of the key components of an onshore Oil Rig (Sources: Right image modified from www.entranceconsulting.com bottom image extract and modified from www.slb.com with Photo by RBS, 2021).

Plate 3.1: The Crown 750 truck mounted drill rig used by REN to drill the stratigraphic wells and will be used to drill the proposed D1-D6 and G1-G6 exploration and appraisal wells in the AOI in PEL No. 73.

Plate 3.2: The Crown 750 truck mounted drill rig designed for light impact and mobility across desert conditions, is being used by REN to drill the stratigraphic wells and will be used to drill the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 in PEL No. 73.

3.3.3.3 Technical Summary of the Key Drilling Operational Stages

The following is the summary of the key stages that are implemented for each of the proposed exploration and appraisal wells sites drilling operations:

1. **Preconstruction and drilling requirements:**

   - Identify and confirm location, access route, sources of construction materials from nearest access point to the well locations and land ownership.
   - Survey location to accommodate drilling contractor's foot print.
   - Delineate all site obstacles including villages, water points, protected fauna, and all key sensitive components of the local reserving environmental as assessed in the EIA Report with mitigation measures provided in the EMP Report.
   - Confirm surface use consent and agreement with surface land owner/s as may be applicable.
   - Confirm that all permits, authorisations, consents, and certificates such as ECC, freshwater abstraction and wastewater discharge permits, Radioactive sources authorisation, explosive permits, Oil Spill Contingency Plan (OSCP), Emergency Response Plan (ERP) and permit to drill are in place.
   - Confirm the source of construction materials (location of the borrow pit/s) and the traditional authorities having jurisdiction over a given borrow pit area for signing of purchase agreement to mine construction materials, and.
   - Confirm water source options and method of transport. A back-up source will need to be confirmed.

2. **Construction phase:**

   - Drilling contractor construction equipment.
   - Build access road and location per approved drilling permit and environmental requirements using acceptable building materials and practices.
   - Dig and fence off reserve and water pits with sheep tight fencing or to local requirements, and.
   - Drill water supply well and complete. Have rental diesel powered generator available.

3. **Mobilisation and well spudding:**

   - Drilling contractor drilling rig with support equipment.
   - Drilling contractor living quarters and office facilities as required to support drilling personnel and up to 6 operator personnel.
   - Mobilise casing, cement and well head equipment to location.
   - Hold pre-spud meeting with all personnel.
   - Notify Reconnaissance management and government of spud date and time, and.
   - Well spudding commences.

4. Conductor Casing:

- Drill 12.25" (311.15 mm) air/rotary to a minimum of 40 meters (+/- 157'). Set and grout 10.75" Overburden Drilling (OD) conductor in place, and.
- Install diverter or rotating head system in preparation to drill to bottom of the Etjo formation.

5. Drilling surface / intermediate and setting casing and cementing process through up 900 m:

- Pick-up 9.875" (250.825 mm) air / mud / rotary surface bit with Bottom Hole Assembly (BHA) as required.
- Have mud loggers rigged up and begin logging at 500 meters.
- Drill to 900 meters (+/-2953'), catch samples every 10 meters.
- Rig-up and run 7.625 "Overburden Drilling (OD) casing to within 3 meters (+/- 10') of bottom.
- Cement casing per agreed to specifications.
- After waiting on cement for 6 hrs, cut-off casing and install 3000 Pounds per square inch (PSI) wellhead, and.
- Test well head to 100 BAR (1500 PSI).

6. Drilling and continuous Coring from 900 meters (2953') to 1900 m (6234'):

- Install Blow-Out Preventer (BOP) and test to 207 Bar (3000 PSI).
- Test casing 70% of manufactures rating or 100 bar, whichever is lower.
- Pick-up 171.45 mm (6.75") clean out bit. Drill out cement and 3m new hole.
- Pull Out of Hole (POOH) lay down tools. Strap or count drill pipe on way out of hole to confirm depth.
- Pick-up coring tools with core bit to cut minimum 63.50 m (2.5") core and Run In Hole (RIH).
- Begin coring from 903 meters to +/- 1900 meters.
- Core and retrieve cores as required. Retrieval and storage will be determined by geologist on site. A written procedure will be furnished before coring begins. Catch samples every 3 meters.
- Make wiper or reaming trips as required by hole conditions.
- Pull Out of Hole (POOH), deploy coring tools in preparation to run wire line logs.
- Log per attached logging procedure.
- Rig-up and run 114.3m (4.5") Overburden Drilling (OD) casing.
- Cement casing to agreed specifications.
- Waiting on cement (WOC) 6 hours, and.

- Land casing and pack-off as required. Test pack-off to 207 bar (3000 PSI).

7. Drilling below 1900 meters to Total Depth (TD) of +/- 2800m (+/-8202'):

- Pick-up 98.425m (3.875") bit and required Bottom Hole Assembly (BHA).
- Run In Hole (RIH) to top of cement.
- Drill ahead from 1900 meters to 2500 meters. Catch samples every 3 m.
- Circulate samples per geologist's instructions.
- Be prepared to trip for core as required. If additional coring is required, do so per on-site geologist's instructions otherwise continue per above.
- At Total Depth (TD), circulate samples, and.
- Pull Out of Hole (POOH) to run wire line logs according to the logging procedure.

8. Well Test / Plug and Abandon Hole:

- If commercial discovery, run well tests.
- Run In Hole (RIH) open ended to plug and abandonment operations (P&A) hole per attached program.
- Pull Out of Hole (POOH) setting cement plugs per regulatory requirements.
- Cut-off well head. Install dry hole marker per local requirements.
- Back fill cellar and reclaim location as required by surface use agreement or permit requirements, and.
- Rig Down Move Out (RDMO) location.

9. Rehabilitate all surface disturbances and clear the site of any debris.

10. Camp removal, site closure / abandonment / renter as may be required.

3.3.3.4 Possible Test to be Conducted During Drilling Operations

As part of the proposed drilling operations for each of the proposed key priority wells, the following test may be conducted subject to favourable well profiles conditions that may be encountered:

(i) Drill Stem Testing (DST) in open hole during drilling phase covering the following produce:

- ❖ After drilling thru prospective test zone and open hole wireline evaluation is complete, pick-up DST tools with dual packers, tester and circulating valve and downhole gauge bundle. Run In Hole (RIH) with drill pipe. (Run water cushion dictated by estimated reservoir pressure).
- ❖ Isolate prospective zone, correlating depth with wireline. Set packers, install dual master test tree at rig floor (bottom master valve should be pneumatic actuated). Tie flowline into test manifold and well test equipment. Test flow line and manifold to 5 bar. Open tester valve. Monitor pressure at manifold, let surface well pressure stabilize.
- ❖ Flow well on small choke through test manifold and test equipment. Gradually increase flow rate as dictated by well conditions.

- ❖ Fluids will flow into storage tanks and gas will be diverted through flare stack and burned.

- ❖ Flow test zone as may be required between 10-30 days.

- ❖ After test, well would be killed by circulating kill weight fluid through circulating valve in test string and displacing gas from test string on backpressure schedule. When pressure is 0 psi and well is static, packers would be released, and DST tools and bottomhole assembly (BHA) pulled out of hole and laid down, and.

- ❖ Well would resume drilling or be prepared to run and cement casing.

(ii) DST in cased hole, after well is drilled, cased and cemented and will cover the following procedures:

- ❖ Pick up Tubing-Conveyed Perforating (TCP) guns and DST tools consisting of retrievable packer, activated tester and circulating valve and BHP gauge bundle. RIH with work string. Water cushion to be determined by test zone reservoir pressure.

- ❖ Set TCP guns correlative to zone of interest, correlating depth with Gamma Ray (GR)-wireline. Space out for DST packer and TCP guns. ND Blowout Preventer (BOP's). NU test tree in cellar. Set DST packer. Land tree. Test tree to 5 MPa. Tie in flowline and test manifold. Test same to 5 MPa.

- ❖ Detonate TCP guns to perforate zone. Monitor surface pressure on test manifold.

- ❖ Flow well on small choke through test manifold and test equipment. Gradually increase flow rate as dictated by well conditions.

- ❖ Fluids will flow into storage tanks and gas will be diverted through flare stack and burned.

- ❖ Flow test zone as may be required between 10-30 days.

- ❖ After test, well would be killed by reverse circulating kill weight fluid through circulating valve in test string and displacing gas from test string on backpressure schedule. When pressure is 0 psi and well is static, packer would be released, and DST tools, TCP guns and BHA pulled out of hole and laid down, and.

- ❖ Well should be tested and appraised per procedure.

(iii) Other general tests that may be considered or routinely undertaken include the following:

- ❖ Sample collect / sampling at appropriate depths.

- ❖ Logging operations.

- ❖ Modular Formation Dynamics (MDT) wireline formation testing which is a mini-drillstem test aimed at providing fast and accurate measurements of formation pressure and both the vertical and horizontal permeability of the formations near the wellbore. It also allows for the collection of high-quality formation fluid samples.

- ❖ Formation evaluation test that may allow fluids in the formation being evaluated to flow into the drill stem and to the surface. Pressure-recording devices tool measure and record pressure in the well while it is both flowing and not flowing (shut in), and.

- ❖ Other tests as may be agreed with / requested by the Partners and / or MME.

3.3.4 Engineered Drilling Site Layout and Construction

A standard single well site for conventional onshore oil or gas drilling similar to the proposed exploration and appraisal wells sites in PEL No. 73, will typically affect a surface area measuring around 3Ha, a size of a typical homestead or subsistence agricultural field in rural Namibia (Figs. 3.3 and 3.4 and Plate 3.3). The well site will typically hold the drilling rig and additional equipment along with supervisory accommodation and material storage (Figs. 3.3 and 3.4 and Plate 3.3). A grader is used to upgrade and level the existing tracks to accommodate for the transportation of heavy truck-mounted drill rig as well as other supply truck that will support the proposed drilling operations. The construction of all the access and site supporting infrastructures such as the reserve pit follows strict engineered designs and engineering requirements managed by qualified and experienced specialist teams, engineers and contractors (Figs. 3.5-3.9).

A bulldozer and a grader combined with labour-based manpower where it exists, has been used to create new access roads to the drilling localities and around the actual drilling sites of Well Nos. 6-1 and 6-2 and the same approach will be used for the other wells to be drilled in PEL No. 73. Careful consideration will be given to the sensitivities of the local receiving environment including: Not cutting down of larger trees and protected flora as well as being on a look out for possible unexploded ordinances that may be buried. The scale and duration of site preparation is site-specific and may last for few hours to a couple of days, weeks or months. Once drilling is completed, the affected area will be reclaimed to minimise surface disturbance or transformed into a local central community support area such as a community centre supported by a reforestation, garden and nursery projects or a multipurpose crush pen in support of the local farmers due to the presence of a water supply borehole. To prepare for the drilling operations, the existing access road will be upgraded and vegetation around the proposed well sites will be selectively cleared by preserving protected species and big trees and shrubs that do not need to be removed (Figs. 3.3-3.5 and Plate 3.3).

3.3.5 Guiding Principles on Borrow Pits

Construction materials will be required for the proposed D1-D6 and G1-G6 exploration and appraisal well sites and the supporting infrastructure areas such as access roads. REN will not be operating its own owned borrow pit/s because all the existing or new borrow pits within AOI in Kavango East and West Regions, belong to the relevant traditional authority having jurisdiction over a given borrow pit area. All the required construction materials will be purchased from the relevant traditional authority through a purchase agreement to be signed between the construction contractor and the relevant traditional authority before construction materials can be obtained from any given borrow pit. The following is the summary of the key issues / guiding principles that shall be considered during the selection, operation, rehabilitation and restoration of a borrow pits area as authorised by the relevant traditional authority:

(i) Avoid working on borrow pit allocated areas that may results in conflict with the local community due to the site sensitivity or proximity to sensitive environmental resources such as villages, grave yard, or communal fields.

(ii) Management of surface water management, including erosion and sediment control, and airborne dust, and avoid areas which might affect groundwater levels where borrow pits intersect the water table

(iii) Avoid areas with mature and protected tress when clearing the vegetation and avoid creation of voids and unstable/steep landforms that may be unsafe for livestock or wildlife

(iv) Consider challenges and opportunities to the local site rehabilitation and restoration as well as revegetation establishment including post-rehabilitation livestock, fauna and feral animal access to the area often used as a water point source, and.

(v) The detailed rehabilitation management plan shall be prepared and shall include measures that are intended to achieve the nominated final use and landform for each site, such that they shall be with shall slopes, safe, stable, self-sustaining, non-polluting, and free-draining.

Figure 3.3: Example of a typical 3Ha footprint site coverage showing a general drilling site layout adopted for the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73.

Figure 3.4: Layout example of a typical 3Ha footprint created by an onshore drilling well site coverage superimposed on an actual drilling location and as adopted for the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73 (Drawn not to scale).

Plate 3.3: Example of an oil and gas well site layout showing a drone view of the 8-2 Makandina well site in Kavango East Region.

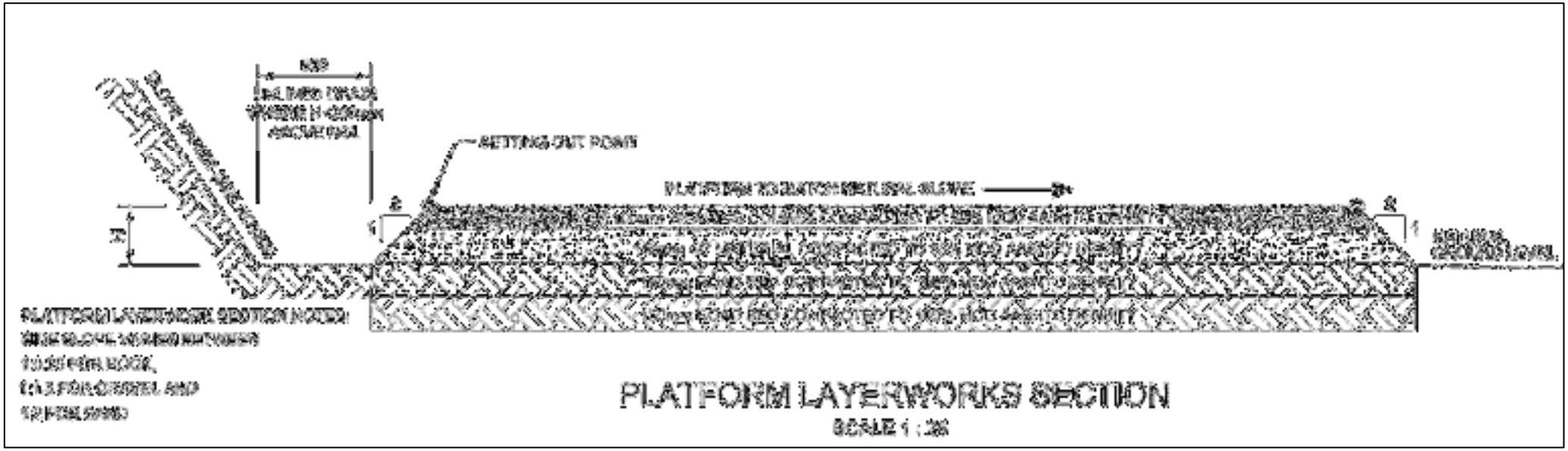


Figure 3.5: Rig platform drilling site engineering design example (Source: Preliminary Drawings by Burmeister & Partners for REN, 2022).

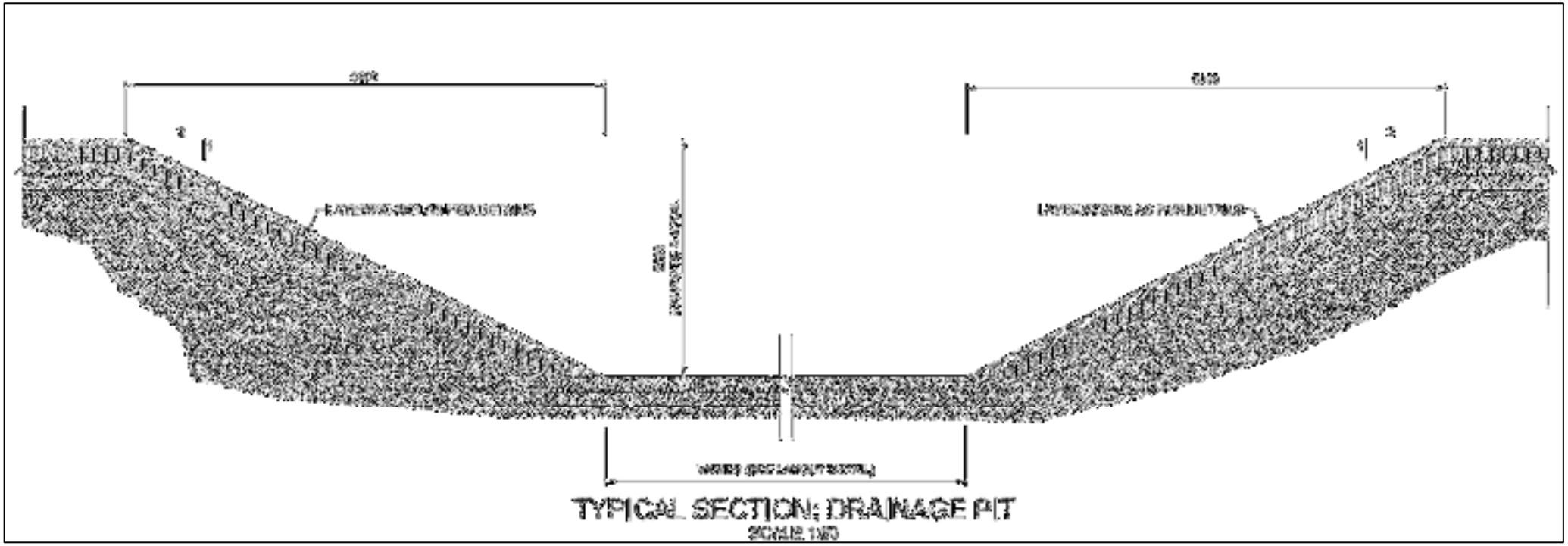


Figure 3.6: Drainage / reserve pit site engineering design example (Source: Preliminary Drawings by Burmeister & Partners for REN, 2022).

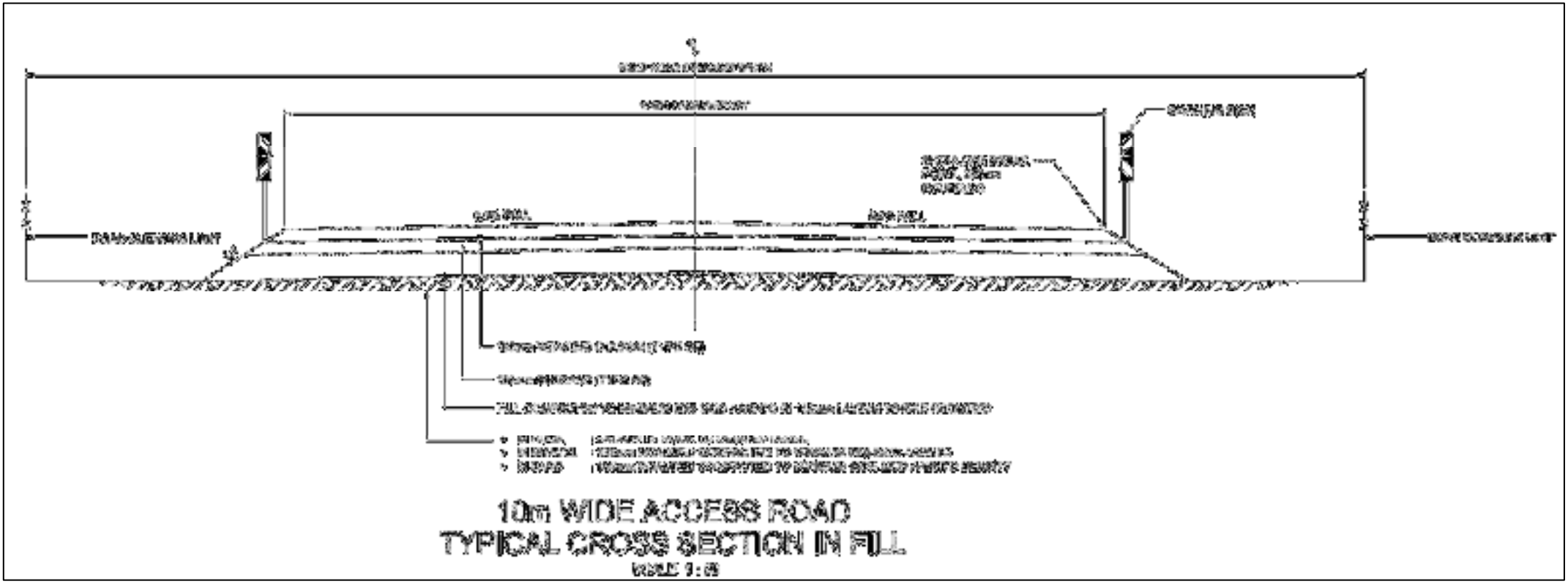


Figure 3.7: Access Road design fill drilling site engineering example (Source: Preliminary Drawings by Burmeister & Partners for REN, 2022).

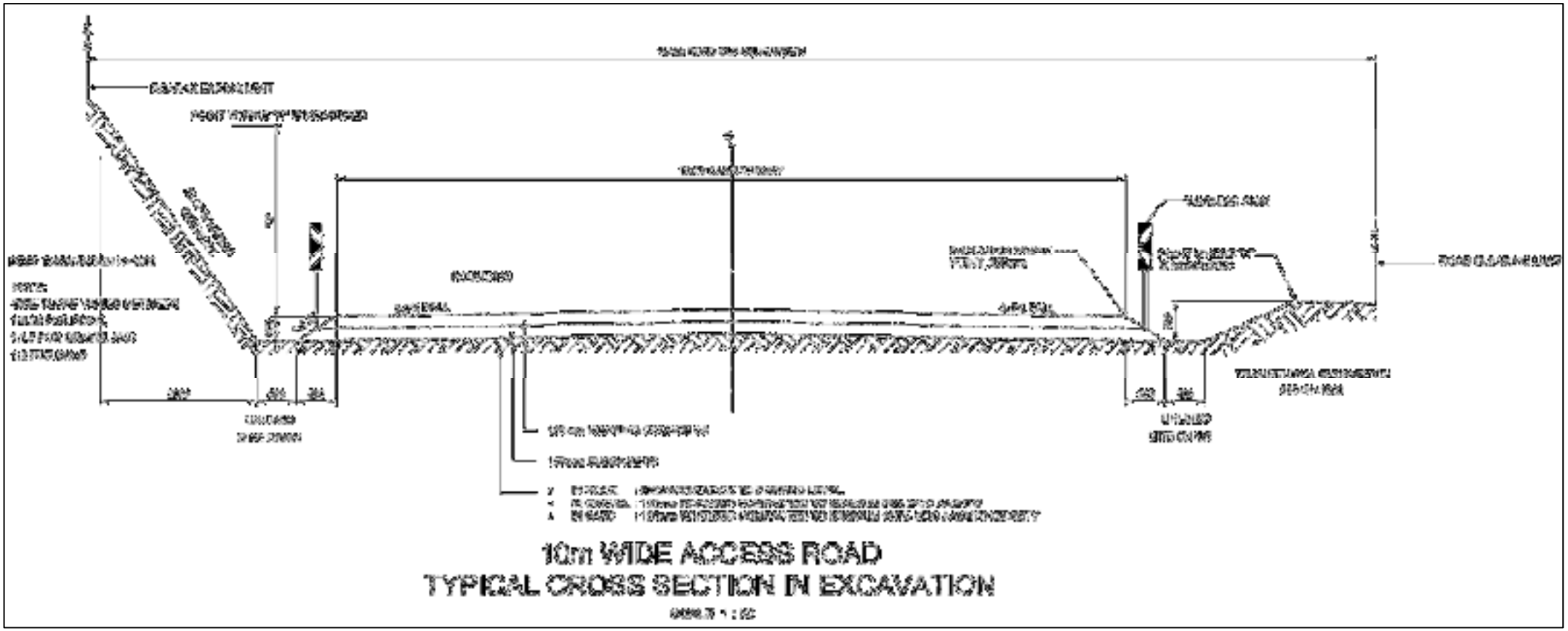


Figure 3.8: Access Road design excavation drilling site engineering example (Source: Preliminary Drawings by Burmeister & Partners for REN, 2022).

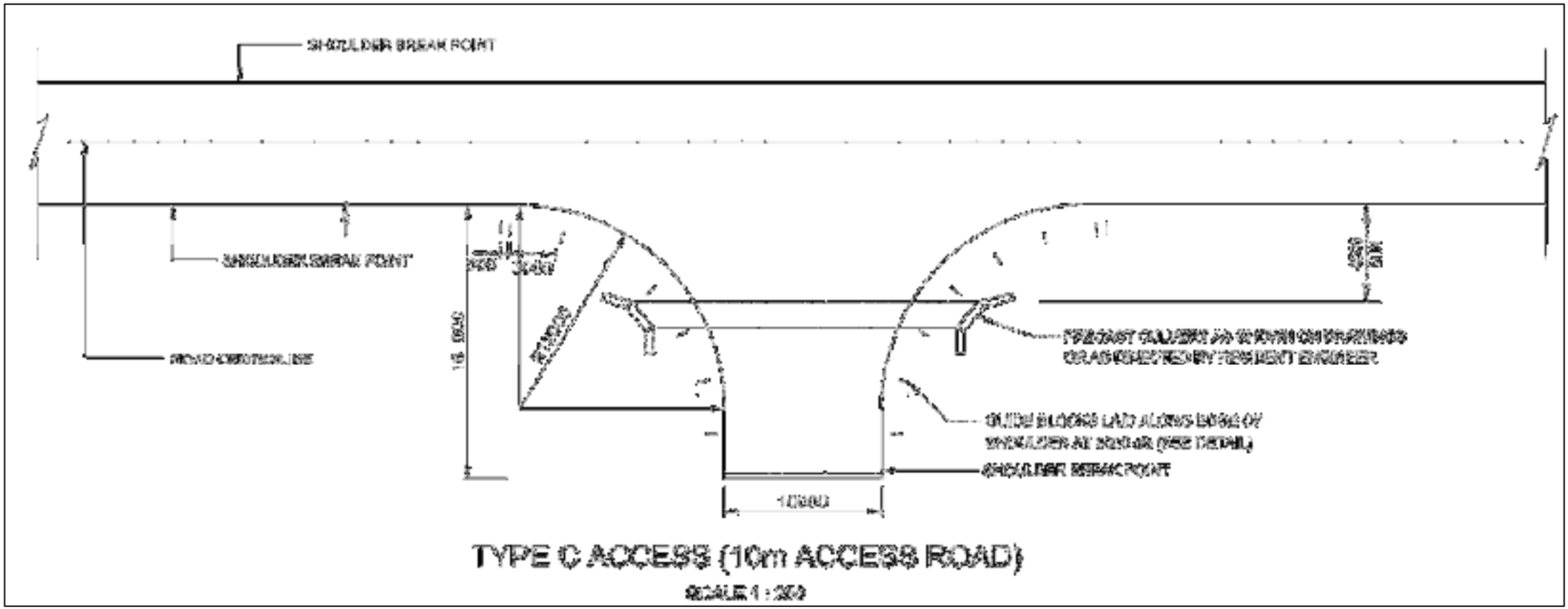


Figure 3.9: Type C access road design drilling site engineering example (Source: Preliminary Drawings by Burmeister & Partners for REN, 2022).

3.3.6 Oil Gas Well Drilling Fluid Systems

Drilling mud, also called drilling fluid, in petroleum engineering, a heavy, viscous fluid mixture that is used in oil and gas drilling operations to carry rock cuttings to the surface and also to lubricate and cool the drill bit (Fig. 3.2). Drilling fluid systems generally fall into the following three (3) categories:

(i) Water-based muds.

(ii) Oil-based muds, and.

(iii) Air drilling fluids, such as mist, foams, and stiff foams, used in only very specific, limited applications.

REN has chosen to use the latest, and most effective water-based drilling fluids for the proposed drilling operations. The company will be using the engineered organic and biodegradable water-based drilling fluid system that minimises environmental impacts.

This Polyamine/ Polymer/ partially-hydrolyzed polyacrylamide (PHPA) system uses freshwater as the base fluid. PHPA mud is a class of water muds that use partially-hydrolyzed polyacrylamide (PHPA) as a functional additive, either to control wellbore shales or to extend bentonite clay in a low-solids mud. As a shale-control mud, PHPA is believed to seal microfractures and coat shale surfaces with a film that retards dispersion and disintegration (Clark *et al*., 1976 and Fraser, 1987).

Potassium Chloride (KCl) is used as a shale inhibitor in most PHPA mud designs. In low-solids muds, PHPA interacts with minimal concentrations of bentonite to link particles together and improve rheology without increased colloidal solids loading. The following is the summary of the primary and secondary products descriptions:

(i) Primary product descriptions:

- Barite: Barium Sulphate is a high specific gravity mineral used to increase the weight of drilling fluids.
- Bentonite (Gel): Bentonite is used to increase the rheology of drilling fluids to help with hole cleaning and development of filter cakes.
- Caustic Soda: Sodium Hydroxide is used when it is necessary to increase the pH of the mud system.
- PHPA: Partially Hydrolyzed Polyacrylamide is used to enhance bentonite and encapsulate solids as well as provide viscosity to sweeps
- PAC LV: Polyanionic Cellulose is used to control fluid loss.
- GEL PA-D: This is the Fully Organic and Biodegradable Polyol inhibition product that will stabilize any reactive clays that would normally destabilize when introduced to water.
- Soda Ash: Sodium Carbonate is used to control hardness found in make-up water, and.
- XCD: Xanthan Gum is a high molecular weight bio polysaccharide.

(ii) Secondary product descriptions:

- Calcium Carbonate: Specifically, sized acid soluble Lost Circulation Material.
- Broad spectrum biocide used to control bacteria growth within stored water-based mud drilling fluids.

- Crushed walnut hulls that are used for clearing the bit of clays and Lost Circulation Material.
- Citric Acid: is used to control the pH of muds.
- Magma Fiber: specially formulated extrusion spun mineral fiber Lost Circulation Material that is acid soluble.
- Mica: sized grades of Muscovite Mica for Lost Circulation.
- Zinc Carbonate: H_2S scavenger for water base muds to protect tubular goods from corrosion.

The plant-based products added to the base fluid are created through organic processes and are biodegradable. The adopted water-based system is tested, proven safe, and environmentally sound. The system is approved for use by the most stringent regulatory regimes for projects around the world, from national oil companies to private operators. It is also the most expensive system to implement.

The drilling fluid system includes three main components: the drilling fluid system, the circulating/cleaning system, and the reserve pits (Fig. 3.10 and Plate 3.3). The circulating system is part of the Crown 750 conventional drilling rig that is being used by REN in exploratory drilling operations. The system includes the drilling fluid pumps, distribution lines, separators and solids control. To further enhance safety, REN augmented the original two mud pumps on the rig with a third, more powerful pump.

The reserve pit is adjacent to the drilling rig and, along with storage tanks, is where the excess fluids and cuttings are managed (Fig. 3.10 and Plate 3.3). Like most oil and gas wells, the rocks being drilled through for the three exploratory wells are environmentally benign (unlike mining operations) and any fluids encountered while drilling stay in the formation due to the equivalent circulating density of the drilling fluid system.

The cuttings from the well are also being captured and bagged, with half of the cuttings set aside for the Namibian Government for future study. REN is having the cuttings analysed by international and national-based environmentally focused laboratories.

An organic gel/clay barrier at the pit base prevents seepage into groundwater and soils (Fig. 3.10). This approach is better than polyurethane pit linings, which are easy to install but challenging to remove during reclamation, which can lead to shredding and leaks.

REN always has a full-time expert on-site, testing the reserve pit fluid properties on a regular basis. There are also experienced geologists on-site examining the cuttings every 3 metres to understand the formations that are being penetrated, to measure and monitor their properties. As expected, there has been no flows or losses of fluid into the ground from the pits at previous drilled well sites 6-1 (Kawe), 6-2 (Mbambi) and 8-2 Makandina wells.

Any remaining drilling fluid and cuttings will initially be used to fertilise soils around tested portions of the drilling site with the intention of then supplying this topsoil enhancement to the nearby farmers. REN is currently working with the local agricultural authorities to test this process. The drilling fluid products are organic and biodegradable, promoting nitrogen levels which are an essential nutrient for plant, crop, and grass growth.

Fluid system:

- Water-Based – the best approach to protect the environment
- This Polyamine/ Polymer/PHPA system uses freshwater as the base fluid
- Plant-based products added to base fluid are organic and biodegradable

Circulating System

- Part of our Crown 750 drilling rig
- Includes pumps, distribution lines, separators and solids control
- To further enhance safety, third more powerful pump added

Reserve Pit

- Where excess fluids and cuttings are managed (along with storage tanks)
- Rocks being drilled are benign and any fluids encountered stay in ground
- Cuttings also being captured and bagged for analysis

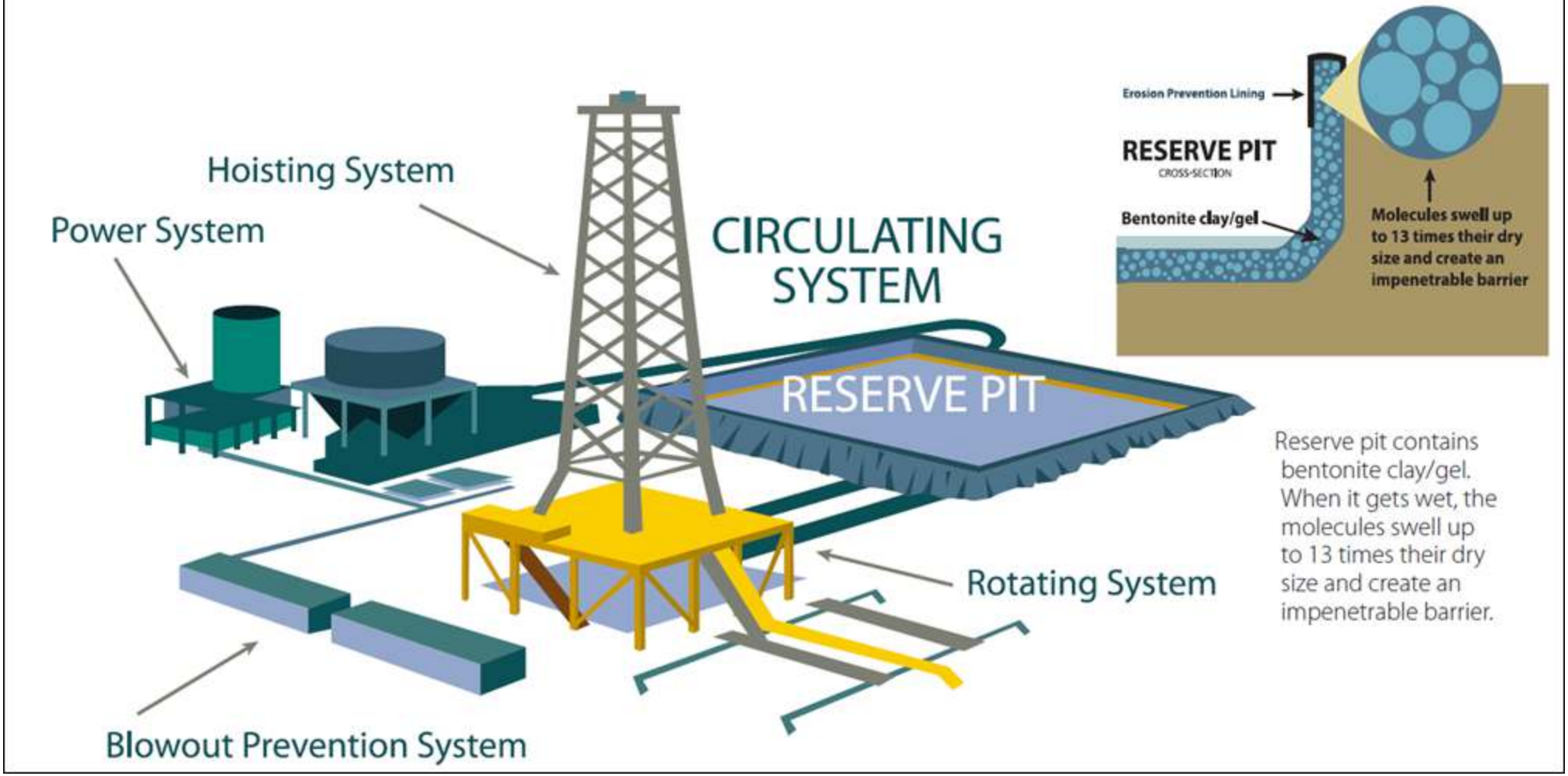


Figure 3.10: Illustration of the well site layout to be adopted for each well showing all the key engineered components that will be used to control well pressures and protect the receiving environment including surface and ground water resources (Source: REN, 2021).

3.3.7 Proposed Wells Engineered Design and Permitting

3.3.7.1 Basis for Well Design

The design of oil and gas wells, including the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 will be undertaken in line with international standards and regulatory requirements of the MME, the Competent Authority (Fig. 3.11).

Prior to the implementation of each of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6, the Basis for Well design documents must be approved by the Ministry of Mines and Energy together with the supporting documents such as the Emergency Response Plan (ERP) and Oil Spill Contingency Plan (OSCP) complimented by a rig inspection. Well design addresses engineered well design requirements followed by well construction details in delivering the functional requirements to be achieved during the drilling process.

The well design specification as presented in Figs. 3.11 and 3.12, includes: Target formation(s) and geological prognosis, subsurface target location(s) and tolerances, fluid pressure and formation strength prognoses, logging, coring, and sampling.

The drilling program focuses on the planned hole and casing sizes, and setting depths, required drilling mud properties (weight, viscosity, etc.), planned well trajectory and directional drilling requirements, cement recipes and job specifications (rate, volume, etc.) and hole cleaning requirements prior to completion (Table 3.1).

The completion program addresses the final stages of the operations and covers the specification design for lower and upper completions, material specification for all completion components and procedures to be adopted.

3.3.7.2 Mud Logging Program, Sampling and Analysis

The mud logging program will focus on the following:

- 24 hour/day geological monitoring and evaluation at the wellsite with real-time and archival data presentation and distribution. Computer-plotted multiscale.
- Presentations compiling Rate of penetration (ROP), depth, lithology, oil, total hydrocarbon gas detection, Flame ionization detection (FID) gas chromatography, Carbon Dioxide (CO_2) and Hydrogen Sulphide (H_2S) Monitoring, complete lithology, and oil show descriptions.
- Drilling rig instrumentation data monitored, recorded, and presented (from Pason). All data available in LAS, ASCII, WITS and graphics (PDF, etc.) files on local network, internet (where connected), disk, e-mail, and.
- The Iso Tube Gas Sampling System will be used to capture and preserve gas samples. This rigid structure is far stronger than gas bags and less susceptible to leakage. Long-term testing shows virtually no chemical or isotopic degradation of gases stored for >3 years.

A wireline sidewall coring tool will be available to take samples from sites identified by wireline logging. The following core analysis will be performed:

- Palynology.
- Organic geochemistry.
- Standard core analysis (porosity, permeability, etc.).
- Rock physics, and.
- Special core analysis (if merited).

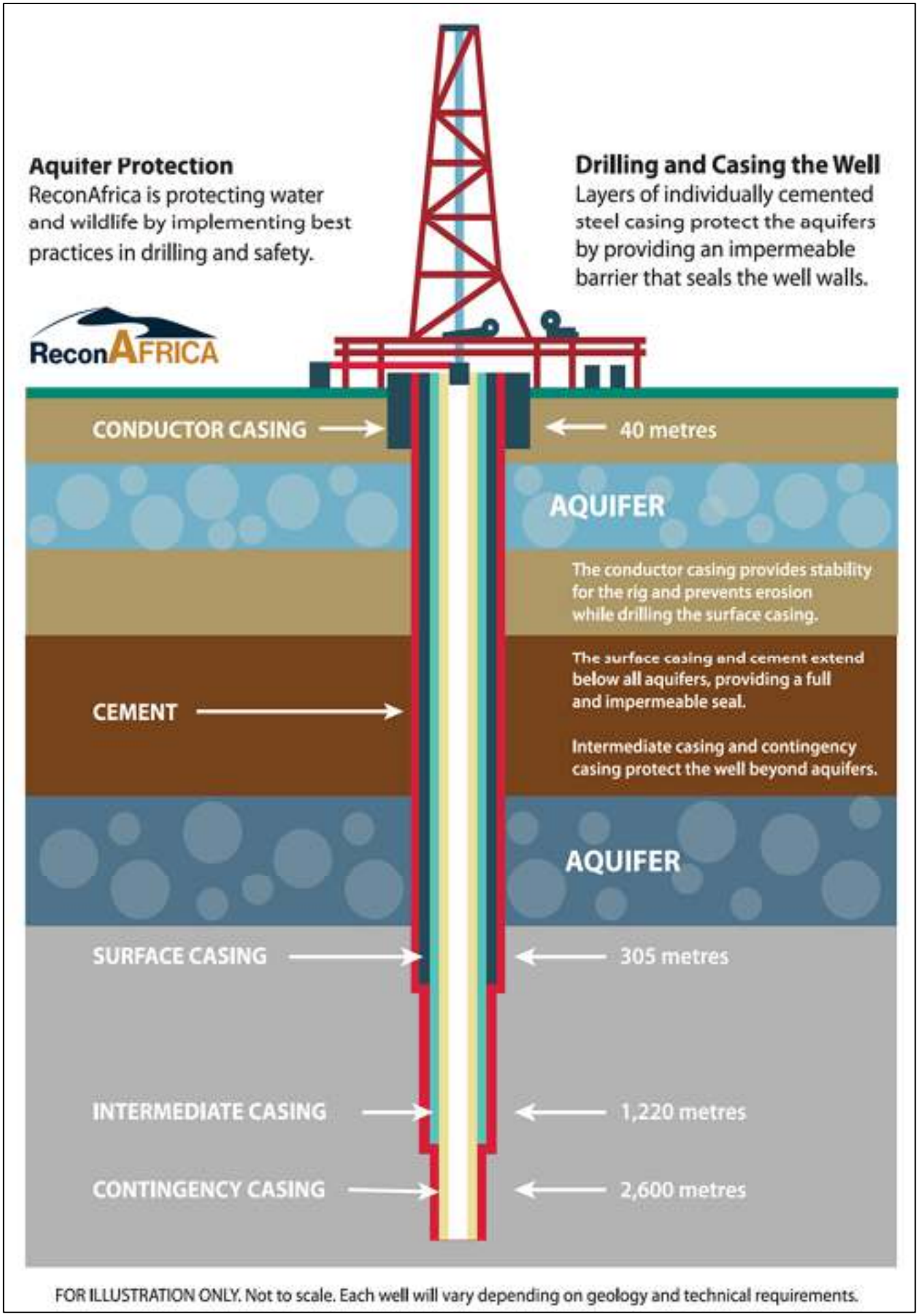


Figure 3.11: Illustration of the well design and engineering barriers that will fully isolate and protect groundwater resources with respect to the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 (Source REN, 2022).

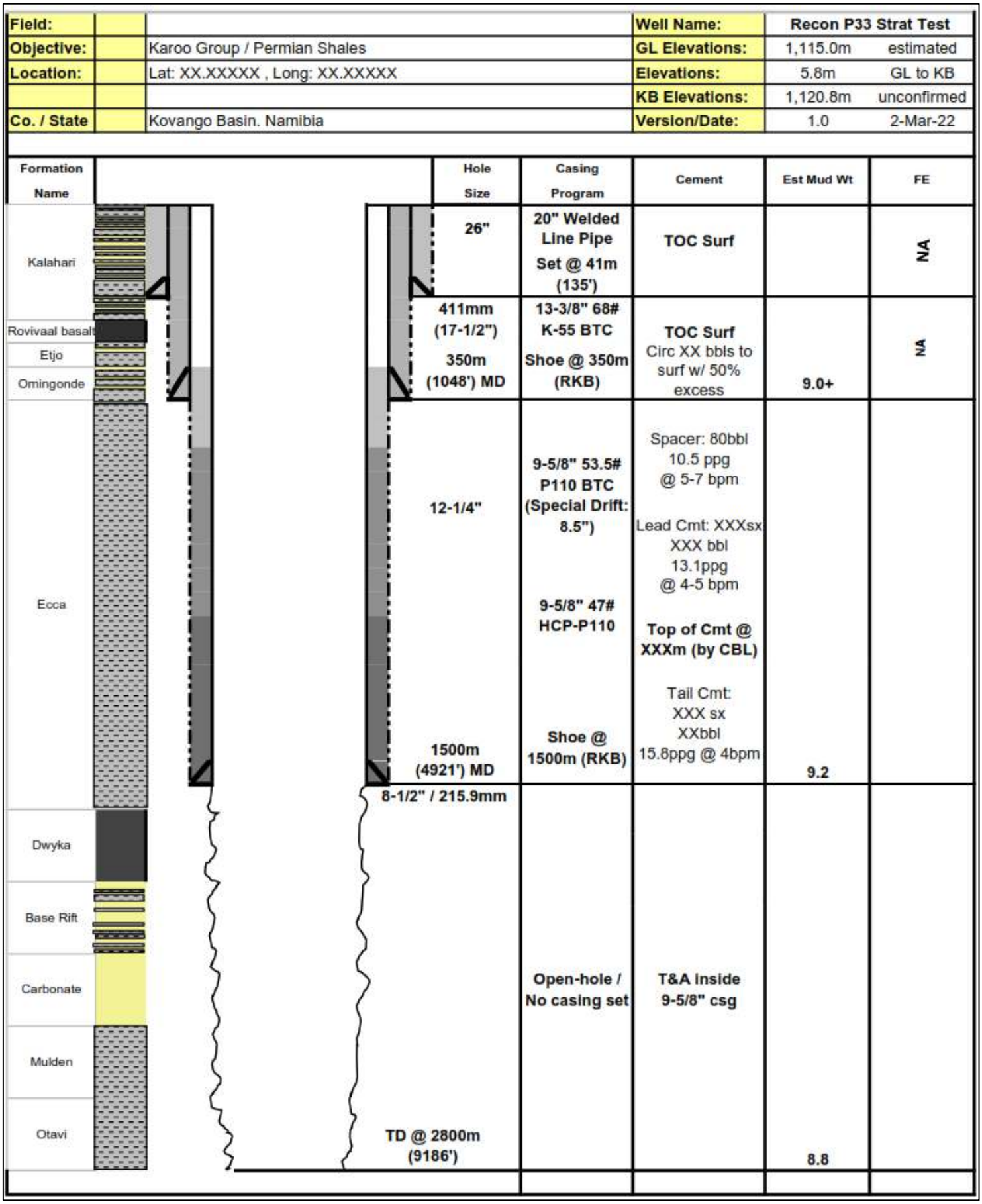


Figure 3.12: Example of Basis for well design wellbore schematic (Source REN, 2021).

Table 3.1: Casing and mud information.

Casing String	Hole Size	Casing O.D.	Depth (ft)	Mud Type	Max. MW, ppg
Conductor	26”	20”	130		
Surface	17-1/2”	13-3/8”	1,000	Hi-Viscosity	9.1
Intermediate	12-1/4”	9-5/8”	4,800	KCL/Polymer	9.1
Liner	8-1/2”	7-5/8”	8,500	KCL/Polymer/PHPA	9.5
Production	6-1/2”	4-1/2”	12,500	KCL/Polymer/PHPA	10.0

3.3.7.3 Expected Final Status

Well testing may be conducted to determine whether a formation will produce, or continue to produce, hydrocarbons at a rate that gives a reasonable return on the investments. Operators also use test data to determine the limits of the reservoir and to plan the most efficient methods for producing wells and operating the discovered fields. Well testing may be undertaken subject to the status of potential commerciality for each individual well to be drilled in PEL 73.

3.3.7.4 Permitting and Approval of the Basis for Well Design

Permitting and approval of the basis for well design is regulated by MME under the Petroleum (Exploration and Production) Act, 1991 (Act 2 of 1991). Before a well can be drilled, a permit to drill is granted by the Petroleum Commissioner based on the submission of the basis for well design together with all the supporting documents.

The Proponent is required to submit to MME a Pre-Drill Data Package (PDDP) including basis for well design, well data, diagrams / documents in line with the international well design and operations management, control, and barrier standards as well as casing and tubing design procedures for each well to be drilled.

Other supporting documents including: Copy of the Environmental Clearance Certificate (ECC), Environmental Impact Assessment (EIA) Report, Environmental Management Plan (EMP) Report, Oil Spill Contingency Planning (OSCP) and Emergence Response Plan (ERP) must also be submitted for review and approval as may be applicable.

Rig inspection is often undertaken before the implementation of the drilling operations following the granting of the permit to drill. Drilling progress as well as well testing, abandonment, and drilling completion must be monitored and reported to the Petroleum Commissioner on the daily / weekly/ monthly basis or as may be applicable and provided for in the Petroleum Agreement.

A drilling Health, Safety and Environment (HSE) monitoring closure report shall be prepared and submitted to MME and MEFT at the end of the drilling operations for each well approved for drilling.

3.3.8 Waste Management

3.3.8.1 Municipal Related Solid Waste Management

REN has hired a Rundu-based solid waste management contractor, Rent-A-Drum (RaD) to provide solid and liquid waste management support to the drilling of the proposed exploration and appraisal wells sites.

RaD is a well experienced and resourced company which is responsible for collection of all the solid waste from the drilling site (Plates 3.4 and 3.5). Onsite solid waste collection facilities and storage/ transfer areas are provided (Plates 3.6 and 3.7).

RaD has a good Health and Safety system and Emergency Response in place and the company tracks every man hour and every trip and every waste load including the safety of the vehicles. The waste collected from the drilling sites is sorted at RaD enclosed storage yard in Rundu (Plates 3.4 and 3.5).

Plastics, cans, and paper are sorted, bailed and sent out to Windhoek (Plate 3.5). The contractor does keep records of all waste removed from the current stratigraphic well drilling sites and the similar waste management strategies will be applied for the proposed exploration and appraisal wells sites.

3.3.8.2 Hazardous Waste Management

RaD will also collects hazardous waste from the proposed exploration and appraisal wells sites. Hazardous waste such as used oil and grease will be collected and sent out to Tsumeb (±350 km West of Rundu) and used for various purposes for fuels or maintenance purposes especially in the minerals processing processes such as the smelter or cement plants.

Unfortunately, the Town Council of Rundu operates more than 1 dumpsite with illegal dumping of solid waste common around the townlands. The Rundu Town Council waste solid waste disposal site is not a legally registered solid waste facility that can accept all types of solid wastes including hazardous waste. The site is poorly managed to accept any form of hazardous waste from the ongoing oil and gas drilling operations.

This solid waste disposal site will require some site upgrades to be able to receive hazardous solid waste from the ongoing oil and gas drilling operations in PEL 73.

3.3.8.3 Liquid Waste Management

Waste water management (sewage) is using a combination of an onsite mobile French Drain and chemical toilets as may be applicable (Plate 3.8). RaD does provide sewage waste management support to REN drilling sites.

Collected sewage waste will be transported to Ndama Sewage works in Rundu managed by the Town Council. The contractor shall keep and track records of how much waste water (sewage) is being removed from each individual drilling sites.

Plate 3.4: Rent-A-Drum waste management facility in Rundu (Marvin, 2021).

Plate 3.5: Processed solid waste at the Rent-A-Drum facility in Rundu and ready for transfer to Windhoek (Marvin, 2021).

Plate 3.6: Example of the onsite solid waste management facilities to be provided and implemented for each of the proposed drilling locations (Source: RBS Monitoring Team, 2022).

Plate 3.7: Example of the onsite solid waste management transfer station to be provided and implemented for each of the proposed drilling locations.

Plate 3.8: Example of the onsite liquid waste management facilities and transfer support to be provided and implemented for each of the proposed drilling locations.

3.3.9 Vibration, Noise, Dust and Associated Emissions

Environmental emission sources of vibrations, noise, dust, and associated emissions that may be associated with the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 can be classified into point sources. The point sources identified are:

- Emission from drilling rig.
- Emission from other diesel engines / generator sets, and.
- Emission from vehicle movement.

All the equipment will be operational 24 hours a day. The drilling rig and associated machinery are likely to emit noise levels in the ranges of 60-65 db (A). All the proposed wells sites will be drilled at more than 500 m from the nearest settlement / sensitive receptors, and this will reduce the likely noise impacts on the local receiving environment. Noise from machinery in addition to drilling noise will also be generated from heavy machinery. However, such emission will get dispersed with increasing distance away from the source of the noise. When a mechanical rig is in operation at its maximum efficiency, the drilling platform (derrick) can be assumed as the location of the hypothetical source of noise at the drill site where maximum noise levels can be generated. Noise levels recorded in various directions at distance 50 m can be used for estimation of magnitude of the average noise equivalent source. Noise level due to such a source works out to be at 44 dBA at a distance of 1 km.

As environmental attenuation, particularly due to air absorption and crops/grass/shrubs cannot be neglected, and the levels will work out to be less by 7 to 10 dBA depending on the nature of vegetation, relative humidity, and frequency of the noise. Therefore, average noise levels at about 1 km from the drilling rigs would be around 37-44 dBA. The overall background noise levels would increase by 2-3 dBA and 1-2 dBA during day and night time, respectively, due to drilling operations.

As per World Health Organisation (WHO) recommendations, there is no identified risk in damage of hearing due to noise levels less than 75 dBA (Leq 8 hrs). Most of the international damage risk criteria for hearing loss permit (Leq12 hrs) up to 87 dBA.

Additional World Health Organisation (WHO) recommendations for community noise annoyance, permits day time outdoor noise levels of 55 dBA Leq, and night time outdoor noise level of 45 dBA Leq to meet steep criteria i.e. Leq (24 hrs) = 52.2 dBA and Ldn = 55 dBA. Except for the drilling platform, continuous attendance of workers at the drilling locations is not required. Hence, the noise levels only at the drilling platform are of concern for occupational consideration.

Other potential emissions are likely to be from the generators consisting mainly of NOx, CO_2 and PM. The concentration of SO_2 in the emitted gas will depend on the fuel source. Since diesel contains little sulphur, using diesel as fuel will lead to low SO_2 emissions.

Dust is likely to be generated especially during the dry season from April-November around the drilling as well as along the main gravel roads to the drilling sites and minor site access roads. Good site management practices and management of vehicles speed limits are among the key mitigation considerations that have been evaluated in the EIA Report.

3.4 Oil Spill Preparedness and Overall Emergency Response Plan

3.4.1 Regulatory Requirements

In accordance with the provisions of the Petroleum Agreement signed between REN and the State represented by MME, the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), and the Petroleum Laws Amendment Act, 1998, (Act 24 of 1998), the Environmental Management Act, 2007, (Act No. 7 of 2007) and all other applicable Regulations, REN is required to prepare an Oil Spill Contingency Plan (OSCP) and Emergency Response Plan (ERP) documents to be approved by MME and in support of the application for permits to drill each of the proposed oil and gas wells. The OSCP provide for management of hydrocarbon spills arising from each of the proposed well drilling activities

and from a single drilling rig within the AOI in PEL No. 73. The OSCP provide for other potential oil spills associated with the other operational areas and logistic linkages such as a fuelling tanker truck overturning between Rundu and the drilling location. The ERP document linked to the project specific bridging documentations provide for a comprehensive emergency response plan covering all the operational levels and linkages of the proposed project operations.

3.4.2 Oil Spill Contingency Plan (OSCP)

3.4.2.1 Scope and Purpose of the OSCP

The OSCP document establishes and defines information, strategies, procedures, and the structure for responding to emergencies involving oil spills, with the purpose to stop or minimise any accidental discharge of hydrocarbons, and to mitigate negative effects. The OSCP is applicable to any oil spill scenarios involving Reconnaissance Energy Namibia and its contractors, including the drilling rig, and all other companies working on the Kavango Basin onshore drilling campaign in Namibia.

Oil spill prevention is built on well engineering and well primary and secondary control measures. Primary well control measures such as hydrostatic pressure and secondary measures such as the use of Blow-Out Preventers (BOPs) include several preventative dual barriers between the well and the external environment to avoid a loss of well control, with several elements included to ensure a robust series of primary and secondary barriers. Tertiary well control is applied in the highly unlikely situation in which all primary and secondary barriers fail sequentially.

3.4.2.2 Well Assurance

REN will implement a series of strict internal and external well engineering and construction assurance mechanisms. A basis of well design will be prepared and approved by MME prior to the spudding of each of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 as part of the well assurance requirements. Well assurance includes the technical well design, which is engineered to the highest industry standards and verified by an independent external expert well examiner. The well is designed to substantially exceed the maximum anticipated formation pressures which could be expected to be encountered. In addition, procedures and management systems are put in place to ensure responsibilities and management is clear throughout the drilling activities in response to an oil spill and as per the provisions of the OSCP.

3.4.2.3 Primary Well Control

The primary well control barrier is provided by the weight of the drilling fluid column (or hydrostatic pressure) inside the wellbore. This barrier is maintained by keeping a wellbore fluid column with a higher pressure inside the wellbore than the pressure in the formations penetrated by the wellbore. Weighting agents are added to the drilling fluid to increase the density of the fluid inside the wellbore when required, and subsequently maintain a higher fluid (hydrostatic) pressure.

A number of Loss Control Materials (LCM will be retained onsite for use in the event that hazards (predominantly associated with downhole mud losses and borehole stability issues) are encountered during drilling. Under some circumstances the mud weight required to stabilise the borehole can effectively fracture the rock and result in downhole drilling fluid losses into the underground formations. When this occurs Loss Control Materials (LCM) can be added to the mud system to help reduce the loss rate.

3.4.2.4 Secondary Well Control

The drill rig will be equipped with the Blow-Out Preventer (BOP) as shown in Fig. 3.13 with key components shown in Plate 3.9. This key equipment will provide the secondary well control barrier. The annular preventers can be closed and will seal on any size of drilling tool passing through it and the pipe rams are designed to seal on drill pipe of a variety of sizes.

The shear rams will shear drill pipe and casing respectively. The BOP is pressure tested prior to well deployment and routinely re-tested after installation with no longer than 21 days between tests (as per

API Recommended Practice S53: Recommended Practices for Blowout Prevention Equipment Systems for Drilling Wells).

If the primary fluid barrier fails and it is observed that the well is flowing, an Annular Preventer and a set of BOP rams will be manually functioned to close in the well and stop any further flowing of the well, thereby regaining control. Under such circumstances the well is said to have “kicked.” It would be expected that after closing in a “kick,” pressure would build up below the BOP. The magnitude of the pressure provides an accurate indication of the pressure of the formation fluid that is present in the rock that has been drilled.

In the event of a kick, after closing the well in, it is necessary to circulate out any formation fluid that has entered the wellbore in a controlled manner, whilst keeping the BOP closed. To do this the contents of the well will be circulated by pumping fresh drilling fluid down the drill string.

Once all the influx is out of the well, circulation will continue with drilling fluid which has been increased in density until this new mud has returned to the surface and the well is full of the new denser fluid. With that stage completed, equilibrium is once again reached with the hydrostatic pressure within the well bore exceeding the pressure of the formation fluid present in the pore spaces within the rock. That way the well is once again said to be overbalanced and under primary control. At that point the BOP can then be opened and drilling resumed.

The BOP control system uses hydraulic operating fluids to actuate the BOP valves, which is largely comprised of water, with a small quantity of a biodegradable additive (1-5% by volume) that prevents bacterial growth and improves lubricity.

3.4.2.5 Tertiary Well Control

Tertiary well control describes the third line of defence, where the formation cannot be controlled by the primary or secondary well controls described above. The following are some examples of methods of applying tertiary well control:

- Drill a relief well to intercept the flowing well and kill it with heavy mud.
- Rapid pumping of heavy mud to control the well with equivalent circulating density – termed a dynamic kill.
- Pump barite or heavy weighting agents to plug the wellbore in order to stop flowing.
- Pump cement to plug the wellbore, and.
- Deployment of a capping stack and containment systems.

REN will have contingency plans in place prior to implementation of the drilling to allow execution of any of the above methods of tertiary well control to be implemented in case of the unlikely event that both primary and secondary well controls are lost.

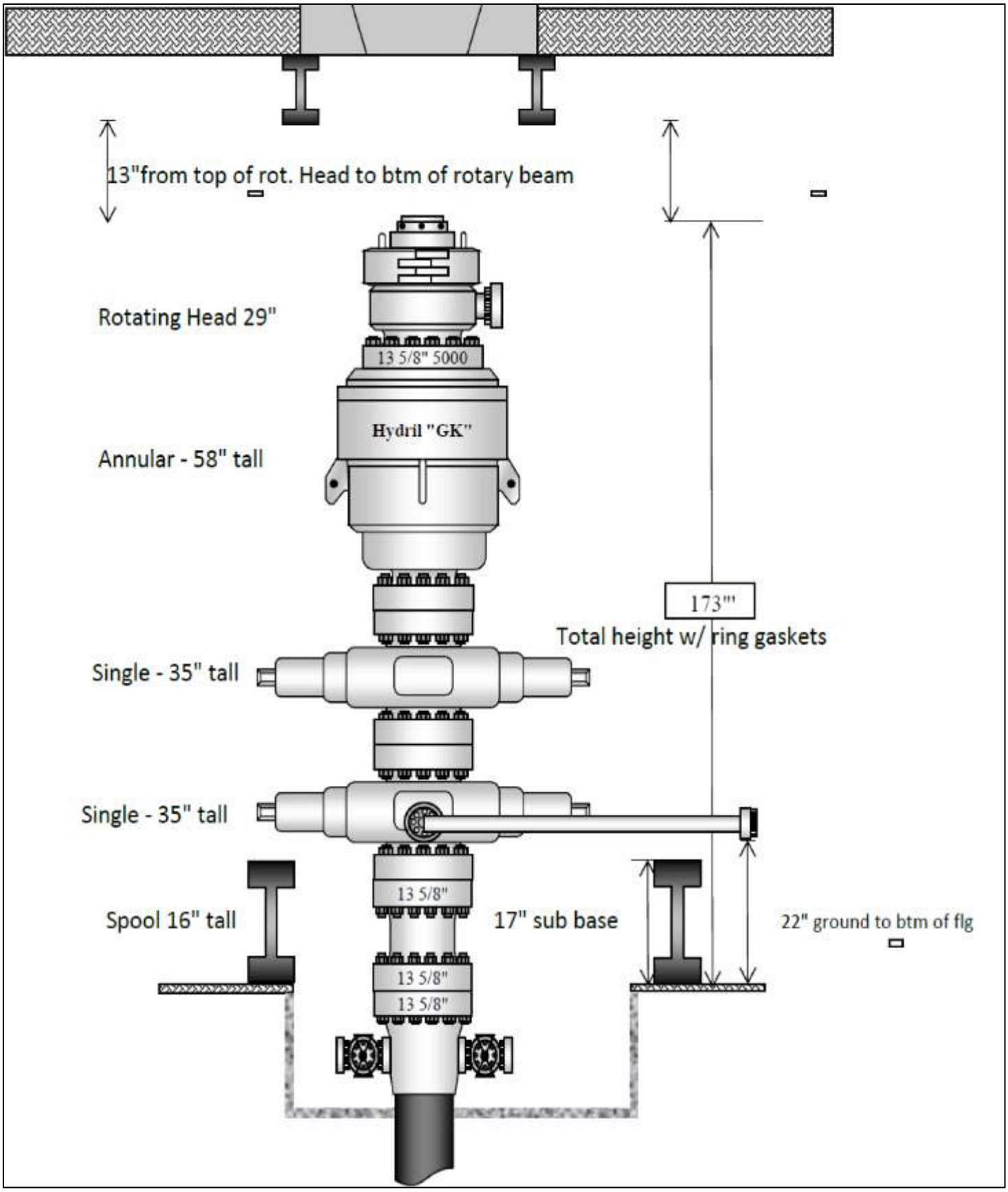


Figure 3.13: The BOP stack used in the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73 (Source: REN, 2021).

Plate 3.9: The BOP stack to be used in the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73.

3.4.3 Emergency Response Plan (ERP)

3.4.3.1 Overview

REN has prepared a separate Emergency Response Plan (ERP) document to be approved by MME and contains basic information on the key locations and facilities with respect to the proposed drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73. The ERP document has been prepared in accordance with the provisions of the Petroleum (Exploration and Production) Act, 1991 (Act 2 of 1991). The purpose of the ERP is:

- To define tasks that should be carried out in an emergency together with adequate guidance on priorities.
- To establish the assignment of such tasks and the appropriate delegation of authority, and.
- To establish communication lines ensuring efficient response to and control of an emergency.

The ERP document is linked to project specific Bridging Documentations and for cases where lead or major emergency response role ('Primacy') resides with a contractor and in these cases, REN supporting the contractor. The following is the summary of the key operational areas that may be associated with an emergency event detailed in the ERP:

- Drilling locations operational area.
- Rundu Operations base, and.
- Logistic route between Rundu and the drilling location.

The drilling rig is the principal installation of this project and shall meet the technical performance and environmental standards required by REN and Government regulations. The rig, Rundu Operations Base or the logistic route will implement, in case of emergency, the ERP actions for emergency event control and containment / recovery as may be applicable. The Emergency Response Facilities including staff rooms, ambulance with an onsite Doctor shall be based at each of the drilling locations (Plate 3.10) and the Rundu operations base shall have a detailed site plan layout and rig components including the following:

- Clear site layout with marked storage facilities and list of the type of materials stored in each area in terms of the hazard rating.
- List of inventories drilling supplies including lifesaving equipment.
- Drilling programme and well designs.
- Forms and check lists.
- Emergence Response documents.
- Clear outline of the emergency reporting and communication procedures.
- EIA and EMP Reports with copies of all permits, certifications, authorisations, endorsements, and consents covering the drilling operations.
- List of the type of communication systems.
- Computers / Laptops/ printers, and.
- Telephone lists and directories.

Plate 3.10: Example of the onsite emergency response support available 24hrs at each drilling location.

3.4.3.2 ERP Scenarios

The following is the summary of Emergency scenarios that have been covered in the ERP document:

- Explosion or fire.
- Hydrocarbon or chemical release.
- Well control incident.
- Riser / Pipeline Incident.
- Medical Emergency.
- Installation abandonment.
- Notification of fatality.
- Aircraft Accident.
- Road accident Windhoek to Rundu or Rundu to drilling site.
- Person / Vehicle Overdue.
- Natural disaster.
- Non-Governmental Organisation (NGO) activities / demonstrations.
- Serious crime.
- Arrest of employee.
- Kidnap, ransom, extortion.
- Bomb threat.
- Civil unrest, and.
- Country evacuation.

3.5 Sustainability, Health, Safety, Environment and Social Governance

3.5.1 Overview

The Proponent is committed to responsible operations through Corporate Social Responsibility (CSR) Guiding Principles, commitment to tracking and reporting on Environmental, Social and Governance (ESG) indicators linked to the various corporate policies and subprojects. Detailed information on the sustainability, health, safety, environment, and social governance of the Proponent can be found at https://REN.com.

3.5.2 Environmental, Health and Safety Commitments

The Proponent is committed to the protection of all matters related to Environmental, Health and Safety (EHS) of all the employees, contractors, customers, and the public-at-large with respect to the ongoing and upcoming operational activities. During the proposed drilling operations, the Proponent will implement EHS measures together with the Contractor by:

- Implementing sustainable project actions.

- ❖ Enhancing job-safety and efficient productivity measures.
- ❖ Taking environmental, social and governance proactive steps, and.
- ❖ Improving work quality and greater employee satisfaction amongst other EHS elements.

The overall EHS goals include the following: Zero accidents, no harm to people and no damage to the environment. To achieve these goals, the Proponent and the Contractor will be required to always apply best practices (Annex 3).

3.5.3 Environmental, Social, and Governance (ESG)

The Proponent has a clear Corporate Social Responsibility (CSR) Guiding Principles aligned with the expectations of communities, other stakeholders and global expectations. The Environmental, Social and Governance (ESG) criteria of the Proponent provides a basis for measuring key indicators performances against the global standards that have been committed to; in particular, information on the project activities, in relation to measurable norms.

The following is the summary of the key measurable performance criteria:

- ❖ Commitment to ESG from the start.
- ❖ Develop Carbon offset projects lock step with project development.
- ❖ Reforestation, offsets, emissions reductions N$112 million (C$10m) ESG Commitment.
- ❖ N$20 (C$1.35) million donated for COVID-19 relief efforts.
- ❖ Planned 10 fresh water boreholes drilling program for regional communities with 26 boreholes already drilled and handed over to the local communities.
- ❖ Educational, agricultural and health and wellness focused strategies to align with Namibian and Global Best Practices.
- ❖ Namibia's Vision 2030, Harambee Prosperity Plan, NDP5.
- ❖ CDP, UN Global Compact, TCFD, SASB, GRI Sustainability Disclosures Solar Powered Water Pumps 19 REN' s 1st Community Water Well Active Engagement with Local Communities.
- ❖ Strong local hiring and training policy.
- ❖ Comprehensive Stakeholder Consultation, Environmental Impact Assessments and Environmental Management Plans for all projects and activities, strict adherence to regulations and environmental best practice.
- ❖ Protection of local ecosystems, and.
- ❖ Working in concert with all relevant Government Ministries.

3.5.4 Community Relations

REN has become part of the local communities of Kavango East and West Regions. The reality on the ground in both the Kavango East and West Regions is the clear effects of inherited generational poverty, under development and lack of economic opportunities. Access to clean drinking water for rural communities is hard to come by and for many women the daily reality involves walking up to 10km each way, to the "local" area where they source water (Plate 3.11).

Local community members, the Namibian Government and the Proponent are all committed to meaningful and positive impacts on the lives of the residents by drilling potable water boreholes closer to their homesteads (Plate 3.12).

The commitment of the Proponent in alleviating the daily hardship associated with access to clean water is demonstrated by the handing over to the local communities the following twenty-six (26) completed water boreholes (Fig. 3.14 and Plate 3.12).

1. Cumezao Village, Borehole No. 205866.
2. Kawe Village, Borehole No. 205864.
3. Makandina 2 Village, Borehole No. 205865.
4. Mutwe Gombahe (Christmas water), Borehole No. 206090.
5. Bravel, Borehole No. 206230.
6. Draai Ya Kamuncaya, Borehole No. 205474.
7. Epingiro, Borehole No. 206088.
8. Gonghwa Village, Borehole No. 206188.
9. Hamweyi , Borehole No. 206086.
10. Kayanga Teya, Borehole No. 206083.
11. Magongo, Borehole No. 205471.
12. Mahahe 2, Borehole No. 205508.
13. Mauvara, Borehole No. 205464.
14. Mayana, Borehole No. 206095.
15. Mpuma, Borehole No. 205468.
16. Mukuni- Shighuru, Borehole No. 205483.
17. Muparara, Borehole No. 206087.
18. Mutjimaumwe, Borehole No. 206085.
19. Nautchova 2, Borehole No. 206232.
20. Nyondo Tarred Road, Borehole No. 206084.
21. Sainca, Borehole No. 205512.
22. Shamangumba, Borehole No. 205493.
23. Siurungu 2, Borehole No. 206231.
24. Suito, Borehole No. 206089.
25. Taratata, Borehole No. 205789, and.
26. Tjova, Borehole No. 206082.

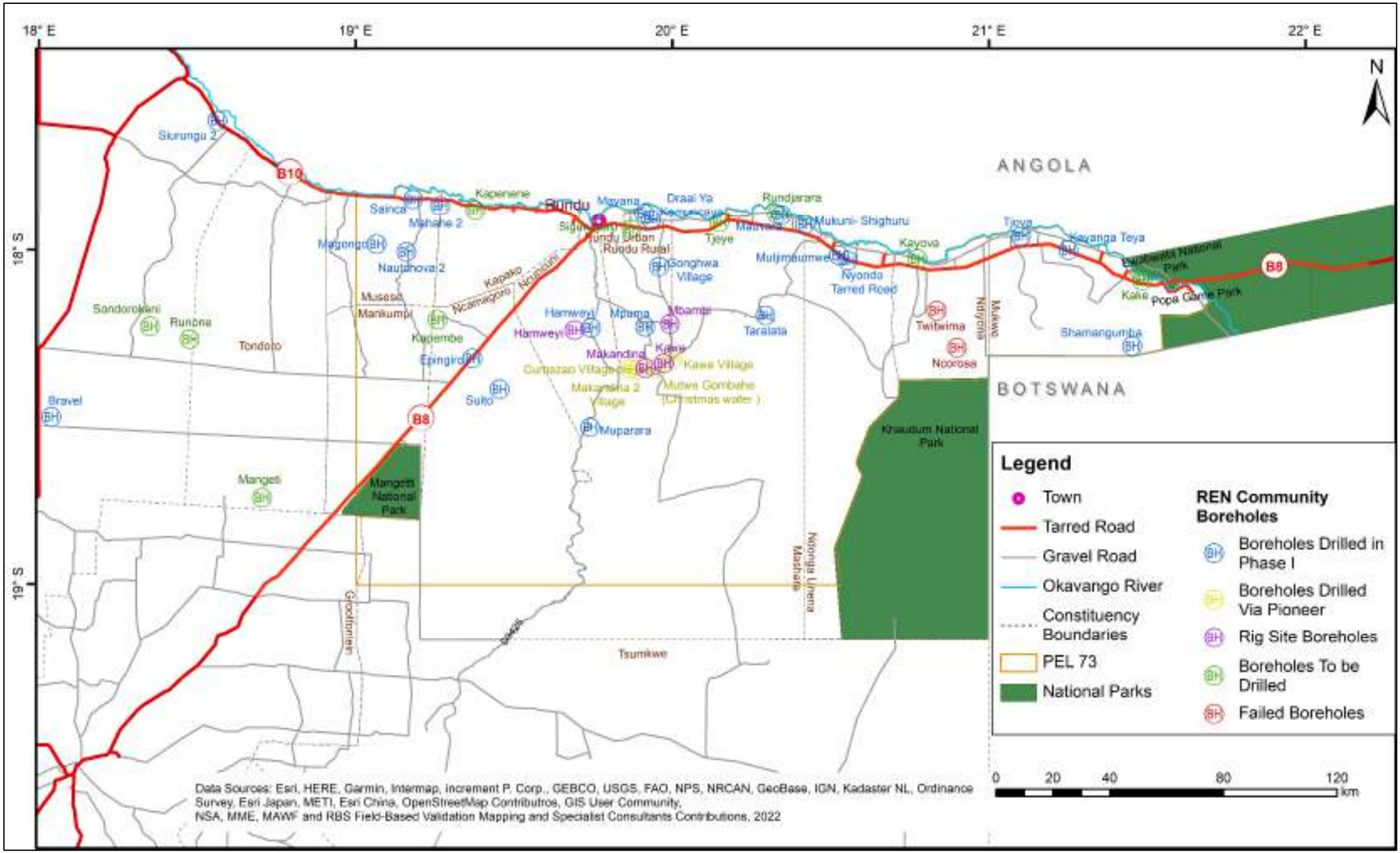


Figure 3.14: Location of twenty-six (26) successfully completed rural community water boreholes drilled and or equipped in Kavango East and West Regions and supported by REN under its CSR Programme. The Proponent plan to drill ten (10) additional boreholes in 2023-2024 (Source: REN, 2022).

Furthermore, the Proponent is committed to completing the following additional ten (10) rural community water boreholes for year 2023-2024 (Fig. 3.14):

1. Kapembe.
2. Kake, Borehole No. 206407.
3. Kapenene.
4. Rundjarara, Borehole No. 206404.
5. Kayova, Borehole No. 206406.
6. Runone.
7. Mangeti
8. Tjeye, Borehole No. 206403.
9. Siguruguru, and.
10. Sondorokeni.

3.5.5 Social Responsibility

REN's goal is to provide responsible energy development and power independence to Namibia. The Proponent is committed to conducting safe operations, respecting communities and other stakeholders and protecting the environment in Namibia. To support these commitments, the Proponent has incorporated environmental, social and governance norms and standards in current ongoing and planned project activities and business ventures (https://REN.com). Recently, REN collaborated with the Namibian for a vaccination campaign, especially targeting the hard-to-reach communities in the Kavango East and West Regions of Namibia (Plate 3.13).

3.5.6 Supporting Science, Technology, Engineering, Arts and Mathematics (STEAM)

In 2022, REN has awarded scholarships to ten (10) first year students from Kavango East and West Regions, studying in the fields of Science, Technology, Engineering, Arts and Mathematics (STEAM), at the University of Namibia (UNAM) and Namibia University of Science and Technology (NUST) (Plate 3.14).

The scholarship initiative forms part of the company's ESG approach to business and is in addition to its obligatory contribution to funding education and training through the Petroleum Training and Education Fund (PetroFund). The scholarships, covering tuition and non-tuition, were awarded to the students studying in the fields of chemical, civil, mechanical, and mining engineering as well as education: science and mathematics (Plate 3.14).

3.5.7 Contractors Operational Manuals and Policies

The Contractors who will be involved in the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 will be required to prepare a comprehensive Health, Safety and Environment (HSE) operational standards, manuals, and policies for approval by REN.

The following HSE Contractor documentations will be required and will link directly to the EMP framework as well as the sustainability, health, safety, environment, and social governance documentations of the Proponent:

- ❖ Bridging Document.
- ❖ HSE Management Manual.

- ❖ Project HSE Plan.
- ❖ Waste Management Plan.
- ❖ Journey Management Plan.
- ❖ Working with local communities guideline.
- ❖ Grievance Mechanism, and.
- ❖ Cultural Heritage Procedure.

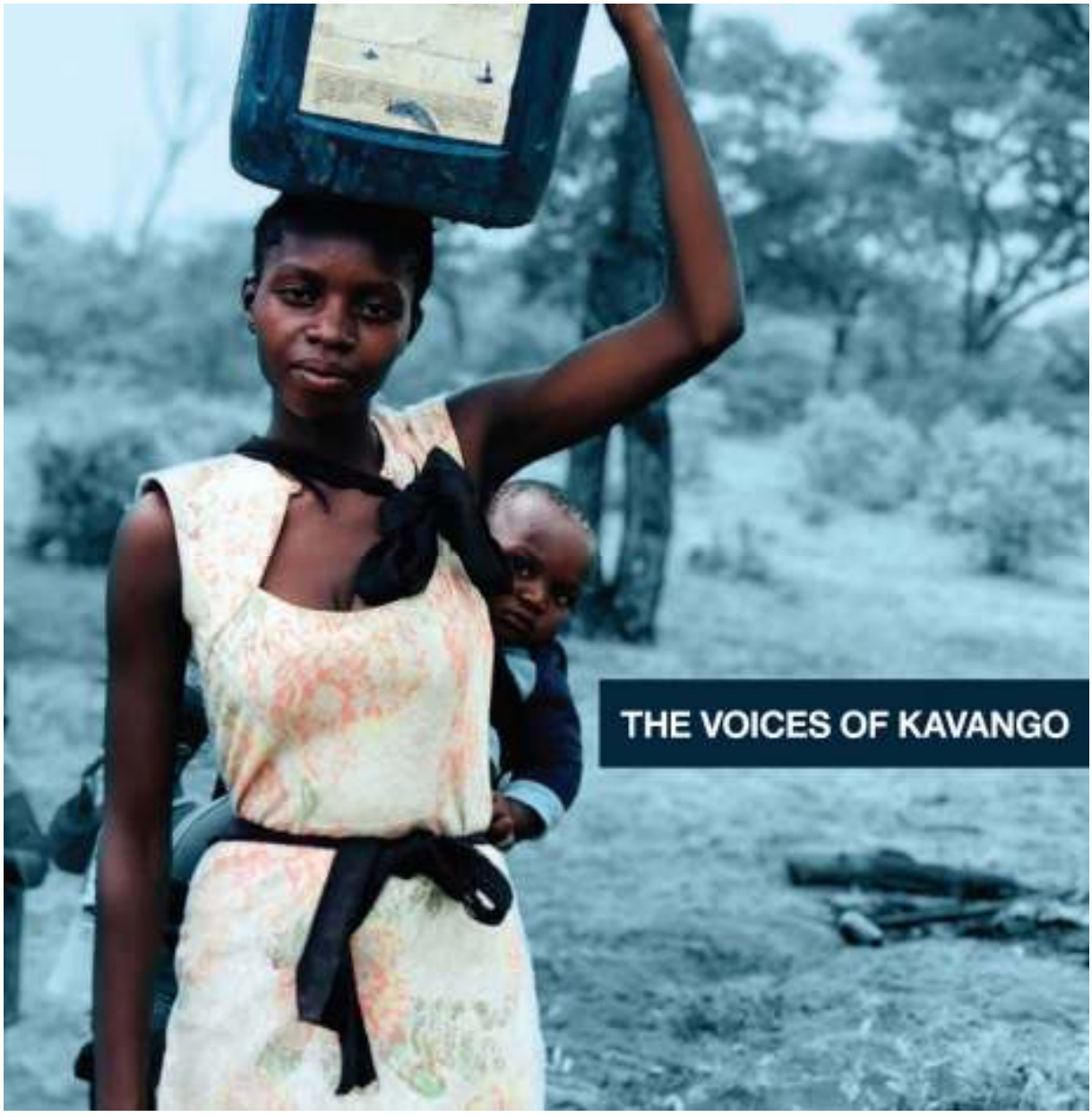


Plate 3.11: Example of the true realities on the ground and effects of inherited generational poverty, under development and lack of economic opportunities in both Kavango West and East Regions: Leopaldine Mundombe, 18-year-old mother of a six-month old baby boy would walk for 6km, with her baby on her back at times, to fetch fresh drinking water. Women and children in rural communities of Kavango West and East Regions walk for distances of up to 10 km to fetch a 20-litter container of potable water that usually only last for a day (Source: https://REN.com).

Plate 3.12: One of the completed community water wells programmes handed over to the community of Mutwegombahe, a demonstration of the Proponent's commitment to uplifting the lives of the local community (Source: https://REN.com).

Plate 3.13: REN collaborative vaccination campaign, especially targeting the hard-to-reach communities in the Kavango East and West Regions of Namibia. The support provided by REN forms part of the N$15 million (CAD $1.27 million) contributions towards COVID-19 relief support in the country (Source: REN, 2021).

Plate 3.14: REN has awarded scholarships to ten (10) first year students from Kavango East and West Regions, studying in the fields of Science, Technology, Engineering, Arts and Mathematics (STEAM) as part of the company's commitment to education through Environmental, Social, and Governance (ESG) (Source: REN, 2022).

4. LEGISLATIVE FRAMEWORK

4.1 Overview

The statutes, common, customary, and international laws are the four (4) sources of laws as enshrined in the constitution which is the supreme law of Namibia. All other laws must be in line with the Namibian Constitution. The most important legislative instruments and associated authorisations, permits, licenses, concerts, compliances applicable to the proposed petroleum exploration activities (Drilling proposed exploration and appraisal wells Nos. D1-D6 and G1-G6) include: Petroleum, environmental management, land rights, water, atmospheric pollution prevention, health, and labour as well as other indirect laws linked to the accessory services and engineering works.

4.2 Petroleum (Exploration and Production) Legislation

The national legislation governing petroleum operations in Namibia falls within the authority of the Ministry of Mines and Energy (MME) as the Competent Authority (CA) responsible for granting authorisations, permits, licenses, concerts, compliances as may be applicable to a petroleum exploration project. The legislative framework governing upstream oil and gas operations in Namibia is modern and well developed, and has been specially formulated for the international oil industry covering the following:

(i) Petroleum (Exploration and Production) Act, 1991, (Act No. 2 of 1991).

(ii) Petroleum Laws Amendment Act, 1998 (Act No. 24 of 1998).

