

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

PROPOSED ESTABLISHMENT OF THE LISELO MAIZE IRRIGATION FARM, AT LISELO IN ZAMBEZI REGION



PROPONENT:



Tulela Agriculture
(pty) Ltd
P.O Box 2360
Tsumeb
Namibia

MAY-2022

ENVIRONMENTAL CONSULTANTS

**CENTER FOR
GEOSCIENCES
RESEARCH**

PROJECT DETAILS

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PROFESSIONAL REGISTRATION	Pr.Sci.Nat
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RESPONSIBILITY	Environmental Researcher: Centre for Geosciences Research
QUALIFICATIONS	Academics: A major in Chemistry (Organic & Inorganic Chemistry, Physical chemistry, Industrial Chemistry, Analytical Chemistry & Instrumental Analysis) with completed research in Synthesis of Organic and Inorganic compounds. An academic understanding in waste water management including waste water treatment and water analysis, Environmental chemistry & Radio Chemistry, Crystallography & Mineral Chemistry, understanding of soil chemistry and environmental impact assessment studies, An Introduction to Microbiology, Microbial Genetics and Diversity of life.

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1.1. Introduction

The Tulela Agriculture (pty) Ltd (Proponent), a Namibia Company has applied for 5000

hectares of land from the Zambezi Communal Land Board in the Liselo area of Zambezi region. Of which the initial 1000 hectares is the envisaged development immediately for irrigated and rain fed maize crop.

On behalf of Tulela Agriculture (pty) Ltd CEGEOR cc has been appointed to undertake Environmental Impact Assessment and Environmental Management Plan. The assessment is to produce a scoping Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the design, build, operate the Liselo irrigation farm at Liselo in Zambezi Region.

2.1. Project locality

The Tulela Agriculture Liselo Maize Irrigation Farm is located approximately 10km East of Katima Mulilo town bordering with the Winela farm (Image 1). The total area the community allocated to the project under lease hold for 50 year is 5000ha, with an initial 1000ha to be developed immediately for maize irrigation, (**Figure 2**).

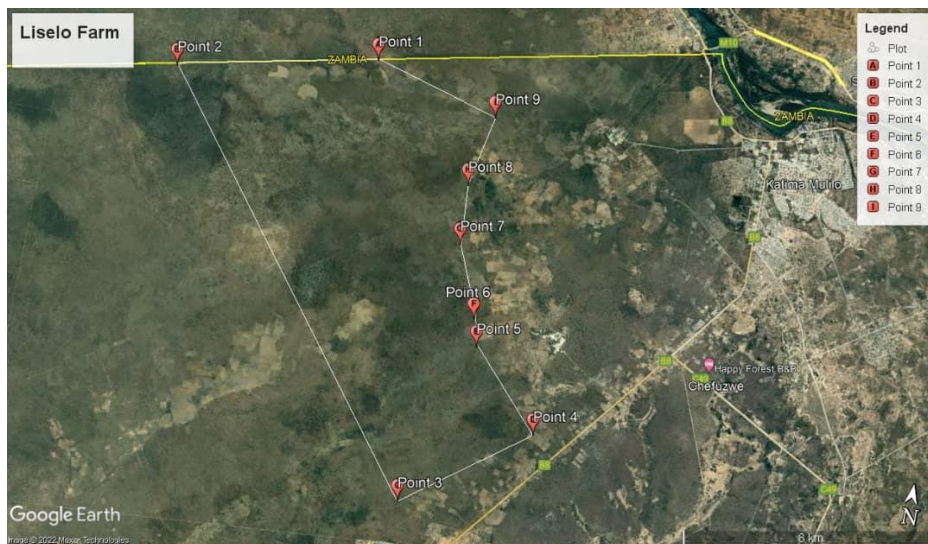


Figure 1, Locality of the Tulela Agriculture Liselo Maize Irrigation Farm.

3. Details of the proposed new infrastructure

The Tulela Agriculture Liselo Maize Irrigation Farm project will consist of the following structures:

3.1 Pumps and Controls

Pumps Controls will be located in close vicinity of the pump but on higher lying ground. The pumps will be powered using grid or other power substitute..

3.2 Bulk Transfer Pipeline

The Bulk Transfer Pipeline runs from the RPS across the B6 bitumen road below through the culvert and delivers water to field edge via a uPVC 355mm class 9 pipeline. A series of air valves will be included on specified high points for vacuum and air removal.

A road crossing at B6 national road detail has been included which will be used to apply for the road crossing permit from the local authority prior to the construction of this portion of the pipeline.

The pipeline route has been designed to avoid any dwellings but will run through some dryland fields. Once installed, the fields can once again be utilized without any risk to the pipeline. The Liselo community has been informed of this and has agreed to this approach during the EIA information sharing session on the 14th April..

3.3 Pipeline Distribution Network

The Main pipeline branches off into the distribution pipelines at a reinforced concrete manhole located on the edge of the Liselo irrigation fields. The manhole will house non-return valves as well as the main shut off valves to each lateral line allowing individual shut off of each section for maintenance purposes. Each non-return valve will be fitted with bypass valves in order to bleed or drain the system.

3.3.1 On-Field Irrigation System

▪ Irrigation Equipment

A dragline system will be installed on each section plot comprising of the following:

- 63mm Galvanised Steel Control Point Water meter, pressure control valve, air-valve & fustigation valves.
- Central uPVC manifold pipeline of 63mm and 50mm.
- 9 x Aluminium irrigation hydromantic valves.
- 9 x Dragline Hose/Stand/Sprinkler Assembly.

- 9x Brass (or Plastic alternative) full circle impact sprinkler delivering 1.32 m³/hr at 25m pressure.

