8. DESCRIPTION OF THE AFFECTED ENVIRONMENT

Key features of the study area are presented in this chapter.

8.1 CLIMATE

Climate data is provided for the towns of Tsolo and Maclear, which are considered to be representative of the general study area. Both towns have sub-tropical climate with moderate rainfall.

Tsolo receives an average annual rainfall of 749 mm, with most rainfall falling in summer. The lowest (15 mm) average monthly rainfall is experienced in June and the highest (108 mm) in January. The coldest month is July with an average minimum temperature of 3.2°C and January being the hottest month with an average maximum temperature of 26.5°C (**Table 15**).

Table 15: Climate data for Tsolo

Tsolo	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Average monthly rainfall (mm)	108	107	107	47	26	15	17	22	42	68	89	101
Average minimum Temp (°C)	15.1	15.2	14.1	9.3	7.1	3.5	3.2	5.2	8.2	11	12.4	13.7
Average maximum Temp (°C)	26.5	26.4	25.7	22.5	21.7	19.5	19.4	21	22.5	23	24.4	25.7

Source: www.climate-data.org

Maclear receives an average annual rainfall of 786 mm, with the wettest month being January receiving an average monthly rainfall of 130 mm. The driest months are June and July with both 13 mm average rainfall. The hottest temperatures are experienced in summer with average maximum temperature of 20.1°C in January. July is the coldest month with temperatures as low as 0°C (**Table 16**).

The variations in temperature and rainfall in the two towns is due to the difference in elevation: Maclear lies at an elevation of 1 280 m above mean sea level whereas Tsolo is at an elevation of 945 m.

Table 16: Climate data for Maclear

Maclear	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Average monthly rainfall (mm)	130	121	113	46	24	13	13	21	38	64	88	115
Average minimum Temp (°C)	13.9	13.9	12.6	9.3	5.6	0.8	0	3.1	7.3	9.5	11.3	12.6
Average maximum Temp (°C)	26.3	26	24.8	22.5	20	16.4	16.3	18.8	21.7	23	24.3	25.7

Source: www.climate-data.org

8.2 TOPOGRAPHY

The Ntabelanga Dam basin is located within an east-west valley with rising hills to the north and south.

The Lalini Dam basin is generally U-shaped in an east-west and north-south direction surrounded by hills mainly to the north, east and south. The dam wall is located in the east of the dam on the Tsitsa River. The dam site is located about 3.5 km upstream of the scenic Tsitsa Falls.

Deep dongas are evident where the soils are deep and easily erodible.

South of the proposed Lalini Dam, the proposed power line route linking the hydro power plant to the grid (including power line route alternatives) rise up out of the Tsitsa River valley onto the upper plateau over a rolling open landscape to where it meets the national grid approximately 18 km away.

The area around Tsolo earmarked for irrigation consists of gentle rolling hills, much of which used to be terrace farming. Sections are adjacent to drainage lines while others are on sloped terrain. The areas around the Ntabelanga Dam are mainly on flatter lying land adjacent to the edge of the dam and adjacent to the river downstream of the dam.

8.3 GEOLOGY AND SOILS

The study area is underlain by sedimentary rocks of the Tarkastad Subgroup of the Beaufort of the Karoo Supergroup and post Karoo dolerite intrusives. The Karoo Supergroup consists of light brownish grey, fine to medium grained sandstones and subordinate thinner bluish to reddish grey mudrocks. There are also traces of mudflake conglomerates. These sediments were deposited by north flowing braided river systems (**Figure 28**).

There is a low level of tectonic deformations in this region. Dolerite Sills and Dykes are found with thermally metamorphosed adjacent sediments. The dykes are only a few meters wide but stretch for long distances. Dolerite is a dark basic intrusive igneous rock consisting of plagioclase, feldspar and pyroxenes and its soils generally have high potential for both rain fed and irrigated crops and forestry. Beaufort sediments are characteristically erodible.

The bedrock is the main constituent in the study area with some thick colluvial soil deposits covering it.

