

Ministry of Public Works and Transport



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PROPOSED SIPHOFANENI-SITHOBELA-MALOMA-NSOKO (MR-14)

And

MALOMA-SIPHAMBANWENI (MR 21) ROADS UPGRADE

VOLUME I: MR-14 ROAD

Ecology Report

By

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I. INTRODUCTION

I-1 The Project

The **Ministry of Public Works and Transport (MoPWT)** is proposing to upgrade the MR 14 road from Siphofaneni, Sithobela, Maloma, and Nsoko from a gravel road with the necessary re-alignments in some sections to conform to the national road standard for main roads, and its associated climbing lanes, to a tarred surface. The approximate length of the road is 87 km.

This project is one of several being carried out countrywide, to upgrade main roads for the current 2023/2024 fiscal year as part of government's capital investment in infrastructure to boost economic growth. The project area is located in a rural setting under the Siphofaneni Inkhundla, Sithobela Inkhundla and Lubulini Inkhundla in the Lubombo region of Eswatini.

I-2 Purpose of the Biodiversity Study

Eswatini's ecologically attractive because of its varied topography in a small area. Contained within a pocket sized country is a dramatic transition from high plateau to bushveld with soaring mountains and deep valleys, several major rivers and four main vegetation types; montane grassland (a broad strip down the west of the country), savanna or bushveld, forest and wetland.

Each habitat supports a different biome of flora and fauna, some being endemic (found only here and nowhere else on earth) but all are increasingly vulnerable to modern day threats. The mountain grasslands support the most plant species and the second most vertebrate species. Particularly in spring and summer the grasslands are a spectacular display of brilliant flowers.

Increasing numbers of international tourists want to stretch their legs in natural places during their summer holidays. With hiking trails connected to accommodation and other local ecotourism hotspots (rock paintings, cultural villages, etc), Eswatini's grasslands could be big income generators, yet preserve their usefulness for future generations. The rare and elusive blue swallow and aardwolf could be major drawcards for photographic tourists. Large tracts of these magnificent grasslands have been degraded by too frequent fire, overgrazing and alien invasives including wattle, lantana and bugweed. Savanna or bushveld is the common African scene of grasses interspersed with trees and shrubs, supporting a rich variety of animals and plants.

Eswatini's bushveld ranges from sour bushveld in a strip down the centre of the country, lowveld bushveld and Lubombo bushveld on the east and far east of the country respectively. The lowveld bushveld is where most larger mammals occur. All savanna habitats are negatively impacted by human encroachment, fires and overgrazing.

An environmental audit of the project is being carried out by First Environment to determine immediate, past and current environmental issues. One area that needs in depth investigation is the biodiversity along the project area. This report details results of an ecological survey carried out on plant and animal species along project area and the immediate surroundings.

I-3 Approach and Methodology

The project is the Siphofaneni-Sthobela-Maloma-Nsoko area in the Lubombo region of Eswatini. Through an ecological survey, the habitat, occurring in the affected area recorded broadly. The vegetation and its condition in the area was noted.

Interviews were conducted with a number of relevant informants who provided information on the threats to the plants, birds and mammals and others. Based on visits and communication with the relevant stakeholders and experts, the impacts on the flora and fauna resulting from excavation and site clearing are reported herein.

In this survey, flora and fauna checklists were used to record species and assign their conservation status using Red Data Lists, the Flora Protection Act, and Game Act schedules. Community consultations (local indigenous knowledge) were also used, as well as available literature on previous surveys of the area.

2 Vegetation

The project is characterised by two veld types: Lowveld Sour Bushveld in the Sthobela-Maloma section, Grassveld along the project road. The Lowveld Sour Bushveld is transitional between the lowveld and mountain sourveld. The Grassveld is a dense grassland, decreasing in height with increasing altitude. The grassland is considered to be the climax vegetation for this region, with patches of woody vegetation only existing in areas of favourable conditions.

The broader classification of the vegetation of the project area is described as the lowveld savanna biome; the savanna being one of seven (7) floristically distinct biomes of Southern Africa.



Photoplate #1 Alien/Invasive Species along the Project Road



Photoplate #2 Pristine Forests along the Project

2.1 Plant Communities and Special Habitats

Terrestrial Habitats

The Lowveld grassland is one of seven distinct vegetation biomes in Southern Africa, and one of the two main biomes found in Eswatini, namely the grassland biome confined to western Eswatini (part of the project area), and the Savanna biome confined to eastern Eswatini.

Assuming that all of the vegetation in the new legal outspan will be removed, the design implies that potentially a significant amount of terrestrial vegetation will be lost in a 87 km stretch of the road corridor, given that along its entire length, the legal outspan is 19m on either side of the road centerline.

This will result in an irreversible negative impact on the predominantly grassland terrestrial habitat.

Wetlands Habitats

Patches of wetlands are found in some sections of the road.

The project will result in an irreversible negative impact on the wetlands, which are protected in Eswatini under the Ramsar Convention.

2.2 Flora Species

Table 1 : is a list of species found at along project area.

