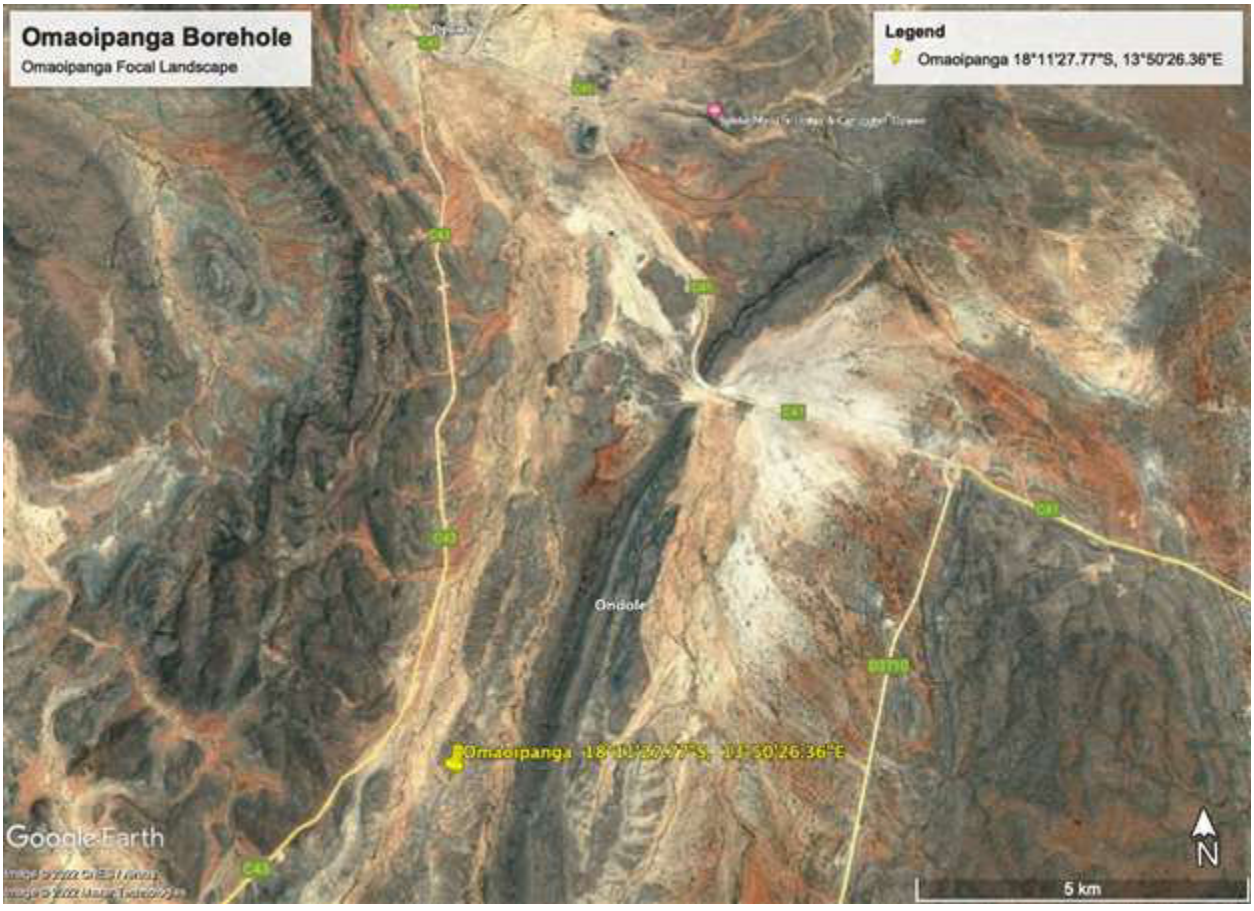
Ministry of Environment, Forestry and Tourism

NAMIBIA INTERGRATED LANDSCAPE APPROACH FOR ENHANCING LIVELIHOODS AND ENVIRONMENTAL GOVERNANCE TO ERADICATE POVERTY

NiLALEG

ENVIRONMENTAL SOCIAL MANAGEMENT PLAN REPORT FOR THE DRILLED BOREHOLE AT OMAOIPANGA VILLAGE, KUNENE REGION



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DATE	23 OCTOBER 2022
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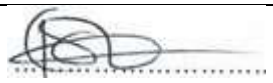
MR. IPEINGE MUNDJULU RED-DUNE CONSULTING CC	
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ACRONYMS

DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
ECO	Environmental Compliance Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act (No. 7 of 2007)
EMP	Environmental Management Plan
L	Litre
m^3	Cubic
MEFT	Ministry of Environment Forestry and Tourism
Mm^3	Million Cubic
NILALEG	Namibia Integrated Landscape Approach for Enhancing Livelihoods and Environmental Governance
PPE	Personal Protective Equipment
RD	Red-Dune Consulting CC
SEMP	Social Environmental Management Plan
SM	Site Manager

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EXECUTIVE SUMMARY

The NILALEG Project is supporting the installation of solar-powered boreholes to improve access to water for human consumption and agricultural activities in Omaoipanga Focal Landscape at Omaoipanga & Oruhozu Village in Kunene Region, Ruacana Focal Landscape at Omaoipanga and Omaoipanga Village in Omusati Region and, Zambezi Focal Landscape at Zilitene Village in Zambezi Region.

This scoping and EMP report for Omaoipanga Focal Landscape at Omaoipanga Village concluded that there are no significant social and /or environmental impacts that the project has caused. The borehole was drilled at the depth of 100m with a diameter of 254mm. The test pump indicated a yield of 3.2m^3 / hour (3200 L/hour). The first two (2) water strike was observed at the depth of 85m and 94m. The drilling inspector from Directorate of Water Supply and Sanitation Coordination from Kunene Regional Council indicated that the borehole was a success and only required analysis of water quality. During site assessment, Red-Dune was guided by the consortia Integrated Rural Development and Nature Conservation (IRDNC).

1. Introduction and Background

1.1. Project Overview

The Ministry of Environment, Forestry and Tourism (MEFT) in partnership with the United Nations Development Programme (UNDP) are currently implementing a six (6) year project called the Namibia Integrated Landscape Approach for Enhancing Livelihoods and Environmental Governance to Eradicate Poverty (NILALEG) Project with funding from the Global Environment Facility (GEF).

The project aims to "promote an integrated landscape management approach in key agricultural and forest landscapes, reducing poverty through sustainable nature-based livelihoods, protecting and restoring forests as carbon sinks, and promoting Land Degradation Neutrality".

Amongst other needs identified during the stakeholder consultations which were undertaken at the start of the project, the NILALEG Project is supporting the installation of solar-powered boreholes to improve access to clean and safe water for human consumption and agricultural activities in Omaoipanga Focal Landscape at Omaoipanga & Oruhozu Village in Kunene Region, Ruacana Focal Landscape at Okawapehuri and Ombabihaka Village in Omusati Region and, Zambezi Focal Landscape at Zilitene Village in Zambezi Region.

The aim of this study is to develop the Social Environmental Management Plan (SEMP) for the drilled borehole in Omaoipanga Focal Landscape at Omaoipanga Village, Kunene Region.

1.2. Namibian Climate

Generally, Namibia is an arid country, with a large part of country having a climatic condition characterized by high temperatures and, periodic low rainfall. Rainfall decreases from east to west, with Zambezi Region receiving the highest rainfall of 600ml/year to less than 25 ml in the Southwest and West of the country. The country experiences high climatic variability in the form of persistent droughts, unpredictable and highly variable rainfall patterns, temperatures, and scarcity of water. High solar radiation, low humidity and high temperatures lead to very high evaporation rates, which vary between 3800 ml per annum in the south to 2600 ml per annum in the north. In many areas, potential evaporation is about five times greater than the average rainfall. Surface water sources such as dams are subject to high evaporation rates.

The study area, Omaoipanga village has an extreme dry climatic condition, a typical of the Kunene Region. The area is mountainous, experience frequent droughts. Rainfall season is between February and April but highly sporadic, ranging from a mere 50mm in most cases and seldomly to about 400mm per year. The area temperatures are high with an average maximum temperature between 35^0C and minimum between 14^0C.