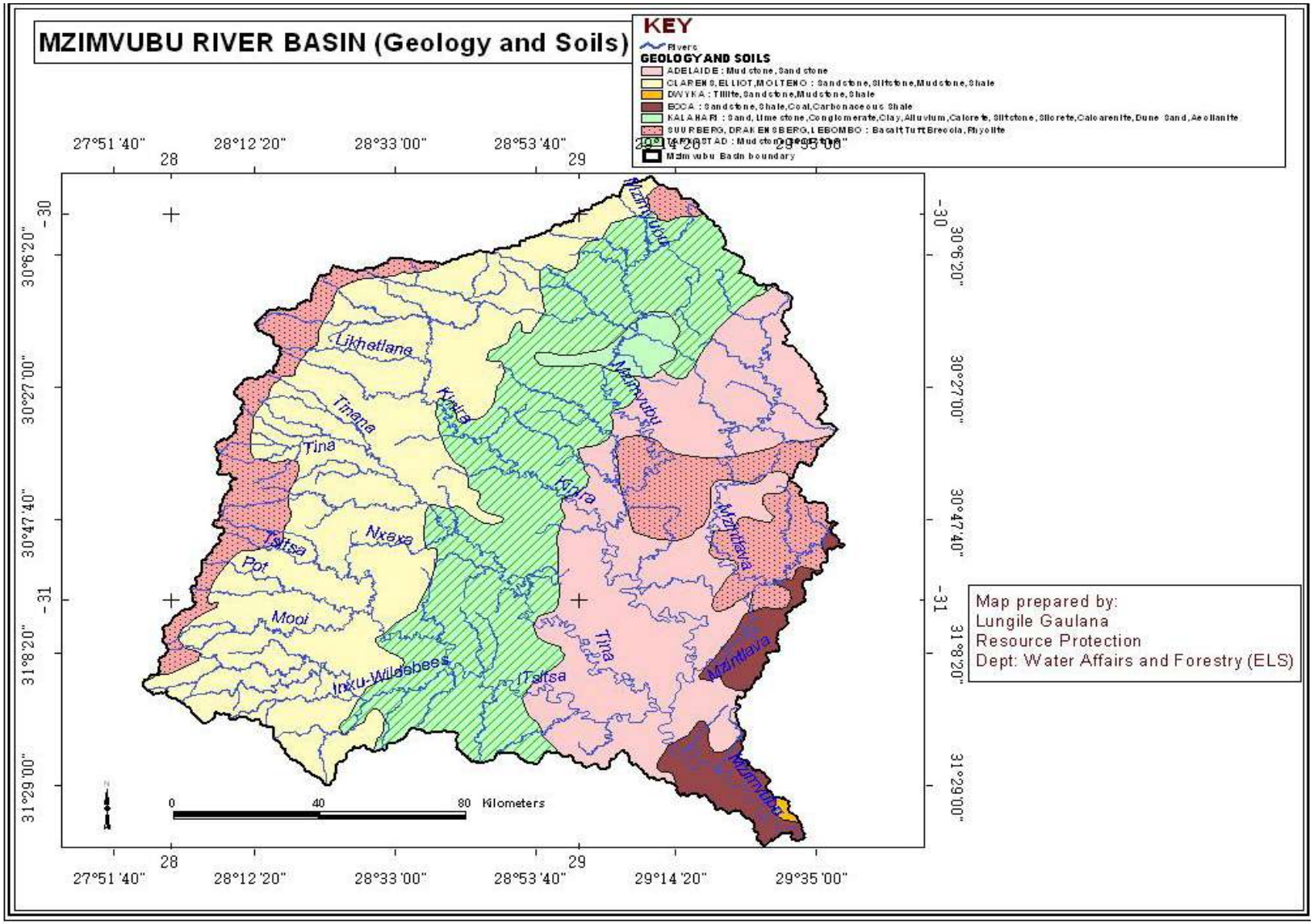


Figure 28: Geology and soils in the Mzimvubu catchment (DWAF, 2008)

Alluvial sand occurs in the course of the Tsitsa River and major tributary rivers and streams. Due to the steep and incised nature of the rivers, sand is mainly confined to the river channel, with few and only localised over-bank deposits (DWA, 2013b).

The area has Hutton 2200 salm and Hutton 2100 salm soil types. Orthic topsoils overlie red apedal subsoils. Topsoil texture is sandy loam becoming sandy clay loam in the subsoil. Soils thus have luvic character as clay has moved from top to subsoil over time. Textural transition from top-to subsoil is gradual providing free root penetration. Soil structure is apedal tending to weak crumb (DWA, 2013a).

Soil erosion

There are extensive areas of severe gulley erosion on the inter-fluvial areas adjacent to stream channels (**Figure 29**). The erosional and piping characteristics are suggestive of the presence of dispersive soils (DWA, 2013b).