- **Design Irrigation Scheduling**

Each plot comprises of 8 sprinkler positions. The soils allow for a two-day irrigation cycle thus 4 positions are to be irrigated every 8 hours. This will also allow two families to utilize one plot. The plot can effectively be divided into two 0.5ha units both utilizing the same dragline system irrigating on alternating days. The system delivers 24 mm per 12 hrs resulting in a gross application rate of 12mm per day.

4.0 Construction activities

All components for the irrigation construction will be transported to site by road on low-bed trailers and small trucks. Materials and equipment required will be transported from via Windhoek (from South Africa and/or Walvis Bay along the Windhoek- Okahandja-Swakopmund main road (i.e. the B1 and B2 then the Trans Caprivi Highway to Zambezi Region as well as other district roads to the Liselo area. No significant impacts associated with traffic interruption are expected on these roads.

Contractor camp sites of approximately 250 m² by 300 m² are normally made along at project sites. The sites for such camps forms part of the ongoing work. It is believed that the construction team for the irrigation project will be able to use the existing road trails available in the vicinity of the project site. Only smaller access tracks will be needed in isolated cases.

4.1 Maintenance activities

Pump stations and water pipelines require maintenance. Obvious accidents such as leakages, lightning strikes or towers blown over by exceptionally strong winds will be repaired by using the access roads (servitudes) which will be created during the construction process.

5.0 Potential key socio-economic and biophysical impacts associated with the construction, operation and maintenance of the proposed project

- Increase in employment opportunities
- Cumulative visual impact
- Nuisance and disrespect towards farmers/community
- Land disturbance

- Water quality pollution potential
- Loss of biodiversity and ecosystem services
- Surface drainage diversion, with associated erosion
- Air and noise pollution
- Flooding risks
- Pollution to groundwater aquifer
- Waste discharge
- Oil/fuel spillage
- Salinisation
- Reduced runoff

6.0 WHAT IS AN EMP

An Environmental Management Plan (EMP) can be defined as “*an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced*”. EMPs are therefore important tools for ensuring that the management actions arising from Environmental Impact Assessment (EIA) processes are clearly defined and implemented through all phases of the project life-cycle (construction, operation and decommissioning).

7.0 OBJECTIVES OF THIS EMP

Objectives of this EMP are:

- Ensuring compliance with regulatory authority stipulations and guidelines;

- To formulate measures which will mitigate adverse impacts of the proposed project on various environmental components, which have been identified during the environmental impact assessment.
- To formulate measures to protect environmental resources where possible.
- To formulate measures to enhance the value of environmental components where possible.
- Responding to changes in project implementation not considered in the EIA;
- Responding to unforeseen events; and
- Providing feedback for continual improvement in environmental performance.

7.1 SCOPE OF THIS EMP

To achieve the above objectives, the scope of this EMP will include the followings:

- 7.1.1 Definition of the environmental management objectives to be realized during the life of a project (i.e. construction, operation and/or decommissioning phases) in order to enhance benefits and minimize adverse environmental impacts.
- 7.1.2 Description of the detailed actions needed to achieve these objectives, including how they will be achieved, by whom, by when, with what resources, with what monitoring/verification measures, and to what target or performance level.
- 7.1.3 Clarification of institutional structures, roles, communication and reporting processes required as part of the implementation of the EMP.
- 7.1.4 Description of requirements for record keeping, reporting, review, auditing and updating of the EMP.

7.2 WHAT ARE THE LEGAL IMPLICATIONS AND OBLIGATIONS UNDER THIS PLAN?

The EMP will be sent to the Directorate of Environmental Affairs (DEA) of the Ministry of Environment and Tourism (MET) for approval. Once the DEA is satisfied with the contents of the EMP, they will issue an Environmental Clearance Certificate (ECC) to

the **Tulela Agriculture (pty) Ltd** The ECC is linked with the recommendations of the Environmental Management Plan.

Once the ECC is issued the EMP becomes a legally binding document and each role-players including contractors and sub-contractors are made responsible to implement the relevant sections of the EMP, and are required to abide to the conditions stipulated in this document.

8.0 LAND ENVIRONMENT

8.1 BIODIVERSITY MANAGEMENT

8.1.1 CONSTRUCTION PHASE

Even though the project area is already disturbed by the community, the following mitigations are to be undertaken to minimize further impact on the existing biodiversity:

- 8.1.1 Remove (e.g. capture) unique fauna and sensitive fauna before commencing with the development activities and relocate to a less sensitive/disturbed site if possible.
- 8.1.2 Where it is clear that certain large species will be destroyed consideration should be given to offering to rescue the individuals involved and relocate them to nearby garden in Katima Mulilo.
- 8.1.3 Disturbance of marginal vegetation at raised land masses should be limited.
- 8.1.4 Attempt to avoid the removal of bigger trees during the development phase(s) especially with the development of access routes – as these serve as habitat for a myriad of fauna and most importantly these.
- 8.1.5 Prevent and discourage fires – especially during the construction phase(s) – as this could easily cause runaway field fires and could affect the local fauna, and could also cause further problems (e.g. loss of grazing & domestic stock mortalities, etc.) for the neighboring farmers.
- 8.1.6 Preferably workers should be transported in/out to the construction sites on a daily basis to avoid excess damage to

the local environment (e.g. fires, wood collection, poaching, etc.).