1.3. Water Resource Availability

1.3.1. Surface Water

The primary surface water in Namibia is found in dams, Ephemeral Rivers and Perennial Rivers which have a potential of 200 Mm^3 and 1,105Mm^3 per annum respectively. The Ephemeral Rivers in the interior flows during the raining season. Western flowing rivers drains into the Atlantic Ocean, Fish River drains into Orange River, Cuvelai system, which is not a defined River system but rather Iishanas or flood plain drains into Etosha Pan and partially contribute to Kavango, Kwando and Kunene River.

Perennial Rivers, which has permanent flow are all found on the border of the country. Zambezi in the northeast has a mean annual flow of 40,000 Mm^3, its flow per second,

180Mm^3, is about twice the overall Dams capacity in Namibia at 100Mm^3. The Kwando / Linyati / Chobe has an annual flow of 10,000Mm^3, Kunene 5,500Mm^3 and Orange River with 11,000Mm^3 flow[1].

1.3.2. Ground Water

Namibia highly relies on ground water. About 50-60% water is ground water which has a potential yield of 360Mm^3[2]. Geologically, the main aquifers are the Karst, Otjwarongo, Omaruru Delta (OMDEL), Lower Kuiseb, Windhoek, Stampriet, Koichab and Ohangwena II.

1.3.3. Other water supply

Unconventional and yet capable water resource in country includes; Desalination of seawater, re-use of semi-purified water for sports grounds and parks, re-cycling of industrial and mining water, reclamation from wastewater effluent, artificial recharge of aquifers, mixing of potable and brackish water, use and purification of brackish water, rainfall harvesting and fog harvesting amongst others.

1.4. Water Supply and demand in Namibia

Namibia has made huge progress since independence in 1990 to increase water supply from 43% supply to 93% and 85% in urban and rural areas respectively by 2019 and the country aims for 100% water supply by 2030. In 2008, total water demand in the country amounted to 334.1Mm^3 against a total supply of 422.5Mm^3, while projected demand by 2025 and 2030 are expected to double at 635.6Mm^3 and 811.7Mm^3 respectively. Irrigation schemes consumes

[1] Integrated Water Resources Management Plan for Namibia, 2010

[2] Integrated Water Resources Management Plan for Namibia, 2010 pp26

over 40% amount of total water supply in the country and by 2030, irrigation is focused to consume 64.4% of the country water supply[3].

2. The NILALEG Project

2.1. Omaoipanga Focal Landscape

2.1.1. Population Demography

Kunene region has an area of 115 293 km^2 and has six (6) constituency with a total population of 97 865[4] representing 4.2% of the total Namibia's population (fig 1). The regions' growth rate is 2.4% and has the lowest population density of 0.8 persons per square kilometers (not all region is inhabitable due to its mountainous landscape). Literacy level in the region is the lowest in the country with 66.5%.

Total Population	
Kunene	86 856
Epupa	17 696
Kamanjab	8 441
Khorixas	12 566
Opuwo	27 272
Outjo	12 447
Sesfontein	8 434

Urban Localities in Kunene	
Khorixas	6 796
Opuwo	7 657
Outjo	8 445

Figure 1. Kunene region (Source: 2011 Kunene Regional Profile)

The project landscape is located in Opuwo Rural electoral constituency which has a population of 27,272 people.

[3] Integrated Water Resources Management Plan for Namibia, 2010 pp26
[4] Namibia Inter-censal Demographic Survey 2016 Report

2.1.2. Geology, topography, and hydrology

Kunene region is made up of flat areas and areas of undulating terrains formed by hills and mountains (Fig 2). Drainage is normally from catchment formed by mountains into water streams but, seldom due to poor rainfall in the region. The main source of water in the region is ground water from boreholes.

Figure 2. Landscape at Omaoipanga borehole

2.1.3. Biodiversity

Generally, the vegetation structure of the area is predominantly sparse shrubland dominated by *mopane* (*Colophospermum Mopane*) and shrubs of Acacia species such as *Acacia hebeclada* and *Acacia mellifera.* The area has a high plant diversity.

The study area is located in the village and due to human activities, there are no wild animals, only domestic animals were observed in the area. Elephants are not known to frequent area. The people's livelihood highly depend on crop and livestock farming, particularly small stocks of goats and cattle Fig 3.