(iii) Petroleum Taxation Act, 1991 (Act No. 3 of 1991), and.

(iv) Model Petroleum Agreement (MPA), 2007.

The Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991) is administered by the Petroleum Commissioner in the Ministry of Mines and Energy. Under the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991) the following Petroleum Upstream Licences may be granted to any applicant who may meet the requirements to be granted such a license:

(i) Petroleum Reconnaissance Licence (PRL): A reconnaissance licence allows its holder to carry on reconnaissance operations subject to terms and conditions as stipulated under Section 22-28 of the Act. A reconnaissance Licence is non-exclusive.

(ii) Petroleum Exploration Licence (PEL): An exploration licence allows its holder to carry on exploration operations exclusively in the block(s) to which it relates subject to the terms and conditions and in the block(s) as may be specified in such Licence as stipulated under Section 29-38 of the Act, and.

(iii) Petroleum Production Licence (PPL): A production licence allows its holder to exclusively carry-on production operations on the block(s) to which that licence relates and to sell or dispose of petroleum recovered within such block(s) and any other activities as stipulated under subsections 39-43 of the Act. Only one (1) production License has so far been issued in Namibia covering the Kudu Gas field situated offshore in the Orange Basin near the border between Namibia and South Africa.

Reconnaissance Energy Namibia is holding a PEL granted under Section 22-28 of Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991).

The Petroleum Laws Amendment Act, 1998 (Act 24 of 1998) provides for the amendments to the Petroleum (Exploration and Production) Act, 1991, (Act No. 2 of 1991), so as to make provision for the extension of the duration of exploration licences; to further regulate the obligation of holders of exploration licences with regards to the terms and conditions of any such licences; to rectify the provisions of section 41 in relation to discoveries which are of commercial interest; to provide for the submission of decommissioning plans together with applications for production licences; to make

different provision for the royalty payable on petroleum in respect of licences issued after the commencement of this Act; to further regulate the annual charges payable by holders of exploration and production licences; and to provide for the decommissioning of facilities on the cessation of production operations; to amend the Petroleum Taxation Act, 1991 (Act 3 of 1991), so as to reduce the rate of petroleum income tax; to provide for the allowance of deductions in respect of annual contributions to trust funds established for purposes of decommissioning of facilities in certain areas; to levy tax on surplus amounts in such trust funds; to provide for the allowance of deductions in respect of exploration expenditure incurred in any one or more other licence areas where no gross income was received; to make other provision for additional profits tax payable by the holders of production licences issued after a certain date; and to make further provision for the modification of Part III by virtue of terms and conditions contained in a petroleum agreement in relation to participation by the National Petroleum Corporation of Namibia (Namcor) in exploration or production operations; and to provide for incidental matters.

4.3 Other Key Applicable Legislation

4.3.1 Legislative Overview

The Environmental Assessment (EA) process in Namibia is governed by the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) in the Ministry of Environment, Forestry and Tourism (MEFT). The objectives of the Act and the Regulations are, among others, to promote the sustainable management of the environment and the use of natural resources to provide for a process of assessment and control of activities which may have significant effects on the environment. The Minister of Environment, Forestry and Tourism (is authorised to list activities which may only be undertaken if an environmental clearance certificate has been issued by the environmental commissioner, which activities include those relating to oil and gas exploration and production operations).

The drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73 falls within the categories of activities that cannot be undertaken without an Environmental Clearance Certificate (ECC). In addition to the requirements for undertaking Environmental Assessment prior to the project implementation, the Environmental Management Act and the EIA Regulations also provide for obligations of the PEL holder to provide for project rehabilitation and closure plan.

The proposed petroleum exploration activities involving the drilling of multiple exploration and appraisal wells by REN requires an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) to have been undertaken as provided under the Environmental Protection Clause 11 of the Petroleum Agreement, Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), and the Petroleum Laws Amendment Act, 1998, (Act 24 of 1998). An Environmental Clearance Certificate (ECC) is granted under the provisions of the Environmental Management Act, 2007, (Act No. 7 of 2007) and Environmental Impact Assessment (EIA) Regulations, 2012.

This environmental assessment only covers the scope of work for the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6. The prepared EIA and EMP reports exclude the production phase and possible method/s of oil or gas production that may be applicable. At present, the Proponent only holds a Petroleum Exploration License (PEL), not a Production License as provided for in the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), and the Petroleum Laws Amendment Act, 1998, (Act 24 of 1998).

4.3.2 Strategic Environmental Assessments and Environmental Impact Assessment

Strategic Environmental Assessment (SEA) is a high-level environmental assessment tool which provides for a systematic and comprehensive process of evaluating the environmental effects of a Policy, Plan or Programme (PPP) and the associated alternatives as may be applicable (Table. 4.1). The final goal of an SEA is to better reflect environmental aspects in formulating and deciding on Policies, Plans, and Programmes of Organs of State and, thereby, contribute to the sustainability and coexistence opportunities of various Government developmental strategies that eventually translates into projects. SEA reflects decisions by Organs of State such as the Ministry of Mines and Energy, the Ministry of Environment, Forestry and Tourism and the Ministry of Agriculture, Water and Land Reform

with respect to Policies, Plans and Programmes further upstream in the planning process, where decisions are being taken, that might influence project related decisions further downstream at project levels.

In this instance, the implementation of the National Policy, Plan or Programme on onshore oil and gas exploration by the MME (an Organ of State) with the overall objectives of attracting investment and development of the subsurface natural resources in Namibia for the benefits of its people, falls within the higher level environmental management framework of an SEA while the key projects being implemented by various petroleum exploration companies (Proponents) holding PELs, including REN, falls with the lower level sphere of an EIA (Table 4.1). Environmental Impact Assessment (EIA) on the other hand focuses on the downstream project level activities such as the ongoing exploration operations such as seismic survey or drilling that REN as the Proponent is currently undertaking or planning to undertake within PEL 73.

Table 4.1: Comparative summary overview of Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA).

ASSESSMENT TYPE	ACTIVITY FOCUS	RESPONSIBILITY	OUTPUTS
Strategic Environmental Assessment (SEA)	• Policies • Plans • Programmes	• Organs of State (Line Ministries such as MME, Parastatals, Regional Councils, Municipalities)	SEA Report with a Strategic Environmental Management Plan (SEMP) Report
Environmental Impact Assessment (EIA)	• Project Specific Activity	• Proponent (Private person, private entity such as REN)	EIA Report with an Environmental Management Plan (EMP) Report

Section 23 of Part VI of the Environmental Management 2007 (Act No. 7 of 2007) sets out the objects of environmental plans as follows:

(a) Co-ordinate and harmonise the environmental Policies, Plans, Programmes and decisions of the various Organs of State that exercise functions that may affect the environment or are entrusted with powers and duties aimed at the achievement, promotion, and protection of a sustainable environment, in order to –

- ❖ Minimise the duplication of procedures and functions, and.
- ❖ Promote consistency in the exercise of functions that may affect the environment.

(b) Enable the Minister to monitor the achievement, promotion, and protection of a sustainable environment.

The Environmental Management 2007 (Act No. 7 of 2007) does not mention SEA. However, in practice the preparation of an Environmental Plan with respect to a Policy, Plan or Programme for an Organ of State referred to in Section 23 of Part VI of the Environmental Management Act 2007, (Act No. 7 of 2007) can only be achieved by undertaking a SEA study. In other words, the SEA study is a key tool that can be used to develop an Environmental Plan of a Policy, Plan or Programme of an Organ of State.

Responsibilities for the implementation of Environmental Plans / SEA are legally and exclusively reserved to the Organs of State such as Line Ministries, Agencies, Regional Councils and Larger Municipalities and it is not for the Proponents such as REN. The Organ of State may delegate the task of preparing an Environmental Plan to an Environmental Assessment Practitioner (EAP). An Environmental Plan is restricted to Organs of State with functions of Policies, Plans, Programmes, which might negatively affect the receiving environment. According to Subsection 24 (1) of the Environmental Management 2007, (Act No. 7 of 2007), the Minister may identify and list by notice in

the Gazette or by regulation organs of state which are exercising functions that may affect the environment.

Every Organ of State identified and listed in terms of Subsection 24 (1) of the Environmental Management 2007, (Act No. 7 of 2007), is required to prepare an environmental plan in the prescribed form and manner. The Act further states that every Organ of State contemplated in subsection (1), must in the preparation of an environmental plan take into consideration every other environmental plan already adopted with a view to achieving consistency among such plans. However, such a list or gazetted or regulatory list of Organs of State with functions that may affect the environment has not yet been developed within the framework of the Environmental Management 2007 (Act No. 7 of 2007).

In line with the provisions of the Environmental Management 2007 (Act No. 7 of 2007), the Ministry of Lands and Resettlement as an Organ of State prepared the Intergraded Land Use Plans for Kavango East and West Regions in 2015. However, the Integrated Land Use Plans failed to consider the likelihood for subsurface resources such as oil, gas or minerals potentially occurring in Kavango East or West Regions and failed to provide consistency with the Ministry of Mines and Energy Policies, Plans, Programmes as contemplated in the Environmental Management 2007, (Act No. 7 of 2007).

As shown in Table 4.1, REN as a Proponent undertaking exploration operations in PEL 73 over a site-specific key area of interest at local project level activities is subject to undertaking an EIA and EMP to obtain an ECC for exploration activities as may be applicable. The activities of REN do not fall at the high level of Policies, Plan or Programmes run by Organs of State and subject to an SEA but a lower project activity level run by Proponents and subject to EIA and EMP (Table 4.1). REN as a Proponent is under no obligation to undertake an SEA and an SEA study will be irrelevant to a site-specific well drilling operations to be undertaken within a localised Area of Interest in PEL 73.

4.3.3 Communal Land Rights

The drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73 falls within the communal lands of Kavango West and East Regions administered by various traditional authorities through Regional Communal Land Boards. Communal land is the land that belongs to the State and is held in trust for the benefit of the traditional communities living in local areas. Communal land cannot be bought or sold, but a part thereof can only be given as customary land right or right of leasehold in accordance with the provisions of the Communal Land Reform, 2002, (Act No. 5 of 2002).

The Communal Land Reform, 2002, (Act No. 5 of 2002) provides for the allocation of surface user rights in respect of communal land, establishment of Communal Land Boards, gives powers to the Chiefs and Traditional Authorities and boards in relation to communal land matters and provides for all the incidental matters related to the allocation and administration of Communal land in Namibia. Although communal land is owned by the State, allocation of surface user rights is delegated to the traditional authorities.

Consents and access to surface land rights for drilling of wells shall be channelled through the specific lease holder/s if the land has already been formally allocated to an individual or family with supporting documentations such as a leasehold. In the absence of a formal leasehold, access to surface user land rights shall first be channelled through a local village headman / headwoman, with surface land rights ownership confirmed by the traditional authority before approaching the Communal Land Boards either Kavango West or East Regional Council. Appropriate written consents shall be obtained as may be applicable with endorsements /approvals from the relevant Communal Land Boards of the two (2) Regions. Appropriate written consents shall always be obtained before the implementation of any oil and gas exploration or supporting activities.

4.3.4 Water Legislation

Water Act 54 of 1956 under the Minister of Agriculture, Water and Land Reform (MAWLR) provides for the control, conservation, and use of water for domestic, agricultural, urban, and industrial purposes. In terms of Section 6, there is no right of ownership in public water and its control and use is regulated and provided for in the Act. In accordance with the Act, the ongoing exploration operations must ensure that mechanisms are implemented to prevent water pollution. Additional permits will be required to

abstract groundwater for industrial use as well as for “water works” for the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73. The broad definition of water works will include the reservoir on site (as this is greater than 20,000m^3), water treatment facilities and pipelines as may be applicable. Due to the water scarcity of the area, all water will be recycled (including domestic wastewater as may be applicable). The Act requires the Proponent to have a permit to drill a water borehole, permit to abstract freshwater for industrial use and permit to discharge the wastewater effluents from the industrial and domestic campsite areas.

4.3.5 Atmospheric Pollution Prevention Legislation

The Atmospheric Pollution Prevention Ordinance, 11 of 1976 falling under the Ministry of Health and Social Services (MHSS) provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto. Part III of the Act sets out regulations pertaining to atmospheric pollution by smoke. Preventative measures for dust atmospheric pollution are outlined in Parts IV and V with respect to gases being emitted by vehicles.

4.3.6 Labour, Health, and Safety Legislations

The Labour Act, 1992, Act No. 6 of 1992 as amended in the Labour Act, 2007 (Act No. 11 of 2007), falling under the Ministry of Labour, Industrial Relations and Employment Creation (MLIREC) refers to severance allowances for employees on termination of a contract of employment in certain circumstances and health, safety, and welfare of employees. In terms of the Health Safety and Environment (HSE), the Labour Act, 2007 protects employees and every employer shall, among other things: provide a working environment that is safe, without risk to the health of employees, and that has adequate facilities and arrangements for the welfare of employees, provide and maintain plant, machinery and systems of work, and work processes, that are safe and without risk to the health of employees, and ensure that the use, handling, storage or transportation of hazardous materials or substances is safe and without risk to the health of employees. All hazardous substances shall have clear exposure limits and the employer shall provide medical surveillance, first-aid and emergency arrangements as fit for the operation.

4.3.7 Coronavirus (COVID-19) Pandemic, Emergencies and Health Restrictions

The drilling of the proposed multiple exploration and appraisal wells within the AOI in PEL No. 73 will require the mobilisation of equipment, specialist personnel and tools from different parts of the World. The current global Coronavirus (COVID-19) pandemic and the associated health restrictions globally will result in some delays and logistical disruptions. Locally, Namibia might have a State of Health Emergency under the Public and Environmental Health Act, 2015 (Act No. 1 of 2015) that may also affect not only the equipment, tools, and specialist workforce mobilisation but also the actual field implementation of the project.

In an event of new COVID-19 health restrictions, this will affect the field campsite set-up, vehicles passengers and all aspects of the proposed project. The Proponent through the Contractor and subcontractors shall adhere to all the international, regional, and local COVID-19 health restrictions and protocols that may be in place at the time of drilling the individual exploration and appraisal wells within the AOI in PEL No. 73.

4.3.8 Summary of Applicable National Legislations

The following is the summary of the important legislative that may be applicable to the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73:

- Namibian Constitution Articles 91(c) and 95.
- Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991).
- Environmental Management Act (No. 7 of 2007) and Regulations (2012).
- Water Act, 1956, Act No. 54 of 1956.

- Atomic Energy and Radiation Protection Act (Act No. 5 of 2005).
- Immigration Control Act 7 of 1993.
- Customs and Excise Act 20 of 1998.
- Regional Councils Act, 1992, (Act 22 of 1992) as amended.
- Local Authorities Act, 1992, (Act 23 of 1992) as amended.
- Hazardous Substances Ordinance (1974).
- Public and Environmental Health Act, 2015 (Act No. 1 of 2015)
- Health Act (No. 21 of 1988).
- Air Quality Act (No. 39 of 2004).
- Atmospheric Pollution Prevention Act (No. 45 of 1965).
- Communal Land Act (No. 10 of 2002).
- Communal Land Reform Amendment Act (No. 13 of 2013).
- Forestry Act (No. 12 of 2001) and Forest Amendment Act (No. 13 of 2005).
- The Labour Act, 1992, Act No. 6 of 1992 as amended in the Labour Act, 2007 (Act No. 11 of 2007).
- Labour Act (No. 11 of 2004) – Health & Safety Regulations (1997).
- National Heritage Act (No. 27 of 2004).
- Nature Conservation Amendment Act (No. 5 of 1996).
- Nature Conservation Ordinance (No. 4 of 1975).
- Soil Conservation Act (No. 70 of 1969), and.
- Traditional Authorities Act (No. 17 of 1995).

4.4 Regulatory Agencies and Permits Register

4.4.1 Key National Regulatory Permits and Agencies

Government agencies with permits responsibilities over the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73 are shown in Table 4.2. Table 4.3 shows the relevant permits / licenses required with respect to the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73. Namibia has standards and guidelines with respect to the freshwater and wastewater and lacks gaseous and noise limits.

The comparative water quality guideline is shown in Table 4.4. The industrial effluent likely to be generated by the proposed operations if any, must comply with provisions of the Government Gazette No 217 dated 5 April 1962 (Table 4.5).

Table 4.2: Government agencies with permits responsibilities over the drilling of multiple exploration and appraisal wells within the AOI in PEL No. 73.

AUTHORITY	TYPE OF AUTHORISATION
Office of the Environmental Commissioner (OEC), Ministry of Environment, Forestry and Tourism	Issue of Environmental Clearance Certificate (ECC) based on the review of the Environmental Assessments (EA) Reports prepared in accordance with the Environmental Management Act (2007) and the Environmental Impact Assessment Regulations, 2012. The Directorate of Forestry (DOF) is responsible for issuing of forestry permits with respect to harvest, transport, and export or market forest resources.
Directorate of Forestry Ministry of Environment, Forestry and Tourism (MEFT)	Issues the following permits under the Forest Act (Act 12 of 2001) and the Regulations, 2015: ❖ A Harvesting Permit is required for any tree cutting and/or harvesting of wood in an area greater than 15 hectares per annum as stated under Section 22 (1), 23 (1), 24 (2&3) and 33 (1&2) of the Forest Act (Act 12 of 2001). The permit is issued by a Licensing Officer, and stipulates conditions of the harvesting on the reverse side of the permit. Inspection of an area to be harvested is done before the permit is issued, and when an application for renewal is made every 3 months. ❖ A Transport Permit is required to convey any wood or wood products (e.g., droppers, planks, charcoal, and firewood). It is obtainable from any Forestry Office, and is valid for 7 days. ❖ An Export Permit is required to send any wood or wood products outside Namibia. It is obtainable from any Forestry Office, and is valid for 7 days. ❖ A Marketing permit is required to enable the producer to sell his/her products to any other party. The permit is valid for 3 months in commercial areas while in communal areas the permit is valid for 1 month only. The National Botanical Research Institute's (NBRI) mandate is to study the flora and vegetation of Namibia, to promote the understanding, conservation and sustainable use of Namibia's plants for the benefit of all.
Ministry of Mines and Energy (MME)	Competent Authority overseeing all matters related to petroleum exploration and production activities in Namibia. MME is responsible for issuing of all types of Petroleum Licenses / Authorisation.
Ministry of Agriculture, Water and Land Reform	The Directorate of Resource Management within the Department of Water Affairs (DWA) at the MAWLR is currently the lead agency responsible for management of surface and groundwater utilisation through the issuing of permit for water borehole drilling, abstraction permits and waste water disposal permits. DWA is also the Government agency responsible for water quality monitoring and reporting.
Ministry of Health and Social Services (MHSS)	National Radiation Protection Authority (NRPA) falling under the MHSS is responsible for granting radioactive authorisation (Import and Export Permits) for tools with radioactive sources used for logging during the drilling process
Ministry of Home Affairs, Immigration, Safety and Security (MHAISS)	The Inspector General Explosive Control Division Namibian Police Force under the MHAISS is responsible for granting explosive permits (Import and Export) for tools with explosive charges used to support the drilling process
Kavango West and East Regional Councils	Overall responsibility of management of regional land resources and communal land surface user rights through the Communal Land Boards as may be required by the proposed project.
Kavango West and East Regions Traditional Authorities	Traditional authorities in Namibia are the custodians of State land falling within authority of the respective tribal land. With the approval of the Regional Land Boards, traditional authorities through the local structures of headmen and headwomen as well as Village Development Communities (VDCs) are responsible for allocation of communal land surface user rights to the local communities.

Table 4.3: Summary of the permit register with respect to drilling of multiple exploration and appraisal wells in AOI in PEL No. 73.

Type of Permit	Authorising / Institution	Legal Framework
1. Environmental Clearance Certificate (ECC)	Office of the Environmental Commissioner, Ministry of Environment, Forestry and Tourism (MEFT)	Environmental Impact Assessment (EIA) Regulations and Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007)
2. Harvesting Permit for cutting down trees	Directorate of Forestry Ministry of Environment, Forestry and Tourism	Forest Act (Act 12 of 2001
3. Freshwater Abstraction Permit, Waste Water Discharge Permit, Water Borehole Drilling Permits and Exploration and Appraisal Well Drilling Permit for drilling through a Groundwater Aquifer	Department of Water Affairs (DWA), Ministry of Agriculture, Water and Land Reform (MAWLR)	Water Act 54 of 1956, Government Gazette No 217 dated 5 April 1962 and Water Resources Management Act, 2004, (Act No. 24 of 2004).
4. Oil Spill Contingency Plan (OSCP)	Approved / Endorsed by the Ministry of Mines and Energy (MME) – Office of the Petroleum Commissioner	Petroleum (Exploration and Production) Act, 1991 and Associated Regulations
5. Emergency Response Plan (ERP)		
6. Radioactive Authorisation (Import, Storage, Transport, Use and Export Permits) of radioactive sources for logging	Authorisation Issued by the National Radiation Protection Authority (NRPA), Ministry of Health and Social Services (MHSS)	Atomic Energy & Radiation Protection Act (Act No 5 of 2005) and Radiation Protection & Waste Disposal Regulations (No 221 of 2011)
7. Explosive Permit (Import, Storage, Transport, Use and Export Permits) of Explosives equipment in drilling (Downhole equipment recovery) and well testing (Perforating steel casing, cement and formation rock) stages	The Inspector General Explosive Control Division Namibian Police Force, Ministry of Home Affairs, Immigration, Safety and Security	Explosives Act, 1956 (Act 26 of 1956, as amended) and Regulations (GNR 1604 of 8 September 1972, as amended)
8. Oil and Gas Well Drilling Permit / Consent / Permit to Drill with Basis for Well Design	Ministry of Mines and Energy – Office of the Petroleum Commissioner	Petroleum (Exploration and Production) Act, 1991 and Petroleum Regulations as Amended
9. Surface User Rights Consent, Endorsement, Leasehold or Permission to Occupy (PTO)	Chief's Council, Traditional Authority, Regional Land Boards and Regional Councils or Long-term Leasehold Land Owner	Communal Land Act (No. 10 of 2002), Communal Land Reform Amendment Act (No. 13 of 2013) and Regional Councils Act, 1992, (Act 22 of 1992) as amended and applicable

Table 4.4: Comparison of selected guideline values for drinking water quality (after Department of Water Affairs, 2001).

Parameter and Expression of the results			WHO Guidelines for Drinking-Water Quality 2nd edition 1993		Proposed Council Directive of 28 April 1995 (95/C/13-1/03) EEC	Council Directive of 15 July 1980 relating to the quality intended for human consumption 80/778/EEC		U.S. EPA Drinking water Standards and Health Advisories Table December 1995		Namibia, Department of Water Affairs Guidelines for the evaluation of drinking-water for human consumption with reference to chemical, physical and bacteriological quality July 1991			
			Guideline Value (GV)		Proposed Parameter Value	Guide Level (GL)	Maximum Admissible Concentration (MAC)	Maximum Contaminant Level (MCL)		Group A Excellent Quality	Group B Good Quality	Group C Low Health Risk	Group D Unsuitable
Temperature	t	°C		-	-	12	25		-	-	-	-	-
Hydrogen ion concentration	pH, 25° C	-	R	<8.0	6.5 to 9.5	6.5 to 8.5	10		-	6.0 to 9.0	5.5 to 9.5	4.0 to 11.0	<4.0 to >11.0
Electronic conductivity	EC, 25° C	mS/m		-	280	45	-		-	150	300	400	>400
Total dissolved solids	TDS	mg/l	R	1000	-	-	1500		-	-	-	-	-
Total Hardness	$CaCO_3$	mg/l		-	-	-	-		-	300	650	1300	>1300
Aluminium	Al	µ g/l	R	200	200	50	200	S	50-200	150	500	1000	>1000
Ammonia	NH_4^+	mg/l	R	1.5	0.5	0.05	0.5		-	1.5	2.5	5.0	>5.0
	N	mg/l		1.0		0.04	0.4		-	1.0	2.0	4.0	>4.0
Antimony	Sb	µ g/l	P	5	3	-	10	C	6	50	100	200	>200
Arsenic	As	µ g/l		10	10	-	50	C	50	100	300	600	>600
Barium	Ba	µ g/l	P	700	-	100	-	C	2000	500	1000	2000	>2000
Berylium	Be	µ g/l		-	-	-	-	C	4	2	5	10	>10
Bismuth	Bi	µ g/l		-	-	-	-		-	250	500	1000	>1000
Boron	B	µ g/l		300	300	1000	-		-	500	2000	4000	>4000
Bromate	BrO_3^-	µ g/l		-	10	-	-	P	10	-	-	-	-
Bromine	Br	µ g/l		-	-	-	-		-	1000	3000	6000	>6000
Cadmium	Cd	µ g/l		3	5	-	5	C	5	10	20	40	>40
Calcium	Ca	mg/l		-	-	100	-		-	150	200	400	>400
	$CaCO_3$	mg/l		-	-	250	-		-	375	500	1000	>1000
Cerium	Ce	µ g/l		-	-	-	-		-	1000	2000	4000	>4000
Chloride	Cl^-	mg/l	R	250	-	25	-	S	250	250	600	1200	>1200
Chromium	Cr	µ g/l	P	50	50	-	50	C	100	100	200	400	>400
Cobalt		µ g/l		-	-	-	-		-	250	500	1000	>1000
Copper after 12 hours in pipe	Cu	µ g/l	P	2000	2	100	-	C	TT##	500	1000	2000	>2000
		µ g/l		-	-	3000[1]	-	S	1000	-	-	-	-
Cyanide	CN^-	µ g/l		70	50	-	50	C	200	200	300	600	>600
Fluoride	F^-	mg/l		1.5	1.5	-	at 8 to 12 °C: 1.5	C	4	1.5	2.0	3.0	>3.0
		mg/l		-	-	-	at 25 to 30 °C: 0.7	P,S	2	-	-	-	-
Gold	Au	µ g/l		-	-	-	-		-	2	5	10	>10
Hydrogen sulphide	H_2S	µ g/l	R	50	-	-	undetectable		-	100	300	600	>600
Iodine	I	µ g/l		-	-	-	-		-	500	1000	2000	>2000
Iron	Fe	µ g/l	R	300	200	50	200	S	300	100	1000	2000	>2000
Lead	Pb	µ g/l		10	10	-	50	C	TT#	50	100	200	>200
Lithium	Li	µ g/l		-	-	-	-		-	2500	5000	10000	>10000
Magnesium	Mg	mg/l		-	-	30	50		-	70	100	200	>200
	$CaCO_3$	mg/l		-	-	7	12		-	290	420	840	>840
Manganese	Mn	µ g/l	P	500	50	20	50	S	50	50	1000	2000	>2000
Mercury	Hg	µ g/l		1	1	-	1	C	2	5	10	20	>20
Molybdenum	Mo	µ g/l		70	-	-	-		-	50	100	200	>200
Nickel	Ni	µ g/l		20	20	-	50		-	250	500	1000	>1000
Nitrate*	NO_3^-	mg/l	P	50	50	25	50		45	45	90	180	>180
	N	mg/l		-	-	5	11	C	10	10	20	40	>40
Nitrite*	NO_2^-	mg/l		3	0.1	-	0.1		3	-	-	-	-
	N	mg/l		-	-	-		C	1	-	-	-	-
Oxygen, dissolved	O_2	% sat.		-	50	-	-		-	-	-	-	-
Phosphorus	P_2O_5	µ g/l		-	-	400	5000		-	-	-	-	-
	PO_4^{3-}	µ g/l		-	-	300	3350		-	-	-	-	-
Potassium	K	mg/l		-	-	10	12		-	200	400	800	>800
Selenium	Se	µ g/l		10	10	-	10	C	50	20	50	100	>100
Silver	Ag	µ g/l		-	-	-	10	S	100	20	50	100	>100
Sodium	Na	mg/l	R	200	-	20	175		-	100	400	800	>800
Sulphate	SO_4^{2-}	mg/l	R	250	250	25	250	S	250	200	600	1200	>1200
Tellurium	Te	µ g/l		-	-	-	-		-	2	5	10	>10
Thallium	Tl	µ g/l		-	-	-	-	C	2	5	10	20	>20
Tin	Sn	µ g/l		-	-	-	-		-	100	200	400	>400
Titanum	Ti	µ g/l		-	-	-	-		-	100	500	1000	>1000
Tungsten	W	µ g/l		-	-	-	-		-	100	500	1000	>1000
Uranium	U	µ g/l		-	-	-	-	P	20	1000	4000	8000	>8000
Vanadium	V	µ g/l		-	-	-	-		-	250	500	1000	>1000
Zinc after 12 hours in pipe	Zn	µ g/l	R	3000	-	100	-	S	5000	1000	5000	10000	>10000
		µ g/l		-	-	5000	-		-	-	-	-	-

P: Provisional
R: May give reason to complaints from consumers

C: Current. P: Proposed. S: Secondary.
T#: Treatment technique in lieu of numeric MCL.
TT##: treatment technique triggered at action level of 1300 µ g/l

Table 4.5: R553 Regional Standards for Industrial Effluent, in Government Gazette No 217 dated 5 April 1962.

Colour, odour and taste	The effluent shall contain no substance in concentrations capable of producing colour, odour or taste	
pH	Between 5.5 and 9.5	
Dissolved oxygen	At least 75% saturation	
Typical faecal coli	No typical faecal coli per 100 ml	
Temperature	Not to exceed 35 °C	
Chemical demand oxygen	Not to exceed 75 mg/l after applying a correction for chloride in the method	
Oxygen absorbed	Not to exceed 10 mg/l	
Total dissolved solids (TDS)	The TDS shall not have been increased by more than 500 mg/l above that of the intake water	
Suspended solids	Not to exceed 25 mg/l	
Sodium (Na)	The Na level shall not have been increased by more than 50 mg/l above that of the intake water	
Soap, oil and grease	Not to exceed 2.5 mg/l	
Other constituents	Residual chlorine	0,1 mg/l as Cl
	Free & saline ammonia	10 mg/l as N
	Arsenic	0,5 mg/l as As
	Boron	1,0 mg/l as B
	Hexavalent Cr	0,05 mg/l as Cr
	Total chromium	0,5 mg/l as Cr
	Copper	1,0 mg/l as Cu
	Phenolic compounds	0,1 mg/l as phenol
	Lead	1,0 mg/l as Pb
	Cyanide and related compounds	0,5 mg/l as CN
	Sulphides	1,0 mg/l as S
	Fluorine	1,0 mg/l as F
	Zinc	5,0 mg/l as Zn

4.4.2 Applicable International Standards

The Constitution of the Republic of Namibia, the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) and the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 as well as other associated laws with respect to exploration, petroleum exploration and production, land, energy, labour and health and safety all provides for the mechanism of assessing key issues associated with development projects in Namibia.

The only key missing components to the regulatory frameworks in Namibia are benchmarks, limits, standards, and guidelines with respect to gaseous, liquid, and solid emissions linked to oil and gas exploration and production.

In the absence of national gaseous, liquid, and solid emission limits for Namibia, the proposed project shall target the Multilateral Investment Guarantee Agency (MIGA) gaseous effluent emission level and liquid effluent emission levels (Table 4.6) and all other applicable international best industry practices which are based on the Best Practicable Environmental Option (BPEO).

Noise abatement measures must target to achieve either the levels shown in Table 4.7 or a maximum increase in background levels of 3 dB (A) at the nearest receptor location off-site (MIGA guidelines).

Table 4.6: Liquid effluent emission levels (MIGA /IFC).

Pollutant	**Max. Value**
pH	6-9
Total suspended solids	50 mg/l
Total metals	10 mg/l
Phosphorous (P)	5 mg/l
Fluoride (F)	20 mg/l
Cadmium (Cd)	0.1 mg/l

Table 4.7: Noise emission levels (MIGA /IFC).

	Maximum Allowable Leq (hourly), in dB(A)	
Receptor	Day time (07:00 – 22:00)	Night time (22:00 – 07:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

5. RECEIVING ENVIRONMENT

5.1 Climatic and Topographic Settings

The climate of the project area is warm – hot for most of the year. Summer temperatures on average range between a minimum temperature of 20°C to maximum day temperatures of 30-35°C for 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. Rainfall mostly falls during summer with no rainfall of significance between May to August. Rain occurs between December to March, with the highest rainfall peaking in January and February (Fig. 5.1). Annual rainfall figures are variable with the lowest rainfall recorded at 221mm/annum and the highest rainfall of 1204mm/annum. The highest rainfall in one day was 190mm, measured at Rupara. Rainfall in the Kavango East and West Regions, like the rest of Namibia, is highly variable spatially and temporally. The mean annual rainfall is highly variable between 400 and 600 mm per year (Fig. 5.1). The distribution of rainfall is extremely seasonal with all the rain falling in summer from October to April and characterised by heavy occasional thunderstorms (Fig. 5.1). The mean annual gross evaporation is between 2600-2800 mm (Fig. 5.1).

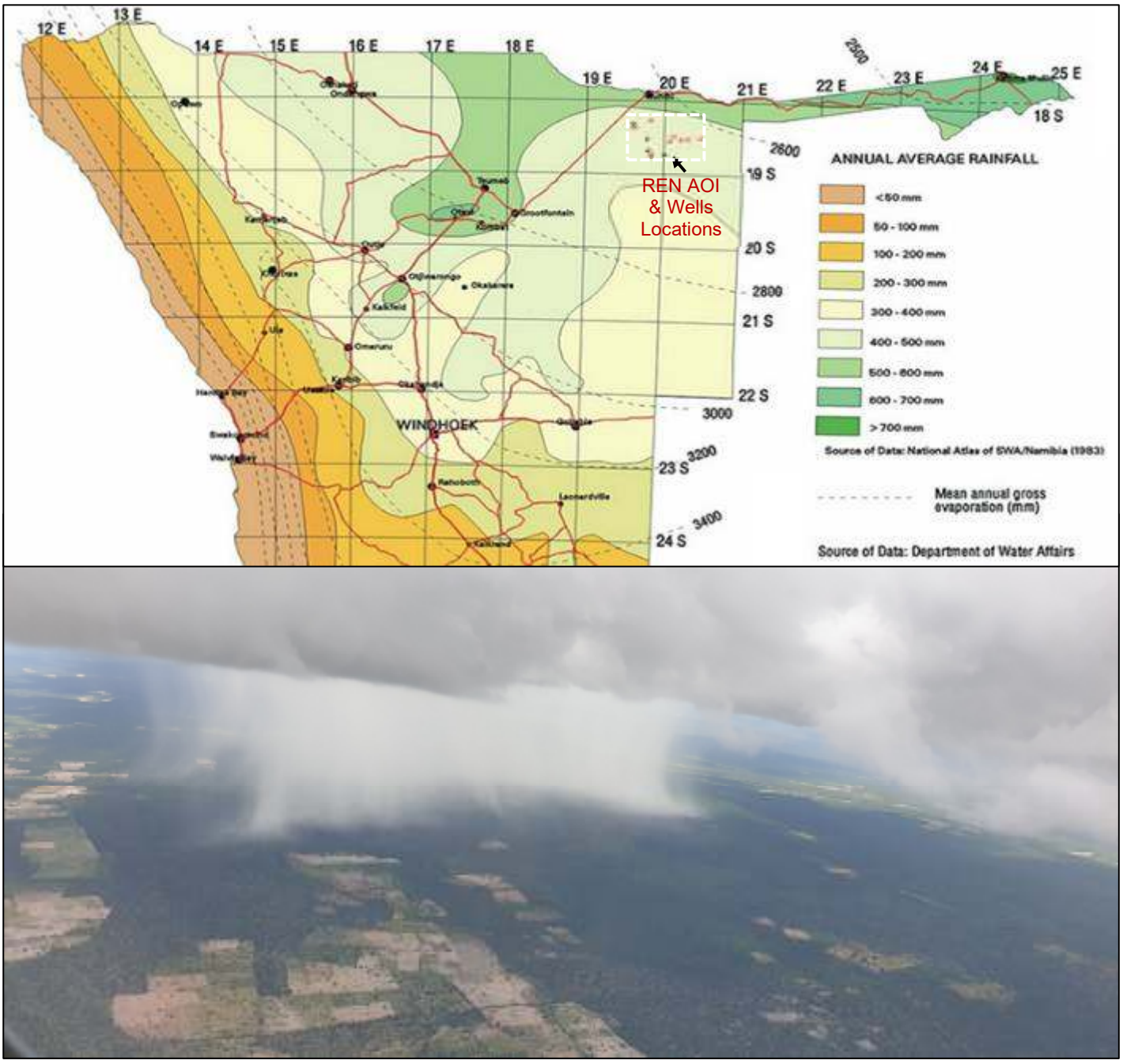


Figure 5.1: Climatic patterns of Namibia showing the locations of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 in Kavango West and East Regions.

The Kalahari Group sediments that dominate the surficial topographic features of the Kavango Sedimentary Basin form part of the greater Kalahari Basin stretching into Angola, Zambia, Zimbabwe, Botswana, and South Africa (Fig. 5.2). The AOI is a flat gently sloping landscape formed by a sea of windblown sands. The only positive relief are undulating, east-west striking, permanent dunes prominent in the west of the Omatako Omuramba and further east, closer to Botswana (Figs. 5.2-5.5). Dune crests are approximately between 10-15m high with interstitial dune valleys between 1-2km wide. The terrain, from east to west, has a height difference of approximately 100m over a 300km distance, with heights of approximately 1200 metres above mean sea level (mamsl) in the west falling to approximately 1080 mamsl in the east at the border with Botswana (Fig. 5.3). The general topographic profile of the project area from south to north has heights of 1200 mamsl in the south falling to 1070 mamsl in the north close to and beyond the Okavango River.

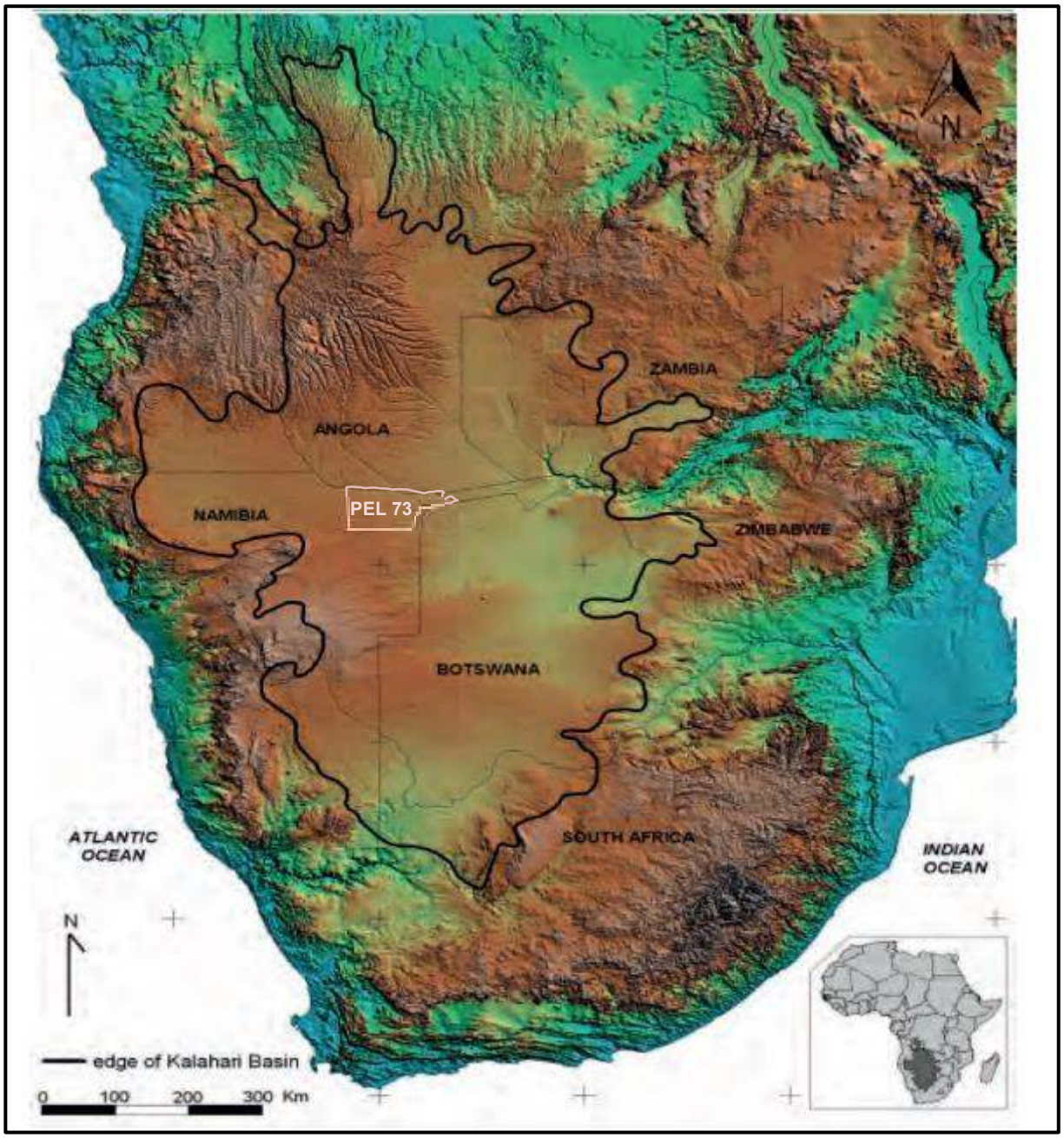


Figure 5.2: Lateral extent of Kalahari Group sediments showing the regional location of PEL No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 falling within the newly discovered Kavango Sedimentary Basin forming part of the greater Kalahari Basin stretching into Angola, Zambia, Zimbabwe, Botswana, and South Africa (Modified Source: Haddon, 2005).

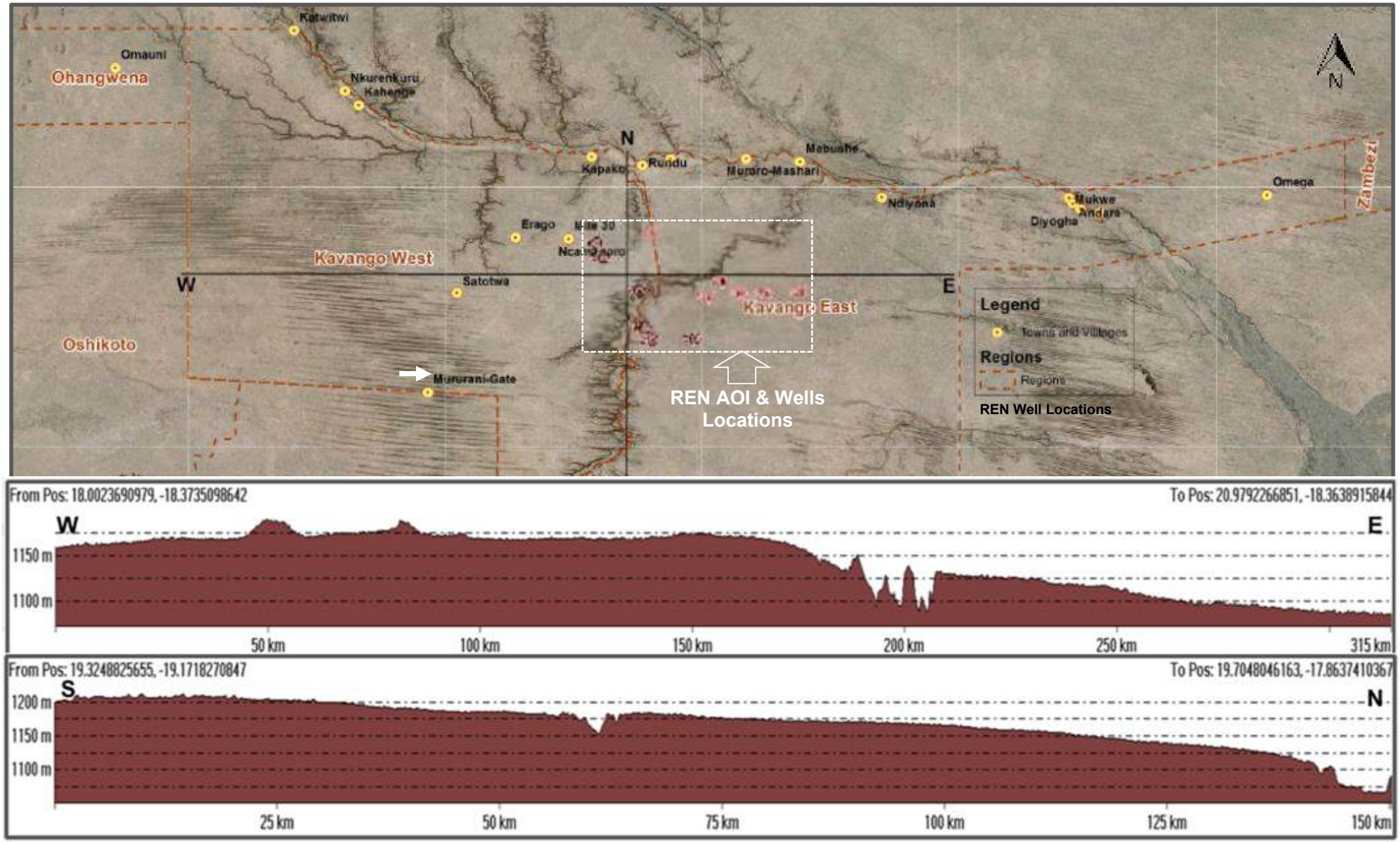


Figure 5.3: Location of the proposed exploration and appraisal wells with respect to the general topography the project area with relief features such as the Omatako Omuramba valley and other smaller river valleys joining the Okavango River from the south (Julius, 2021).

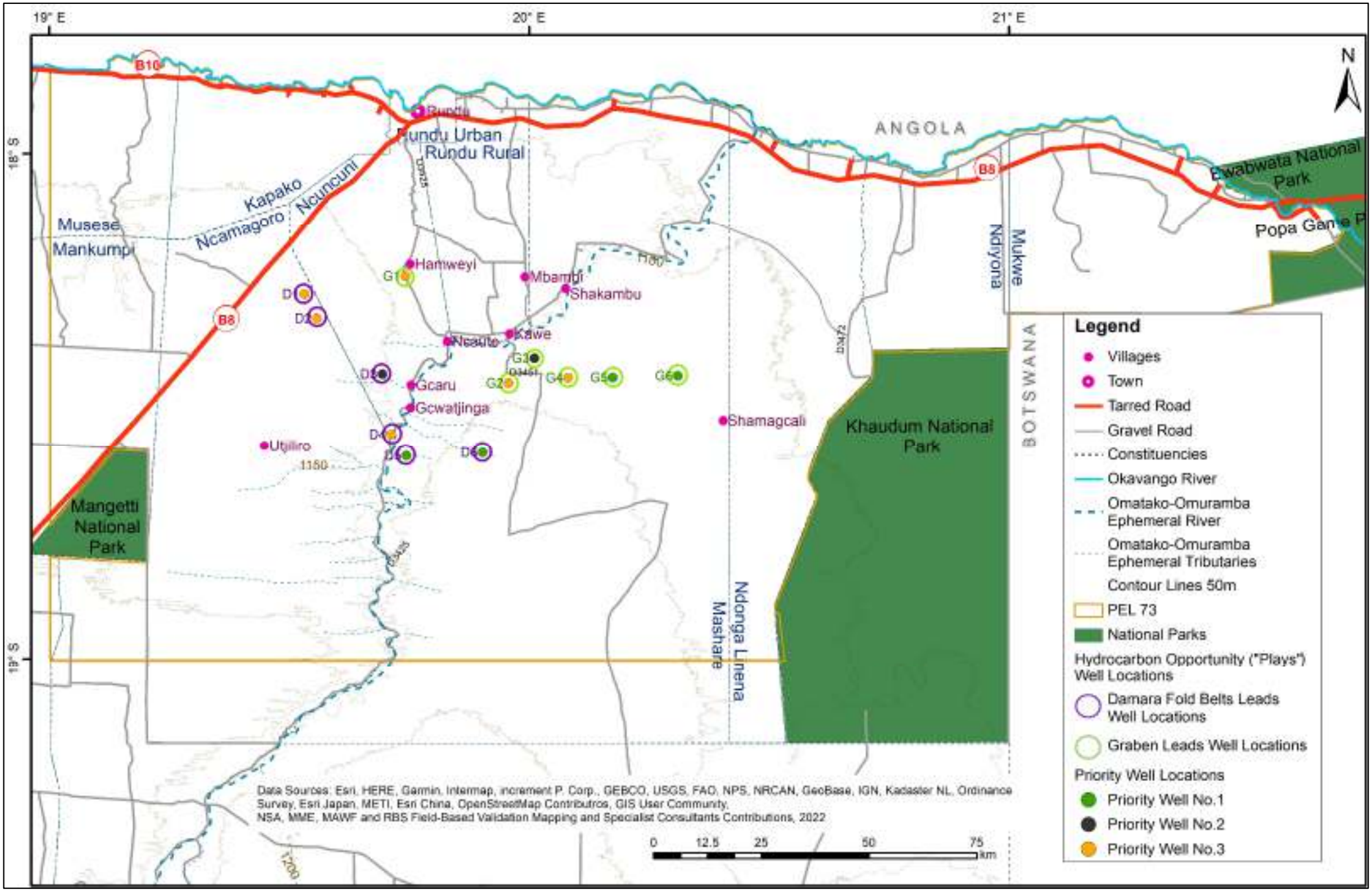


Figure 5.4: Regional topographic setting around PEL No. 73 with respect to the proposed exploration and appraisal wells locations.

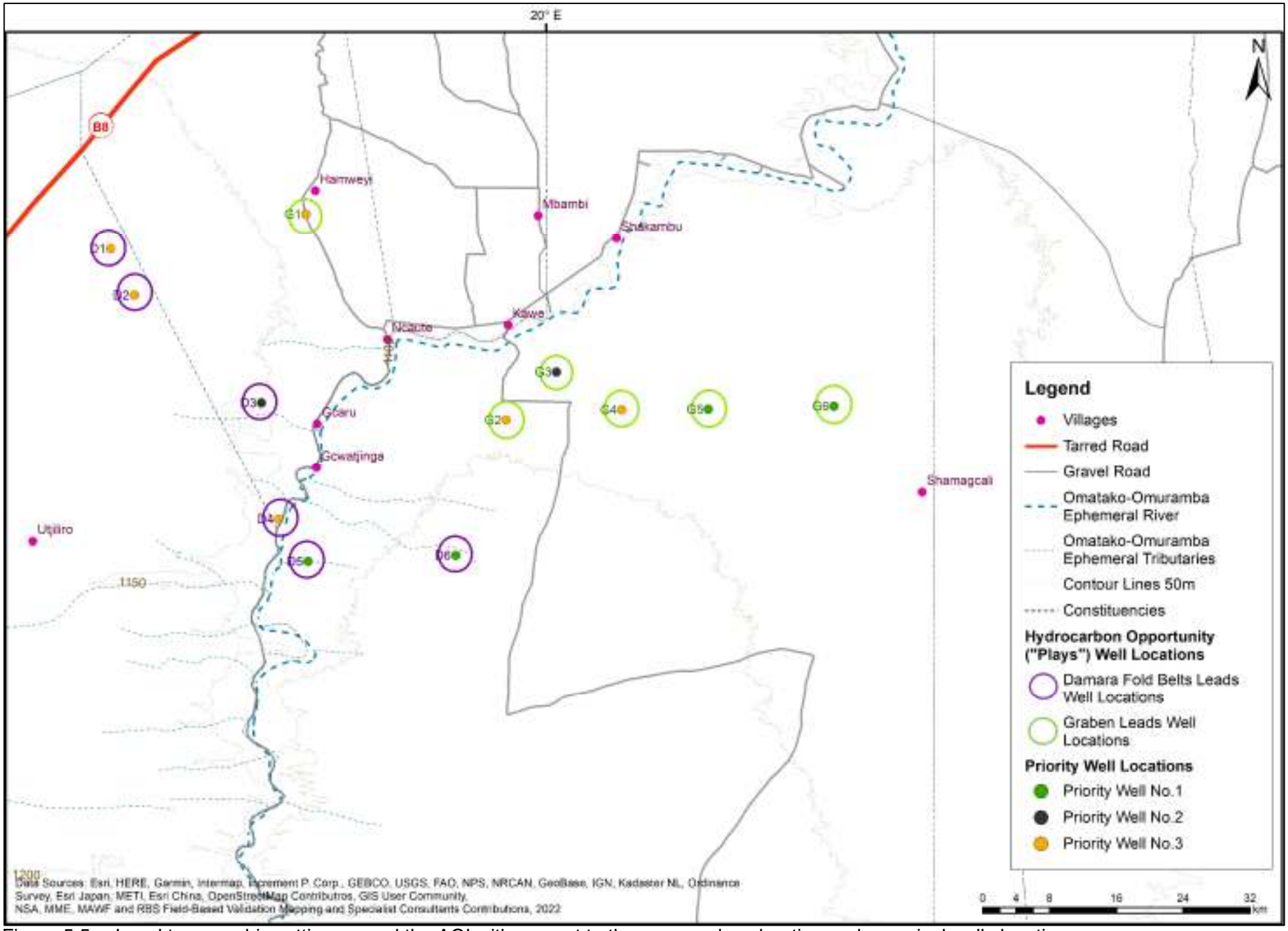


Figure 5.5: Local topographic setting around the AOI with respect to the proposed exploration and appraisal wells locations.

5.2 Regional and Local Land Uses

5.2.1 Regional Land Use

The landscape around the proposed exploration and appraisal wells sites is characterised by gentle undulating sandy topography of the forested / vegetated sandy Kalahari Dune Belt. The well locations fall within the greater Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) initiative (Fig. 5.6). The KAZA TFCA initiative covering Angola, Botswana, Namibia, Zambia, and Zimbabwe was created in cooperation with Peace Parks Foundation and the World-Wide Fund for Nature.

In July 2006, the KAZA TFCA was endorsed as a Southern Africa Development Community (SADC) project, and on 7th December 2006 the Ministers of Environment and Tourism of the five partner countries signed a Memorandum of Understanding at Victoria Falls, Zimbabwe, providing for work towards the establishment of the KAZA TFCA initiative. KAZA TFCA is a multiple land use regional transboundary conservation initiative with a common vision of promoting and supporting sustainable livelihoods through coexistence and utilisation of multiple resource and resources areas including National Parks, Game Reserves, Forest Reserves, Conservancies, Game/Wildlife Management Areas and Communal lands (Fig. 5.6).

The KAZA TFCA would also promote cross border tourism, linking some of the world's premier tourism destinations, including the Victoria Falls in Zimbabwe and the Okavango Delta in Botswana. The Namibian component of KAZA TFCA plays a pivotal role in providing migration routes for wildlife between Angola, Botswana, and Zambia (www.met.gov.na). The livelihoods of ordinary local people within KAZA TFCA inclusive of the project areas are highly dependent on seasonal subsistence agriculture, animal husbandry, fishing, natural resource harvesting, tourism, trading, and hunting.

The overall vision of KAZA TFCA is still a working progress because the rightful beneficiaries who are the rural local communities continue to languish in inherited generational poverty right at the doorsteps of KAZA, as seen around the local villages in Kavango West and East Regions such as Ncaute, Kawe, Mbambi, Makandina, Mutwegombahe, Mbambi, Ncuncuni, Cuma, Hamweyi , Ncaute, Gcauru Sivaradi, Shakambu, Cumezawo and as well as at Masambo, Omega 1 in Bwabwata National Park, Western Zambezi Region situated right in the core of the KAZA TFCA (Figs. 5.6-5.10). As part of the socioeconomic profile of the AOI in PEL No. 73, extensive consultations, meetings, and interviews with the local communities regarding various local socioeconomic opportunities including the role of KAZA TFCA, have been conducted since January 2021 and continue to be undertaken to this day.

Based on the results of the results of the ongoing socioeconomic field-based assessments being undertaken and community consultation activities conducted in the AOI, local communities residing in AOI falling within the KAZA boundary do not know that they are living within KAZA TFCA. During the socioeconomic fieldwork and community consultations that the RBS Team continue to undertake in the AOI of PEL 73, local community members have been and continue to be interviewed to solicit their views and knowledge regarding the ongoing oil and gas exploration operations in the local areas falling within the KAZA TFCA. The respondents included the headman, representatives of VDC members and individuals in household and with the exception of the Community Forest and Conservancy leaderships, many of the local residents do not know what KAZA involved, majority have never heard of the word KAZA concept.

Based on the results of the socioeconomic assessments undertaken in the AOI within PEL 73 since 2021, there is very high inherited generational poverty for the rural local communities that are supposed to be thriving within the boundary of KAZA TFCA. This is evident for all to see in most rural villages falling within the AOI in PEL 73. The high-value tourism benefits currently being derived by certain businesses in the name of KAZA TFCA are in the hands of international, regional, and historically privileged KAZA TFCA countries nationals of well-connected tourism related business operators and selected NGOs consultants linked to various Community Based Natural Resource Management (CBNRM) programs, and all working together in safeguarding their interests against the poor indigenous rural masses who genuinely deserve a sizeable piece of the high value tourism products of the KAZA TFCA. Local communities within the AOI do not know what KAZA TFCA is all about and the majority have never even heard the word "KAZA TFCA". It remains to be seen if or when such politically envisioned KAZA TFCA tourism benefits will ever make some positive socioeconomic

impacts on the lives of the highly deprived rural communities who were meant to be the key beneficiaries of the KAZA TFCA political vision. The reality is, the KAZA TFCA tourism and all the related economic benefits have never reached and will probably never reach the rural communities in KAZA TFCA countries and Namibia included.

Unless there is a serious regional political shift with respect to the broadening of the economic space and opportunities, rural communities including those falling within the AOI portion of the KAZA TFCA boundary will continue to swim in inherited generational poverty because the privileged elite club currently holding the keys to the economic gates of the KAZA TFCA tourism products will never want to genuinely share the economic benefits.

The indigenous knowledge, cultures and resources of the rural communities will merely continue to be used as vehicles for high-value tourism and economic products for increased revenue and accumulation of wealth by selected few international, regional, and historically privileged nationals of well-connected tourism related business operators and selected NGOs consultants especially in Namibia.

5.2.2 Land Use of the D1-D6 and G1-G6 Well Sites AOI

The overall AOI and the proposed exploration and appraisal wells locations Nos. D1-D6 and G1-G6 well locations fall in the communal areas of the Ncamangoro, and Ncuncuni Constituencies of Kavango West Region and Mashare Constituency of Kavango East Region (Figs. 5.7-5.10). Formal proclaimed national parks within the general area of the AOI and PEL No. 73 are: Bwabwata, Khaudum and Mangetti National Parks (Figs. 5.7-5.10).

Ncamangoro, and Ncuncuni Constituencies fall within the boundaries of the Mbunza traditional authority while the Mashare Constituency falls within the Sambyu Traditional Authority (Figs. 5.7-5.10). Each of the proposed exploration and appraisal wells to be drilled will cover a footprint area of less than 3Ha within the AOI and not the entire PEL 73 or the entire AOI.

According to the Namibian Association of CBNRM Support Organisations (NACSO), there are 2 community forests in Kavango West (Kahengu and Katope community forests) and 10 community forests in Kavango East (Ncumacara, Ncamagoro, Mbeyo, Gcwatjinga, Ncaute, Cuma, Likwaterera, Hans Kanyinga, George Mukoya and Muduva Nyangana community forests) (Figs. 5.7 and 5.8). George Mukoya and Kapinga Kamwalye are the two (2) community conservancies situated to the eastern boundary and central parts of the AOI (Figs. 5.7 and 5.8).

George Mukoya Conservancy is located on the northern border of Khaudum National Park, adjacent to Muduva Nyangana Conservancy. The Kapinga kaMwalye Conservancy is situated in the Shambyu tribal district and falls into the two political constituencies of Mashare and Rundu Rural in the Kavango East Region. The communal conservancy covers an area of 1301 km^2 and is situated approximately 20 km east of Rundu. The southern parts of the targeted AOI are fenced under the communal land use / government resettlement programme (Figs. 5.7-5.10).

The land uses in the general area is mainly communal / subsistence farming comprising cattle, donkeys and seasonal crop farming which sometimes involves slash and burn practices and clearing of larger tracks of pristine forestry.

Subsistence seasonal (January to April) crop farming of sorghum, millet and maize are centred on widely spaced communal villages situated along the Omatako- Omuramba Ephemeral River Channel (Plates 5.1- 5.3). Increasingly, local areas are being cleared for both agriculture and new settlements with villages centred around communal water points where water is readily available (Plates 5.1-5.3).

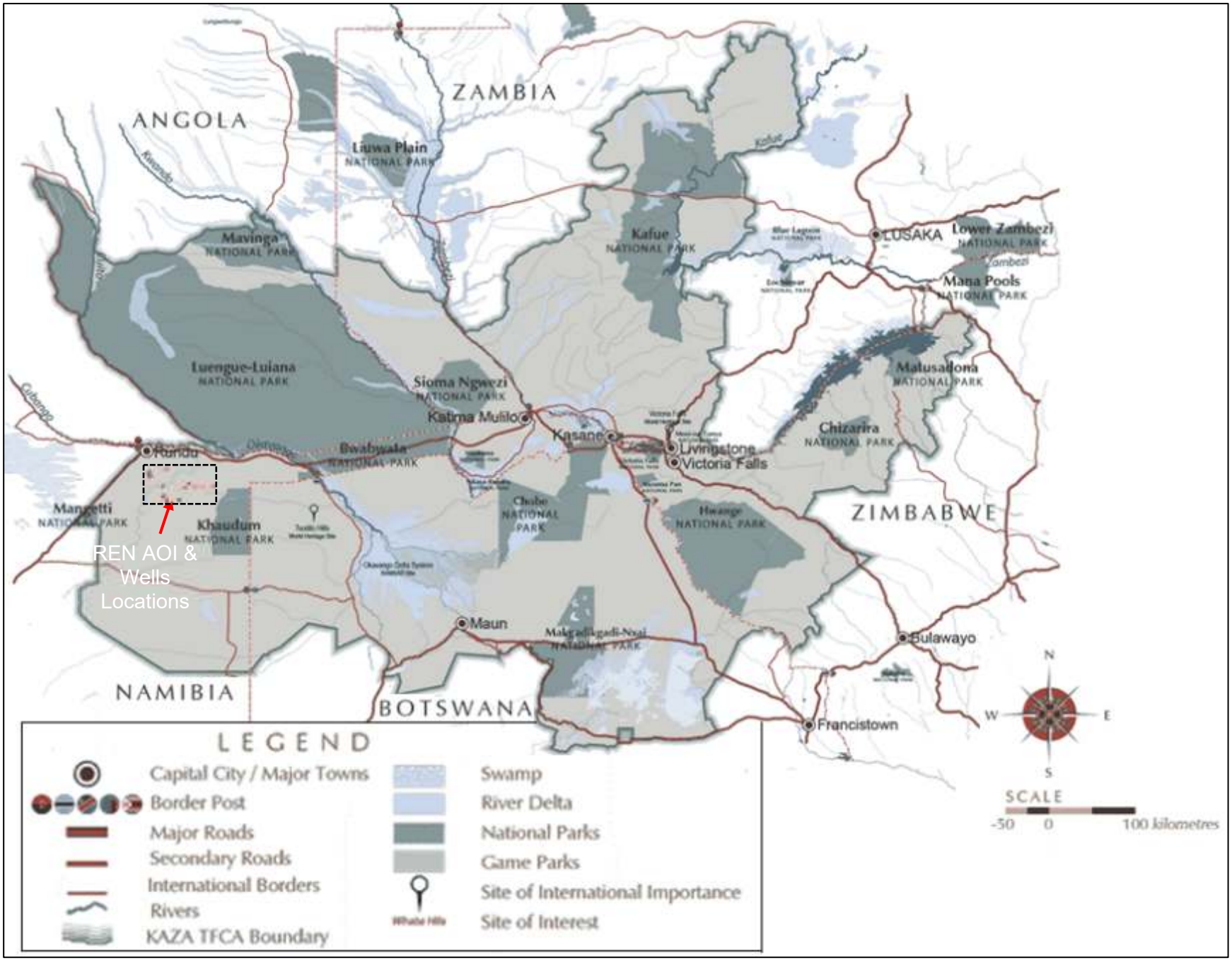


Figure 5.6: The Transboundary Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) initiative and location of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 (www.kavangozambezi.org/en/).

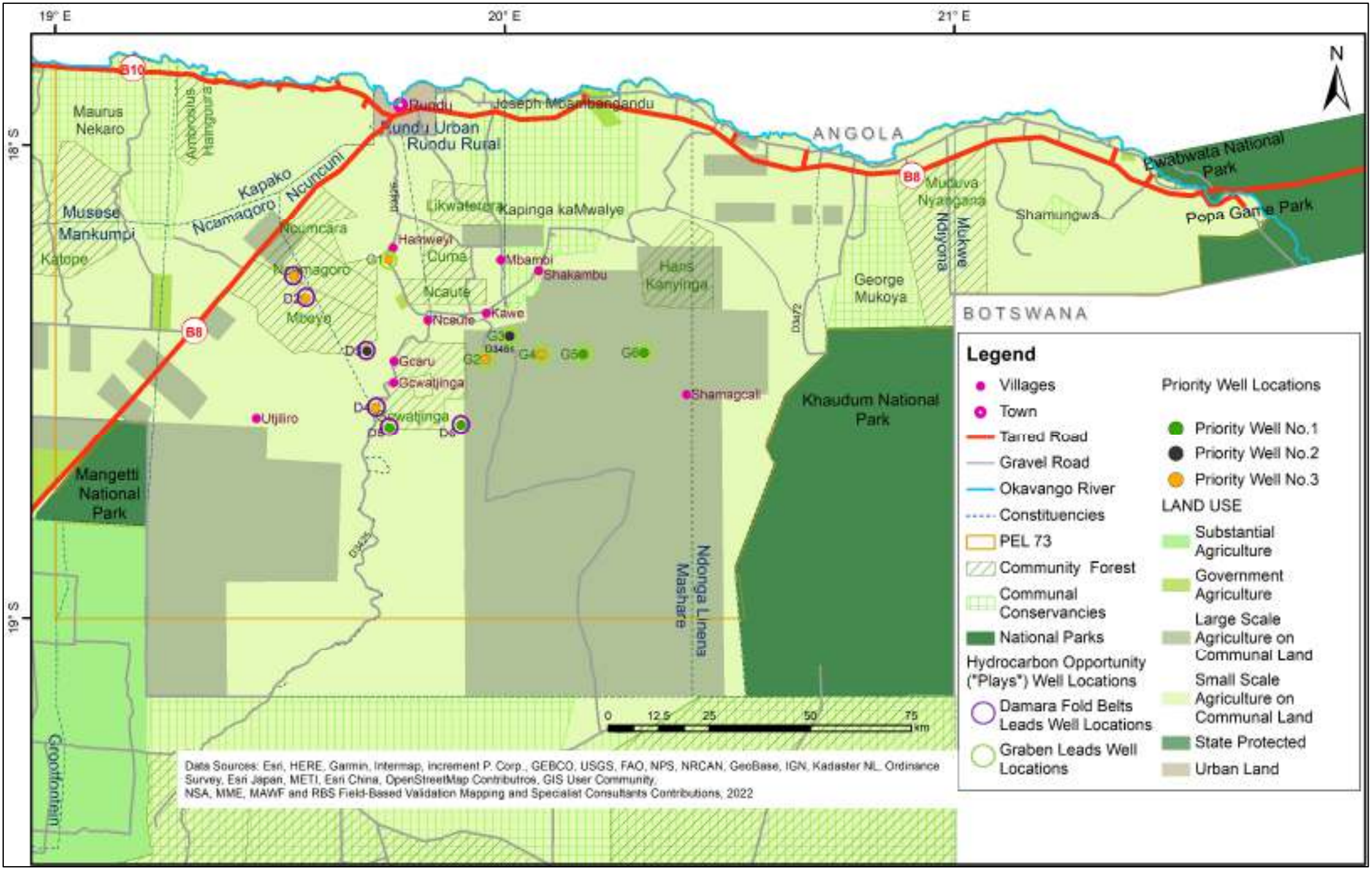


Figure 5.7: Regional land use around PEL No. 73 with respect to the proposed new exploration and appraisal wells sites.

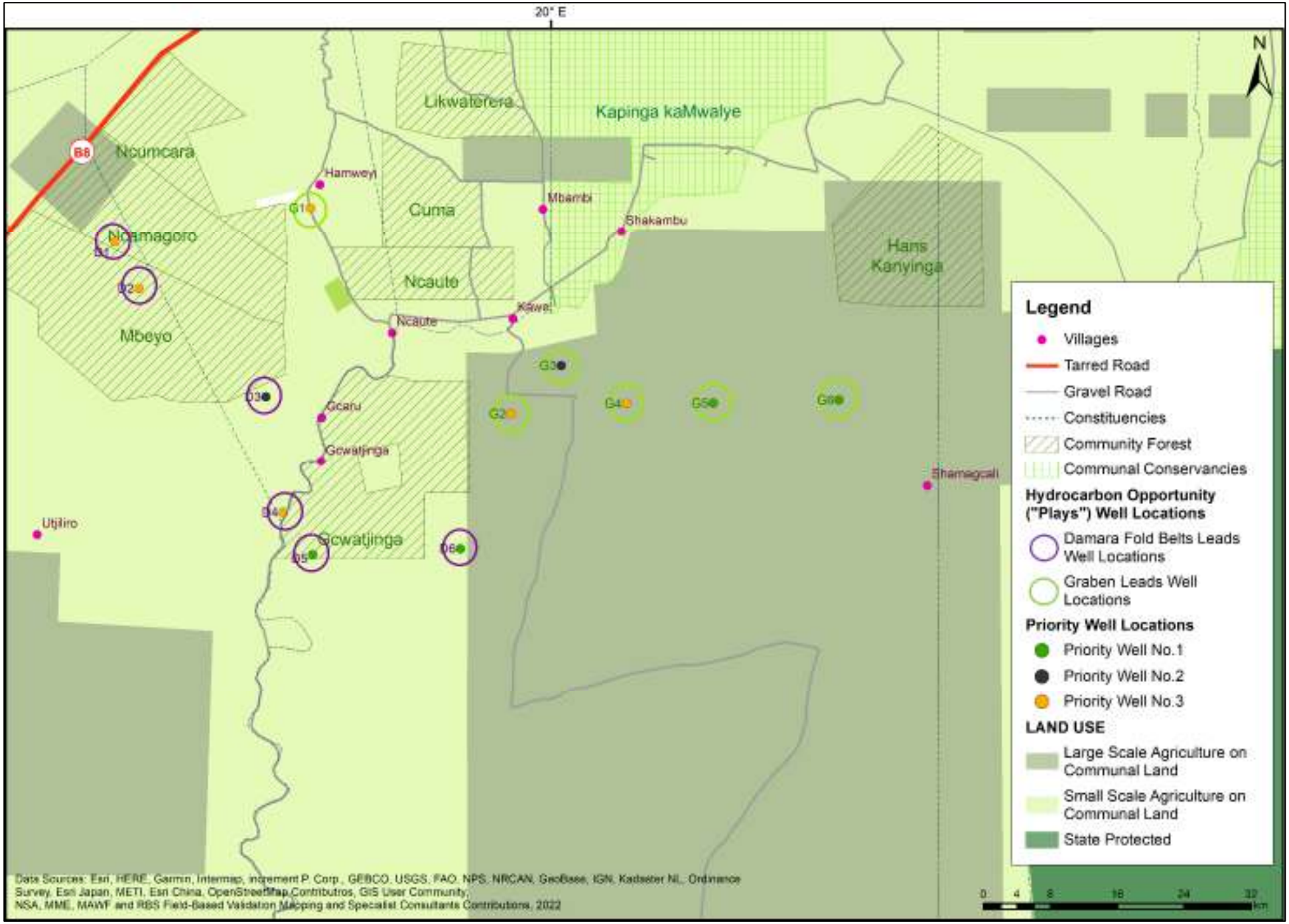


Figure 5.8: Local land use around the AOI with respect to the proposed new exploration and appraisal wells sites.

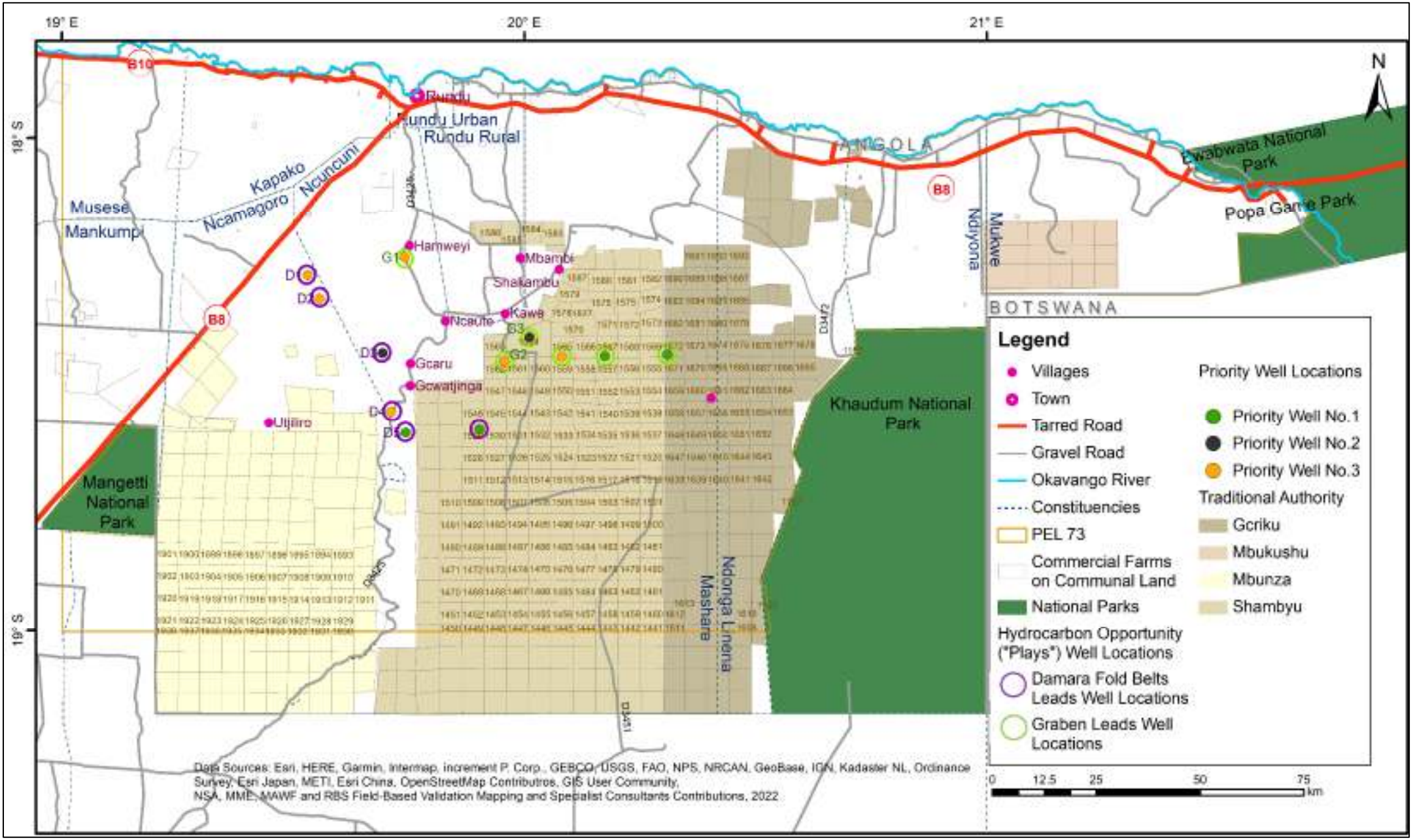


Figure 5.9: Commercial farms on communal land and traditional authority boundaries around PEL 73 with respect to the proposed new exploration and appraisal wells sites.

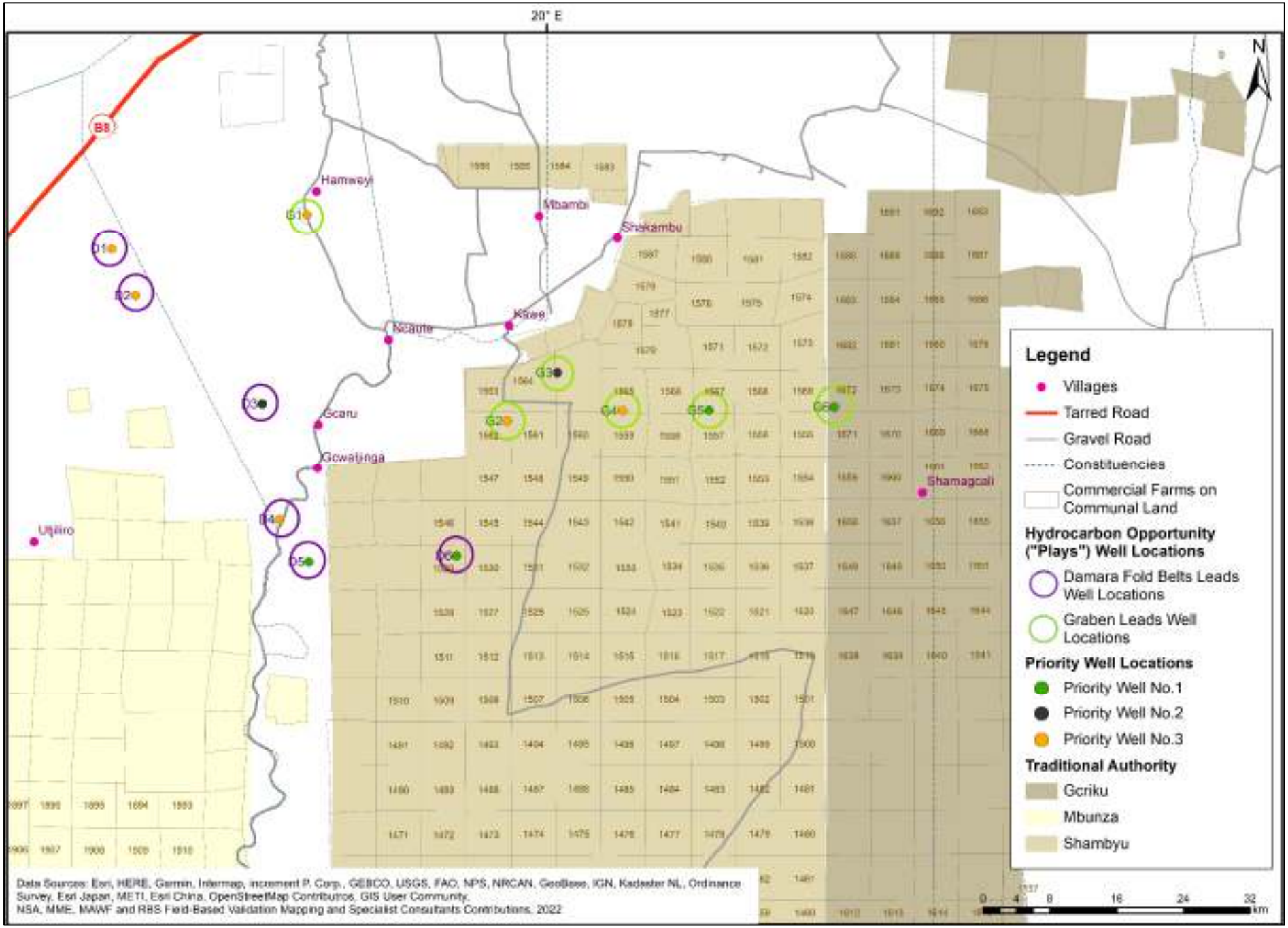


Figure 5.10: Commercial farms on communal land and traditional authority boundaries around the AOI with respect to the proposed new exploration and appraisal wells sites.

Plate 5.1: Drone view to the southeast at Makandina showing the extensive forest clearing and fossilised Omatako–Omuramba Ephemeral Channel cleared and fully cultivated for subsistence crop production.

Plate 5.2: Drone view to the southwest at Makandina showing the extensive forest clearing and fossilised Omatako–Omuramba Ephemeral Channel cleared and fully cultivated for subsistence crop production between Makandina and Ncaute.

Plate 5.3: Drone view to the south at Kawe showing extensive forest clearing and fossilised Omatako–Omuramba Ephemeral Channel cleared for settlements and subsistence crop production commonly found around proposed D1-D6 and G1-G6 exploration and appraisal wells sites.

5.3 Flora, Fauna, and Habitats of the Proposed Wells Sites

5.3.1 Fauna and Flora Assessment Process

A comprehensive and intensive literature review (i.e., desktop study) regarding the vertebrate fauna (i.e., reptiles, amphibians, mammals and birds) and flora (i.e., trees/shrubs >1m in height and grasses) that could potentially occur in the around the D1-D6 and G1-G6 well sites and accesses areas was conducted by a specialist consultant Peter Cunningham, and this was followed by dry and set seasons field-based assessments conducted in November-December, 2022 and January-February, 2023 periods, respectively.

5.3.2 Approach to the Field Survey

The determination of the actual faunal diversity included the following:

- Small mammal transects to determine small mammal diversity in the area.
- Assess larger mammal presence in the area.
- Reptile and amphibian transects to determine reptile and amphibian diversity in the area.
- Bird transects to determine avian diversity in the area.
- Tree/shrub transects to determine diversity in the area, and.
- Grass transects to determine diversity in the area.

Diurnal reptile transects were conducted along various transects throughout the proposed development area and were not conducted in rigid straight lines, but focused on the habitat viewed as most suitable for reptiles. Reptiles observed were either caught by hand or by using an active capture technique called ‘reptile noosing’ where an extendable fishing rod was fitted with a soft thread noose, positioned over the unsuspecting head of an individual and pulled tight. This technique does not result in the death or injury of the caught specimen. Species caught were identified in situ, photographed and released unharmed at the point of capture.

Amphibians were searched for in areas deemed suitable habitat – e.g. drainage lines, pans, etc. – with species encountered identified in situ.

Small mammal trapping was conducted by active trapping using collapsible aluminium Sherman traps baited with peanut butter and oats. Traps were set at 3 sites throughout the area with thirty (30) traps used and were placed 10m apart for 1 night (i.e. potential maximum of 30 captures within the general area in habitats viewed as potentially suitable for small mammals in the area. Assessing larger mammals from the area was conducted by traversing the area on foot and included actual sightings, tracks, scats and other signs – e.g. borrows, scrapes, carcasses, etc.

Bird transects (variable lengths, directions and times) were conducted on foot and by vehicle following permissible tracks throughout the area (when in vehicle) during daylight hours using binoculars to identify and confirm species. According to the original Terms of Reference (ToR), fieldwork to determine the actual floral diversity was to include the following:

- Trees and shrubs – species composition, and.
- Grasses – species composition.

Vegetation composition was assessed along various transects at each of the proposed sites while a rapid assessment of all the trees and shrubs was also conducted at each site.

5.3.3 Regional Biodiversity Assessment of Fauna and Flora

The proposed D1-D6 and G1-G6 exploration and appraisal well sites and accesses areas fall 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 (Annex 4). The vegetation structure is classified as broadleaved woodlands (Mendelsohn *et al*., 2002).

The most important perennial drainage line in the area is the Okavango River (to the north), while the most important ephemeral drainage line is the Omuramba Omatako which meanders down the centre between Blocks 1819 and 1820 of the PEL 73. The Woodland Biome – of which the PEL 73 area forms part of – is not well represented in the protected area network in Namibia of which only 8.4% of the biome is protected (Barnard 1998).

The general area is regarded as “medium” in overall (all terrestrial species) diversity (Mendelsohn et al. 2002). Overall terrestrial endemism – all species – in the area on the other hand is “low” (Mendelsohn et al. 2002). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “average” with oryx, kudu and giraffe dominant especially in areas bordering the National Parks while the overall diversity and density of large carnivorous mammals (large predators) is determined as “average” with 1-5 species expected – e.g. leopard, brown hyena, spotted hyena, cheetah and wild dog (Mendelsohn et al. 2002).