Siswati Name	Scientific Name	Type	Uses	Abundance Inside Mine	Abundance Outside Mine
Sitfwetfwe	<i>Acacia borleae</i>	Tree	Used for fencing	√√	√√√
Lugagane	<i>Acacia ataxacanta</i>	Tree	Wood for fencing	√√	√√
Umkhaya	<i>Acacia burkei</i>	Tree	Wood for furniture	√√	√√
Sasane	<i>Acacia tortilis</i>	Tree	Used for fencing	√√	√√√
Umgamba	<i>Acacia davyi</i>	Tree	Fencing	√	√√
Umkhanya kudze*	<i>Acacia xanthophloea</i>	Tree	Medicinal	√	----
Singa	<i>Acacia gerrardii</i>	Tree	Fencing	√√	√√√
Inshagwe	<i>Acacia nilotica</i>	Tree	Fencing	√√√	√√√

* Represents species protected under the Flora Protection Act

+Represents Alien Species

- Absent

√ Low Abundance

√√ Abundant

√√√ Very Abundant

Table 1 Flora Recorded along project area.....Cont'd

Siswati Name	Scientific Name	Type	Uses	Abundance Inside Mine	Abundance Outside Mine
Inhlaba*	<i>Aloe malothii</i>	Shrub	Used for making snuff	√	√√
Vovovo*	<i>Cordyla Africana</i>	Tree	Bark used at emetic	√√	√√√
Umvangati*	<i>Pterocarpus angolensis</i>	Tree	Furniture; medicine for calves	√√	√
Umneyi*	<i>Berchemia zeyheri</i>	Tree	Edible fruit; wood for furniture	√√	√√√
Umnunu*	<i>Balanites maughamii</i>	Tree	Medicinal	√	√√
Lisundvu*	<i>Phoenix reclinata</i>	Shrub	Edible fruit, for beer making, leaves for basketry	√	√√
Umkhuhlu*	<i>Trichila emetica.</i>	Tree	Medicinal	√√	√√√
Umvongotsi*	<i>Kigelia Africana</i>	Tree	Medicinal	√	√
Sijejele	<i>Euclea natalensis</i>	Tree	Edible fruit	√√√	√√√
Licobhe	<i>Dalbergia armata</i>	Shrub	Basket; calf muzzle	√√	√√
Inovi	<i>Erianthemum dregei</i>	Shrub	Bird-lime	√	√
Lijowe	<i>Datura stramonium</i>	Shrub	Medical for swellings	√√√	√
Litabhane	<i>Scolopia mundii</i>	Shrub	Edible (like potato)	√	√
Gcumgcumu	<i>Physalis angulate</i>	Shrub	Edible fruit	√√	√
Imbondvo lemhophe	<i>Combretum zeyheri</i>	Tree	Used at Incwala	√√	√√√
Imbondvo lemnyama	<i>Combretum molle</i>	Tree	Use for fencing	√√	√√√
Sangongongo	<i>Plectroniella armata</i>	Tree	Edible fruit	√	√√
Silevusembuti	<i>Asparagus macowanii</i>	Shrub	Medicinal	√√	√√√
Umtfombotsi	<i>Spirostachys Africana</i>	Tree	Bark for back-ache, wood furniture, powder for sicholo	√√√	√√√
Umsenge	<i>Cussonia natalensis</i>	Tree	Emetic	√	√√
Umsiphane	<i>Grewia bicolor</i>	Tree	Root as emetic	√√√	√√√
Umwuwane	<i>Dombeya rotundifolia</i>	Tree	Medicinal	√	√√
Umdvute	<i>Euphorbia tirucalli</i>	Tree	Dye for black cattle	√√√	√√√
Siganganyane	<i>Lannea discolor</i>	Tree	Edible fruit	√√	√√√
Umhlafto	<i>Ricinus communis</i>	Tree	Medicinal	√√√	√
Umtfudvuluka	<i>Ximenia Americana</i>	Tree	Edible fruit	√	√√
Umphafa	<i>Zizypus mucronata</i>	Tree	Used for bearing a corpse at burial	√√	√√
Umganu	<i>Sclerocarya birrea</i>	Tree	Edible nuts, and fruit used for making	√	√√

			beer		
Umkhiwa	<i>Ficus capensis</i>	Tree	Edible fruit	vV	vVv
Incithamuzi	<i>Ilex mitis</i>	Tree	For bidden in homes	vV	vVv
Umntulwa	<i>Vangueria cyanescens</i>	Tree	Peg lighting	v	v
Ngcotfo	<i>Cassine transvaalensis</i>	Tree	Bark use at emetic; for luck	vV	vVv
Imbabatane	<i>Ctenomeria capensis</i>	Shrub	Medicinal	v	vV
Umsutane	<i>Lippia javanica</i>	Shrub	Cultural use	vV	vVv
Lusekwane	<i>Dichrostachys cirenea</i>	Shrub	Used at Incwala ceremony	vV	vV
Sanama	<i>Acanthospermum australe</i>	Shrub	Weed	vVv	vVv
Umfomamasi	<i>Rauvolfia caffra</i>	Tree	Bark medicine	v	vV
Ligusha	<i>Corchorus confuses</i>	Shrub	Edible Leaves	v	vV
Umsobo	<i>Solanum nigrum</i>	Shrub	Edible leaves	vV	v
Umhlonhlo	<i>Euphobia inges</i>	Shrub	Medicinal	v	vV
Umphungankomo	<i>Peltophorum africanum</i>	Tree	Medicinal	v	v
Umzilazembe	<i>Danrostachys cenerea</i>	Tree	Fencing	vV	vV
Sigwenga	<i>Sansevieria hyacinthoides</i>	Shrub	Rope making	v	v
Sihlonhlwana	<i>Euphorbia clavigera</i>	Tree	Medicinal	v	vV