Figure 3. Goats observed at areas in Omaoipanga

2.2. Omaoipanga Borehole

2.2.1. Location

The study area, Omaoipanga village is in the electoral constituency of Opuwo Rural Constituency (-18.191046^{0}S, 13.840655^{0}E) Fig 4. The population for village was not established, however the population density is about 0.8 people / Km^2.

Figure 4. Omaoipanga Borehole

2.2.2. Borehole Information

The borehole at Omaoipanga village was drilled on 8th August 2022 by Tulu Trading Enterprise. It is drilled to a depth of 100m and has a diameter of 254mm. The borehole yields 3.2m^3/ hour of water where the first two water strike was observed at 85m and 95m (fig 5).

Figure 5. Omaoipanga Borehole

3. The need and desirability of the Project

At national level, this project is in line with the Integrated Water Resource Management (IWRM) for Namibia which aims to achieve a sustainable water resources management regime, contributing to social equity, economic efficiency, and environmental sustainability.

At regional level, Kunene region is one the driest region in the country. Annually rainfall ranges from a mere 50ml/year to a rare 400ml/year. In 2021, the office of the Governor of Kunene region coordinated a Regional Drought Assessment program which indicated that Kunene region had severe droughts for the past seven (7) consecutive years due to poor rainfall. Evidently, the area does not have surface water, the aridity of the area coupled with effect of climate change requires investments in water resource development to ensure sustainable water supply for the livelihood of the local people. Therefore the drilled boreholes is crucial towards supporting the livelihood of local people.

4. Statutory Requirement

The Environmental Management Act (Act No 7 of 2007) (EMA) and its Environmental Impact Assessment Regulation 2012, has listed Water Resource Developments activities not to be undertaken without an Environmental Clearance Certificate (ECC) as follows.

a) 8.1 The abstraction of ground or surface water for industrial or commercial purposes
b) 8.2 The abstraction of groundwater at a volume exceeding the threshold authorised in terms of a law relating to water resources.

The statutory requirement under point (a), 8.1 of the EIA regulation obliges the NILALEG Project to develop an Environmental Management Plan (EMP) for the borehole which have been drilled at Omaoipanga. The NILALEG project, thus contracted Red-Dune Consulting cc to develop the EMP for the operation of the borehole.

5. Project Scope

The scope of this project was to develop a SEMP for the drilled borehole at Omaoipanga village as per the provision of EMA and EIA regulation.

6. Policy, Legal and Administrative Framework

Table 1. Regulatory framework applicable to the project

Legislation	Relevant authority	Applicability
The Namibia Constitution	**Government Republic of Namibia**	The Namibian constitution is the supreme law of the country and makes provision for environmental protection and sustainable development.
Environmental Management Act No. 7 of 2007	**Ministry of Environment, Forestry and Tourism**	The environmental management act No.7 of 2007 aims to promote the sustainable use of natural resources and provides the framework for the environmental and social impact assessment, demands precaution and mitigation of activities that may have negative impacts on the environment and provision for incidental matters. Furthermore, the act provides a list of activities that may not be undertaken without an environmental clearance certificate.
Environmental Assessment Policy (1995)	**Ministry of Environment, Forestry and Tourism**	The Environmental Assessment Policy for Sustainable development and Environmental Conservation emphasize the importance of environmental assessments as a key tool towards implementing integrated environmental management. Sets an obligation to Namibians to prioritize the protection of ecosystems and related ecological processes. The policy subjects all developments to environmental assessment and provides guideline for the Environmental Assessment. The policy advocates that Environmental Assessment take due consideration of all potential impacts and