- 8.1.7 Implement erosion control. The area(s) towards & adjacent the drainageline(s) are easily eroded and further development may exacerbate this problem.
- 8.1.8 Avoid construction within 20m of the main drainage line(s) to minimise erosion problems as well as preserving the riparian associated fauna. Tracks along steep slopes should be negotiated without blading to avoid unnecessary habitat destruction.
- 8.1.9 Prevent and discourage the setting of snares (poaching), illegal collecting of field foods (e.g. mushrooms, etc.), indiscriminate killing of perceived dangerous species (e.g. snakes, scorpions, etc.) and collecting of wood as this would diminish and negatively affect the local fauna – especially during the development phase(s).
- 8.1.10 Prevent the number of domestic pets – e.g. cats & dogs – accompanying the workers during the construction phase as cats decimate the local fauna and interbreed & transmit diseases to the indigenous African Wildcat found in the area. Dogs often cause problems when bonding on hunting expeditions thus negatively affecting the local fauna.
- 8.1.11 Avoid “overnighting” at the construction sites during the construction phase as this could lead to problems such as the killing/poaching/collection of local fauna.

8.2 TRAFFIC MANAGEMENT

8.2.1 CONSTRUCTION PHASE

There will be no major impact on the land environment during construction phase as identified during studies since the area is already disturb. However, the following mitigation measures are to be undertaken to minimize the impact:

- 8.2.2 The internal roads will be designed with adequate widths to minimize traffic congestion due to the movement of trucks carrying raw materials required for construction.

- 8.2.3 Special care will be taken during transportation of construction material like cement, sand, aggregate etc. as considerable quantities of such material would be transported from various material suppliers.
- 8.2.4 The material will be sourced from the nearest available supplier in Katima Mulilo. Since the road transport is unavoidable, such movement will be carried out during non- peak hours.
- 8.2.5 Avoid development & associated infrastructure in sensitive areas – e.g. in/close to drainage lines. This would minimize the negative effect on the local environment especially unique features serving as habitat to various species.
- 8.2.6 Where crossing sensitive sites are unavoidable utmost care is needed to prevent habitat destruction.
- 8.2.7 Blading and bulldozing should not be permitted in river beds.

8.2.8 Avoid driving randomly through the area (i.e. “track discipline”), but rather stick to permanently placed roads/tracks – especially during the construction phase.

8.2.9 A tracks map should be made for each stretch of the route,

8.2.10 Stick to speed limits of maximum 30km/h as this would result in fewer faunal road mortalities. Speed humps could also be used to ensure the speed limit.

8.2.11 Tracks along steep slopes should be negotiated without blading to avoid unnecessary habitat destruction.

8.2.12 During operation avoid the creation of multiple roads strips,

8.2.13 Strict track control will be essential during construction and operational phases. Tracks to be used should be clearly demarcated from very early on, and transgressors should be penalised. This will ensure that no unnecessary vehicular collateral damage is incurred.

8.2.14 OPERATION PHASE

The impact on land environment during operation phase will be due to movement of vehicles of residents and users of the irrigation schemes. Mitigation measures to be taken to minimize impacts on land environment will be as follows:

8.2.15 Adequate measures will be taken considering the natural drains by incorporating design elements like steep land landscaping etc.

8.2.16 There will be minimum amount of cut and fill to reduce disturbance to the existing surface water hydrology

8.2.17 Natural drain lines which fall in the path of proposed roads will be maintained as far as possible through construction of culverts.

8.2.18 Adequate provisions will be made through provision of internal roads of minimum 9m width for smooth vehicle entry and exit into the irrigation scheme.

8.2.19 Approach road (external road) and internal roads for onsite traffic movement will be planned as per project development.

8.3 SOLID WASTE MANAGEMENT

Solid waste management is a challenge during construction and operational phases of projects of this nature. Therefore, proper handling and management of the wastes is critical for the protection of the environment and surrounding communities. Solid waste which will be generated from this project if not managed will have an effect on the environment. The following are the mitigation measures to be taken to minimise the impact of solid waste during construction and operation of the irrigation scheme.

8.3.1 CONSTRUCTION PHASE

- 8.3.2 Waste disposal sites should be established on site where paper, plastic and wire should be kept during construction and operation period.
- 8.3.3 The collected solid waste should be disposed at the Katima Mulilo Town Council solid waste disposal site.
- 8.3.4 For human waste, during the construction phase, mobile toilet should be made available on site for workers and once these facilities are full, the collected human waste should be disposed at the Katima Mulilo Town Council human waste disposal site.
- 8.3.5 Prior to the disposal of the above mentioned waste by the Contractor/ Tulela Agriculture must enter into agreement with Katima Mulilo Town Council for permission to use their facility.

8.3.1 OPERATION PHASE

- 8.3.2 Management of solid waste generated during the operation phase would include collection, transportation and disposal in a manner so as to cause minimal environmental impact.
- 8.3.3 It will be made mandatory for waste to be segregated right at the source of waste generation. Collection of segregated waste would be made from the irrigation scheme and amenity areas.
- 8.3.4 Waste disposal sites for usage during operation period to be included in the design of the irrigation project. If possible mobile waste disposal drum to be assigned for each plot.
- 8.3.5 Waste or unwanted vegetables/crops from the plots to be collected at one

collecting area and transported to disposal sites at Katima Mulilo Town Council. Random disposal of unwanted crops by Tulela Agriculture should be discouraged as this could create breeding sites for misquotes which will pose health hazards to the Liselo community members.