In the Mzimvubu and Tsitsa River catchments, soil erosion is an outcome of high rainfall intensities, steep slopes, erodible soils and land use practices that are conducive to erosion. The latter include overgrazing and cultivation on unsuitable thin soils with sloping terrain, which causes grass to not recover, a loss of root structure and sheet erosion.

Figure 29: Donga in the Ntabelanga Dam area

Structures placed in the way of water flow paths have caused the interception of flood paths and springs, cutting off recharge to wetlands and the formation of artificial flood barriers, thereby also causing erosion, as well as sedimentation, and damage to the structures themselves.

Erosion and land degradation affect ecosystem health and negatively impact on the majority of downstream rivers, which are characterised by high turbidity and increased siltation. The high sediment loads in rivers will increase water treatment costs and decreases the lifespan of any dams or hydropower schemes.

A catchment rehabilitation and management programme, aimed at restoring eroded land and thereby reducing the levels of sedimentation that are expected to impact on the yield of the dams, has been initiated in the Mzimvubu River catchment. A budget of R 450 million over the next 10 years has been allocated to the programme. The work has begun in the Tsitsa River catchment in order to synchronise with the proposed new dams currently under investigation. The programme is being implemented by the Department of Environmental Affairs. It will include alien vegetation eradication, the phased restoration of eroded areas and future erosion preventative measures such as sediment trapping and reuse, planting of erosion reducing vegetation, improving land-use practices by rotational usage regime including rotational fencing of grazing areas for protection purposes.

The benefits of the programme include the restoration of wetlands and productive land, reduction of future erosion and land loss, and the reduction of sediment released into the river resulting in improved water quality, reduced water treatment costs and longer operational lifespan of proposed dams and hydropower plants. Improved runoff and river flow regulation via wetlands will improve base flow and reduce peak flood events. The programme will create temporary and permanent jobs.

In order to minimise the impacts on sedimentation within the dam a sediment management program should be implemented as part of the DEA's catchment rehabilitation and management plan for the dam catchments and should include awareness training on sustainable agricultural practices.

While this project will impact positively on the Mzimvubu Water Project, it is conducted as an independent project and its activities are not a part of this EIA.

8.4 FLORA

8.4.1 Bioregions

The study area falls within the Sub-escarpment Grassland and Sub-escarpment Savanna Bioregions (Mucina and Rutherford, 2006) (**Figure 30**).

8.4.2 Vegetation types

The study area falls within several vegetation types (Mucina and Rutherford, 2006). These include the *Bisho Thornveld, Drakensberg Foothill Moist Grasslands, Eastern Valley Bushveld, Eastern Griqualand Grassland, Mthata Moist Grassland* and *Southern Mistbelt Forest* (**Figure 33**). These vegetation types are discussed below.

The *Bisho Thornveld* vegetation is found at altitude spanning 200-700 m. It is formally classified as a 'Least Threatened' vegetation type (provincial conservation target is 25%). Up to 20% has been transformed for cultivation, urban development or plantations. Erosion in this vegetation type ranges from low to moderate.