Legislation	Relevant authority	Applicability
		mitigations measures should be incorporated in the project design and planning stages (as early as possible).
Pollution Control and Waste Management Bill (in preparation)	**MEFT, MHSS and others**	The Pollution Control and Waste Management Bill, intents to regulate and prevent the discharge of pollutants into the air and water as well as providing for general waste management.
Public Health Act (Act No. 36 of 1919)	**Ministry of Health and Social Services**	The Public Health Act aims to protect the public from nuisance and states that no person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health.
Water Resources Management Act (Act No. 11 of 2013)	**Ministry of Agriculture, Water and Land Reform**	This Act provides a framework for managing water resources based on the principles of integrated water resources management. It provides for the management, development, protection, conservation, and use of water resources. Therefore, water abstraction should satisfy the provisions of the water act (water abstraction / borehole permit should be applied from the respective ministry).
Water Act No, 54 of 1956	**Ministry of Agriculture, Water and Land Reform**	This act states that, all water resources belong to the state. It prevents pollution and promotes the sustainable utilization of the resource. To protect these resources, this act requires that permits are obtained when activities involve the following: (a) Discharge of contaminated into water sources such as pipe, sewer, canal, sea outfall and

Legislation	Relevant authority	Applicability
		(b) Disposal of water in a manner that may cause detrimental impact on the water resources
Soil Conservation Act No. 76 of 1969	**Ministry of Agriculture, Water and Land Reform**	This act promotes the conservation of soil, prevention of soil erosion. Prevent soil salinification.
National Heritage Act No. 27 of 2004	**Ministry of Urban and Rural Development**	The Act makes provision for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. Part V Section 46 of the Act prohibits removal, damage, alteration or excavation of heritage sites or remains, while Section 48 sets out the procedure for application and granting of permits.
Regional Councils Act, 1992 (Act No. 22 of 1992)	**Ministry of Urban and Rural Development**	The Regional Councils Act legislates the establishment of Regional Councils that are responsible for the planning and coordination of regional policies and development. The main objective of this Act is to initiate, supervise, manage and evaluate regional development.

7. Impact Assessment

7.1. Impact Identification

During literature review and site assessment, possible impacts were listed. The criteria used to assess the impacts and the method of determining their significance is outlined in Table 2 below. This process conforms with the Environmental Impact Assessment Regulations of Environmental Management Act, 2007 (Government Gazette No. 4878) EIA regulations. The approach for determining and analysing impacts was undertaken into two steps.

- **Impact Determination**; during this step, the impact is assessed based on severity, spatial scale and its duration.
- **Impact Significance**; various rating exists to determine the overall rating of the impact

Impact significance is determined under two mitigation scenarios; **without mitigation** and **with mitigation**. The confidence of impact mitigation depends on the level of certainty based on available information to assess the impact.

Table 2. Criteria for Impact Evaluation

Risk Event	**Rating**	**Description of the risk that may lead to an Impact**
Impact type	**0**	No Impact
	+VE	Positive
	-VE	Negative
Probability	The probability that an impact may occur under the following analysis	
	1	Improbable (Low likelihood)
	2	Low probability
	3	Probable (Likely to occur)

	4	Highly Probable (Most likely)
	5	Definite (Impact will occur irrespective of the applied mitigation measure)
Confidence level	The confidence level of occurrence in the prediction, based on available knowledge	
	L	Low
	M	Medium
	H	High
Significance (Without Mitigation)	0	None (Based on the available information, the potential impact is found to not have a significant impact)
	L	Low (The presence of the impact's magnitude is expected to be temporal or localized, that may not require alteration to the operation of the project
	M	Medium (This is when the impact is expected to be of short term moderate and normally regionally. In most cases, such impacts require that the projects are altered to mitigate the impact or alternative method of mitigation is implemented
	H	High (The impact is definite, can be regional or national and in long term. The impact could have a no-go implication unless the project is re-designed or proper mitigation can practically be applied
Mitigation	The applied measure / alternative to reduce / avoid an impact	
Significance (With Mitigation)	0	None (Based on the available information, the potential impact is found to not have a significant impact)
	L	Low (The presence of the impact's magnitude is expected to be temporal or localised, that may not require alteration to the operation of the project
	M	Medium (This is when the impact is expected to be of short term moderate and normally regionally. In most cases, such impacts require

		that the projects are altered to mitigate the impact or alternative method of mitigation is implemented
	H	High (The impact is definite, can be regional or national and in long term. The impact could have a no-go implication unless the project is re-designed or proper mitigation can practically be applied
Duration	Time duration of the impacts	
	1	Immediate
	2	Short-term (0-5 years)
	3	Medium-term (5-15 years)
	4	Long-term (more than 15 years
	5	Permanent
Scale	The geographical scale of the impact	
	1	Site specific
	2	Local
	3	Regional
	4	National
	5	International