- 8.3.6 For human waste during the operation of the irrigation scheme, permanent ablution facility to be erected at the irrigation field with proper lining of the collector to avoid any infiltration of the human waste into the underground aquifers.
- 8.3.7 Prior to the disposal of the above mentioned waste by the Contractor/ Tulela Agriculture must enter into agreement with Katima Mulilo Town Council for permission to use their facility.
- 8.3.8 Biodegradable waste from residential buildings, commercial blocks would be transferred to mechanical composting units within the site for disposal. Compost from the same will be used for landscaping.
- 8.3.9 Reusable and recyclable waste will be disposed by selling to scrap dealers and private contractor for resale.
- 8.3.10 Non-degradable waste will be transferred to municipal solid waste management system

9 AIR POLLUTION

During the construction phase dust will be generated onsite by earth moving equipment and also on the gravel road by trucks and vehicles. Epidemiological studies indicate that workers exposed to construction process dust stand an increased risk of suffering from asthma symptoms, chronic bronchitis, nasal inflammation and impairment of lung function.

9.3 CONSTRUCTION PHASE

9.3.1 *Mobile source emissions*

- 9.3.2 Transportation of raw materials required for construction will be carried out during non-peak hours.
- 9.3.3 Idling of delivery trucks or other equipment will not be permitted during unloading or when not in active use.
- 9.3.4 To minimize dust emissions due to trucks carrying cement, gravel, sand to site, ready mix concrete carried in enclosed container will be used which is a better option compared to on-site batch mixing.
- 9.3.5 Dust covers will be provided on trucks used for transportation of materials prone to fugitive dust emissions.
- 9.3.6 Covering scaffolding and cleaning of vehicles which can reduce dust and vapor emissions will be used.
- 9.3.7 Measures such as the use of wet processes enclosure of dust-producing processes under negative air pressure (slight vacuum compared to the air pressure outside the enclosure),
- 9.3.8 Exhausting air containing dust through a collection system before emission to the atmosphere, and exhaust ventilation should be used in the workplace.
- 9.3.9 Use of personal protective equipment for proper dust control for respiratory protection and should be used only where dust control methods are not yet effective or are inadequate.
- 9.3.10 Direct skin contact should be prevented by gloves, wearing respiratory protection during cleanup,
- 9.3.11 Educational awareness programs for workers should be instituted about hazard of exposure to dust and on the use and maintenance of exhaust ventilation systems, and the use and maintenance of personal protective

equipment to avoid risk of dust and noise.

9.4 Stationary source emissions

- 9.4.1 Most of the machinery related to construction will be located close to construction area for ease of handling.
- 9.4.2 Machinery such as conveyers and mixers will be screened with sheets of suitable material to reduce transport of suspended particulate matter and noise.
- 9.4.3 All stationary construction equipment will be located as far away as possible from sensitive receptor locations in order to allow maximum dispersion of emitted pollutants.
- 9.4.4 Areas prone to fugitive dust emissions due to activities such as excavation, grading sites and routes of delivery vehicles across patches of exposed earth, will be frequently water sprinkled to prevent re-entrainment of dust.
- 9.4.5 Hosing down road surfaces especially if they are unfinished surfaces also helps to prevent fugitive dust emissions.
- 9.4.6 Other measures include appropriate containment around bulk storage tanks and materials stores to prevent spillages entering watercourses.
- 9.4.7 Apart from these, equipment/ machines and vehicles will be always kept in good state of repair to minimize emissions. Construction areas will be enclosed, wherever possible.
- 9.4.8 All gravel roads in construction areas should have a speed limit of 30km/h for light vehicles and 20km/h for heavy vehicles in order to minimise the amount of dust generated by vehicles.

9.5 OPERATIONAL PHASE

- 9.5.1 Plantation along the roadside helps to reduce effects of air/ noise pollution. A row of trees will be planted along the plot periphery to screen the site from air/noise pollution.
- 9.5.2 Regular maintenance and upkeep of the internal road within project will ensure smooth traffic flow and will help to reduce air pollution.
- 9.5.3 As per the project analysis, the impact of proposed project would be positive when proper traffic flow is maintained.

9.5.4 The entrance/ exit to the Liselo Irrigation Farm will be maintained so that there are no obstructions to traffic flow as also road side parking will be avoided.

10 NOISE POLLUTION

Noise emissions are commonly associated with all earth moving equipment and drilling activities. The main noise sources are associated with drilling, breaking, crushing and handling–moving, screening, and transport of equipment or materials to or from the construction site. Considering the close proximity of the area to the surrounding homestead, mitigation measures will be introduced to minimize the impact of noise and vibration.

10.3 CONSTRUCTION PHASE

- 10.3.1 Reduction of noise from drilling rigs by using down hole drilling or hydraulic drilling;
- 10.3.2 Implementation of enclosure and cladding of processing plants;
- 10.3.3 Installation of proper sound barriers and (or) noise containments, with enclosures and curtains at or near the source equipment.
- 10.3.4 Use of rubber-lined or soundproof surfaces on processing equipment (e.g. screens, chutes, transfer points, and buckets);
- 10.3.5 Use of rubber-belt transport and conveyors;
- 10.3.6 Installation of natural barriers at facility boundaries (e.g. Vegetation curtains or soil berms);
- 10.3.7 Optimization of internal-traffic routing, particularly to minimize vehicle-reversing needs (reducing noise from reversing alarms) and to maximize distances to the closest sensitive receptors;
- 10.3.8 Construction of berms for visual and noise screening.
- 10.3.9 High noise generating construction activities like, compacting etc. will be carried out only during day time.
- 10.3.10 Workers working near high noise construction machinery will be provided with ear muffs/ ear plugs.

10.4 OPERATION PHASE

During operation phase it is important to maintain the noise levels within the irrigation scheme for the safety and better health of residents and users. The various precautions to be taken to maintain acceptable noise level within the project area are:

- 10.4.1 Buffer in form of wall or tree plantation will be provided along the main roads.