* Represents species protected under the Flora Protection Act

+Represents Alien Species

- Absent

v Low Abundance

vV Abundant

vVv Very Abundant

Table 1 Flora Recorded along project area.....Cont'd

Siswati Name	Scientific Name	Type	Uses	Abundance Inside Mine	Abundance Outside Mine
Inhlang'shane	<i>Allophylus africanus</i>	Tree	Edible fruit	v	vVv
Ludvonca lesganga	<i>Ceratotheca triloba</i>	Shrub	Medicine	vV	vVv
Bhungele	<i>Ehretia rigida</i>	Tree	Edible fruit	vV	v
Sihlalavane	<i>Combretum hereroense</i>	Tree	Timber	v	vV
Umvalasangweni	<i>Gardenia cornuta</i>	Tree	Hut protection, use by traditional doctors	v	vV
Umhuluka	<i>Croton menyharthii</i>	Tree	Medicinal	vVv	vVv
Sihlangu	<i>Maytenus heterophylla</i>	Shrub	Used for making wooden spoon	vV	vV
Liletsa	<i>Pappea capensis</i>	Tree	Use by traditional doctors	vV	vVv
Inkhokhokho	<i>Ficus petersii</i>	Tree	Edible fruit use for carving	v	v
Lisololo lelikhulu (Orchid)	<i>Bauhinia acuminata</i>	Tree	Indigenous grass /erosion control	v	-----
Ngwengane	<i>Cynodon dactylon</i>	Grass	Cattle Fodder	vVv	vVv
Lubabe	<i>Panicum maximum</i>	Grass	Erosion control	vVv	vVv
Umsingitane	<i>Sporobolus africanus</i>	Grass	Pig's food	v	vV
Lidzangamane	<i>Aneilema dregeana</i>	Grass	Thatching	vVv	v
Red grass	<i>Themeda triandra</i>	Grass	Thatching	v	v
Lucunga	<i>Cymbopogon excavatus</i>	Grass	Mentioned in a proverb (socio-cultural)	v	vV
Umtsentsese	<i>Imperata cylindrical</i>	Grass	Unknown	vV	v
Intala	Unknown	Grass	Medicinal	vVv	vVv
Liphakama	<i>Venonia natalensis</i>	Grass	Cultural	v	vV
Libhuma	<i>Typha latifolia</i>	Grass	Grinding mats	vVv	v
Insikane	<i>Cyperus fastigiatus</i>	Grass	Cultural	vV	v
Umuzi*	<i>Ascolepis capensis</i>	Grass	Mat making	vVv	vV
Incoboza	<i>Cyperus articulatus</i>	Grass	Indigenous grass /erosion control	vV	v

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Eswatini's tree list is an impressive 700 species including several endemics but at least 56 threatened species. Of the 3678 floral groups including shrubs, herbs and grasses, over a dozen are endemic.

A total eighty nine (89) of species of plants were found. Eleven (11) are protected under the Flora Protection Act. Seven (7) are exotic/aliens. Special habitats that were found were the wetland patches which are protected under the Ramsar Convention.

Settlement, poor conservation practices (overgrazing) have destroyed much of this native vegetation in most rural areas of the project. Together with mining, this vegetation is now described as broken veld.

Red Data Species

Of the eighty nine (89) species identified within the mine perimeter and just outside it, eleven (11) are protected under the Flora Protection Act. Of these species, two (2) are now absent on the outside.

Conservation

All plant species are more abundant in the undisturbed areas, the most predominant being *Acacia sp.* and *Spirostachys Africana*. This supports the notion that restricted use of land along the project is conservationally friendly as exposed to unrestricted human access to habitats outside the mine boundary.

Medicinal Plant Species

Eighteen (18) medicinal plants species were found on site and one (1) of these plants species was not present inside the project boundaries. For example, *Aloe arborescence* can now be found only outside the perimeter, but others such as *Euphorbia* and *Trichila sp.* where only barks are used in treatment are found outside and inside the mine as well.

Woody Plants Species

Ten (10) wood species were found inside the undisturbed portions of the project and one (1) is not present outside the boundaries of the project. The wooden species are used mainly for timber.

Exotic/ Invasive Alien Species

Several alien plants are problematic especially in the disturbed areas within the project, including notorious *Chromolena odorata*, *Lantana camara* and *Parthenium hysterophorus*. All these alien plants are problematic even outside the project, where, in addition to these, cultivate fields and fallow land do contain alien herbaceous species. A number of these, however, are used by the locals either as relishes or in traditional medicine.

3. Fauna

3.1 Mammalian Species

There are 131 species of mammals in Eswatini of which at least 30 are facing extinction and three are regionally extinct (cheetah, wild dog and Lichtenstein's hartebeest). Since most of ESwatini's larger mammalian species have been hunted extensively, the only sizeable population of wild mammals are found in the country's parks and reserves where elephant (*Laxodonta africana*), black rhinoceros (*Diceros bocornis*), and white rhinoceros (*Ceratotherium simum*) and lion have been reintroduced. Hunting extinctions notwithstanding, the extensive alteration of natural vegetation throughout ESwatini for variety of economic activities continues to affect the abundance, diversity and distribution of wildlife. Despite these considerable constrains to free ranging wild animals, some animals have been sighted in areas of suitable habitats.

At some section of the project area, large mammals still roam the extensive forests, especially the well conserved lands along the MR-14 to the north, where ungulates such as the Inyala have found refuge, and has led to the development of this farm into an eco-lodge.

Table 2 is a checklist of mammals identified in the area, which includes the herds of cattle that freely roam the area.