7.2. Potential Negative Impacts of the Project

- Over abstraction of water
- Quality of water (Safe for human consumption)
- Loss of habitat and biodiversity from site preparations and occupation
- Safety risk for animals on concrete drinking platforms
- Risk of enticing elephants to frequent the area in search for water
- Conflict of water useage among villagers

- Corrosive water (Borehole metal casing corrosion)

7.3. Potential Positive Impact of the project

- Increase of community water supply
- Improved livestock
- Reduced distance of travel by people and animals to water point
- Supply of water during drought

8. The Environmental Management Plan

8.1. Purpose of the EMP

This Environmental Management Plan (EMP) is a risk strategy that contains logical framework, monitoring programme, mitigation measures, and management control strategies to minimize environmental impacts. It further stipulates the roles and responsibility of persons involved in the project. These strategies are developed to reduce the levels of impacts for the projects

8.2. Compliance to the EMP

This EMP is a legally binding document as given under the provisions of the Environmental Management Act, 2007 (Act No. 7 of 2007). The NILALEG Project and its contractors should adhere to the framework of this document.

8.3. Roles and Responsibility

8.3.1. Proponent

The proponent, NILALEG Project as representative of Ministry of Environment Forestry and Tourism shall take overall responsibility for proper implementation of the EMP. It remains the responsibility of the proponent to appoint key personnel for the implementation of the EMP such as Site Manager and ensure that all employees and contractors are conversant with the EMP.

8.3.2. Site Manager

The Site Manager (SM) represents the proponent on site. He/she shall be responsible for daily activities in ensuring environmental protection. All communication with regard to the implementation of EMP must be channelled through the SM

8.3.3. Employees

It shall be responsibility of employees to always adhere to the provision of EMP when on site

8.3.4. Environmental Compliance Officer

Compliance to EMP is enforced by the environmental inspector as provided for under Environmental Management Act (No. 7 of 2007) (EMA)

8.4. Disciplinary Action

This EMP is a legally binding document, non-compliance to the EMP is punishable in accordance to the provision of EMA

9. The EMP table

The is an operational Socio Environmental Management Plan (SEMP). The borehole has been drilled already, minimal site clearance was undertaken to allow movement of vehicles and drilling equipment on site. This SEMP will focus on the identified impact under subsection 7.2 & 7.3 above.

9.1. Positive Impacts

Environmental / Social Impact	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible
Skill and Knowledge transfer	To ensure minimum capacity for the operation and maintenance of the borehole infrastructure	1. Identify and train competent people (Preferable youth) to do basic maintenance of the borehole infrastructure	• Training report	SM
Increase in community water supply	To ensure Namibia 100% rural water supply by 2030	2. Aid in increasing water point in the village 3. Limit migration of people due to water scarcity 4. Reduced distance travel by people and animal to water points 5. Improved livelihood and food security through irrigation	• Report on sustainable water supply by the borehole	SM

Environmental / Social Impact	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible
Improved livestock	Improved wellbeing of livestock	1. Less stress on livestock long distance movement in search of water, in turn, improved quality of livestock for better market prices 2. Sustainable supply of water during drought	• Reports on livestock survival and improvement on their well being • High survival of livestock during drought	SM

9.2. Negative Impacts

Environmental / Social Impact	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible
Over abstraction of underground water	To prevent over abstraction of from the aquifer and to conserve the aquifer.	1. Do not abstract more than 70% of the total borehole yield 2. Where possible, install automatic measuring gauge to monitor abstraction 3. Monitor water level periodically at least once a year 4. Test pumps should be carried at least annually to monitor the performance of the aquifer and assess aquifer sustainability	• Abstraction monitoring report	Site Manager
Human and Animal Health (Quality of Water fit for human consumption)	To ensure the water is fit for human consumption	1. Ensure that periodic water sample are assessed for quality to ensure fit human consumption 2. Assess the water quality and treat the water when necessary	• Water quality monitoring reports	Site Manager
Safety risk of hooved animals on concrete drinking platform	To ensure safety of hooved animal at water point on concrete	1. Ensure that concrete surface of the water trough is kept rugged and rough to avoid slippery that could injure animals	• Physical site inspection	Site Manager