According to Maggs (1998) there are approximately 4344 higher plant species with the most species being within the grasses (422), composites (Asteraceae) (385), legumes (Fabaceae) (377) and fygies (Mesembryanthemaceae) (177), recorded from Namibia. Total species richness depends on further collecting and taxonomic revisions.

High species richness is found in the Okavango, Otavi/Karsveld, Kaokoveld, southern Namib and Central Highland (Windhoek Mountains) areas. Endemic species – approximately 687 species in total – are manly associated with the Kaokoveld (north-western) and the succulent Karoo (south-western) Namibia. The major threats to the floral diversity in Namibia are: Conversion of the land to agriculture (with associated problems), and poorly considered development (Maggs 1998, Mendelsohn *et al*., 2002).

A large variety of deciduous trees are found in the Savannah and Woodlands [Northern Kalahari area] vegetation type. The grasses are usually hard and unpalatable in this area with Anthephora pubescens, Brachiaria nigropedata and Schmidtia pappophoroides viewed as the climax grasses in the open savannah areas (Giess 1971).

The general area has a “medium” plant diversity of between 300-399 species although the Okavango River to the north has a higher diversity (400-499 species) (Figs. 5.11-5.14 and Annex 4). The endemism is viewed as “low” throughout with no species viewed as endemic (Mendelsohn et al. 2002). Simmons, (1998a) puts the plant endemism in the general area at between 1-10 species depending on the locality. These estimates are limited to “higher” plants as information regarding “lower” plants is sparse.

The greatest variants affecting the diversity of plants are habitat and climate with the highest plant diversity generally associated with high rainfall areas. Pockets of high diversity are found throughout Namibia in “unique” habitat – often transition zones – e.g. mountains, inselbergs, etc. – and riparian areas.

Furthermore, Mendelsohn et al. (2002) views the overall plant production as “very to extremely high” while the variation in plant production is mostly “very low to low” (0-10%) although dependant on the location. The grazing potential is viewed as “low to average” in the general area while the browse potential is viewed as “good”.

Bush thickening (encroachment) is not viewed as problematic in the general area (Bester 1996, Cunningham 1998). The risk of farming is viewed as “low” with the tourism potential viewed as “average to high” (Mendelsohn et al. 2002).

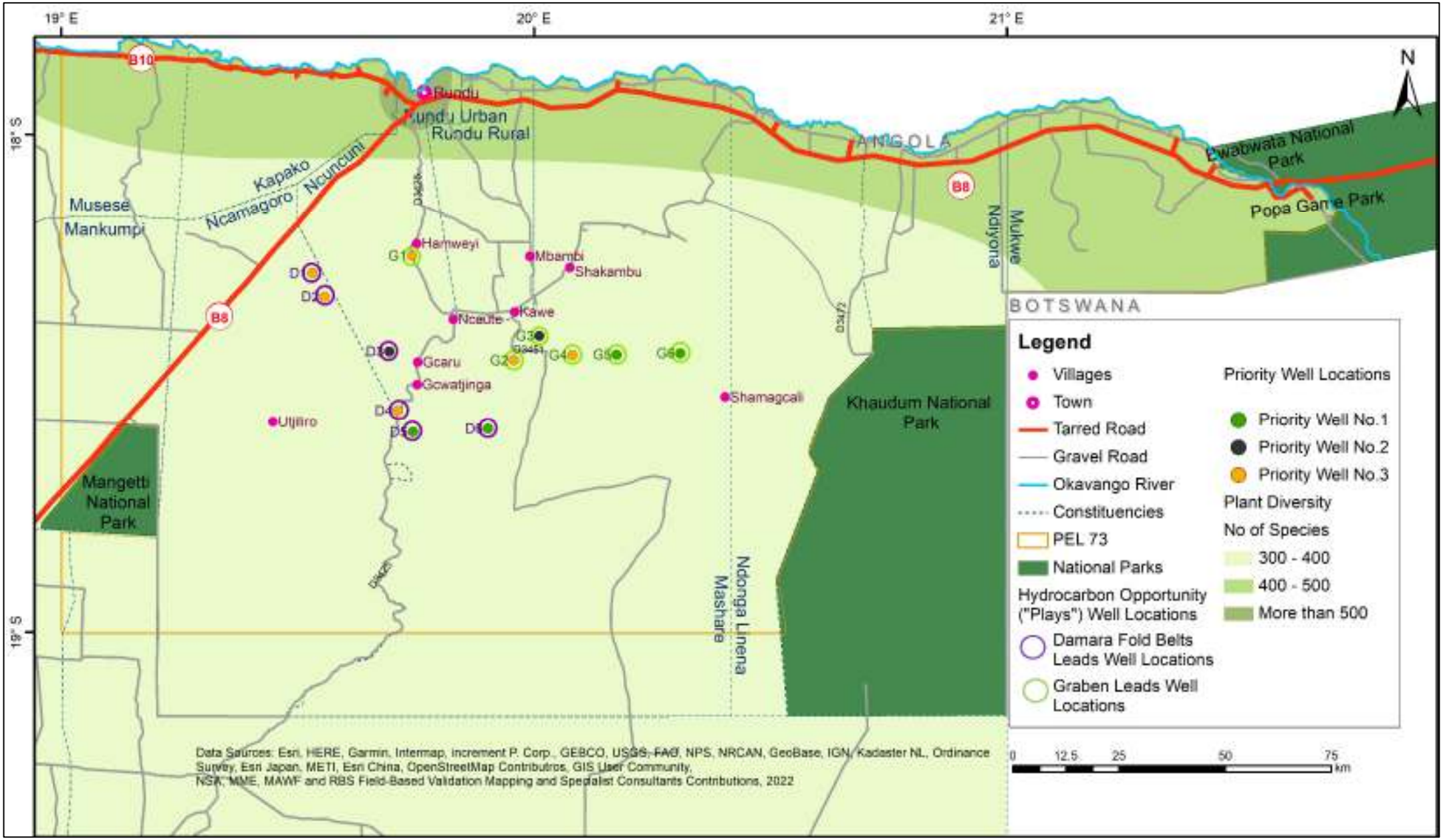


Figure 5.11: Regional plant diversity around the AOI in PEL 73 with respect to the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 well site and access areas.

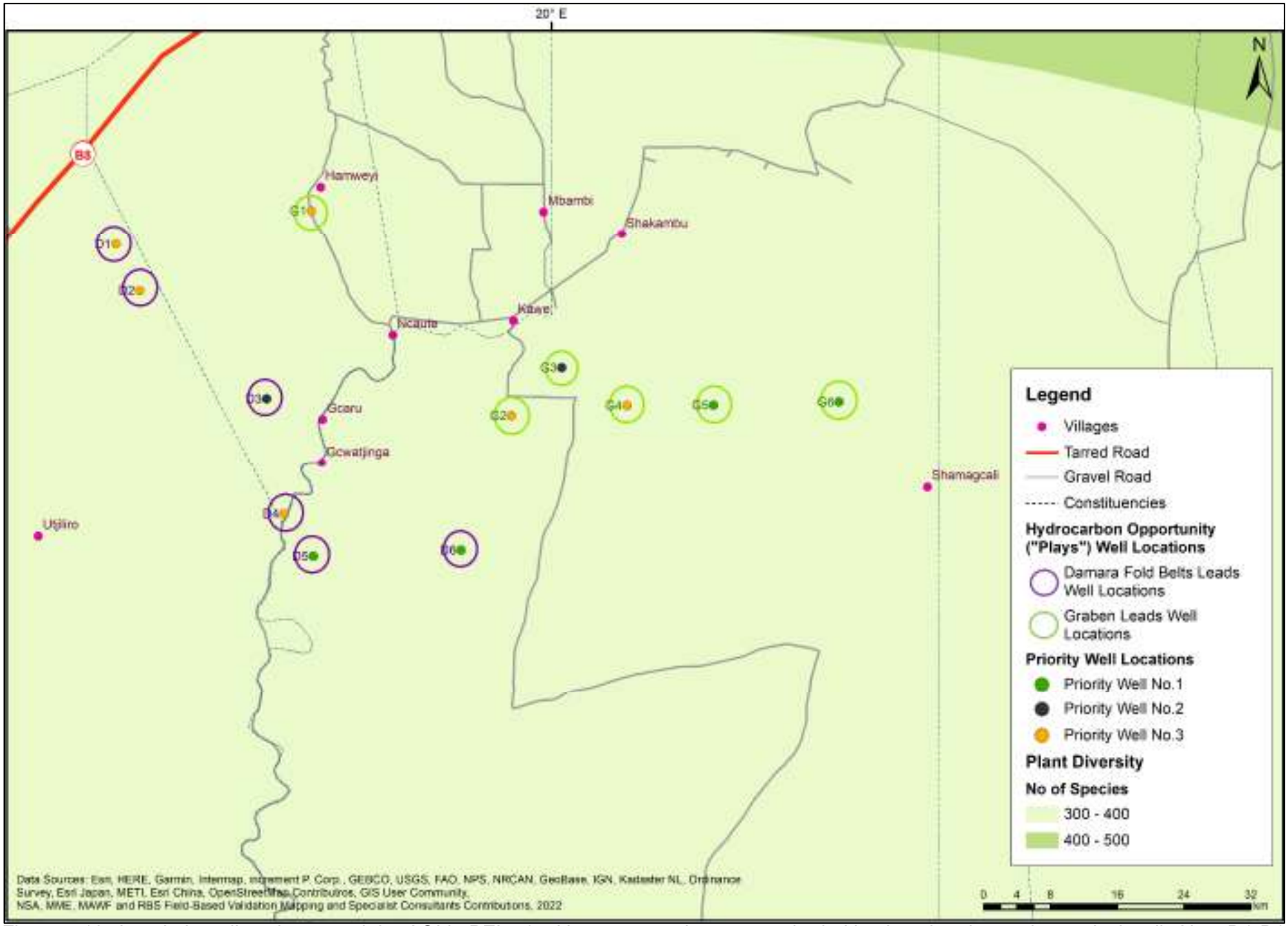


Figure 5.12: Local plant diversity around the AOI in PEL 73 with respect to the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 well site and access areas.

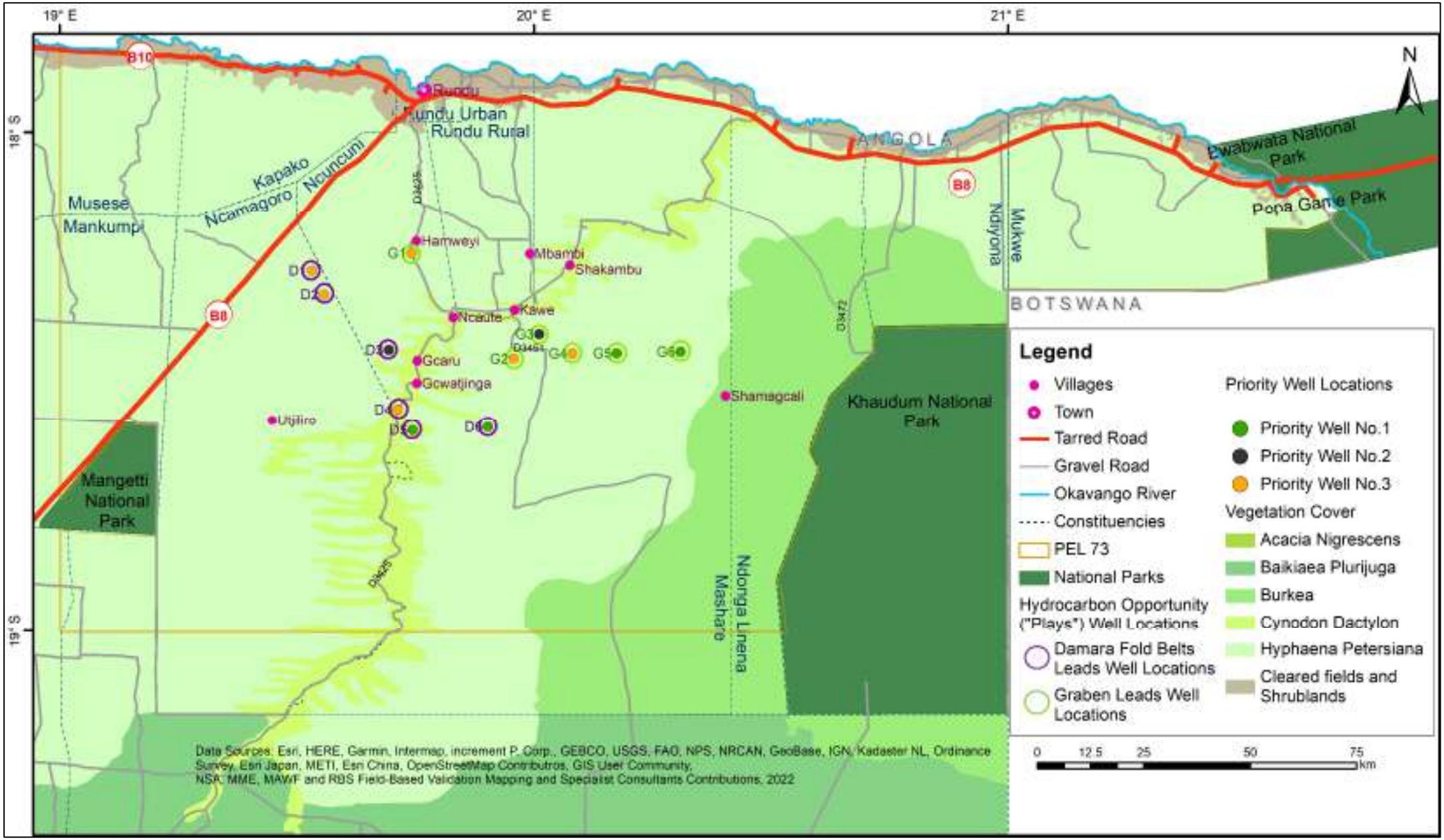


Figure 5.13: Regional vegetation around the AOI in PEL 73 with respect to the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 well site and access areas.

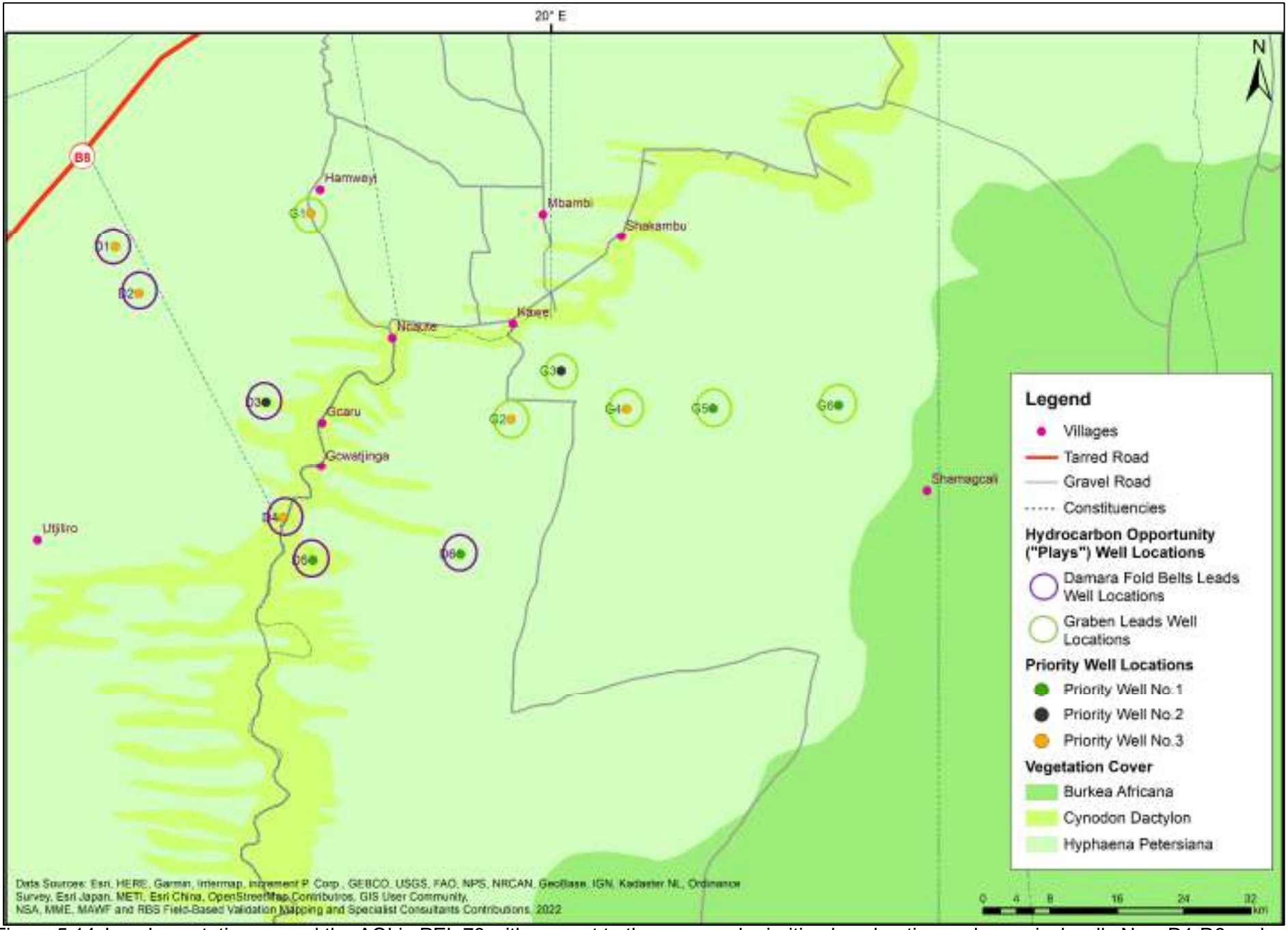


Figure 5.14: Local vegetation around the AOI in PEL 73 with respect to the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 well site and access areas.

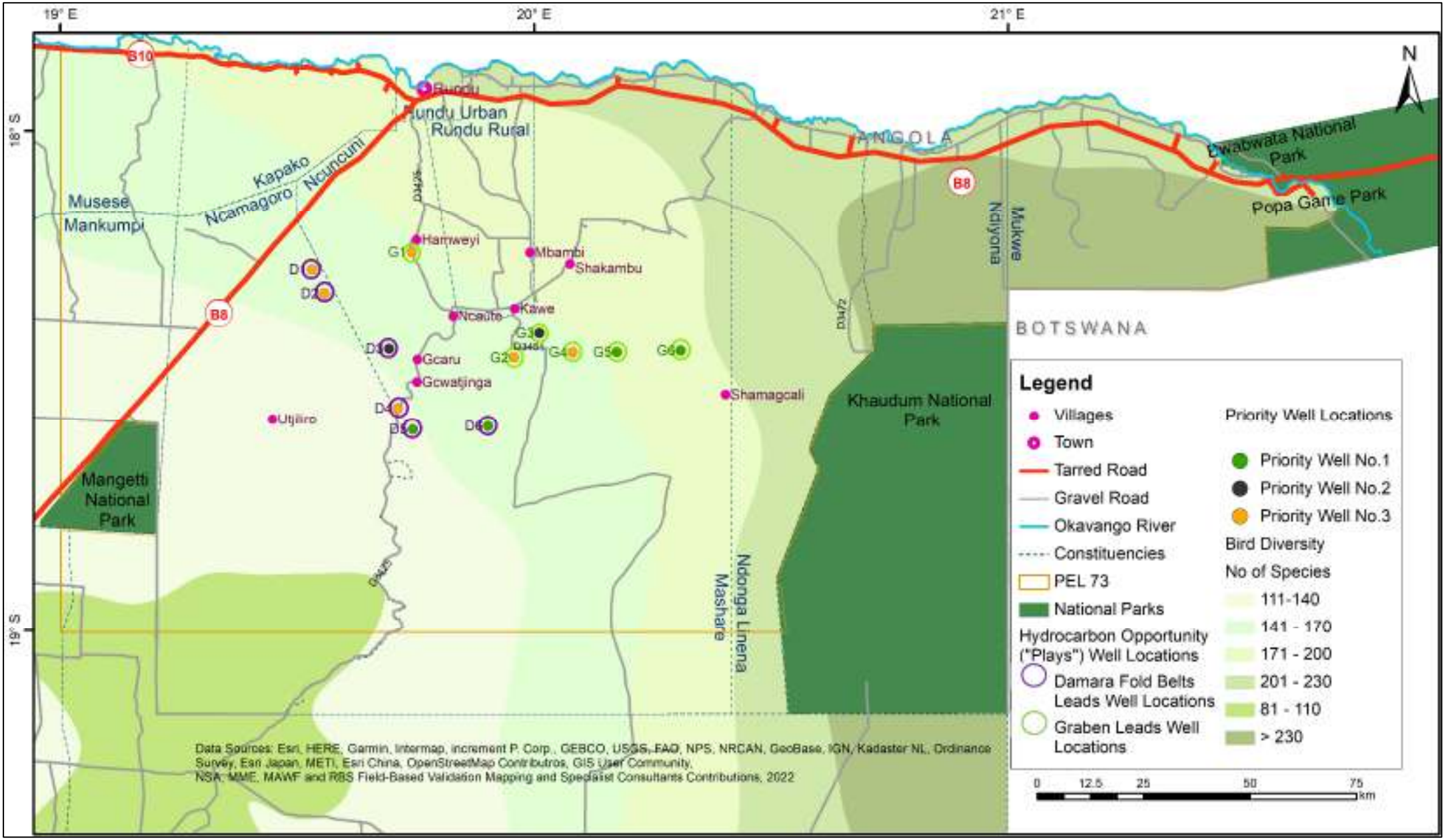


Figure 5.15: Regional bird diversity around the AOI in PEL 73 with respect to the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 well site and access areas.

5.3.4 Local Faunal Biodiversity Assessments for D1-D5 and G1-G5 Well Sites

5.3.4.1 Overview

During the fieldwork conducted by Peter Cunningham, all the faunal species were pooled for the 12 x Well Sites visited (Annex 4). It is estimated that at least 107 species of larger trees and shrubs (>1m in height) and up to 111 species of grasses at least 67 species of reptile, 32 amphibian, 116 mammal and 210 bird species (breeding residents) are known to or expected to occur in the general Kavango East Region (Fig. 5.11-5.15 and Annex 4). Detailed information on the regional flora and fauna found around the proposed D1-D6 and G1-G6 well site and access areas are provided in Annex 4.

5.3.4.2 Reptiles

The 67 reptile species expected to occur in the general area consist of at least 3 tortoises (all vulnerable and protected game), 3 terrapins, 31 snakes (2 blind snakes, 1 thread snake, 1 python, 1 borrowing snake, 1 purple glossed, 1 quill snouted and 24 typical snakes) of which 3 species are classified as rare and 1 species as vulnerable, 5 worm lizards, 8 skinks, 4 old world lizards, 2 plated lizards, 2 monitor lizards, 1 agama, 1 chameleon and 6 geckos and 1 crocodile. Snakes (31 species), skinks (8 species) and 6 geckos are the most important groups of reptiles expected from the general area.

Three species were confirmed and in total 18 species confirmed from the general area – i.e. along the Okavango River and/or using previous records and publications (e.g. Cunningham 2020, Cunningham 2021a,b, Cunningham 2022, Cunningham and Adank 2005, Visser 2010). This included 3 tortoises, 1 python, 5 typical snakes, 3 Old World lizards, 2 monitors, 1 agama, 1 chameleon,1 gecko and crocodile – i.e. a total of at least 18 species are confirmed from the general area (Annex 4). However, species such as the Nile/water monitor and crocodile are exclusively associated with the Okavango River system only – i.e. would not occur in the inland areas. The presence of the tortoises, rock monitor and python, are also expected to be tenuous and patchy as they are traditionally collected as veld foods and expected to be extirpated throughout most of the area inhabited by humans.

The 3 species confirmed from the area include the Cape rough-scaled lizard (*Ichnotropis capensis*), black-lined plated lizard (*Zonosaurus (Gerrhosaurus) nigrolineatus*) and spotted sandveld lizard (*Nucras intertexta*) – not included in Table 1 and out of its known range (Plates 5.4-5.6). The lack of reptiles observed during the fieldwork would mainly be ascribed to the low density of reptiles in the area; small focus area and burnt area.

The most important species are viewed as those with some form of conservation status (Namibian and International) with the tortoises, pythons and monitor lizard probably the most important groups of reptiles in the general area. Tortoises and the monitor lizard are often killed for food or succumb as road kills while snakes are killed for various reasons often on sight. The 2 endemics (*Ichnotropis grandiceps* and *Lygodactylus bradfieldi*), 3 species classified as rare (*Lycophidion multimaculatum*, *Psammophis jallae*, *Causus rhombeatus*) and 6 species classified as vulnerable (*Stigmochelys pardalis*, *Psammobates oculiferus*, *Kinixys spekii, Python natalensis*, *Varanus albigularis*, *Varanus niloticus*) are viewed as the most important species in the general area.

The 2 species classified as data deficient by the IUCN (2022) – *Pelusios (bechuanicus) upembae* and *Ichnotropis grandiceps* – are also viewed as important although *P. upembae* would be associated with the Okavango River system only. Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the general area than presented in Annex 4.

The general area has been heavily impacted in places, especially along the Omuramba Omatako and areas close to towns and settlements such as Rundu and Ncaute, etc., due to subsistence farming and logging activities and none of the unique reptiles are expected to be exclusively associated with the proposed D1-D6 and G1-G6 well sites and accesses areas. The proposed mitigations presented in Annex 4 and the EMP Report are expected to minimise the overall effect on reptiles potentially occurring in the area.

Plate 5.4: Cape rough-scaled lizard (*Ichnotropis capensis*) was the most commonly and widespread reptile observed around the proposed D1-D6 and G1-G6 well sites and accesses areas (Photo by P. Cunningham, 2022).

Plate 5.5: Black-lined plated lizard (*Zonosaurus (Gerrhosaurus) nigrolineatus*) was only observed once south of Ncaute (Photo by P. Cunningham, 2022).

Plate 5.6: Spotted sandveld lizard (*Nucras intertexta*) – out of its known range – observed around Gcwatjinga area (Photo by P. Cunningham, 2022).

5.3.4.3 Amphibians

According to the literature, at least 32 species of amphibians can occur in suitable habitat in the general area although only 17 species potentially occur around the proposed D1-D6 and G1-G6 well sites and accesses areas. The AOI is under represented, with 1 tree frog, 1 rain frog, 4 toads, 1 pygmy toad, 2 shovel-nosed toads, 3 reed frogs, 1 kassina, 2 rubber frogs, 3 puddle frogs, 1 ornate frog, 5 grass frogs, 3 platannas, 1 caco, 1 bullfrog and 3 sand frogs known and/or expected (i.e., potentially could be found in the area) to occur in the area (Annex 4). Of these, none are endemic from the general area. The lack of amphibians observed during the fieldwork would mainly be ascribed to limited time on site and overall sandy area without suitable amphibian habitat (Annex 4). The most important species from the area is the giant bullfrog (*Pyxicephalus adspersus*) with "populations are decreasing" according to the IUCN (2022) as it is consumed as food throughout its range (Griffin *pers. com.*). Most amphibians are expected to be associated with the Okavango River system in the area rather than the sandy interior, although the ephemeral Omuramba Omatako and pans throughout the general area would also be suitable habitat.

5.3.4.4 Mammals

The overall mammal diversity around the proposed D1-D6 and G1-G6 wells sites and accesses areas is estimated at between 76-90 species with no species being endemic to the area (Mendelsohn *et al.* 2002). Griffin (1998c) puts the species richness distribution of endemics at 9-11 species in the general area while Simmons (1998a) indicates that no endemics occur in the area. The closest Government protected area – Khaudum National Park – has an estimated 92 species of mammals although no data for Mangetti National Park is included (Griffin 1998c). According to the literature at least 116 species of mammals are expected to occur in the general area although not all the species (i.e., 11 species) indicated in Annex 4 are found away from the Okavango River and associated floodplains – e.g., otters, hippo, etc.

Of the species expected to occur in the greater area wells sites and accesses areas, 6 species are viewed as rare (*Nycteris hispida*, *Kerivoula argentata*, *Kerivoula lanosa*, *Mastomys shortridgei*, *Civittictis civetta*, *Paracynictis selousi*), 3 endangered (*Lycaon pictus*, *Lutra maculicollis*, *Equus (burchellii) quagga*), 15 vulnerable, 3 specially protected game, 20 protected game, 7 indeterminate, 10 insufficiently known, 4 huntable game, 3 problem animals, 25 peripheral and 12 not listed under Namibian legislation (Griffin and Coetzee 2005). The IUCN (2022) classifies 1 species as endangered (*Lycaon pictus*), 7 species as vulnerable (*Loxodonta africana*, *Smutsia (Manis) temminckii*, *Acinonyx jubatus*, *Panthera pardus*, *Panthera leo*, *Hippopotamus amphibious*, *Giraffa cemelopardalis*) and 3 species as near threatened (*Hipposideros vittatus*, *Aonyx capensis*, *Hydrictis (Lutra) maculicollis*). The SARDB (2004) classifies 2 species as endangered, 5 species as vulnerable, 12 species as near threatened and 7 species as data deficient while CITES lists 2 species as Appendix I and 12 species as Appendix II. Some species have more than one classification. The House Mouse (*Mus musculus*) is viewed as an invasive alien species to the area. *Mus musculus* are generally known as casual pests and not viewed as problematic although they are known carriers of "plague" and can cause economic losses (Picker and Griffiths 2011).

Habitat alteration and overutilisation are the two primary processes threatening most mammals (Griffin 1998c) with species probably underrepresented in Annex 4 for the general area being the bats and rodents, as these groups have not been well documented from the arid central-western part of Namibia.

5.3.4.5 Avian

Many species expected to occur around the proposed D1-D6 and G1-G6 wells sites and accesses areas are migratory – e.g., bustards and korhaan – and not found permanently in the area (Annex 4). Other species that may frequent the areas only if water collects in the Omuramba Omatako or whilst moving between wetlands in Etosha and Bushmanland – e.g., cranes, ducks, flamingo, etc. As very little ringing/recording occurs in this part of Namibia, little is known about the distribution and ecology of many species from the general wells and accesses areas with many more species expected to occur. A total of 45 bird species were observed throughout the area of interest. Other birds observed, but not included in Annex 4 as they are migrant species, and/or not expected in the area, etc. are common house martin, barn swallow, yellow-billed kite, Dederik cuckoo, Jacobin cuckoo, red-backed

shrike, red-billed oxpecker, African paradise flycatcher (Plates 5.7 and 5.8). A total of 100 species are confirmed from the general area – i.e. Cunningham (2020, 2021a,b, 2022) (Annex 4).

The most important species are viewed as those classified as endangered (hooded vulture, white-backed vulture, tawny eagle, martial eagle, bateleur, southern ground-hornbill), vulnerable (secretarybird, white-headed vulture, lappet-faced vulture and) and near threatened (marabou stork, peregrine falcon, kori bustard) from Namibia (Simmons et al. 2015) as well as those classified by the IUCN (2022) as critically endangered (hooded vulture, white-headed vulture, white-backed vulture), endangered (lappet-faced vulture), vulnerable (secretarybird, tawny eagle, martial eagle, southern ground-hornbill) and near threatened (bateleur, kori bustard). An important species confirmed from the general area is the red-billed oxpecker (Cunningham 2020, 2021a,b, 2022). Although their numbers have increased in communal areas in north-eastern Namibia (Robertson and Jarvis 2000), elsewhere they have been negatively affected due to arsenic-based cattle dips.

The proposed D1-D6 and G1-G6 wells sites and accesses areas have been heavily impacted in places, especially along the Omuramba Omatako and areas close to towns and settlements such as Rundu and Ncaute, etc., due to subsistence farming and logging activities and none of the unique birds are expected to be exclusively associated with the proposed D1-D6 and G1-G6 wells sites and accesses areas. The proposed mitigations as detailed in Annex 4 and the EMP Report are expected to minimise the overall effect on mammals potentially occurring in the area.

Plate 5.7: Red-billed oxpecker on donkey observed in AOI (Photo by P. Cunningham, 2022).

Plate 5.8: Yellow-billed kite were commonly observed around the proposed D1-D6 and G1-G6 wells sites and accesses areas (Photo by P. Cunningham, 2022).

5.3.5 Flora Biodiversity Assessments for D1-D5 and G1-G5 Well Sites

5.3.5.1 D1 Local Flora Biodiversity Assessments

During the fieldwork a total of 12 larger trees and shrubs were confirmed around the proposed D1 well site and access areas and of which 5 species are protected (41.7%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area.

Fourteen species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Burkea africana (burkea) (31.2%) being dominant. Protected tree/shrub species are well represented around the proposed D1 well site and access areas and make up 38.7% of species (Fig. 5.16 and Plates 5.9-5.11).

Important protected trees found around the D1 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.17. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site as part of the site preconstruction or construction process.

During the fieldwork a total of 4 grasses were confirmed from the proposed development site (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.7).

None of the important species are exclusively associated with the proposed development areas. The proposed mitigations in the EMP are expected to minimise the overall effect on grass potentially occurring in the area (Annex 4).

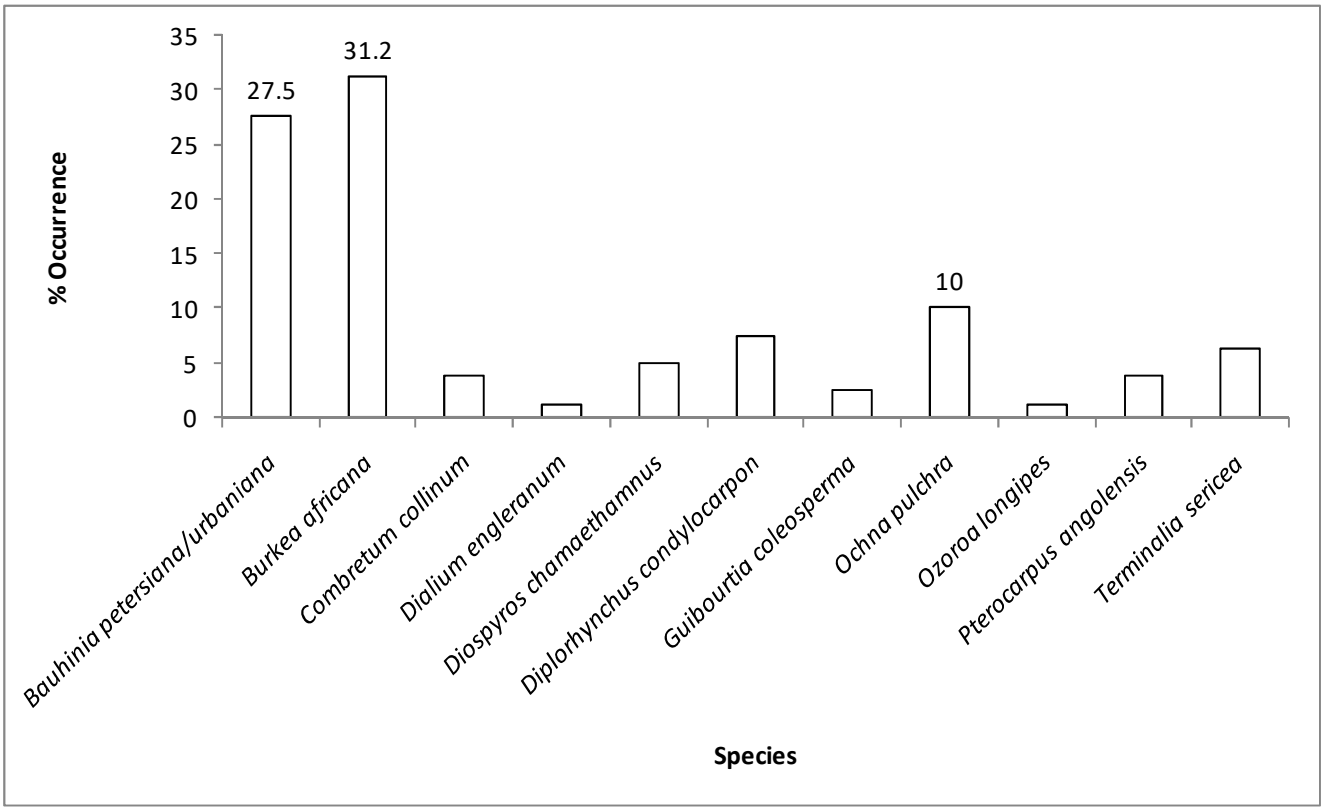


Figure 5.16: The tree/shrub species diversity is dominated by Burkea africana (burkea) around the proposed D1 well site and access areas (Source: Annex 4).

Plate 5.9: The proposed D1 well site and access areas are dominated by Burkea africana (burkea) protected trees (Photo by P. Cunningham, 2022).

Plate 5.10: Large *Guibourtia coleosperma (false mopane)* and *Burkea africana (burkea)* – both protected trees and occur in the general area around the proposed D1 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.11: Large Pterocarpus angolensis (kiaat) protected trees found around the proposed D1 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.12: The proposed D1 well site and access areas had recently been burnt with grass seedlings emerging (Photo by P. Cunningham, 2022).

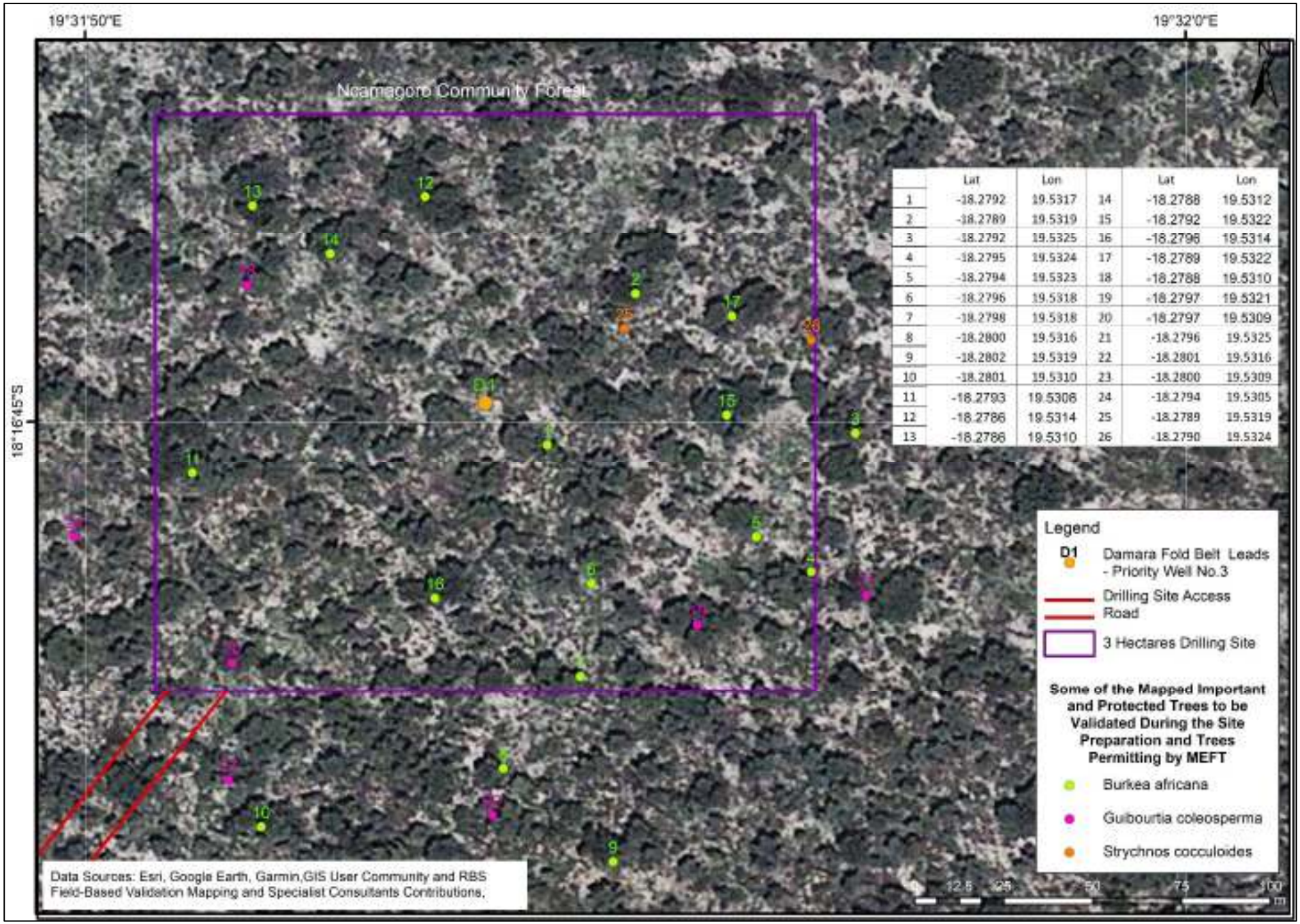


Figure 5.17: Some of the mapped important and protected trees around the proposed D1 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

5.3.5.2 D2 Local Flora Biodiversity Assessments

During the fieldwork a total of fourteen (14) larger trees and shrubs were confirmed around the proposed D2 well site and access areas and of which 6 species are protected (41.7%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Twelve species (12) of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Burkea africana (burkea) (37.4%) being dominant. Protected tree/shrub species are well represented around the proposed D2 well site and access areas and make up 60% of species (Fig. 5.18 and Plates 5.13 and 5.14).

Important protected trees found around the proposed D2 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.19. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site as part of the preconstruction and construction process.

During the fieldwork a total of 3 grasses were confirmed from the proposed development sites (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.15).

None of the important species are exclusively associated with the proposed development areas. The proposed mitigations in the EMP are expected to minimise the overall effect on grass potentially occurring in the area (Annex 4). Three species of grass were confirmed along various transects over 150m (N=150 points each 1m apart) with bare ground and the climax Digitaria seriata (Kuruman finger-grass) (66.7%) being dominant (Plate 5.15 and Fig. 5.20).

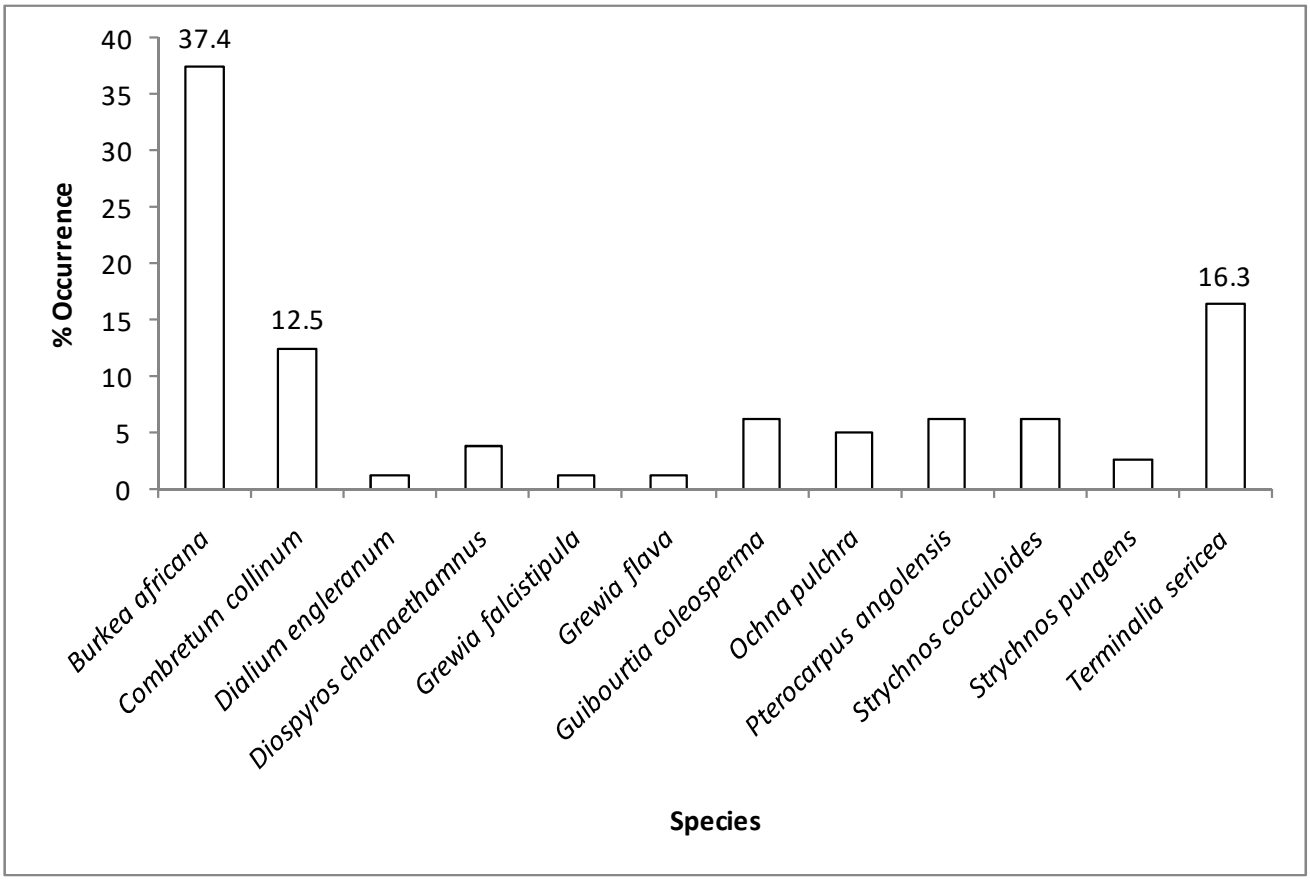
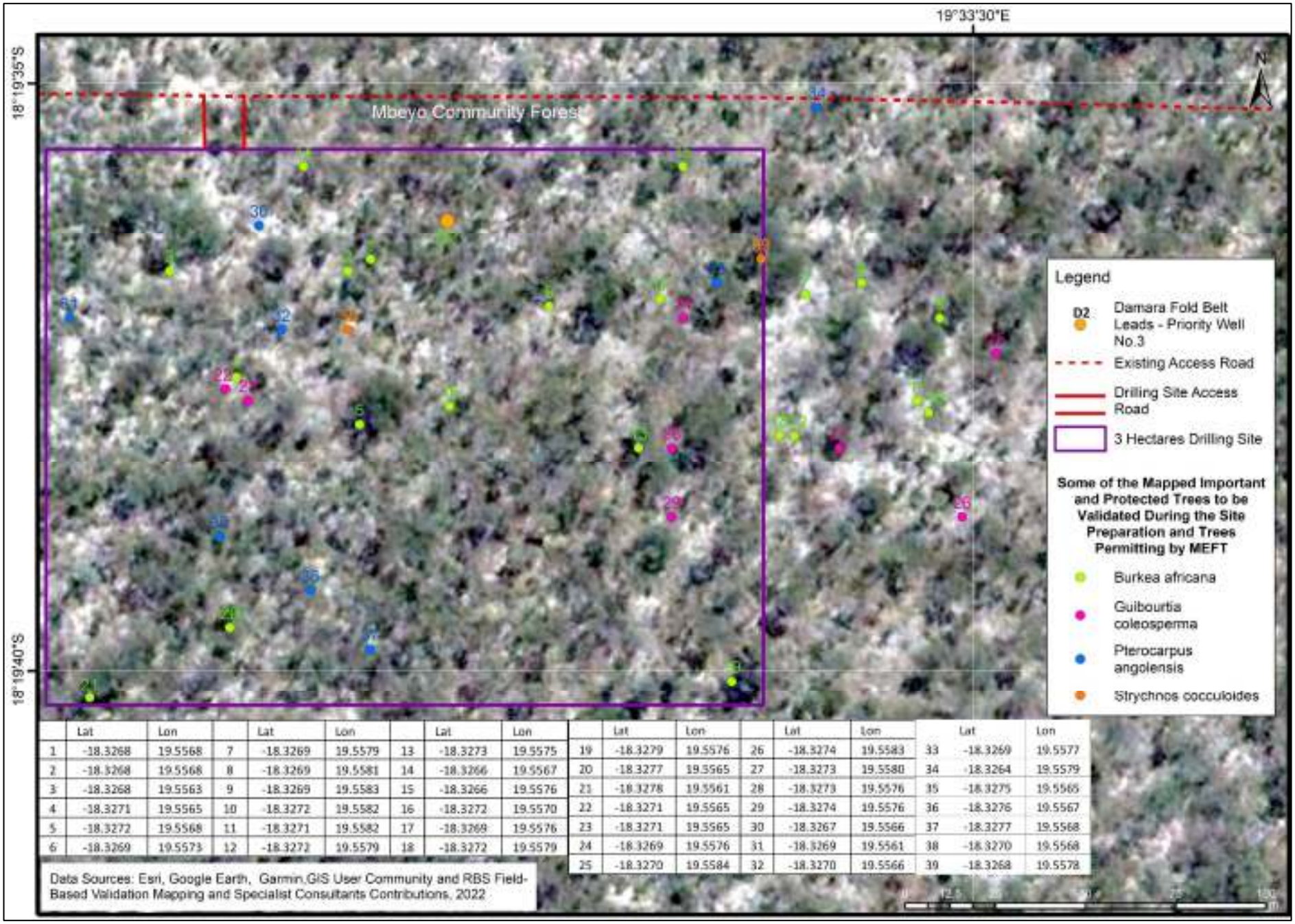


Figure 5.18: The tree/shrub species diversity is dominated by Burkea africana (burkea) around the proposed D2 well site and access areas (Source: Annex 4).

Plate 5.13: The area is dominated by Burkea africana (burkea) and Pterocarpus angolensis (kiaat) protected trees found around the proposed D2 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.14: *Strychnos cocculoides* (corky monkey orange) a protected tree found in the area of the proposed D2 well site and access areas (Photo by P. Cunningham, 2022).



	Lat	Lon		Lat	Lon		Lat	Lon
1	-18.3268	19.5568	7	-18.3269	19.5579	13	-18.3273	19.5575
2	-18.3268	19.5568	8	-18.3269	19.5581	14	-18.3266	19.5567
3	-18.3268	19.5563	9	-18.3269	19.5583	15	-18.3266	19.5576
4	-18.3271	19.5565	10	-18.3272	19.5582	16	-18.3272	19.5570
5	-18.3272	19.5568	11	-18.3271	19.5582	17	-18.3269	19.5576
6	-18.3269	19.5573	12	-18.3272	19.5579	18	-18.3272	19.5579

	Lat	Lon		Lat	Lon		Lat	Lon
19	-18.3279	19.5576	26	-18.3274	19.5583	33	-18.3269	19.5577
20	-18.3277	19.5565	27	-18.3273	19.5580	34	-18.3264	19.5579
21	-18.3278	19.5561	28	-18.3273	19.5576	35	-18.3275	19.5565
22	-18.3271	19.5565	29	-18.3274	19.5576	36	-18.3276	19.5567
23	-18.3271	19.5565	30	-18.3267	19.5566	37	-18.3277	19.5568
24	-18.3269	19.5576	31	-18.3269	19.5561	38	-18.3270	19.5568
25	-18.3270	19.5584	32	-18.3270	19.5566	39	-18.3268	19.5578

Figure 5.19: Some of the mapped important and protected trees around the proposed D2 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.15: The tall grass is Hyperthelia dissolute (yellow thatching grass) used for thatching locally found around the proposed D2 well site and access areas (Photo by P. Cunningham, 2022).

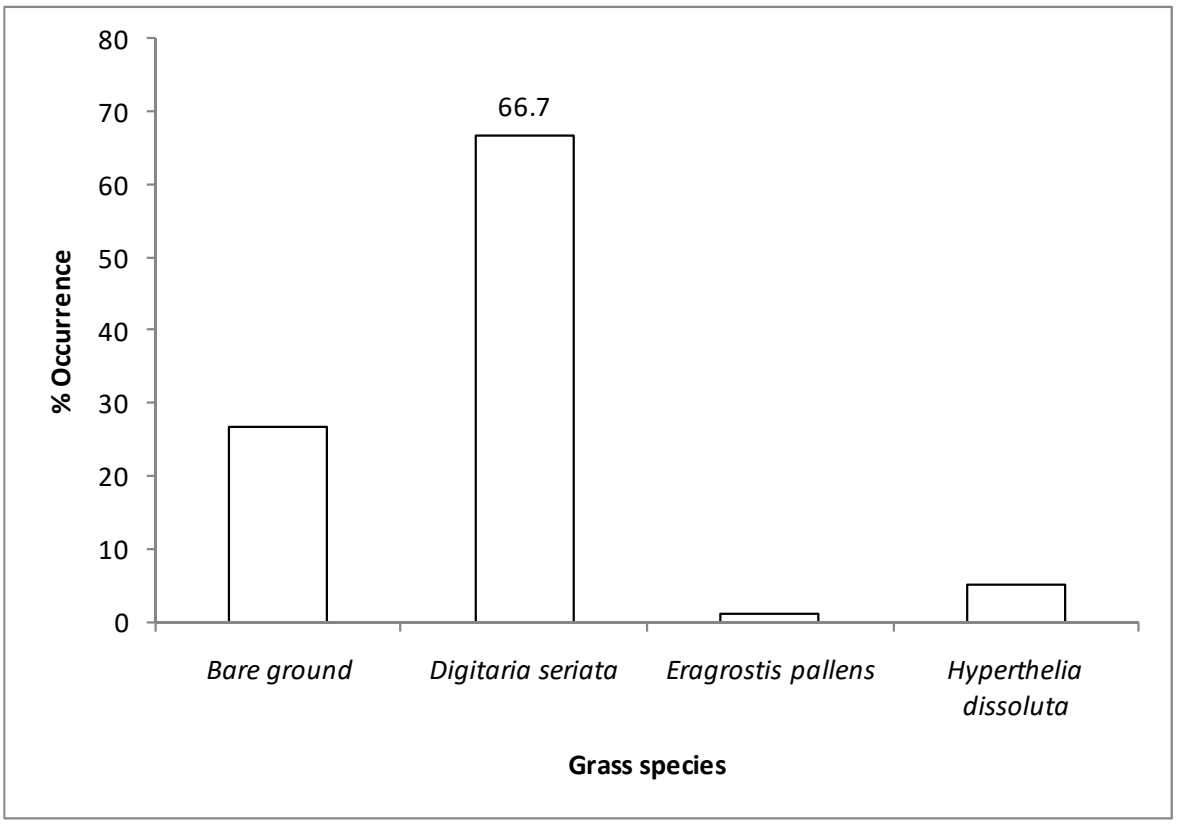


Figure 5.20: The grass species diversity is dominated by bare ground and Eragrostis pallens (broom grass) around the proposed D2 well site and access areas (Source: Annex 4).

5.3.5.3 D3 Local Flora Biodiversity Assessments

During the fieldwork a total of 13 larger trees and shrubs were confirmed around the proposed D3 well site and access areas and of which 6 species are protected (46.2%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Thirteen (13) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Terminalia sericea (silver cluster-leaf) (28.7%) being dominant. Protected tree/shrub species are well represented in the proposed D3 well site and access areas and make up 42.6% of species (Fig. 5.21 and Plates 5.16-5.18).

Important protected trees found around the D3 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.22. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site as part of the preconstruction or construction process.

During the fieldwork a total of 7 grasses were confirmed from the proposed development site (Annex 4). Few grass species were confirmed around the well site and access areas due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.19 and Fig. 5.23)

Four (4) species of grass were confirmed along various transects over 150m (N=150 points each 1m apart) with the climax Eragrostis pallens (broom grass) (26%) being dominant (Fig. 5.23). This grass is used for thatching purposes.

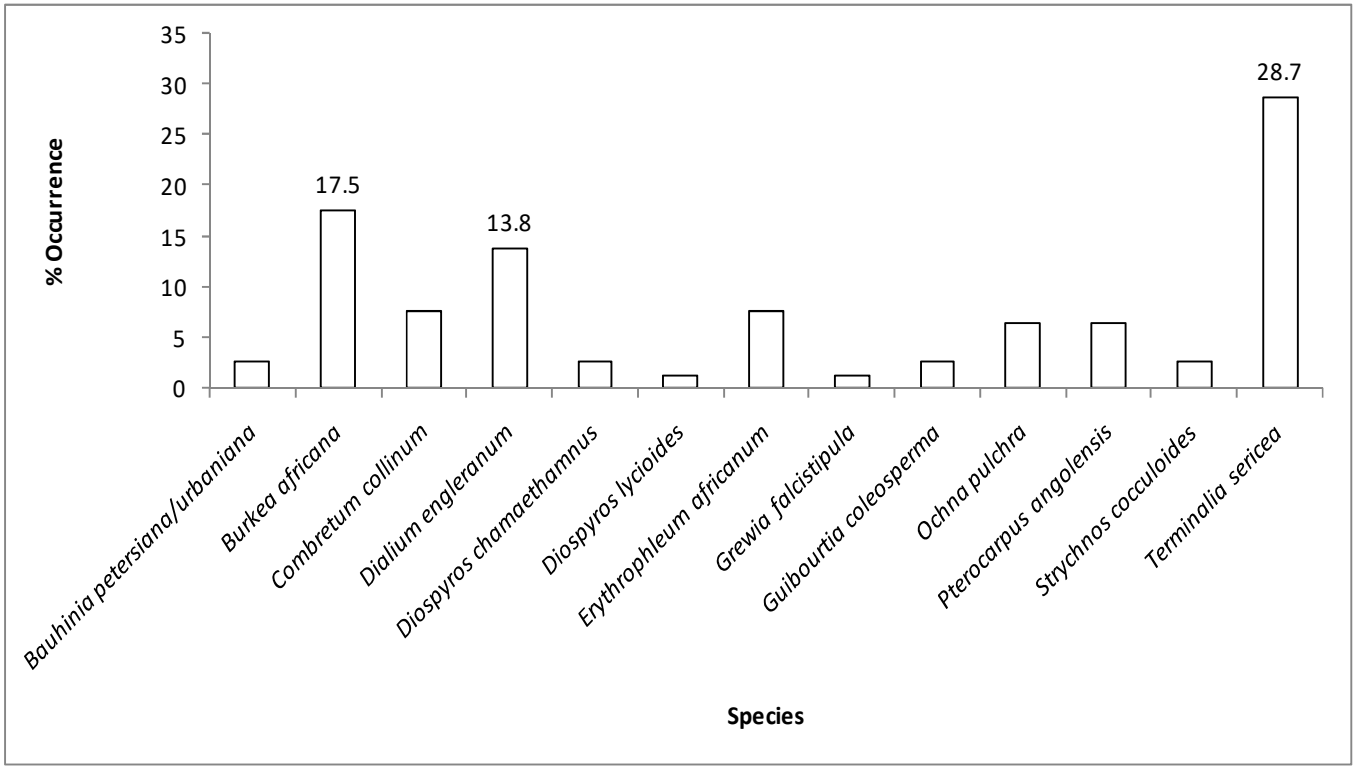


Figure 5.21: The tree/shrub species diversity is dominated by Burkea africana (burkea) around the proposed D3 well site and access areas (Source: Annex 4).

Plate 5.16: Burkea africana (burkea) protected trees and are some of the largest trees found around the proposed D3 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.17: Young Dialium engleranum (Kalahari podberry) protected trees and are dominant in the general the area of the proposed D3 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.18: Strychnos cocculoides (corky monkey orange) protected tree at the proposed D3 well site and is an important fruit tree in Kavango East and West Regions (Photo by P. Cunningham, 2022).

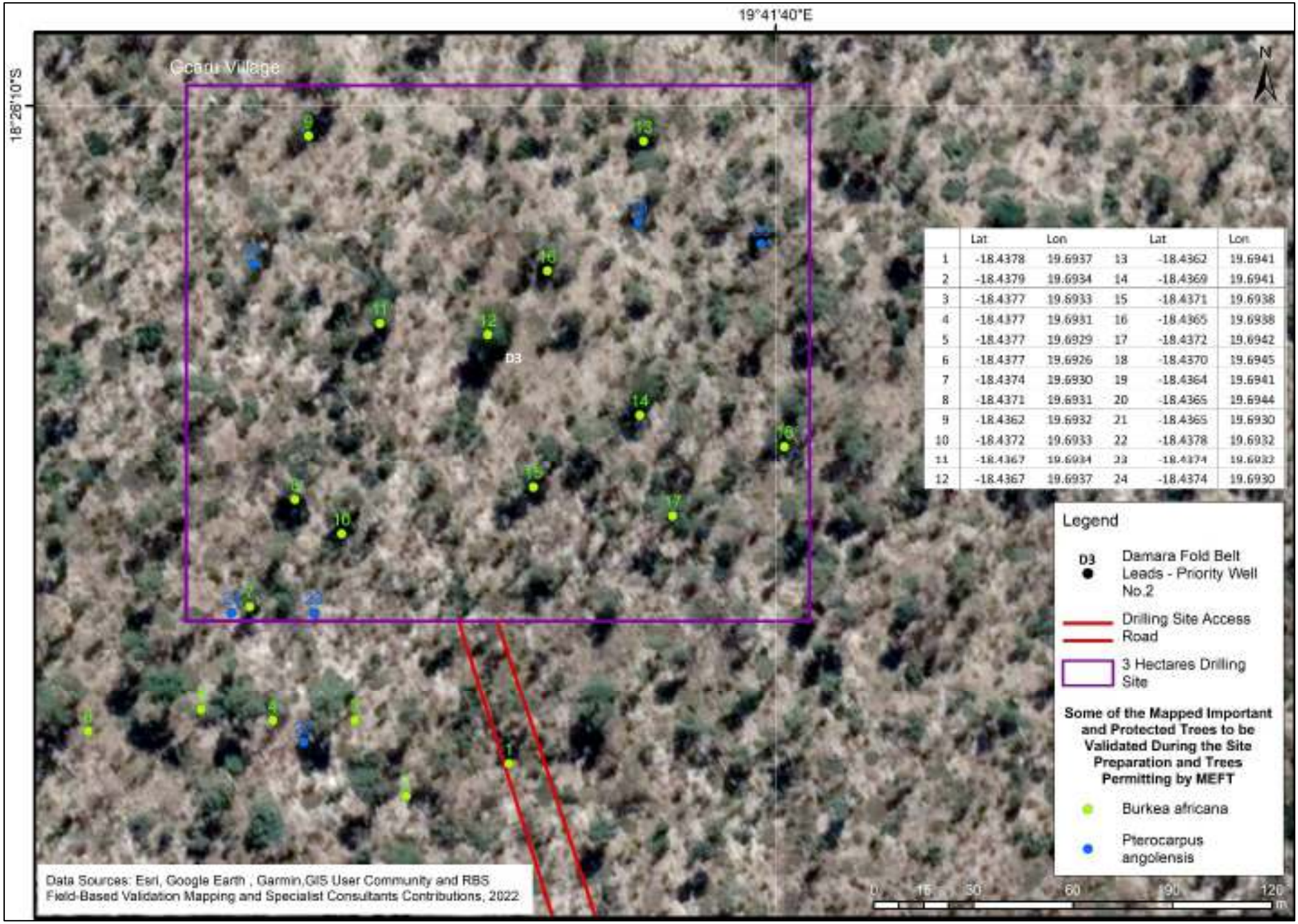


Figure 5.22: Some of the mapped important and protected trees around the proposed D3 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.19: Dense bush limits grass cover around the proposed D3 well site and access areas (Photo by P. Cunningham, 2022).

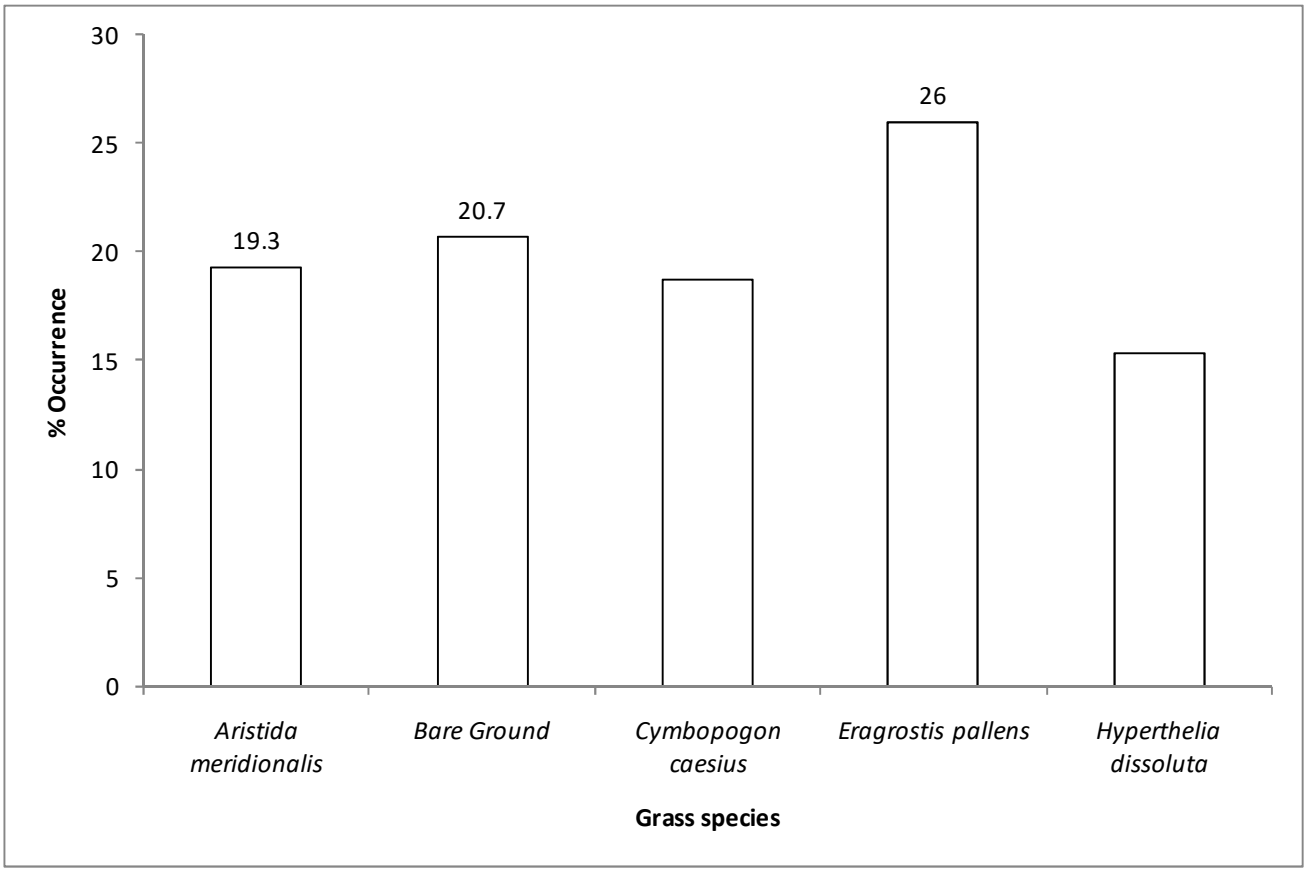


Figure 5.23: The grass species diversity is dominated by Eragrostis pallens (broom grass) around the proposed D3 well site and access areas (Source: Annex 4).

5.3.5.4 D4 Local Flora Biodiversity Assessments

During the fieldwork a total of 15 larger trees and shrubs were confirmed around the proposed D4 (D4_1) well site and access areas and of which 6 species are protected (40%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Thirteen (13) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Terminalia sericea (silver cluster-leaf) (35%) being dominant. Protected tree/shrub species are well represented around the proposed D4 (D4_1) well site and access areas and make up 22.5% of species (Fig. 5.24 and Plate 5.20-5.22).

Important protected trees found around the proposed D4 (D4_1) well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.25. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site as part of the preconstruction and construction process.

During the fieldwork a total of 5 grasses were confirmed from the proposed development site (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.23 and Fig. 5.25).

Four species of grass were confirmed along various transects over 150m (N=150 points each 1m apart) with bare ground and the climax Eragrostis pallens (broom grass) (32%) being dominant (Fig. 5.25). This grass is used for thatching purposes.

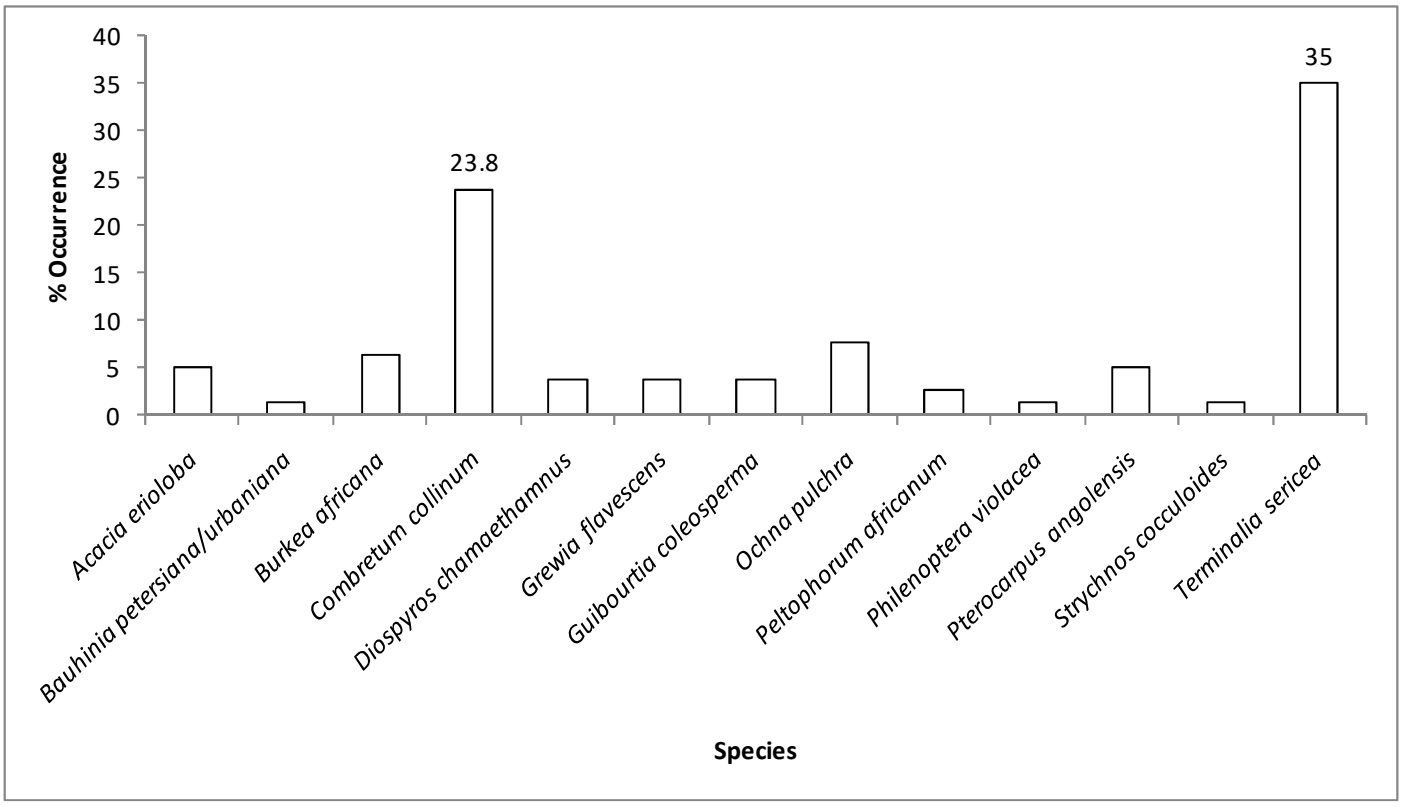


Figure 5.24: The tree/shrub species diversity is dominated by Terminalia sericea (silver cluster-leaf) around the proposed D4 (D4_1) well site and access areas (Source: Annex 4).

Plate 5.20: Only individual Philenoptera violacea (northern omupanda) protected trees and were encountered in the area of the proposed D4 (D4_1) well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.21: Guibourtia coleosperma (false mopane) protected trees and occur around the proposed D4 (D4_1) well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.22: Young Schinziophyton rautanenii (manketti) protected trees observed around the proposed D4 (D4_1) well site and access areas (Photo by P. Cunningham, 2022).

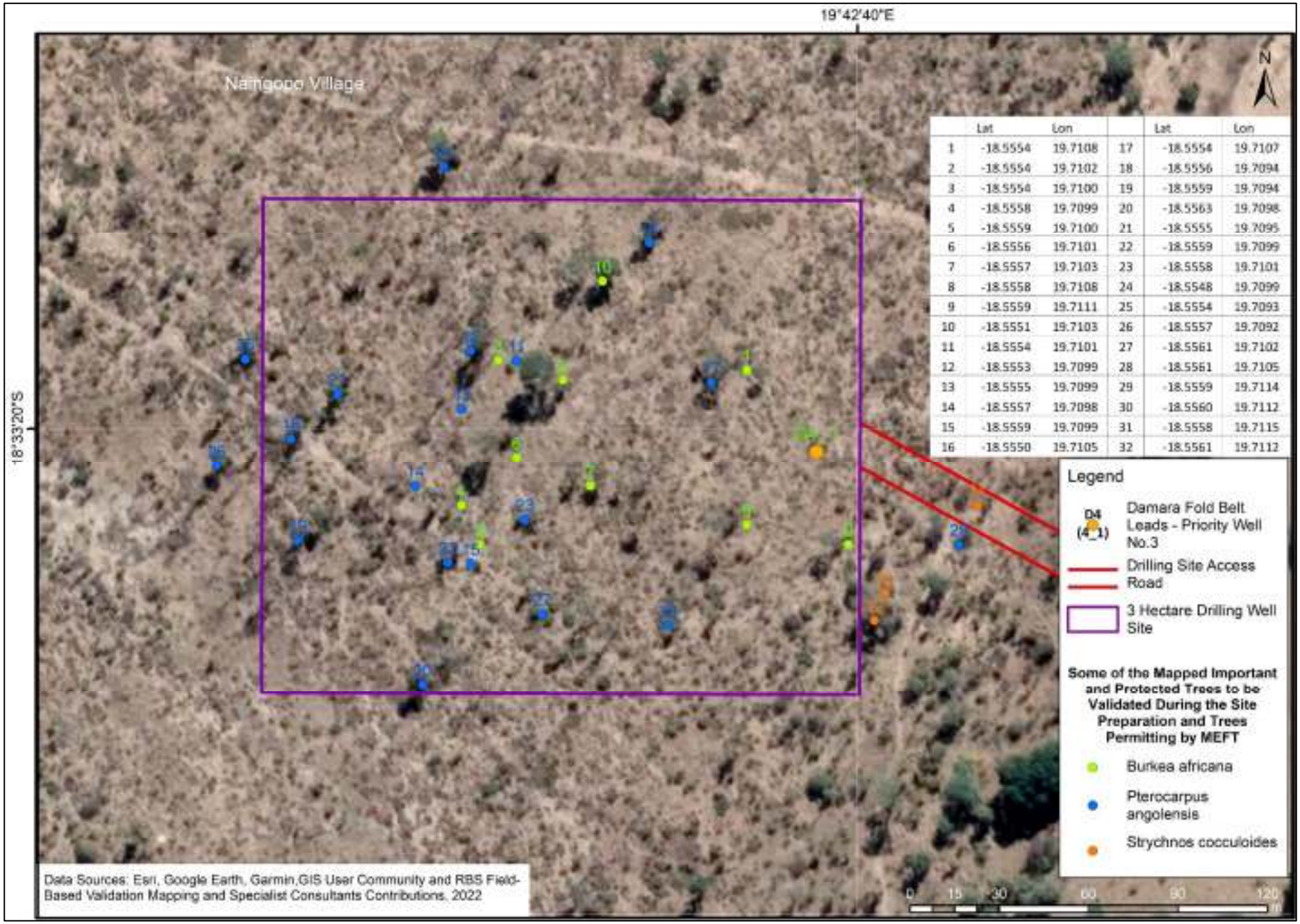


Figure 5.25: Some of the mapped important and protected trees around the proposed D4 (D4_1) well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.23: Proposed D4 (D4_1) development area is located on the edge of an old cleared field area close to a homestead with a continuous grazing system (Photo by P. Cunningham, 2022).

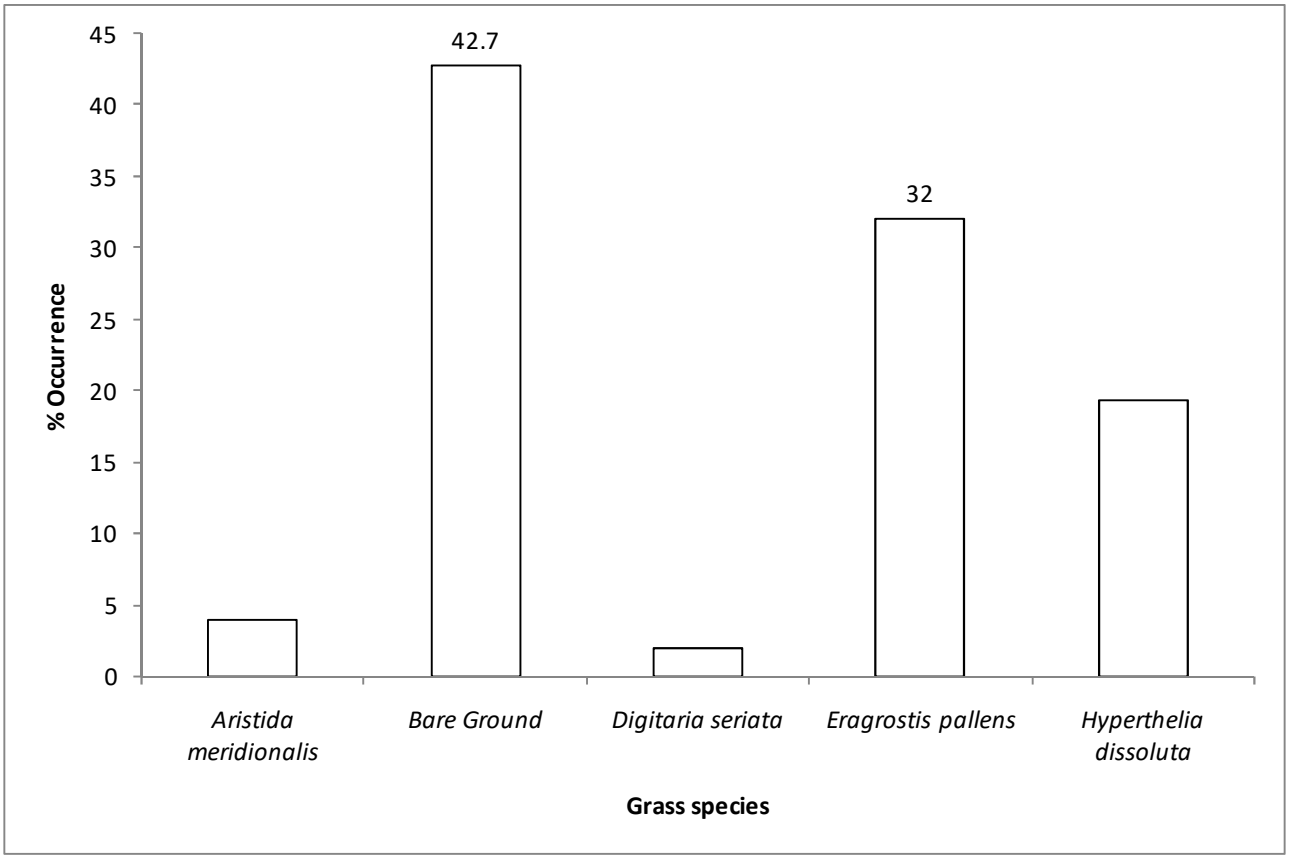


Figure 5.26: The grass species diversity is dominated by bare ground and Eragrostis pallens (broom grass) around the proposed D4 (D4_1) well site and access areas (Source: Annex 4).

5.3.5.5 D5 Local Flora Biodiversity Assessments

During the fieldwork a total of 12 larger trees and shrubs were confirmed around the proposed D5 well site and access areas and of which 7 species are protected (58.3%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Twelve (12) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Burkea africana (burkea) (27.5%) being dominant.

Protected tree/shrub species are well represented in the around the proposed D5 well site and access areas and make up 51.2% of species (Fig. 5.27 and Plates 5.24-5.26).

Important protected trees found around the proposed D5 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.28. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site.

Due to a recent fire around the proposed D5 well site and access areas, a survey of grasses was not possible (Plate 5.27 and Annex 4).

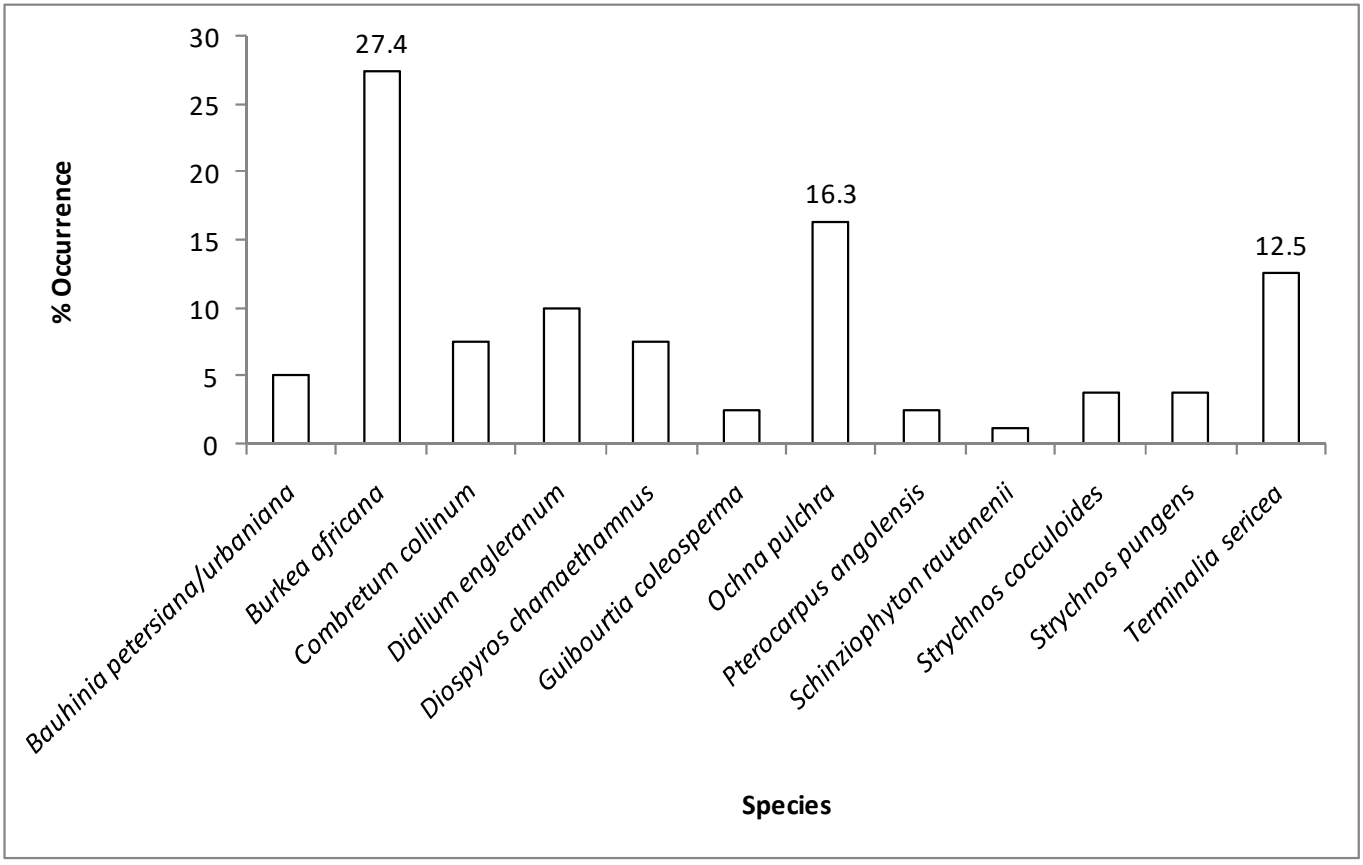


Figure 5.27: The tree/shrub species diversity is dominated by Burkea africana (burkea) around the proposed D5 well site and access areas (Source: Annex 4).