Table 2 List of Mammals Known To Occur in the Project Area

English Name	Scientific Name	Siswati Name
Mole*	<i>Amblysomus sp.</i>	Imvukunyane
Grey duiker*	<i>Sylvicapra grimmia</i>	Impunzi
African wild dog*	<i>Canis mesomelas</i>	Inja Yesiganga
Scrub hare*	<i>Lepus saxatilis</i>	Logwaja
Impala*	<i>Aepyceros melampus</i>	Impala
Nyala*	<i>Tragelaphus angasii</i>	Linyala
Bushbuck *	<i>Tragelaphus scriptus</i>	Imbabala
African wild cat	<i>Felis lybica</i>	Ligoya
Red veld rat	<i>Aethomys chrysohilus</i>	Ligundvwane

Represents Protected species under the Game Act

Table 2 List of Mammals Known To Occur in the Project Area....C'ntd

English Name	Scientific Name	Siswati Name
Slender mongoose	<i>Galerella sanguine</i>	Umshigwane
Thick-tailed bushbaby	<i>Otolemur crassicaudatus</i>	Singwe
Common molerat	<i>Cryptomys hottentotus</i>	Ligundvwane
Wahlberg's epauleted fruit bat*	<i>Epomophorus wahlbergii</i>	Lilulwane
Skunk	<i>Mephitis spp</i>	Licaca
Bush squirrel	<i>Epexerus ebii</i>	Imbolwane
Vervet monkey*	<i>Pygerythrus cercopithecus</i>	Ingobiyane
Dwarf galago	<i>Galagoides demidovi</i>	Singwe
House rat	<i>Rattus rattus</i>	Ligundvwane
Multimamate rat	<i>Mastomys natalensis</i>	Ligundvwane
Warthog	<i>Phacochoerus africanus</i>	Budzayikatane
Bush pig	<i>Potamochoerus larvatus</i>	Ingulube Yesiganga
Rock dassie	<i>Hyracoidea</i>	Imbila
Angoni vlei rat	<i>Otomys anginiensis</i>	Ligundvwane
Black-backed jackal	<i>Canis mesomelas</i>	Mphungutje
Striped polecat	<i>Ictonyx striatus</i>	Licaca
Side-striped jackal	<i>Canisadustus</i>	Jakalazi

Represents Protected species under the Game Act

A total of twenty-six (26) mammalian species were found to be occurring in the project area. Although this is less than 10% of the recorded mammals of Eswatini, still the number is quite high. Of these, nine (9) species enjoy legal protection.

The large ungulates, *Aepyceros melampus*, *Tragelaphus angasii*, *Tragelaphus scriptus*, still roam the mountain forests, especially in the Maloma area, while the medium-and-small-sized mammals are regularly encountered in the settlements forests.

Species Diversity

Mining activities have a significant impact on mammals of the area. Larger mammals will probably avoid the mining site, however, hunting activity will likely be increased by the influx of humans to the site, causing a reduction in species population. As previously indicated, the Game Act prohibits such an activity.

Habitat Alteration

No essential destruction of vegetation at the active mine areas lead to a migration of mammals towards safer haven such as the nearby conserved lands along the MR-14 to the north. However, the encroachment of mining activities in some parts of the mine has provided suitable shelter for these mammals, e.g., duiker. The much smaller mammals, e.g. *Rattus sp.*, which are known urban survivors, probably roam in the active minerals for example mine building areas. It is likely, mining noise and dust from crushers and haulage trucks forced these mammals out of the undisturbed areas.

3.2 Avifauna Species

The streams crossing the road and wetlands associated with springs in the project area are home to several herpetofauna species, and this has attracted a variety of bird species to the area. Table 3 below is a list of birds recorded on site. Most of these are common birds in the area.

Table 3 Birds Recorded on MR-14 Road and Surrounding Areas

Siswati Names	Common Names	Scientific Names
Lituba	Laughing dove	<i>Streptopelia senegalensis</i>
Lituba	Cape turtle dove	<i>Streptopelia capicola</i>
Litubantfontfo	Green spotted dove	<i>Turtur chalcospilos</i>
Ligwegwezi	Crowned plover	<i>Vanellus coronuta</i>
Lihhwabayi	Pied crow	<i>Corvus albus</i>
Indlati	Speckled mouse bird	<i>Colius striatus</i>
Lishilolo	Red faced mouse bird	<i>Colius indicus</i>
Sangoli	Pied kingfish	<i>Ceryle rudis</i>
Umguphane	Cape sparrow	<i>Passer melanutus</i>
Sangoli	Woodland kingfisher	<i>Halcyon senegalensis</i>
Ikingfishi	Brown hooded king fisher	<i>Halcyon albiventris</i>
Inkonjane	Black saw wing swallow	<i>Hurundo cucullata</i>
Lusoti	Bateleur eagle	<i>Terathopius ecaudatus</i>
Tsekwane	Harmer kop	<i>Scopus umbretta</i>
Lingangane	Hadedda ibis	<i>Bostrychia hagedash</i>
Dvoye	Secretary bird	<i>Sagittarius serpentarius</i>
Intsendzele	Natal francolin	<i>Francolinus natalensis</i>
Lintiyane	Blue waxbill	<i>Uraeginthus angolensis</i>
Sijolobela	Long tailed shrike	<i>Corvinella melanaleuca</i>
Lisomo	Fork tailed drongo	<i>Dicrurus adsimilis</i>
Umshoshaphansi	Grass veld pipit	<i>Anthus cinnamomeus</i>
Ligwegwezi	Wettled plover	<i>Vanellus senegallus</i>
Lilanda	Cattle egret	<i>Bubulcus ibis</i>
Intsengu	Southern black flycatcher	<i>Meleanornis pammeliana</i>