10.4.2 Smooth flow of traffic will be ensured on the internal road to avoid idling of vehicles.

11 WATER ENVIRONMENT

11.3 CONSTRUCTION PHASE

- 11.3.1 Construction area will be isolated and care will be taken to divert the run-off to storm water drainage, so possibility of pollution from construction run-off is prevented. Also, subsurface work will be carried out only during with less rain storms, like during spring and winter.
- 11.3.2 Precaution will be taken to ascertain that no waste material like cement, paint and solid material like iron rods and any other material is dumped into storm water system.
- 11.3.3 No accumulation of stagnant water will be allowed to prevent breeding of mosquitoes.

11.4 OPERATION PHASE

- 11.4.1 Adequate measures will be taken considering the natural drains by incorporating landscape design elements like steep land landscaping etc.
- 11.4.2 A well engineered storm water drainage system will be provided as a part of this development.
- 11.4.3 Existing natural drainage lines on site will be maintained as far as possible.

12 SPILLAGE OF OIL AND FERTILISER MANAGEMENT

This risk associated with leaks or spillage of fuel or fertilizer at the irrigation site during construction and operation of the irrigation scheme have the potential of reaching both groundwater and surface water if there are active pathways. Even though the pathways to groundwater resources are not significant, those to surface water (during wet periods) taking into consideration. In addition, spillage of fertilizer is a concern although the likelihood of this risk occurrence is low; the impact if it happens is significant, for this reason, the risk is highlighted as a going concern of high priority and therefore mitigation measures to be taken are presented below:

12.3 CONSTRUCTION PHASE

- 12.3.1 Contain spillage and remove the contaminated soil for storage into bags.
- 12.3.2 Ensure construction of effective storage facility for fertilizer.
- 12.3.3 Accessibility to spill prevention and response equipment, such equipments should be visible and accessible to all farmers/employees at any given time.

12.4 OPERATION PHASE

- 12.4.1 Accessibility to spill prevention and response equipment, such equipments should be visible and accessible to all farmers/employees at any given time.
- 12.4.2 Designated waste collection tanks should be available on site and away from waterways, and such isolation should be maintained at all times.
- 12.4.3 Necessary response teams; such teams should be adequate to response to possible risk of oil and fertilizer if it threatens fresh water bodies.
- 12.4.4 Routine inspection of fertilizer holding facility for structural integrity of holding facilities.

13 GUIDELINES FOR BIO-AESTHETIC MANAGEMENT

13.3 PROTECTION OF TREES ON SITE

Protection of existing trees within the project area which would not be affected by the proposed layout will be the first priority during construction. The precautions to be taken are as follows:

- 13.3.1 Care will be taken to maintain the form such that the aesthetics is maintained and the horizon is not modified.
- 13.3.2 Precaution would be taken while transporting construction material to the site to prevent accidental damage or spillage.
- 13.3.3 The work force will be briefed about importance of preserving and protection of exiting trees before starting the construction work.
- 13.3.4 Trees propagation/ plantation will be initiated by project proponent from project initiation stage for better results.
- 13.3.5 Specifically, large and healthy trees will be given maximum weight age in tree protection than giving importance to merely the number of trees, as is not possible to avail such full grown and mature trees in short span of time with any efforts and cost. The existing trees will be removed only when it is a must and all other options are thoroughly considered and exhausted.
- 13.3.6 It is recommended that tall trees will be planted to form an avenue along roads and to buffer the vehicles noise and dense canopy trees will be planted on the periphery of the plot to form a screen to reduce impact of air/ noise pollution.

14 SOCIO-ECONOMIC ENVIRONMENT

The Liselo community like most of the communities in Zambezi region, cultivate dryland plots as well as small gardens around their homesteads. Hence surviving on subsistence farming. The 5000 hectares designated area for Tulela Liselo irrigation agriculture project comprise of land that has been inherited by the Liselo community for subsistence farming. As evidenced by the constitution the Liselo Traditional Khuta on behalf of its community members (Fig 7), have agreed to lease the 5000 hectares for the Tulela Liselo irrigation agriculture project, in the hope that they will benefit from the project.

During stakeholder consultations it was established that, about half of the household lands are ploughed through hire of the government tractor that is available. Some 40% of the households own cattle and use oxen for ploughing and among those with no cattle there is some exchange of labour for use of oxen.

14.3 CONSTRUCTION PHASE

- 14.3.1 Where unskilled labor can be used during the construction phase, a 'locals first' policy should be considered.
- 14.3.2 It is proposed that local people, meaning the community members from Liselo settlement, should be employed as far as possible, especially where no specific skills are required.
- 14.3.3 The Tulela Agriculture management and Chairperson of the Liselo Khuta should be in consultation to assist with the recruitment of construction workers.
- 14.3.4 Both men and women should be granted the opportunity to be employed by the project.
- 14.3.5 When technical skills for maintenance will be required during the operation of the irrigation schemes, the Tulela Agriculture (pty) Ltd should arrange for assistance with local vocational training centers for such assistance. If possible MOU could be signed with such institution for ease working

relationships and sustainability of the irrigation scheme.

14.3.6 The Contractor and their employees are encouraged to purchase or support local retailers in Katima Mulilo unless the intended material/product to be purchased is not locally available.

14.3.7 The Contractor is encouraged to support locally available accommodation

14.3.8 The Contractor is encouraged to purchase materials needed for the construction of the irrigation scheme locally, unless the intended material/product to be purchased is not locally available.

14.3.9 The Contractor and their employees are encouraged to make these payments when applicable to support the economic growth of the country.