Plate 5.24: Burkea africana (burkea) protected trees are some of the largest trees found around the proposed D5 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.25: Strychnos cocculoides (corky monkey orange) – font – and Guibourtia coleosperma (false mopane) – back – both species are protected trees and occur in the area of the proposed D5 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.26: A few large Pterocarpus angolensis (kiaat) protected specimens observed around the proposed D5 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.27: The sandy area around the proposed D5 well site and access areas is devoid of grass due to a recent fire (Photo by P. Cunningham, 2022).

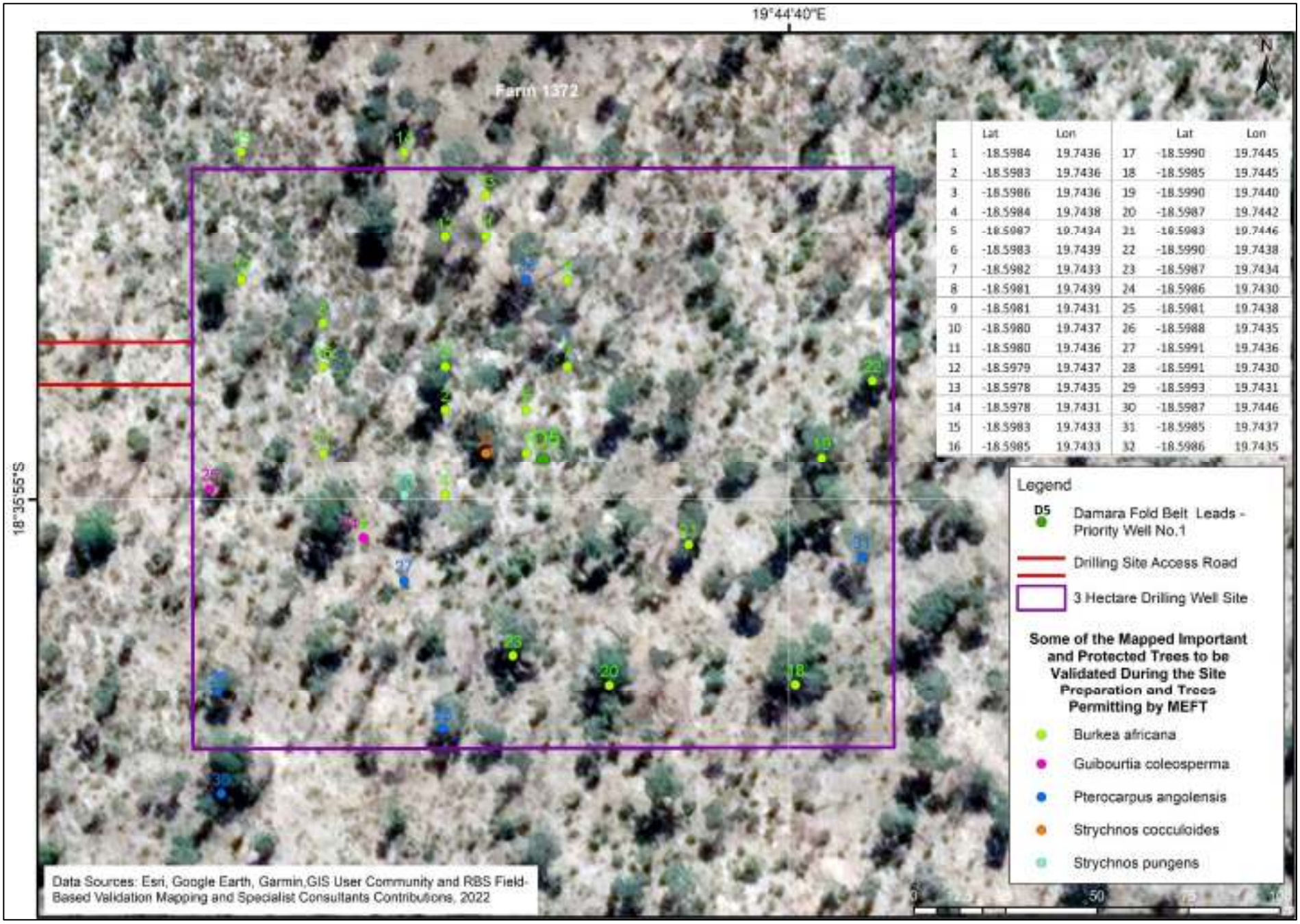


Figure 5.28: Some of the mapped important and protected trees around the proposed D5 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

5.3.5.6 D6 Local Flora Biodiversity Assessments

During the fieldwork a total of 13 larger trees and shrubs were confirmed around the proposed D6 well site and access areas and of which 6 species are protected (46.2%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Twelve (12) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Burkea africana (burkea) (27.5%) being dominant. Protected tree/shrub species are well represented in the proposed D6 well site and access areas and make up 51.2% of species (Fig. 5.29 and Plates 5.28-5.30).

Important protected trees found around the proposed D6 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.30. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site.

During the fieldwork a total of 4 grasses were confirmed from the proposed development site (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.31 and Fig. 5.31).

Three species of grass were confirmed along various transects over 150m (N=150 points each 1m apart) with bare ground and the climax Eragrostis pallens (broom grass) (70%) being dominant (Fig. 5.31). This grass is used for thatching purposes.

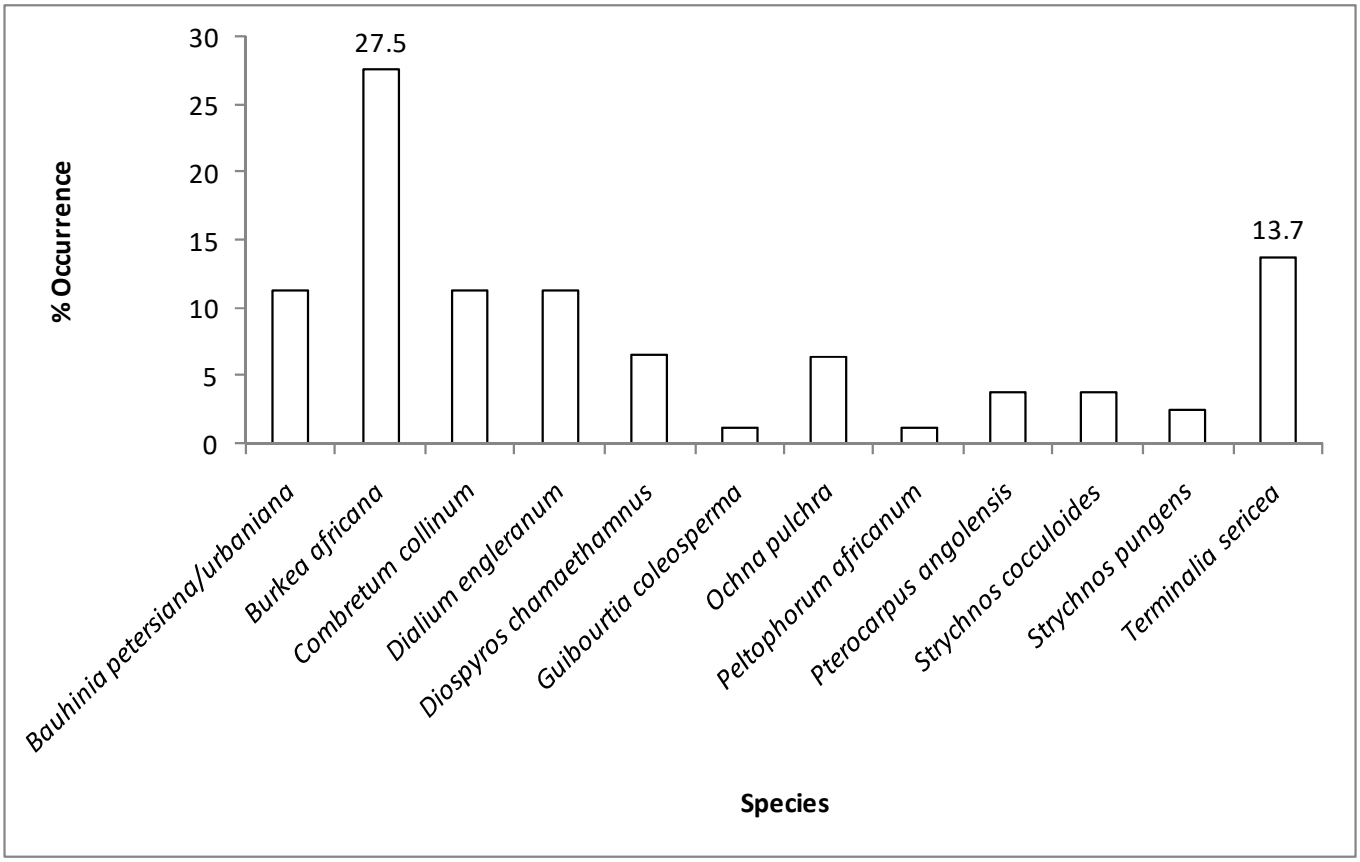


Figure 5.29: The tree/shrub species diversity is dominated by Burkea africana (burkea) around the proposed D6 well site and access areas (Source: Annex 4).

Plate 5.28: Burkea africana (burkea) protected trees are some of the largest trees found around the proposed D6 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.29: Large Pterocarpus angolensis (kiaat) protected trees and occur around the proposed D6 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.30: Strychnos cocculoides (corky monkey orange) protected trees found around the proposed D6 well site and access areas and are important fruit trees throughout the Kavango East and West Regions (Photo by P. Cunningham, 2022).

Figure 5.30: Some of the mapped important and protected trees around the proposed D6 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.31: The sandy area around the proposed D6 well site and access areas with dense bush does not have high grass diversity (Photo by P. Cunningham, 2022).

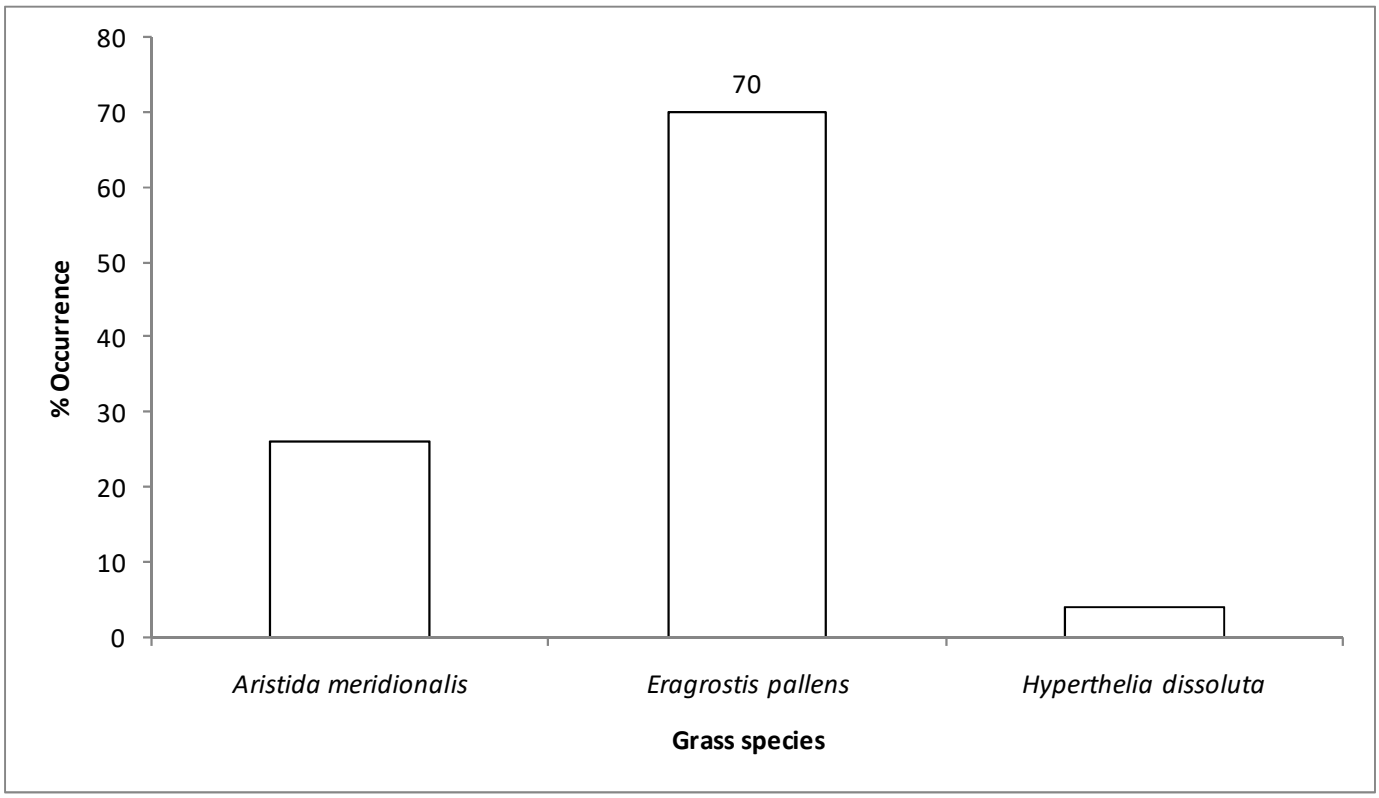


Figure 5.31: The grass species diversity is dominated by bare ground and Eragrostis pallens (broom grass) around the proposed D6 well site and access areas (Source: Annex 6).

5.3.5.7 G1 Local Flora Biodiversity Assessments

During the fieldwork a total of 13 larger trees and shrubs were confirmed around the proposed G1 well site and access areas and of which 6 species are protected (46.2%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Thirteen species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Burkea africana (burkea) (32.5%) being dominant. Protected tree/shrub species are well represented around the proposed G1 well site and access areas and make up 61.2% of species (Fig. 5.32 and Plates 5.32-5.34).

Important protected trees found around the proposed G1 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.33. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site.

During the fieldwork a total of 3 grasses were confirmed from the proposed development site (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.35).

Due to a recent fire around the proposed G1 well site and access areas, a survey of grasses was not possible (Plate 5.35).

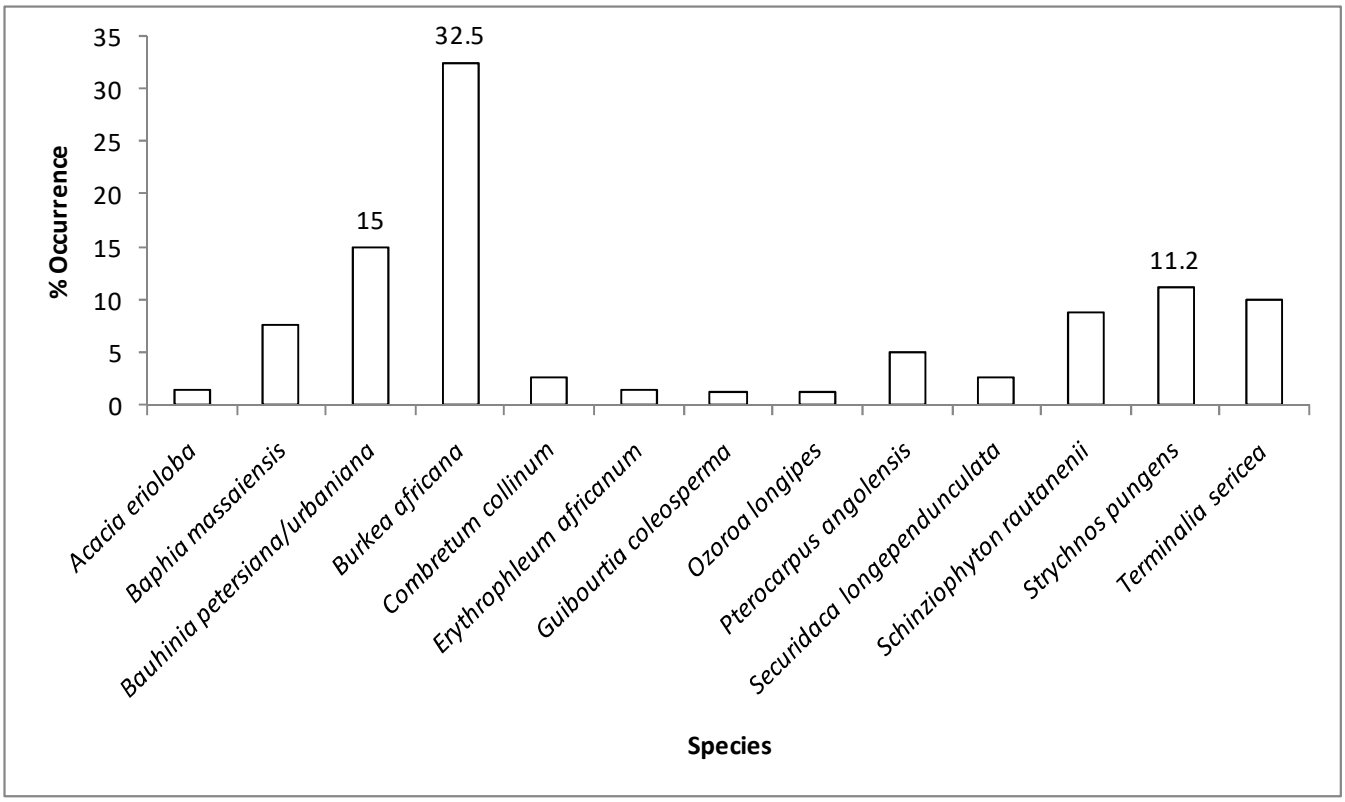


Figure 5.32: The tree/shrub species diversity is dominated by Burkea africana (burkea) around the proposed G1 well site and access areas (Source: Annex 4).

Plate 5.32: Burkea africana (burkea) protected trees and are some of the largest trees around the proposed G1 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.33: Guibourtia coleosperma (false mopane) protected trees are important species fond around the proposed G1 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.34: Pterocarpus angolensis (African teak or kiaat) protected trees found around the proposed G1 well site and access areas and have been heavily utilised in the past for timber (Photo by P. Cunningham, 2022).

Plate 5.35: Continuous grazing by cattle and frequent fires have resulted in grass diversity and biomass being low around the proposed G1 well site and access areas (Photo by P. Cunningham, 2022).

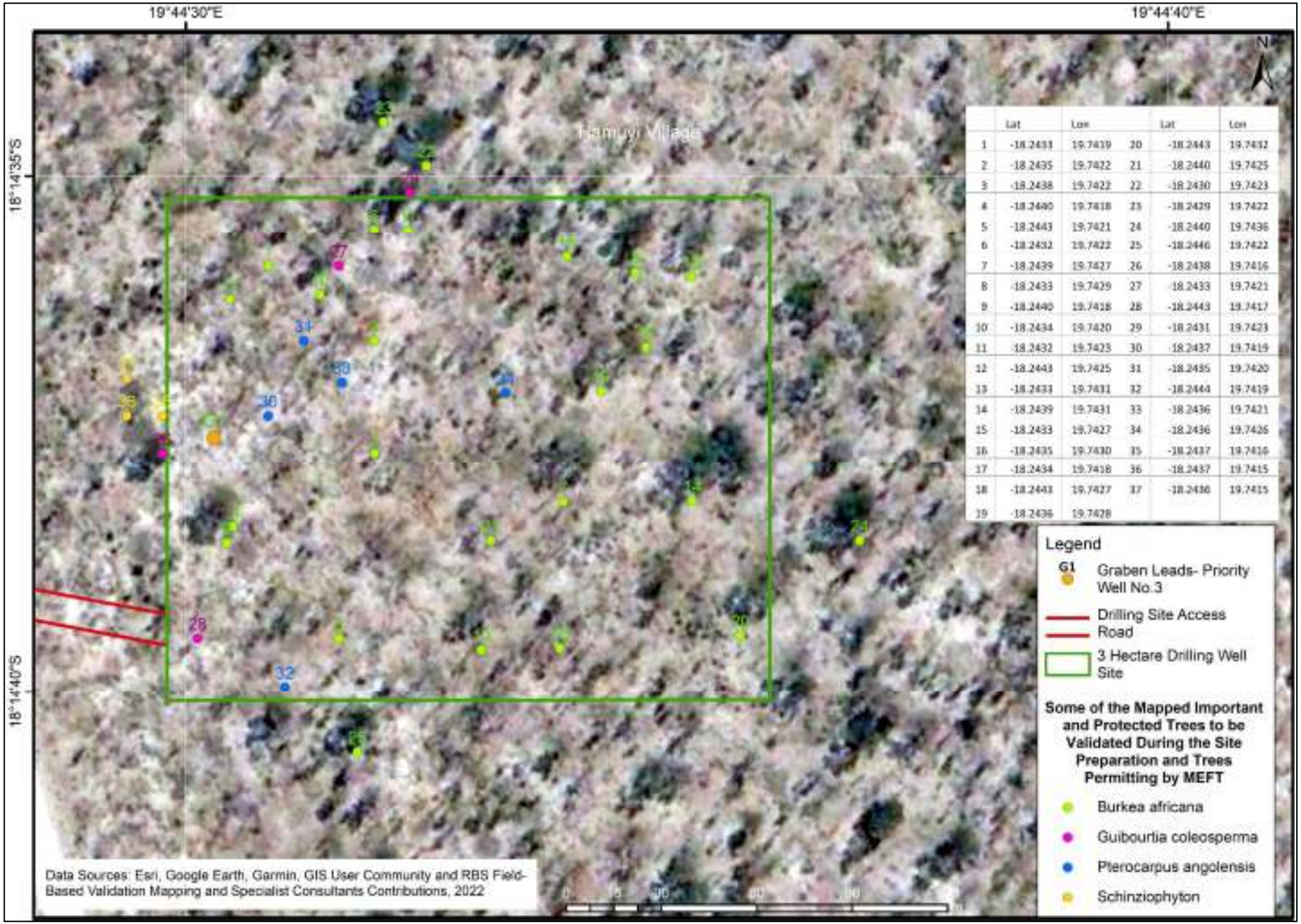


Figure 5.33: Some of the mapped important and protected trees around the proposed G1 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

5.3.5.8 G2 Local Flora Biodiversity Assessments

During the fieldwork a total of 15 larger trees and shrubs were confirmed around the proposed G2 well site and access areas of which 6 species are protected (40%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Fourteen (14) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Burkea africana (burkea) (25%) being dominant. Protected tree/shrub species are well represented around the proposed G2 well site and access areas and make up 41.5% of species (Fig. 5.34 and Plates 5.36-5.38).

Important protected trees found around the proposed G2 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.35. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site.

During the fieldwork a total of 8 grasses were confirmed from the proposed development site (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.39 and Fig. 5.36).

Three (3) species of grass were confirmed along various transects over 150m (N=150 points each 1m apart) with bare ground and the subclimax Eragrostis lehmanniana (Lehmann's love-grass) (54%) being dominant (Plate 5.39 and Fig. 5.36).

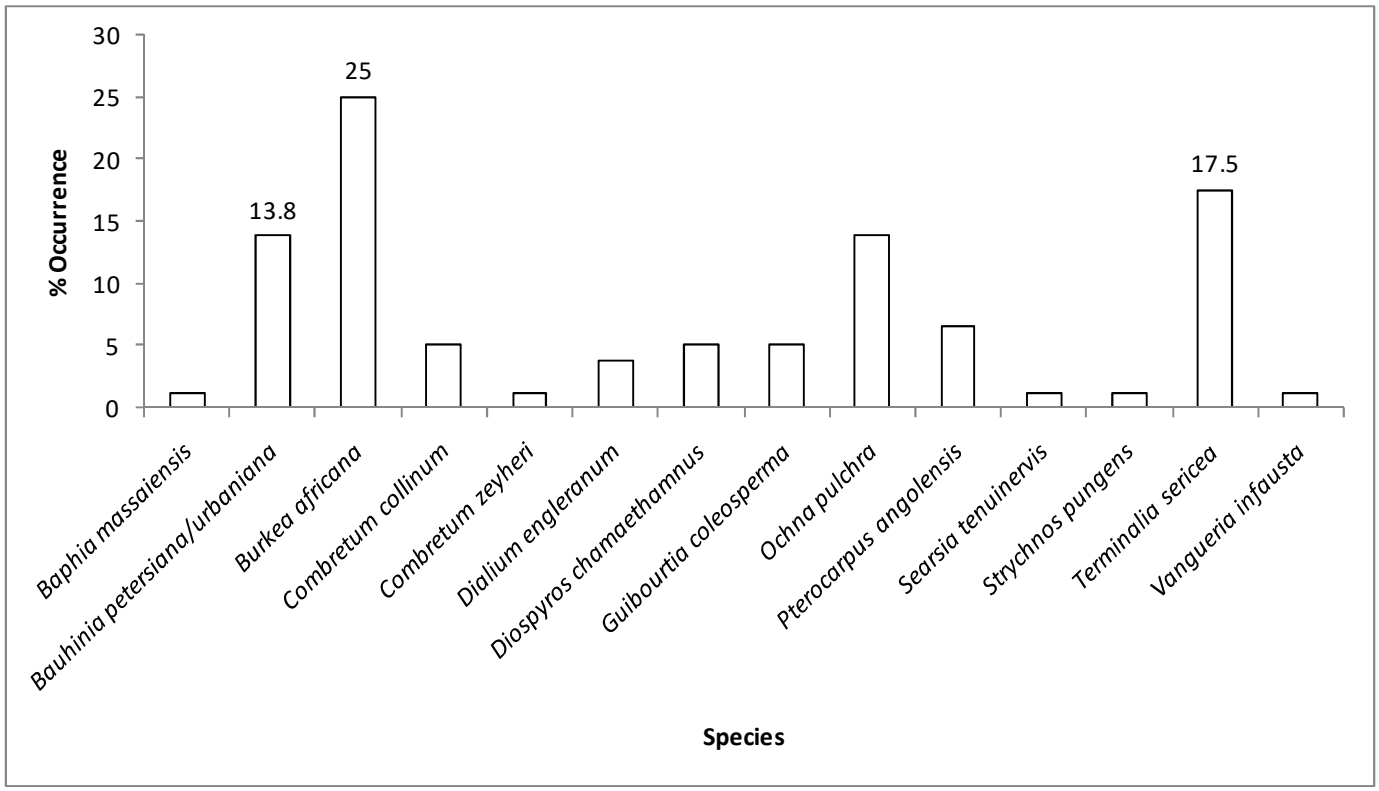


Figure 5.34: The tree/shrub species diversity is dominated by Burkea africana (burkea) around the proposed G2 well site and access areas (Source: Annex 4).

Plate 5.36: Burkea africana (burkea) protected trees and shrubs are some of the largest trees found around the proposed G2 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.37: Guibourtia coleosperma (false mopane) protected trees are found around the proposed G2 well site and access areas and are used for wood and are important fruit trees (Photo by P. Cunningham, 2022).

Plate 5.38: Large Pterocarpus angolensis (kiaat) protected trees and shrubs around the proposed G2 well site and access areas (Photo by P. Cunningham, 2022).

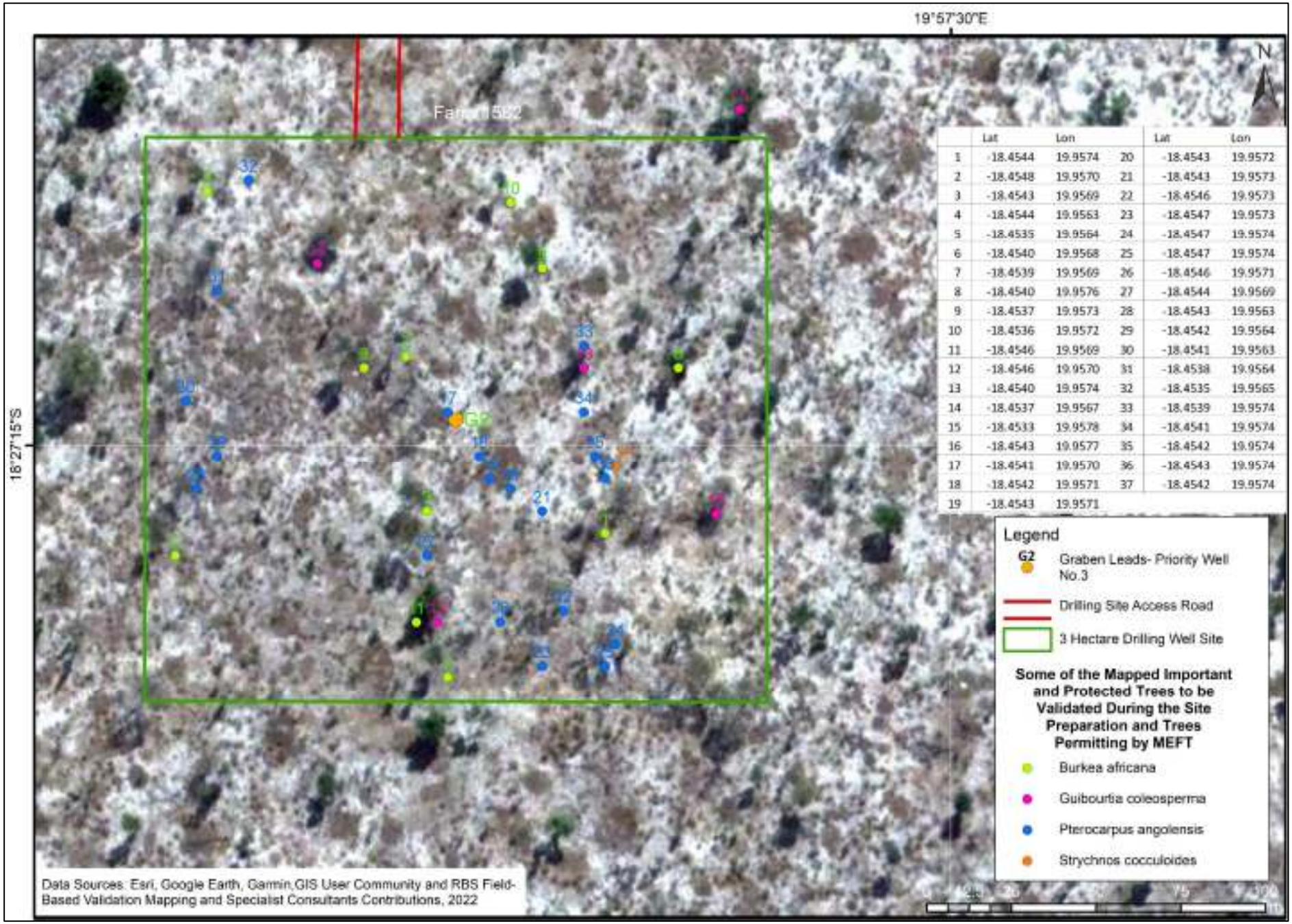


Figure 5.35: Some of the mapped important and protected trees around the proposed G2 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.39: The sandy area around the proposed G2 well site and access areas with dense bush does not have high grass diversity (Photo by P. Cunningham, 2022).

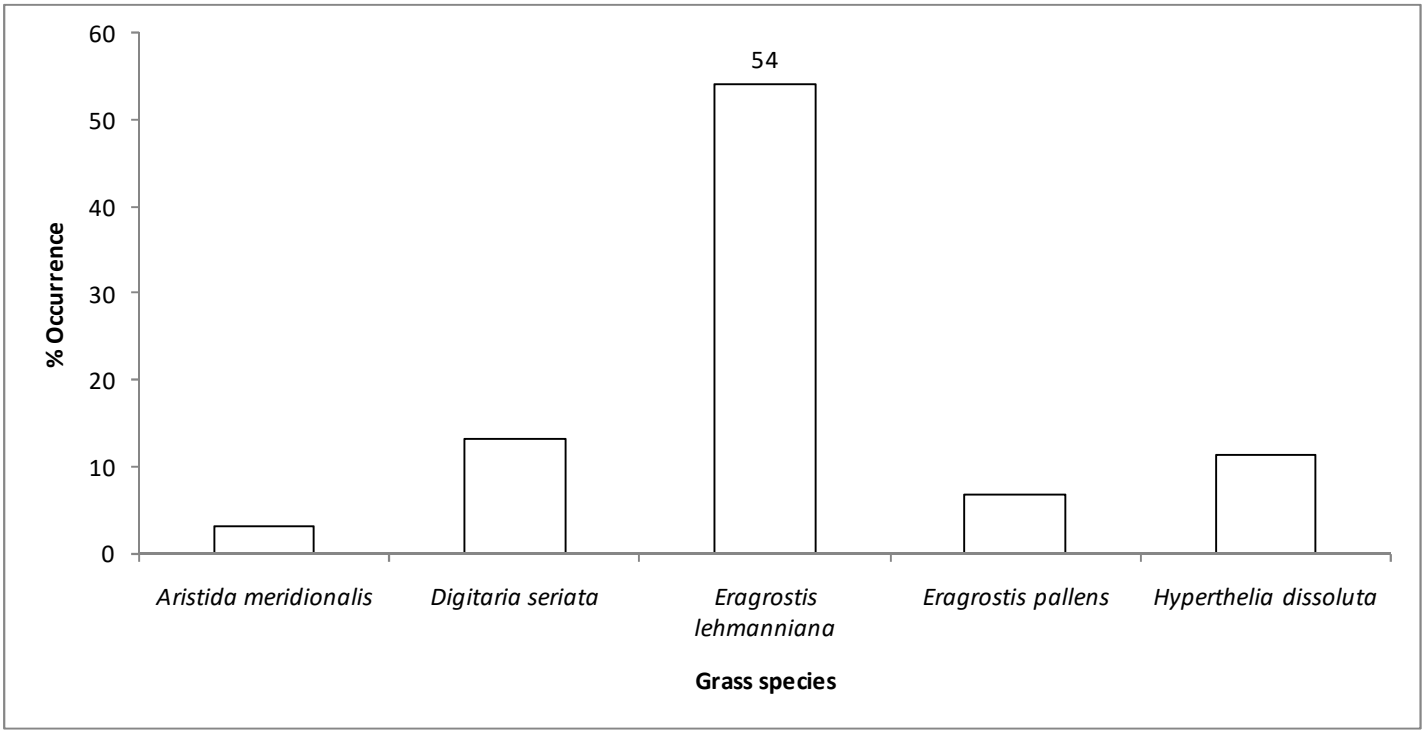


Figure 5.36: The grass species diversity is dominated by bare ground and Eragrostis lehmanniana (Lehmann's love-grass) around the proposed G2 well site and access areas (Source: Annex 4).

5.3.5.9 G3 Local Flora Biodiversity Assessments

During the fieldwork a total of 20 larger trees and shrubs were confirmed around the proposed G3 well site and access areas and of which 1 species is protected (3.8%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Nineteen (19) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Baphia massaiensis (sand camwood) (25%) being dominant. Protected tree/shrub species are not well represented around the proposed G3 well site and access areas and make up 3.8% of species (Fig. 5.37 and Plates 5.40-5.42).

Important protected trees found around the proposed G3 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.38. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site.

During the fieldwork a total of 6 grasses were confirmed from the proposed well site and access areas (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.43 and Fig. 5.39).

Four species of grass were confirmed along various transects over 150m (N=150 points each 1m apart) with Digitaria seriata (Kuruman finger-grass) (23.4%) being dominant (Plate 5.43 and Fig. 5.39).

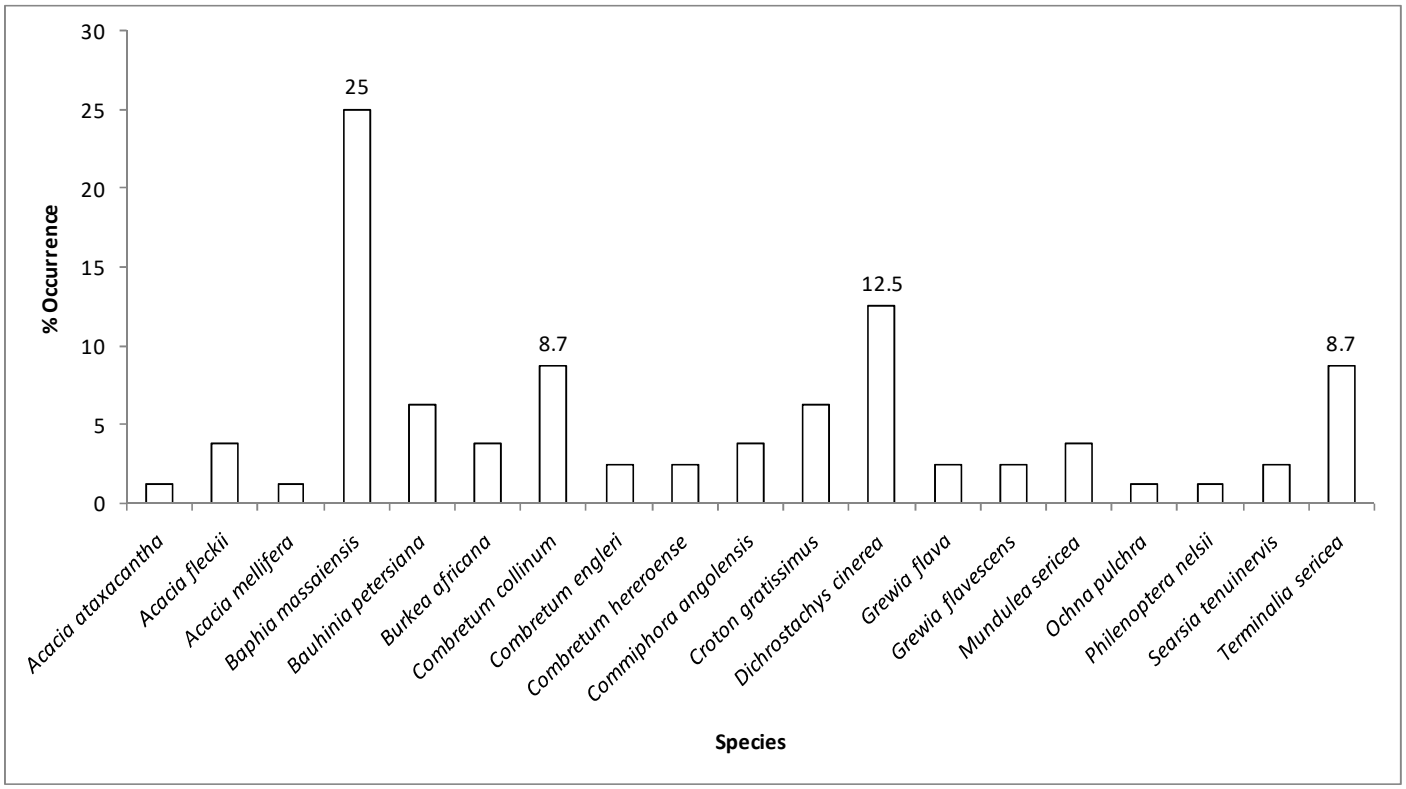


Figure 5.37: The tree/shrub species diversity is dominated by Baphia massaiensis (sand camwood) around the proposed G3 well site and access areas (Source: Annex 4).

Plate 5.40: Baphia massaiensis (sand camwood) dominating around the proposed G3 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.41: The proposed G3 well site and access areas are dominated by shrubs due to long term continuous burning regime followed in the area (Photo by P. Cunningham, 2022).

Plate 5.42: The few large trees remaining around the proposed G3 well site and access areas dominated by Burkea africana (burkea) which are a protected species (Photo by P. Cunningham, 2022).

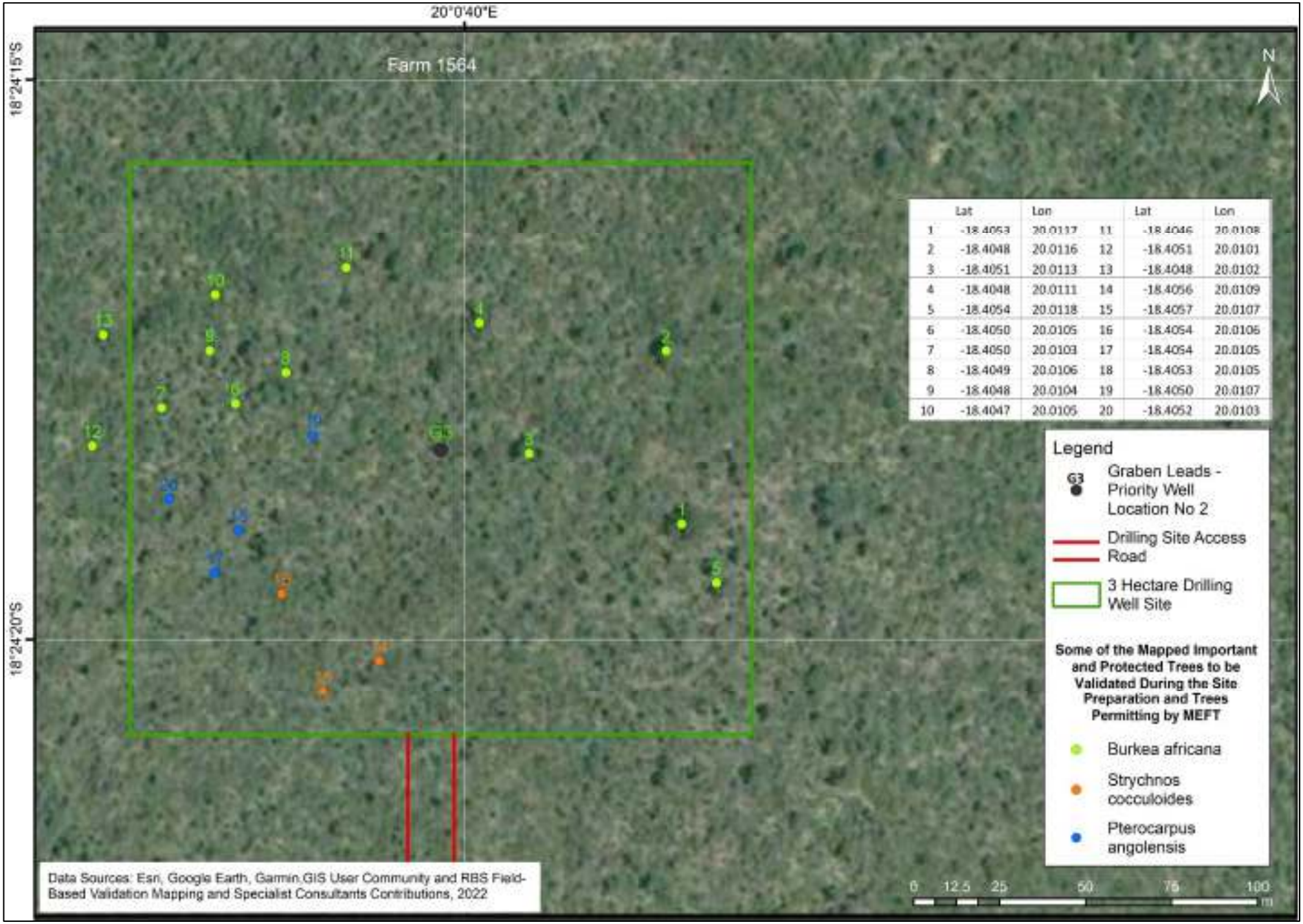


Figure 5.38: Some of the mapped important and protected trees around the proposed G3 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.43: The dominant grasses around the proposed G3 well site and access areas in the shrubby open area is Digitaria seriata (Kuruman finger-grass) and Hyperthelia dissolute (yellow thatching grass) (Photo by P. Cunningham, 2022).

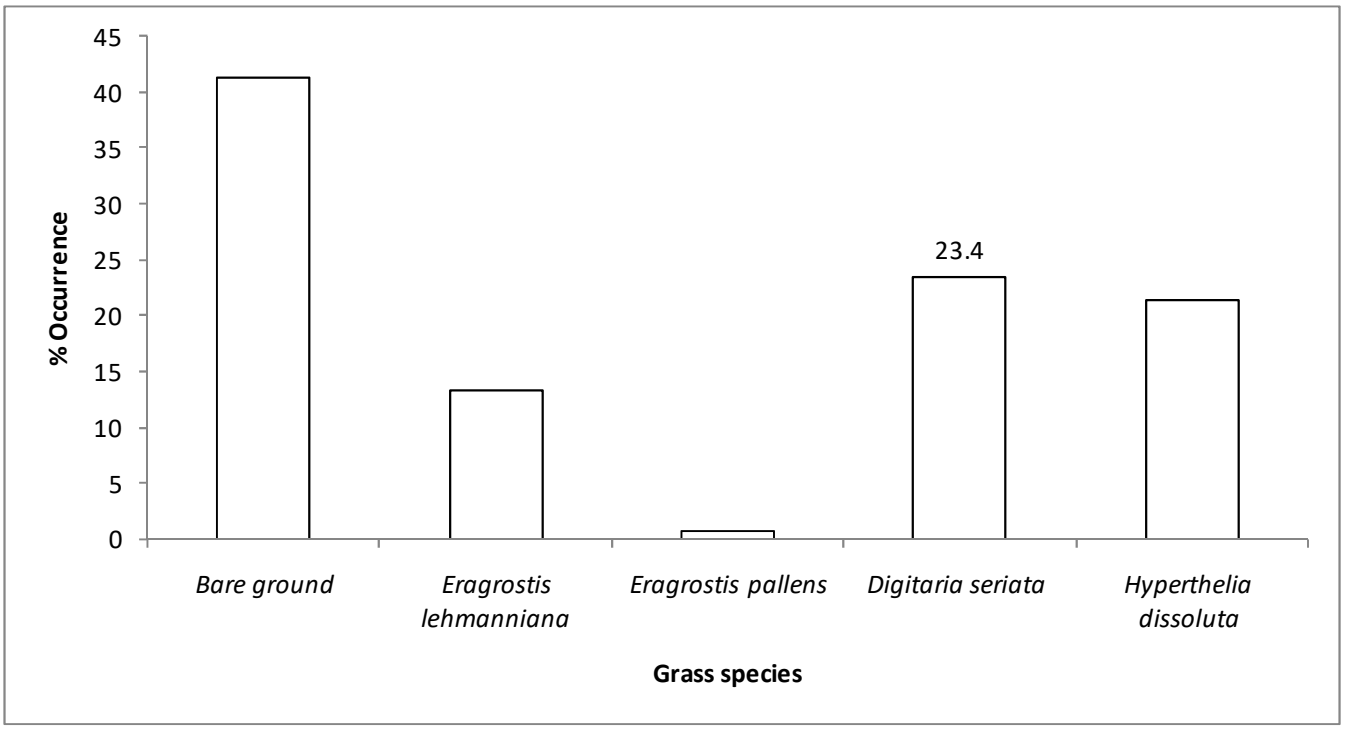


Figure 5.39: The grass species diversity is dominated by bare ground, Digitaria seriata (Kuruman finger-grass) and Hyperthelia dissoluta (yellow thatching grass) around the proposed G3 well site and access areas (Source: Annex 4)

5.3.5.10 G4 Local Flora Biodiversity Assessments

During the fieldwork a total of 18 larger trees and shrubs were confirmed around the proposed G4 well site and access areas of which 4 species are protected (22.2%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Fifteen (15) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Terminalia sericea (siver cluste leaf) (17.5%) being dominant. Protected tree/shrub species are not well represented around the proposed G4 well site and access areas and make up 7.5% of species (Fig. 5.40 and Plates 5.44-5.46).

Important protected trees found around the proposed G4 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.41. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site.

During the fieldwork a total of 3 grasses were confirmed around the proposed well site and access areas (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.47 and Fig. 5.42).

One species of grass was confirmed along various transects over 150m (N=150 points each 1m apart) with Aristida stipitata (bristle-grass) (70%) being dominant (Plate 5.47 and Fig. 5.42).

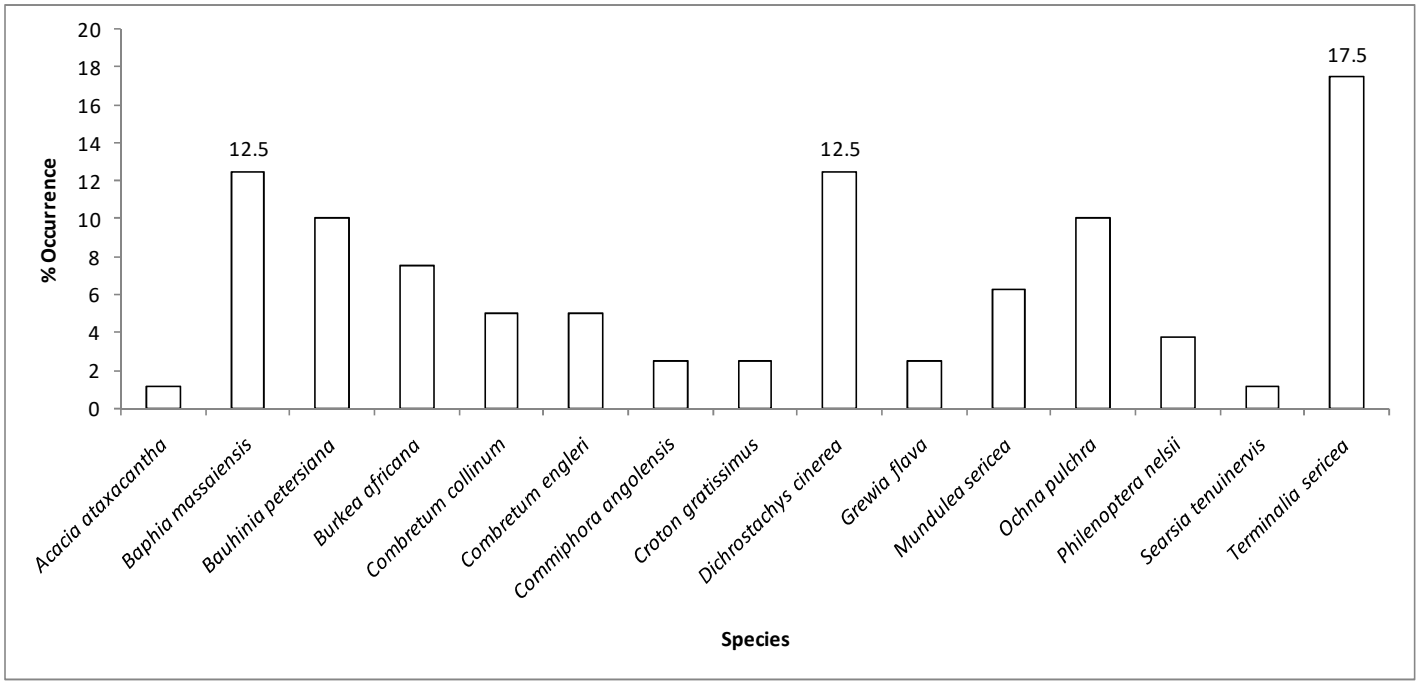


Figure 5.40: The tree/shrub species diversity is dominated by Terminalia sericea (siver cluste leaf) around the proposed G4 well site and access areas (Source: Annex 4).

Plate 5.44: Burkea africana (burkea) protected trees are some of the largest trees found around the proposed G4 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.45: The proposed G4 well site and access areas are densely bushed with a variety of species present (Photo by P. Cunningham, 2022).

Plate 5.46: The general area around the proposed G4 well site and access areas are sandy and well vegetated (Photo by P. Cunningham, 2022).

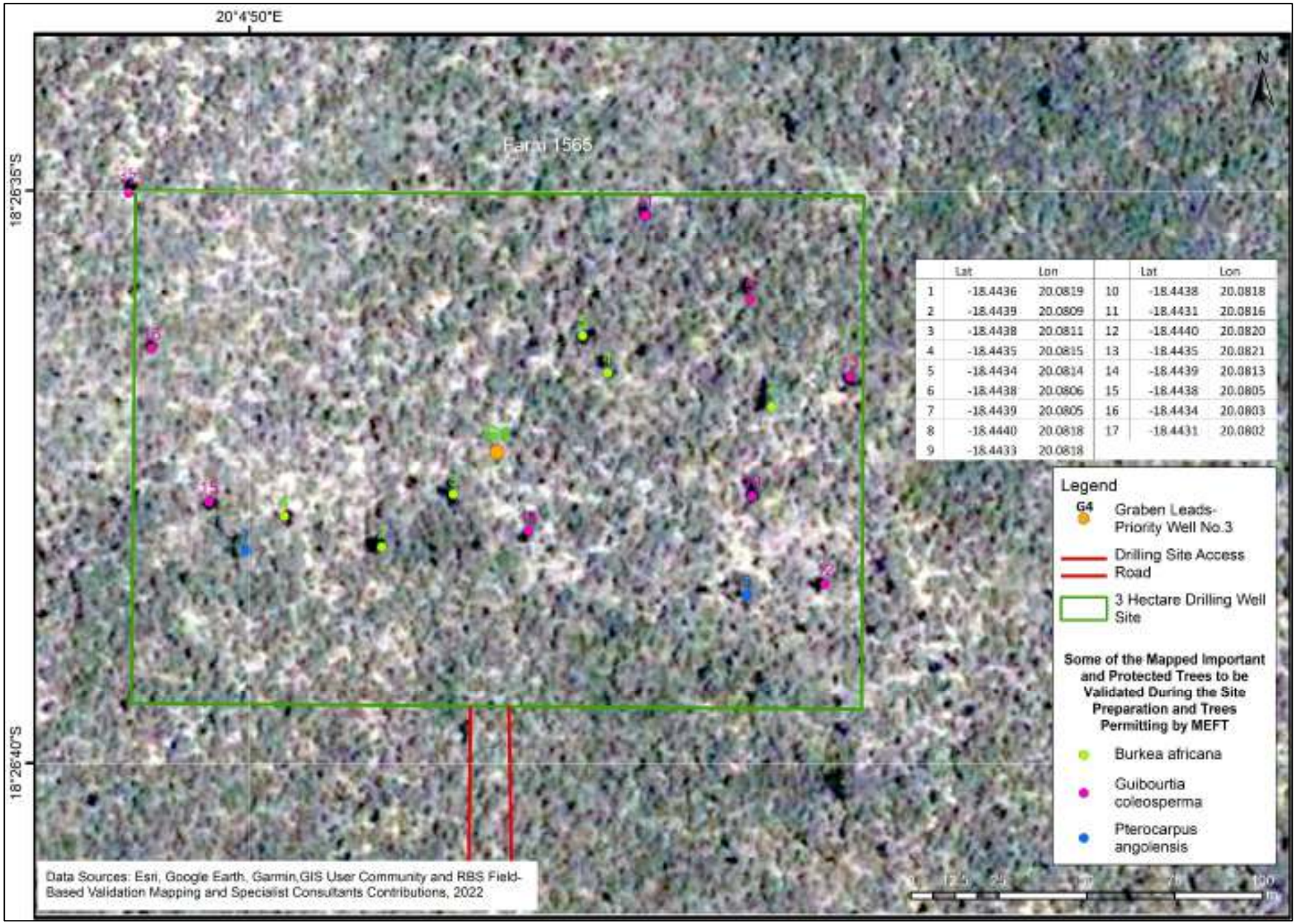


Figure 5.41: Some of the mapped important and protected trees around the proposed G4 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.47: Aristida stipitata (bristle-grass) grass is the dominant grass species found throughout the proposed G4 well site and access areas (Photo by P. Cunningham, 2022).

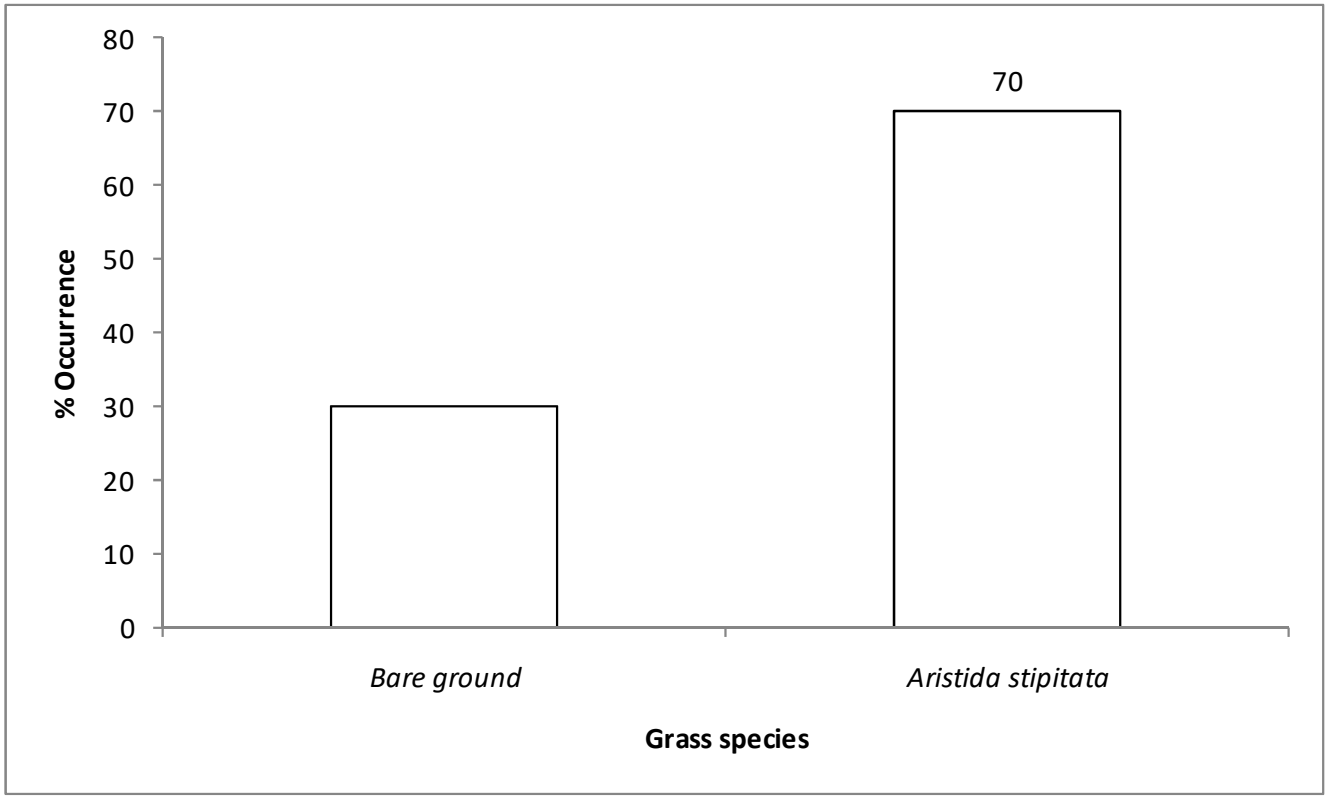


Figure 5.42: The grass species diversity around the proposed G4 well site and access areas are dominated by bare ground and Aristida stipitata (bristle-grass) (Source: Annex 4).

5.3.5.11 G5 Local Flora Biodiversity Assessments

During the fieldwork a total of 20 larger trees and shrubs were confirmed around the proposed G5 well site and access areas and of which 0 species are protected (0%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Nineteen (19) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Croton gratissimus (lavender Croton) (18.7%) being dominant. Protected tree/shrub species are not well represented around the proposed G5 well site and access areas and make up 0% of species (Fig. 5.43 and Plates 5.48-5.50).

Important protected trees found around the proposed G5 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.44. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site.

During the fieldwork a total of 4 grasses were confirmed around the proposed well site and access areas (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.51 and Fig. 5.45).

Two species of grass were confirmed along various transects over 150m (N=150 points each 1m apart) with the subclimax Eragrostis lehmanniana (Lehmann's love-grass) being dominant (Plate 5.51 and Fig. 5.45).

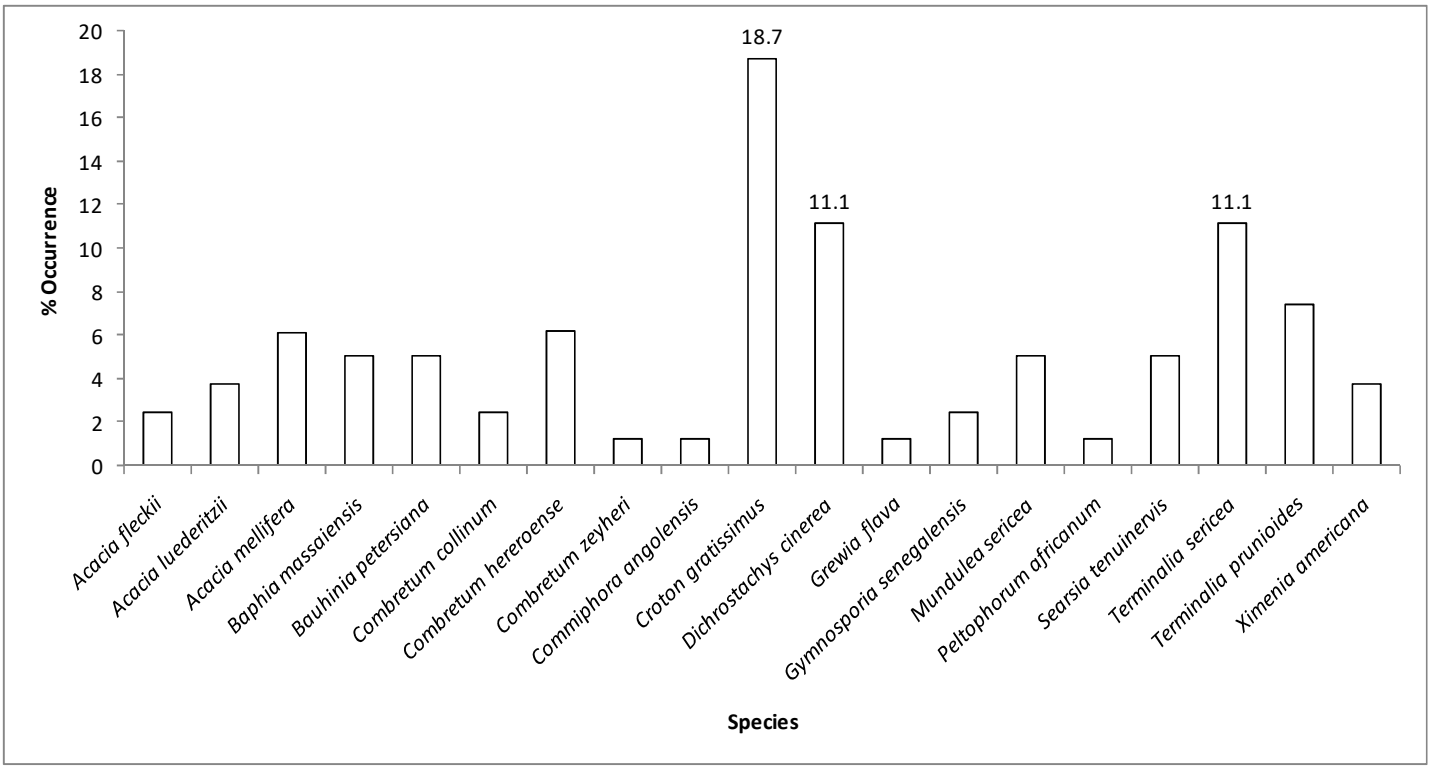


Figure 5.43: The tree/shrub species diversity is dominated by Burkea africana (burkea) around the proposed G5 well site and access areas (Source: Annex 4).

Plate 5.48: Acacia luederitzii (Kalahari Acacia) and Terminalia prunioides (purple pod Terminalia) are some of the largest trees found around the proposed G5 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.49: Large individual Philenoptera nelsii (Kalahari omupanda) occur around the proposed G5 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.50: The proposed G5 well site and access areas are dense and dominated by a variety of trees/shrubs (Photo by P. Cunningham, 2022).

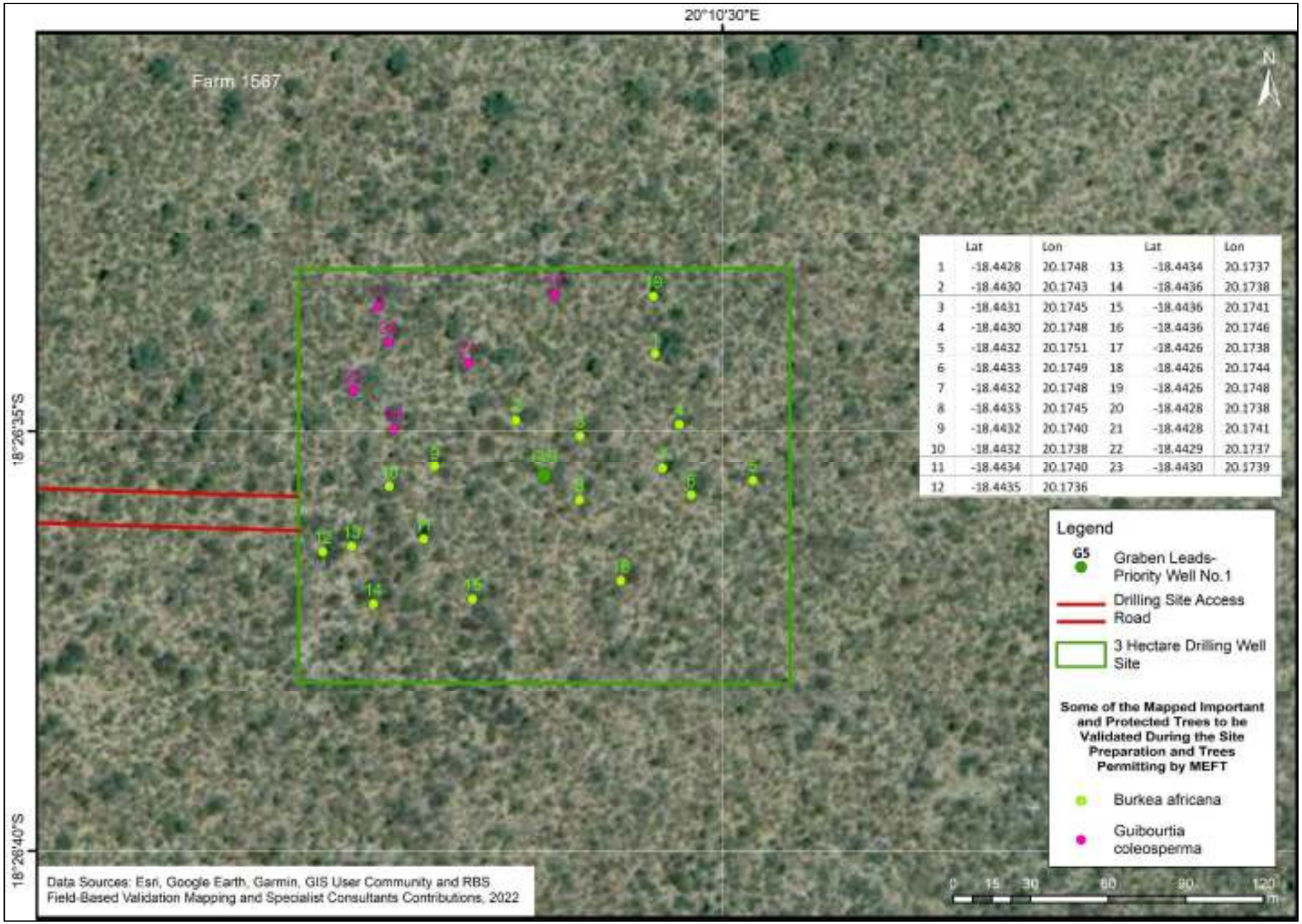


Figure 5.44: Some of the mapped important and protected trees around the proposed G5 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.51: Large areas have been cleared of bush for fields with an increased grass and herb growth evident around the proposed G5 well site and access areas (Photo by P. Cunningham, 2022).

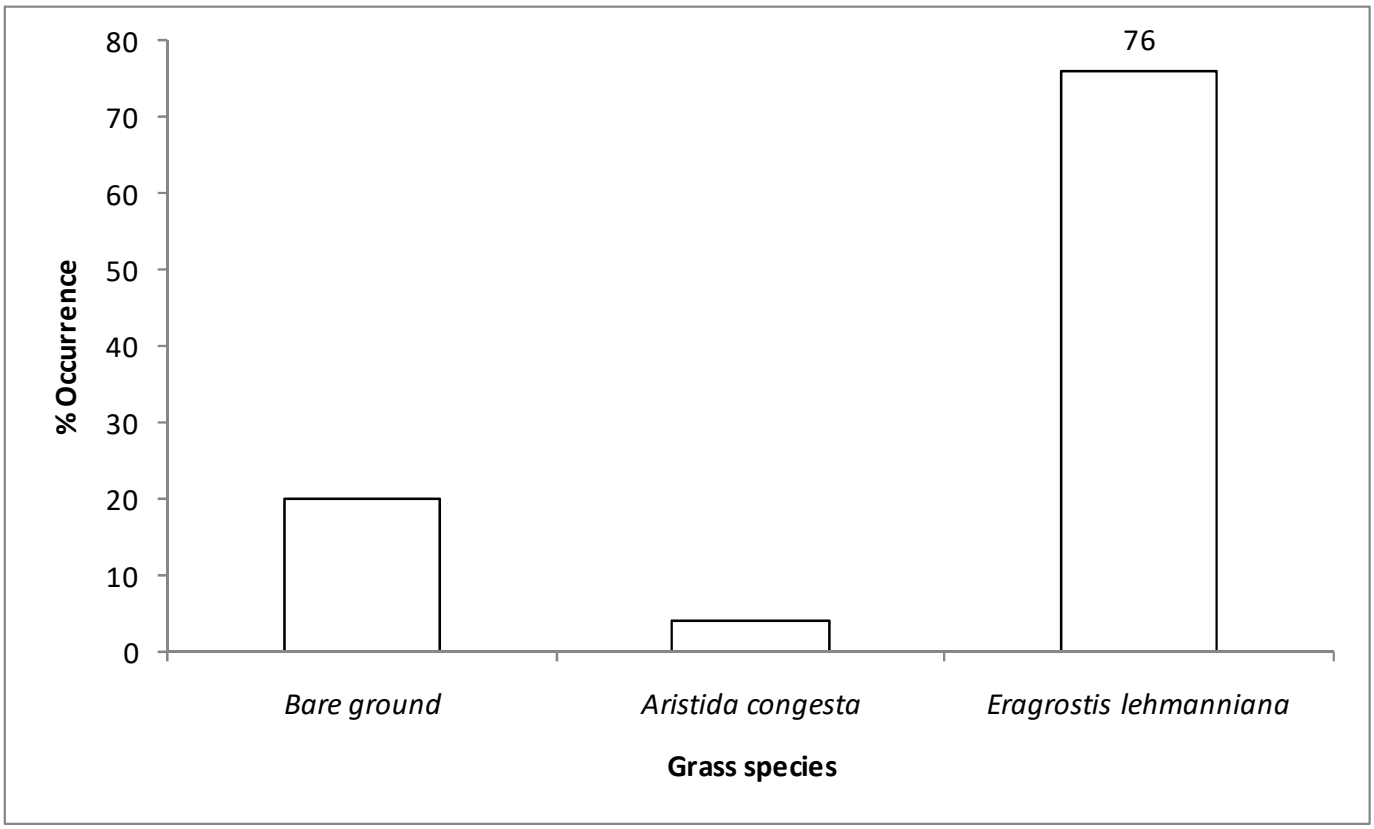


Figure 5.45: Eragrostis lehmanniana (Lehmann's love-grass) grass is dominant grass species found around the proposed G5 well site and access areas (Source: Annex 4).

5.3.5.12 G6 Local Flora Biodiversity Assessments

During the fieldwork a total of 17 larger trees and shrubs were confirmed around the proposed G6 well site and access areas and of which 5 species are protected (29.4%) while a total of 51 species were confirmed by Cunningham (2020, 2021a,b, 2022) along the seismic routes and other well sites in the general area (Annex 4).

Fourteen (14) species of larger trees and shrubs were confirmed along various transects over 800m (N=80 points each 10m apart) with Terminalia sericea (siver cluste leaf) (22.6%) being dominant. Protected tree/shrub species are well represented around the proposed G6 well site and access areas and make up 23.8% of species (Fig. 5.46).

Important protected trees found around the proposed G6 well site and access areas have been tagged / marked with a red tape and are plotted as shown in Fig. 5.47. A Harvesting Permit granted by the Directorate of Forestry in the MEFT is required before important and protected trees are cutdown / removed from the site.

During the fieldwork a total of 5 grasses were confirmed around the proposed G6 well site and access areas (Annex 4). Few grass species were confirmed from the area due to the deep sandy soils with a limited diversity; dense bush; cattle thoroughfare and area being frequently grazed and burnt (Plate 5.55 and Fig. 5.48).

Three species of grass were confirmed along various transects over 150m (N=150 points each 1m apart) with Eragrostis lehmanniana (Lehmann's love-grass) (44%) being dominant (Plate 5.55 and 5.48).

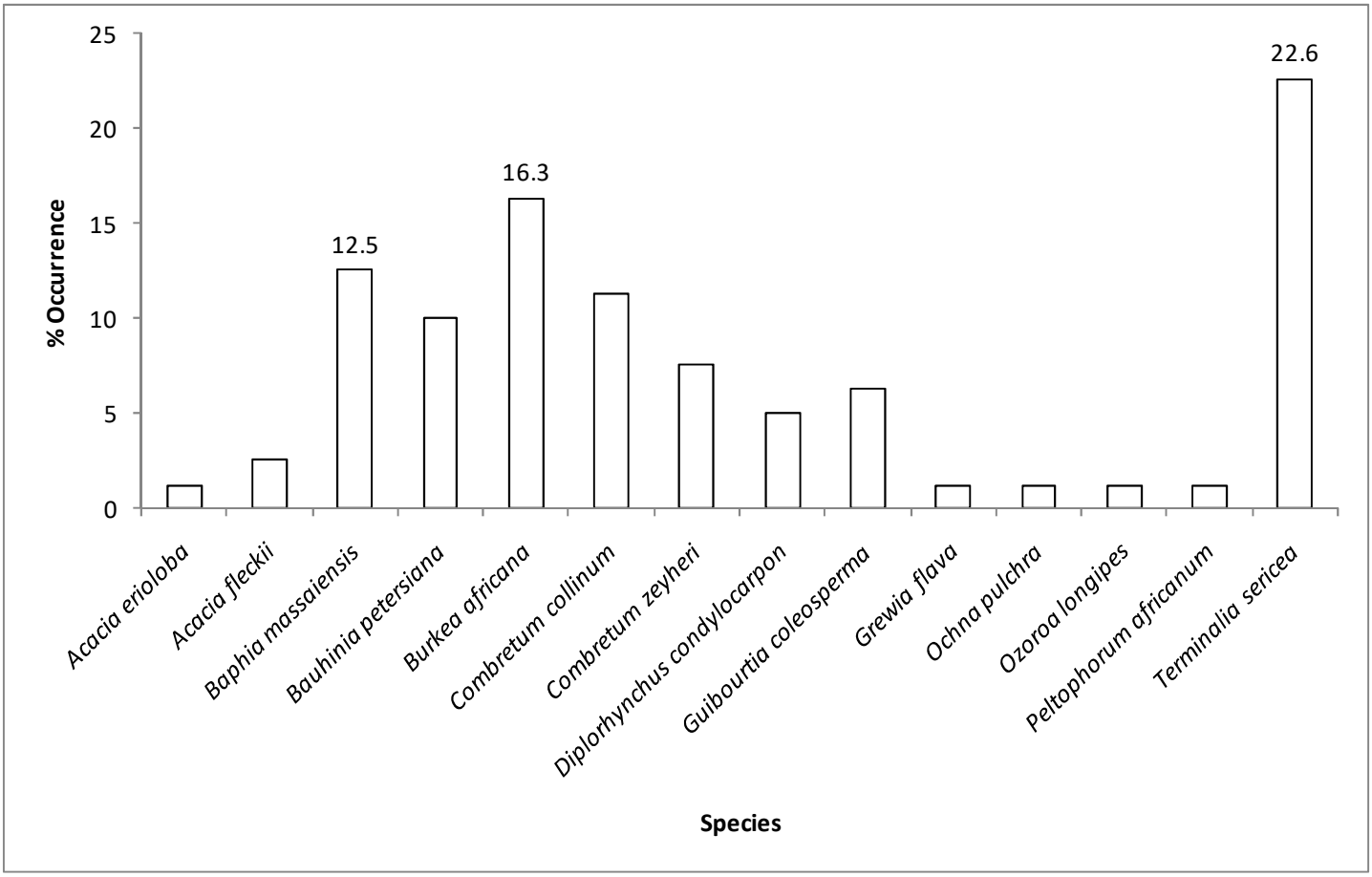


Figure 5.46: The tree/shrub species diversity is dominated by Terminalia sericea (siver cluste leaf) around the proposed G6 well site and access areas (Source: Annex 4).

Plate 5.52: Burkea africana (burkea) protected trees are some of the largest trees found around the proposed G6 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.53: Some large Guibourtia coleosperma (false mopane) protected trees were observed around the proposed G6 well site and access areas (Photo by P. Cunningham, 2022).

Plate 5.54: The proposed G6 well site and access areas are sandy and dominated by Burkea africana (burkea) and Terminalia sericea (silver clster leaf) trees/shrubs (Photo by P. Cunningham, 2022).

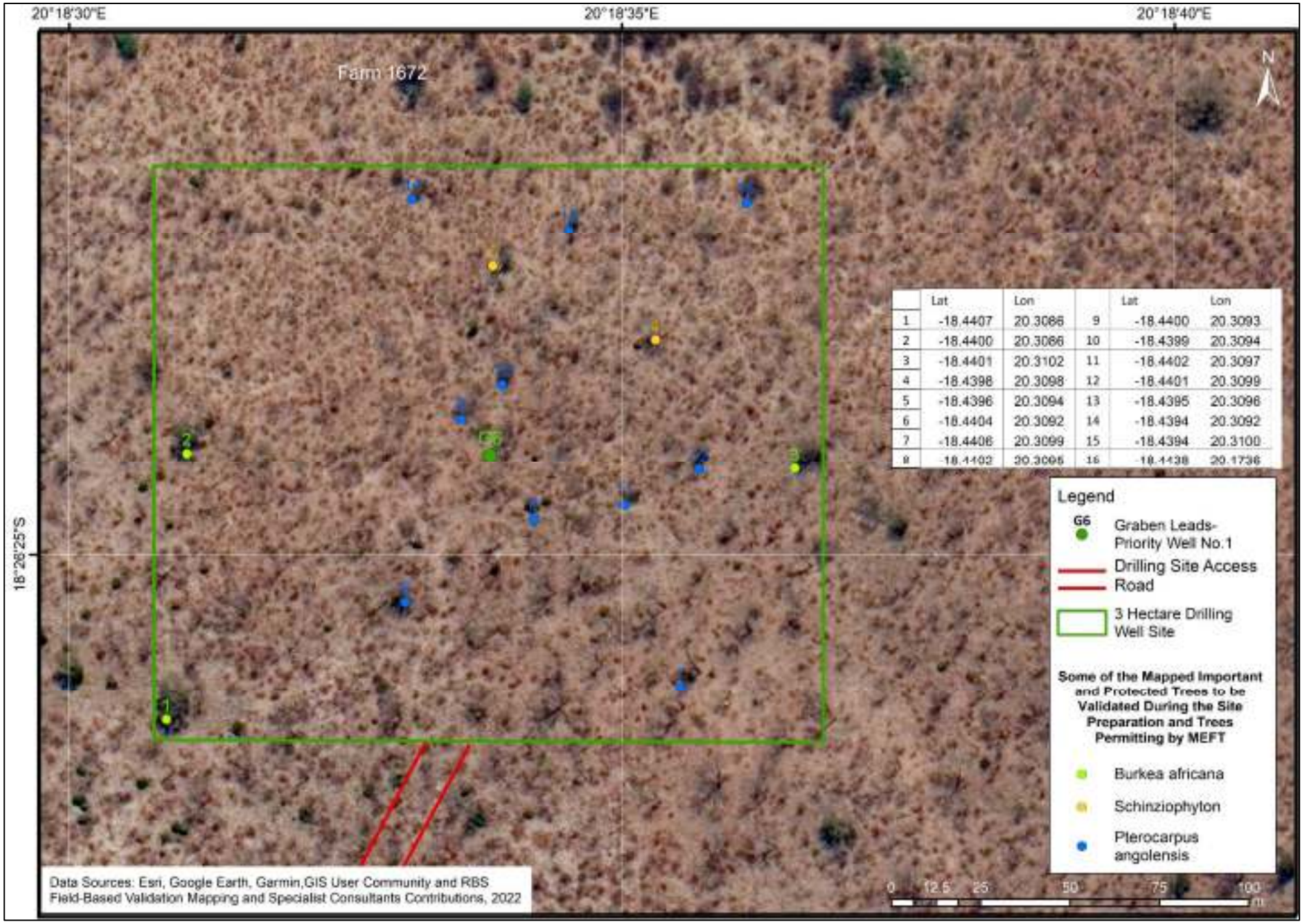


Figure 5.47: Some of the mapped important and protected trees around the proposed G6 well site and access areas that shall be protected or permitted before being removed during the site preparation if this site is going to be drilled.

Plate 5.55: Aristida species and Eragrostis lehmanniana (Lehmann's love-grass) grasses are dominant grasses species around the proposed G6 well site and access areas (Photo by P. Cunningham, 2022).

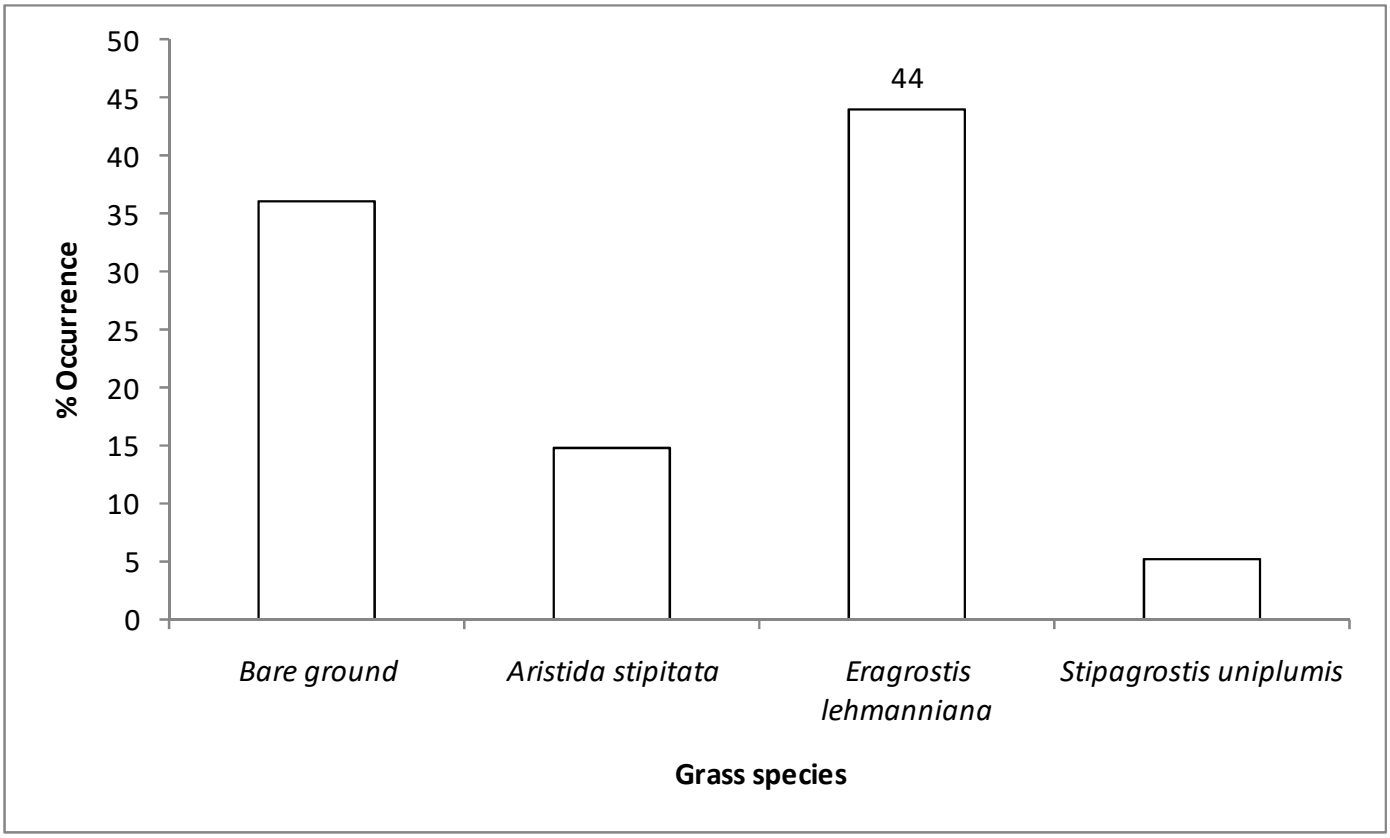


Figure 5.48: The grass species diversity is dominated by bare ground and Eragrostis lehmanniana (Lehmann's love-grass) around the proposed G6 well site and access areas (Source: Annex 4).