Livukutfu	Rock pigeon	<i>Columba guinea</i>
Lihlokohloko	Spectacled weaver	<i>Ploceus ocuralis</i>
Inyoni	Brubru	<i>Nilaus afer</i>
Lohheya	Steppe buzzard	<i>Buteo buteo</i>
Lohheya	Lizard buzzard	<i>Kaupifalco monogrammicus</i>
Ligibholo	Black eyed bulbul	<i>Pycnonothus barbatus</i>
Sigwaca	Common quail	<i>Coturnix delegorguei</i>
Ncedze	Neddicky	<i>Cisticola fulvicapilla</i>
Mbalane	Small billed form	<i>Maleorus pectoralis</i>
Lihlokohloko-lelibovu	Redbishop	<i>Euplectes orix</i>
Lusoti	Brown snake eagle	<i>Circaetus cineris</i>
Imphangele	Helmeted guinea fowl	<i>Numida meleagris</i>
Incocodzi	Little spotted wood pecker	<i>Campether acalliautii</i>
Incwincwi	Black sun bird	<i>Nectarinia amethystine</i>

All Birds Protected under the Game Act

Table 3 Birds Recorded on MR-14 Road Road and Surrounding Areas ...cont'd

Siswati Names	Common Names	Scientific Names
Inyoni	Grey headed sparrow	<i>Passer diffuses</i>
Inkonjane	Lesser striped swallow	<i>Hirundo abyssinica</i>
Inyoni	Grey headed sparrow	<i>Passer diffuses</i>
Inyoni	Hoopoe	<i>Upupa epops</i>
Inyoni	Klaas' cuckoo	<i>Chrysococcyx klaas</i>
Phezukomkhono	Black cuckoo	<i>Cuculus clamosus</i>
Inyoni	Little grebe	<i>Tachybuptus ruffcolis</i>
Intsengu	Little swift	<i>Apus affinis</i>
Inyoni	Long billed crombec	<i>Sylvetta rescens</i>
Intsengu	Paradise flycatcher	<i>Terpsiphone viridis</i>
Inyoni	Pintailed whydah	<i>Vidua macroura</i>
Inyoni	Puffback	<i>Dryoscopus cubla</i>
Inyoni	Purple crested louriee	<i>Tauraco porphyreolophus</i>
Inyoni	Rattling cisticola	<i>Csticola chiniana</i>
Inyoni	Red billed wood noopoe	<i>Phoeniculus purpureus</i>
Umshoshaphansi	Richard's pipit	<i>Anthus cinnamomeus</i>
Inyoni	Southern boubou	<i>Laniarius ferrugineus</i>
Inyoni	Southern black tit	<i>Parus niger</i>
Sikhova	Barn owl	<i>Tyto alba</i>
Inyoni	Black crowned tchagra	<i>Tchagra senegala</i>
Inyoni	Black headed oriole	<i>Oriolus larvatus</i>

Inyoni	Bleating warbler	<i>Camaroptera brachyuran</i>
Inyoni	Rufous bellied heron	<i>Butorides rufiventris</i>
Sikhova	Scops owl	<i>Otus senegalensis</i>
Ligibholo	Sombre bulbul	<i>Andropadus importunes</i>
Inyoni	White helmet shrik	<i>Prionops plumatus</i>
Incwincwi	White bellied sunbird	<i>Nectarinia talatala</i>
Inyoni	Spotted dikkop	<i>Burbinus capensis</i>
Inyoni	Three streaked tchagra	<i>Tchagra australis</i>
Lisoti	Warhlberg's eagle	<i>Aquila warhlbergii</i>
Inyoni	White winged widow	<i>Euplectes albonotatus</i>
Inhlava	Little bee-eater	<i>Merops pusillus</i>
Inyoni	Willow warbler	<i>Phylloscopus trochilus</i>
Inyoni	Yellow breasted apali	<i>Apalis flavida</i>

All Birds Protected under the Game Act

Table 3 Birds Recorded on MR-14 Road Road and Surrounding Areas ...cont'd

Siswati Names	Common Names	Scientific Names
Inyoni	Yellow eyed canary	<i>Serinus mozambicus</i>
Inyoni	Yellow throated sparrow	<i>Petronia superciliaris</i>
Inyoni	Rock kestrel	<i>Falco tinnuculus</i>
Inyoni	Southern ground hornbill	<i>Bucorvus leadbeateri</i>
Inyoni	Pied barbet	<i>Tricholaema leucomelas</i>
Incwincwi	Black sunbird	<i>Nectarinia amethystine</i>
Lusoti	Martial eagle	<i>Polemaetus billicosus</i>
Inyoni	Crested francolin	<i>Francolinus sephaena</i>
Limfemfe	Lilac breasted roller	<i>Coracias caudate</i>
Ligwegwezi	Black smith plover	<i>Vanellus armatus</i>
Inyoni	Rufous bellied heron	<i>Batorides rufiventris</i>
Incocodzi	Bearded wood pecker	<i>Tripias namaquus</i>

All Birds Protected under the Game Act

Of the recorded, 500 bird species, at least 40 are at risk of extinction and 7 are regionally extinct. A total of ninety-three (93) species were recorded on site. The vast forests away from MR14 road and settlement, especially in the mountainous bushlands of Maloma, offer suitable habitats and nesting sites for birds, especially raptors. All birds are protected under the Game Act.

3.3. Herpetofauna

Eswatini occupies a unique position in south-eastern Africa where the Afro temperate and Afrotropical biomes meet, and their related herpetofauna communities represent an interesting vertebrate community in Southern Africa. As presently conceived, there are 154 forms of amphibians and reptiles recorded in Eswatini.

A checklist of herpetofauna at MR-14 Road and Surroundings is shown in Table 4.