14.4 OPERATIONAL PHASE

14.4.1 During operation of the irrigation Farm, Tulela Agriculture (pty) Ltd will maintain a good conduct in terms of the Environmental protection.

15 ENVIRONMENTAL MANAGEMENT PLAN ORGANIZATION & IMPLEMENTATION

During construction phase, contractors as well as site-in-charge will be responsible for implementing all the mitigation measures mentioned above. In operational phase, the work will be continued along with post monitoring. An officer will be appointed by the project proponent the Tulela Agriculture (pty) Ltd, to ensure monitoring and inspection during construction period. The following tables give the mitigation measure to be undertaken during construction & operational phase respectively with the agency responsible for implementation.

The following abbreviations are used to indicate who is responsible for what impact mitigation objective:

15.3.1	Contractor Environmental
Coordinator	CENC
15.3.2	Contractor C
15.3.3	Project ProponentPP
15.3.4	Project Manager PM

Table 1: Mitigation measures during Construction Phase

No	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of the impact	Proposed mitigation measures	
				Action to be taken	Implementing agency
1	Land Environment	Impact on fauna and flora	Significant and permanent if not controlled	Avoid construction within 20m of the main drainage line(s). Avoid disturbance of marginal vegetation Remove (e.g. capture) unique fauna	Contractor/CENC
		Generation of solid waste and debris. Aesthetically unpleasant. problems of	Temporary	Segregation to facilitate reuse/recycling. Construction material waste like bricks, cement etc. will be used as fill material. Recyclable wastes will be	Contractor/CENC

No	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of the impact	Proposed mitigation measures	
				Action to be taken	Implementing agency
		labourers		<p>segregated and sent for recycling.</p> <p>Adequate facilities for the storage of these waste materials on site</p>	Project manager/ Contractor/CENC
2	Air Quality	Traffic congestion Increase air pollution risks	Significant and temporary	<p>Idling of the trucks and dumpers on the roads will not be allowed.</p> <p>Raw materials will be procured from the nearest material supplier.</p> <p>Material will be brought in batches so that there is no sudden increase of traffic volume at one particular time.</p> <p>On-site use of Concrete batching plant.</p> <p>Use of dust covers over construction material during transportation. Keeping all stationary equipment downwind.</p> <p>Stabilization of dust prone areas by sprinkling water</p>	Project manager/Contractor/CENC
3	Noise Quality	Increase in noise levels causing nuisance to the Liselo Community Members	Significant and temporary	<p>Prohibition for use of equipment emitting noise of greater than 90 dB (A) for 8 hour operation.</p> <p>Prohibition of noise from construction activities during night time.</p>	

No	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of the impact	Proposed mitigation measures	
				Action to be taken	Implementing agency
				on machinery with ear muffs/ ear plugs. Provision of temporary barricading around site	
4	Water Environment	<p>Surface and groundwater pollution due to fertilizer.</p> <p>Turbidity and suspended solids due to soil erosion.</p> <p>Blocking of natural drains due to deposition of construction materials.</p>	Significant and temporary	<p>Construction work to be carried out before periods of strong winds and erosion protection measures to be taken.</p> <p>Construction materials to be stored in enclosures.</p> <p>Measures to divert run-off to storm water drainage and prevent pollution from construction run-off.</p> <p>Cleaning of drains on regular basis to avoid blockage. No accumulation of stagnant water</p>	Contractor/CENC
5	Spillage of oil and fertilizer	Contamination of surface	Significant and permanent		

No	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of the impact	Proposed mitigation measures	
				Action to be taken	Implementing agency
	management	groundwater	permanent	fertilizer. Accessibility to spill prevention and response equipment, such equipment should be visible and accessible to all farmers/employees at any given time.	

Table 2: Mitigation measures during Operation Phase

No	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of the impact	Proposed mitigation measures	
				Action to be taken	Implementing agency
1	Land Environment	Change in land use pattern due to proposed irrigation scheme	Significant and permanent if not controlled	Controlled and planned irrigation system	Project Proponent
		Contamination of soil by fuel and lubricants from construction equipments and vehicles. Increased solid waste generation in area. If not managed properly will affect the health of local residents.	Significant and temporary	Avoiding spillage of oil and fuel to prevent seepage into ground and reaching surface water bodies. Waste management practices like waste segregation at source, recycling and reuse, mechanical composting etc. will be adopted Provision of mechanical composting units within the site. Regular collection of non-degradable	Project Proponent

No	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of the impact	Proposed mitigation measures	
				Action to be taken	Implementing agency
				<p>solid waste from the site.</p> <p>Provision of well engineered landfill site.</p>	
4	Water Environment	<p>Water shortage within the area.</p> <p>Water flooding during rainy season.</p> <p>Increase in turbidity of water</p> <p>Reduced runoff due to increased paved areas.</p>	Significant and permanent	<p>Blockage of natural drains to be avoided and cleaning and maintenance to be carried out.</p> <p>Regular maintenance of storm water drains, cleaning and effective soil erosion measures.</p> <p>Water harvesting to recharge on site to be encourage for use during period of pumping failure.</p> <p>Prevent pollution from run-off.</p> <p>Incorporating appropriate irrigation system design and ploughing techniques.</p> <p>Rain water harvesting system will be installed.</p> <p>Sewage treatment plants to recycle domestic</p>	<p>sewa ge and reuse for toilet Proje ct Prop onent</p>