5.3.6 Summary of Important Fauna and Flora Species

5.3.6.1 Reptiles

The most important species within the AOI are viewed as the 2 endemics (*Ichnotropis grandiceps* and *Lygodactylus bradfieldi*), 3 species classified as rare (*Lycophidion multimaculatum*, *Psammophis jallae*, *Causus rhombeatus*) and 6 species classified as vulnerable (*Stigmochelys pardalis*, *Psammobates oculiferus*, *Kinixys spekii, Python natalensis*, *Varanus albigularis*, *Varanus niloticus*) (Annex 4).

Furthermore, *Ichnotropis grandiceps*, is also classified as data deficient by the IUCN (2021), supporting its importance.

5.3.6.2 Amphibians

The most important species within the AOI is the giant bullfrog (*Pyxicephalus adspersus*) with "population is decreasing" according to the IUCN (2021) as it is consumed as food throughout its range (Annex 4).

5.3.6.3 Mammals

The most important species within the AOI are probably those classified as rare (*Nycteris hispida*, *Kerivoula argentata*, *Kerivoula lanosa*, *Mastomys shortridgei*, *Civittictis civetta*, *Paracynictis selousi*) and endangered (*Lycaon pictus*, *Lutra maculicollis*, *Equus (burchellii) quagga*) under Namibian legislation and those classified by the IUCN (2021) as endangered (*Lycaon pictus*), vulnerable (*Loxodonta africana*, *Smutsia (Manis) temminckii*, *Acinonyx jubatus*, *Panthera pardus*, *Panthera leo*, *Hippopotamus amphibious*, *Giraffa camelopardalis*) and near threatened (*Hipposideros vittatus*). However, some of the above species – e.g. other, hippo, etc. – are only associated with the Okavango River.

The most important species expected to occur in the general area would be the African wild dog (*Lycaon pictus*) and pangolin (*Smutsia (Manis) temminckii*).

5.3.6.4 *Birds*

The most important species with the AOI are viewed as those classified as endangered (hooded vulture, white-backed vulture, tawny eagle, martial eagle, bateleur, southern ground-hornbill), vulnerable (secretarybird, white-headed vulture, lappet-faced vulture and) and near threatened (marabou stork, peregrine falcon, kori bustard) from Namibia (Simmons *et al.* 2015) as well as those classified by the IUCN (2021) as critically endangered (hooded vulture, white-headed vulture, white-backed vulture), endangered (lappet-faced vulture), 4 vulnerable (secretarybird, tawny eagle, martial eagle, southern ground-hornbill) and near threatened (bateleur, kori bustard) (Annex 4).

5.3.6.5 Trees/shrubs

At least 10 species of conservation concern – i.e. red data species within the AOI of which 3 species are endemic, 4 species as near threatened (*Baikiaea plurijuga*, *Cromidon pusillum*, *Eulophia leachii*, *Pterocarpus angolensis*), 5 species protected by the Nature Conservation Ordinance No. 4 of 1975 and 4 species viewed as least concern while 4 species is listed by CITES as Appendix 2 (Table 5.1 and Annex 4).

However, except for *B. plurijuga* and *P. angolensis* the majority of the other species are all associated with "moist/wet" areas such as pans/Omuramba, etc. and not expected to occur in the dry sandy areas devoid of surface water.

Table 5.1: Important species – i.e. red data spp. – known to occur in the general area according to Loots (2005).

Species: Scientific name	Conservation status
Baikiaea plurijuga	NT
Brachystelma schinzii	Endemic; LC
Ceropegia stenantha	NC; LC
Cromidon pusillum	Endemic; NT
Eulophia hereroensis	NC; C2; LC
Eulophia leachii	NC; C2; NT
Eulophia livingstoniana	NC, C2
Habenaria epipactidea	NC; C2
Hygrophila gracillima	Endemic; LC
Pterocarpus angolensis	NT

***NC**: Nature Conservation Ordinance No. 4 of 1975*
Endemic; NT – Near Threatened; LC – Least Concern (Loots 2005)
***C2:** CITES Appendix 2 species*
***Source:** Loots (2005)*

5.3.6.6 *Grass*

The grasses commonly used for thatching are: *Eragrostis pallens*, *Hyperthelia dissoluta* and *Cymbopogon* species – which also have economic value, are the important grasses within the AOI (Annex 4).

Except for the general ecological role of grasses (e.g., stabilising the soil, fodder/grazing value, etc.) none of the grasses are viewed as exceptionally unique in the area.

5.3.7 Summary of Important Habitats

The most important habitats in the general wider / regional area around the proposed D1-D6 and G1-G6 well locations are:

1) Perennial Okavango River: The Okavango River is viewed as a site of special ecological importance in Namibia due to its biotic richness, threatened plants and insects (Curtis and Barnard 1998). The river is situated more than 50 km from the nearest proposed well site.

2) Fossilised Ephemeral Omuramba Omatako: 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).

3) 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). Although important larger pans such as Nyae Nyae, etc. fall outside the general area, all other smaller pans are also viewed as important habitat.

4) Khaudum National Park: The Khaudum NP falls within the North-Eastern Kalahari Woodlands vegetation type with omurambas which act as ideal routes for wildlife. Dominant trees include: Acacia erioloba, Adansonia digitata, Baikiaea plurijuga, Combretum imberbe, Guibourtia coleosperma and Spirostachys africana. Important wildlife includes: African wild dog, leopard, lion, spotted hyaena, side-striped jackal, elephant, giraffe, blue wildebeest, eland, kudu, oryx, red hartebeest reedbuck, roan, tsessebe and warthog. Important birds include: Abdim's stork, African golden oriole, African hobby falcon, Bradfield's hornbill, ground hornbill, lesser spotted eagle, racket-tailed roller, steppe eagle and yellow-billed kite (www.meft.gov.na).

5) Mangetti National Park: The Mangetti NP falls within the North-Eastern Kalahari Woodlands vegetation type with the vegetation on the dune crests markedly different to that in dune valleys – i.e. Kalahari woodland vegetation dominates the dune crests, whereas mixed acacia

savannah vegetation characterises the dune valleys. Dominant trees include: Acacia erioloba, Acacia mellifera, Combretum collinum, Commiphora species, Schinziophyton rautanenii and Terminalia sericea. Important wildlife includes: African wild cat, leopard, spotted hyaena, blue wildebeest, common duiker, kudu, oryx, sable, steenbok and occasional elephant and wild dog. Important birds include: bateleur, lapped-faced vulture, tawny eagle, Meyer's parrot, and striped kingfisher (www.meft.gov.na).

6) Undisturbed areas and protected flora species: The general area is not pristine anymore due to prolonged human impact (e.g. settlements, slash-and-burn farming practices, unseasonal fires, etc.), especially along the perennial Okavango and Fossilised Omuramba Omatako ephemeral River Channels, and more recently along the various tracks and roads throughout the area. However, there are some areas far from the rivers and 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.

7) Kapinga Kamwalye Conservancy: The Kapinga Kamwalye Conservancy is the closest conservancy to the proposed development area, and viewed as important to the local communities in the area (MEFT/NACSO 2021, www.nacso.org.na), and.

8) Community Forests: Various Community Forests occur in the general area and include Ncumcara, Ncamagoro, Mbeyo, Cuma and Ncaute, all viewed as important to the local communities in the area (MEFT/NACSO 2021, www.nacso.org.na).

5.4 Regional and Local Socioeconomic Settings

5.4.1 Overview

The greater parts of PEL 73 are general sparely populated with much of the population concentrated along the Okavango River marking the border between Namibia and Angola. The towns and villages that are close to the proposed exploration and appraised wells form a part of the local area of interest (AOI) and are shown in Fig. 5.49. The local communities mainly subsistence farming communities that due to shortage of fertile soils, poor crop yields and limited markets for any surplus from their production live under difficult conditions. The information and data used for the socioeconomic environment of the AOI was derived from the secondary data sources and supplemented with the field-based data sets collected for the selected and targeted areas forming a part of the local area of interest. The primary data obtained from the ongoing field-based community surveys was used to supplement the socio-economic report with information about the communities living in the local area of interest. The data include the information about the demographic characteristics of the communities living nearby the proposed wells, qualitative data on the community's acquaintance with the proposed activities, their views on the Recon Africa previous and current activities. Communities that participated in this survey are Naingopo, Gcaru, Ncaute, Cumezao, Makandina, Mbambi and Mutweghombahe all forming a part of the local area of interest (Fig. 5.49).

The field data was collected by the questionnaire designed to collect quantitative and qualitative data, containing a number of open-ended questions. The questionnaire was administered in a random and voluntary manner by a team of four experienced enumerators, supported by a socio-economic specialist. The data that is used for this assessment was collected during the period of 7th to 23rd December, 2022. The objectives of the review were:

(i) Determine the existing socioeconomic environment of the surrounding communities around the AOI and proposed well locations.

(ii) Determine the socioeconomic issues relevant to the AOI and validate the available secondary and primary data sets, and.

(iii) Determine feasible mitigation measures where applicable.

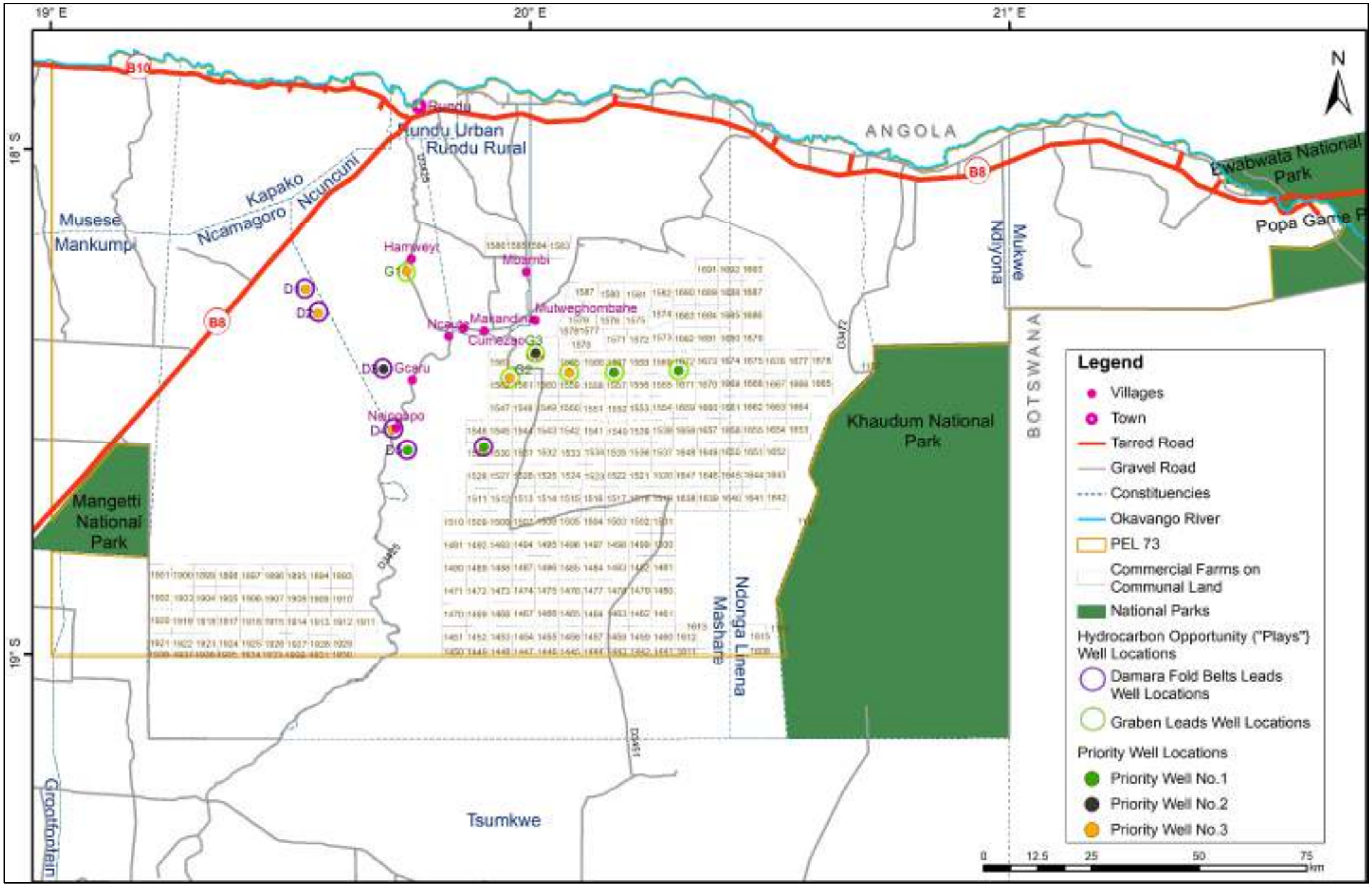


Figure 5.49: Proposed D1-D6 and G1-G6 well sites and the local villages covered in the field-based socioeconomic survey for updating / validating the local socioeconomic profile.

5.4.2 Community Surveys from the Area of Interest (AOI)

The community survey of people living in the area of interest (AOI) is still ongoing, but there are some preliminary results, particularly for the communities in Naingopo, Gcaru, Ncaute, Cumezao, Makandina, Mbambi and Mutweghombahe, used in this report with respect to the proposed multiple exploration and appraisal wells with supporting infrastructure and related services in the AOI (Fig. 5.49). Based on the preliminary findings, it becomes evident that demographic profile of the area of interest is similar to other rural communities living in Kavango East and West Regions.

Preliminary findings from the community survey confirmed that rural areas largely depend on agricultural activities to sustain their living. Around 38 % reported that their livelihoods directly depend on farming, mainly crop farming. Farming as a main source of income was particularly high in Gcaru (54.1%), Makandina (50.8%) and Naingopo (40%). Temporary work or a piece work as referred by the respondents was a second largest source of household's income. In villages like Mutweghombahe it accounts for 22.7% of household's income, Cumezao 18 %, Ncaute 15.4%, Makandina 11,6%.

Highest number of households with main source of income being wages and salaries appears to be in Mutweghombahe and Ncaute, 36.4% and 13.6% accordingly. However, majority of those earning salary or wage income fell in the category between N$1000-5000, and only in Mutweghombahe 36% of those whose main source of income was salary or wage earned between N$5000 to N$10000.

Naingopo village had a high percentage of households that depended on selling selleing of traditional brew called Kasipembe that is a traditional whisky, around 13% of the respondents reported that their household's main source of income was the selling of traditional brew. However, when correlated with their monthly incomes, it was still below N$500.

Other smaller business activities that the communities rely on were reported: selling of crafts, other types of traditional brew, Devil's claw (a medicinal plant), selling firewood and others.

The interviewed communities revealed there is a large number of households that depend on government grants, around 15% of the households. These are mainly old age pensions, child support and disability grants (Table 5.2).

Table 5.2: Percent distribution of households' main source of income by constituency (Source of data: field data 28 November-21 December, 2022).

	Mbambi	Mutweghombahe	Makandina	Ncaute	Cumezao	Gcaru	Naingopo
Government grants	9.5	0.2	15.2	23.2	11.1	14.5	19.5

In addition to the standard survey questions, the community survey contained a number of other questions regarding the people's knowledge about the Proponent's current activities in the AOI, people's opinions about the company, if they have benefited and if yes, then how.

Communities were asked if they have heard about the REN and 79% replied affirmative. People that were less familiar with REN operations were from Naingopo, Ncaute and Cumezao villages. In general communities in the AOI surveyed are aware of the Proponents activities and a question on what do they know about REN, the vast majority replied that the Proponent is searching for oil and gas in their areas, however a number of communities thought that the presence of REN in the area was for de-bushing and clearing their roads, road maintenance, build new roads and removal of litter. Particularly high percentage of population of those people were from Naingopo, 21.7% of interviewed population. This is because REN have had limited activities and interactions with the communities in the south and southwest parts of the AOI.

The respondents who claimed that they are familiar with REN operations were asked on how REN activities have affected their communities. The majority (76%) replied that REN positively affected their community (Fig. 5.50).

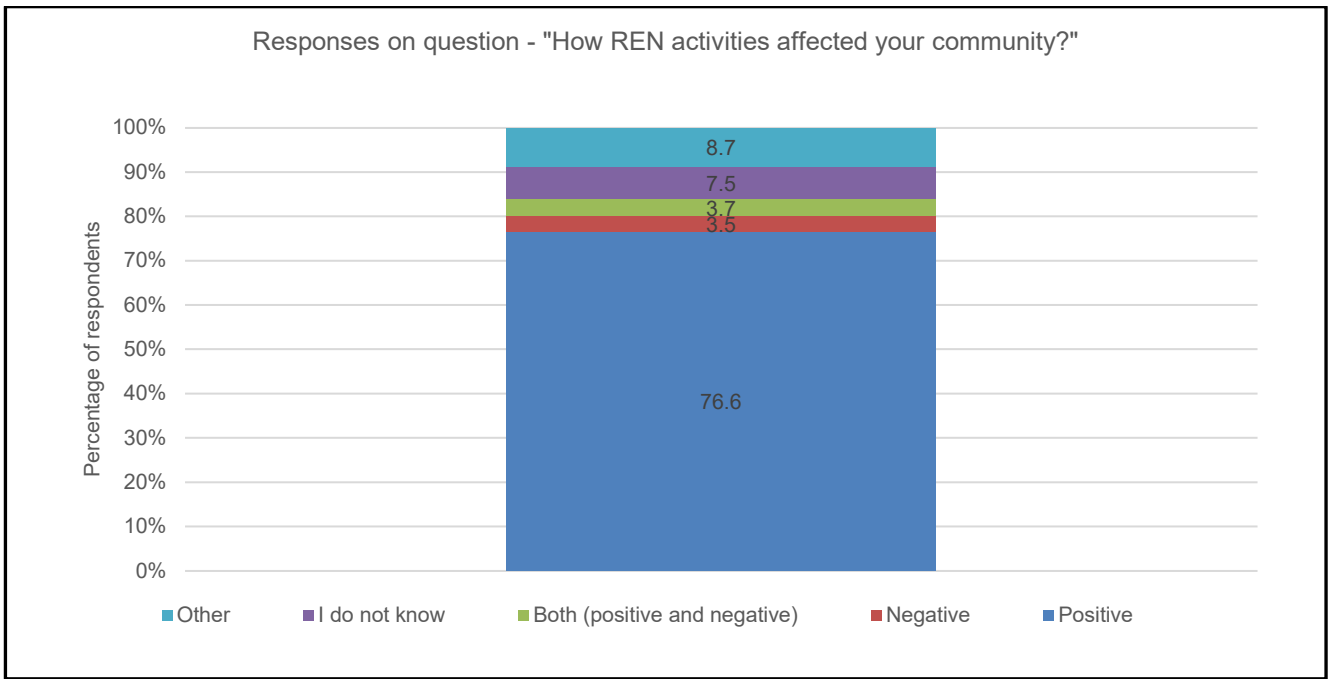


Figure 5.50: Responses on rating the REN activities on the communities based on the results of the ongoing field-based socioeconomic surveys aimed at validating the socioeconomic profile of the AOI in PEL 73.

Those respondents who were familiar with REN's activities, but not necessarily personally benefitted, as a main positive contribution to their communities acknowledged the drilling of water boreholes and construction of water tanks as the key positive impacts the company has made in their communities. This development brought overwhelming satisfaction to their communities which are located in the AOI (Fig. 5.49). Now these communities have better access to water and it is also easier to get water for their cattle. Apart from providing water to the local rural communities, other activities that were appreciated by the local people were as follows: Employment, making gravel roads and maintenance, provision of stationery and sport supplies such as balls to schools, provision with solar generating power, solar lights to school pupils. A respondent from Mutweghomahe observed that even some crime has reduced in his village. Around 16% of respondents claim that their livelihoods directly benefited from the REN activities through employment, access to water and others.

Those who thought that REN has negatively affected their community as shown in Fig. 5.50, form part of the respondent group that also indicated that they did not personally benefit from the REN activities. These respondents were mainly from Naingapo and Makandina villages and in less representation from Kawe, Mbambi and Cumezao, none from Mutweghomahe (Figs. 5.49 and 5.50). The main reasons cited: did not get employment or their community did not get a water borehole closer to their village. The person who benefited from the REN, but was not in opinion that REN activities contribute positively to his village, was not satisfied that the people are not given longer contracts.

The community members that were employed by the REN and receives some payments were reporting back on how they used the monies earned for their work. Among the purchasing basic necessities such as food and groceries, some reported that they bought farming animals – cows, donkeys, goats and chicken, some bought corrugated zinc sheets and built their houses, bought other construction materials, others used their money to pay school fees for their children, hostel feels, bought school uniforms and stationery for their school going children. There was a man who fulfilled his 'dream' of being able to go to town (Rundu) for the first time in his life at the age of 28 years.

Around 17% of the community who remain positive and believe they might benefit from REN activities in the future and only one man from Makandina village was not optimistic about his chances to benefit in future. Analysing this case closer it appeared that the respondent has already benefited in the past and does not believe he will be employed again. Others were not sure if they will benefit or not.

Communities were asked what kind of improvement they would like to see in their community/village. Apart of the bigger dreams for more schools, clinics, better roads, better water and electricity supply for their communities, better network coverage, presence of the Ministry Home Affairs to be able to receive their IDs and other documents, there were also some smaller wishes what communities desired, such as vegetable gardens, sewing machine, farming equipment such as ploughs, tractors or simply renovate their church among the others.

The survey is still going and thus the above mentioned reflect only preliminary results of the field-based survey activities covering the AOI and other parts of Kavango East and West Regions where REN has supported rural communities with rural water supply boreholes.

5.4.3 Socioeconomic Profile Summary of Conclusions

The following is the socioeconomic summary of the Kavango East and West Regions where the AOI and the proposed D1-D6 and G1-G6 well sites and supporting infrastructures are located:

- There are 148466 people in Kavango East Region (3.8% of the total population of Namibia) and 89313 people in Kavango West (6.4% of the total population of Namibia).
- The growth rate of population is positive, yet at a slow paste, particularly for Kavango West – 0.6% which is the second lowest in the country. The growth rate for Kavango East is 1.6%.
- Female population lager than male population, Kavango East Region - 53.5% and Kavango West – 52.7%. At the constituency level female population differ - Kavango East constituencies have greater percentage of female population than Kavango West constituencies.
- The population of the area is youthful. Around 41.4% of people in Kavango East and 46.5% of people in Kavango West are youth from 0 to 14 years which is above national average for this age group (36.4%).
- People of working-age group (15-59 years) is smaller than the national average. Kavango East - 52.7% and Kavango West 47.2% are people of working-age group.
- Kavango teenage pregnancy rate is the highest in the country.
- Kavango Regions have highest child mortality rates <5 (CMR) in the country - 112 deaths per 1000 live births (Namibia - 69 deaths per 1000 live birth).
- Kavango regions have the lowest life expectancy in Namibia - 43.9 years for male and 52.8 years for female.
- High proportion of persons with disabilities, particularly high in Kavango West (7.6%) which is the highest rate in Namibia. Kavango East has 6.0% of persons with disabilities.
- High percent of orphans aged 18 years and below, particularly in Kavango East - 15.9%. Kavango West - 14% of orphans in this age group. The national average stands at 12.5%.
- Kavango West Region has the highest percentage of population without birth certificate (32.2%) followed by Kavango East with 19.9%. This limits people accessing social services, such as social grants and educational services.
- Population densities differ between Kavango East and Kavango West regions. Kavango East - 6.2 people per km^2 and Kavango West - 3.6 people per km^2.
- Long-term migration trend is negative. More people are migrating out than migrating in Kavango East and Kavango West Regions. Lack of employment leads to the high migration rate to other regions, particularly for men.

- Within the area of interest there are three traditional (tribal) authorities - Shambyu, Gciruku and Mbukushu in the Kavango East, and Kwangali and Mbunza traditional authorities in the Kavango West Region

- Rukavango-speaking people constitute the largest language group - 79.4% of the population. San constitute around 0.4% of the regions' population.

- The literacy rates for the Kavango East (82.3%) and Kavango West (82.9%) are below the national average. Male literacy rate slightly higher than female.

- High unemployment rate, for Kavango East (48.2%) which is highest in the country.

- Youth unemployment is particularly severe in Kavango East where more than half of youth (62.5%) are unemployed.

- Kavango West Region has the highest percentage of informal employments (91.8%), Kavango East - 78.8%.

- Farming is the main source of household income. Large share of people depends also on the old-age pensions, cash remittances, retirement fund, orphan or disability grants.

- Kavango regions have highest incidence of poverty, 53% of population. Poverty is defined as the number of households who are unable to afford sufficient resources to satisfy their basic needs. Within the region the highest poverty incidence is recorded in Kapako, Kahenge, Mashare, Mpungu constituencies.

- Traditional dwellings are the most common type of housing, accounting for 72.9 % of all households in Kavango regions. Kavango East has a large percent distribution of improvised housing units/shacks - 46.7% of all households.

- The Kavango West and East regions are relatively well covered with a network of roads; unfortunately, most of these roads are gravel or sandy roads that make travel difficult. Kavango East Region has one airport (Rundu) that accommodates national flights. Several smaller airstrips cater for the tourism sector especially in the eastern part of the region.

- People living deeper in the interior areas are distant from social infrastructure, thus access to education and medical treatment is difficult.

- Communities living in the northern part of the Kavango West and Kavango East regions along the road from Nkurenkuru to Rundu and Rundu to Divundu road are relatively well connected to the national electricity grid. The remainder of the rural communities situated away from the river and the main road are connected mostly with off-grid facilities.

- Okavango River is the main source of water for the people living along the river, whereas villages away from river depend entirely on groundwater from boreholes supplied by MAWF and in some cases from seasonal pans. The urban areas - settlements and towns are provided with water by the NamWater.

- The main economic activities are agriculture, mainly small-scale mahangu farming, providing some food self-sufficiency but little food security; aquaculture; timber harvesting; tourism, particularly in Kavango East Region.

- There is a number of community forests within the Kavango East and Kavango West regions. Two community forests in Kavango West and ten community forests in Kavango East. Illegal harvesting of timber is on rise, mainly attributed to the high demand for timber worldwide and low incomes of local communities, and.

- Tourism is mainly in Kavango East, but limited and undeveloped in Kavango West Region Tourism is mostly focused on the eastern part of the region around Divundu, to some extent in

the central part of the region next to the Kavango River and in Rundu. This is associated with the fact that most of the biodiversity, wildlife and scenic areas are found in the eastern part of the region. Kavango East Region falls within the Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA).

The results of the ongoing field-based socioeconomic survey of AOI indicate clearly some of the development areas and needs of the rural communities in the AOI and the Environmental, Social Governance (ESG) and Corporate Social Responsibility (CSR) opportunities that REN and other companies operating in the area can support.

The Proponent has a clear ESG and (CSR) Guiding Principles aligned with the expectations of communities and other stakeholders. N$20 (C$1.35) million was donated for COVID-19 relief efforts. Planned 10 fresh water boreholes drilling program for regional communities with twenty (26) boreholes already drilled and handed over to the local communities. Educational, agricultural and health and wellness focused strategies to align with Namibian and Global Best Practices. Strong local hiring and training policy.

Possible positive impacts on local and national levels include: payment of rental license fees, contributions to the PetroFund, short-term contractual employment opportunities, contribution to national subsurface knowledge-base and support to rural water supply through Corporate Social Responsibility (CSR), and cumulative impacts, and.

5.5 Subsurface Ground Components

5.5.1 Regional Geology and Petroleum System

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); 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 (De Swardt and Bennet, 1974).

PEL 73 and the REN delineated Kavango Sedimentary Basin falls within the greater Kalahari Basin of Southern Africa. The Kalahari Basin comprises Kalahari Group sediments (Fig. 5.51). The Kalahari Group sediments consists of conglomerate and gravel, marl, sandstone, alluvium and lacustrine deposits, Kalahari Sand, and duricrusts (mainly calcrete and silcrete) intersected in the drilling of the Kawe 6-2, Mbambi 6-1 and Makandina 8-2 Stratigraphic wells by REN.

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 Kalahari Basin favouring thick sediment accumulations and creation of subbasins. As shown in Fig. 5.52, the western subbasins within which the AOI is situated are locally dissected by numerous parallel faults which form graben.

REN has developed a fully integrated structural inversion model for the entirety of the Kavango Sedimentary Basin defining a pull-apart basin with targetable half grabens capable of housing substantial thickness of Karoo-aged sediments and reef-prone Lower Paleozoic Units (https://reconafrica.com/operations/kavango-basin).

According to REN, (2022), regional geologic investigations of the Permian Karoo Seaway, including main Karoo Basin, Botswana Kalahari Basin and Namibian basins Karasburg, Nama, Waterberg, Huab and Owambo support potential for adequate thickness of resource-prone sediments. Preliminary analyses indicate basin depths supportive of oil and gas thermal maturation levels.

According to REN, (2022), the seismic data, acquired after the drilling of the stratigraphic wells 6-1 and 6-2, shows growth in the Karoo section across the bounding rift faults, consistent with the premise of the Kavango Sedimentary Basin being formed as part of a larger rift system, the Southern Trans Africa Rift and Shear System (“STARSS”) (Fig. 5.53).

A generalised illustration of the stratigraphic column for the Rift Graben areas of the Kavango Sedimentary Basin is shown in Fig. 5.53. Six potential reservoirs and four potential source rock intervals have been identified in the rift trend and intra-rift fault blocks.

The two stratigraphic test wells were drilled on intra-rift fault blocks and encountered multiple potential reservoirs in both the Permian Karoo graben rift fill, and the pre-rift carbonates (Fig. 5.53). Oil and gas show from these wells were encountered in the Karoo and pre-rift intervals.

Within the greater Kavango Sedimentary Basin, REN has identified the “Karoo Rift Basin” and the multiple leads and prospects associated with this extensional basin. Phase 2 seismic data show that the Karoo Rift Basin is composed of a number of sub-basins that should open up new plays within the context of the original exploration concepts as illustrated in Fig. 5.53.

In addition, the 2D seismic data also identified targets in the “Damara Fold Belt”, an extensive area of folded and faulted anticlines to the southwest of the Karoo Rift Basin, potentially serving as excellent structural and stratigraphic traps in the Pre-Karoo stratigraphy (Figs. 5.54 and 5.55). Initially identified with the Phase 1 2D seismic data, the additional seismic data show an extensive area of compressional folded and faulted anticlines in the Pre Karoo, Damara Fold Belt, which extends across northern Namibia (Fig. 5.55).

These structures are exceptionally well imaged in the southwestern part of the greater Kavango Sedimentary Basin which is not overlayed by the Karoo Rift Basin. Pre-Karoo formations have been penetrated in each of the 3 wells drilled in PEL 73, including the 6-2 well which contained 2 intervals with significant oil shows and reservoir porosity.

Augmenting the seismic data imaging, the outcrop data to the south and west show large exploration targets; anticlinal structures potentially hundreds of square kilometres in size, a significant portion of which could be under four-way dip closure.

Karoo Rift Basins and the Damara Fold Belt are illustrated in Figs. 5.53-5.55. As shown in the seismic lines in Figs. 5.54 and 5.55, there is a whole spectrum of play types, not only structurally diverse, but in highly varied stratigraphic and depositional settings to be validated by the proposed D1-D6 and G1-G6 exploration and appraisal well drilling programme.

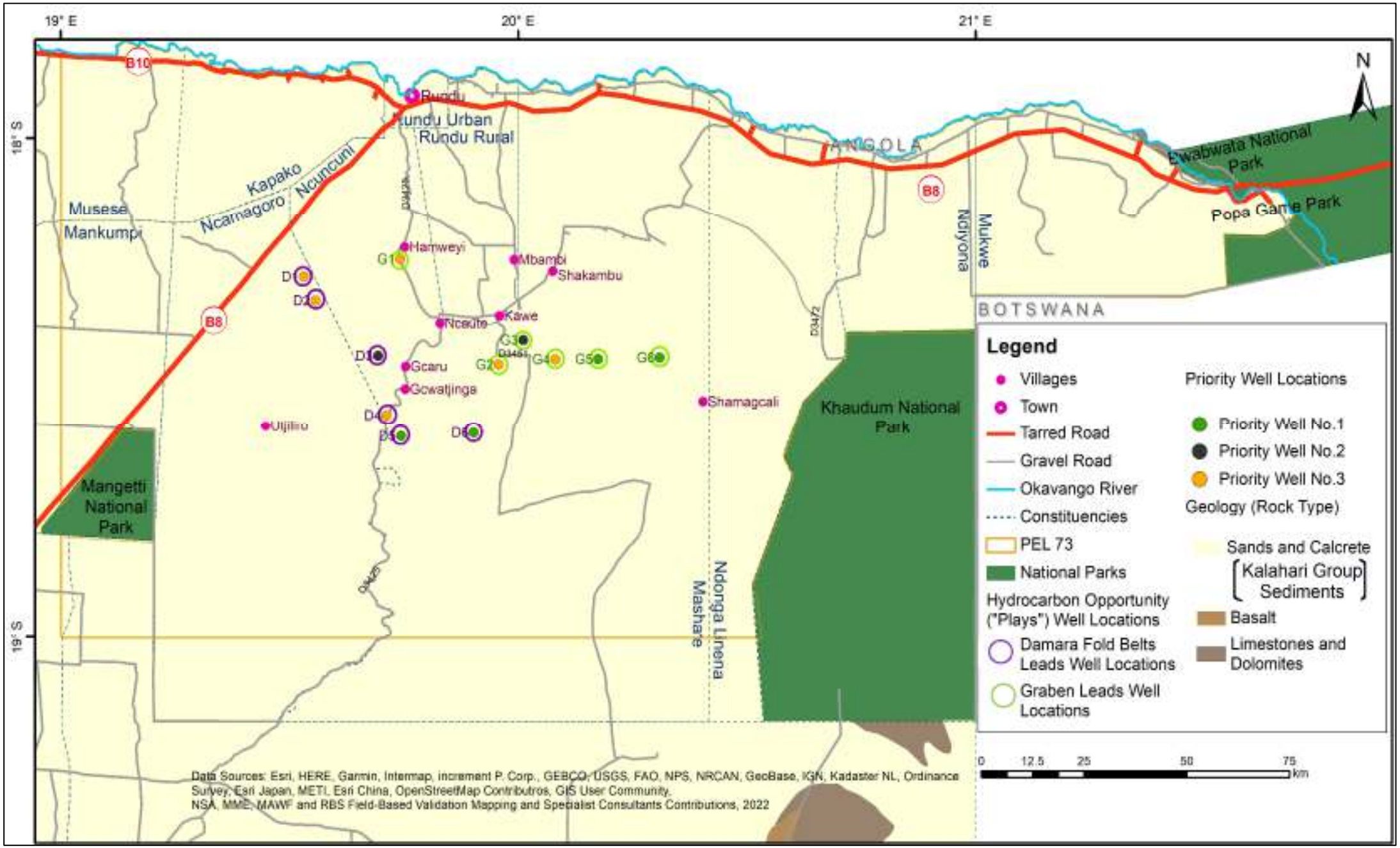


Figure 5.51: Surficial geology around the PEL 73 and proposed D1-D6 and G1-G6 exploration and appraisal wells sites.

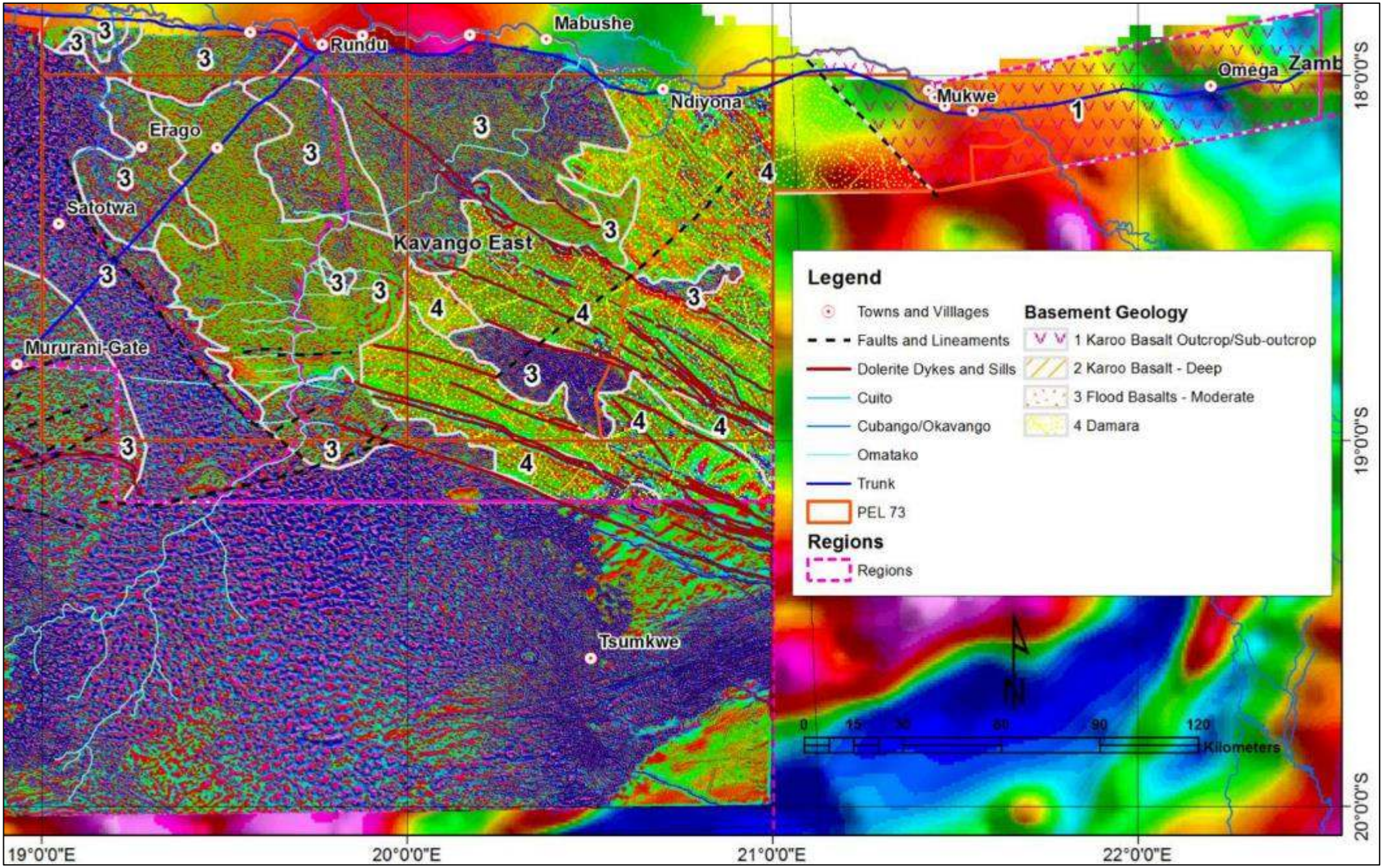


Figure 5.52: Basement geology of the Kavango Sedimentary Basin (Julius, 2021).

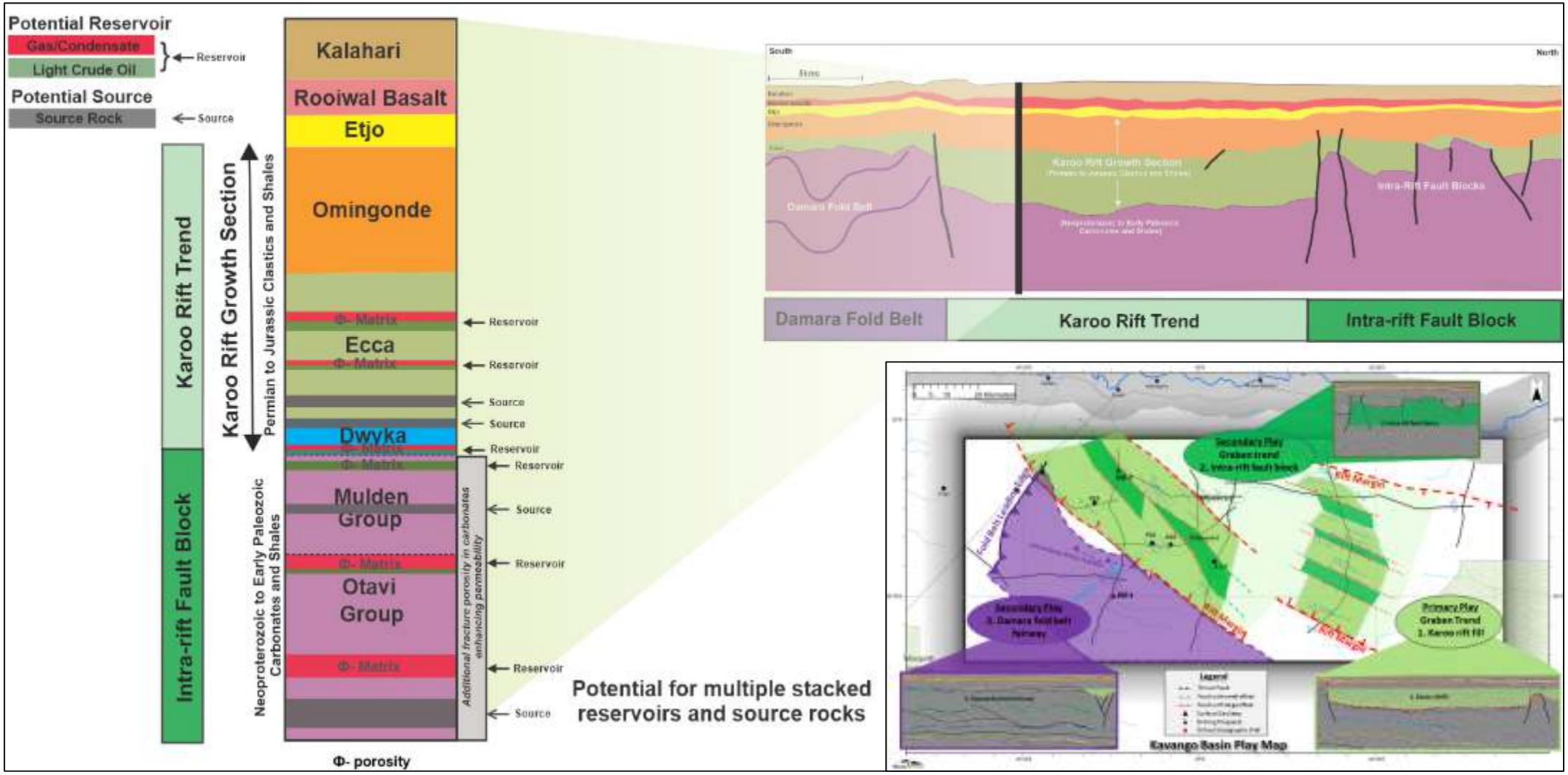


Figure 5.53: Generalised stratigraphic column for the Rift Graben areas of the Kavango basin. Six potential reservoirs and four potential source rock intervals have been identified in the rift trend and intra-rift fault blocks (Source: REN, 2022).

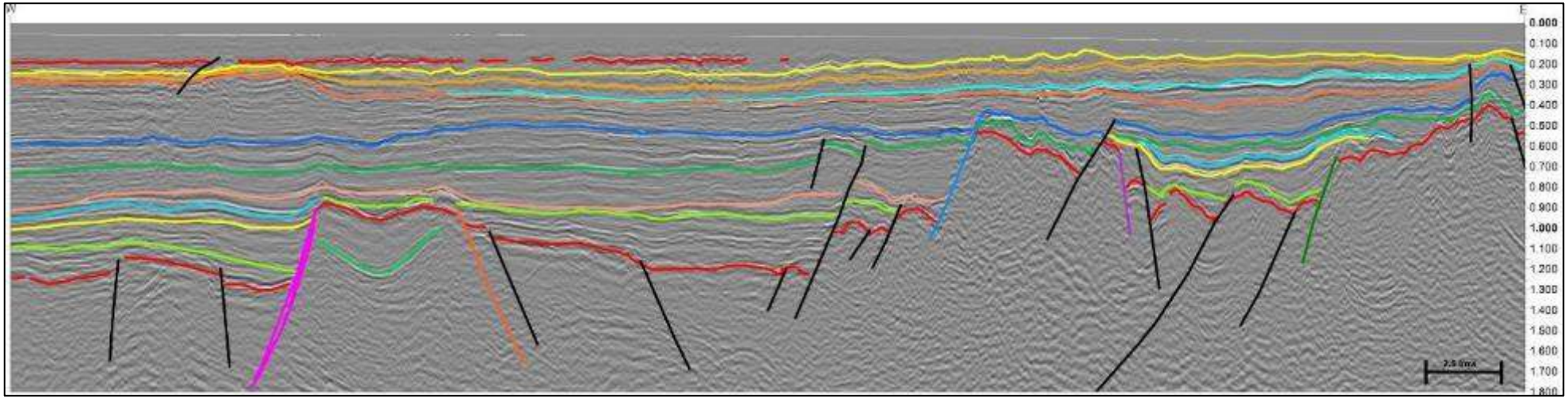


Figure 5.54: Seismic section through the Karoo Rift Basin showing the main and perched grabens (rift valleys); note the series of normal faults controlling the rift basin architecture and depositional stratigraphy (Source: REN, 2023).

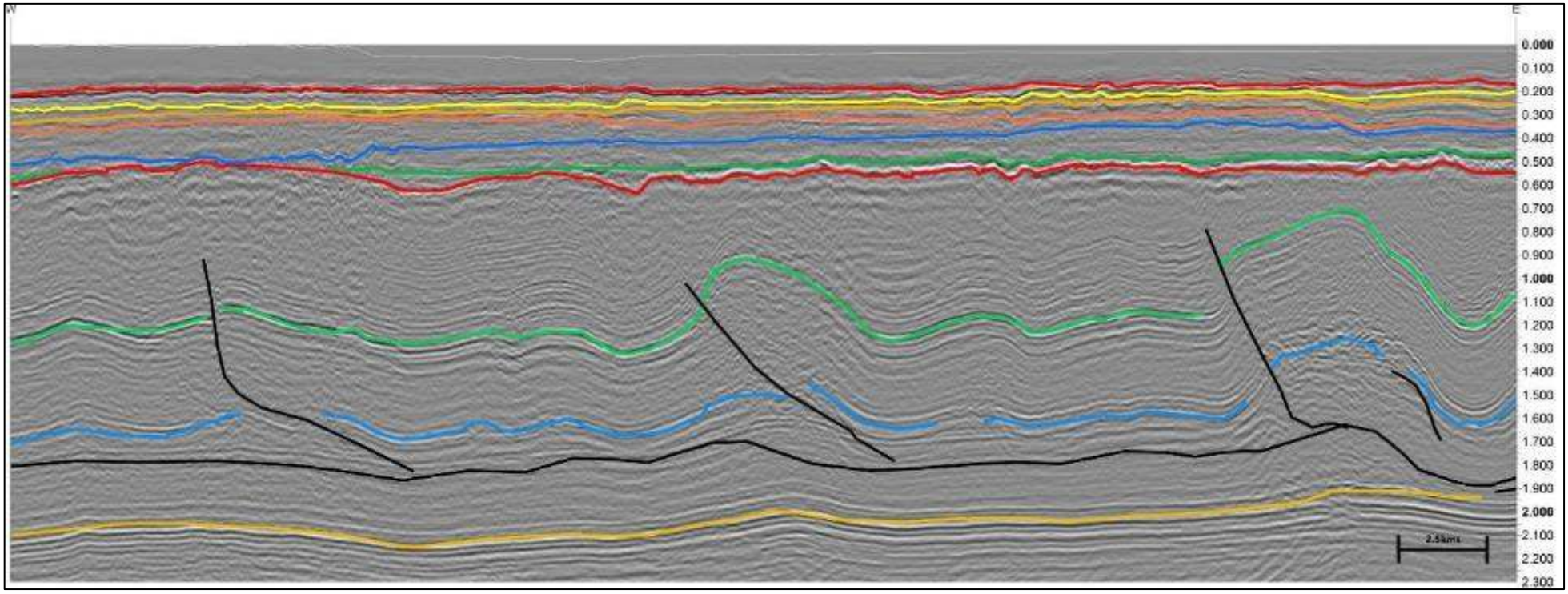


Figure 5.55: Damara Fold Belt Seismic line 2 (Source: REN, 20223).

5.5.2 Surface Water (Hydrology) and Drainage Basins

According to Oldeland et. al., (2013), the Okavango River has its origin in the semi-humid highlands of Angola and drains the endorheic Okavango River basin through the arid and semi-arid eastern parts of Namibia into Botswana where it drains into a wetland, also known as the Okavango Delta (Figs. 5.56 and 5.57 and Table 5.3). The well locations and AOI are not situated in the active catchment areas of the Okavango River but falls in the fossilised channels of the Omatako–Omuramba Ephemeral Rivers which has not contributed to runoff to the Okavango for over 50 years (Oldeland *et. al.,* 2013).

The Okavango River basin upstream of the Delta covers an area of about 171,000 km² (Mohembo). About 95% of the streamflow entering the Delta is generated by two main tributaries, namely the Cubango River (108,000 km²) and the Cuito River (57,470 km²), both located in Angola (Oldeland *et. al.,* 2013).

The proposed D1-D6 and G1-G6 exploration and appraisal wells sites fall within the graben structure of the Omatako Drainage Basin bordered by Kavango Drainage Basin (Fig. 5.58). In the Kavango Drainage Basin streams essentially flow south-north into the Okavango River; deviating from the regional slope and probably emphasizing local structural control, whereas in the Omatako Drainage Basin the Omatako Ephemeral River flows north east into the Okavango River (Fig. 5.58).

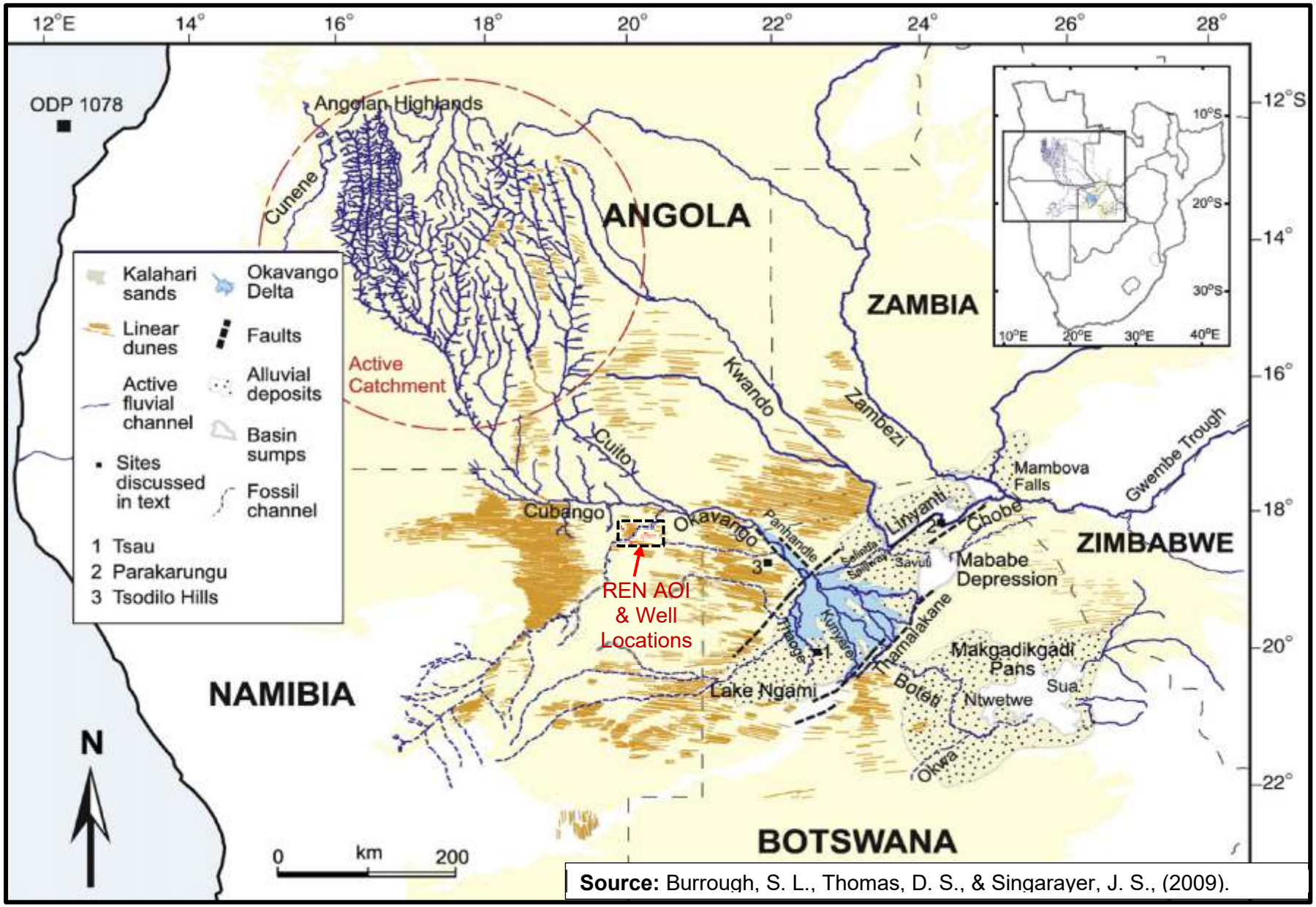
The present drainage within the general surrounding areas of the proposed D1-D6 and G1-G6 exploration and appraisal wells sites, although largely ephemeral apart from the Okavango River are exorheic, meaning that it allows flow into other external bodies of water for example rivers, swamps, and lakes. In this context they all drain into the greater Okavango River. This is true except for the Fumbe Stream which is endorheic (allows no flow into other external body of water) (Fig. 5.58).

Of interest to hydrogeology about drainage is stream network density (Dd), stream network frequency (Df), stream network texture, stream network topology and slope variations because these drainage aspects closely relate to dynamic nature of river sections or basin portions, dominant processes within basins/river sections, geology and geomorphology of basins/river sections and inform processes like run-off, infiltration, overland flow, sediment response and through flow.

In context of the above referenced value of stream/river aspects, in the far north west of the AOI is Mpuku stream (Kavango Drainage Basin) which displays high tributary network frequency (inter stream spacing along the trunk stream) of approximately a stream tributary every 12 km compared to other streams of relatively same distance coverage like the Fountain stream draining Ncaute, Ncuncuni to Rundu. Another high tributary network frequency is observed along the first 67 km of the Omatako River from the southern border of the AOI. In that section of the Omatako Drainage Basin, the Omatako Ephemeral River has a tributary every 5.4 km; thereafter the Omatako Ephemeral River has no tributary for about 85 km (Fig. 5.58).

About stream network density (sum of stream length per unit area of section of basin), km/km^2) the dissected portion of the Omatako Drainage Basin's Dd is estimated at 0.033 whereas that of the Mpuku stream is approximately 0.072, meaning that the Mpuku Stream drainage area's runoff potential is relatively two-fold more than that of the dissected portion of the Omatako Ephemeral River. However, it should be qualified here that stream density (Dd) values of less 5 (0.033 for Omatako Ephemeral River, and 0.072 for the Mpuku stream) imply coarse stream texture which is characteristic of dry regions with none perennial flow or flow only during rainy seasons (Ephemeral).

These observations allow inference into the dynamic and active drainage portions of the AOI. Portions outside the dynamic zones are either quiet or relatively less dynamic, and play roles of sediment and run-off accommodation, through flow, and infiltration sites. The dynamic portions are the relatively dynamic drainage portions of the AOI, and it is expected that these are sites of erosion, run-off, and overland flow.



Source: Burrough, S. L., Thomas, D. S., & Singarayer, J. S., (2009).

Figure 5.56: Regional map of the Middle Kalahari and the hydrological systems of the Okavango, Kwando, and Zambezi catchments in relation to the sump basins (Lake Ngami, the Mababe Depression and the Makgadikgadi pans). The proposed exploration and appraisal wells sites are not situated in the active catchment areas but in fossil channels of the Omatako–Omuramba Ephemeral rivers. According to Oldeland et. al., (2013), the Omatako Ephemeral River has not contributed to runoff from the Okavango for over 50 years.

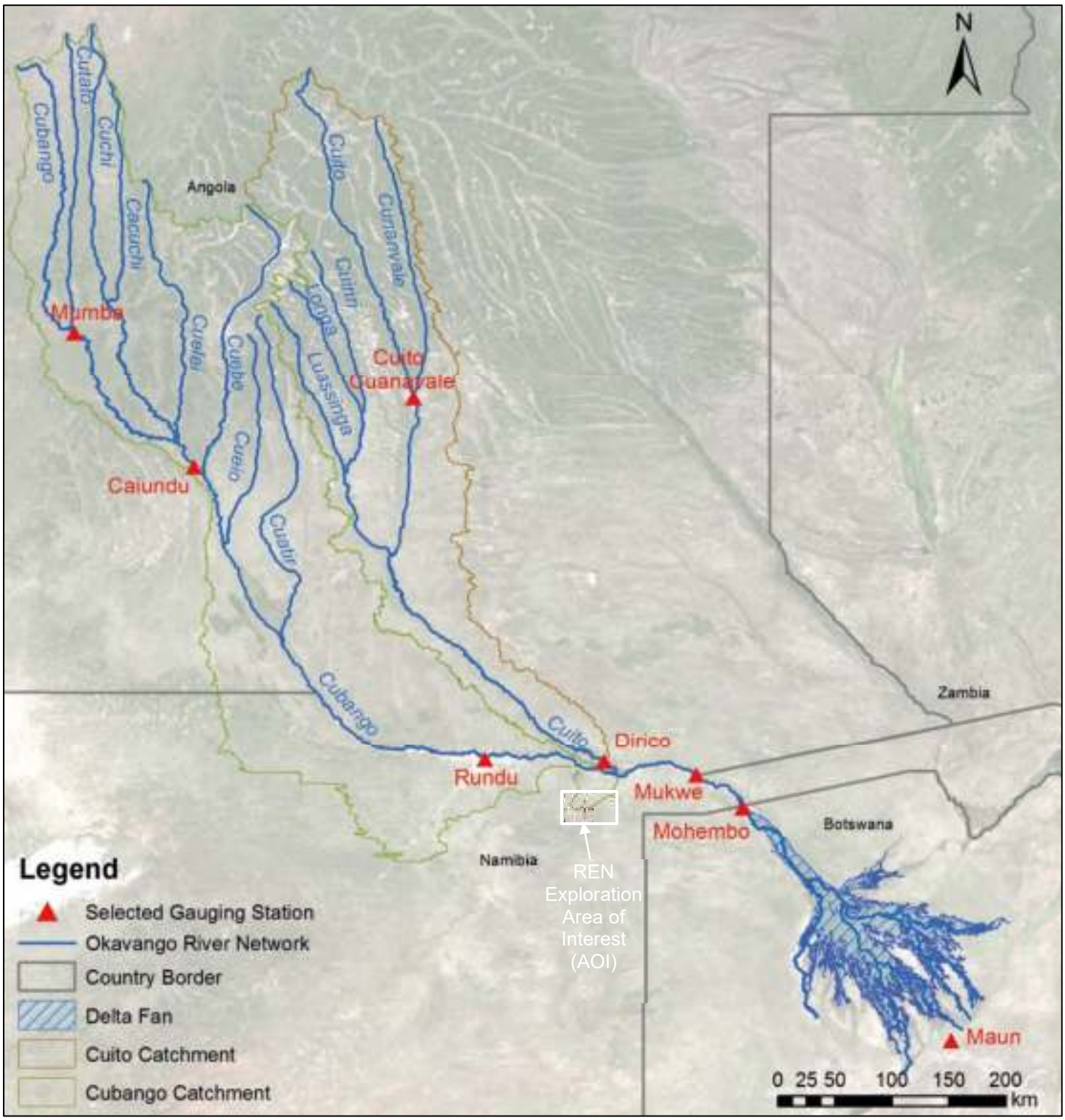


Figure 5.57: Okavango River Basin including all main tributaries and the Okavango Delta with its entrance at Mohembo gauging station and outlet at Maun with respect to REN exploration area of interest (Source: Oldeland *et, al.* 2013).

Table 5.3: Okavango Basin - Hydrology General information (Source: Oldeland et, al. 2013).

Other names	Countries	Region
Kawango	Angola, Namibia, Botswana	Southern Africa
Tributaries west (Cubango Catchment)	**Tributaries east (Cuito Catchment)**	**Cities**
Cubango, Cutato, Chuchi, Cacuchi, Celei, Cuebe, Cueio, Cuatir	Cuito, Cuanavale, Lussinga, Longa, Cuiriri	Menongue (Angola), Rundu (Namibia), Maun (Botswana)
Source	**Source location**	**Source elevation**
Bié Plateau (Central Plateau of Angola)	Close to Tchicala Tcholohanga (other names: Vila Nova, Chicala Choloanga) near the village/settlement of Lumbula	1,850 m approx.
Source coordinates	**Mouth**	**Mouth elevation**
12°42´40.76´´ S 16°03´50.48´´ E	Between Seronga (east) and Ikoga (west) into the Okavango Delta (Botswana)	Outlet of the Panhandle between Seronga and Ikoga: 980 m; Maun: 940 m (Delta outlet)
Mouth coordinates	**Length**	**Basin**
18°50´40.76´´ S 16°03´50.48´´ E	Cubango: 1,260 km approx., Cuito: 920 km approx., Okavango (including the Delta until Maun): 1,860 km approx.	165,000 km² approx. (until the entrance into the Panhandle at Mohembo)
Discharge average		
304 m^3s^{-1} approx (Station Mukwe, 10/1949 - 09/1998)*		

Drainage analysis efficiently links to surface-water and groundwater interaction, therefore the observations presented above offer an opportunity to infer the surface-water and groundwater interaction dynamics of the study area in view of preferential sites, losing or gaining, pathways, infiltration potential, and flow fields.

In the above given context and about surface-water groundwater interaction, it is important to note that the rivers/streams in the study area are of coarse stream texture and only flow in exceptionally wet seasons and for short periods, this keeps their stream beds above the groundwater table for most of the time. Therefore, when they flow after good rains, they tend to lose the water to the sub-surface flow, with high evapotranspiration. This becomes even more-so considering that they are low gradient streams (gradient of less than 2%).

The Omatako Ephemeral River holds potentially areas of surface water ponding, infiltration, and groundwater through flow. Productive boreholes will then be preferable located in the last quarter of the active zone to the second half of the inactive zone, this inference is based on the observed relative high mass transport capacity and the observation that this section of the Omatako Ephemeral River cuts from the western banks and buries on the eastern banks of the channel. Therefore, productive boreholes in this section should be bias towards the eastern side of the river channel.

The drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells sites will have little to no interference to surface water drainage system of the area (Fig. 5.58).

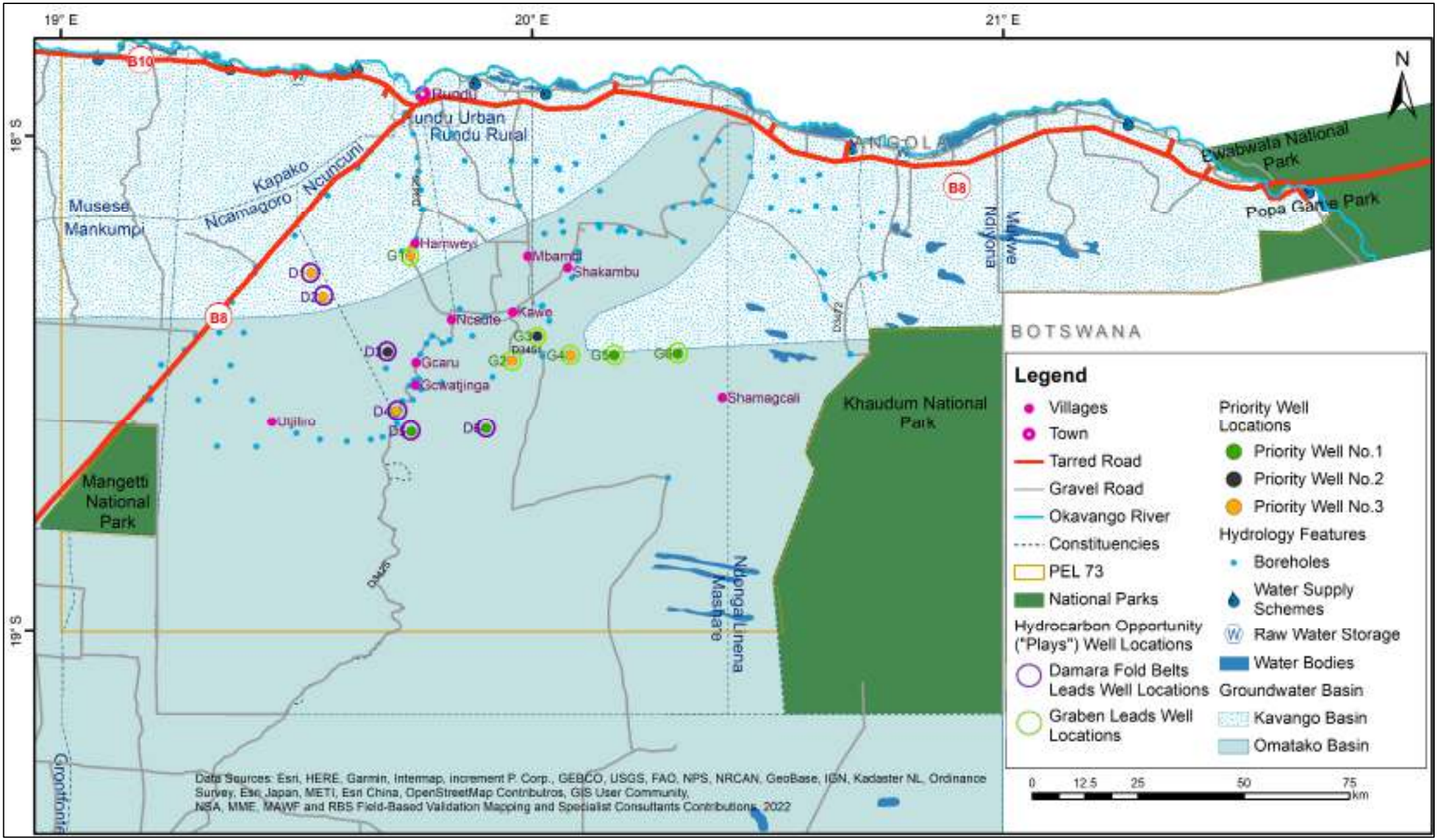


Figure 5.58: Omatako and Kavango Drainage Basins and the proposed D1-D6 and G1-G6 exploration and appraisal wells sites.

5.5.3 Hydrogeology (Groundwater)

5.5.3.1 Overview

The hydrogeology component of this EIA Report has been prepared by Julius, (2021 and 2022) as part of larger ongoing study and water monitoring activities being undertaken in PEL 73 (Annex 5 Extract). The occurrence of groundwater within the AOI can be broadly divided into: Primary of saturated Kalahari Sediments of the Kalahari Group and secondary aquifers of fractured/faulted and weathered bedrock geology. The groundwater potential for the Kavango East and West Regions can be described as moderate to low, despite the chance of finding water, is often. Water Quality for most places is considered good quality water, especially in the western territories with greater Kalahari thickness. However, there are areas where groundwater is of bad/poor quality, and has been the cause of suffering to many communities having no access to drinking water. Poor quality groundwater is mostly located to the east where the Kalahari sediments are thin and has limited saturated thickness. These boreholes penetrate secondary aquifers within bedrock features with poorer water quality. Poor quality water is associated with stagnant waters.

Attempts have been made to correlate Kalahari stratigraphy with groundwater regimes. Upper, lower, and middle Kalahari aquifers have been suggested to correlate with Tsumkwe, Eiseb and Omatako Formations (Hegenberger 1982). However very little is known about their geohydrology in terms of lateral extent, its yield and expected water quality. To fully understand the aquifers found within the Kavango Region, greater research is still required to investigate the prevalent groundwater regimes of the Kavango Basin. Research will separate favourable areas of good yield and quality from areas where groundwater is of an inferior quality. Dumushe (in Otjozondjupa) is one area where shallow good quality water overlies water of a poorer quality. The community uses water from shallow wells for drinking and water from deeper penetrating boreholes for livestock.

Boreholes drilled next to and along the Okavango River, intersect paleo-channels of the Okavango River, with often high yielding boreholes, mostly used for Bulk Water Supply Schemes. It has been found with deeper drilling along the river that a confined (artesian) saline aquifer underlies the paleo-channel (alluvium) aquifers on top.

5.5.3.2 Depth to Groundwater

Approximately 35% of boreholes extracted from the Groundwater Information System (GROWAS II) database held by the Ministry of Agriculture, Water and Land Reform (MAWLR) did not contain any rest water level data. Surface heights were allocated to borehole data for 1047 boreholes. Boreholes with inadequate data were omitted from the database for creating a piezometric surface. A total of 682 boreholes had rest water levels which was used to generate a surface and contour plot of the piezometric surface.

A contour map of rest water level was produced, which is an indication of the depth to groundwater (Fig. 5.59). Noticeable, is that there is a separation in the depth to groundwater which coincides with a northwest fault line, a prominent geological feature. It is understood that this feature represents weak zone/fault which acted as conduit for magmatic basaltic lava flows. This fault line separates groundwater to the south, with depths of between 80-120m, from shallower groundwater to the east, with water levels less than 60m. Fig. 5.59 further reveals a shallow water zone occurring along a north-south line that passes through Rundu and stretches for approximately 120km. Water along this feature is not deeper than 25m. This zone seems to follow the valleys of ephemeral rivers/Omirambas in that vicinity and terminates against the northwest boundary fault which causes a steep gradient of water level rise further to the south.

Apart from zones of shallow water along the river, the Kavango West Region has groundwater located deeper than 80m. Groundwater for the most part of the Kavango East Region is shallow and is not deeper than 40m. Close to the river water levels are less than 20m. However there seems to be a steep gradient where water levels drop from 40m below ground level to levels of 15m over a short distance next and close to the river. The depth to groundwater in actual effect, provides an overview of the pump inlet depth to abstract water from. The deeper the groundwater, the greater the depth in abstracting water from, for a particular area.

5.5.3.3 Groundwater Flow

It is widely accepted that groundwater flow mimics the topography, which means water will flow from the south, north towards the Okavango River, and to the east towards the Okavango Delta in Botswana. This perhaps is true, on a broad scale but local change in flow can be expected. Fig. 5.60, is a piezometric surface created to determine the flow of groundwater in the region. Three groundwater highs are depicted in Fig. 5.60, from where groundwater flows away to lower/depressions.

One of the significant depressed zones lies south of the northwest fault zone which is the boundary between deep and shallow waters and act as a graben where water is draining into. North of the Omatako Omuramba, groundwater flows north, whereas south of the Omatako Omuramba water drains south.

In the north in the vicinity of Nkurenkuru, there is a northwest high from where groundwater drains south towards the ephemeral rivers, and then towards the Okavango River. A general NW-SE area of elevated groundwater, running parallel to the river, has groundwater draining first inland towards ephemeral rivers, then north-eastwards towards the main river flow.

Groundwater in the south east in the vicinity of the northern dyke swarms, water drains south-south-east (SSE) in the direction of the Okavango Delta. The lowest groundwater is in the east in the vicinity of Andara and Popa Falls, where water follows the direction of the river. At the western edge of the license area, groundwater is connected to the Ovambo Basin, flowing in a south-westerly direction. In the Ngoma-Baramasoni area groundwater seems to accumulate in this depression.

From the piezometric surface plot shown in Fig. 5.60, it can be determined that groundwater flow is quite complex and is not as simple as just water flowing following the general topography, which is south to north and west to east. The significance is that recharge of the Kalahari Aquifers is from different areas, which is mainly in the south but also from areas in the central part of the license area and all linked to rainfall as key source of recharge for Kalahari Aquifers. Groundwater flow is to some extent the manifestation the faulting found in the area. The overall groundwater gradient for the PEL area is generally low-gentle.

5.5.3.4 Borehole Yields

The lowest yield of 0.08m^3/h was recorded for the dataset with the highest yield of 98m^3/h, with an average of 10m^3/h and a median of 7.8 m^3/h (Fig. 5.61). The statistics reveal that the majority of boreholes have yields between 2-4 m^3/h, followed by boreholes with yields between 8-10m^3/h, with a median of approximately 8m^3/h. This suggests that boreholes on average have moderate yields of 8m^3/h. These yields are significant in relation to other parts of Namibia, where rural water supply borehole yields are perhaps less than 4m^3/h in general.

Exceptional yields of 50-98 m^3/h have been recorded for certain boreholes, which is mostly in close proximity to the Okavango River. Higher yielding boreholes further away from the Okavango River is an exception to the rule. Overall boreholes tapping the Kalahari Aquifer have above average yields compared to other parts in Namibia, which suggest that groundwater potential is good. The concentration of boreholes is denser in the vicinities closer to the Okavango River where most of the population also live. Areas of lower density are found furthest east (Khaudom) and further west, north of the commercial farms, where access to these areas are cumbersome. To some extent borehole yield is influenced by the design of a borehole, where a poor design can result in a loss of yield capacity due to poor well performance. This makes the correlation of yield with other geohydrological parameters or lithologies and stratigraphy cumbersome.

There is a remarkable difference in yield from borehole east and west of Mururani, the veterinary checkpoint. Higher yielding boreholes to the west are influenced by basement faults striking northeast, which originates in the vicinity of Tsumeb, where Otavi Dolomite are cropping out. In the east, boreholes are deeper and intersect water at greater depths, with lower saturated thickness and yields. This is classic example of where bedrock features contribute to greater yield capacity despite both sets of boreholes intersecting Kalahari sediments.

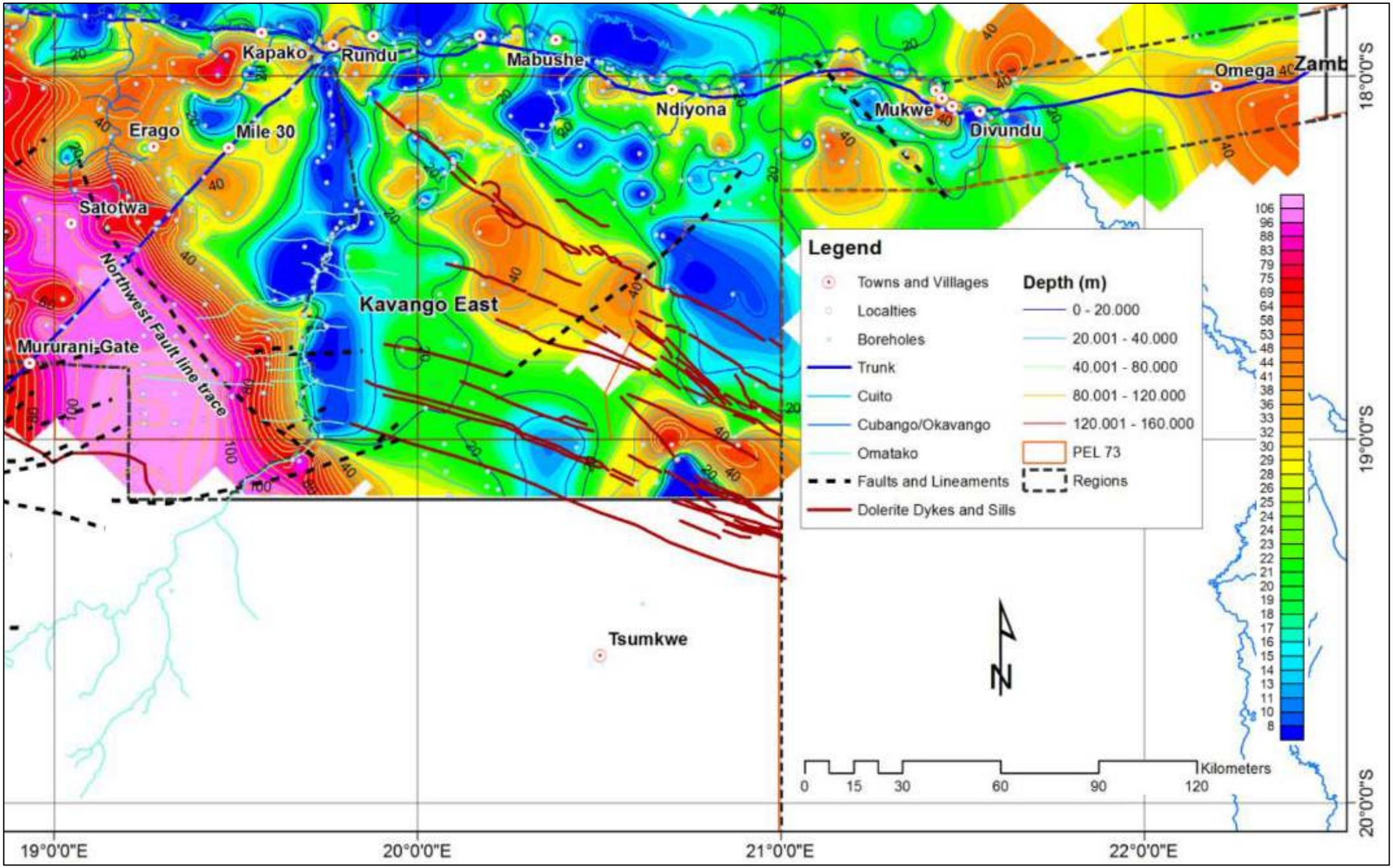


Figure 5.59: Depth to groundwater map for PEL 73 (Source: Annex 5).

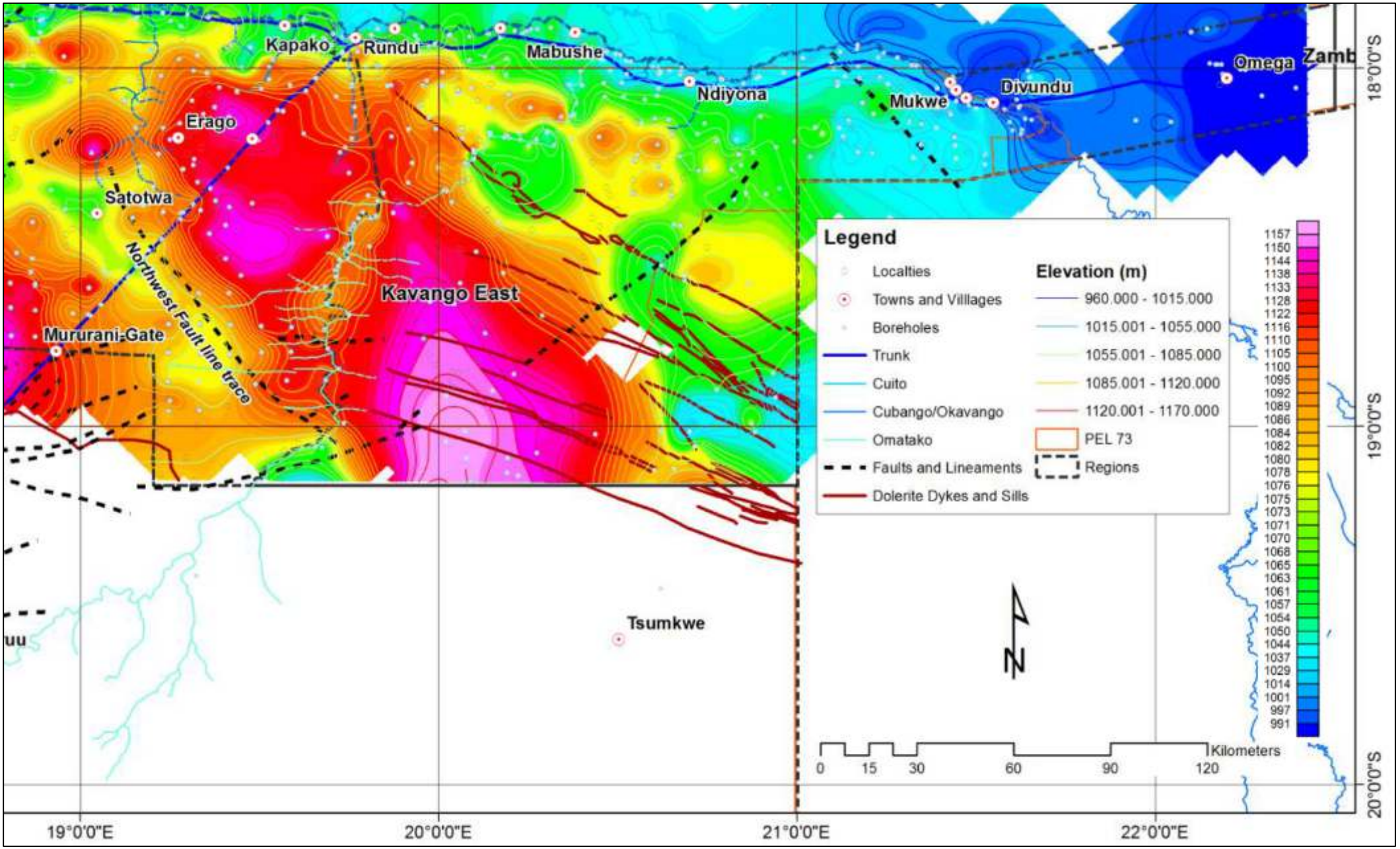


Figure 5.60: Piezometric surface map for PEL 73 (Source: Annex 5).