Table 4 Herpetofauna Known To Occur in the MR-14 and Surrounding Areas

Type	Common Name	Scientific Name	Siswati Name
Lizard	Monitor lizard	<i>Varanus niloticus</i>	Chamu
Tortoise	Leopard tortoise	<i>Geochelone pardalis</i>	Lifudvu
Lizard	Stripped skink	<i>Mabuya striata</i>	Umgololo
Snake	African rock python*	<i>Python sebae</i>	Inhlatfu
Lizard	Cape dwarf gecko	<i>Lygodactylus capensis</i>	Umgololo
Lizard	Variegated skink	<i>Mabuya varia</i>	Umgololo
Lizard	Tree agama	<i>Agama atricolis</i>	Intfulu

* Represents Protected species under the Game Act

Table 4 Herpetofauna Known To Occur in the MR-14 and Surrounding Areas...C'ntd

Type	Common Name	Scientific Name	Siswati Name
Frog	Bushveld Frog	<i>Laptozelis mossambicus</i>	Sicoco
Frog	Common plantana	<i>Breviceps adspersus</i>	Sicoco
Frog	Guttural frog	<i>Bufo gutturalis</i>	Sicoco
Snake	Black mamba*	<i>Dendroaspis polyopsis</i>	Imamba
Snake	Mozambique spitting cobra*	<i>Naja mossambica</i>	Imfeti
Snake	Puff adder*	<i>Bitis arietans</i>	Libululu
Snake	Egyptian cobra*	<i>Naja haje</i>	Phemphetfwane
Lizard	Dwarf chameleon	<i>Bradypodion spp</i>	Lunwabu
Frog	Common grass frog	<i>Rana angolensis</i>	Sicoco
Frog	Bushveld rain frog	<i>Breviceps adspersus</i>	Sicoco
Snake	Rhombic egg-eater	<i>Dasypeltis scabra</i>	Inyoka
Lizard	Velvety gecko	<i>Homopholis wahlbergii</i>	Umgololo
Snake	Brown house snake	<i>Lamprophis fuliginosus</i>	Inyoka
Lizard	Rainbow skink	<i>Mabuya quinquetaeniata</i>	Umtala-nyoka
Lizard	Striated skink	<i>Mabuya striata</i>	Umgololo
Snake	Olive grass snake	<i>Psammophis subtaeniatus</i>	Inyoka
Frog	Tremelo sand frog	<i>Tomopterna cyptosis</i>	Sicoco
Frog	Knocking sand frog	<i>Tomopterna krugerensis</i>	Sicoco
Snake	Bibron's blind snake	<i>Typhlops bibronii</i>	Inyoka Lengaboni
Lizard	Rock monitor	<i>Varanus alobigularis</i>	Chamu

* Represents Protected species under the Game Act

Of the 155 herpetofauna species reported in Swaziland, A total number of (27) species were recorded on site, five (5) are protected species. The forests offer suitable habitats for snakes, which are also attracted by rats and chickens in the settlements. The rocky terrain in the Maloma hills is ideal habitats for lizards.

5. Pisces (Fish)

Despite its small land area (17,363 km²), Eswatini is intersected by many river systems, including several that originate outside the country. As a consequence, Eswatini is home to at least forty (40) species of fish. Table 5 is a list of fish species in the Usuthu River, Mhlathuze River and Ngwavuma River.

Table 5 List of Fish Species Along the Road Project

Scientific Name	Common Name	Siswati Name
<i>Anguilla mossambica</i>	Longfin eel	Mokhane
<i>Barbus argenteus</i>	Rosefin barb	Imfishi
<i>B. unitacniatus</i>	Longbeard barb	Imfishi
<i>B. marequensis</i>	Largescale yellowfish	Imfishi
<i>B. timaticulatus</i>	Threespot barb	Imfishi
<i>B. toppini</i>	Eastcoast barb	Imfishi

Table 5 List of Fish Species Along the Road Project

Scientific Name	Common Name	Siswati Name
<i>Barillius zambezensis</i>	Barred minnow	Imfishi
<i>Chiloglanis anoterus</i>	Pennant tail catlet	Bhabuli
<i>C. paratusb</i>	Sawfin rock catlet	Bhabuli
<i>Clarias gariepinus</i>	Sharptooth catfish	Bhabuli
<i>Cyprinus carpio</i>	Carp	Imfishi
<i>Egraulicypris brevianalis</i>	River sardine	Isadini
<i>Labeo cylindricus</i>	Red eye labeo	Imfishi
<i>L. molybdinus</i>	Leaden labeo	Imfishi
<i>L. rosae</i>	Rednoise labeo	Imfishi
<i>L. rubropunctatus</i>	Redspotted labeo	Imfishi
<i>Micralestes acutidens</i>	Silver robber	Imfishi
<i>Microterus salmoides</i>	Largemouth bass	Bhasi
<i>Clarias gariepinus</i>	Sharptooth catfish	Bhabuli
<i>B. polylepis</i>	Barb	Imfishi
<i>Sarotherodon mosssambicus</i>	Mozambique tilapia	Imfishi
<i>Salmo gairdneri</i>	Salmon	Imfishi

Twenty-two (22) fish species are known to occur in lowveld rivers and streams, of which the barb family, which is by far the most diverse in the checklist, does not include the *B. afer*, *B. burgi*, *B. andremi* or *B.serra*,

which appear on the Red Data list – Freshwater fish. The second diverse (*Labeo*) does not include the *L. seeberii*, which is threatened.

6. SIGNIFICANT BIODIVERSITY ISSUES/IMPACTS

Impact on Terrestrial Habitats

During construction, direct impacts on flora will arise from the need to remove vegetation from the project area. Unplanned and indiscriminate vegetation will lead to destruction of wildlife habitats.

It is expected that the extent of the impact will be confined to the road prism, as well as at off-site areas such as site offices, borrow pits, service yard, batching plant, and spoil sites.