Environmental / Social Impact	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible
	platforms surrounding the water trough			
Risk of water infrastructure destruction buy elephant	To prevent infrastructure destruction by elephant	1. Build a wall of not less that 2.5m high and thick enough that will prevent elephants access to the water tank and solar infrastructures (Appendix 2)	• Elephant incident report	Site Manager
Conflict of water use buy villagers	To prevent conflict among villager / users of the borehole	1. Raise awareness of the indented purpose of the borehole 2. Ensure no one is made to be entitled to owning or have controlling power on who should use the borehole	• Community consultation and awareness raising report	Site Manager
Corrosion of borehole metal casing	To the casing are not corroded that may affect pump yields and water quality	1. Some studies have recommended the use of non-corrosive casing. However, ensure periodic monitoring of casing from corrosion	• Corrosion monitoring reports	Site Manager

10. Decommissioning and Rehabilitation Plan

Decommissioning is normally the reverse of construction where all installed equipment / structure must be removed. Supply of water has an infinite timeframe. Unless otherwise of a pressing issue national issue, such as degraded water quality, that would necessitate decommissioning, the borehole is aimed to outlive generations to come. Aging equipment that required replacement should be done by qualified Namibians to ensure smooth operation of the borehole.

It is critical to develop a strategy for periodic rehabilitation to ensure that the borehole yields are not affected and water quality monitoring.

11. Conclusion and Recommendations

11.1. Conclusions

This Social Environmental Management Plan was developed post drilling of the boreholes. During site inspection, there were no concern on how few trees and shrubs were cleared to create working space on site and make way for the drilling vehicle. This study was undertaken with high degree of certainty and no impacts was observed which could not be minimized at insignificant levels.

11.2. Recommendations

It is recommended to the approving authority for the issuance of the ECC. Strong emphasis is put on ensuring water quality to protect the health of human and animals.

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13. Appendixes

Appendix 1 (a). Borehole Information

STEP DRAWDOWN TEST FORM

Contractor Name: Tulu Trading — Page: ____ of: ____

Location: Naivipanga — Borehole No: 206422

Map Sheet: No. ____ — Elevation: ____ masl

Latitude: S/2, 19105" — Longitude: E013, 28607

Test: 5 Steps Steptest — Duration: 4 hours

Test borehole/observation: — Date: 26/09/2022

Rest water level before start of test: 77.91 m — Date: 26/09/2022

Pumping depth: 90m m — Borehole depth: 120 m

Diameter ____ mm — Distance from pumped borehole: 60 m

Direction from pumped borehole ____ m — Water samples: 2

	PUMPING WATER LEVELS				RECOVERING WATER LEVELS			COMMENTS
	Clock Time	Pump Time (min)	Water Level (m)	Flowmeter Reading (m^3)	Clock Time	Recovery Time (min)	Water Level (m)	
①	10H01	1	77.91	1.27m3	14H01	1	82.87	
	10H02	2	77.77	1.28m3	14H02	2	81.21	
	10H03	3	78.69		14H03	3	80.76	
	10H04	4	78.81		14H04	4	80.53	
	10H05	5	79.26		14H05	5	80.21	
	10H07	7	79.42		14H07	7	80.04	
	10H10	10	79.44		14H10	10	79.83	
	10H15	15	79.57		14H15	15	79.61	
	10H20	20	79.53		14H20	20	79.57	
	10H25	25	79.74		14H25	25	79.31	
	10H30	30	79.81		14H30	30	79.26	
	10H35	35	79.88		14H35	35	79.11	
	10H40	40	79.92	1.40m3	14H40	40	78.89	
	10H50	50	79.96	1.41m3	14H50	50	78.66	
②	11H00	60	80.97		15H00	60	79.23	
	11H30		80.99	1.61m3	15H30	30	78.17	
③	12H00		81.87	1.62m3	16H00		78.06	
	12H30		82.61	1.83m3	16H30		77.90	
④	13H00		82.88	1.90m3	17H00	17H3	77.90	
					Recovery	18H00	77.93	
	14H00		82.89	2.16m3		12H30	77.90	
						19H00	77.91	

Pumptest Readings SR _____ FROM _____

Borehole at: Chacayi Ranga Borhole Nr LWW 206 422

TEST: 100hr Test DURATION: 8 TIME: 10H00 DATE: 24/09/22

Res: Water Level: 77-91 Borehole depth 100m

Diameter _____ Pumpdepth: 90m Observation-/Test borehole ?