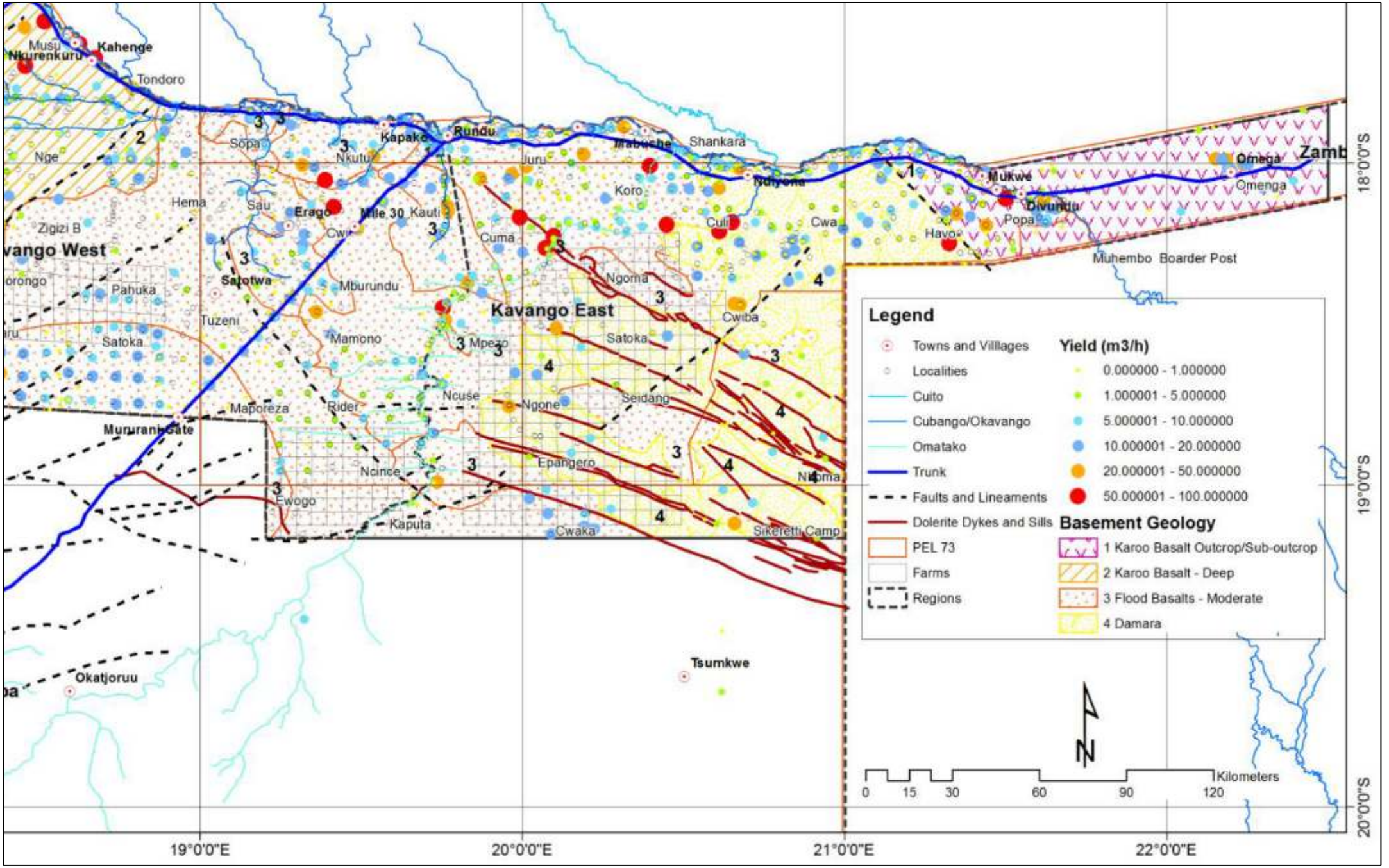


Figure 5.61: Boreholes yields for PEL 73 (Source: Annex 5).

5.5.3.5 Water Quality

Water Quality is essential to ensure water does not pose a potential risk to the health of people, the environment, animals and aquatic ecosystems. Water quality analysis determines whether water has no adverse effect on the fitness of water for a specific use. Water quality is being described by its physical, chemical, biological and aesthetic properties to determines its fitness for a variety of uses. Water quality properties are determined by constituents/determinants dissolved or suspended in water. The Water Quality Guidelines is a set of information provided by constituents, with a water quality range for each constituent and the norms used to assess its effects, and how effects might be mitigated and possible remedies/treatment options.

According to the Namibian Guidelines for the evaluation of drinking water for human consumption with regard to chemical, physical and bacteriological quality water is classified as A (Excellent), B (Good), C (Poor (low risk) and D (Unsuitable for human consumption).

Water Quality data has been deduced from an extract of GROWAS II Database. The latest water quality analyses were selected as a representation of water quality of a particular water point, since more than one analysis were exported from the GROWAS database. Total Dissolved Solids (TDS) are a good indicator of the overall water quality and will be the determinant used to evaluate the water quality at a regional level. Based on the TDS, will the quality of water be classed as class A, B, C or D. Class A and B are accepted ranges of water quality with class C and D, not acceptable for human consumption. A total of 717 records have been extracted from the reduced GROWAS database.

A histogram plot of TDS was constructed from water chemistry data from GROWAS. 90% of the data had a TDS between 500-1000mg/l (ppm), which is considered water of good quality and of Class B at least. The average TDS for this dataset was 745ppm which is water of Class A, according to the Namibian Guidelines of Water Quality (Table 4.4).

About 75% of the data falls within the category of good quality water. The highest TDS recorded for boreholes of the Kavango Region is 24,799ppm. Water Quality exceeding a TDS of 2,000ppm is considered Class C and is not fit for human consumption. About 86 (12%) samples exceeded this value.

Despite the occurrence of poor-quality groundwater, good quality groundwater does exist, in the vicinity close by, normally not further than 5km. It is inferred that poor quality water occurs in the same vicinity of high yielding boreholes, which is associated with bedrock aquifers and stagnant water (Fig. 5.62). Poorer water quality might also be associated with the saline aquifer water below a fresh water aquifer.

Care should be exercised in areas of shallow bedrock, to ensure drilling does not intersect these layers of poorer water quality. It is in the opinion of the author (Julius, 2021), that poorer water quality is associated with stagnant water in areas underlain by basalt bedrock, where the Kalahari aquifer is fairly thin.

However, no correlation could be established between poorer water quality and any lithology or stratigraphy. Boreholes with poorer water quality is high in sodium salts ($NaCl_2$ and Na_2SO_4), which is indicative of stagnant water with high resident times.

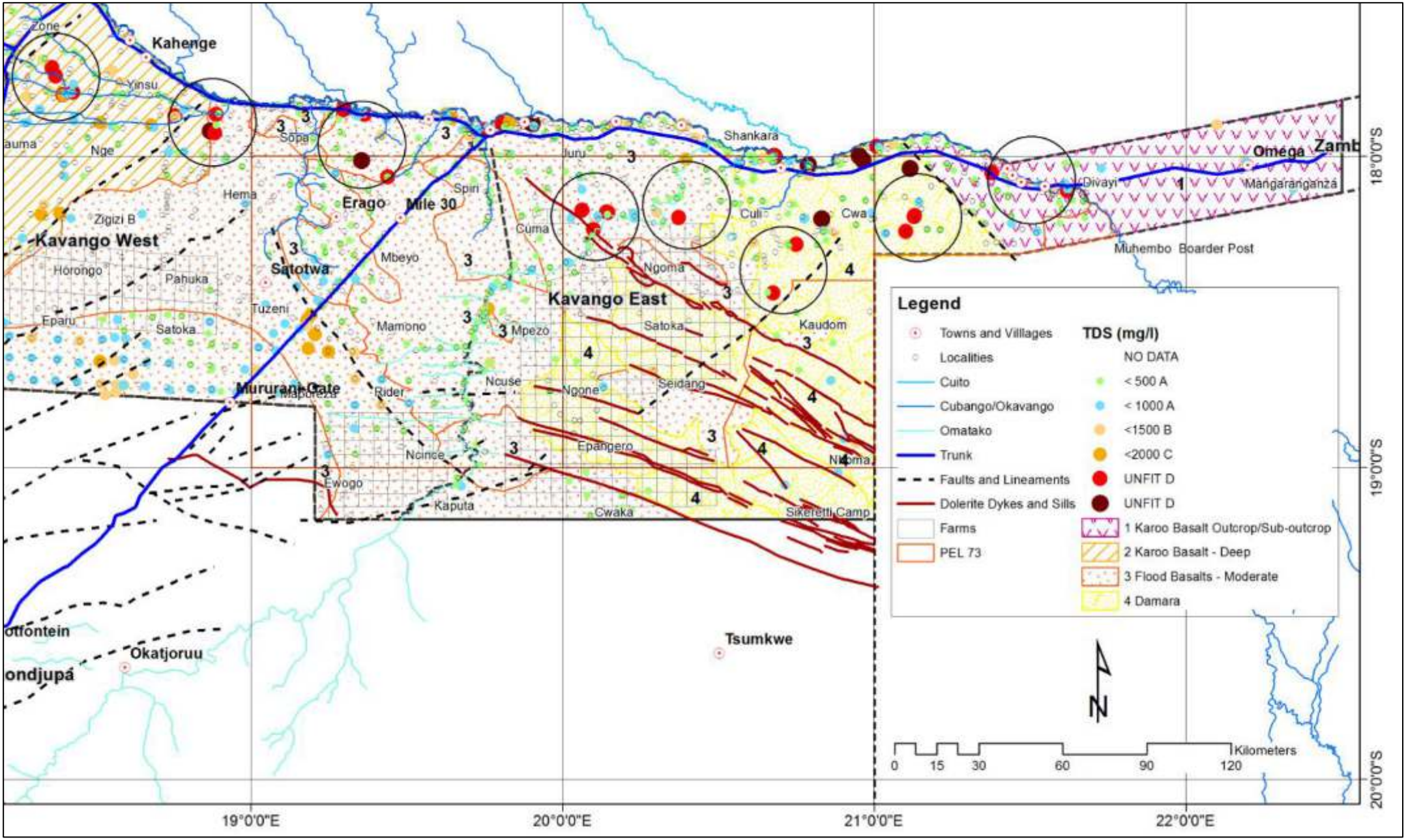


Figure 5.62: Water Quality (TDS) map of PEL 73 (Source: Annex 5).

5.5.3.6 Recharge

The quantification of recharge is complicated and is not supported by the monitoring of wells, which is lacking for the majority of the area. Recharge is calculated as a function/fraction of rainfall. Attempts have been made to estimate the recharge of the Kavango Sedimentary Basin, with results suggesting values of as little as 1mm/annum of mean annual precipitation or 1 litre per square meter (l/m^2). In the absence of good scientific data, recharge as a rule of thumb is taken as 1% of precipitation for Namibia, which estimates recharge to be $120l/m^2$, with an annual average rainfall of 500mm.

Various attempts on determining recharge indicates a significant variation in results, which requires proper research to make sense of actual recharge. This will require a proper monitoring network, equipped with weather stations at water points for this purpose. However, in the absence of proper data a fraction of annual precipitation is a crude method of estimating annual recharge.

Areas of recharge for boreholes in the west are from northeast conduits/fault zones originating in the vicinity of Tsumeb, which results in shallower groundwater and greater borehole yields. Recharge for boreholes on the eastern side of Mururani, and parts inland from the Okavango River, gets recharged from local rainfall.

It is believed that the deeper aquifer below the flow of the Okavango River is fed by recharge from the Kalahari aquifers, elsewhere, where aquifers are shallow, the Okavango is responsible for its recharge. Water quality is known to deteriorate over time. Recharge (Rainfall) plays a vital role in maintaining water quality with each episode of recharge. Since no monitoring is done including Kalahari aquifers, the changes in water quality over time is not quantified.

5.5.3.7 Aquifer Thickness

The data within GROWAS does not contain information on the lithologies intersected for most boreholes in the area. Only a few boreholes have data regarding the lithologies intersected. This makes the determination of aquifer thickness difficult. However, the saturated thickness can be estimated and defined as the thickness between the first water strike and the final depth of the borehole which gives you an idea of arbitrary aquifer thickness.

The data reduction exercise revealed a few shortcomings, within the database. Some boreholes had water strike data, but not a final depth. Some boreholes had no water strike and final depth data, but had a 2nd water strikes recorded. Erroneous data was removed from the dataset for the calculation of saturated thickness. From the analysis the following main points have been recognised (Fig. 5.63):

- The average depth of boreholes is 94m, with a minimum of 15m and a maximum of 317m.
- The average water strike is 51m, with a minimum of 4m and a maximum 150m, and.
- The average saturated thickness for the region is 43.4m, with a minimum of 3m and a maximum of 225m.

Kalahari thickness could not be determined on existing borehole data from GROWAS. Very few boreholes had depth to bedrock or Kalahari thickness recorded. The Kalahari isopachs plotted infers that the Kalahari sediments increase in depth from east to west to southwest and increase in thickness of up to 350m. A depth of over 300m seems like an over estimation, as this depth is possibly derived from boreholes intersecting the Etosha-Cuvelai Basin.

Maps of depth to water strike and saturation thickness with borehole depth has been compiled, which is another indication of depth to groundwater and the yield capacity of a borehole. Saturated thickness gives you an idea of the groundwater potential of the area. The greater the column of saturation the greater the yield capacity anticipated.

There is a marked difference in water encountered by boreholes, below or south of the northwest fault, where water was struck water at depths greater than a 100m, whereas in the west, west of Mururani,

along the southern border, water strikes are less than 50m becoming shallower progressing southwest towards Tsumeb (Fig. 5.64).

It is believed that the two northeast faults south and west of Tsumeb are conduits giving rise to this elevated water table. Elsewhere south of the Kavango river, water strikes are found to be between 50m and a 100m. Water strikes close to the river are less than 25m. Near the first two (2) stratigraphic wells water is expected to be shallow and will be intersected/struck within the first 50m of drilling.

The saturated aquifers thickness in relation to borehole depth are shown in Fig. 5.65. Very few boreholes have saturated thicknesses greater than a 100m. The majority of boreholes have a saturated thickness between 40-60m. Deeper boreholes south of the prominent northwest fault have a saturated thickness of less than 25m, despite increased drilling depths of greater than 140m. This suggests boreholes will have lower yields in comparison to boreholes with greater saturated thickness. This rationale, however is only applicable to boreholes tapping Kalahari sediments.

Borehole saturation thickens in the vicinity of exploration wells, implies boreholes will have a saturation thickness between 50-100, with depths rarely exceeding a 150m.

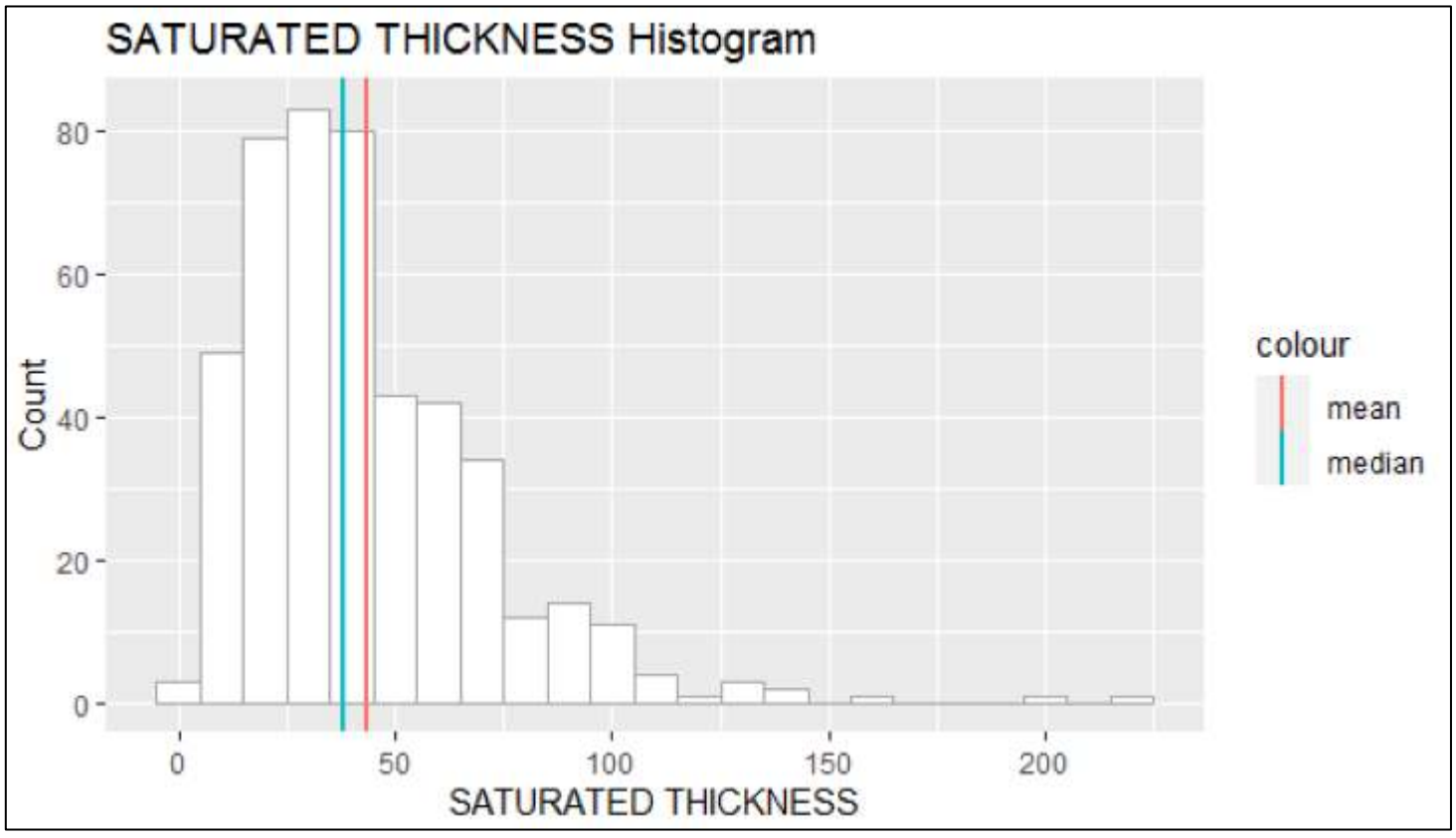


Figure 5.63: Saturated Thickness, Histogram (Source: Annex 5).

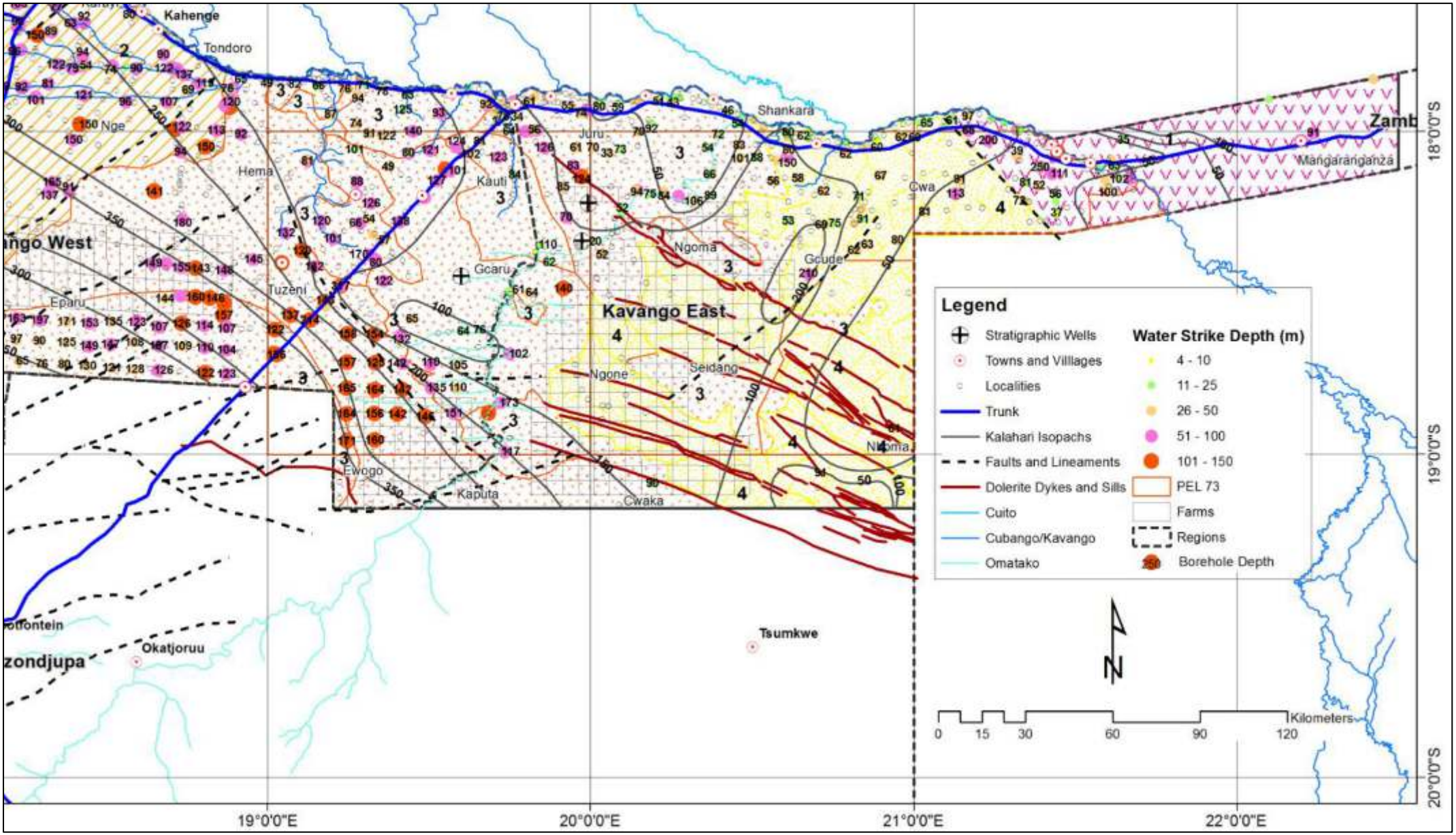


Figure 5.64: Water strike depth, with borehole depth around PEL 73 (Source: Annex 5).

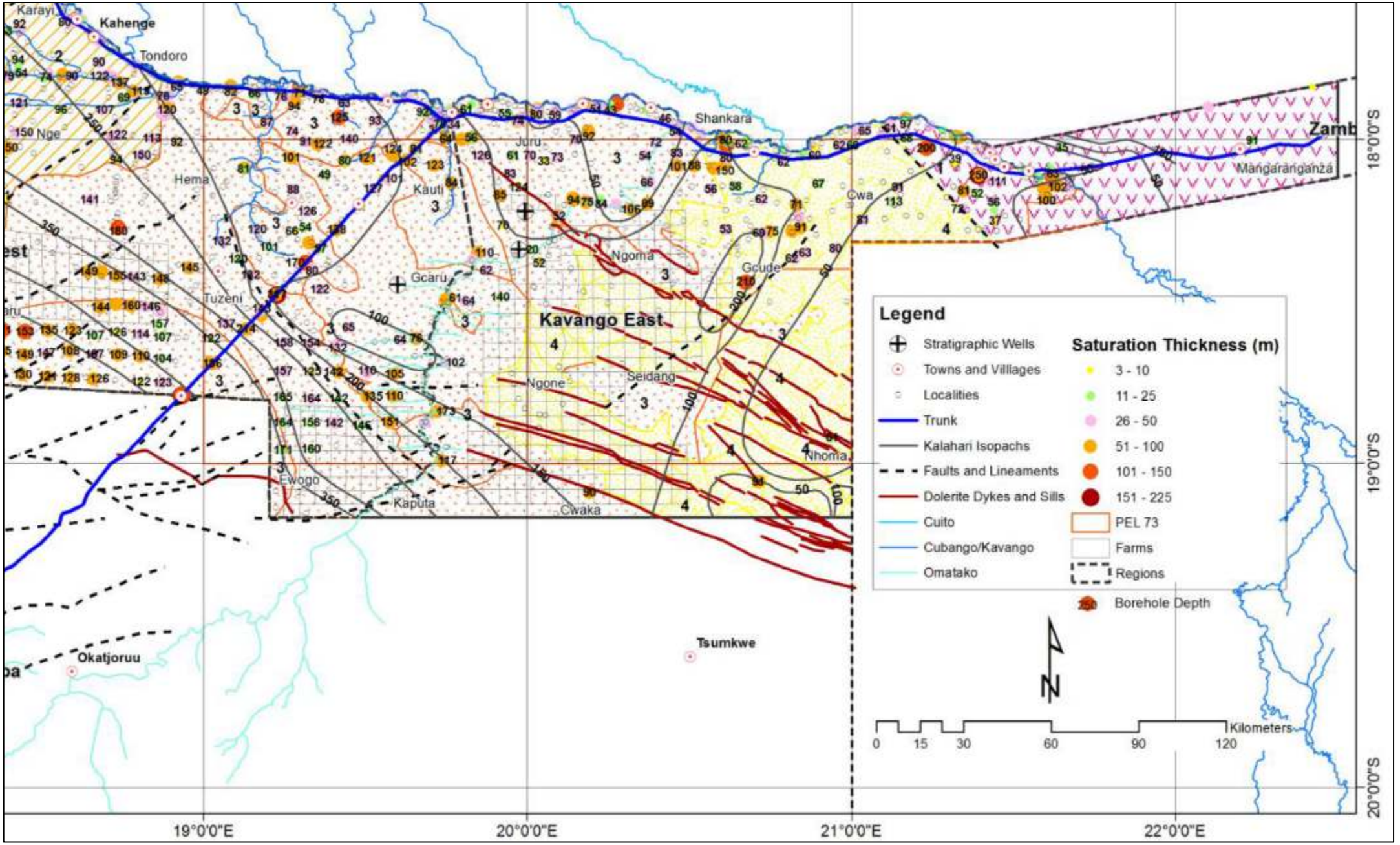


Figure 5.65: Saturation thickness with borehole depth around PEL 73 (Source: Annex 5).

5.5.3.8 Groundwater Use and Abstraction

The major consumers of groundwater, are communal farmers, who are widely spread across the Kavango West and East Regions of PEL 73 and use water mainly for livestock and domestic use. No formal abstraction records are kept by farmers, which makes the calculation of water abstraction by farmers impossible. Water being consumed at community water points is also not being metered and is therefore not known. The impact of water abstraction by communities is difficult to determine. Various attempts have been made to determine the water demand per water point, but the figures produced are unreliable, especially the livestock numbers per household per water point. Relying on census population data is also cumbersome since the number of people served by the number of water points in an enumerator is also elusive. However, given the data available, an attempt was made through the use of spatial analysis and assumptions on the number of livestock per hectare, to determine an average water demand figure per enumerator per borehole. The water demand per enumerator has been calculated based on the number of livestock it can support per hectare (10LSU) and the population size per enumerator. Approximately 80 litres per day (L/day) have been allowed for water consumption for both livestock and people. A spatial join was done on census data which assigns the number of boreholes to its enumerator which it contains. Results of the analysis were as follows:

- The least water required is 0.005m^3/h or 0.14m^3/day and the highest of 5.9 m^3/h or a 141m^3/day, with an average of 0.9 m^3/h or 22 m^3/day, and.

- Borehole Yield on average can supply approximately between 8-10 m^3/h or 192-240 m^3/day.

The results of the analysis determines that the average borehole yield, satisfies the required water demand per water point. The required water demand for petroleum exploration especially well drilling operations has been determined as approximately 7m^3/h, which is close to the average borehole yield for the region. Operational or safe yield, is normally taken as 70-80% of sustainable yield. This indicates that a borehole must yield at least 9m^3/h to fulfil the water requirements of petroleum drilling operation. Only farms under irrigation of more than 1ha, require a permit, or if water is for other use, other than domestic/farming. Other users of groundwater are schools, clinics and police stations and other amenities. Schools and clinics" have exclusive water points, however these installations get shared with the communities. These water points are assigned to Rural Water Supply in the Regional Council. The Namibian Water Corporation (NamWater) is the official bulk water supplier of settlements and villages. NamWater has a few schemes in the Region, which is mostly located along the river. All NamWater groundwater schemes draw water from aquifers close to the Okavango River and do not draw water from the river. Water from boreholes has the advantage that it does not require purification or treatment.

5.5.3.9 Hydrocensus Results

The first hydrocensus survey in PEL 73 was conducted on behalf of REN by Pioneer Minerals and Mining Consultancy from the 14th April-05th May 2021 and this programme continue to be undertaken as an annual event. Ninety water points were visited and include those falling around proposed D1-D6 and G1-G6 exploration and appraisal wells sites. The survey was restricted to a 2.5km buffer zone surrounding the seismic profile lines all falling within the AOI and also covered the area of the proposed D1-D6 and G1-G6 exploration and appraisal wells sites. Water points are referenced by waypoint number (WPT), assigned to the water point during the survey. Most localities visited were predominantly water points established by the MAWLR, Division Rural Water Supply (RWS), consisting mainly of boreholes. Shall water wells in the area were the main stay of water supply in the past. Boreholes have since, systematically replaced these water wells. Water wells still exist and are used for domestic and stock watering. They often positioned along the major ephemeral rivers or Omurambas and remain a major source of water for rural communities. Water wells provide the most rudimentary access to water and water are abstracted using rope and bucket. Wells are in the minority and are always within a 2km radius of an existing borehole. In some areas, wells have dried up and people consequently abandoned the area.

A typical RWS borehole consists of storage facilities (3x10m^3 plastic tanks), a tap stands and a drinking trough for animals. Mono rotary pumps driven by diesel engines mainly equipped boreholes in the past. Improvements in water supply technologies saw submersible pumps replacing mono pumps. Solar and electrical driven systems are progressively replaced mono pumps, since many villages went without

water because of diesel fuel shortages. Diesel is difficult to access, since Rundu is the only centre, which sells diesel and inaccessible for many rural villages. Many communities prefer installations of solar driven pumps because of the low cost associated with these systems. In places where water has a high demand, higher pumping rates are required, and electricity and diesel are the preferred power sources. RWS for the Kavango Region is not without challenges and improvements in technologies and design can contribute in a positive way. Many boreholes are taken care by a “pump boy” as caretakers. However, many of these “pump boys” lack the technical ability to service and maintain water points. This is the biggest threat ensuring adequate water supply to many villages in both Kavango West and East Regions.

Many communities expect government to provide access to water, which comes at a price, especially in areas where water is not readily available everywhere like in Kavango East and West Regions. Government funds and implements most water supply development projects, which consist of the drilling and construction of water supply infrastructure. Thereafter, the upkeep of water supply points becomes the responsibility of the community. Communities at times cannot afford, nor has expert knowledge or tools to maintain their water points, which leads to infrastructure being dilapidated and abandoned when out of order. Institutions with own water supply visited during the survey were mainly schools, clinics, and police stations. The Ncaute Police Station is the only police station in the area, visited. In some instances, schools and clinics were mostly reliant upon water supply from community boreholes and in other instances had their own water supply. Water supply to schools, clinics, and police stations is the responsibility of their respective Ministries and Regional government. Problems related to community boreholes leave many schools and clinics without water, since the reinstatement of water supply lies with the water point committees and not with the Ministry of Education or Health. Maintenance of water supply infrastructure for schools and clinics with their own water supply, are subject to maintenance contracts, issued under their respective Ministries and Regions. Many schools and clinics suffer from water shortages because of the lack of reliable service contracts issued or no maintenance being done at all. Water demand by water point was calculated based on figures of large and small stock and people near a water point. Forty litres/day (40l/day) for large stock, 20l/day for small stock and 50l/day per person were allowed for water demand calculations. Water demand figures were gathered from community members present at a water point.

5.5.3.10 Groundwater Conclusions and Water Monitoring around Proposed Well Sites

A hydro census was conducted to compile additional data on the groundwater resources and water infrastructure within the project area, PEL 73. The intention was to determine the level of access to water within the immediate area of REN exploration activities, but also to gather which localities might be affected by REN exploration activities. Two aquifer systems have been identified, during the hydrocensus, to occur within the AOI namely a shallow perched aquifer, and a primary sedimentary aquifer. Perched Aquifers primarily occur along ephemeral rivers (Omurambas) within the Ndonga and Omatako Omurambas, occurring at depths no greater than 5m. The perched aquifers have limited extent both laterally and vertically. These aquifers are still used as sources of water, abstracting from water using a rope and bucket. Wells are equipped with hand pumps to abstract water. Water from wells is used for both domestic and stock watering.

Kalahari Aquifers occur at greater depths comprising saturated Kalahari Group sediments of sands, silts and clays. The Kalahari Aquifers vary in depth and thickness and is basically a function of basin morphology. Kalahari Aquifer yields are varied and ranges between <1m^3/h and up to 14m^3/h for the boreholes surveyed in the AOI in PEL 73. Depth to groundwater is shallow (<10m) to moderate (10-50m), with shallow groundwater occurring mostly along the Omurambas and deeper groundwater occurring further away. More than 50% of boreholes located had no groundwater information. Over the entire PEL 73, a total of 90 water points, were visited during the survey and consisted of 78 boreholes 11 wells and one pond. Based on the findings of the hydrocensus that the following groundwater monitoring programme has been implemented and will continue to be undertaken inclusive of all the existing and proposed water boreholes to be drilled around the proposed D1-D6 and G1-G6 exploration and appraisal wells sites:

(i) Boreholes near existing and proposed D1-D6 and G1-G6 exploration and appraisal wells sites should form part of the monitoring programme that includes water quality sampling and testing.

(ii) Water quality sampling should be undertaken quarterly or bi-annually with the results shares with the local communities or land owners for proposed D1-D6 and G1-G6 exploration and appraisal wells sites falling on commercial farms on communal land, and.

(iii) A groundwater monitoring network should include all water points with high water demand and boreholes near the existing and proposed D1-D6 and G1-G6 exploration and appraisal wells sites. The groundwater monitoring will not only assist REN in effectively utilising the local groundwater resources but will also help local communities in avoiding over pumping of boreholes due to high-water demands. The monitoring of community water boreholes with high water demand will help in detecting increases in sodium salts overtime due to over pumping. Without the monitoring the increase in salt resulting in poor water quality may be wrongly attributed to the drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells sites by REN while the real cause to the deterioration of local groundwater quality is the over pumping.

5.6 Archaeology

5.6.1 Overview of Archaeological Resources in PEL 73

The archaeological inputs and assessment for this project has been provided by Dr Alma Mekondjo Nankela, a specialist Archaeologist, Rcheritage Services Cc, Archaeosciences and Consultants (Annex 6). Detailed field-based assessment of the archaeological and cultural resources associated with the AOI and proposed D1-D6 and G1-G6 exploration and appraisal wells sites are provided in Annex 6. Previous systematic archaeological investigations of the Kavango East and West Regions revealed human occupations that predate the pre-colonial farming settlements. In addition to archaeological heritage, modern heritage of Kavango East and West Regions is characterised by remnants of numerous historic, sacred cultural sites as well as present-day community graves and cemeteries mainly along the Omatako River basin not affected by the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73.

5.6.2 Archaeological Baseline Findings

The archaeological heritage impact assessment has identified a group of archaeological heritage sites within the footprint of the proposed project. These are located along the Omatako River Basin between Ncaute and Taratara villages (Table 5.4 and Fig. 5.66). Additionally, a group of other sites whose quantity has not been established are also found southwest of Omatako River basin. These sites will not be impacted by the drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells sites neither are they vulnerable nor sensitive (Annex 6). However, it cannot be ruled out that other significant archaeological evidence of pre-colonial occupation will likely be found along the tributaries of the Omatako River Basin mainly due to the presence of fresh water in the immediate area. If they do occur, the nature of anticipated archaeological materials along the Omatako Ephemeral River course will likely be of diagnostic nature from Late Stone Age period due to the spread of the industry in this area.

However, such surface artefacts will have no archaeological values because they will likely be been already disturbed by extensive agricultural activities all along the Omatako Ephemeral River and associated tributaries (Plate 5.56).

Table 5.4: GPS coordinates of the identified archaeological sites reflected in Fig. 5.66.

Site No.	GPS location	Region	Local Area Name
1	18°13'54.72"S / 19°44'9.88"E	Kavango East	Mcuma/Chimpanda
2	18°21'50.17"S / 19°49'53.12"E	Kavango East	Shikambu
3	18°21'48.47"S / 19°51'24.65"E	Kavango East	Baramasono
4	18°11'1.21"S / 20°10'15.72"E	Kavango East	Baramasono
5	18°10'59.89"S / 20°11'18.68"E	Kavango East	Taratara

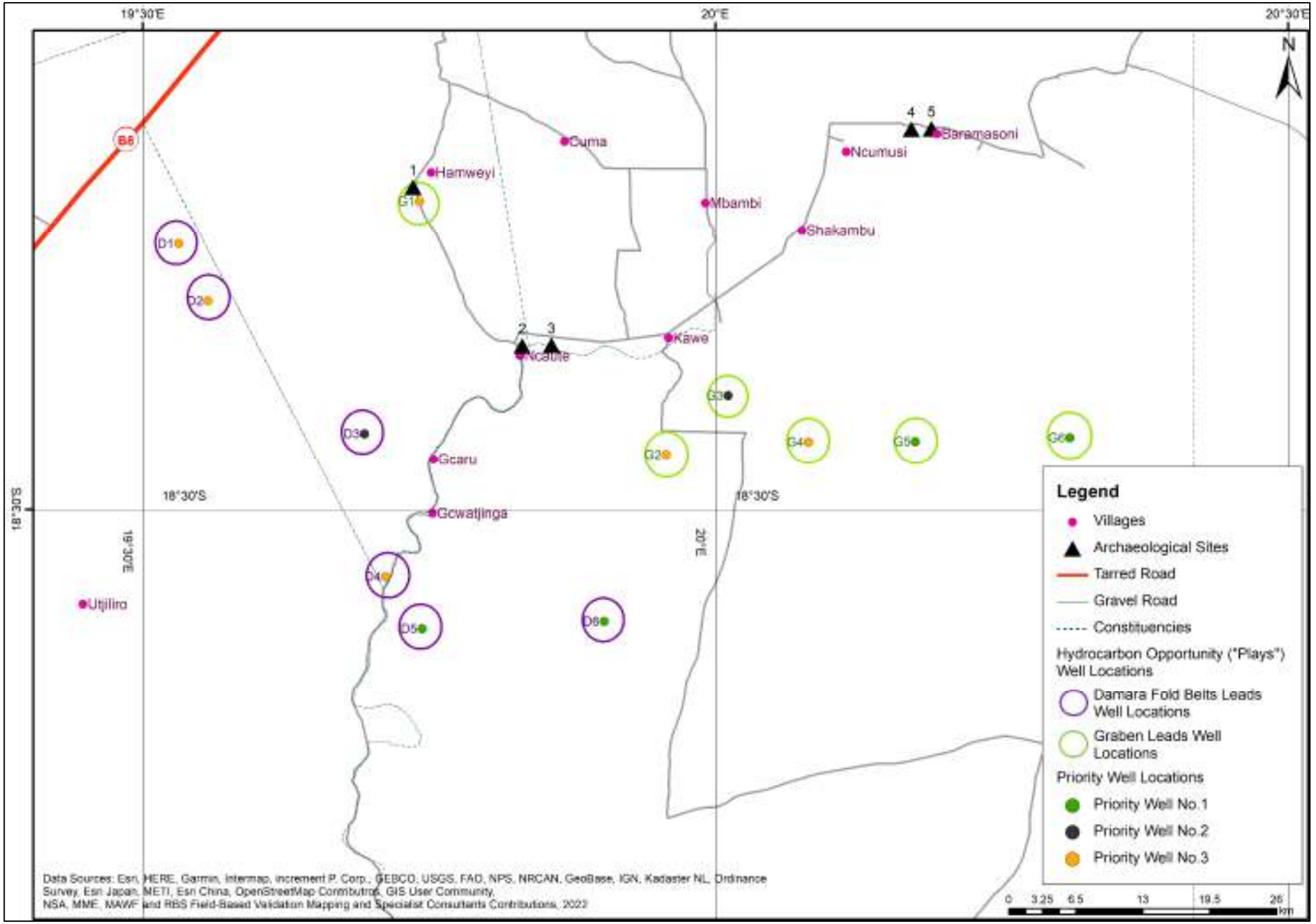


Figure 5.66: A group of archaeological sites (black triangles) in relation to the proposed D1-D6 and G1-G6 exploration and appraisal wells sites (Archaeological Data Source: Annex 6).

Plate 5.56: Extensive human induced disturbances including agricultural activities all along the fossilised Omatako Ephemeral River and its Ephemeral tributaries that could have resulted in the disturbances of any archaeological resources in the area.

5.7 Stakeholder and Public Consultation

5.7.1 Overview

According to the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007), a person conducting a public consultation process must give notice to all potential Interested and Affected Parties (I&APs) of the application for ECC which is subjected to public consultation and participation process. The EIA Regulations clearly state that potential interested and affected parties must be provided with a reasonable opportunity to comment on the application under section 21(6) of the EIA Regulations.

Consultation of the public, local communities as Interested and Affected Parties (I & APs) has been part of the EIA process for the proposed D1-D6 and G1-G6 exploration and appraisal wells drilling operations in line with the environmental regulatory requirements.

Due to the specialised nature of the proposed project activities and situated in remote communal areas, the project team had focused heavily on working with the regional, local, and traditional leaders and the local communities. Continuous consultation and updating of the political (Governors and local Councillors) and traditional leaders of the Kavango West and East Regions about the proposed activities will continue to be undertaken.

The public, local community and stakeholder consultation process undertaken for the proposed D1-D6 and G1-G6 exploration and appraisal wells drilling operations has built on the previous consultations and engagement activities undertaken since 2019 with respect to the stratigraphic well drilling operations and seismic survey operations.

5.7.2 Objective of Undertaking Consultation Process

The overall objective of undertaking the local communities, public and stakeholder consultation process was to inform all the Interested and Affected Parties (I&APs) about the proposed project activities, disclose the Terms of Reference, the assessment and management reports and allow for inputs, comments or objections of the proposed D1-D6 and G1-G6 exploration and appraisal wells drilling operations by the Proponent.

5.7.3 Consultation Approach and Implementation

In accordance with provisions of the national regulations and corporate requirements of the Proponent, the identification and assessment of stakeholders and issues of importance to them, was a key step of the stakeholder identification process (Table 5.5).

Prior to the implementation of the consultation process, the proposed project was registered with the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT) under the Application No. 00459 as listed on the MEFT Portal www.eia.meft.gov.na. A formal screening notice from the Environmental Commissioner in terms of assessment procedures as provided for in Section 35 (1)(a)(b) of the Environmental Management Act, 2007, (Act No. 7 of 2007) was received and used in the preparation of the Scoping, EIA and EMP Reports as well as all other required submittals in support of the application for the ECC.

As part of the EIA process additional consultation activities were undertaken during the months of January and February 2023 focusing on the registered stakeholders, local communities including land owners and traditional authorities, and public awareness. The public, stakeholder and community consultations and engagements activities supported the process of obtaining consents for the land for each of the proposed drilling sites, local access routes, and borrow pits areas and met the drilling ECC regulatory consultations requirements. The Proponent through the RBS Team and CLOs, will continue to consulted and engaged all the key stakeholder groups including the following:

(i) Namibia central government ministries such as Ministry of Mines and Energy (MME), Ministry of Environment, Forestry and Tourism (MEFT), Ministry of Agriculture, Water and

Land Reform (MAWLR), Ministry of Urban and Rural Development (MURD), Ministry of Home Affairs, Immigration, Safety and Security (MHASS), Ministry of Health and Social Services (MHSS), Ministry of Works and Transport (MWT), Ministry of Labour, Industrial Relations and Employment Creation (MLIREC), and Ministry of Gender Equality, Poverty Eradication and Social Welfare (MGEPESW).

(ii) Kavango West and Kavango East Regional Councils.

(iii) Local Authorities such as Rundu and Nkurenkuru as well as all the local villages and settlements.

(iv) Traditional Authorities of Mbunza, Sambyu, Gciriku, Kwangali, and Mbukushu/Hambukushu.

(v) Local communities.

(vi) Land owners.

(vii) Namibian state-owned enterprises.

(viii) Farming, conservation, conservancy, forest associations / bodies.

(ix) Business (Private sector) organisation associations / bodies.

(x) Project contractors and business partners.

(xi) National Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs).

(xii) Regional initiatives / bodies such as Kavango–Zambezi Transfrontier Conservation Area (KAZA TFCA) and Permanent Okavango River Basin Water Commission (OKACOM), and.

(xiii) Other Interested and Affected Parties (I&AP) / Public.

5.7.4 Consultations Process Disclosures Requirements

As provided for in the EIA Regulations, 2012, all the documents and reports that the Proponent intends to submit to the Environmental Commissioner in the MEFT to support the application for the ECC for the proposed D1-D6 and G1-G6 exploration and appraisal well drilling operations in PEL No. 73 have been shared with the registered stakeholders for their inputs, and comments. All the Interested and Affected Parties (I&APs) requesting for registration were required to disclose their interest as provided for in the EIA Regulations, 2012, Regulation 23 (1), (b) which states as follows:

(1) A registered interested or affected party is entitled to comment in writing, on all written submissions made to the Environmental Commissioner by the applicant responsible for the application, and to bring to the attention of the Environmental Commissioner any issues which that party, believes may be of significance to the consideration of the application, if:

(a) the interested and affected party discloses any direct business, financial, personal, or other interest which that party may have in the approval or refusal of the application.

All registered stakeholders (Interested or Affected Parties) have been given the opportunity to comment in writing, on all written submissions to be made to the Environmental Commissioner in MEFT by the applicant responsible for the application, and to bring to the attention of the Environmental Commissioner any issues which any party, believed may be of significance to the consideration of the application, subject to the comments being submitted within seven (7) days of notification of an application or receiving access to a scoping report or an assessment report; or the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.

Table 5.5: Detailed work programme used for I&APs consultations process with respect to the proposed D1-D6 and G1-G6 exploration and appraisal wells drilling operations.

SCOPING, SPECIALIST STUDIES, EIA AND EMP PROJECT CONSULTATION ACTIVITIES	INFORMATION TO DISCLOSE	STAKEHOLDER TARGET GROUP	RESPONSIBILITY

ACTIVITIES	2022			2023		
	Oct	Nov	Dec	Jan	Feb	Mar
1. Project screening	■					
2. Prepared Summarised Background Information Document (BID) and Draft Scoping Report	■	■				
3. Prepared Public Advert and consultation materials	■	■				
4. Registered the project with the Environmental Commissioner in the Ministry of Environment Forestry and Tourism via Ministry of Mines and Energy		■				
5. Conduct scouting and all specialist fieldwork and prepare Draft EIA and Draft EMP and specialist reports		■				
6. Opened a Stakeholder Register and updated continuously		■	■			
7. Directly contact and engage the key Interested and Affected Parties especially the local communities, traditional authorities, and Councillors		■	■			
8. Twenty (21) days of public and stakeholder consultations from the date of 1st publication. Public notices were published in the New Era Daily (English) Newspaper, Market Watch of the Namibian Sun (English), Republikein (Afrikaans Newspaper) and Allgemeine Zeitung (Namibian German Newspaper) during the months of November and December 2022. Public notices have also been placed at strategic places in Rundu, Nkurenkuru, Ncaute and other local villages in Kavango East and West Regions.		■	■			
9. Conduct additional specialist fieldwork and prepare Final Scoping / BID, Specialist, Draft EIA and Draft EMP Reports		■	■	■		
10. Conduct 2nd Consultations: Stakeholder meetings in Rundu, Nkurenkuru and local villages in affected communities.				■		
11. Finalised Specialist, EIA and EMP Reports as may be applicable based on the inputs and comments obtained during the final phase of the public and stakeholder consultation processes.				■	■	
12. Submit the Application for ECC to the Environmental Commissioner with final EIA and EMP Reports and arrange for clarification meeting/s with regulators.					■	■

INFORMATION TO DISCLOSE

1. Background Information Document (BID) summarising the proposed project
2. All consultation materials
3. Draft Scoping Report with Terms of Reference (ToR) for EIA and EMP inclusive of specialist studies undertaken
4. Final EIA and EMP Reports

STAKEHOLDER TARGET GROUP

1. Central government ministries such as the MME, MEFT, MAWLR, MURD, MHASS, MHSS, MWT, MLIREC, and MGEPESW, and.
2. Namibian regional governments for Kavango West and East Regions
3. Local Authorities such as Rundu and Nkurenkuru as well as all the local villages and settlements
4. Traditional Authorities of Mbunza, Sambyu, Gciriku, Kwangali, and Mbukushu/Hambukushu, and
5. Namibia state owned enterprises

1. Farming, Conservation, Conservancy, Forest associations / bodies.
2. Business (Private sector) organisation associations / bodies.
3. Project contractors and business partners

1. National Non-Governmental Organisations (NGOs) and Community Based Organisations (CBOs).
2. Regional/ local bodies / initiatives such as Kavango–Zambezi Transfrontier Conservation Area (KAZA TFCA) and Permanent Okavango River Basin Water Commission (OKACOM).
3. Interested and Affected Parties (I&AP) / Public

RESPONSIBILITY

- Risk-Based Solutions (RBS) CC undertook all the activities and prepared the Scoping, EIA and EMP Reports in support of the application for ECC on behalf of REN
- REN provided all the applicable proposed wells coordinates, boundary, maps, rig, drilling and all project technical specifications

5.7.5 Consultation Activities Undertaken

5.7.5.1 Draft Scoping Report with EIA and EMP Terms of Reference Consultation Process

Scoping phase consultations process has been undertaken during the months of November and December 2022. The scoping phase consultation process involved the publishing of public notices in the local newspapers as required by the Environmental Management Act, 2007, (Act No. 7 of 2007) and EIA Regulations, 2012 and as part of the notification process to the public, Interested and Affected Parties (I&APs) (Figs. 5.67-5.70 and Plate 5.57).

During the months November 2022, full page public notices were published in the following local newspapers (Figs. 5.67-5.70):

(i) New Era Daily English Newspaper dated Thursday, 24th November 2022.

(ii) Market Watch Insert in Allgemeine Zeitung (Namibia German) Daily Newspaper dated Wednesday, 30th November 2022.

(iii) Market Watch Insert in Namibian Sun (English) Daily Newspaper dated Wednesday, 30th November 2022, and.

(iv) Market Watch Insert in Republikein (Afrikaans Newspaper) Daily Newspaper dated Wednesday, 30th November 2022.

The deadline for registration and submission of inputs, comments or objections to the Background Information Document (BID) and Draft Scoping Report that were issued for consultations was Friday, 16th December 2022 (Figs. 5.67-5.70). A Stakeholder Register was opened on the 24th November 2022 and a total of 132 stakeholders were registered during the Draft Scoping consultation process with respect to the application for ECC for the proposed D1-D6 and G1-G6 exploration and appraisal wells drilling operations in PEL 73.

A total of sixteen (16) stakeholders who responded to the Draft Scoping Report public notices were registered and eight (8) stakeholders submitted comments, inputs and objections to the BID and Draft Scoping Report (Annex 7). The EPAs responses to the inputs, comments or objections submitted by the registered stakeholders with respect to the BID and Draft Scoping Report are provided in Annex 7. Key inputs to the EIA and EMP process provided by the registered stakeholders were incorporate in the Draft EIA and EMP Reports that were released for comments by the stakeholders in February 2023.

In addition to the full-pages public notices that were published in the local newspapers, key local and regional stakeholders and community meetings were also undertaken in Kavango East and West Regions during the months of November and December 2022 as shown in Table 5.6, Plate 5.57 and Annex 7. A total of 116 stakeholders were registered and consulted in Kavango East and West Regions. Details of key issues raised by the local stakeholders at the meetings and responses provided by the EAPs and project team are shown in the attached minutes in Annex 7.

Table 5.6: List of stakeholder meetings that were undertaken in November and December 2022 with local stakeholder groups in Kavango East and West Regions.

No.	Community/ farm owner	Date	Prioritised Well Location
1	Gcaru Village	23/11/2022	D3
2	Naingopo Village	24/11/2022	D4
3	Mr. Johannes A. Balzar	25/11/2022	G3 - 1564
4	Mr. Pitjo Magnus		G5 - 1567
5	Mr. Alex Kamenye		G6-1672
6	Mr. & Mrs Suzette von Wieligh	29/11/2022	G4- 1565
7	Mr. Karapo Viota	29/11/2022	D5-1372
8	The Shakambu Farmers Association	07/12/2022	All Wells
9	Mr. Erastus Naujoma	07/12/2022	D6-1529
10	Mr. Gerard Kakonda	08/12/2022	G2 - 1562
13	Traditional Authorities	14/12/2022	All Wells

5.7.5.2 Draft EIA and EMP Stakeholders Consultation Process

Following the preparation of the Draft EIA and EMP Reports, stakeholder consultation activities were undertaken during the month of February 2023. All the registered stakeholders were given the opportunity to review the Draft EIA and EMP Report and provide comments, inputs or objections to all the documents that the Proponent intends to submit to the Environmental Commissioner. The Draft EIA and EMP Reports stakeholder consultation process involved the disclosure of the Draft EIA, EMP and specialist reports, publishing of public notices in the local newspapers as required by the Environmental Management Act, 2007, (Act No. 7 of 2007) and EIA Regulations, 2012 and undertaking of additional communities and key stakeholder consultation meetings (Figs. 5.71-5.74 and Plate 5.58). During the month of February 2023, half page public notices were published in the following local newspapers (Figs. 5.71-5.74):

(i) New Era Daily English Newspaper dated Monday, 6th February, 2023.

(ii) Market Watch Insert in Allgemeine Zeitung (Namibia German) Daily Newspaper dated 16th February 2023.

(iii) Market Watch Insert in Namibian Sun (English) Daily Newspaper dated Thursday, 16th February 2023, and.

(iv) Market Watch Insert in Republikein (Afrikaans Newspaper) Daily Newspaper dated 16th February 2023.

The deadline for submission of inputs, comments or objections to the Draft EIA and EMP Reports that were issued for consultations was Monday, 27th February 2023 (Figs. 5.71-5.74). A Stakeholder Register that was opened on the 24th November 2022 was updated during the month of February 2023 and to date a total of 281 stakeholders have been registered with respect to the application for ECC for the proposed D1-D6 and G1-G6 exploration and appraisal wells drilling operations in PEL 73. Five (5) registered stakeholders submitted comments, inputs and objections to the Draft EIA and EMP Reports (Annex 7). The EPAs responses to the inputs, comments or objections submitted by the registered stakeholders with respect to the Draft EIA and EMP Reports are provided in Annex 7. Key inputs to the EIA and EMP process provided by the registered stakeholders have been integrated in the Final EIA and EMP Reports.

In addition to the half-pages public notices that were published in the local newspapers, key local and regional stakeholders and community meetings were also undertaken in Kavango East and West Regions during the month of February 2023 as shown in Table 5.7, Plate 5.58 and Annex 7. Details of the key issues raised by the local communities and stakeholders at the meetings and responses provided by the EAPs and project team are shown in the attached minutes in Annex 7.

Table 5.7: List of Draft EIA and EMP Reports stakeholder meetings that were undertaken during the month of February 2023 with local stakeholder groups in Kavango East and West Regions.

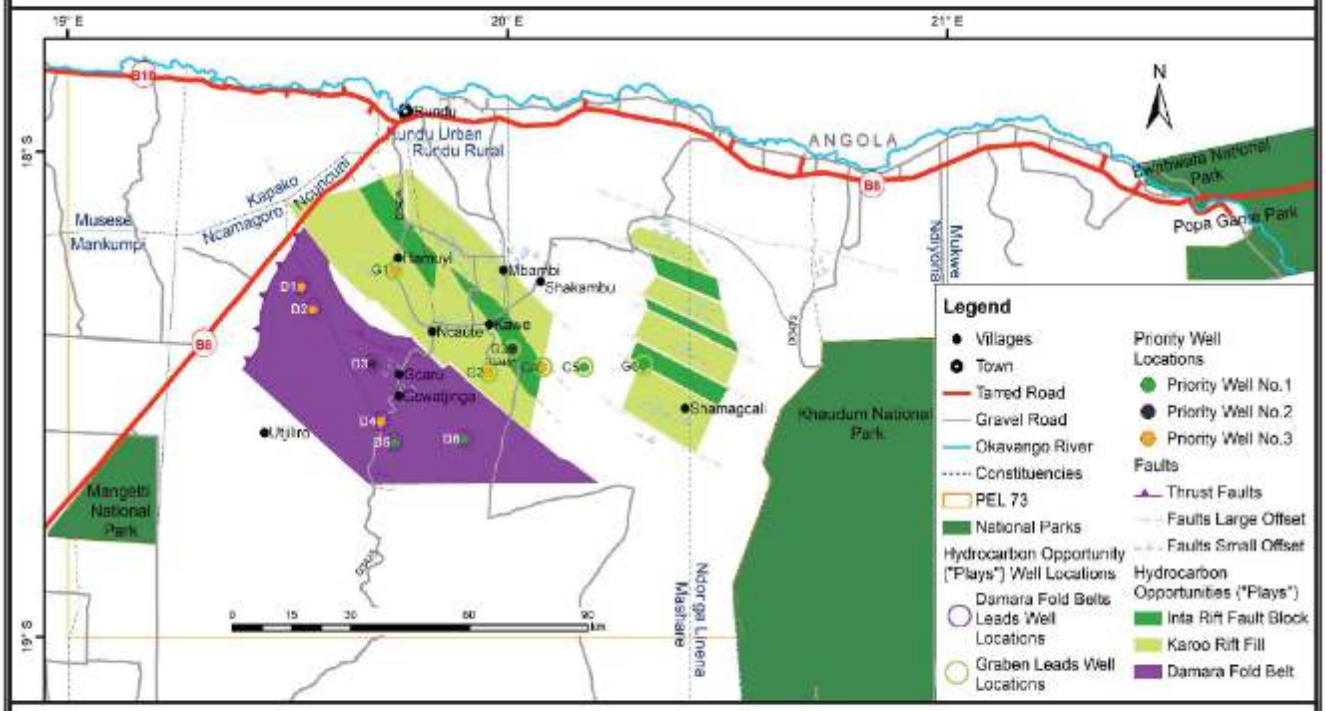
No.	Community/ farm owner	Date	Prioritised Well Location
1	Hamweyi Village	20/02/2023	G1
2	Ncomagoro community and forest committee	22/02/2023	D2
3	Mbeyo community forest committee	23/02/2023	D1
4	Kavango East Regional council, Governor, Hon. Councillors, and key stakeholders	24/02/2023	D1-D6 and G1-G6

Hardcopies of the EIA, EMP, specialist reports and associated annexes that the Proponent intended to submit to the Environmental Commissioner in MEFT to support the application for ECC for drilling of the proposed D1-D6 and G1- G6 exploration and appraisal wells, were distributed to the Kavango East and West Regional Councillors, traditional authorities, and the Farmers Union. Land owners of the commercial farms on communal land were given access to the digital folder where all the digital reports in PDF Formats were made available to all the registered stakeholders.

PUBLIC NOTICE FOR APPLICATION FOR ENVIRONMENTAL CLEARANCE (ECC)

ReconAFRICA

Application for Environmental Clearance Certificate (ECC) for Drilling of Multiple Exploration and Appraisal Wells with Supporting Infrastructures such as Borrow Pits, Access Roads, and Related Services in Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73, Kavango East and West Regions, Northern Namibia



Reconnaissance Energy Namibia (REN) (Pty) Ltd, (the **"Proponent"**) holds petroleum exploration rights under the PEL No. 73 covering Degree Square Block No. 1819 and parts of Blocks 1719, 1720, 1721, 1820 and 1821 over the Kavango Sedimentary Basin (KSB) in Kavango West and East Regions in northern Namibia. PEL 73 was granted by the Minister of Mines and Energy under Section 29-36 of the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991). The Proponent is proposing to drill a number of seismically defined prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 in the KSB, PEL No. 73. Ongoing stratigraphic well drilling, 2D seismic survey operations and the proposed drilling of the prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6, forms part of the ongoing petroleum exploration work programme for PEL No. 73 as agreed in the Petroleum Agreement signed between the Ministry of Mines and Energy (MME) and REN. The results of the 6-1 Mbambi, and 6-2 Kawe, 6-2 Makandina stratigraphic test wells drilled by REN in 2021 and 2022 respectively, and the subsequent 2D seismic survey data acquired in the Kavango Sedimentary Basin (KSB), have established a significant rift basin similar to other major petroleum provinces / rift basins in other parts of the World. Thus far, the integrated interpretation has established the following three (3) groups of hydrocarbon opportunities ("Plays"), Primary: Karoo Rift Fill (Light Oil), Secondary: Intra-Rift Fault Blocks (Light Oil), and Secondary: Damara Fold Belt (New Play, Gas/Gas Condensate. A new petroleum system (play) for KSB, the Damara Fold Belt, has been established based on the interpretation of the seismic data acquired since 2021. The Damara Fold Belt was not anticipated in the original studies of the KSB.

Stratigraphic wells currently being drilled are designed to confirm and map the KSB, associated subbasins and petroleum systems with well targets, prospects and leads as part of a de-risking process based on regional data sets including airborne geophysics, initial 2D seismic and regional geological mapping results. As this de-risking progresses, the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 are designed to confirm the existence of economic oil and / or gas resources with the delineated targets / prospects and leads process based on additional 2D seismic survey data acquisition and interpretation, airborne geophysical surveys and the stratigraphic well data sets. The objectives of the proposed exploration and appraisal wells drilling programme is to continue with the search for oil gas in Kavango Sedimentary Basin and the associated subbasins and to identify potentially commercial petroleum systems. The drilling of the proposed exploration and appraisal wells will be undertaken using the Crown 750 truck mounted drill rig currently being used by REN to drill the stratigraphic wells and will apply the same drilling technology with the addition of well testing in an event of a discovery. REN will continue with the drilling of the stratigraphic wells based on the current granted permits until all the required permits, consents and authorisations to drill the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 have been granted by the Government.

The drilling of the proposed prioritised exploration and appraisal wells, cannot be undertaken without an Environmental Clearance Certificate (ECC) as required by the Environmental Protection Clause 11 of the Petroleum Agreement, Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), Petroleum Laws Amendment Act, 1998, (Act 24 of 1998), Environmental Management Act, 2007, (Act No. 7 of 2007) and the Environmental Impact Assessment (EIA) Regulations 30 of 2012. In fulfilment of the environmental requirements, the Proponent has appointed Risk-Based Solutions (RBS) CC as the environmental / permitting de-risking Consultant, led by Dr Sindila Mwiya and supported by Ms Emerita Ashipala and Mr Samison Mulonga as the Environmental Assessment Practitioners (EAPs) to prepare EIA and Environmental Management Plan (EMP) Reports to support the application for ECC. Interested and Affected Parties (I&APs) are hereby invited to register and submit written inputs / objections with respect to the application for ECC for the proposed drilling of the priority exploration and appraisal wells Nos. D1-D6 and G1-G6 with supporting infrastructures such as borrow pits, access roads, and related services in Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73, Kavango West and East Regions, Northern Namibia.

A Background Information Document (BID), and a Draft Environmental Scoping Report are available for comments and inputs upon registration as a stakeholder / Interested and / Affected Party (I&AP). Note: In terms of the provisions of the EIA Regulation 23 (1), an interested and / or affected party is required to disclose any direct business, financial, personal, or other interest which that party may have in the approval or refusal of the ECC application and such declaration will be required when registering as a stakeholder.

REGISTER BY SENDING AN EMAIL WITH YOUR NAMES, ORGANISATION, CONTACT DETAILS AND DECLARATION / DISCLOSURE OF INTEREST TO:

Ms Emerita Ashipala (EAP/ Risk-Based Solutions Independent Senior Technical Consultant), **Email**: emerita.ashipala@gmail.com
or
Mr Samison Mulonga (EAP/ Risk-Based Solutions Independent Senior Technical Consultant), **Email:** mulongas@gmail.com

For specific technical clarifications on onshore oil and gas exploration and the environment please contact:
Dr Sindila Mwiya EAP / Technical Permitting Advisor / International Resources Consultant, **Email:** frontdesk@rbs.com.na

REGISTRATION & WRITTEN SUBMISSIONS DEADLINE IS: FRIDAY, 16th DECEMBER 2022

In addition to the current ongoing local community and stakeholder consultation meetings, additional meetings will be organised in local communities, Rundu, Kavango East Region and Nkurenkuru, Kavango West Region in January 2023

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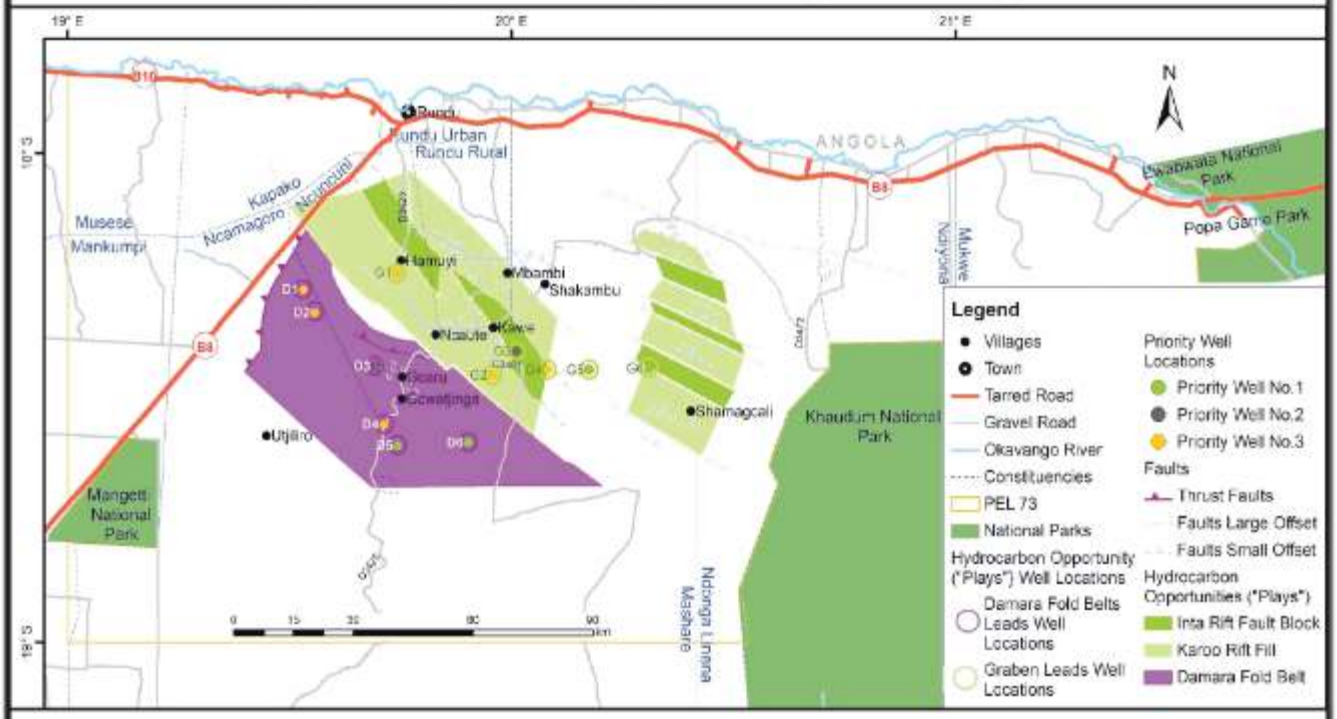
Figure 5.67: Copy of the 1st full page Public Notice that was published in the New Era (English) daily newspaper dated Thursday, 24th November 2022.

PUBLIC NOTICE FOR APPLICATION FOR ENVIRONMENTAL CLEARANCE (ECC)

ReconAFRICA

Application for Environmental Clearance Certificate (ECC) for Drilling of Multiple Exploration and Appraisal Wells with Supporting Infrastructures such as Borrow Pits, Access Roads, and Related Services in Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73, Kavango East and West Regions, Northern Namibia



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Stratigraphic wells currently being drilled are designed to confirm and map the KSB, associated subbasins and petroleum systems with well targets, prospects and leads as part of a de-risking process based on regional data sets including airborne geophysics, initial 2D seismic and regional geological mapping results. As this de-risking progresses, the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 are designed to confirm the existence of economic oil and / or gas resources with the delineated targets / prospects and leads process based on additional 2D seismic survey data acquisition and interpretation, airborne geophysical surveys and the stratigraphic well data sets. The objectives of the proposed exploration and appraisal wells drilling programme is to continue with the search for oil and gas in Kavango Sedimentary Basin and the associated subbasins and to identify potentially commercial petroleum systems. The drilling of the proposed exploration and appraisal wells will be undertaken using the Crown 750 truck mounted drill rig currently being used by REN to drill the stratigraphic wells and will apply the same drilling technology with the addition of well testing in an event of a discovery. REN will continue with the drilling of the stratigraphic wells based on the current granted permits until all the required permits, consents and authorisations to drill the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 have been granted by the Government.

The drilling of the proposed prioritised exploration and appraisal wells, cannot be undertaken without an Environmental Clearance Certificate (ECC) as required by the Environmental Protection Clause 11 of the Petroleum Agreement, Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), Petroleum Laws Amendment Act, 1998, (Act 24 of 1998), Environmental Management Act, 2007, (Act No. 7 of 2007) and the Environmental Impact Assessment (EIA) Regulations 30 of 2012. In fulfilment of the environmental requirements, the Proponent has appointed Risk-Based Solutions (RBS) CC as the environmental / permitting de-risking Consultant, led by Dr Sindila Mwiya and supported by Ms Emerita Ashipala and Mr Samison Mulonga as the Environmental Assessment Practitioners (EAPs) to prepare EIA and Environmental Management Plan (EMP) Reports to support the application for ECC. Interested and Affected Parties (I&APs) are hereby invited to register and submit written inputs / objections with respect to the application for ECC for the proposed drilling of the priority exploration and appraisal wells Nos. D1-D6 and G1-G6 with supporting infrastructures such as borrow pits, access roads, and related services in Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73, Kavango West and East Regions, Northern Namibia.

A Background Information Document (BID), and a Draft Environmental Scoping Report are available for comments and inputs upon registration as a stakeholder / Interested and / Affected Party (I&AP). Note: In terms of the provisions of the EIA Regulation 23 (1), an interested and / or affected party is required to disclose any direct business, financial, personal, or other interest which that party may have in the approval or refusal of the ECC application and such declaration will be required when registering as a stakeholder,

REGISTER BY SENDING AN EMAIL WITH YOUR NAMES, ORGANISATION, CONTACT DETAILS AND DECLARATION / DISCLOSURE OF INTEREST TO:

Ms Emerita Ashipala (EAP/ Risk-Based Solutions Independent Senior Technical Consultant), **Email:** emerita.ashipala@gmail.com
or
Mr Samison Mulonga (EAP/ Risk-Based Solutions Independent Senior Technical Consultant), **Email:** mulongas@gmail.com,

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Dr Sindila Mwiya EAP / Technical Permitting Advisor / International Resources Consultant, **Email:** frontdesk@rbs.com.na

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Figure 5.68: Copy of the 2nd full page Public Notice that was published in the Market Watch Insert in Allgemeine Zeitung (Namibia German) Daily Newspaper dated Wednesday, 30th November 2022.

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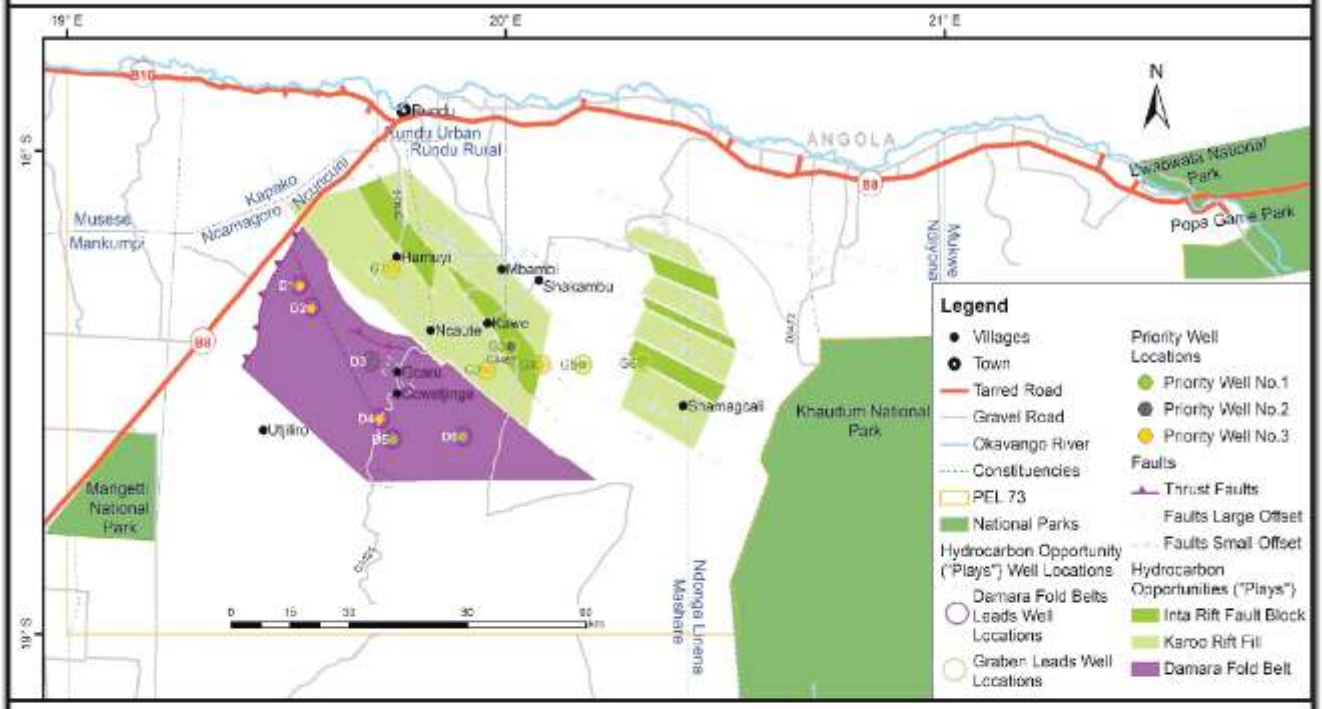

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Stratigraphic wells currently being drilled are designed to confirm and map the KSB, associated subbasins and petroleum systems with well targets, prospects and leads as part of a de-risking process based on regional data sets including airborne geophysics, initial 2D seismic and regional geological mapping results. As this de-risking progresses, the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 are designed to confirm the existence of economic oil and / or gas resources with the delineated targets / prospects and leads process based on additional 2D seismic survey data acquisition and interpretation, airborne geophysical surveys and the stratigraphic well data sets. The objectives of the proposed exploration and appraisal wells drilling programme is to continue with the search for oil and gas in Kavango Sedimentary Basin and the associated subbasins and to identify potentially commercial petroleum systems. The drilling of the proposed exploration and appraisal wells will be undertaken using the Crown 750 truck mounted drill rig currently being used by REN to drill the stratigraphic wells and will apply the same drilling technology with the addition of well testing in an event of a discovery. REN will continue with the drilling of the stratigraphic wells based on the current granted permits until all the required permits, consents and authorisations to drill the proposed prioritised exploration and appraisal wells Nos. D1-D6 and G1-G6 have been granted by the Government.

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REGISTER BY SENDING AN EMAIL WITH YOUR NAMES, ORGANISATION, CONTACT DETAILS AND DECLARATION / DISCLOSURE OF INTEREST TO:

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REGISTRATION & WRITTEN SUBMISSIONS DEADLINE IS: FRIDAY, 16th DECEMBER 2022
In addition to the current ongoing local community and stakeholder consultation meetings, additional meetings will be organised in local communities, Rundu, Kavango East Region and Nkurenkuru, Kavango West Region in January 2023

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Figure 5.69: Copy of the 2nd full page Public Notice that was published in the Market Watch Insert in Namibian Sun (Namibia English) Daily Newspaper dated Wednesday, 30th November 2022.

PUBLIC NOTICE FOR APPLICATION FOR ENVIRONMENTAL CLEARANCE (ECC)

ReconAFRICA

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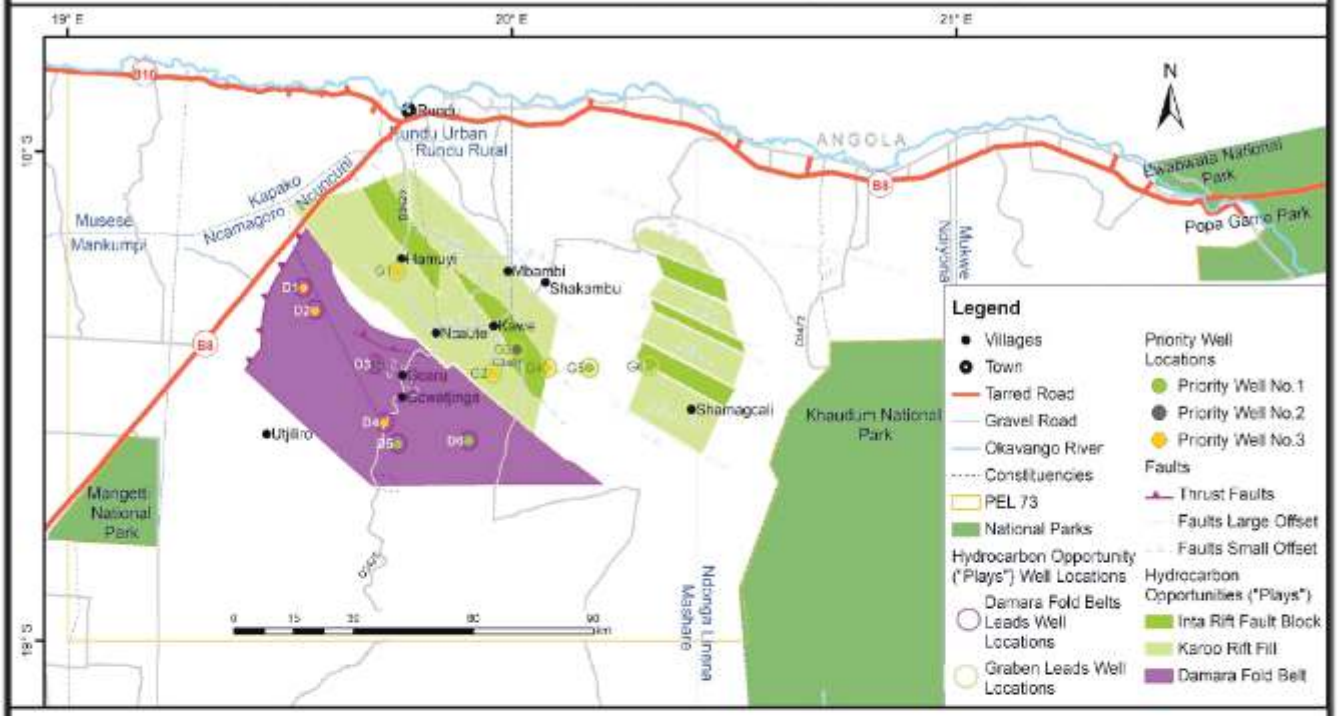

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Figure 5.70: Copy of the 2nd full page Public Notice that was published in the Market Watch Insert in Republikein (Afrikaans Newspaper) Daily Newspaper dated Wednesday, 30th November 2022.

Plate 5.57: Images from the consultation meetings held during the months of November and December 2022 with the local communities in villages, individual owners of the commercial farmland on communal land, farmers associations, traditional authority and councillors in Kavango East and West Regions with respect to the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites (Source: Annex 7).

From presidential palace to KFC: Bolsonaro's peculiar exile in US

DORAL - He used to preside over Latin America's largest country and its 214 million people. Now Brazil's former far-right leader lives in a small Florida town and eats alone in a fast-food restaurant.

Bolsonaro, 67, has found an unusual refuge in the United States, where he arrived in late December, several days before his supporters stormed government buildings in Brasilia in an attempt to overturn the election victory of his rival, leftist Luiz Inacio Lula da Silva.

At home, Bolsonaro is being investigated over his alleged involvement in the unrest, which he denies.

From the lavish presidential palace, Bolsonaro, a political soulmate of former US president Donald Trump, went on to live in a small community of nearly identical houses near the Disney World resort.

In his first six weeks in the United States, Bolsonaro has kept a low profile, staying at the Orlando home of Brazilian former martial arts champion Jose Aldo, making a trip to a local supermarket and being photographed eating fried chicken alone at a KFC fast-food restaurant.

On Friday, the man who until recently commanded huge crowds in his home country, spoke to some 400 supporters during an event organized by the American conservative organization Turning Point USA at the Trump National hotel in the city of Doral, near Miami.

It was unclear if Trump himself played any part in organizing the event.

The meeting had the vibe of an election rally. Bolsonaro spoke passionately about fulfilling his duties to his country -- except that the man dubbed the "Trump of the Tropics" was in Florida, several thousand miles (kilometers) away from his homeland.

"There is no greater satisfaction than that of having fulfilled a duty," Bolsonaro said of his presidency. He spoke before an audience dressed in elegant suits and dresses as well as the yellow-and-green shirts of the Brazilian soccer team.

Three days earlier, Bolsonaro spoke in the ballroom of a shopping mall restaurant in Orlando at an event put together by the Brazilian expatriate community in Florida.

Bolsonaro, who had repeatedly cast doubt on Lula's narrow victory in an October 30 runoff, again questioned his election loss, calling himself "more popular than ever."

"Many people are still shaken by what happened in the elections... But we will face this moment and, God willing, we will win together," he said.

But Bolsonaro added that he regretted "what some inconsistent people did" during the unrest.

The crowd was welcoming at both Florida events, with supporters hugging and taking selfies with him and cheering him on.

Bolsonaro faces an uncertain future.

After publicly declaring his intention to return to Brazil at the end of January, Bolsonaro earlier this week applied for a new visa to be able to stay in the United States for six more months.

And one of his sons, Senator Flavio Bolsonaro, suggested last week that the former president had no return date.

"It may be tomorrow, or six months from now, or he may never come back," he told reporters.

On Tuesday, at the Orlando restaurant, Bolsonaro nevertheless promised to "remain active in Brazilian politics." He didn't elaborate.

Now it remains to be seen whether Bolsonaro maintains a low profile or whether he tries to boost his standing in the United States.

"I've always been a huge admirer of the American people their liberties, their patriotism and their love of the flag," he told the gathering Friday.

- Nampa/AFP

Tragic... In addition to seven deaths, two other Haitians have been hospitalised with pneumonia since Thursday, one of them in critical condition.
Photo: Jamaica Observer

7 Haitians have died this year while waiting to leave Peru

LIMA - Seven Haitian migrants have died this year in the Andean highlands of Peru as their efforts to cross into Bolivia have been stymied by protests against the Lima government, the UN refugee agency said Saturday.

Six of the deaths, including that of a minor, occurred in the small town of Desaguadero, where a bridge over a river of the same name links Peru and Bolivia, Iris Bano Romero, a UN refugee agency spokeswoman in Peru, told AFP.

The other death, she said, occurred in the town of Juli, also near the Bolivian border.

The Haitians fall victim to a combination of factors: difficult access to food, shelter and supplies, and temperatures -- at an altitude of 3 800 meters - sometimes near freezing.

In addition to the deaths, two other people have been hospitalized with pneumonia since Thursday, one of them in critical condition, Bano Romero said.

She said the deaths and illnesses occurred despite the "very generous" efforts of locals to help.

The Haitians, some of whom had passed years in Chile or Brazil, were hoping to eventually reach the United States, Bano Romero said.

Blockades erected amid the political crisis in Peru have made life difficult for both locals and migrants, making it hard to obtain basics like food and fuel, or to pay for rent and other services, the UN official said.

The blockades on Desaguadero's international bridge are among several around the country erected to protest the government of President Dina Boluarte.

She succeeded Pedro Castillo as president after he was ousted from office and arrested on 7 December after attempting to dissolve Congress and govern by decree.

- Nampa/AFP

Attracting foreign doctors key to fixing Australian health system

CANBERRA - Australian Health Minister Mark Butler has identified attracting more foreign doctors as key to fixing the country's health system.

The minister said yesterday that a review into general practice (GP) should investigate ways to attract more foreign health workers to Australia and have their existing qualification recognised.

Federal, state and territory leaders agreed on Friday to the review of GP before they address widespread problems in the health system later this year.

A separate report on Medicare, Australia's universal health care system, made recommendations to improve the accessibility and affordability of health care.