Although construction will be a temporary activity, the loss of terrestrial plants, and therefore habitats for wildlife, will be permanent.

Impact on Sensitive Habitats: Wetlands

The road will cross the water courses at three points, starting at Sinceni, and will cross the tributaries at Maloma where bridges will be aligned, and finally the wetland associated with the Nsoko bridge. In these low-lying areas, patches of sensitive wetland habitat will be impacted.

Therefore, the direct major impact on the wetland ecosystem structure and functions by the MR-14 Road is a major very high negative, as wetlands are protected internationally under the Ramzar Convention.

Impact on Sensitive Aquatic Habitats

The MR-14 Road, especially on river crossings, is part of the catchment of the water courses.

The impact of the proposed MR-14 Road on the aquatic habitats of the project area relates to the need to maintain ecology water, which ecological water flows are at risk of obstruction by the proposed re-alignments, and whose structures (culverts, etc.) may alter the River topography, alter the direction of run-off, produce surface collapse, change the state of the riverbed, and reduce flood discharge capacity of the river, and thereby ultimately impact negatively on this sensitive aquatic habitat.

Impact on Protected Flora

As the vegetation in most of the site is grass and gravel, only few legally protected species will be affected. However, unplanned and indiscriminate vegetation removal will result in loss of protected wooded vegetation found near the riverbank. There are nine (9) legally protected plants including *Annona senegalensis*, *Phoenix reclinata*, *Aloe sp*, etc.

Direct impacts on flora arise from the need to permanently remove vegetation from the site. This is because most of the soil is proposed to be removed to make way for imported gravels suitable for construction of the road.

Impact on Mammals

During construction, it is unlikely that the proposed development will have a significant impact on mammals of the area. Larger mammals will probably avoid active construction sites; however, hunting activity will likely be increased

by the influx of humans to the corridor, causing a reduction in species population. Poaching is a serious crime in Eswatini under the Game Act of 1993.

In addition, lack of sensitisation of work crew may also result in killing of mammals, the corridor may still have a few species of free roaming mammals in suitable habitats such as vervet monkeys, which are not much liked in Eswatini.

Impact on Birds

Bateleurs are widespread in Southern Africa and endangered in Eswatini as humans spread across the land, bateleurs disappeared into protected areas, killed by nest disturbance and trapping for their feathers by traditional healers. The nest, built mainly by the male and placed in the fork of a large, leafy tree, is a platform of small sticks lined with green leaves. These diurnal (active in the day) eagles are both scavengers and bunters. They are often the first raptors (birds of prey) to find a carcass following roads in search of roadkill and their diet consists of small mammals, birds reptiles and a few fish bateleurs providing rodent control, snake control and cleaning up roadkill and other decaying carcasses.

Other eagles that can be sighted in Eswatini are the black eagle (rare Highveld resident), tawny eagle (uncommon resident in the lowveld, steppe eagle (uncommon summer migrant), Wahlberg's eagle (common summer migrant), booted eagle (uncommon summer migrant), African hawk eagle (rare lowveld resident), longcrested eagle (uncommon lowveld and middleveld resident), martial eagle (rare lowveld and middleveld resident), crowned eagle (uncommon Highveld and middleveld resident), brown snake eagle (uncommon resident), blackbreasted snake eagle (rare resident).

Other raptors found in Eswatini include the secretarybird, kites (yellowbilled, black and black-shouldered kites), honey buzzard, buzzards (steppe, forest jackal and lizard buzzards), cuckoo hawk, sparrowhawks (redbreasted, ovambo, little and black sparrowhawks), goshawks (little banded, African Gabar an dark chanting goshawks), harriers (African marsh, Montagu's and black harriers), gymnogene, osprey, falcon (peregrine, lanner and hobby falcons), kestrel (western redfooted, eastern redfooted, rock and lesser kestrel (western redfooted, eastern redfooted, rock and lesser kestrel) and vultures (hooded, Cape, whitebacked, lappetfaced and whiteheaded vultures).

Noise and human presence causes some of the birds to relocate. Although birds are transients, it means they occasionally stray onto active areas and risk poaching, especially the helmeted guinea fowl, *Numida meleagris*, that freely roam in the area.

Impact on Herpetofauna

Amphibians in the area are attracted to the dams, whereas the rocky habitats and old overburden sites are habitats for lizards.

The undisturbed bushes are habitats for snakes, which are also in danger of being killed by construction vehicles or intentional extermination by workers because reptiles such as snakes and lizards as well as frogs, are not that much liked in Eswatini.

Likely impacts during construction would be the unnecessary clearing of off-site areas, resulting in the destruction of habitats for herpetofauna. During construction, the contractor and his/her work crews may cause loss of these species by straying onto adjacent uncleared areas either intentionally, or unintentionally. Workers will come across frogs and snakes and be tempted to kill them.

There is a strong likelihood of killing of reptiles by construction crews especially those generally not liked in Eswatini, including snakes and frogs. The killing of legally-protected animals under the Game Act is a serious crime in Eswatini.

Impact on Fish

There Twenty-two (22) fish species are known to occur in lowveld rivers. Large lowveld fish such as *Anguila mossambicus*, are found in the bigger Usutu River, providing valuable protein to the St Phillips, Siphofaneni, and other communities.

There are recorded cases of illegal fishing in rivers, and this must be controlled under the Fresh Water Fish Act of 1937.

Invasive/Alien Species Invasion

There is a profusion of alien species on site, notably *Lantana camara*. A total of five (5) alien/exotic species were found.