No	Affected Environmental Parameters	Likely adverse impacts in absence of mitigation measures	Nature of the impact	Proposed mitigation measures	
				Action to be taken	Implementing agency
5	Public Health and Safety	Health problems to people staying within the plots.	Moderate and Permanent	<p>Road side plantation and its maintenance to prevent air/ noise pollution within site.</p> <p>Adequate parking facility at the irrigation scheme.</p> <p>Provision of adequate road safety like signage- posts/ road-crossings etc.</p> <p>Firefighting / Disaster Management Plan provisions for buildings.</p>	Project Proponent

10. MONITORING EMP

Monitoring of the EMP performance for the proposed project by the **Contractor** emphasizes early dictation, reporting and corrective action. It is divided into three parts, namely:

- Monitoring of project activities and action to be undertaken by the Environmental Coordinator (ENC) appointed by the Contractor.
- The Environmental Coordinator (ENC) shall report all incidents and situations which have the potential of jeopardizing compliance of statutory provisions as well as provisions of this EMP to the Project Proponent.
- The Environmental Coordinator (ENC) shall take corrective prompt measures, adequate and long lasting in addressing non-compliance activities or behaviour.

To ensure compliance of the Contractor ENC to the implementation of the EMP, it is highly recommended that an External Environmental Expert is appointment by the proponent to ensure the implementation of the EMP. The tables (5-9) provided below are to be used for monitoring purpose by the Contractor's ENC.

Table 3: Solid waste disposal: wire, paper, drill bites, and human waste

Mitigation	Compliance	Follow up Action Required	By Whom	When	Date Completed
Are disposal drums/bins available or full?					
Is there any litter around the site and its surroundings?					

Table 4: Oil spillage or used oil

Mitigation	Compliance	Follow up Action Required	By Whom	When	Date Completed
Are disposal drums available or full?					
Is there any oil spills around the site and its surroundings?					

Table 5: Land and Soil Disturbance

Mitigation	Compliance	Follow up Action Required	By Whom	When	Date Completed
Are there any deviations from the provisions of the EMP on land and soil disturbance?					
Are car track barricades in place?					

Table 6: Dust generation on site and gravel roads stretch

Mitigation	Compliance	Follow up Action Required	By Whom	When	Date Completed
Are there any deviations from the provisions of the EMP on dust					

pollution?					
Are the particulate levels acceptable?					

Table 7: Biodiversity (fauna and flora)

Mitigation	Compliance	Follow up Action Required	By Whom	When	Date Completed
Are there any deviations from the provisions of the EMP on biodiversity?					
Is traipses harvesting plant taking place feeding of animal or introduction of animals?					

Table 8: Noise and Vibration on site

Mitigation	Compliance	Follow up Action Required	By Whom	When	Date Completed
Are there any deviations from the provisions of the EMP on noise and vibration on site?					
Are there any complaints from the surroundings neighbour about noise emanating from the sites or tracks transporting materials/produce?					

Table 9: Compliance

Mitigation	Compliance	Follow up Action Required	By Whom	When	Date Completed
Are staff members and site visitors aware of the provisions of the EMP?					
Is there a copy of the EMP on site?					
Ask at least two people on various provisions of the EMP?					

11. ENVIRONMENTAL CODE OF CONDUCT

The Code of Conduct outlined in this section of the EMP applies and is not limited to, subcontractors, visitors, permanent and temporal workers. Therefore, anybody who finds him or herself within the boundaries of the Tulela Agriculture Liselo Irrigation Farm must adhere to the Environmental Code of Conduct as outlined in this section of the EMP.

- The Contractor ENC will implement on site environmental guidelines and has the authority to issue warnings as well as discipline any person who transgresses environmental rules and procedures. Persistent transgression of environmental rules will result in a disciplinary hearing and thereafter continued noncompliance behaviour will result in permanent removal from the construction sites.
- Continuous assistance from an External Environmental Expert to the Contractor ENC must be maintained in case some members of the project team do not understand or do not know how to keep up with established environmental guidelines.

Natural environment management guidelines

- a. Never feed, tease or play with, hunt, kill, destroy or set devices to trap any wild animal (including birds, reptiles and mammals), livestock or pets. Do not bring any wild animal or pet to the construction sites;
- b. Do not pick any plant or take any animal out of the construction area EVER. You will be prosecuted and asked to leave the project area;
- c. Never leave rubbish and food scraps or bones where it will attract animals, birds or insects. Rubbish must be thrown into the correct rubbish bins or bags provided;
- d. Protect the surface material by not driving over it unnecessarily;
- e. Do not drive over, build upon, or camp on any sensitive habitats for plants and animals;
- f. Do not cut down any part of living trees / bushes for firewood;
- g. Do not destroy bird nest, dens, burrow pits, termite hills etc. or any other natural objects in the area.

Vehicle use and access guidance

- i. Never drive any vehicle without a valid licence for that particular vehicle and do not drive any vehicle that appears not to be road-worthy;
- ii. Never drive any vehicle when under the influence of alcohol or drugs;
- iii. DO NOT make any new roads without permission. Stay within demarcated areas;
- iv. Avoid U-Turns and large turning circles. 3-point turns are encouraged. Do not ever drive on rocky slopes;
- v. Stay on the road, do not make a second set of tracks and do not cut corners;
- vi. DO NOT SPEED - 30 km per hour for normal vehicles and 20km per hour for heavy trucks on gravel roads and around the site;
- vii. No off-road driving is allowed;
- viii. Vehicles may only drive on demarcated roads;
- ix. Adhere to speed limits and drive with headlights switched on along any gravel road.

Control of dust guidance

- a. Do not make new roads or clear any vegetation unless instructed to do so by your Contractor or the Environmental Coordinator or Site Manager;
- b. Do not try to disturb the surface of the natural landscape as little as possible.
- c. Do not speed on gravel roads and around the construction sites, and adhere to the speed limits.
- d. Apply water to suppress dust where the generation of the dust on either gravel roads or construction sites is beyond control.