Butler, who has said Medicare is in the worst condition in its 40-year history, believed attracting more GPs would relieve pressure on the whole system.

Welcome... Australian health minister Mark Butler said attracting foreign doctors is the key to fixing the country's health system. Photo: Xinhua

"It's about going overseas and recruiting as an Australian healthcare system doctors and nurses and other healthcare professionals to come to Australia," he told *Sky News Australia*.

"I think the premiers and chief ministers recognised that last week, they're seeing the pressure on their hospital systems because of the problems in general practice. If we don't turn that around, then the whole of our healthcare system is going to be under enormous pressure."

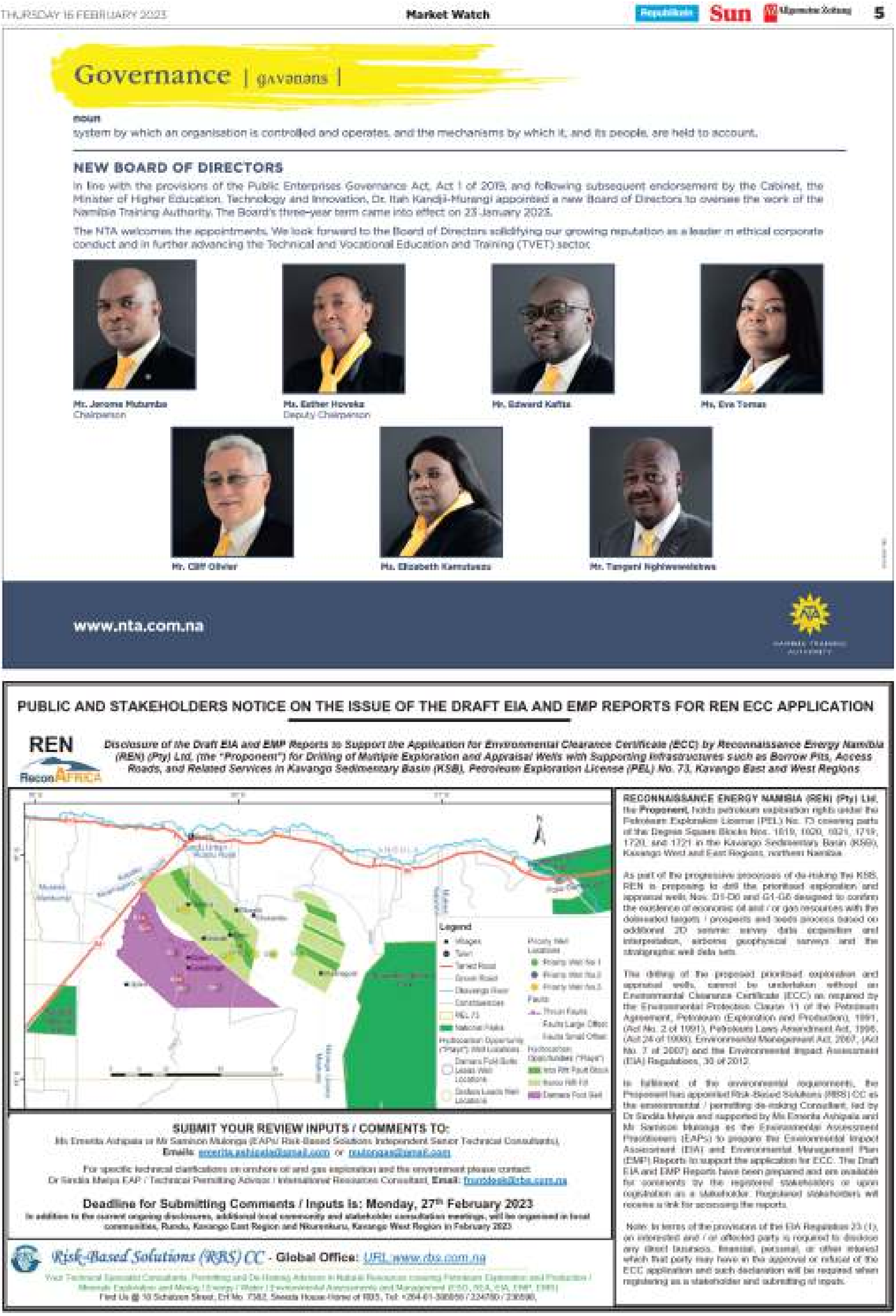
Additionally, the government has flagged giving pharmacists the ability to prescribe medications for common conditions rather than requiring a GP visit.

According to the Pharmacy Guild of Australia (PGA), the measure would circumvent 6.5 million GP visits every year.

Butler said it "doesn't make sense" to have health workers not working to the full extent of their training.

- Nampa/Xinhua

Figure 5.71: Copy of the 1st Draft EIA and EMP Reports Public Notice that was published in the New Era English daily newspaper dated Monday, 6th February, 2023.



THURSDAY 16 FEBRUARY 2023 Market Watch 5

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noun

system by which an organisation is controlled and operates, and the mechanisms by which it, and its people, are held to account.

NEW BOARD OF DIRECTORS

In line with the provisions of the Public Enterprises Governance Act, Act 1 of 2019, and following subsequent endorsement by the Cabinet, the Minister of Higher Education, Technology and Innovation, Dr. Itah Kandjii-Murangi appointed a new Board of Directors to oversee the work of the Namibia Training Authority. The Board's three-year term came into effect on 23 January 2023.

The NTA welcomes the appointments. We look forward to the Board of Directors solidifying our growing reputation as a leader in ethical corporate conduct and in further advancing the Technical and Vocational Education and Training (TVET) sector.

Mr. Jerome Mutumba, Chairperson
Ms. Esther Hoveka, Deputy Chairperson
Mr. Edward Kaffia
Ms. Eva Tomas
Mr. Cliff Olivier
Ms. Elizabeth Kamutuezu
Mr. Tangeni Nghiwewelekwa

www.nta.com.na

PUBLIC AND STAKEHOLDERS NOTICE ON THE ISSUE OF THE DRAFT EIA AND EMP REPORTS FOR REN ECC APPLICATION

REN ReconAFRICA

Disclosure of the Draft EIA and EMP Reports to Support the Application for Environmental Clearance Certificate (ECC) by Reconnaissance Energy Namibia (REN) (Pty) Ltd, (the "Proponent") for Drilling of Multiple Exploration and Appraisal Wells with Supporting Infrastructures such as Borrow Pits, Access Roads, and Related Services in Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73, Kavango East and West Regions

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For specific technical clarifications on onshore oil and gas exploration and the environment please contact:
Dr Sindila Mwiya EAP / Technical Permitting Advisor / International Resources Consultant, **Email**: frontdesk@rbs.com.na

Deadline for Submitting Comments / Inputs is: Monday, 27th February 2023

In addition to the current ongoing disclosures, additional local community and stakeholder consultation meetings, will be organised in local communities, Rundu, Kavango East Region and Nkurenkuru, Kavango West Region in February 2023

Risk-Based Solutions (RBS) CC - Global Office: URL www.rbs.com.na

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Figure 5.72: Copy of the 2nd Draft EIA and EMP Reports Public Notice published in the Market Watch Insert in Allgemeine Zeitung (Namibia German) Daily Newspaper dated Thursday, 16th February 2023.

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NAMIBIA TRAINING AUTHORITY

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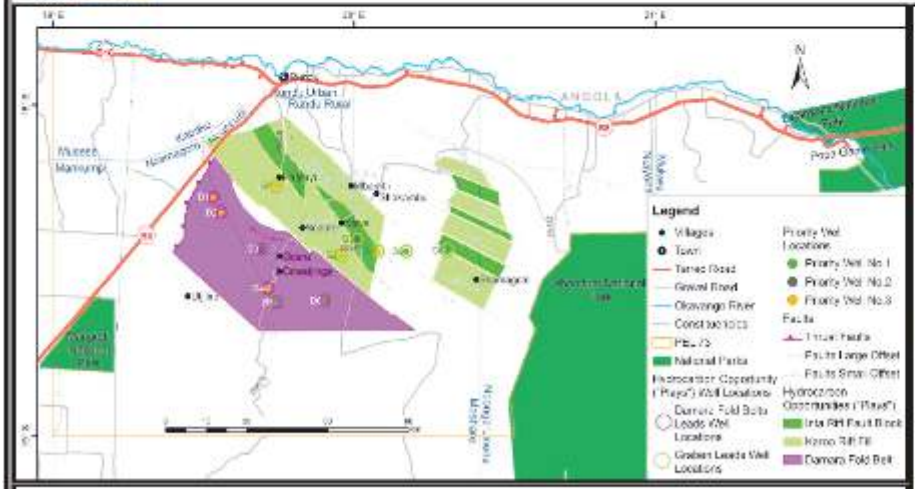

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Note: In terms of the provisions of the EIA Regulation 23 (1), an interested and / or affected party is required to disclose any direct business, financial, personal, or other interest which that party may have in the approval or refusal of the ECC application and such declaration will be required when registering as a stakeholder and submitting of inputs.

Figure 5.73: Copy of the 2nd Draft EIA and EMP Reports Public Notice published in the Market Watch Insert in Namibian Sun (Namibia English) Daily Newspaper dated Thursday, 16th February 2023.

Governance | gʌvənəns |

noun
system by which an organisation is controlled and operates, and the mechanisms by which it, and its people, are held to account.

NEW BOARD OF DIRECTORS

In line with the provisions of the Public Enterprises Governance Act, Act 1 of 2019, and following subsequent endorsement by the Cabinet, the Minister of Higher Education, Technology and Innovation, Dr. Itah Kandjii-Murangi appointed a new Board of Directors to oversee the work of the Namibia Training Authority. The Board's three-year term came into effect on 23 January 2023.

The NTA welcomes the appointments. We look forward to the Board of Directors solidifying our growing reputation as a leader in ethical corporate conduct and in further advancing the Technical and Vocational Education and Training (TVET) sector.


Mr. Jerome Mutumba
Chairperson


Ms. Esther Hoveka
Deputy Chairperson


Mr. Edward Kafita


Ms. Eva Tomas


Mr. Cliff Olivier


Ms. Elizabeth Kamutuezu


Mr. Tangeni Nghiwawelekwa

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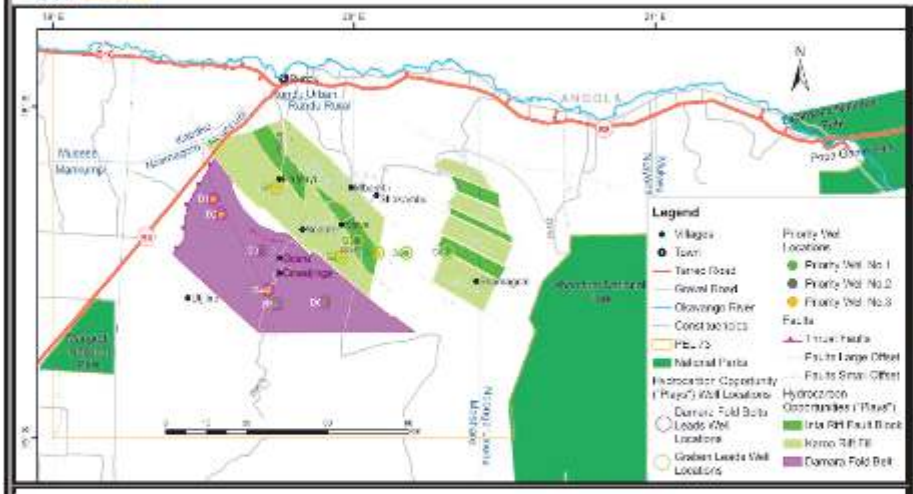
NAMIBIA TRAINING AUTHORITY

PUBLIC AND STAKEHOLDERS NOTICE ON THE ISSUE OF THE DRAFT EIA AND EMP REPORTS FOR REN ECC APPLICATION

REN ReconAFRICA

Disclosure of the Draft EIA and EMP Reports to Support the Application for Environmental Clearance Certificate (ECC) by Reconnaissance Energy Namibia (REN) (Pty) Ltd, (the "Proponent") for Drilling of Multiple Exploration and Appraisal Wells with Supporting Infrastructures such as Borrow Pits, Access Roads, and Related Services in Kavango Sedimentary Basin (KSB), Petroleum Exploration License (PEL) No. 73, Kavango East and West Regions



RECONNAISSANCE ENERGY NAMIBIA (REN) (Pty) Ltd, the Proponent, holds petroleum exploration rights under the Petroleum Exploration License (PEL) No. 73 covering parts of the Degree Square Blocks Nos. 1819, 1820, 1821, 1719, 1720, and 1721 in the Kavango Sedimentary Basin (KSB), Kavango West and East Regions, northern Namibia.

As part of the progressive processes of de-risking the KSB, REN is proposing to drill the prioritised exploration and appraisal wells Nos. D1-D6 and G1-G8 designed to confirm the existence of economic oil and / or gas resources with the delineated targets / prospects and leads process based on additional 2D seismic survey data acquisition and interpretation, airborne geophysical surveys and the stratigraphic well data sets.

The drilling of the proposed prioritised exploration and appraisal wells, cannot be undertaken without an Environmental Clearance Certificate (ECC) as required by the Environmental Protection Clause 11 of the Petroleum Agreement, Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), Petroleum Laws Amendment Act, 1998, (Act 24 of 1998), Environmental Management Act, 2007, (Act No. 7 of 2007) and the Environmental Impact Assessment (EIA) Regulations, 30 of 2012.

In fulfilment of the environmental requirements, the Proponent has appointed Risk-Based Solutions (RBS) CC as the environmental / permitting de-risking Consultant, led by Dr Sindila Mwiya and supported by Ms Limenia Ashipala and Mr Samson Mulonga as the Environmental Assessment Practitioners (EAPs) to prepare the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) Reports to support the application for ECC. The Draft EIA and EMP Reports have been prepared and are available for comments by the registered stakeholders or upon registration as a stakeholder. Registered stakeholders will receive a link for accessing the reports.

Note: In terms of the provisions of the EIA Regulation 23 (1), an interested and / or affected party is required to disclose any direct business, financial, personal, or other interest which that party may have in the approval or refusal of the ECC application and such declaration will be required when registering as a stakeholder and submitting of inputs.

SUBMIT YOUR REVIEW INPUTS / COMMENTS TO:

Ms Emerita Ashipala or Mr Samson Mulonga (EAPs/ Risk Based Solutions Independent Senior Technical Consultants).
Emails: emerita.ashipala@gmail.com or mulongasac@gmail.com

For specific technical clarifications on onshore oil and gas exploration and the environment please contact:
Dr Sindila Mwiya EAP / Technical Permitting Advisor / International Resources Consultant, **Email:** frontdesk@rbs.com.na

Deadline for Submitting Comments / Inputs Is: Monday, 27th February 2023

In addition to the current ongoing disclosures, additional local community and stakeholder consultation meetings, will be organized in local communities, Rundu, Kavango East Region and Nkurenkuru, Kavango West Region in February 2023.

Risk-Based Solutions (RBS) CC - **Global Office:** *URL:www.rbs.com.na*

Your Technical Specialist Consultants, Permitting and De-Risking Advisors in Natural Resources covering Petroleum Exploration and Production / Minerals Exploration and Mining / Energy / Water / Environmental Assessments and Management (ESIA, SEA, EIA, EMP, EMS)
Find Us @ 10 Schutzen Street, Erf No. 7382, Sikeda House, Home of RBS, Tel: +264-61 306058 / 224780 / 236088,

Figure 5.74: Copy of the 2nd Draft EIA and EMP Reports Public Notice published in the Market Watch Insert in Republikein (Afrikaans Newspaper) Daily Newspaper dated Thursday, 16th February 2023.

Plate 5.58: Images from the additional consultation meetings held during the month of February 2023 with the local communities in village of Hamweyi, Ncamagoro and Mbeyo Community Forests, and Kavango East Regional Council and key stakeholder representatives from the Kavango East and West Farmers Union, MEFT and traditional authorities with respect to the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites (Source: Annex 7).

5.7.6 Selection of the Appropriate Consultation Method

A variety of consultation and engagement techniques have been used to share information, gather information, consult, and disseminate project information to the public and stakeholders such as key lines ministries, regional councils, traditional authorities, and local communities with respect to the proposed exploration and appraisal wells No. D1-D6 and G1-G6. Culturally and language appropriate consultation methods and were provided throughout the consultation and engagement processes especially with the local communities. The local RBS consultants from the Kavango East and West Regions employed from the various local communities supported all the local community consultation activities. The following is the summary of the general community and stakeholder consultation and engagement approaches that have been used for this project:

- Prepared formal project specific information in forms of presentations or project briefs / leaflets and posters, when consulting government (Central, Regional or Local Authority) officials.

- When dealing with communities, targeted meetings with a mixture of the use of posters, handout leaflets, and formal interactive simple physical visual examples, presented local languages or / and translations into local languages.

- Public notices in the local newspapers, use of local radio programmes, advertisements and announcements, and.

- By overlapping the actual drilling activities with the local community consultations and engagements process for the drilling of additional wells, local communities and stakeholders will have the opportunity to see the drilling rig and some local community members will have the chance to visit the drilling locations during the operations to have the first-hand experience on oil and gas exploration process.

The following is the summary examples of the specific delivery methods used at the various consultation meetings / events undertaken for this project:

1. Regulatory stakeholder consultation process combined formal meeting with PowerPoint presentation and posters with field-based visits and verifications of the actual site conditions. Field-based presentation and discussions were held in the field.

2. Community meetings in Kavango West and East Regions delivered using posters, printed handouts and simplified physical illustrations and local landscape examples to explain key aspects of the proposed project activities. For instance, a camping mattress was used to create folding and illustrate the formation of a Sedimentary Basin. The sediment infilling in the Omatako Fossilised Ephemeral River or local ephemeral river will also be used to explain how sedimentary basins are formed over millions of years. The local elders who attended the meetings were invited to attest to the fact that the current fossilised Omatako Ephemeral River and the local tributaries used to flow many years ago but now the channels have been filled-up by sediments, and today, the channels are being used for cultivation of crops and no longer flows into the Okavango River during the rainy season. In demonstrating the formation of a sedimentary basin, the folds on the mattress were filled up with sand and compacted to illustrate the formation of a sedimentary basin and associated petroleum system. Various plumbing pipes were used to demonstrate the casing and cementing process highly central to the engineering requirements of an oil and gas basis for well design and drilling operational standards.

3. Translations from English to local languages where required were provided by the local RBS team based in Rundu and employed from the local community.

4. All the community meetings were delivered in the local languages by the local RBS and REN teams based in Rundu and employed from the local community, and.

5. As part of the consultation activities, regulators, traditional authorities, local communities and interested key stakeholders may be given opportunities to see the drilling operations subject to the various site constraints and HSE requirements.

5.7.7 Discussion of Issues Raised and Meetings and Stakeholder Submissions

Minutes of the key stakeholders, public and community consultation and engagement activities conducted between November and December 2022 are attached in Annex 7. Written submissions made by various Interested and Affected Parties (I&APs) are provided in the Annex 7 with responses provided where applicable.

All the inputs, comments and submissions to the proposed drilling operations have all been reviewed, evaluated and have been incorporated in the environmental assessment process where relevant and applicable to the proposed scope of work (Proposed drilling of the prioritised D1-D6 and G1-G6 exploration and appraisal wells sites).

The following is the summary of the grouped key and relevant issues (excluding irrelevant personal vendettas) that have been raised by registered stakeholders with detailed explanations provided in various Chapters of the EIA and EMP Reports as well as in the Annex 7 attached to this EIA Report as may be applicable to the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in PEL No. 73:

1. Exploration and appraisal wells and the relevance to different types of oil and gas wells.

2. Environmental assessment (Scoping, EIA and EMP) methodology and impact assessment process and proposals for a Strategic Environmental Assessment (SEA) instead of an EIA.

3. Deliberate assertions of the Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA) political vision as a formal international or regional (SADC) or national (Namibian) formally proclaimed no-go park area. The assumptions / assertions are all centred on exclusive economic self-interests without considerations of the wider inherited generational poverty that exists within the KAZA TFCA area that will never be solved by a single sector such as tourism which is being pushed as the only key solution.

4. Petroleum exploration and the associated environmental, social impacts and permitting standings linked to the various stages of exploration.

5. Need for continuous consultation and engagements of the regional councils, traditional authorities, and local community.

6. Continuous updates to the regional and traditional authorities' leadership on project progress and outcomes.

7. Social aspects (socioeconomic benefits from the ongoing oil and gas exploration in Kavango East and West Regions).

8. Social aspects (employment and recruitment process).

9. Local community investments in schools, healthcare, and rural water supply in line with ongoing Government Programmes.

10. Environmental, Social and Governance (ESG) and Corporate Social Responsibility (CSR) programmes.

11. Potential negative impacts associated with the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites on the community forestry and conservancies.

12. Drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites potential impacts to land owners, local land uses and local infrastructure such as houses and water wells / boreholes.

13. General social media trends and activism on global, regional and local Climate Change movements, moving away from fossils fuels, environmental activism and extremism, radical

environmentalism, global, regional (SADC), and national security, and some media houses, civil societies and individuals backflashes and deliberate Social Media misinformation campaigns and fearmongering centred on the globally well-known formal proclaimed protected areas excluded from exploration, and names dropping of the Okavango Delta, the Okavango River, and the San Community as instruments for financial gains and attraction of international donations at the expense of the poor rural communities from Kavango West and East Regions overwhelmed by inherited generational poverty.

14. The process of oil and gas exploration, de-risking, consultations, discovery, production and associated negative environmental impacts.

15. Status and outcomes of the drilled stratigraphic wells, and.

16. Petroleum agreement and the small 10% local participation interests of Namibia through Namcor.

Overall, key concerns from the Kavango East and West Regions stakeholders and community consultations and engagement meetings were centred on local socioeconomic issues and any likely local benefits to be derived from the proposed project activities. Despite the current activities being short-term exploration operations, REN has committed to employing local people, work with local communities and uplift the lives of the local community through ESG and CSR projects with special focus on rural water quality and supply, health, reforestation, soil fertility improvement initiative, and food security through community gardens initiatives.

The company has committed to implementing a community water wells programme by drilling community water wells in both the Kavango West and East Regions. The fully equipped solar powered water boreholes continue to be drilled in line with the requirements and specifications of the MAWLR. To date, a total of twenty-six (26) water boreholes programme have been drilled for various rural communities in Kavango East and West Regions and an additional ten boreholes will be supported in 2023-2024.

Most of the questions and comments raised had been focused on local community benefits within the framework of the proposed exploration and appraisal wells drilling operations and future possible discovery and development of economic oil and/ or gas resources. However, it is important to know that if economic oil and/or gas are discovered, a new EIA and EMP studies as well as ESG and CSR framework will be undertaken with respect to a new Production License that the Government may grant to the Proponent. The Production License may make additional provisions for targeted local community benefits, participation and local investments.

REN holds a Petroleum Exploration License (PEL) No. 73 and this license is for exploration and appraisal activities and not for producing oil or gas through fracking. Furthermore, REN's Crown 750 drilling rig is a relatively small rig designed for mobility and drilling conventional wells only. The rig is truck mounted and designed for light impact and mobility across desert conditions. With 1000 HP the Crown 750 can drill to about 4000m depth which restricts operations to vertically drilled conventional formations only.

If economic oil or gas resources are discovered following the appraisal drilling operations, then a final ECC for production process inclusive of the supporting infrastructures that could be a pipeline, refinery, or Power Station (if it is gas that is found) will be required.

The environmental assessment process described in this report has been conducted by a team of independent, appropriately qualified, and highly experienced consultants and advisors. The team has been led by Dr Sindila Mwiya who is an independent consultant, highly qualified and experienced Engineering and Environmental Geologist. He has more than twenty (20) years of experiences, has conducted more 200 EIAs since 2004 and hold a PhD with research interests, academic training and knowledge in Engineering Geology / Geotechnical / Geoenvironmental / Environmental Engineering, Artificial Intelligence and Knowledge-Based Systems with special focus on EIAs, EMPs, EMSs, SEAs and SEMPs for subsurface resources (minerals, petroleum, water) and energy in Arid and Semiarid Environments.

6. IMPACT ASSESSMENT

6.1 Assessment Procedure

The environmental assessment process adopted for this project took into considerations the provisions of the Environmental Protection Clause 11 of the Petroleum Agreement signed between Reconnaissance Energy Namibia and the Government of the Republic of Namibia, 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) and all other applicable national laws and Regulations. The impact assessment process took into considerations the proposed activities, trade-offs, alternatives, and key issues all centred on knowledge-based system matrix risk assessment approach. Specialist consultants provided key specialist inputs and recommendations on the impact assessment outcomes and mitigation measures.

6.2 KBSMM Impact and Risk Assessment System Methodology

Knowledge-Based System Model Methodology (KBSMM) is an expert system rule-based artificial intelligence (AI) that captures the knowledge of human experts to support decision-making centred on the source-pathway-target /receptor risk assessment regulatory, standards, and engineering boundary conditions. The knowledge-based risk assessment methodology adopted for the impact assessment process has been based on the rule-based matrix interaction of characterised climatic, environmental, and ground model datasets as inputs data components (Knowledge-Base) in the evaluation of the significant positive and negative impacts or influences on the receiving environment as results of the proposed activities (Drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells in the AOI in PEL No. 73) (Fig. 6.1).

The KBSMM system methodology took into consideration the interactions of the proposed activities with respect to the source-pathway-receptor / target of the characterised climatic, environmental, and ground model datasets of the receiving environment (physical, biological, socioeconomic and ecosystem services and functions) (Figs. 6.1-6.3). The Knowledge-Base (KB) created during the Scoping, EIA and EMP phases has been based on the influence assessments of the characterised components of the environment built during the desktop and field-based general and specialist studies inputs to the overall impact assessment process (Figs. 6.2 and 6.3).

The impact / influence and risk assessment boundary conditions were provided by the national regulatory, standards, limits, engineering, environmental and sector-specific protocols for drilling of the exploration and appraisal wells and the applicable international best industry practices which are based on the Best Practicable Environmental Option (BPEO) (Figs. 6.1-6.3). The KBSMM model inputs variables for the EIA and EMP process will cover the source-pathway-receptor / target characterised climatic, environmental, and ground model datasets. Source-pathway-receptor / target risk assessment looping approach has been used to determine or validate the influence (impact assessment), and ultimate likely harm that may be linked to the various phased activities of each of the various stages of the proposed drilling of the exploration and appraisal wells Nos. D1-D6 and G1-G6 inclusive of the supporting infrastructures such as the new access roads to each of the proposed new well sites within the AOI in PEL No. 73 (Figs. 6.3 and 6.4).

6.3 KBSMM Knowledge Base

6.3.1 Climatic Model Data Sets

The climatic data sets used in the regional and local site-specific desktop and field-based assessment process comprised precipitation, temperature, evapotranspiration, and wind data sets. The following is the summary explanation of the roles that climatic data sets may have with the activities of the proposed D1-D6 and G1-G6 exploration and appraisal wells (Figs. 6.1 and 6.2):

(i) Temperature: Temperature has a direct influence on the fluids that may influence the operation of each site by supporting evapotranspiration. It also has an influence on the operation and design of the site.

(ii) Rainfall: Rainfall is one of the data sets used in water balance assessments with respect to potential fluids, leachate or contaminant mobilisation and flash flood occurrences. The data sets had some influence on site design and type of lining used and overall site operations.

(iii) Evapotranspiration: This combined effect of evaporation and transpiration is important in water balance assessments with direct influences on site operations, and aftercare stages, and.

(iv) Wind Direction and Speed: The direction and speed of the prevailing winds was critical to the site operations and determination of the optimum location. The data had a direct influence on the site operations including dust and noise management.

6.3.2 Environmental Model Data Sets

The regional or local environmental data sets comprised the economic activities (drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells including all the supporting infrastructure) and coordination support available in the region or area, types and amounts of waste generated, likely contaminants from waste generated / activities undertaken, ecological, habitats and ecosystems including fauna and flora as well as community considerations such, land ownership, social, health and safety, archaeological, cultural, and political issues. The following is the summary explanation of the roles of the environmental data sets may have on the drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells including all the supporting infrastructure (Fig. 6.2):

(i) Economic activities and logistic support (Drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6): The types of economic activities and logistical support services and infrastructure for drilling the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 forms a key component of the environmental data sets and the determination of the likely positive or negative impacts.

(ii) Types and amount of waste: Understanding the characteristics of the liquid and solid waste streams to be handled is vital in the evaluation of the hazard exposure in terms of the overall risk assessment and design engineered barriers and determination of the monitoring strategy. The footprint and volume size of the proposed well sites may have an influence on the selection and operation of each site with respect to the land availability in the local areas.

(iii) Likely contaminants: The state (solid, gas, liquid, or vapour) of any likely contaminants that may be associated with the drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells including all the supporting infrastructure.

(iv) Ecological, habitats, ecosystems, fauna, flora, and local, regional, or global Climate Change influences: Namibia is home to several unique and protected habitats, ecosystems, fauna, and flora that are highly vital as they support other sectors of the national economy such as tourism, agriculture, conservation, food security and services. Understanding the likely level of sensitivity of the regional or local drilled sites was important to the successful development and determination of the monitoring and reporting strategy, and.

(v) Community considerations: Proposed drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells including all the supporting infrastructure may influence or be influenced by local community issues and acceptability of oil and gas exploration. Other key components of the community considerations included: Land ownership (state or private land), local social settings, labour, natural capital, human rights, public and workers health and safety, archaeological, cultural, political, and civil society influences.

As part of the data desktop and field-based collection, evaluation, influence / impact and risk assessments processes for the final sites-specific ranking and determination of the mitigation measures and monitoring and reporting strategies, conducted specialist studies provided additional specific subject matter such as flora, fauna, water, and archaeology assessment results, recommendations and mitigations measures.

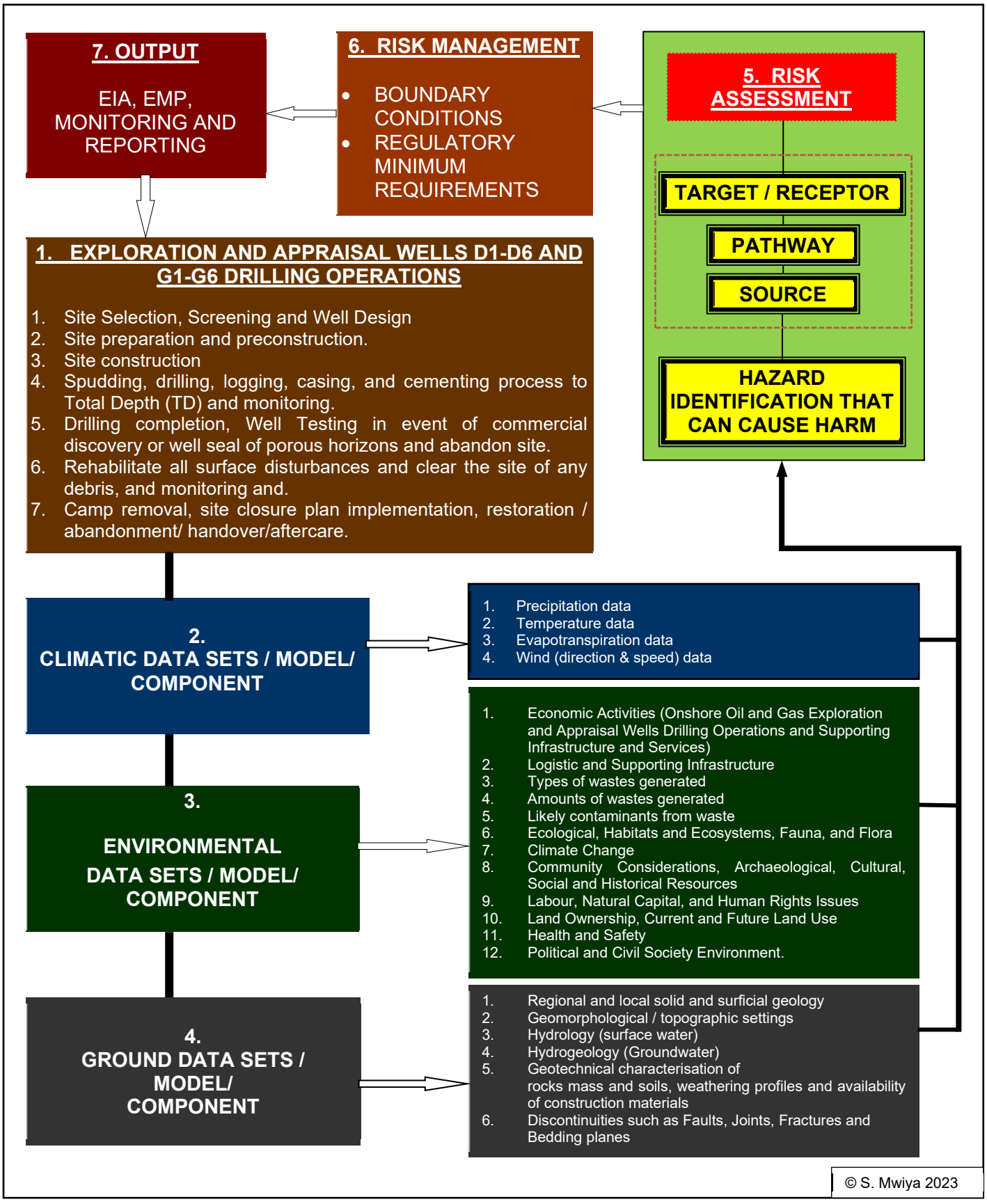


Figure 6.1: Detailed outline of the technical methodology based on a complete looped Knowledge-Based System Model Methodology (KBSMM) used during the EIA and EMP process desktop and field-based knowledge-based impact assessment, risk assessment and determination of the monitoring and reporting strategy. The system model methodology has a built-in looping that allows for the evaluation of a full exploration and appraisal well drilling project lifecycle.

6.3.3 Ground Model Data Sets

The ground data sets covered regional/local solid and surficial geology, geomorphological / topographic settings, hydrology (surface water), hydrogeology groundwater), geotechnical characterisation of rocks and soils, weathering profiles and availability of construction materials, and discontinuities such as faults, joints, fractures, and bedding planes of the drilled sites (Fig. 6.2). The geology (solid and superficial) and water (surface and groundwater) resources are all potential targets and pathways that are linked to the drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells including all the supporting infrastructure. Other ground components which include the local terrain (geomorphology and topographic features), discontinuities, geotechnical as well as the mineralogy will aid the influence of sources in causing or minimising the impacts to be controlled through favourable engineering designs fully supported by the ground components (Fig. 6.2). Regional/local solid and surficial geology, geomorphological and topographic settings also linked directly to the availability of local construction and operational materials in support of the drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells including all the supporting infrastructure project lifecycle (Fig. 6.2).

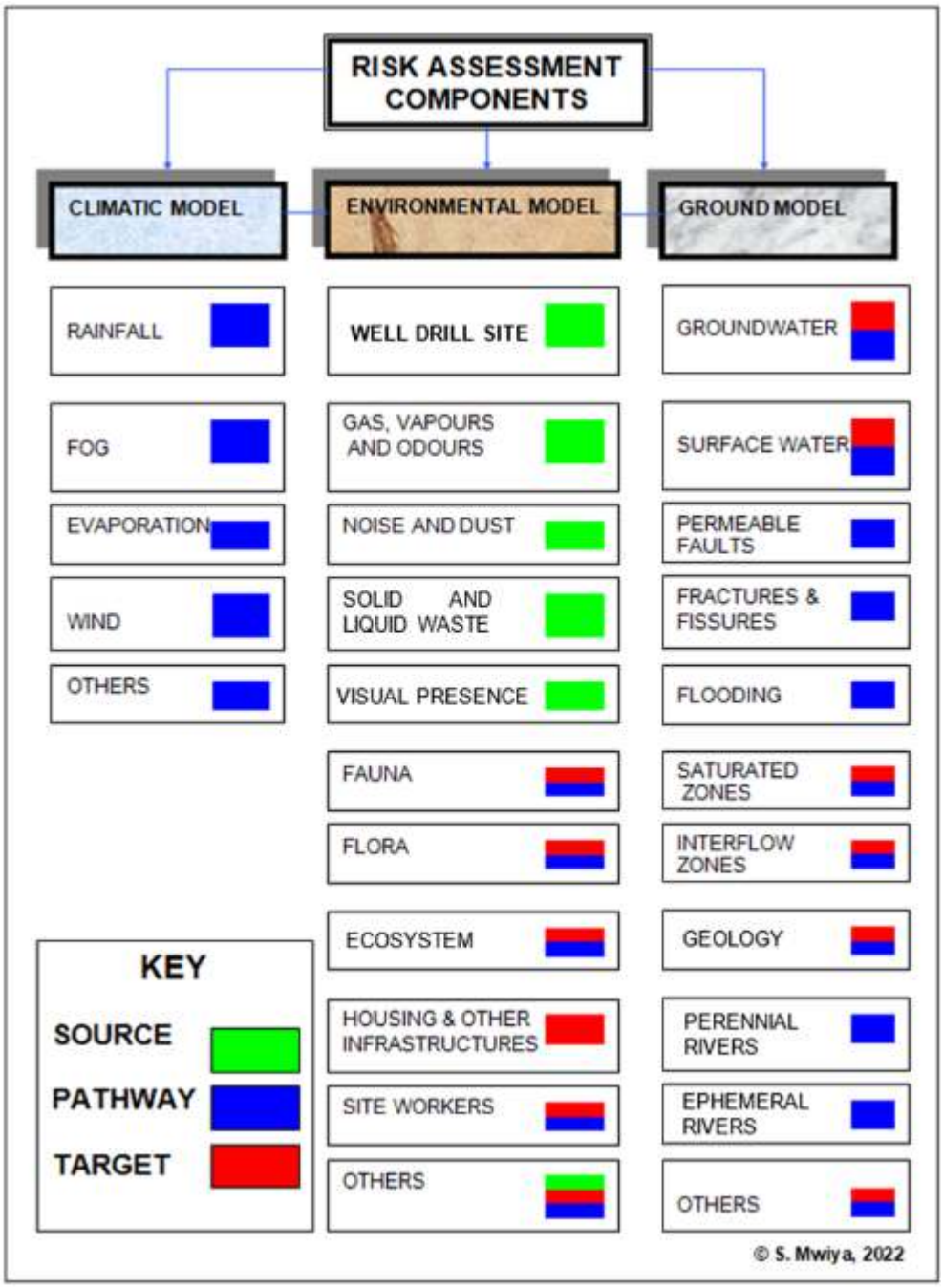


Figure 6.2: A Knowledge-Based System Model Methodology (KBSMM) interactive characterised inputs risk assessment factors for onshore oil and gas exploration and appraisal wells drilling operations.

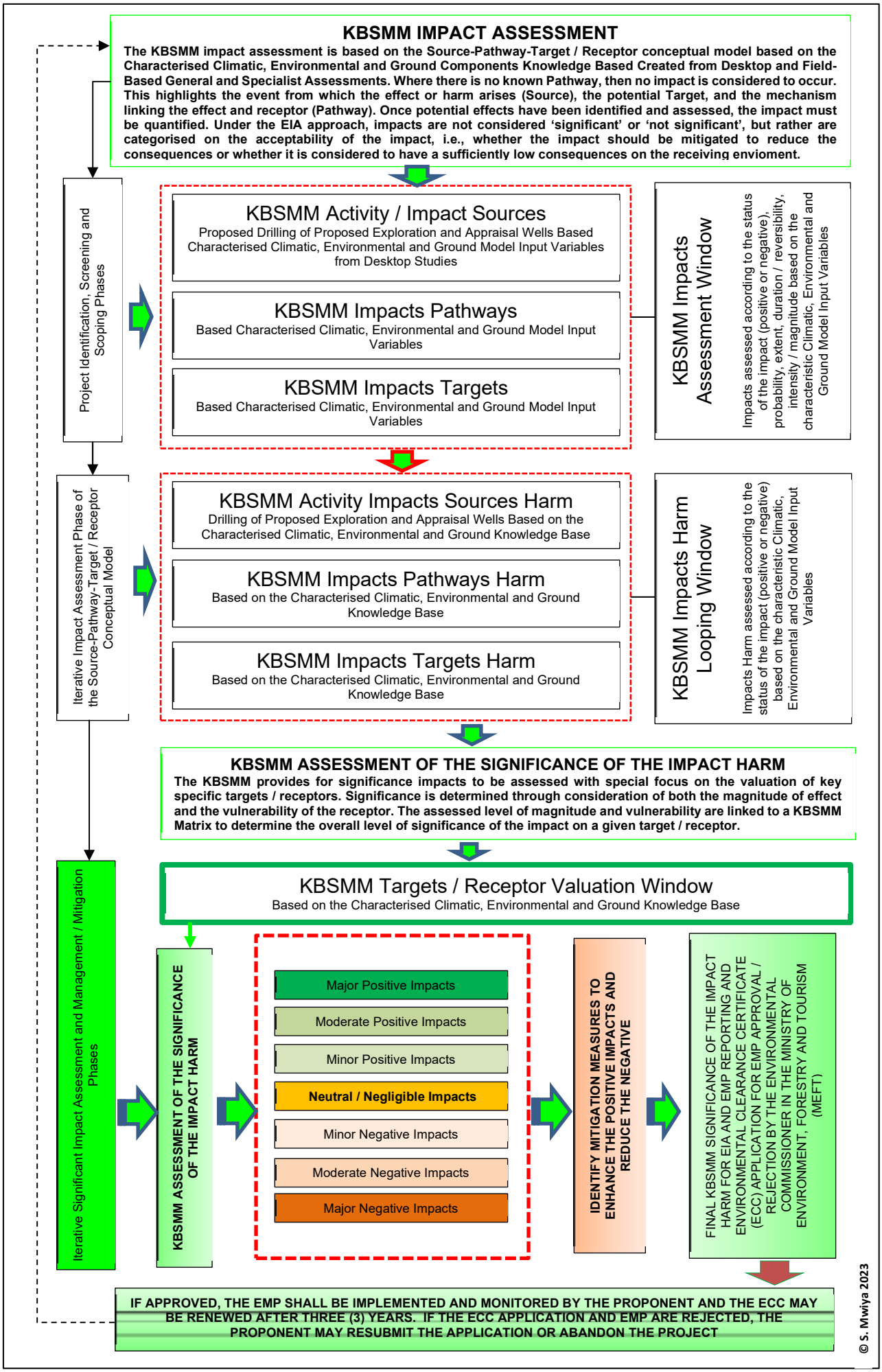


Figure 6.3: KBSMM logic interactive system methodology used in the impact assessment and assessment of significance of the impact harm linked to the EMP.

6.3.4 Source-Pathway-Receptor Risk Assessment Chain, Harm and Mitigation

To evaluate the level of influence, risk, and harm that the drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells including all the supporting infrastructure may have on the receiving environment, the EIA assessment process has focused on the climatic, environmental, and ground model data set characterised into sources, pathways, and targets / receptors chains (Figs. 6.1 and 6.2). It is important to note that in the absence of any of the sources, pathways, or targets/ receptors there is no impact, harm, or risk to mitigate or monitor or manage (Figs. 6.1-6.4). The following is the summary of the key definitions of the KBSMM Source-Pathway-Receptor risk assessment chain, and resultant harm requiring mitigation:

(i) The risk source/s refers to knowledge-based identified potential impact hazards that may be present and can cause harm to the exposed target/s / receptors (Figs. 6.1-6.4).

(ii) The risk pathway refers to the route direct or indirect through which the risk source/s may be transferred and exposed to a target/s of concern, and.

(iii) The risk target/s or receptor/s refers to the destination (area point of exposure) at which the source/s may cause harm to the various components of the receiving environment.

The characterisation of source/s, pathway/s and target/s chain has been undertaken for climatic, environmental and ground model data components with respect to the drilling of the proposed D1-D6 and G1-G6 exploration and appraisal wells including all the supporting infrastructure.

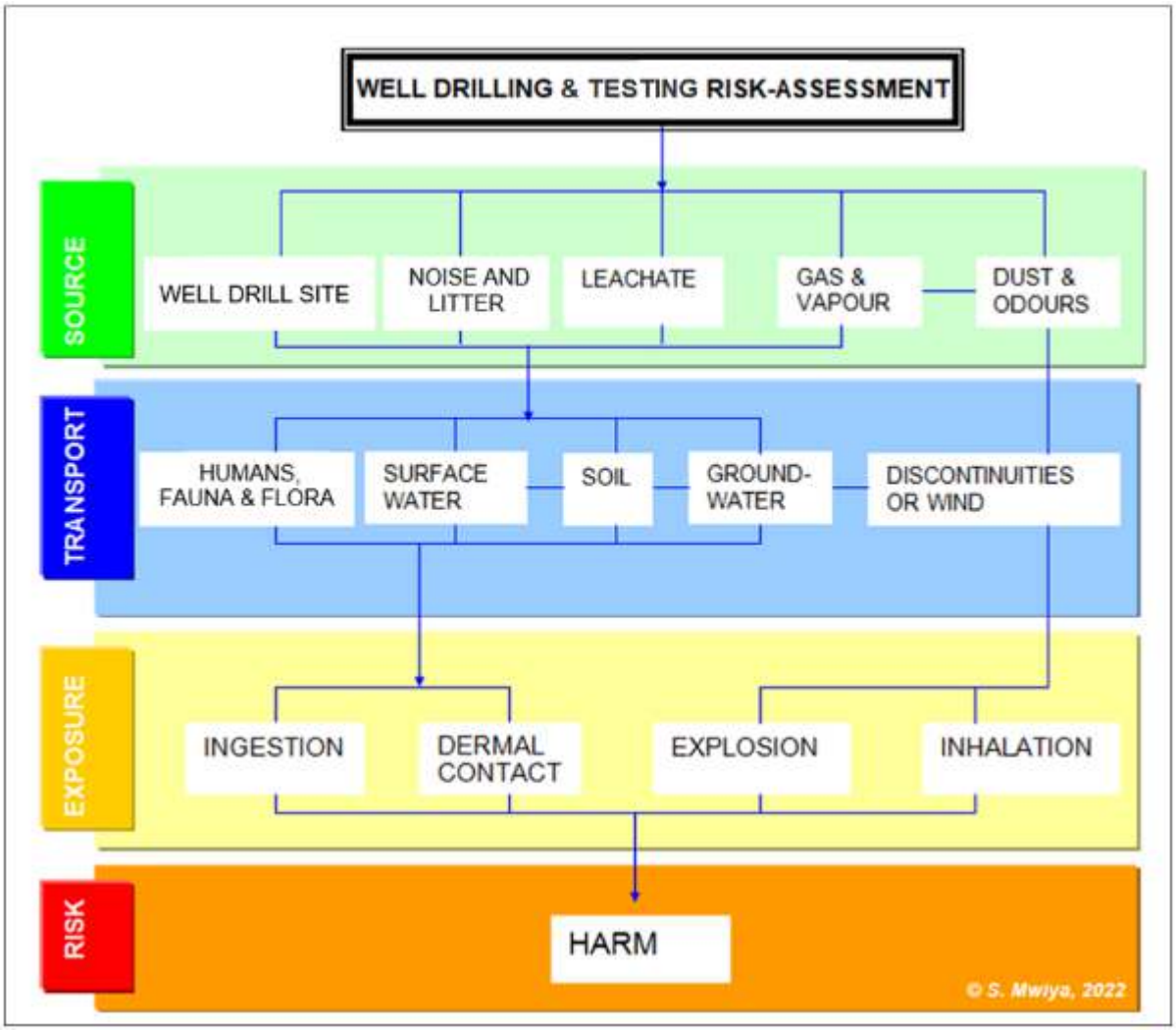


Figure 6.4: A Knowledge-Based System Model Methodology (KBSMM) risk consequences (harm) pathways to the receiving target/receptors windows for onshore oil and gas exploration and appraisal wells drilling operations.

6.4 Identification and Characterisation of Likely Impacts

6.4.1 Characterisation of Likely Sources Impacts

Based on the KBSMM framework, the likely key sources of negative impacts on to the receiving environment (physical, biological, and socioeconomic/cultural/ archaeological) are divided into the following two (2) main categories:

(1) Routine and physical presence operational activities:

(i) Pre-construction and onsite assessment of the drilling requirements.

(ii) Site construction and preparation including clearing, ground levelling and compactions.

(iii) Mobilisation, equipment installation and testing.

(iv) Spudding and conductor casing.

(v) Drilling surface / intermediate and setting casing and cementing process through up 900 m or top section of the well as per the well design.

(vi) Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234') or as per the specific well design.

(vii) Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202') or as per the specific well design.

(viii) Well testing / appraisal and equip the well for possible production support if a commercial discovery.

(ix) Plug and abandon hole if dry.

(x) Rehabilitate all surface disturbances and clear the site of any debris, and.

(xi) Camp removal, site closure / abandonment, and.

(xii) Site restoration into a local community site equipped with water supply and associated supporting infrastructure as may be applicable.

(2) Unplanned accidental events:

(1) Major land accidental incidence such as diesel / oil spill / fire / explosion.

6.4.2 Characterisation of Likely Positive Impacts

Based on the results of this EIA Report, the following is the summary of the key characterised positive impacts that the proposed drilling of multiple exploration and appraisal wells in the AOI within PEL No. 73 will have on the local (AOI), regional (Kavango East and West Regions) and national (Namibia) receiving environment:

1. Payment of the annual license rental fees to the Central Government averaging N$ 1.5 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. Minimum of USD 70, 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 deep subsurface wells 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. Contribution to the development of local infrastructures such as rural water supply through current ongoing initiatives under the Corporate Social Responsibility (CSR) and ESG Projects such as the rural water supply, reforestation, nursery, wildlife monitoring, game counting and assessment of wildlife migratory corridors between Mangetti and Khaudum National Parks chocked by the current fenced commercial farmlands on communal land.

5. The need for site clearing, pruning and opening-up of some of the inaccessible sections of the tracks and roads to be used for the proposed drilling operations will provide temporary employment opportunities for the local people.

6. The pruning and opening-up of some of the inaccessible sections of the tracks and roads to be used for the proposed drilling operations will improve access and connect local communities, and.

7. The pruning and levelling of the tracks and roads running along the boundaries of the large-scale agricultural commercial farming units on communal land 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 increase their productivity.

6.5 Knowledge-Based Impact Assessment Criteria

6.5.1 Knowledge-Based Evaluation of Impacts

KBSMM characterised sources of potential positive or negative impacts and the sensitivity of the receiving environment have been evaluated as part of the EIA and EMP process for the proposed drilling of the priority multiple exploration and appraisal wells D1-D6 and G1-G6, inclusive of the supporting infrastructures such as borrow pits and access roads within the AOI in PEL No. 73.

For each negative impact of high or medium significance, mitigation objectives are set (i.e., ways of reducing negative impacts), and attainable management actions have been provided in the EMP Report. Without mitigation, monitoring and impact management, these impacts would either breach statutory limits or be unacceptable to statutory authorities or to the local communities / stakeholders, as they would result in a significant deterioration of one or more environmental resources or component of the receiving regional or local receiving environment.

6.5.2 Knowledge-Based Environmental Impact Assessment Rankings

To ensure consistency in the evaluation of environmental impacts associated with the proposed drilling of the priority multiple exploration and appraisal wells D1-D6 and G1-G6, inclusive of the supporting infrastructures such as borrow pits and access roads within the AOI in PEL No. 73, the rating criteria for the impact assessment were standardised to include a set of definition applied in the qualitative and semi-quantitative risk assessment loop (Table 6.1).

To the extent possible, allocation to rank categories has been based on quantifiable criteria which can be measured as detailed in Table 6.1.

Furthermore, when evaluating impacts, the allocated ranks refer to the resultant *impact* (e.g., habitat area affected, or time that the result of the impact will last), and not of the *cause* thereof (e.g., time of active impact). Each activity has been assessed with respect to the type of effect that the aspect will have on the relevant component of the receiving environment and included “what will be affected and how?”

The criteria used in the determination of the significance rating of the impact(s) is detailed in Table 6.2.

Table 6.1: Definition of impact categories and the KBSMM boundary conditions.

Rating	Definition of Rating
Status of the Impact – in terms of meeting the objective of maintaining a healthy environment.	
Positive	The impact benefits the environment
Negative	The impact results in a cost to the environment
Neutral	The impact has no effect
Probability – the likelihood of the impact occurring	
Negligible	Possibility negligible
Improbable	Possibility very low
Probable	Distinct possibility
Highly Probable	Most likely
Definite	Impact will occur regardless of preventive measures
Degree of confidence in predictions – in terms of basing the assessment on available information	
Low	Assessment based on extrapolated data
Medium	Information base available but lacking
High	Information base comparatively reliable
Extent – the area over which the impact will be experienced	
Site specific	Confined to within < 1 km of the project
Local	Confined to the study area or within 5 km of the project
Regional	Confined to the region, i.e. > 5 km but < National
National	Nationally
International	Beyond the borders of Namibia
Duration – the time frame for which the impact will be experienced	
Very short	Less than 2 years
Short-term	2 to 5 years
Medium-term	6 to 15 years
Long-term	More than 15 years
Permanent	Generations
Intensity – the magnitude of the impact in relation to the sensitivity of the receiving environment	
Negligible	Natural functions and processes are negligibly altered due to adaptation by the receptor(s) to high natural environmental variability
Mild	Natural functions and processes continue albeit in a modified way that **does not** appear to have a significant disruptive effect (i.e. changes are temporary)
Moderate	Natural functions and processes continue albeit in a modified way that **does** appear to have a noticeable disruptive effect (i.e. changes are permanent)
Severe	Natural functions or processes are altered to the extent that they temporarily cease resulting in severe deterioration of the impacted environment
Very Severe	Natural functions or processes permanently cease or are completely disrupted

Table 6.2: The criteria used to determine the significance rating of the impact(s) and the KBSMM boundary conditions.

Low	Where the impact will have a negligible influence on the environment and no modifications or mitigations are necessary for the given project description. This would be allocated to impacts of any severity/ magnitude, if at a local scale/ extent and of temporary duration/time.
Medium	Where the impact could have an influence on the environment, which will require modification of the project design and/or alternative mitigation. This would be allocated to impacts of moderate severity, locally to regionally, and in the short term.
High	Where the impact could have a significant influence on the environment and, in the event of a negative impact, the activity(ies) causing it should not be permitted without substantial mitigation and management, and pro-active rehabilitation commitments (i.e., there could be a 'no-go' implication for the project). This would be allocated to impacts of severe magnitude, locally over the medium-term, and/or of severe magnitude regionally and beyond.

6.5.3 Overall Component and Significant Impact Assessment

6.5.3.1 Overall Component Impact Assessment

The overall component impact assessment took into considerations the activities of proposed drilling of the priority multiple exploration and appraisal wells D1-D6 and G1-G6, inclusive of the supporting infrastructures such as borrow pits and access roads within the AOI in PEL No. 73 as the overall source of impact. The various components of the receiving environment have been considered as the receptor / target that may be impacted positively or negatively by the proposed drilling of multiple exploration and appraisal wells activities. The components of the receiving environment encompassed the following:

- Physical Conditions / Natural Environment – Air, noise, water, green space, climate change,

built environment – houses, roads, transport systems, buildings, infrastructure, etc.

- ❖ Biological Conditions: fauna, flora, habitats, and ecosystem - services, function, use values and non-use etc., and.

- ❖ Socioeconomic Conditions: Social, economic, labour, gender, human rights, natural and social capital, archaeological, cultural resources, and cultural issues

In evaluating the degree of potential negative impacts, the following factors have been taken into consideration:

- ❖ Impact Severity: The severity of an impact is a function of a range of considerations, and.

- ❖ Likelihood of Occurrence (Probability): How likely is the impact to occur?

In evaluating the severity of potential negative environmental impacts, the following factors have been taken into consideration:

- ❖ Receptor/ Resource Characteristics: The nature, importance, and sensitivity to change of the receptors / target or resources that could be affected.

- ❖ Impact Magnitude: The magnitude of the change that is induced.

- ❖ Impact Duration: The time over which the impact is expected to last.

- ❖ Impact Extent: The geographical extent of the induced change, and.

- ❖ Regulations, Standards and Guidelines: The status of the impact in relation to regulations (eg. discharge limits), standards (eg. environmental quality criteria) and guidelines.

The overall impact severity has been categorised using a semi-quantitative KBSMM scale as shown in Table 6.3 for magnitude, Table 6.4 for duration and Table 6.5 for extent.

Table 6.3: KBSMM boundary conditions scored on a scale from 0 to 5 for impact magnitude.

SCALE (-) or (+)		DESCRIPTION
0		no observable effect
1		low effect
2		tolerable effect
3		medium high effect
4		high effect
5		very high effect (devastation)

Table 6.4: KBSMM boundary conditions scored time over which the impact is expected to last and its reversibility.

SCALE (-) or (+)		DESCRIPTION
T		Temporary
P		Permanent

Table 6.5: KBSMM boundary conditions scored geographical extent of the induced change.

SCALE (-) or (+)		DESCRIPTION
L		limited impact on location
O		impact of importance for municipality.
R		impact of regional character
N		impact of national character
M		impact of cross-border character

The likelihood (probability) of the pre-identified events occurring has been qualified using a qualitative scale of probability categories (in increasing order of likelihood) as shown in Table 6.6. Likelihood is estimated on the basis of experience and/ or evidence that such an outcome has previously occurred. Impacts resulting from routine/planned events are classified under category (E).

The overall individual components of the impact assessment with respect to the impact duration, geographical extent and probability of occurrence have been determined using a semi quantitative approach as shown in Table 6.7.

Table 6.6: KBSMM boundary conditions scored scale of probability categories (in increasing order of likelihood).

SCALE (-) or (+)		DESCRIPTION
A		Extremely unlikely (e.g., never heard of in the industry)
B		Unlikely (e.g., heard of in the industry but considered unlikely)
C		Low likelihood (e.g., such incidents/impacts have occurred but are uncommon)
D		Medium likelihood (e.g., such incidents/impacts occur several times per year within the industry)
E		High likelihood (e.g., such incidents/impacts occur several times per year at each location where such works are undertaken)

6.5.3.2 Overall Significant Impact Assessment

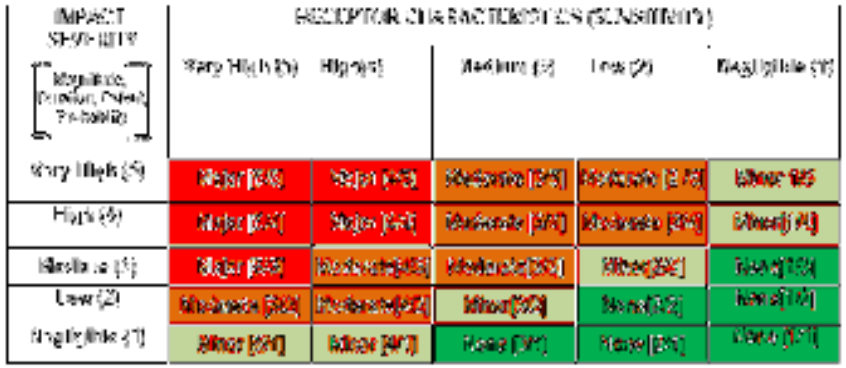
The determination of the significance of the negative impacts / key issues caused by the proposed drilling of the priority multiple exploration and appraisal wells D1-D6 and G1-G6, inclusive of the supporting infrastructures such as borrow pits and access roads within the AOI in PEL No. 73, as key sources of impact based on the environmental baseline results (created Knowledge-Base) and the intensity of the likely negative impact as assessed under individual components likely to be impacted and the results are presented as shown in Table 6.7.

The assessment process focused on the degree to which the proposed project activities are likely to result in unwanted consequences on the receptor covering the receiving environment (natural, built, socioeconomic, flora, fauna, habitat, and ecosystem). The results of the overall significant impact assessment of the individual components assessed are presented as shown in Table 6.8.

Table 6.7: Recommended format presentation of the overall EIA likely impacts results that the proposed drilling of the priority multiple exploration and appraisal wells D1-D6 and G1-G6, inclusive of the supporting infrastructures such as borrow pits and access roads, may have on the individual components of the receiving sensitive environment (physical, biological, socioeconomic, cultural, and archaeological environments) within the AOI in PEL No. 73 with respect to duration, geographical extent, and probability occurrence.

SENSITIVITY RATINGS				PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT				
SENSITIVITY RATING		CRITERIA		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 Forestry	Tourism and Recreation	Cultural, Biological and Archaeological Resources
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.	Pre-construction and drilling requirements																
		2.	Construction phase																
		3.	Mobilisation																
		4.	Spudding and Conductor casing																
		5.	Drilling surface / intermediate and setting casing and cementing process through up 900 m																
		6.	Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234')																
		7.	Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202')																
		8.	Well testing in event of a commercial discovery																
		9.	Plug and abandon Well if the Outcome is not economic																
		10.	Rehabilitate all surface disturbances and clear the site of any debris																
		11.	Camp removal, site closure / abandonment / handover																
	UNPLANNED ACCIDENTAL EVENTS	12.	Major land accidental incidence such as diesel / oil spill/ fire / explosion (Note: Well Control arrangements and related Emergency Response Plan (ERP) are designed to bring the risk of any unplanned accidental event to ALARP (As Low As Reasonably Practicable) and tolerable																

Table 6.8: Recommended format presentation of the overall EIA likely significant impacts results as assessed with respect to the proposed drilling of the priority multiple exploration and appraisal wells D1-D6 and G1-G6, inclusive of the supporting infrastructures such as borrow pits and access roads, on the receiving environment (physical, biological, socioeconomic, cultural, and archaeological environments) over the AOI in PEL No. 73.



				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 Forestry	Tourism and Recreation	Cultural, Biological and Archaeological Resources
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	1.	Pre-construction and drilling requirements																
		2.	Construction phase																
		3.	Mobilisation																
		4.	Spudding and Conductor casing																
		5.	Drilling surface / intermediate and setting casing and cementing process through up 900 m																
		6.	Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234')																
		7.	Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202')																
		8.	Well testing in an event of a commercial discovery																
		9.	Plug and abandon well if the outcome is not economic																
		10.	Rehabilitate all surface disturbances and clear the site of any debris																
		11.	Camp removal, site closure / abandonment/ handover																
	UNPLANNED ACCIDENTAL EVENTS	12.	Major land accidental incidence such as diesel / oil spill/ fire / explosion (Note: Well Control arrangements and related Emergency Response Plan (ERP) are designed to bring the risk of any unplanned accidental event to ALARP (As Low As Reasonably Practicable) and tolerable																

6.6 Positive Impacts Assessment Results

6.6.1 Assessment of Likely Positive Impacts

The likely positive impacts 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, scholarships, training and skills transfer, boost to local economies and creation of local, regional and national knowledge-bases (Tables 6.9 - 6.13).

Table 6.9: Continue with the payment of the annual license rental fees to the central Government.

Continued contribution to local, regional, and national economy through payment of the annual license rental fees to the Central Government averaging N$1.5 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	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	National
	Duration	Short-term
	Intensity	Moderate
	Significance	High

Table 6.10: Continue with annual contributions to the PetroFund and direct awarding of scholarships to local students from Kavango East and West Regions.

Continue with a minimum of USD50, 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. IN addition, the Proponent has awarded ten (10) scholarship to students from Kavango East and West Regions.	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Local, Regional and National
	Duration	Medium-Term
	Intensity	Very High
	Significance	Very High- Combined PetroFund and direct Scholarship funding of Namibians both at national and regional levels.

Table 6.11: Provisions of short-term contractual employment opportunities.

Short-term contractual employment opportunities (2-3 months per well) for the local communities during the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Local, Regional and National
	Duration	Short- Medium
	Intensity	Very High
	Significance	High; a significant number of especially rural families in Kavango West and East Regions will benefit in terms of short-term employment and wages.

Table 6.12: Expansion of the subsurface local, regional and national knowledge-bases.

The data to be generated from the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 will be highly useful in the national search for other subsurface resources such as minerals, water, geothermal and general geoscience research, and development	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Local, Regional and National
	Duration	Long-term
	Intensity	High
	Significance	Very High- Creation of the local, regional and national knowledge-bases

Table 6.13: Support to the development of rural water supply and other local infrastructure through Corporate Social Responsibility (CSR) and Environment, Social Governance (ESG).

Contribution to the development of local infrastructures such as rural water supply through Corporate Social Responsibility (CSR) and Environment, Social, Governance (ESG) Programmes such as wildlife monitoring, reforestation and local food security, that the Proponent is current supporting in Kavango East Regions	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Local, Regional and National
	Duration	Permanent
	Intensity	Very High
	Significance	Very High – Up twenty (26) Rural Water supply boreholes have been drilled and donated to the rural communities in Kavango East and West Regions. Additional ten (10) water boreholes are planned for 2023-2024 period. The Proponent supporting wildlife monitoring, reforestation and local food security initiatives collaborating with other partners and Government.

6.6.2 Summary of Likely Positive Cumulative Impacts

Positive cumulative benefits for the country at national level and local communities in Kavango West and East Regions will be derived from the continued procurement of local services, goods, equipment, and professional services by the Proponent in addition to other businesses using the same services. Local community semi-skilled workers who may be employed in the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 will likely acquire new and lifelong skills that may prove useful in other sectors of the Namibian economy. The drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 will guarantee positive impacts through continued contributions by the Proponent to the PetroFund and payment of license rental fees in addition to the contributions by other oil and gas exploration companies operating in Namibia. Short-term contracts and employment opportunities will be guaranteed in addition to all other opportunities being offered by other companies in Namibia and in Kavango West and East Regions. Table 6.14 summarises the results of the positive cumulative impact assessment with respect to the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73.

Table 6.14: Likely positive cumulative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 at local, regional, and national levels.

Cumulative positive impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 at local, regional, and national levels.	*Status*	Positive
	Probability	Definite
	Confidence	High
	Extent	Local, Regional and National
	Duration	Permanent
	Intensity	High
	Significance	Very High-Highly support the alleviation of inherited generational poverty, promote education, creates employment opportunities, and creation of local, regional and national knowledge-bases.

6.7 Negative Impacts Assessment Results

6.7.1 Summary of Likely Negative Impacts Receptors

Based on the finding of this EIA Process, the following is the summary of the key likely negative environmental impact receptors that the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 may have on the receiving environment:

1) Habitats and ecosystems.

2) Reptiles.

3) Amphibians.

4) Mammals.

5) Avian.

6) Trees and Shrubs.

7) Grasses.

8) Socioeconomic.

9) Existing infrastructure, current and future land uses.

10) Ecosystem functions, services, use values and non-use use.

11) Physiography and geology.

12) Visual and land degradation.

13) Water vulnerability and supply infrastructure.

14) Security, health, and safety.

15) Noise and vibrations.

16) Emissions and influence on air quality.

17) Drill cuttings and drilling fluids.

18) Solid and liquid waste generation.

19) Archaeological and cultural resources.

20) Accidental major event.

21) Loss of well control and oil spill.

22) Climate Change, and.

23) Cumulative Impacts.

The above listed likely negative impacts have been evaluated during the process of preparing this EIA Report for the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with mitigation measures provided in the separate EMP Report. The impact assessment process has been undertaken based on an Artificial Intelligent (IA) matrix framework of the Knowledge-Based System Model Methodology (KBSMM) of the characterised desktop and field-based validated populated knowledge-base of the climatic, environmental and ground models inputs, linked to the source-pathway-target/receptor chain mechanism for determining the ultimate possible negative harm to the receiving environments such as the physical, biological, socioeconomic, cultural, and archaeological environments. The impact / influence and risk assessment and determination of the EMP boundary conditions (mitigation measures to be implemented and monitored by the Proponent) directly link to the national regulatory permitting, standards, limits, engineering, environmental and sector-specific protocols and the applicable international best industry practices which are based on the Best Practicable Environmental Option (BPEO).

6.7.2 Likely Negative Impacts on Habitats and Ecosystems

The most important areas in the general surrounding areas of PEL 73, AOI and the sites targeted for the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites are:

1. **KAZA TFCA**: KAZA TFCA is a multiple land use regional transboundary conservation initiative with a common vision of promoting and supporting sustainable livelihoods through coexistence and utilisation of multiple resource and resources areas including national parks, game reserves, forest reserves, conservancies, game/wildlife management areas and communal lands livelihoods that are dependent on seasonal subsistence agriculture, animal husbandry, fishing, natural resource harvesting, tourism, trading and hunting. Within KAZA TECA, there are also vital subsurface resources such as water, minerals, geothermal energy, and petroleum that are unfortunately not mentioned under KAZA vision but are fundamental and strategic resources of the individual member States sharing the KAZA political vision.

   The overall vision is still a working progress because the rightful beneficiaries who are the rural local communities continues to languish in inherited generational poverty right at the doorsteps of KAZA, as seen around the local villages in Kavango West and East such as Kawe, Mbambi, Makandina, Mutwegombahe, Mbambi, Ncuncuni, Cuma, Hamweyi, Ncaute, Gcauru Sivaradi, Shakambu, Cumezawo and Kawe as well as at Masambo, Omega 1 in Bwabwata National Park, Western Zambezi Region situated right in the core of the KAZA TFCA.

   The poverty situation and plight of the rural local communities that are supposed to be thriving within the boundary of KAZA TFCA is evident in all the KAZA countries including Kavango East, Kavango West and Zambezi Regions of Namibia. The high-value tourism benefits currently been derived by certain businesses in the name of KAZA TFCA are in the hands of international, regional, and historically privileged KAZA TFCA countries nationals of well-connected tourism related business operators and selected NGOs consultants and all working together in safeguarding their interests against the poor indigenous rural masses. It remains to be seen if or when such politically envisioned KAZA TFCA tourism benefits will ever make some positive socioeconomic impacts on the lives of the highly deprived rural communities who were meant to be the key beneficiaries of the KAZA TFCA political vision. The reality is, the KAZA TFCA tourism and all the related economic benefits have never reached and will probably never reach the rural communities in KAZA TFCA countries and Namibia included. Unless there is a serious regional political shift with respect to the broadening of the KAZA TFCA economic space, rural communities in KAZA TFCA countries will continue to swim in inherited generational poverty because those currently holding the keys to the economic gates of the KAZA TFCA tourism products will never want to genuinely share the economic benefits. Rural communities and their cultures and resources will merely only continue to be used as tourism products for increased revenue and accumulated wealth to the selected few international, regional, and historically privileged nationals of well-connected tourism related business operators and selected NGOs consultants.

   Sensitive areas within the Namibian portion of KAZA TFCA are known and the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL 73 do not fall in the sensitive areas such as the formally proclaimed national parks, which are legally excluded from oil and gas exploration in Namibia (Figs. 5.6-5.10). The drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites will be highly localised occupying a maximum footprint of 3Ha per site which is 36 Ha in total for the proposed twelve wells, even if all the proposed wells were to be drilled, which is not the case.

   The proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites fall within the local communal land and has no negative environmental consequence on the greater local, regional, national or international KAZA TFCA ecosystems extending beyond the borders of Namibia. The main AOI in PEL 73 and the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites situated more than 50km and 260 km away from the Okavango River and Okavango Delta, respectively (Fig. 1.37).

2. **Okavango River**: The Okavango River is viewed as a site of special ecological importance in Namibia due to its biotic richness, threatened plants and insects (Curtis and Barnard 1998). Although the boundary of PEL No. 73 reaches the Okavango River, the key AOI and the likely sites for the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites are not situated near this river. REN has set no-go buffer zones to protect the environment and wildlife that include a 10-km setback from the Okavango River. The main AOI in PEL 73 and the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites situated more than 50km from the Okavango River (Figs. 1.37 and 6.5).

3. **Fossilised Omuramba Omatako Ephemeral rivers**: The fossilised Omuramba Omatako Ephemeral rivers viewed as sites of special ecological importance in Namibia due to its biotic richness, large mammals, high value for human subsistence and tourism (Annex 4). Unfortunately, the general area has been heavily degraded by subsistence agriculture, roads, and human settlements (Plates 5.1-5.3). The likely sites for the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites are not situated within the channels of the fossilised Omuramba Omatako Ephemeral rivers.

4. **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 (Annex 4). Although important larger pans such as Nyae Nyae, etc. fall outside the general area, all other smaller pans are also viewed as important habitat. The likely sites for the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites are not situated within the Ephemeral pans.

5. **Khaudum National Park**: The Khaudum National Park falls within the North-Eastern Kalahari Woodlands vegetation type with omurambas which act as ideal routes for wildlife. Dominant trees include: *Acacia erioloba, Adansonia digitata, Baikiaea plurijuga, Combretum imberbe*, *Guibourtia coleosperma* and *Spirostachys africana*. Important wildlife includes: African wild dog, leopard, lion, spotted hyaena, side-striped jackal, elephant, giraffe, blue wildebeest, eland, kudu, oryx, red hartebeest reedbuck, roan, tsessebe and warthog. Important birds include: Abdim's stork, African golden oriole, African hobby falcon, Bradfield's hornbill, ground hornbill, lesser spotted eagle, racket-tailed roller, steppe eagle and yellow-billed kite (Annex 4). The Khaudum National Park is excluded from PEL 73 and the Proponent is not allowed to conduct oil and gas exploration in proclaimed national parks, and.

6. **Mangetti National Park**: The Mangetti National Park falls within the North-Eastern Kalahari Woodlands vegetation type with the vegetation on the dune crests markedly different to that in dune valleys – i.e., Kalahari woodland vegetation dominates the dune crests, whereas mixed acacia savannah vegetation characterises the dune valleys. Dominant trees include: *Acacia erioloba, Acacia mellifera, Combretum collinum, Commiphora* species, *Schinziophyton rautanenii* and *Terminalia sericea.* Important wildlife includes: African wild cat, leopard, spotted hyaena, blue wildebeest, common duiker, kudu, oryx, sable, steenbok and occasional elephant and wild dog. Important birds include: bateleur, lapped-faced vulture, tawny eagle, Meyer's parrot, and striped kingfisher (Annex 4). The Mangetti National Park is excluded from PEL 73 and the Proponent is not allowed to conduct exploration in proclaimed national parks.

7. **Community Forestry and Conservancies**: Community Forest within the general AOI are: Ncumacara, Ncamagoro, Mbeyo, Gcwatjinga, Ncaute, Cuma, Likwaterera, Hans Kanyinga, George Mukoya and Muduva Nyangana. Kapinga Kamwalye is only nearest community conservancy to the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites (Fig. 6.5). Subsurface resources exploration such as the proposed oil and gas exploration activities are allowed to be undertaken in community forestry and conservancies. If the Proponent intends to undertake oil and gas exploration activities in a community forestry or conservancy, the operations shall be done in line with the provisions of a given community forestry and conservancy zone management plan. Consent to undertake oil and gas exploration activities shall also be obtained from a given community forestry and conservancy management team. None of the proposed wells locations fall within a conservancy (Fig. 6.5). The D1 and the D2 wells locations, which are one of the least priority wells to be drilled fall within the Ncamagoro and Mbeyo Community Forests (Fig. 6.5). The D5 which is one of the key priority wells locations

likely to be drilled falls inside the southern margin / boundary of the Gcwatjinga Community Forest (Fig. 6.5), and.

8. **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.), especially along the perennial Okavango and ephemeral Omuramba Omatako Rivers, and more recently along the various tracks and roads throughout the area. However, there are some areas far from the rivers and 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, no new tracks/roads are envisaged as an existing access route will be used to access the proposed development area.

The overall general areas of interest covering the Kavango West and East Regions will have no influence on the ecology and environment of the national parks, Okavango River and other sensitive areas including the faraway Okavango Delta situated in Botswana more than 260 km to the southeast of the AOI.

Habitat destruction, due to the 36Ha total drilling sites footprints of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 and any new access tracks to be created are unlikely to have an influence on the 519,912 km^2 KAZA TFCA, Okavango River system, the fossilised Omuramba Omatako Ephemeral rivers, the Ephemeral pans, the Khaudum and Mangetti National Parks, the conservancies and community forestry because the actual footprints to be created are relatively small and comparable to the local subsistence agricultural fields and homestead footprints found around AOI and PEL No. 73 (Annex 4).

The results of the likely negative environmental impacts associated with the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to the disruption / disturbance of the habitats are summarised in Table 6.15.

Table 6.15: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to the disruption / disturbance of the habitats.

Disturbance of the disruption / disturbance of the habitats within PEL 73, key areas of interests, drilling sites and the surrounding areas	*Status*	Negative
	Probability	Probable; But highly localised affecting an area of about 3Ha
	Confidence	High
	Extent	• Overall impact will be site-specific. Access routes (existing) - Localised disruption/destruction of the habitat and thus consequently fauna associated directly with the actual routes. This however, would be a relatively small area with localised implications. • Proponent will focus on using the already disturbed areas for well locations and existing tracks for access
	Duration	Very short
	Intensity	• Mild. Access routes (existing) - The actual sites where expansion of the existing route(s) is envisaged would be permanently altered. This however, would be relatively small area(s) with localised implications. • The areas adjacent the drill sites, access and other associated infrastructure should not be significantly affected. This however, would depend on control over the contractors during the drilling sites clearing and road building/expansion phase(s), but should be limited to localised implications. • Areas not directly affected by the drilling sites and access routes (existing) although within the immediate area would be affected minimally. This would include dust, noise, light & other associated disturbances in the area, but be limited to the road clearing and drilling activities.
	Significance	Medium to Low

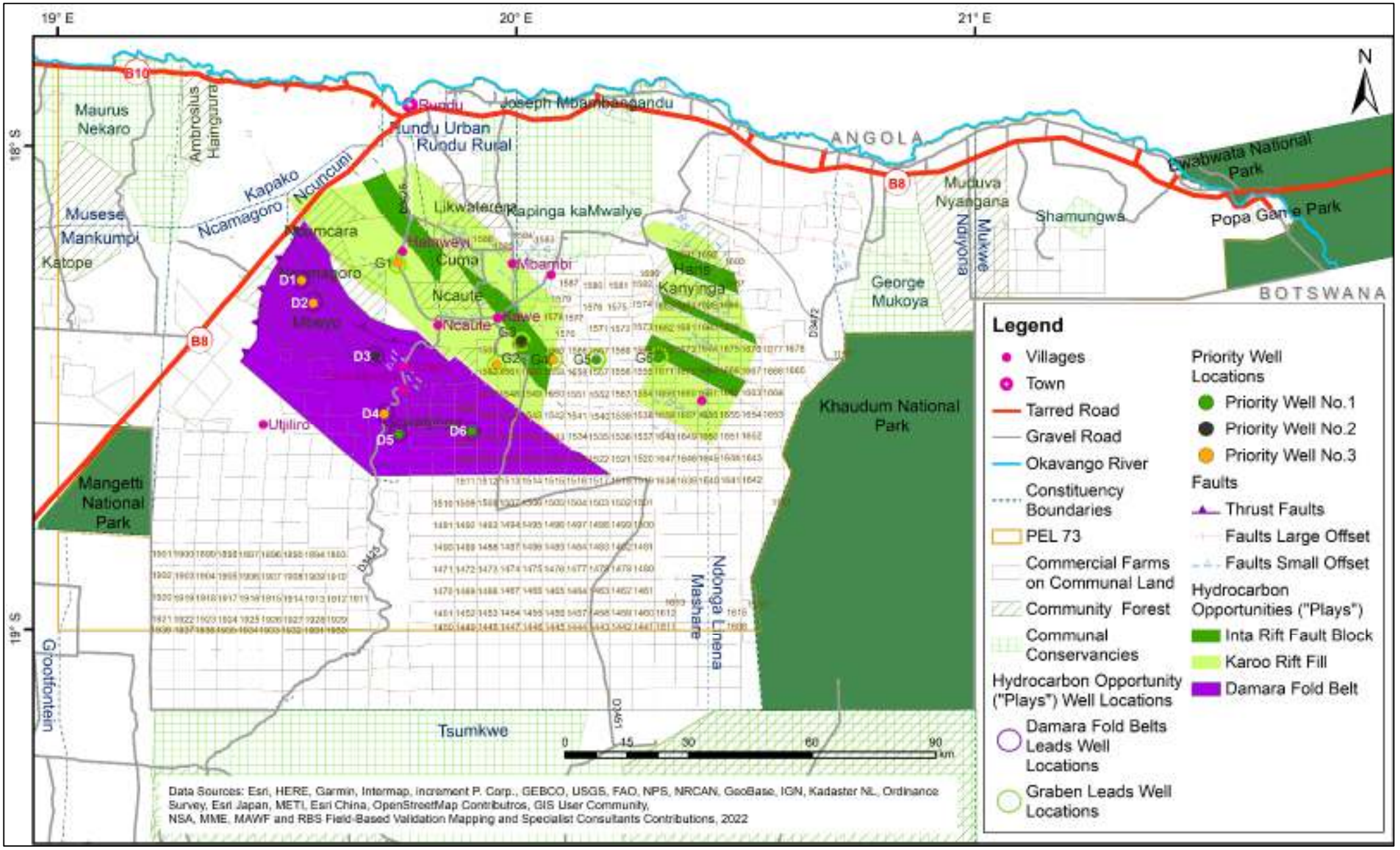


Figure 6.5: Subsurface hydrocarbon opportunity plays of the Kavango Sedimentary Basin, proposed exploration and appraisal wells locations with respect to proclaimed national parks, conservancies, community forests and other land uses. The D1 and the D2 wells locations, which are one of the least priority wells to be drilled fall within the Ncamagoro and Mbeyo Community Forests. The D5 which is one of the key priority wells locations likely to be drilled falls inside the southern margin / boundary of the Gcwatjinga Community Forest.

6.7.3 Likely Negative Impacts on Reptiles

The most important reptile species in the general areas of the proposed drilling sites are viewed as the 2 endemics (Ichnotropis grandiceps and Lygodactylus bradfieldi), 3 species classified as rare (Lycophidion multimaculatum, Psammophis jallae, Causus rhombeatus) and 6 species classified as vulnerable (Stigmochelys pardalis, Psammobates oculiferus, Kinixys spekii, Python natalensis, Varanus albigularis, Varanus niloticus) (Annex 4). The 2 species classified as data deficient by the IUCN (2021) – Pelusios (bechuanicus) upembae and Ichnotropis grandiceps – are also viewed as important although P. upembae would be associated with the Okavango River system only.

The general area has been heavily impacted in places, especially along the fossilised Omuramba Omatako and areas close to towns and settlements such as Rundu and Ncaute, etc., due to subsistence farming and logging activities and none of the unique reptiles are expected to be exclusively associated with the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites areas (Annex 4).

The results of the likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the reptiles and their associated habitats are summarised in Table 6.16.

Table 6.16: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on reptiles.

Likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on reptiles and their associated habitats	*Status*	Negative
	Probability	Improbable
	Confidence	High
	Extent	Site-specific
	Duration	Very Short
	Intensity	Mild
	Significance	Medium to Low (Limited wells footprints (3Ha per well) situated not in sensitive environment)

6.7.4 Likely Negative Impacts on Amphibians

The most important species from the area is the giant bullfrog (Pyxicephalus adspersus) with “population is decreasing” according to the IUCN (2021) as it is consumed as food throughout its range. Most amphibians are expected to be associated with the Okavango River system in the area rather than the sandy interior, although the ephemeral Omuramba Omatako and pans throughout the general area would also be suitable habitat (Annex 4).

The results of the likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on amphibians and their associated habitats are summarised in Table 6.17.

Table 6.17: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on amphibian.

Likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on amphibians and associated habitats	*Status*	Negative
	Probability	Improbable
	Confidence	High
	Extent	Site-specific
	Duration	Very Short
	Intensity	Mild
	Significance	Medium to Low (Limited wells footprints (3Ha per well) situated not in sensitive environment)

6.7.5 Likely Negative Impacts on Mammals

The most important species from the general area are probably those classified as rare (Nycteris hispida, Kerivoula argentata, Kerivoula lanosa, Mastomys shortridgei, Civittictis civetta, Paracynictis selousi) and endangered (Lycaon pictus, Lutra maculicollis, Equus (burchellii) quagga) under Namibian legislation and those classified by the IUCN (2021) as endangered (Lycaon pictus), vulnerable (Loxodonta africana, Smutsia (Manis) temminckii, Acinonyx jubatus, Panthera pardus, Panthera leo, Hippopotamus amphibious, Giraffa cemelopardalis) and near threatened (Hipposideros vittatus, Aonyx capensis, Hydrictis (Lutra) maculicollis) (Annex 4). However, some of the above species – e.g., otter, hippo, etc. – are only associated with the Okavango River. The most important species expected to occur in the general area would be the African wild dog (Lycaon pictus) and pangolin (Smutsia (Manis) temminckii).

Elephant are known to use infrasound communication with frequencies from 14-35 Hz for long distance communication with the best period for such communication just after sunset when night-time cooling enhances low-frequency sounds and thus maximises communication ranges (Garstang *et al*., 1995). Furthermore, elephant also use seismic communication – i.e., ground borne stimuli which works better in sandy soils – to avoid or threaten predators, assess and navigate within the environment, and communicate (O'Connell-Rodwell 2007 and O'Connell-Rodwell et al. 2007). Human noise in the 20-25 Hz frequency range can interfere with the transmission of seismic waves which could increasingly impede elephant seismic communication (Mortimer *et al*. 2018). Drilling rig and machinery like diesel generator sets are likely to emit noise in the range of 60-65 db(A). The proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites are not falling in pristine habitats or elephant specific habitats but in disturbed communal land dominated by subsistence agriculture, rural homesteads and fenced commercial farmlands on communal land (Figs. 6.6 and 6.7). Elephants are **not sedentary** within the AOI or the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites areas.

Elephants are mainly located to the east, in the Khaudum National Park with occasional movements to the west and south, between Khaudum and Mangetti National Parks and north-east between the Khaudum National Park and the Mahangu Core Area (Fig. 6.6 and Annex 4). However, based on the monitoring of the collared animals as shown in Fig. 6.7 appear to have used Khaudum National Park (NP) as their core area. The African Elephants 5719 and 6098, moved between Khaudum NP and Nyae Nyae conservancy, trekking a distance of 1,839.6 km with a home range of 2,208 km^2 and 836.8 km with a home range of 1,360 km^2, respectively (Fig. 6.7). The most interesting movement was that of the African Elephant 5800 which moved crossing the boarders of Namibia and Botswana and spent most of its time in Botswana (Fig. 6.7). It trekked the longest distance, 2,393.5 km and roamed in a home range of 4,621 km^2. To date none of the collared and monitored animals have been recorded to have crossed over into PEL 73 area, except the two Elephants (5719 and 6095) who slightly crossed the border line but did not go inside the license area completely (Fig. 6.7). Overall, it is known that there are occasional elephant movements within PEL 73 and between Khaudum and Mangetti National Parks (Figs. 6.7). However, this potential migratory corridor is heavily fenced because it falls within the commercial farmland on communal land area for Kavango East and West Regions (Fig. 6.8). The results of the likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on mammals and their associated habitats are summarised in Table 6.18.

Table 6.18: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on mammals.

Likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on mammals and associated habitats	*Status*	Negative
	Probability	Improbable
	Confidence	High
	Extent	Site-specific
	Duration	Very Short
	Intensity	Mild
	Significance	Medium to Low (Limited wells footprints (3Ha per well) situated not in sensitive environment / key habitat area

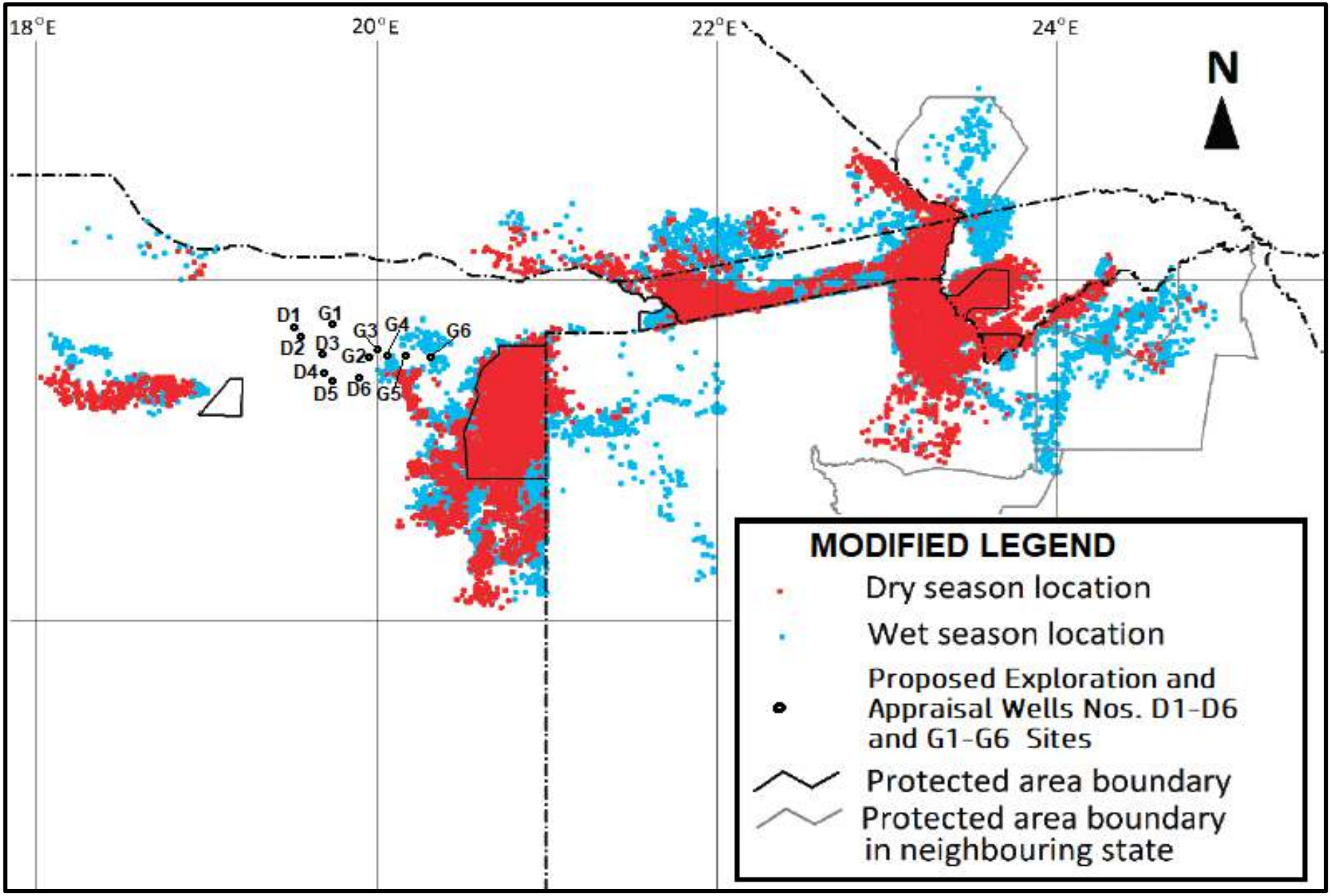


Figure 6.6: Dry and wet season elephant sightings with respect to the proposed well locations within the boundary of PEL 73 (Modified with proposed wells location addition from Source: Craig., *et., al*, 2021).

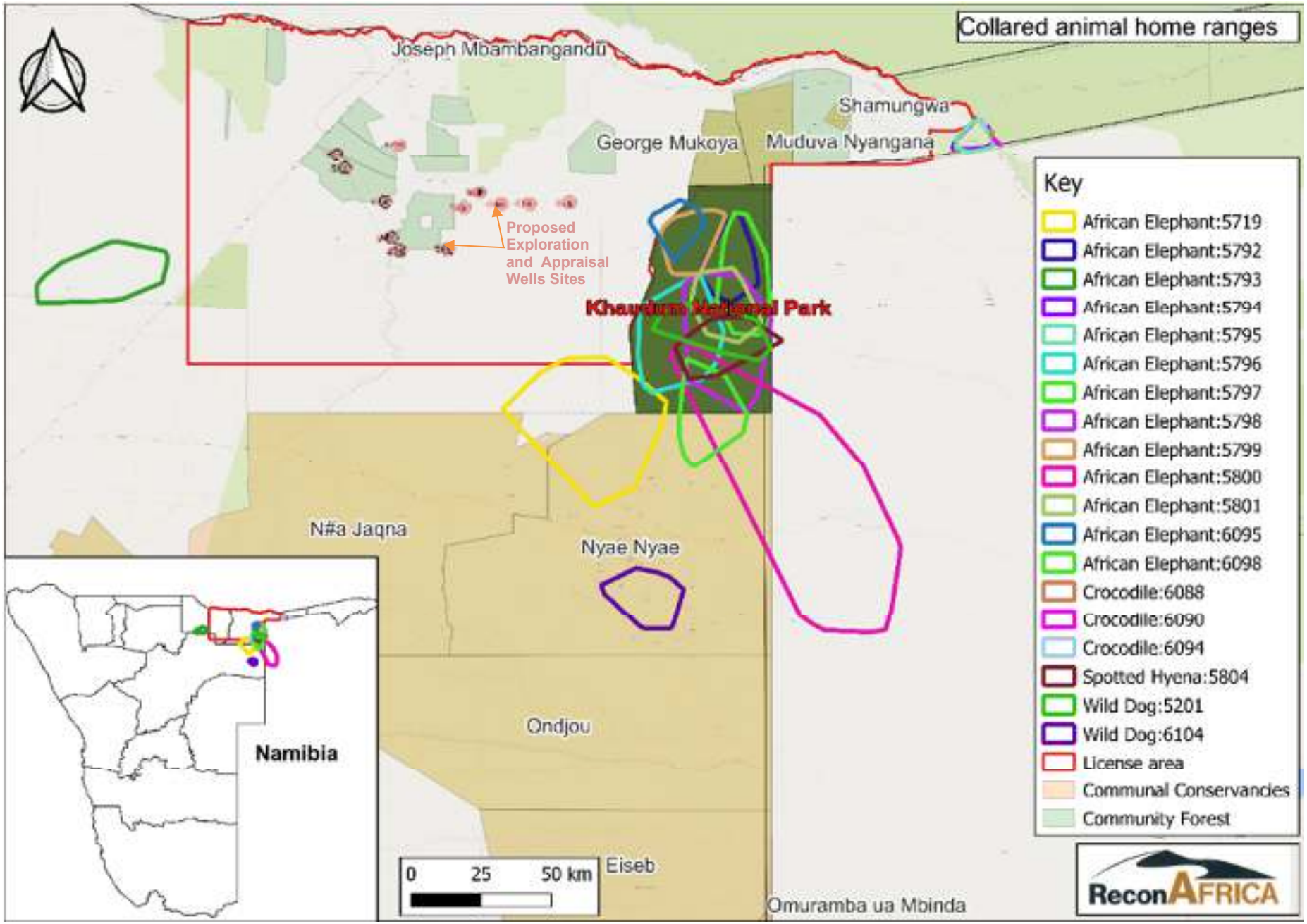


Figure 6.7: Results of the ongoing monitoring of the collared animals home ranges with respect to the proposed well locations within the boundary of PEL 73 (Source: REN, 2022).

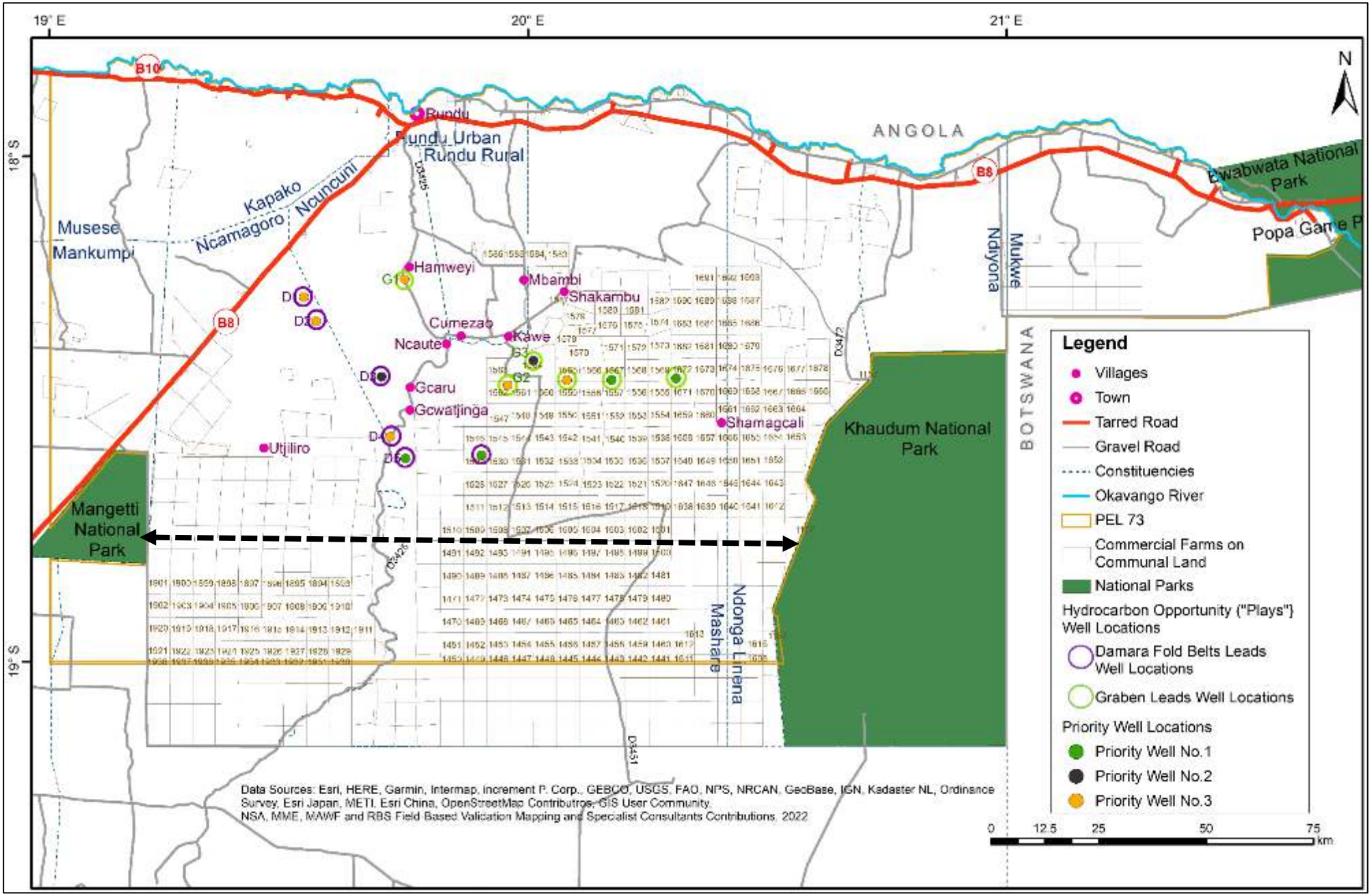


Figure 6.8: Black broken arrow showing occasional elephant movements between Khaudum and Mangetti National Parks across a heavily fenced farmland area. The farms boundary fences are a key source of increased humans and wildlife conflict incidences and are major obstacles for wildlife migration along this potential migratory corridor, not the ongoing or proposed oil and gas exploration activities.

Plate 6.1: Example of the commercial farmland on communal land farms boundary fences around the G5 Well site, which are a major obstacle for wildlife migration along this potential migratory corridor between Khaudum and Mangetti National Parks.

6.7.6 Likely Negative Impacts on Avian

The most important species are viewed as those classified as endangered (hooded vulture, white-backed vulture, tawny eagle, martial eagle, bateleur, southern ground-hornbill), vulnerable (secretarybird, white-headed vulture, lappet-faced vulture and) and near threatened (marabou stork, peregrine falcon, kori bustard) from Namibia (Simmons et al. 2015) as well as those classified by the IUCN (2021) as critically endangered (hooded vulture, white-headed vulture, white-backed vulture), endangered (lappet-faced vulture), 4 vulnerable (secretarybird, tawny eagle, martial eagle, southern ground-hornbill) and near threatened (bateleur, kori bustard).

An important species confirmed from the general area is the red-billed oxpecker and although their numbers have increased in communal areas in north-eastern Namibia, elsewhere they have been negatively affected due to arsenic-based cattle dips.

Habitat destruction would occur due to site clearing for the well infrastructures although the actual footprint is relatively small (~3Ha in size). The widening and upgrading of the existing sandy tracks are also expected to contribute to habitat destruction/alteration. Increased traffic along this access route could lead to increased mortalities (e.g., vehicle mortalities) and illegal hunting of birds as food (e.g., various game birds) or trade (e.g., Meyer's parrot). The proposed mitigations in the EMP are expected to minimise the overall effect on grass potentially occurring in the area. The results of the likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on avian and their associated habitats are summarised in Table 6.19.

Table 6.19: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on avian.

Likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on avian and associated habitats	*Status*	Negative
	Probability	Improbable
	Confidence	High
	Extent	Site-specific
	Duration	Very Short
	Intensity	Low
	Significance	Low (Limited wells footprints (3Ha per well) situated not in sensitive environment)

6.7.7 Likely Negative Impacts on Trees and Shrubs

The most important larger tree/shrub species expected to occur in the general area are Baikiaea plurijuga (Protected F; LR-nt; Near Threatened [IUCN 2021]), Burkea africana (Protected F), Guibourtia coleosperma (Protected F), Dialium engleranum (Protected F)), Philenoptera violacea (Protected F), Pterocarpus angolensis (Protected F; LR-nt), Schinziophyton rautanenii (Protected F), Sclerocarya birrea (Protected F) and Strychnos species (Protected F).

Due to the high density of protected tree species in the general area of wells locations and to minimise the overall impact of the habitat destruction associated with the sites developments, the following relatively "open" area shall be identified before site clearing is undertaken. Protected tree species in the general vicinity of the recommended well sites have been identified and marked as shown in as shown in Figs. 5.17, 5.19, 5.22, 5.25, 5.28, 5.30, 5.33, 5.35, 5.38, 5.41, 5.44 and 5.47 and Annex 4.

Furthermore, red-white danger tape has been attached to each of the identified larger and protected trees to be avoided and/ or preserved within the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites not have big trees to ensure that they are (Plate 6.2 and Annex 4).

Habitat destruction would occur due to site clearing for each of the well infrastructures although the actual footprint is small (~3ha in size per well). The creation of new access and widening and upgrading of the existing sandy track related activities as may be required, are also expected to contribute to the localised habitat destruction/alteration. This would thus not lead to additional habitat disturbances and

increased access into areas currently not as easily accessible which could lead the disruption / disturbance of the habitats within surrounding areas.

The general area has been heavily impacted in places, especially along the fossilised Omuramba Omatako and areas close to towns and settlements such as Rundu and Ncaute, etc., due to subsistence farming, logging activities, wildfires and slush and burn type of subsistence agriculture (Plates 6.3-6.6 and 5.2-5.4).

Slash and burn type of agricultural practice is a widely used subsistence method of growing food in which wild or forested land is clear cut and any remaining vegetation burned. The resulting layer of ash provides the newly-cleared land with a temporary (2-3 years) nutrient-rich layer to help fertilise crops (Plate 6.6). Once the area has become infertile, a new area is again cleared and the process of forest clearing is repeated until such time when there will probably be no newer forestated area to clear.

The identified protected species occur widespread throughout the general area and not exclusively associated with the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites (Annex 4). The proposed mitigations in the EMP are expected to minimise the overall effect on larger trees and shrubs potentially occurring in the area.

The presence of an existing track would thus not lead to additional habitat disturbances and increased access into areas currently not as easily accessible which could lead to increased slash-and-burn practices for agricultural purposes and increased harvesting (e.g., illegal logging) of valuable (and protected) tree species should a new track have been commissioned.

Administrative area will be situated on an area which is already cleared as part of the well footprint of 3Ha with the accommodation for workers to remain at the existing Kawe 6-2 drill site. The results of the likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on tree and shrub as key habitats are summarised in Table 6.20.

Plate 6.2: Red-white danger tape attached to all the identified larger and protected trees to be avoided and/ preserved / permitted around each of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites areas (Cunningham, 2022).

Plate 6.3: Logging of *Baikiaea plurijuga* (Zambezi/Rhodesian Teak – Near Threatened, IUCN 2020) is evident throughout the area.

Plate 6.4: Many areas close to the various tracks and roads and along the Omuramba Omatako are clear cut for subsistence farming.

Plate 6.5: Wild fires, usually started to stimulate grass growth for cattle or accidental fires when clearing land for cultivation, are destructive throughout the area.

Plate 6.6: Slash and burn type of agricultural practice is a widely used subsistence method of growing food in Kavango East and West Regions. It involves the clearing of forested land and the heaps of cleared dry vegetation is burned. The resulting layer of ash provides the newly-cleared land with a temporary (2-3 years) nutrients-rich layer of the sandy soil to help fertilize crops. Once the area is infertile, a new area is cleared and the process of forest clearing is repeated until such time when there will probably be no newer forestated area to clear.

Table 6.20: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on tree and shrub species.

Likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on tree and shrub species as key habitats and resources	*Status*	Negative
	Probability	Probable
	Confidence	High
	Extent	Site-specific and localised influences affecting a footprint area of about 3Ha
	Duration	Medium-term
	Intensity	Low
	Significance	Low ((Limited wells footprints (3Ha per well) situated not in sensitive environment)

6.7.8 Likely Negative Impacts on Grasses

The grass species diversity is dominated by Hyperthelia dissoluta (yellow thatching grass) in the well drill sites. Habitat destruction due to the vegetation clearing around the drill sites and possible new access tracks, may have an impact on the environment especially through the fossilised Omuramba Omatako (and other ephemeral drainage lines). However, the drill sites are not located in sensitive areas such as the Ephemeral Rivers and the actual footprints per well will be small (~3Ha in size).

The creation of new access and widening and upgrading of the existing sandy tracks are also expected to contribute to habitat destruction/alteration. The presence of an existing track would thus not lead to additional habitat disturbances and increased access into areas currently not as easily accessible which could lead to increased slash-and-burn practices for agricultural purposes; increased cattle numbers with added pressure on grasses should a new track have been commissioned.

The results of the likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on grass and key important habitats are summarised in Table 6.21.

Table 6.21: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on grass.

Likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the grass as key habitats and resources	*Status*	Negative
	Probability	Probable
	Confidence	High
	Extent	Site-specific
	Duration	Medium-term
	Intensity	Low
	Significance	Low (Limited wells footprints (3Ha per well) situated not in sensitive environment)

6.7.9 Likely Negative Socioeconomic Impacts

One of the major possible negative impacts may be unrealistic job expectations about the proposed project. It is important for local communities to bear in mind that the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 will be for a short period of time for each well (2-3 months) and may require very high skilled workforce on the drilling location.

The limited but temporary job opportunities will only be available for the limited local people and over a limited period. The limited number of people that will temporary be part of the team will not affect the social and cultural setting of the local communities because the strategy will be employ local people from the surrounding villages when operating in a specific proposed prioritised D1-D6 and G1-G6

exploration and appraisal wells sites area. The following is the summary of the likely negative socio-economic impacts that may be associated with the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73:

(i) In-flux of workers employed by contractors as well as a potential influx of job seekers, resulting in potential increase settlements.

(ii) The influx of opportunistic job seekers may result in increased numbers of opportunistic criminals taking advantage of high unemployment situation in country by creating job advertisement / opportunity frauds.

(iii) Disruption of family structures and social networks. Being away from the family and social networks potentially may lead to increased anti-social behaviour (e.g., alcohol and drug abuse), concurrent casual sexual contacts contributing to increased HIV-Aids rates.

(iv) Potential negative behaviour and cultural influences by the workers from outside the local area to be employed at the drilling locations.

(v) Increased Covid-19 cases in the local and regional setting if the sites health restrictions and protocols are not folly enforced.

(vi) Increased crime rates often associated with alcohol and drug abuse. This could be the result of unsuccessful job seeker needing to find alternative source of income or could be the result of contract workers living in or near the villages.

(vii) Increased demand on water resources.

(viii) The presence of a larger number of workers living in the exploration camp on the site may pose a threat to or allegations of theft linked to the drilling operations workers.

(ix) Increased risk of veld fires on site and adjacent areas which may pose a threat to the livestock and crop farmers as well as damage or even destruction to farming infrastructure, and.

(x) Increased traffic, especially heavy vehicles, using public roads and safety concerns.

The results of the likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on socioeconomic environment are summarised in Table 6.22.

Table 6.22: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the socioeconomic environment.

Likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the socioeconomic environment	*Status*	Negative
	Probability	Probable
	Confidence	High
	Extent	Local
	Duration	Very short
	Intensity	Low
	Significance	Low (Limited negative local community influences)

6.7.10 Likely Impacts on Existing Infrastructure, Current and Future Land Uses

Localised compaction of the surface soils in sandy tracks may occur in some places creating a central ridge in the middle of the track which will make it difficult for lower raised vehicles to pass through the same tracks (Plate 6.7). Localised damage to the existing roads gravel roads may happen, although this is highly unlikely because the roads and tracks will be continuously maintained during the drilling

operations. Some of these existing roads and tracks are already in very bad condition as shown in Plate 6.8 and will be upgraded to better running surfaces before the start of drilling the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73. Levelling of the raised central ridge of the tracks after the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 must be undertaken to make sure that existing local infrastructure continue to serve the local people and visitors to the general area.

Local land uses around Area of Interest (AOI) and the drilling locations community forests, conservancies, agriculture, settlements, and villages (Fig. 6.2). The general area is not pristine due to prolonged human impact (e.g., settlements, slash-and-burn farming practices, unseasonal fires, etc.), especially along the ephemeral Omuramba Omatako River, and more recently along the various tracks and roads throughout the area (Plate 6.6).

However, there are some areas far from the rivers and tracks/roads which have less human impact (albeit not pristine) such as around the proposed well sites, and viewed as more important. However, even these areas are likely to be affected by current and future human activities as increasingly new communal land allocations are expended over these areas (Annex 4).

Results of the likely negative impact assessment of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the existing infrastructure, current and future land uses are summarised in Table 6.23.

Plate 6.7: Local sandy tracks which might have localised compaction in some places creating a central ridge in the middle of the track which will make it difficult for lower raised vehicles to pass through the same tracks.

Plate 6.8: The poor conditions of the already damaged existing road from Ncaute to Naingopo. Existing roads and tracks will need to be upgraded before the start of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73.

Table 6.23: Likely negative environmental impacts assessment results of drilling of the proposed prioritised exploration and appraisal wells sites in the AOI within PEL No. 73 on the existing infrastructure, current and future local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) land uses.

Influence of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the current and future local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) land uses coexistence and potential land use conflicts	*Status*	Negative
	Probability	Probable; the use of supporting infrastructure areas such access road for drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 will coexist with the local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA)
	Confidence	High
	Extent	Local
	Duration	Long-term
	Intensity	Mild
	Significance	Medium to low (Limited wells footprints (3Ha per well) situated not in sensitive environment)

6.7.11 Likely Impacts on Ecosystem Functions, Services, Use Values and Non-Use Use

The drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 will be undertaken within the broader local, regional, and global ecosystem function (what the ecosystem does), services being provided by the ecosystem, direct use and benefits being derived from the ecosystem and within the overall existence values that is not linked to the direct use / benefits to current or future generations. Drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 is not likely to affect the ecosystem due to the limited scope and duration centred around 3Ha footprint of each well site and drilling operations will last for about 2-3 months per well. The well locations will not be situated in sensitive areas that provide vital ecosystem services to the local communities. Even if all the twelve (12) wells were to be drilled, the total ground footprint of the operations will be around 36 Ha of the 2534133 Ha size of the Kavango Sedimentary Basin. The local (drill site) impacts on the ecosystem will be of no influence to the surrounding ecosystems of the Kavango East and West Regions (Regional), national (Namibia), transboundary (KAZA TFCA) and global interconnected coexisting ecosystems functions, services, use values and non-use or passive use and all contributing to the socioeconomic livelihood of the local communities. Table 6.24 summarises the assessment results of the likely negative environmental impacts that the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 may have on the local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) and global interconnected ecosystems functions, services, use values and non-use or passive use.

Table 6.24: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) and global interconnected ecosystems functions, services, use values and non-use or passive use.

Likely negative environmental impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) and global interconnected ecosystem	*Status*	Negative
	Probability	Improbable; Even if all the twelve (12) wells were to be drilled, the total ground footprint of the operations will be around 36 Ha of the 2534133 Ha size of the Kavango Sedimentary Basin.
	Confidence	High
	Extent	Local (within 5 km of project area) Limited wells footprints (3Ha per well) situated not in sensitive environment)
	Duration	Short-term
	Intensity	Mild
	Significance	Low (The ecosystem-based approach considered potential negative impacts to the local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) and global interconnected ecosystems.

6.7.12 Likely Negative Impacts on Physiography and Geology

The undulating forested Kalahari dune belt and the Omatako Ephemeral River channel and its tributaries are major distinctive landscapes features around the local topographic profiles of the stratigraphic well sites in the AOI within PEL No. 73. The well sites are generally flat with surrounding undulating landscapes. The risk of subsidence or landslides due the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 is highly unlikely. There are several different types of soils in the project area, each with its own peculiar geological, textural and weathering/erosion-driven properties, as well as anthropogenic footprints such as compaction by grazing animals, that are relevant to several issues that would need to be considered when executing the project.

These issues include: ecosystem services e.g., the role of soil in support of vegetation and higher food chain members; erosion and ponding potential, as well as surface runoff and their resultant geomorphological features; wind deflation, transportation and deposition of soil-derived particulates; organic matter content, surface sealing and capping and agricultural potential. In the areas where the soils have high sand content, particularly along the sandy tracks, localised minor compaction by vehicles will occur (Plate 6.4).

Soils along the Omatako Ephemeral Rivers and its tributaries are likely to be more susceptible to compaction and surface water ponding during the rainy season due to their higher clay contents (Plate 6.5). However, if the soils are adequately dry (soil moisture content below the plastic limit) when activities occur and vehicles minimise the number of times they drive across those soils, compaction should be minimal. The following is the summary of the geology of the stratigraphic well sites in the AOI within PEL No. 73:

(i) The Kalahari Basin formed during the uplift of the Great Escarpment and deposition occurred in grabens formed through recent tectonics.

(ii) The Kalahari Group Sediments is underlain by basement rocks of Karoo Basalts, Damara Quartzites and Dolomites and Pre-Damara Basement.

(iii) The Kalahari Basin is a vast inland basin which stretches over Angola, Namibia, Zambia, Botswana, and South Africa.

(iv) The Kalahari Sediments is a major primary aquifer of the Kavango Basin, with variable yield and water quality.

(v) The Karoo flood Basalts, dyke swarms and sills underlie much of the Kavango Basin, and.

(vi) A northwest fault is considered to be a major conduit of flood basalt and caused displacement of basalt to the south.

The likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the physiography and geology are summarised in Table 6.25.

Table 6.25: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites and supporting infrastructure in the AOI within PEL No. 73 on the physiography and geology.

Likely negative environmental impacts of stratigraphic well sites and supporting infrastructure in the AOI within PEL No. 73 on the physiography and geology	*Status*	Negative
	Probability	Improbable
	Confidence	High
	Extent	Site-Specific
	Duration	Very short
	Intensity	Mild
	Significance	Low

6.7.13 Likely Negative Impacts on Visual and Land Degradation

It is anticipated that there will be visual impacts on the aesthetics of the local environment especially around the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 and along a specific road or track during the drilling operations. Dust generated by wind erosion or vehicles along the gravel roads is not expected to affect air visibility in the project area due to the limited low speed (30-60km / hr) vehicles can drive, once off drive through most of the roads and tracks except for the access roads / tracks connecting the camp site that may be used multiple times in a day.

Drilling sites layout and design should take into consideration the aesthetics of the selected area and vegetation screening must be always used to shield the drilling sites from local community or public roads and tracks. The use of modern line cutting technology, preferably mulchers for widening of the access roads along minor tracks will ensure that minimal vegetation is removed, hence ensuring that re-vegetation will occur in a much shorter period since the rootstock, and seeds will be left along the tracks and this will promote faster re-growth. The likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to visual and land degradation are summarised in Table 6.26.

Table 6.26: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to visual and land degradation.

Visual effects and land degradation of the drilling sites, supporting infrastructure and vehicles movements along public roads / community areas and tracks resulting in land degradation	*Status*	Negative
	Probability	Improbable
	Confidence	High
	Extent	Site-specific
	Duration	Very short term
	Intensity	Mild
	Significance	Low

6.7.14 Likely Negative Impacts on Water Vulnerability and Supply Infrastructure

The following is summary of the groundwater characteristics of PEL 73 inclusive of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites areas:

(i) Aquifers prevalent in the area are primary aquifers of saturated Kalahari Group sediments and secondary aquifers are fractured/weathered bedrock, fault zones cutting a cross basement geology, and Kalahari sediments and recent faults visible at surface. Overall groundwater potential is moderate to low.

(ii) Aquifers present along the rivers are saline artesian aquifers overlain by alluvium aquifers of paleo-channels of the Okavango River.

(iii) The main sources of groundwater are abstracted from hand dug wells and boreholes.

(iv) The depth to groundwater is deeper in the west than in the east.

(v) Groundwater flow is the manifestation of recent faulting found in the area, with a low-gentle gradient.

(vi) Most boreholes have yields between 2-4m^3/h, with yields of 8m^3/h on average.

(vii) Most boreholes have water of a good quality with TDS levels of 500-1000mg/l.

(viii) Boreholes with poor quality water are high in sodium salts and are associated with stagnant waters.

(ix) Groundwater quality is maintained with each recharge episode.

(x) Average borehole depth is slightly above 90m, with average water strikes at 51m and saturated thickness at 43m.

(xi) Access to clean drinking water is a major challenge for many rural communities in Kavango West and East Regions (Plates 6.9 and 6.10).

(xii) Borehole yields are sufficient to fulfil the water requirements of the exploration phase, and.

(xiii) A Groundwater monitoring and management plan are tools of effective groundwater management that the Proponent will continue to implement.

The drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 will not result in groundwater pollution because each of the proposed wells are fully engineered and regulated infrastructures with multiple barriers such as casing and cement liners protecting water resources. REN's water-management plan includes groundwater assessments, hydro census, monitoring, and mitigation. The company is working collaboratively with representatives from the Ministry of Agriculture, Water and Land Reform (MAWLR), NamWater, Regional Authorities, Traditional Authorities and other experts and interested stakeholders in protecting Namibia's water resources found in Kavango West and East Regions. The water-management program has three key objectives and these are: Aquifer protection, surface water and drainage management, and sustained protection of project no-go zones such as 10 km buffer created along the Okavango River.

The multiple layers of cement and steel casing provide the foundation of the well, sealing it to prevent any fluids from escaping. The organic, biodegradable, water-based drilling fluid system that minimises environmental impacts mud circulation is a closed loop with the return mud going back to the mud tanks. This system incorporates the latest technologies for both safe drilling and surface/subsurface environmental protection. Once drilling is complete, the remaining fluid can be recycled or used as a soil enhancement/fertilizer for agriculture. The fluid will biodegrade, yielding no toxic or damaging by-product, just an effective soil enhancer that has been used by farmers and the agricultural industry in the U.S. and around the world. The total water requirement will be met from own boreholes to be drilled at each well site in addition to the community boreholes that will also be drilled as part of the CSR. If the local water quality does not meet the minimum quality requirement for use as make up water for drilling fluid/potable use, suitable arrangement for transportation of water will be made.

The drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 will not influence the quality of the local groundwater resources provided that no wastewater is discharged directly into the ground from either the drilling operations or camp site areas. The overall water vulnerability to pollution because of the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 is moderate. The Kalahari Sands which are the regional groundwater aquifer is very deep (100 m) but very porous and discharge of wastewater or chemicals/ oils into the ground without any form of engineered barrier, may eventually, result in localised groundwater pollution. Discharge of liquid or solid wastes including waste water, chemical, fuels, or oils into any public stream is prohibited and the proponent must implement the provisions of the EMP on water and waste management.

Liquid effluent discharges and oil or chemical leaks at drill sites, if not properly managed, can potentially lead to pollution of an underlying shallow groundwater source. The source of energy for drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 will be mainly diesel and associated heavy fuels. A groundwater monitoring network should include all water points with high water demand and boreholes near the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73. The monitoring of the surrounding community water boreholes with high water demand will help in detecting increases in sodium salts overtime resulting in poor water quality which could be wrongly attributed to the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 by REN while the real cause is the over pumping due to the high demand. The results of the likely negative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on water and water supply infrastructure are summarised in Tables 6.27 - 6.29.

Plate 6.9: The reality of life and access to portable water for many rural communities in Kavango West and East Regions. Local communities travel for long distances of up to 10 km for some villagers to have access to clean drinking water.

Plate 6.10: One of the twenty (26) local community rural water supply boreholes supported by REN as part of the CSR and ESG programmes and being implemented in Kavango West and East Regions in line with the Ministry of Agriculture, Water and Land Reform (MAWLR) rural water supply programme.

Table 6.27: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the surface and groundwater quality.

Likely negative physical impacts on the surface and groundwater quality because of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73	*Status*	Negative
	Probability	Improbable
	Confidence	High
	Extent	Site-Specific
	Duration	Very short
	Intensity	Mild
	Significance	Low

Table 6.28: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on increased water consumption / depletion of water resources.

Depletion of water resources due to. increased water consumption / during the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73	*Status*	Negative
	Probability	Definite
	Confidence	High
	Extent	Site specific
	Duration	Very short
	Intensity	Mild
	Significance	Low (Water usage yields are approximately 60000m^3 per annum (similar usage as a local community borehole/water well in rural area)

Table 6.29: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the existing local community water supply infrastructure near the stratigraphic well sites.

Likely negative physical impacts (damage) on the existing local community water supply infrastructure near the stratigraphic well sites	*Status*	Negative
	Probability	Negligible
	Confidence	High
	Extent	Site specific
	Duration	Very short term
	Intensity	Mild
	Significance	Low

6.7.15 Likely Negative Impacts on Security, Health, and Safety

Security, public safety, occupational health, and safety security is a major concern are all very important component to any project operations with respect to the local community and workers. During the project course, security issues may escalate due to free movement of people. The increase in human activity, including vehicle and drilling activities, could increase the potential for human-related conflicts, including ignition of wildfires and loss of property or equipment. During the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73, the workers, visitors, and the local community may be exposed to occupational and health hazards not normally encountered during day-to-day life or activity in the area. Accidents between vehicles or vehicles and humans or wildlife may occur. Workers or local people may be exposed to other risks such as falls, fires, and attacks from criminal elements.

The Proponent as well as the contractors and subcontractors will be required to have security detail, public safety and Occupational Health and Safety (OHS) procedures and manuals specifically for the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL

No. 73. Table 6.30 summarises the likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the community and workers security, public safety, Occupational Health, and Safety

Table 6.30: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the community and workers security, public safety, Occupational Health, and Safety.

Security, public safety, occupational health, and safety of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on the local people and workers	*Status*	Negative
	Probability	Improbable; Addition to the already existing structures and disturbed land
	Confidence	High
	Extent	Local (within 5 km of project area)
	Duration	Long-term
	Intensity	Mild
	Significance	Low

6.7.16 Likely Negative Impacts on Noise and Vibrations

The maximum tolerable noise level for workers without hearing protection over an 8 hours period is 90 dBA. A 3-dBA increase (up to 120 dBA) is allowed for every halving of daily exposure so the maximum tolerable noise level for 2 hours of exposure is 96 dBA (i.e., plus 6 dBA). If operator noise levels experienced may exceed 90 dBA, it is likely that the noise levels may present a problem for the workers without hearing protection equipment. Drilling rigs tend to produce noise levels of 60 to 65 dBA at around 150m from the rig. Effective noise control measures can significantly reduce sound levels.

The noise levels from the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 will not exceed 75 dB (A) beyond the boundary of each drill site. However, it is hereby recommended that each of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites shall be located at least more than 300 m away from any nearest settlement. Personal protective equipment will be provided to all the site workers and visitors and their proper usage shall be ensured for eardrum protection of the workers and visitors.

The ecological studies carried out during the study period and secondary data indicates that there are no endangered, rare, and threatened faunal species within and around the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites. There are no ecologically sensitive areas or proclaimed national park near (within 5 km radius) the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites.

Vibrations from the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 will also not affect the local water quality or cause damage to the subsurface structures of the local water supply wells and aboveground infrastructure such as tanks or reservoirs because the actual drilling sites are situated away from existing sensitive infrastructures.

Overall, localised, and limited noise and vibrations may be associated with the support vehicles in the local area but the movement will be limited. The actual well locations will be associated with the noise generation and vibrations from the drilling and supporting equipment such as diesel generators and vehicle movements that could affect the drilling crew, close neighbouring communities and their livestock, and wildlife.

Noise sensitive areas that must be avoided include: Conservancies especially the wildlife management zones, national park, birds nesting sites, schools, clinics, and villages. However, no significant impact is anticipated due to the localised and temporal nature of this project and its expected localised (less 5 km radius) low noise and vibrations levels to be generated (Table 6.31).

Table 6.31: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to noise and vibrations.

The drilling equipment and all the supporting vehicles will likely be associated with the noise generation and vibrations that may affect the drilling crew, very close neighbouring communities, if any and their livestock, and wildlife	*Status*	Negative
	Probability	Improbable
	Confidence	Medium
	Extent	Site-specific (within 5km radius of influence)
	Duration	Very Short
	Intensity	Negligible
	Significance	Low

6.7.17 Likely Negative Impacts of Emissions and Influence on Air Quality

The drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 may also be undertaken during the dry season between April to October when local winds can raise substantial quantities of dust especially along the gravel and sandy roads and tracks. Air quality variation relates primarily to changes in the wind-speeds in the area, and the associated particulate dust that it transports from one place to another and affecting the air quality.

The disturbance of fine grained (fine silt to clay sized particles) soils by vehicles traversing the area may lead to airborne dust during windy conditions resulting in poor local air quality. However, the scale of these transient fugitive dusts is insignificant (more so in relation to dusts raised by the strong winds in the general open areas), and would not significantly alter the ambient air quality.

Locally onsite air quality may also be affected by exhaust emissions from vehicles and machinery, but this is also of a transient and insignificant nature. Sources of offensive but localised odours would include exhaust emissions from vehicles and other equipment, as well as poorly managed waste storage / transfer and sanitary facilities at the campsite area. Likely localised air quality impacts that may be associated with local drilling sites coupled with traffic movements will be negligible (Table 6.32).

Table 6.32: Likely negative environmental impacts assessment drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 on dust and air quality.

Drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 dust generation and influences on the air quality.	*Status*	Negative
	Probability	Improbable
	Confidence	Medium
	Extent	Site-specific
	Duration	Very Short
	Intensity	Negligible
	Significance	Low

6.7.18 Likely Negative Impacts of Drill Cuttings and Drilling Fluids

Drilling fluid will be used to cool the drill bits and carry the rock cuttings from the well bottom to the surface. REN is using a 100% organic, water-based drilling fluid system that minimises environmental impacts. This system incorporates the latest biodegradable water-based technologies for both safe drilling and surface/subsurface environmental protection.

This system is the most expensive of water-based approaches. The water-based system we have opted to use has been approved for use by stringent regulatory regimes for many projects in North America, Australia, Middle East, other parts of Africa and in Europe.

The reserve pit adjacent to the drilling rig and, along with storage tanks, is where the excess drilling fluids and cuttings are managed. An organic gel/clay barrier at the pit base prevents seepage into

groundwater and soils. This approach is better than polyurethane pit linings, which are easy to install but challenging to remove during reclamation, which can lead to shredding and leaks.

Like most oil and gas wells, the rocks being drilled through for the three exploratory wells are environmentally benign and any fluids encountered while drilling stay in the formation due to the equivalent circulating density of the drilling fluid system. The cuttings from the well are also being captured and bagged, with half of the cuttings set aside for the Namibian government for future study. REN is having the cuttings analysed by international and nationally-based environmentally focused laboratories.

Overall, the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 and the generation of cuttings and excess drilling fluids will not have an impact on the receiving environment and the results of the assessment are shown in Table 6.33.

Table 6.33: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to cuttings and drilling fluids generation and management.

Influence of the cuttings and drilling fluids management practices at the stratigraphic well sites	*Status*	Negative
	Probability	Improbable: Cuttings and drilling fluids management procedures will be undertaken in a sealed cutting pit. Drilling fluid is biodegradable water-based system.
	Confidence	Medium
	Extent	Local (<5 km)
	Duration	Very short term
	Intensity	Negligible
	Significance	Low

6.7.19 Likely Negative Impacts of Solid and Liquid Waste Generation

The types of general waste that will be generated at the drilled sites and/or work sites during the drilling operation can be grouped into two categories, namely non-hazardous and hazardous. The non-hazardous wastes would include: Domestic wastes and effluents, plastics, metal cans, and paper. The hazardous wastes would include: Medical and pharmaceutical wastes, waste oils, and used batteries.

REN has contracted a professional waste management company, Rent-A Drum based in Rundu to handle non-hazardous and hazardous solid and liquid waste from the stratigraphic well sites. The solid waste generation is limited to spent drill bits, packaging wastes and used containers. The only hazardous waste generated in exploratory drilling operations is spent lube oil.

Waste oil and any contaminated soil during the operations drill rig movements will all be handled by the waste management contractor. The drilling sites will be equipped with a permanent and mobile French drain or chemical toilets as may be applicable for the management of waste water. Waste bags for management of solid waste will be made available at the drill sites.

Burial of solid waste around the drill sites, or anywhere within or outside the AOI within PEL No. 73 area is prohibited. All solid and liquid wastes collected at the drilling sites will be disposed at an approved municipal facility at Rundu.

The summary of the likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to waste (solid and liquid) management is shown in Table 6.34.

Table 6.34: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect to waste (solid and liquid) management.

Drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 likely Influences on the solid and liquid waste generation and management practices	*Status*	Negative
	Probability	Improbable; Limited volumes with waste management procedures in place and sources sorting infrastructures for effective onsite solid waste management will be provided
	Confidence	Medium
	Extent	Local (<5 km)
	Duration	Very short term
	Intensity	Negligible
	Significance	Low

6.7.20 Likely Negative Impacts on Archaeological and Cultural Resources

The drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 will not likely to affect local archaeological resources although existing disturbance of the areas through previous land-use system and existing infrastructure development activities would or might have probably already compromised some of the sites if existed.

Due to their established significance, the identified archaeological sites within the AOI will be treated as “no go zones” and no disturbances should occur given their vulnerability nature and sensitivities. The “chance finds” procedure which covers the actions to be taken by the Proponent if a heritage site or item has been discovered, must be always implemented.

This will involve the reporting to the National Heritage Council (NHC) the discovery of any suspected archaeological resources so that investigation and assessment by a trained archaeologist or other appropriately qualified person can be conducted.

The “chance finds” procedure is intended to ensure compliance with the relevant provisions of the National Heritage Act, 2004, (Act No. 27 of 2004), especially Section 55 (4): “a person who discovers any archaeological object must as soon as practicable report the discovery to the Council”.

Table 6.35 summarises the likely negative environmental impacts assessment results of drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 on the archaeological, paleontological, and historical resources.

Table 6.35: Likely negative environmental impacts assessment results of drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 on the archaeological, paleontological, and historical resources.

Disturbance / damage of sites of archaeological, historical and/or cultural value during the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73	*Status*	Negative
	Probability	Improbably (Drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 will be localised covering about 3Ha footprints and will not be located near archaeological, historical and/or cultural sites).
	Confidence	Low
	Extent	Site Specific
	Duration	Permanent
	Intensity	Very Severe; if archaeological artefacts, cultural or historical sites are destroyed
	Significance	Low

6.7.21 Likely Negative Impacts of an Accidental Major Event

Different types of accidental events may occur during the drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73. Such accidental events may include: Personal injury, fire, collisions between vehicles, collisions between vehicles and humans or animals, fuel /oil pollution on land from storage, tanks or pipe leaks or rupture or accident during transportation by trucks. To effectively manage all the accidental events that might occur, the Proponent shall prepare an Emergency Response Plan (ERP) linked to specific operational procedures in line with both the national regulations and best practices in the oil and gas industry. In line with the REN emergency organisational response structure as outlined in Fig. 6.9, all emergencies shall be handled in accordance with the level of emergency at hand. In line with international best practise, Incident Command System (ICS) has been used to provide a basis for the response structure. ICS allows for a response organisation to be scaled up or down accordingly, reflecting the growing or reducing requirements response needs through to final demobilisation. To achieve these objectives REN ERP involves the following three (3) levels of responses as detailed in the ERP:

- **Level I - Operational Response**: Managed by the incident facility/site, using the resources available on site;
- **Level II - Tactical Response**: Supporting the decisions and actions taken by the Level I response teams; and provide the additional resources needed for emergency control. The Emergency Management Team, are responsible for issues such as, onsite workers reconciliation, contractor liaison, logistical support, information gathering for corporate public relations and initial statutory notifications etc, and;
- **Level III –Strategic Response:** Supporting and monitoring the actions and effectiveness of the Level II Emergency Management Team, the Level III Crisis Management Team shall concentrate on the long-term strategic implications of the emergency. The legal and reputational issues created by the emergency, and long-term recovery issues.

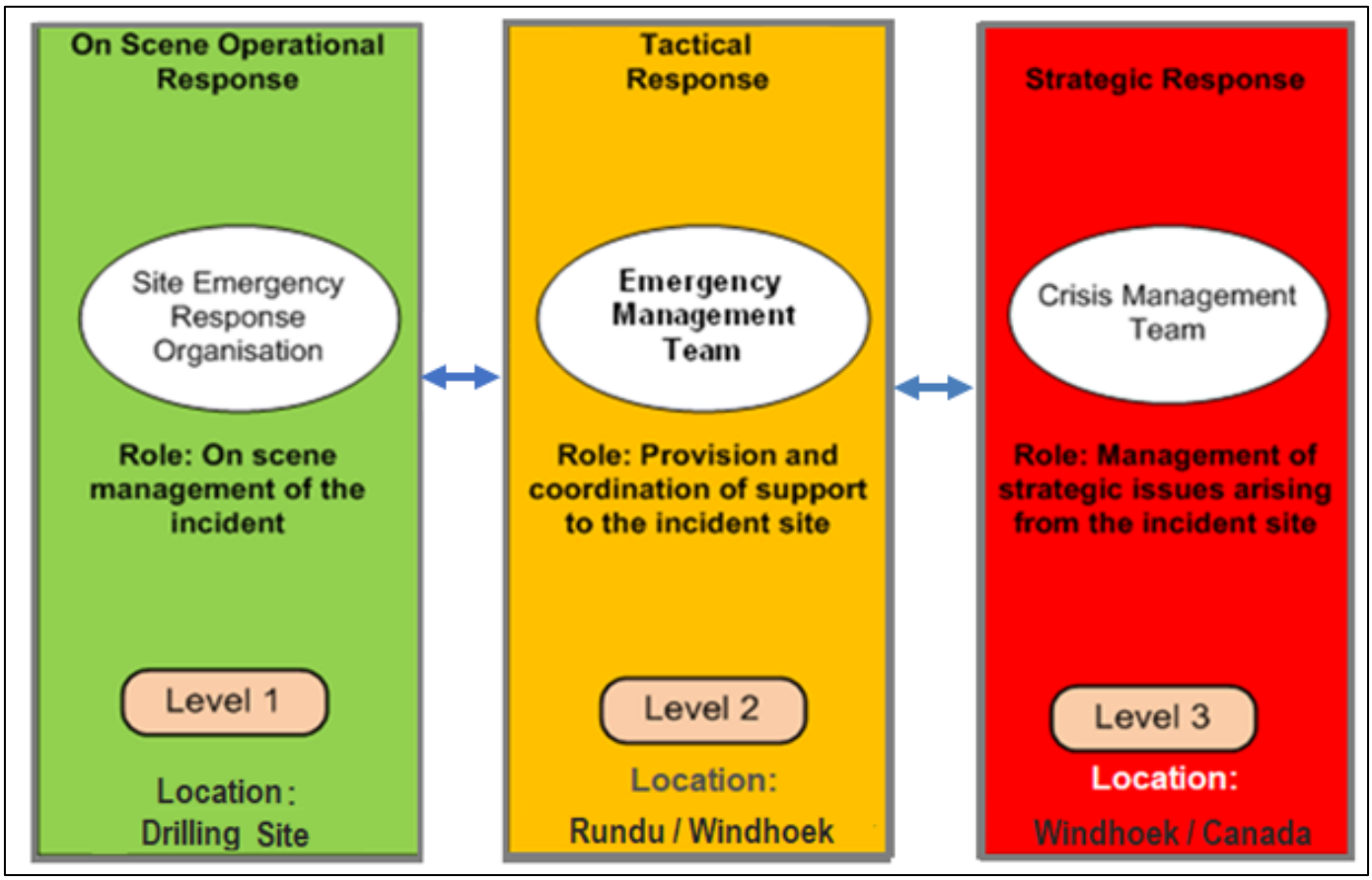


Figure 6.9: Detailed response level and appropriate management response.

REN maintains a three-team response organisation for emergency response with respect to the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 and these are: Level 1 Tactical Response Team (TRT), Level 2 Emergency Management Team (EMT), and Level 3 Crisis Management Team (CMT). This approach provides for the following and lined to emergency response effectiveness:

(i) Response Focus: The relevant team assumes responsibility for the activities most appropriate to its capabilities in terms of personnel, resources, and knowledge;

(ii) Clear Communication: It institutes clarity and accountability for incident communications, and;

(iii) Flexibility: The mobilisation of response personnel and resources is appropriate to the nature of the event.

Table 6.36 summarises the likely negative environmental impacts assessment results of drilling of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 with respect accidental events.

Table 6.36: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73 with respect accidental events.

Occurrence of an accidental event such as personal injury, fire, collisions between vehicles, collisions between vehicles and humans or animals, fuel / oil pollution on land from storage, tanks or pipe leaks or rupture or accident during transportation during the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites in the AOI within PEL No. 73	*Status*	Negative
	Probability	Improbable; An Emergence Response Plan (ERP) and onsite firefight equipment will be put in place as part of the project implementation
	Confidence	Medium
	Extent	Site-specific
	Duration	Very Short
	Intensity	Mild
	Significance	Low

6.7.22 Likely Negative Impacts of Loss of Well Control and Oil Spill

The most prevalent drilling hazards are associated with abnormal pressures and Hydrogen Sulphides. These two (2) operational challenges and risks can be caused by various factors including: Geological faults and structures, pipe sticking and drill pipe failures, lost circulation, borehole deviation, pipe failures, borehole instability, formation contamination, hydrogen sulphide or other gas, hydraulic fracturing, buried valleys, and man-made features. The potential for encountering shallow gas is believed to be generally low based on the results from the previous well sites 6-1, 6-2 and 8-2 drilled in the AOI and PEL 73. Table 6.37 summarises the perceived operating risks and mitigation measures that have been applied to the previous wells drilled in area and similar risk management strategies will be applied to the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 well sites.

Table 6.37: Perceived operating risks and mitigation (Source: REN, 2021).

Risk	REN Mitigation Measures
Abnormal Pressures	• No abnormal pressures are expected. • Obtain valid leak-off test (LOT) at each casing seat. • Consider drilling each hole section with maximum anticipated energy output available to minimise downtime due to wellbore stress imbalance.
Hydrogen Sulphide	• No evidence of Hydrogen Sulphide (H_2S) in produced fluids within the Kavango Sedimentary Basin, however due to low well density, the presence of H_2S cannot be entirely discounted. • H_2S scavenger will be available for mud system if required to remove H_2S from mud system. • Minimum mud pH will be 9.1 • Mud logging unit will be equipped with H_2S detection.

REN applies a rigorous approach to engineering well design, control, and blowout prevention with the emphasis on prevention through the application of a series of measures as discussed in the following sections. Control measures are designed using a three-tier approach and are based on a thorough understanding of risks associated with the type of wellbeing drilled.

Primary well control measures such as hydrostatic pressure and secondary measures such as the use of Blow-Out Preventers (BOPs) include a number of preventative dual barriers between the well and the external environment to avoid a loss of well control, with a number of elements included to ensure a robust series of primary and secondary barriers.

Tertiary well control of drilling a relief well is applied in the highly unlikely situation in which all primary and secondary barriers fail sequentially.

Based on the overall risk assessment undertaken, the probability for an oil spill occurring with respect to the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites to confirm the presence of the Kavango Sedimentary Basin is very low because of the sound well design and engineering standards used, high sites operation operational practices to be adopted and the likely shallow well depths meant for logging purposes (study of the geology) and with no specific targeted reservoir structure anticipated to hold hydrocarbons at each of the targeted stratigraphic well locations.

The drilling locations do not fall within a sensitive environment with the local and surrounding well areas comprising thick Kalahari Sands with grass, shrubs and mature trees and enough space for the drilling rig and camp site areas without need to clearing an expansive area more than 3Ha.

In line with the international guidance on risk assessment for oil spill, a five (5) steps approach was adopted as detailed in the OSCP. The following is the summary of the key steps that were undertaken as part of the oil spill risk assessment process associated with the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73:

- Identification of Oil Spill Scenarios: Potential scenarios that may lead to an accidental release of oil are identified. The source of the spill, event, oil type and volume were considered. This has been achieved by conducting a risk assessment analysis in order to understanding the key processes and issues that may result in potential oil spills. The results of this step were recorder in the risk register.

- The level of impact and likelihood of occurrence of all oil spill scenarios were identified semi quantitatively assessed (Table 6.38).

- The potential impact and likely extent of damage.

- The tiered response approach and response strategy suitable for each scenario has been defined. Influencing factors include: oil type, spill volume, proximity to sensitive resources and response capability, and.

- The risk assessment process was completed by determining the level of impacts in terms of low, medium or high risk as shown in Table 6.39.

Table 6.38: Guideline levels of likely impacts and likelihood of occurrence.

Severity	Environment	Likelihood	Definition
1	Slight impact (Very Low)	A	Never happened of in the industry
2	Minor local impact (Low)	B	Heard of in the industry
3	Moderate regional impact (Medium)	C	Has happened in the organisation or more than once per year in the industry
4	Major national impact (High)	D	Has happened at the location or more than once per year in the organisation
5	Extensive international impact (Very High)	E	Has happened more than once a year at the location

Table 6.39: Spill scenarios, risks, and response assessment.

No.	Source and Location	Event	Oil Type	Volume	Impact	Level Impacts (Table 2.2)	Level Impacts (Table 2.1)	Risk	Response Strategies	Tiered Resources
1	Drilling Location	Minor operational spill during fuel transfer	Diesel, Lube oil, hydraulic oil, oil contaminated drilling mud etc.	<1 m³	Rig deck spill unlikely to reach surrounding operational site areas	B	1	Low	Deck / local area clean-up expected to be undertaken for a spill of this size	Appropriate Tier 1 resources such as the on-board spill kit. This will include sorbents, sand, plastic sheeting, PPE, shovels, rakes and buckets.
2		Full bore release of diesel due to transfer hose rupture Fitted at either end of hose so worst-case scenario would be loss of entire capacity hose	Diesel	>1 m³						
3	Drilling Location, Rundu Operations Base or D3425 Logistic Road Between Rundu and Drilling location	Loss of all diesel / fuel from a single tank	Crude / Diesel, Lube oil, hydraulic oil, oil contaminated drilling mud	>100 m³	Local site spillage likely to reach only immediate surrounding site areas	B	2	Low	Containment and recovery of oil where possible. Shoreline clean-up operations and continual aerial surveillance.	All available Tier 1 resources Consider Tier 2: As may be required subject to event escalation
4	Drilling Location	Major loss of well control during operations resulting in a release of oil until the primary well has been exhausted.	Crude	>500 m^3/day	Deck spill likely to reach surrounding beyond the operational site areas and habitats impacted Government and national media interest guaranteed	B	3	Low	Extensive containment and recovery, clean-up and continual surveillance	All available Tier 1 and Tier 2 as well as Tier 3 Third-Party Services Providers External Resources such as Oil Spill Response Ltd (OSRL) in the UK with Oil spill equipment stockpiles in Malabo Equatorial Guinea and Cape Town South Africa

6.7.23 Likely Negative Impacts on Climate Change

According to the 2020 fourth National Communication to the United Nations Framework Convention on Climate Change published by the MEFT, Namibia's already low climate resilience and adaptive capacities continue to be threatened by changes in temperature and precipitation, periodic droughts, and floods. Namibia's future vulnerability to climate change will be determined by the nature of the biophysical changes to which its population, economy and livelihoods are exposed, and by national and individual capacities to manage, recover from, and adapt to these changes (Republic of Namibia, 2020).

The Paris Climate Accords, adopted in 2015 and the subsequent UN Climate Change Conferences of the Parties (COPs) have global commitment goals of limiting global warming to below 2°C (and ideally below 1.5°C) above pre-industrial levels. Namibia is one of the highly vulnerable nations, such that even a 1.5°C increase in global temperature will have severe local impacts, negatively affecting the agriculture, water, health, and biodiversity sectors (Republic of Namibia, 2020).

According to the 2021 Namibia's Updated Nationally Determined Contribution published by the MEFT, Namibia's mitigation commitment is in the form of a decrease in Greenhouse gasses (GHG) emissions compared to the Business as Usual (BAU) baseline over the 2015-2030 period. The 2021 updated national document presents an improvement in the commitment of the devotion of Namibia to meeting the Paris Agreement goal and following the road to net zero emissions by 2050. Namibia has committed to reducing its GHG emissions conditionally by at least 91% of its BAU scenario by reducing emissions by 21.996 MtCo2e (14%) unconditional part and 77% conditional part) in 2030 compared to BAU (24.167 MtCo2e) (Republic of Namibia, 2021). Adaption is still a relevant feature in Namibia and the country is considered one of the most vulnerable countries to the impacts of climate change (Republic of Namibia, 2021). The country is particularly vulnerable to flooding and droughts. According to the Republic of Namibia, (2021), Ministries with adaptation relevance proposed a total of 49 priority actions with agriculture, tourism and fisheries sectors being critical for adaptation. Several ministries have set goals for both youth and women's participation because gender-balanced training and the promotion of the youth and women are seen as relevant to the adaptation drive (Republic of Namibia, 2021).

Namibia is working towards reducing the effects of global warming on communities and sectors through short and long-term resilience and adaption strategies. In the energy sector, the national sustainable energy strategy of Namibia looks to introduce new emissions-reducing technologies and encourage healthier practices that are more energy efficient. According to the 2021 Namibia's Updated Nationally Determined Contribution published by the MEFT, the projected net cost of the Updated Nationally Determined Contribution (NDC) mitigation measures to be implemented in Namibia is expected to be approximately USD 3.61 billion by 2030 and more than USD 1.72 billion for adaptation targets, representing a total funding need of approximately USD 5.33 billion (or N$ 77 billion). To put this figure of N$ 77 billion into the current and as at February 2022 national budget projections of Namibian fiscal context as published by the Ministry of Finance and Public Enterprises (MFPE), the total estimated revenue for the Financial Year 2022/2023 is N$ 59.7 billion with a budget deficit of 5.6 percent of Gross Domestic Product (GDP) at N$ 11.1 billion. Interest payments for Financial Year 2022/23 will increase to N$9.21 billion in response to new borrowing to fund the budget deficit. Debt servicing will represent 15.4% of total revenue.

Based on the current fiscal standing of Namibia for Financial Year 2022/2023 and beyond, it will be extremely challenging and impossible for the country to be able to finance the N$ 77 billion NDC mitigation budget measures by 2030 without heavily relying on drying-up and scarce handouts, donations, loans, and grants from developed countries. The current and envisaged green environmental financing models that are dependent on handouts, donations, loans, and grants from developed countries coupled with massive socioeconomic challenges and rural inherited generational poverty, will see Namibia struggle to achieve its NetZero by 2050. As such Namibia cannot afford to abruptly stop all greenhouse emitting industries such as oil and gas exploration and switch to green energy overnight. Even the developed and industrialised countries responsible for all the historical, current and the next thirty (30) years of greenhouse gases emissions have adopted long-term strategies of transforming to greener economies and hope to achieve NetZero by 2050 and beyond.

Namibia is a developing country struggling economically with high levels of debt, high youth unemployment, high poverty levels, challenging social economic issues, riddled with unequal

distribution of prosperity with the majority of the indigenous Namibians swimming in inherited generational poverty. The adoption of coexistence developmental approaches in the diversification of the national resources base will greatly help the country to widen its income base and financial independence to be able to fund both the short- and long-term climate change resilience and adaption strategies for the benefit of all Namibians.

The exploration drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 can be classified as a small, short-term, local project aimed at supporting the development onshore fossil fuel opportunities in the Kavango Sedimentary Basin, while at the same time will provide datasets that could support the development of other sectors such as the search geothermal energy, minerals resources energy, solid state minerals resources (base and rare metals) as well as Carbon Capture Storage (CCS) geological systems. The drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 inclusive of all the supporting activities are likely to be associated with the releases of localised and site-specific emissions that may have only localised influences on the local climate with negligible regional (Kavango East and West Regions), national (Namibia), or global significance.

The drilling and supporting equipment will locally emit greenhouse gases and various air contaminants, including sulphur oxides, nitrogen oxides, carbon monoxide and particulate matter. Within the PEL 73 and AOI areas, Climate Change threats have direct impacts on the natural receiving environment and food security. The local release of airborne particulate matter cannot only come the drilling and supporting equipment but also from various local and regional (Kavango East and West Regions) natural and human activities such as wildfires, current land uses including subsistence agriculture of slash and burn, and rural household energy sources such as firewood. It is important to note that all the equipment to be used for the proposed drilling operations will be serviced and maintained regularly. The proposed drilling operations will be overseen by experienced and trained personnel and the operation will adhere to the provisions of the national and international best practices, and the applicable national legislation and regulations.

The short-term duration of the proposed drilling activities will result in local low cumulative negative impacts, and negligible cumulative Climate Change impacts for the regional (Kavango East and West Regions), national (Namibia) and global. There will be no long-term Climate Change impacts at local, regional (Kavango East and West Regions), national (Namibia) and global cumulative impacts following cessation of the proposed drilling operations activities. Table 6.40 summarises the likely negative environmental impacts assessment results of the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 with respect to the contributions to local (drill sites), regional, (Kavango West and East Regions), national (Namibia) and global Climate Change.

Table 6.40: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 with respect to the contributions to local (drill sites), regional, (Kavango West and East Regions), national (Namibia), transboundary (KAZA Area) and global Climate Change.

Contributions to contributions to local (drill sites), regional, (Kavango West and East Regions), national (Namibia) and global Climate Change	*Status*	Negative
	Probability	Improbable: Unlikely due to very limited scale of the and duration proposed operations
	Confidence	High
	Extent	Site-specific
	Duration	Very short-term
	Intensity	Low
	Significance	Low local implications- In seeking the best path forward to address the country's energy deficit, the Government of Namibia is wisely considering many solutions, including oil and gas exploration, geothermal and biomass assessments, as well as examining wind and solar power alternatives. Overall negligible regional (Kavango East and West Regions), national (Namibia), or global significance

6.7.24 Likely Negative Cumulative Impacts

Cumulative impacts are those impacts which result from the incremental impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 when added to other past, present, and reasonably near future activities such as agriculture, tourism, conservation, forestry, new settlements due to population growth and new land allocation.

The cumulative impacts on the habitats, fauna, and flora species, ecosystem functions, services, use values and non-use, physiography and geological resources, water, and water supply infrastructure vulnerability within AOI in PEL No. 73 are considered insignificant. The drilling of each of the proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 will be conducted on 3Ha size local piece of land over a period of 2-3 months. There will no cumulative negative impacts on the receiving environment following the cession of drilling within the AOI and PEL No. 73.

All other operational related impacts such as increased pressures on existing infrastructures, current and future land uses and services, visual, noise, dust, vibration, waste management, security, public safety, Occupational Health and Safety (OHS) and accidental events will be short-term and site-specific and with less additional influence by the other past, present, and reasonably near future activities. The scale of fugitive particulate material generation and their negative impacts on the surrounding environment will be negligible, particularly because the naturally localised strong winds have a much greater impact in this regard.

The scope for cumulative impacts on archaeological and cultural sites from the proposed activity are low, because the drilling operations will highly localised and undertaken on areas that are not sensitive. If archaeological and cultural sites are identified, they can easily be avoided by offsetting the well site and flagged so as not to be disturbed during the operations. Table 6.41 summarises the likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 with respect to the negative cumulative impacts on the receiving environment.

Table 6.41: Likely negative environmental impacts assessment results of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 with respect to cumulative impacts on the receiving environment.

Cumulative impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 on the receiving environment such as socioeconomic, habitats, fauna, and flora species, ecosystem functions, services, use values and non-use use, physiography and geological resources, water, and water supply infrastructure vulnerability and other components of the receiving environment	*Status*	Negative
	Probability	Improbable
	Confidence	Medium to High
	Extent	Site-specific
	Duration	Very short
	Intensity	Low
	Significance	Negligible: The short-term duration of the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 will result in negligible cumulative negative impacts on the environmental and social factors, with no long-term negative cumulative impacts following the cessation of the drilling operations. Even if all the twelve (12) wells were to be drilled, the total ground footprint of the operations will be around 36 Ha of the 2534133 Ha size of the Kavango Sedimentary Basin

6.8 Overall Impact Assessment Process

6.8.1 Overall Impact Assessment Results of Individual Components

The overall impact assessment of the individual components of the receiving environment covering the magnitude, duration, extent, and probability of the potential negative impacts occurring due to the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the

AOI in PEL No. 73 interacting with the various components of the receiving environment is presented in form of a matrix table shown in Table 6.42.

The overall negative assessment as shown in Table 6.42 is based on the grading of the positive and negative impact assessment results of the individual components of the receiving environment as shown in Tables 6.9-6.14 and 6.15-6.41, respectively.

The overall severity of potential environmental impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 on the receiving environment will be of low magnitude, temporally duration, localised extent (3Ha footprint), and low probability of occurrence due to the limited scope of the proposed activities and the adoption of step-by-step progression approach in advancing exploration process.

The standard resources step by step approach to exploration will allow the Proponent to continuously review and update the various components / baseline of the receiving environment as may be applicable against the results of exploration success.

The implementation of the subsequent stage/s of exploration will be subject to the positive outcomes of previous activities as graded and will require separate environmental assessment process and permits as may be applicable.

6.8.2 Assessment Results of the Overall Significant Impacts

The assessment results of the overall significant impacts depended upon the degree to which the process of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 is likely to result in unwanted consequences on the receptor / various component of the receiving environment.

Overall, the assessment of significant impacts has focused on the ecosystem-based approach that considers potential negative impacts to the local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) and global interconnected ecosystems.

The main key sources of impacts that have been used in the determination of significant impacts are all the activities associated with the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73. Each of the key source area/ step of negative impact have been identified and assessed as follows:

- 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.

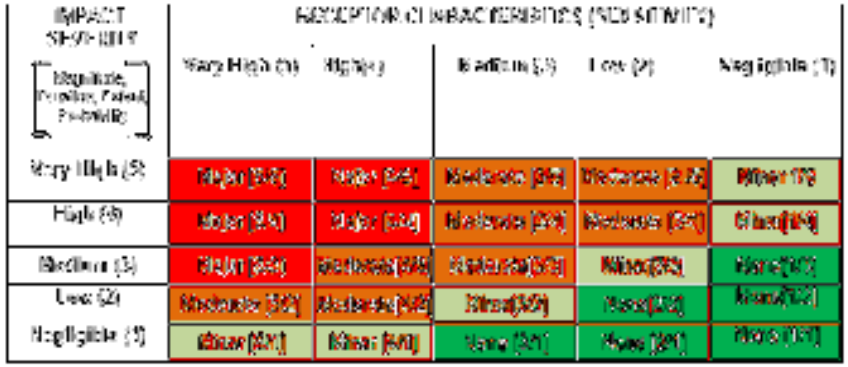
Overall, the results of the significant impact assessment for the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 are shown in Table 6.43. It is important to note that the assessment of the likely negative impacts on the receiving environment as shown in Tables 6.15-6.41, have been considered without the implementation of mitigation measures detailed in the separate EMP Report.

The need for implementation of the appropriate mitigation measures as presented in the EMP Report have been determined based on the results of the positive (Tables 6.9-6.14) and negative impact assessment (Tables 6.15-6.41) and the overall significant impacts assessment results as detailed in Table 6.43.

Table 6.42: Summary results of the overall likely impacts of drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 on the individual components of the receiving environment with respect to duration, geographical extent, and probability occurrence.

SENSITIVITY				PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT					SOCIOECONOMIC, CULTURAL, AND ARCHAEOLOGICAL ENVIRONMENT				
SENSITIVITY RATING		CRITERIA		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 Forestry	Tourism and Recreation	Cultural, Biological and Archaeological Resources
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.	Preconstruction and drilling requirements	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
		2.	Construction phase	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
		3.	Mobilisation	-1	-2	-2	-1	-1	-1	-1	-1	-1	-1	-1	+4	-2	-2	-2	-2
		4.	Spudding and Conductor casing	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
		5.	Drilling surface / intermediate and setting casing and cementing process through up 900 m	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
		6.	Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234')	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
		7.	Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202')	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
		8.	Plug and abandon hole	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
		9.	Rehabilitate all surface disturbances and clear the site of any debris	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
		10.	Camp removal, site closure and restoration / abandonment/ handover	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	+4	-2	-2	-2	-2
	UNPLANNED ACCIDENTAL EVENTS	11.	Major land accidental incidence such as diesel / oil spill/ fire / explosion (Note: Well Control arrangements and related Emergency Response Plan (ERP) are designed to bring the risk of any unplanned accidental event to ALARP (As Low As Reasonably Practicable) and tolerable	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2

Table 6.43: Summary results of the overall likely significant impacts that the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 will have on the components of the receiving environment with respect to duration, geographical extent, and probability occurrence.



				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 Forestry	Tourism and Recreation	Cultural, Biological and Archaeological Resources
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	1.	Preconstruction and drilling requirements	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		2.	Construction phase	-3/2	-3/2	-3/2	-3/2	-3/2	-1/1	-3/2	-1/1	-3/2	-3/2	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		3.	Mobilisation	-3/2	-3/2	-3/2	-3/2	-3/2	-1/1	-3/2	-1/1	-3/2	-3/2	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		4.	Spudding and conductor casing	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		5.	Drilling surface / intermediate and setting casing and cementing process through up 900 m	-3/2	-1/1	-3/2	-3/2	-3/2	-3/2	-1/1	-1/1	-1/1	-1/1	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		6.	Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234')	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		7.	Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202')	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		8.	Plug and abandon hole	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		9.	Rehabilitate all surface disturbances and clear the site of any debris	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
		10.	Camp removal, site closure, restoration / abandonment /handover to community / land owner	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+4/4	-1/1	-1/1	-1/1	-1/1
	UNPLANNED ACCIDENTAL EVENTS	11.	Major land accidental incidence such as diesel / oil spill/ fire / explosion	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary of Conclusions

The proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites areas inclusive of the supporting infrastructures such as the new access roads to each of the proposed new well sites, the use of existing borrow pits as well as all other supporting services form part of the ongoing petroleum exploration activities within the AOI in PEL No. 73. The key AOI interests (Kavango Sedimentary Basin Area) targeted by the REN inclusive of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites areas do not fall in sensitive areas such as a national park or groundwater protection zone or highly active catchment area.

The overall areas targeted for the proposed drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 falls within KAZA TFCA which is a multiple land use regional transboundary conservation initiative with a common vision of promoting and supporting sustainable rural livelihoods through coexistence and utilisation of multiple resource and resources areas, including national parks, game reserves, forest reserves, conservancies, game/wildlife management areas and communal lands livelihoods that are dependent on seasonal subsistence agriculture, animal husbandry, fishing, natural resource harvesting, tourism, trading and hunting. The development of the subsurface resources under KAZA TFCA is not and cannot, in any way be excluded from this visionary multiple land use transboundary initiatives especially where there is opportunity for coexistence. Except for the formally proclaimed national parks in Namibia, there is no prohibition on subsurface resources exploration or utilisation within the KAZA TFCA portion of the Namibian territory and other KAZA TFCA member States.

The proposed exploration and appraisal wells Nos. D1-D6 and G1-G6 within the AOI in PEL No. 73 are not situated in the active catchment areas of the Okavango River Basin but in fossilised channels of the Omatako–Omuramba Ephemeral rivers with no surface flow into the Okavango River. Overall, the key central exploration AOI is situated about 50 km south of the Okavango River and more than 260 km from the Okavango Delta in Botswana and not related to the active catchment area of the Okavango Delta whatsoever. The overall general area falls in the sparsely populated but not pristine communal areas of the Ncamangoro and Mashare Constituencies of the Kavango West and East Regions, respectively. Ncamangoro and Mashare Constituencies falls within the boundaries of the Mbunza and Sambyu Traditional Authorities, respectively.

Overall, all human induced activities including the current land uses such as subsistence agriculture, animal husbandry, natural resource harvesting, conservation, and tourism and the proposed drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73, have the potential to cause negative consequences on the receiving physical, biological, socioeconomic, cultural, and archaeological environments. By identifying the most sensitive components of the receiving environment including high risk habitats beforehand, coupled with environmentally acceptable recommendations (mitigating factors), the overall negative impacts are likely to be minimised, while the positive impacts may be enhanced. The following is the summary of the identified positive and negative components of the receiving environment that have been evaluated and assessed with respect to the proposed drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73:

(i) Possible positive impacts: Payment of rental license fees, contributions to the PetroFund, short-term contractual employment opportunities, contribution to national subsurface knowledge-base and support to rural water supply through Corporate Social Responsibility (CSR), and cumulative impacts, and.

(ii) Possible receptors likely to be negatively and locally impacted: Habitats, reptiles, amphibians, mammals, avian, tree, shrub species, grass, socioeconomic, existing infrastructure, current and future land uses, ecosystem functions, services, use values and non-use or passive use, physiography and geology, visual and land degradation, surface and groundwater quality, increased water consumption / depletion of water resources, existing local community water supply infrastructure, community and workers security, public safety, Occupational Health, and Safety, noise and vibrations, dust and air quality, waste (solid and liquid) management,

accidental events, archaeological, paleontological, and historical resources, contributions to global Climate Change, and cumulative impacts.

The drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 will have high positive impacts on the socioeconomic environment at national, regional and community levels. The overall severity of potential negative environmental impacts on the receiving local (drill site), regional (Kavango East and West Regions), national (Namibia), transboundary (KAZA TFCA) and global environments will likely be of low magnitude, temporal duration, localised extent, and low probability of occurrence due to the limited scope and footprint of the proposed drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73. Mitigation measures have been recommended and are contained in a separate EMP Report. Through the effective implementation and monitoring of the recommended mitigation measures, the overall likely negative impacts of the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites within the AOI in PEL No. 73 on the receiving environment (physical, socioeconomic, and biological) will likely to be low and localised with negligible significant impact.

7.2 Recommendations

Based on the findings of this EIA Report, mitigation measures detailed in the separate EMP Report and the contractual provisions of the Environmental Protection Clause 11 of the Petroleum Agreement and the legal provisions of the Petroleum (Exploration and Production), 1991, (Act No. 2 of 1991), and the Petroleum Laws Amendment Act, 1998, (Act 24 of 1998), the Environmental Management Act, 2007, (Act No. 7 of 2007) and Environmental Impact Assessment (EIA) Regulations, 2012, it is hereby recommended that the proposed prioritised exploration and appraisal wells locations Nos. D1-D6 and G1-G6, inclusive of the supporting infrastructures such as the new access roads to each of the proposed new well sites, borrow pits owned by the traditional authority where construction materials will be purchased from, and other associated services, shall be granted with the a new ECC and other associated permits.

As part of the ongoing petroleum exploration programme in PEL No. 73, the following is the summary of the key recommendations with respect to the drilling of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites inclusive of the supporting infrastructures such as the new access roads to each of the proposed new well sites, the use of existing borrow pits and other associated services:

1) The Proponent shall adhere to the provisions of all the national legislation, regulations, policies, procedures, and all the required permits / authorisation / consents must be obtained before the start of the operations for each of the proposed well sites and supporting infrastructure areas.

2) Mitigation measures detailed in the EMP Report are based on the findings of this EIA Report, and have been modelled around two main concepts namely: best industry practices which are based on the Best Practicable Environmental Option (BPEO) and local Namibian requirements unique to the area of exploration.

3) All the provisions of the EMP and mitigation measures shall be implemented, adhered to and monitored and sites inspections by the external project specialist consultants and EMP monitoring teams shall be undertaken before, during and after the start of construction, operational and closure, rehabilitation and restoration activities for each of the proposed well sites and supporting infrastructure areas.

4) Before the implementation of the individual well drilling operations, the Proponent shall consult with the land owners / land rightsholder / local community / owners of the communal fields and villages that may be affected or likely to be disturbed by the proposed project activities including access to the well locations and sources of construction materials covering the existing borrow pits areas. All the consultations and engagements shall be undertaken through the existing regional and local structures covering the Office of the Governors for Kavango West and West Regions, Councillors, Traditional Authorities, Farmers Associations, Village Headpersons, and Village Development Committees (VDCs) and local community levels.

5) 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 surface user rights conflicts.

6) All borrow pits belong to the traditional authorities and construction materials must be purchased from the relevant traditional authority having jurisdiction over a given borrow pit area and a purchase agreement must be signed before construction materials can be obtained from any given borrow pit in Kavango East and West Regions.

7) Appropriate setback distances (exclusion zones) around sensitive structures such protected areas and human settlements shall always be observed. Such exclusion zone shall be for example be in the ranges of between 400m-500m from an exploration well site to a nearest settlement\ village, and.

8) 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 traditional houses, 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.

Mitigation measures have been recommended and are contained in a separate EMP Report. Through the effective implementation of the mitigation measures and performance monitoring by the Proponent, the overall likely negative impacts of the proposed prioritised D1-D6 and G1-G6 exploration and appraisal wells sites inclusive of the supporting infrastructures such as the new access roads to each of the proposed new well sites, the use of existing borrow pits and other associated services and related activities on the receiving environment (physical, socioeconomic, and biological) will be low and localised with medium to low significant negative impacts.

The process of clearing the drilling sites, access tracks, and use of existing borrow pits (Properties of the Traditional Authorities) areas as well as actual drilling operations will have localised medium significant negative impacts on the local environment without mitigation. Direct supervision, involvement, and continuous monitoring of the process of clearing of all the drilling sites, access tracks, and borrow pits areas, and actual drilling operations will reduce any likely medium significant negative impacts to low.

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4. FAUNA AND FLORA FURTHER READING

See Annex 4

4. SURFACE AND GROUNDWATER

See Annex 5

5. ARCHAEOLOGY FURTHER READING

See Annex 6

9. ANNEXES

1. **CV of the EAP / Team Leader**

2. **Detailed Specifications of the Crown 750 Drilling Rig**

3. **Reconnaissance Energy Namibia Best Practices Documentations:**
   - ***Best Practices: Environment, Social & Corporate Governance (ESG)***
   - ***Best Practices: Exploratory Drilling***
   - ***Best Practices: Water-Based Drilling Fluid Systems***
   - ***Best Practices: Water***
   - ***Best Practices: Wildlife, Flora, and Habitats***

4. **Fauna and Flora Specialist Report**

5. **Surface and Groundwater Specialist Report**

6. **Archaeological Field-Based Specialist Report**

7. **Public, Stakeholders and Community Consultations Materials**