Distance from production hole 60m Water Samples: 14H00

PUMP				RECOVERY			REMARKS
Clock Time	Pump Time	Water Level	Flowmeter Reading	Start Time	Recovery Time	Water Level	
10H00		77.91		17H01		83.90	
10H	2	77.99		17H02	2	82.41	
10H	3	78.61		17H03	3	81.62	
10H	4	78.98		17H04	4	81.81	
10H	5	79.02.1		17H05	5	80.22	
10H	7	79.43		17H07	7	80.11	
10H	10	79.62		17H10	10	80.07	
10H	15	79.81		17H15	15	80.00	
10H	20	79.94		17H20	20	79.12	
10H	25	80.82		17H25	25	79.21	
10H	30	80.79		17H30	30	79.74	
10H	35	80.63		17H35	35	79.37	
10H	40	80.57		17H40	40	79.39	
10H	50	80.46		17H50	50	79.42	
11H00	60	80.34		18H00	60	79.46	
11H15	75	80.21		18H15	75	79.09	
11H30	90	81.76		18H30	90	79.52	
11H45	105	82.82		18H45	105	79.64	
12H00	120	82.62		19H00	120	79.73	
12H30	150	82.47		19H30	150	79.78	
13H00	180	82.26		20H00	180	79.78	
13H30	210	82.19		20H30	210	79.80	
14H00	240	83.90		21H00	240	79.84	
15H00	300	83.90		22H00	300	79.87	
16H00	360	83.90		23H00	360	79.90	
17H00	480	83.90		00H00	480	79.90	
	600			01H00	600	79.90	
				02H00		79.91	

APPENDIX 3.3

Appendix 1(a) Borehole Inspection Report

Kunene Regional Council

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Private Bag 502
Opuwo

DIRECTORATE OF WATER SUPPLY AND SANITATION COORDINATION

Enquiries: M. RUHUMBA

TO: MRS. NJ MUTOTA
REGIONAL HEAD

FROM: MR. M RUHUMBA
ACTING WORKS INSPECTOR

DATE: 27 September 2022

RE: DRILLING NARRATIVE REPORT FOR OKAUAPEHURI

1. INTRODUCTION

The purpose of this short report is basically to give a brief overview of what transpired at Omaoipanga (S – 18, 191046° E -13, 840655°) from the 22nd – 27th September 2022 during the drilling by Tulu Trading Enterprises CC.

2. FINDINGS

The drill crew mobilize to Omaoipanga on the 22nd September 2022 and the Works Inspector and arrived at 15H30 on site.

The drilling exercise commenced on the 22nd September 2022 at 16H30 with 254 drill bit for 12m and installed a 12mx 219mm steel casing (Stand pipe). After casing installation, the bit was changed to 204mm 8 inch and continued drilling on 23 September and stopped at 46 meters. On the 24th Sepetember 2022, the drilling continued up to 100meters getting two (2) water strike at 85m and 94m, with the estimate of 3cubic an hour by airlift. on the 25 September 2022 the drilling team commenced with Development from 06H00 up to 12H00 noon and install 17x6mx177mm (id) steel casing and the Drilling crew Demombilse from site.

On 26 and 27 September 2022 the test pumping team did the 4 steps test and a discharge test with the findings of having 3.2 cubic an hour.

3. RECOMMENDATION

- Therefore, I recommend the Borehole to have been successfully drilled and tested and only waiting for water quality analyses for installation.
- I furthermore, recommend the installation of Omaoipanga Borehole to be installed with an AC/DC pump, With the capacity not more than 4 cubic an hour.

Thank you,

Mr. M. Ruhumba
Acting Regional Works Inspector

Appendix 2. Protection of borehole infrastructure by Elephants