Health and safety guidance

- a. Drink lots of water every day, but only from the fresh water supplies;
- b. Take the necessary precautions to avoid contracting the COVID -19 virus;
- c. Never enter any area that is out of bounds, or demarcated as dangerous or wander off without informing or permission of team leader;
- d. Never climb over any fence or trespass on private property without permission of the landowner or consultation with the Environmental Coordinator, Site Manager.

- e. Report to your Contractor if you see a stranger or unauthorised person in the construction area;

- f. Do not remove any vehicle, machinery, equipment or any other object from the construction camp site without permission of your Contractor or Site Manager;
- g. Wear protective clothing and equipment required and according to instructions from your Contractor or Site Manager;
- h. Do not engage in sexual relationship with minors and also adheres to zero tolerance to spread HIV/AIDS.
- i. Use face masks at all time to reduce the transmission of COVID-19

Preventing pollution and dangerous working conditions guidance

- I. Never throw any hazardous substance such as fuel, oil, solvents, etc. into onto the ground;
- II. Never allow any hazardous substance to soak into the soil;
- III. Immediately tell your Contractor or Environmental Coordinator when you spill, or notice any spillage of hazardous substance anywhere in the field or camp;
- IV. Report to your Contractor or Environmental Coordinator when you notice any container, which may hold a hazardous substance, overflow, leak or drip;
- V. Immediately report to your Contractor or Environmental Coordinator when you notice overflowing problems or unhygienic conditions at the ablution facilities, vehicles, equipment and machinery, containers and other surfaces.

Disposal of solid and liquid waste guidance

- a. Learn to know the difference between the two main types of waste, namely: General Waste; and Hazardous Waste.
- b. Learn how to identify the containers, bins, drums or bags for the different types of wastes. Never dispose of hazardous waste in the bins or skips intended for general waste or construction rubble;
- c. Never burn or bury any waste on the camp or in the field;
- d. Never overfill any waste container, drum, bin or bag. Inform your Contractor or the Environmental Coordinator/ Site Manager if the containers, drums, bins or skips are nearly full;
- e. Never litter or throwaway any waste on the site, in the field or along any road.
- f. No illegal dumping;

- g. Littering is prohibited.

Dealing with environmental complaints guidance

- a. If you have any complaint about dangerous working conditions or potential pollution to the environment, immediately report this to the Environmental Coordinator
- b. If any person complains to you about noise, lights, littering, pollution, or any other harmful or dangerous condition, immediately report this to your Contractor.

Environmental Personnel Register

Table 10 presents the Environmental Personnel Register to be signed by every person who receives or attends the Environmental Awareness Training or who has the training material explained to him or her or in possession of the training material.

Table 10: Environmental Personnel Register

Date	Name	Company	Signature

12. SITE CLOSURE AND REHABILITATION

In the context the proposed project, rehabilitation refers to the process of returning disturbed land and soil to some degree of its pristine state. The scope of the **Contractor** site rehabilitation emphasizes the backfilling of water pipeline trenches cover with top soil in areas that will be disturbed by construction activities. These will be but not limited to the access roads, vehicle tracks around the site, removal and restoration of areas covered by stockpile and rock piles. Furthermore, this section outlines rehabilitation objectives and proposes rehabilitation commitments which the proponent shall adhere to.

12.1. OBJECTIVES OF THE SITE CLOSURE AND REHABILITATION

- Reduction or elimination of the need for a long term management program to control and minimize long term impacts.
- Clean up, treatment or restoration of disturbed or/and contaminated areas.

In addition, the following rehabilitation measures are important and should be implemented wherever necessary:

- A site inspection will be held after completion of the project to determine the nature and scope of the rehabilitation work to be undertaken. The rehabilitation will be done to the satisfaction of both **Tulela Agriculture and staff members from MET**.
- The rehabilitation work should commence soon after the end of the active construction period.
- The access road and all vehicle tracks should be rehabilitated by raking or dragging with tyres or tree branches (other suitable methods) behind a vehicle.
- With regard to both biological productivity and erosion, topsoil is arguably the most important resource in the project area, for that reason, the recovered topsoil and subsoil should be utilized to reconstruct the original soil profile.
- All waste shall be removed, and potential hazards, particularly pits closed and left in a safe disposition.
- All rehabilitated areas shall be considered no go areas and the environmental

coordinator shall ensure that none of the staff members enters the area after rehabilitation.

13. CONCLUSION AND RECOMMENDATIONS

13.1. CONCLUSION

The fundamental principle behind environmental assessments (EAs) is to ensure a balance in social, economic and environmental needs, particularly when proposed projects are of such a nature that they negatively affect some needs at the expense of the other. Ultimately, EAs should enhance proposed projects' propensity towards being more beneficial and important by suggesting measures, designing and implementing programs and plans to that effect.

Against this background, it is anticipated that this project will be beneficial and important to the Liselo Community and Zambezi Region if the guidelines and mitigation measures suggested in this EMP are implemented. However, it should be acknowledged that disturbance to the environment will be incurred, but that will be minimal and within legally acceptable levels in view of the current state of the project area.

This EMP should be viewed as a framework for integrating mitigation measures and applicable legal tools to ensure both compliance and sustainability. It is therefore very important that the contractor provides adequate resources (human, financial, tangible and intangible assets) for the implementation of the plan.

13.2. RECOMMENDATIONS

The proposed project of construction of Tulela Agriculture Irrigation Liselo Farm may go ahead provided that all the provisions of the EMP as well as all issued permit are followed.

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