It is noted that total of six hundred and thirty two (632) tree species were recorded in Swaziland during the Swaziland Tree Atlas project. This project was initiated in 1999 and published in 2005 by the Southern African Botanical Network (SABONET). Of this total number, thirty five (35) were exotic species and five hundred and ninety seven (597) were indigenous species. This project suggested that the highest numbers of species are found in the Lubombo Mountains in the east, near Lufafa peak in the north-west and Sinceni Mountain in central Swaziland. The Lowveld was recorded as one of the regions with low species richness.

7. BIODIVERSITY MITIGATION MEASURES

Conservation of Terrestrial Habitats

Vegetation will not be removed except for the express purpose of construction.

All riparian zones will be left undisturbed.

Site clearance activities that will involve the use of fire will not be allowed, and construction workers will not take part in any activity that will affect the nearby habitats such as:

- collection of wood
- muthi collection

Although none of the species *Themeda triandra*, *Eragrostis racemosa*, *Hyparrhenia hirta*, *Cymbopogon excavatus*, *Heteropogon contortus* and *Sporobolus africanus* are legally protected, it is in the interest of biodiversity conservation that site clearance outside the site is avoided such that only vegetation in the way of construction activities can be cleared.

Sensitive Habitat: Wetlands

The project will ensure that all wetlands associated with the river crossings are considered ecologically-sensitive by the project, and will not be encroached upon unnecessarily.

The project will ensure that these wetlands are protected through adequate drainage that ensures that run-off continues to flow via the project area's drainage channels through to the wetlands.

Since wetlands thrive on either side of intrusions as long as the water flow across is not interrupted, the project will ensure that culverts of adequate size are designed so that water is allowed to flow unhindered throughout the wetland and areas of the road.

At all times, the wetland associated with Nsoko bridge will be off-limits to any development.

Impact on Sensitive Aquatic Habitats

The project will not carry out any development within 33 m of the public rivers and streams as per the Public Stream Bank Regulations.

The project will ensure that culverts of adequate size and functionality are designed so that water is allowed to flow through all bridge structures unhindered, so as to maintain ecological flows.

The culvert design at the river crossings will be such that at the outflow end, fish and other aquatic wildlife are able to move from one side of the river to the other as some species migrate upstream during the spawning season.

Protected Flora

Prior to commencement of construction, the Contractor will peg the road to demarcate its boundaries, so as to enable identification of species within the road corridor that need relocation such as *Anona senegalensis*, which will be marked with red tape.

Prior to construction, the Contractor will engage a qualified Botanist, with horticultural experience, to implement the Biota Rescue Plan for the project.

Prior to commencement of construction, the Contractor will ensure that the endangered plant (and animal) species identified are translocated to nearby areas which will act as proxy sites for the rescued plant species, keeping in mind that rescued species have a high survival rate if transplanted to habitats similar to the area from which they are translocated, i.e., nearby areas.

The project will consult the Ministry of Tourism and Environmental Affairs, Forestry Department, prior to bush clearance, to allow the herbarium to take plant specimens, where necessary. This will be extended to the Gene Bank as well.

Mammals

To protect mammalian wildlife, the Contractor will ensure that site clearance outside the road prism is avoided, such that only vegetation in the way of construction activities can be cleared.

The Contractor will ensure that vegetation is not removed, except for the express purpose of construction.

Because mammals are likely to flee the site once clearing starts, this activity will be directional, always in the direction of the rivers and streams and forests, in order to allow mammals to migrate safely towards the habitats or the mountain bushlands that will offer protection from harm.

The contractor will ensure that workers do not poach on protected mammals. Such species include the legally-protected *Lepus saxatilis*, which is a poacher's favourite outside nature reserves.

Penalties accompanying the bridging of the Game Act will be clearly stated to contractors, who will educate his workforce on them.

Protection of Birds

Species such as *Scopus umbretta* which are attracted by amphibians on site are likely to be killed by work crew due to cultural or superstitious beliefs, and since such species are legally protected, they shall not be killed.

When encountering nesting sites, workers are to leave the trees undisturbed until the eggs hatch and the chicks are old enough to fly.

Herpetofauna

Contract workers will be educated on conservation importance, and will not be allowed to hunt or kill animals. All penalties accompanying the bridging of the Game Act will be clearly stated to workers and contractors.

When encountered, slow moving reptiles such as tortoise, will be assisted by mine workers to migrate to nearby suitable habitats inside the eco-lodge farm.

Amphibians breeding in the wet areas, e.g., the dams, shall not be killed by mine workers. Reptiles, including dangerous snakes, shall not be killed unless in defense of human life.

Impact on Fish

The contractor will protect the aquatic wildlife in the fresh water dams by delienating the dams through fencing so that there is no encroaching onto them.

The contractor will ensure that no one is allowed to fish in the dam without the requisite fishing permits. The mine will ensure through appropriate signs that swimming is not allowed.

The contractor will ensure that nets to catch the fish are not used, and that there is no dumping or discharge of any substances or liquids into these dams that could be injurious to the aquatic life.

The contractor will ensure that small-sized fish caught are returned to the water, and that as per the regulations, the capture of trout, large-mouthed black bass, or any other non-indigenous fish, is prohibited.

Invasive/Alien Species Invasion

The contractor will actively implement the Biodiversity Action Plan and revive the strategies used in the past to identify and cut down all invasive/alien species.

The most effective methods of eradication of invasive aliens will be used. These are:

- Isolated plants must be rooted with a small hand pick.
- Rooted plants must be burnt or preferably left to rot.
- Chemical treatment of cut stems to prevent re-growth

The contractor's progressive landscaping and re-vegetation of disturbed areas will not use alien species. This precaution will also be part of the overall environmental management plan for the site.

8. LIST OF INDIGENOUS KNOWLEDGE CONSULTED

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