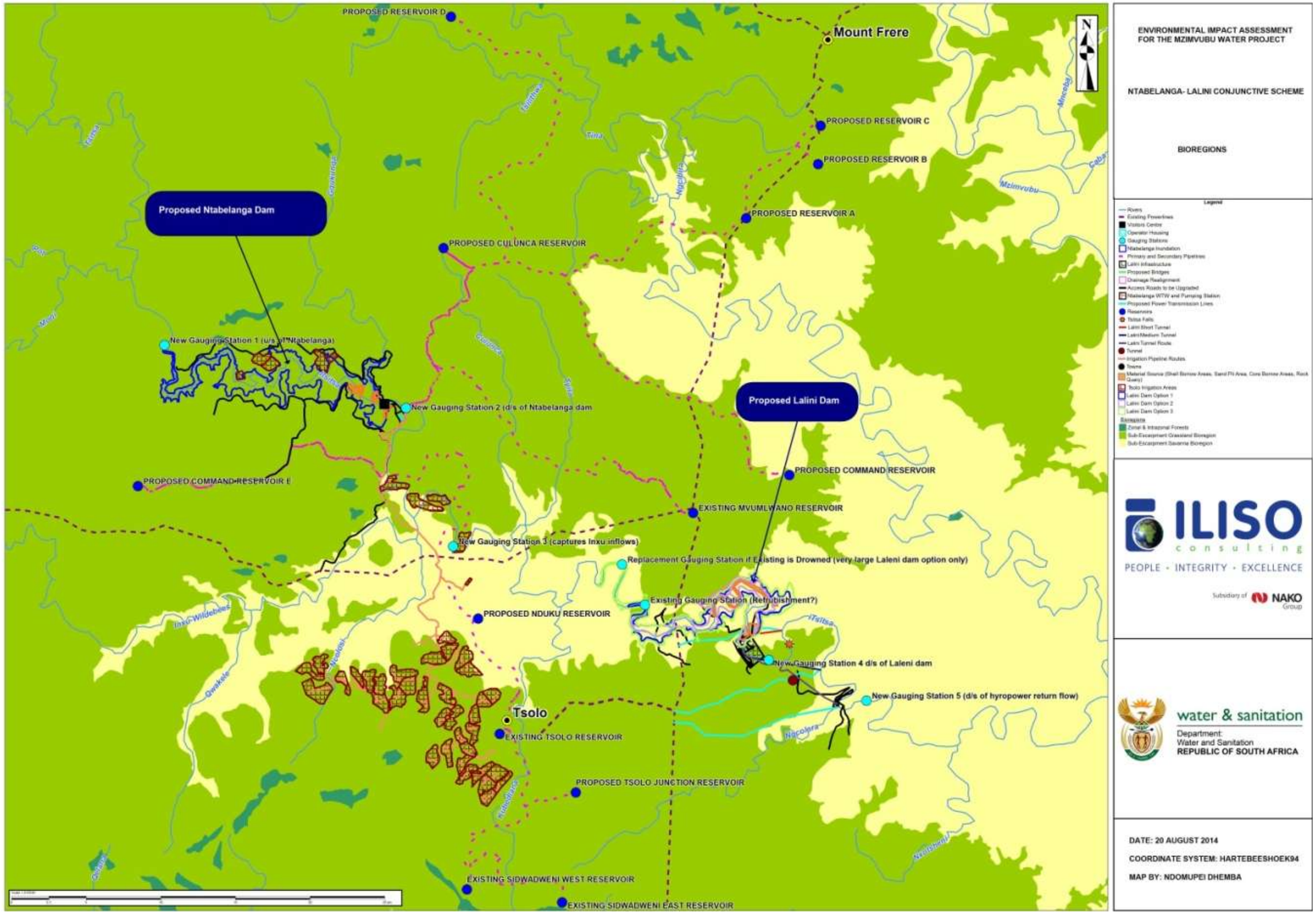


Figure 30: Bioregions

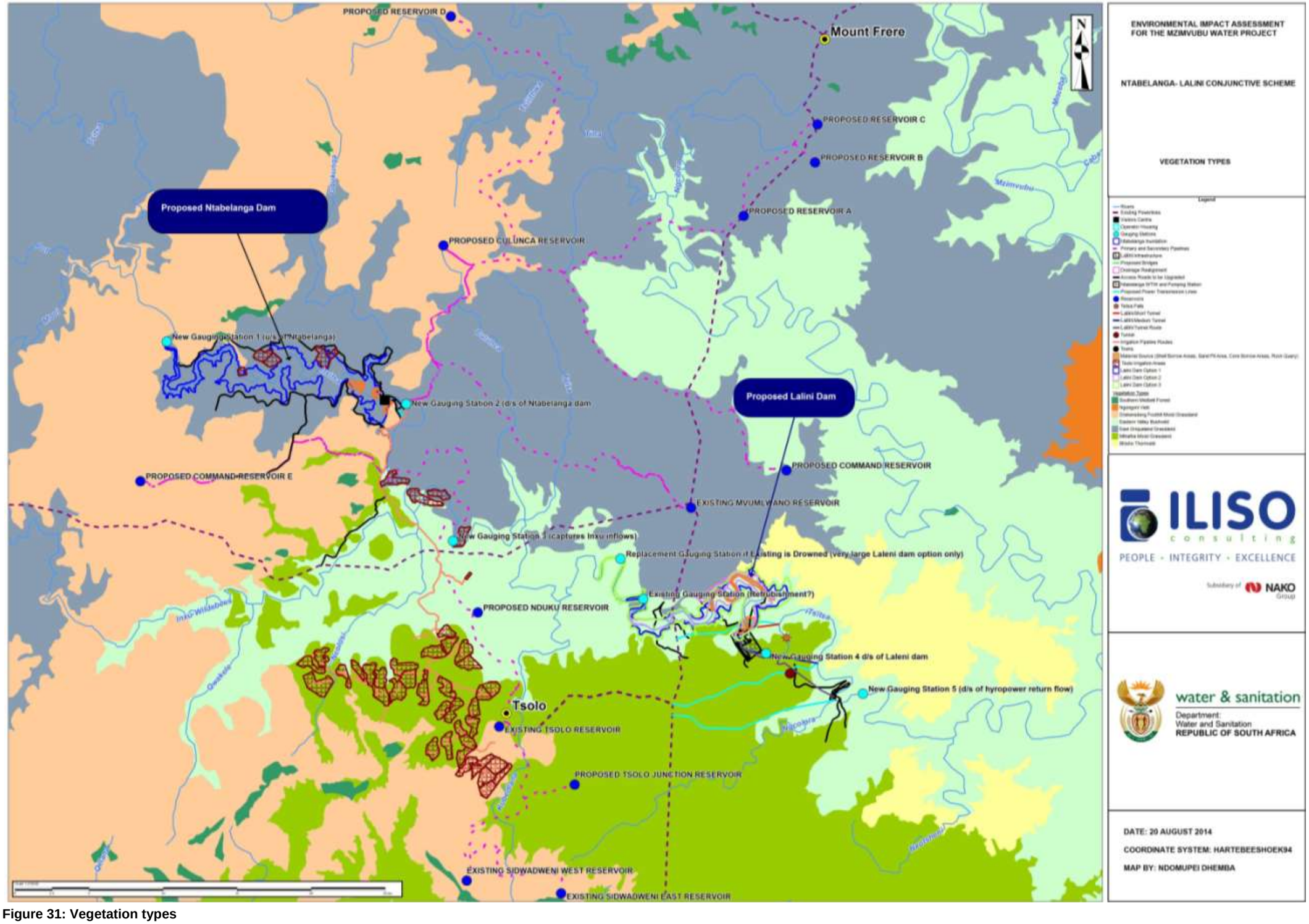


Figure 31: Vegetation types

The *Drakensberg Foothill Moist Grassland* is found at altitudes spanning 880-1860 m. It is formally classified as a 'Least Threatened' vegetation type (provincial conservation target is 23%). Almost 20% has already been transformed for cultivation, plantations and urban sprawl. Alien woody species of *Rubus*, *Acacia dealbata* and *Solanum mauritianum* are potential invasive species in certain areas. Erosion is very low in 28% of the vegetation type, low in 49% and moderate in 17%. Biogeographically important taxa include *Schizochilus bulbinella* and *Schoenoxiphium burttii*.

The *Eastern Valley Bushveld* vegetation is found at altitudes spanning 100-1 000 m. It is formally classified as 'Least Threatened' (provincial conservation target is 25%). Up to 15% of this vegetation type has been transformed mainly by cultivation. Alien plant invasion are a serious threat with *Chromolaena odorata*, *Lantana camara* and *Caesalpinia decapetala* being the most problematic species.

The *Eastern Griqualand Grassland* vegetation is found at altitudes spanning 920-1740 m. It is formally classified as a 'Vulnerable' vegetation type (provincial conservation target is 23%). Over one quarter of the area has already undergone transformation due to cultivation of maize, plantations and urban sprawl. *Acacia dealbata* and *Acacia mearnsii* are invading these grasslands in some places. Erosion is very low in 30% of the vegetation type, low in 31% and moderate in 30% (Mucina and Rutherford, 2006). Biogegraphically important taxa include *Encephalartos friderici-guilielmi.*

The *Mthata Moist Grassland* vegetation is found at altitudes spanning 600-1080 m. It is formally classified as an 'Endangered' vegetation type (provincial conservation target is 23%). More than 40% of the vegetation has been transformed for cultivation and plantations or by dense human settlements. *Acacia mearnsii*, *Solanum mauritianum* and *Richardia humistrata* are the most important aliens. Erosion is a serious problem with high to very high erosion levels in 34% of the vegetation type, moderate erosion in 35% and the remainder having low and very low erosion.

The *Southern Mistbelt Forest* vegetation is found at altitudes spanning 850-1600 m (most patches occur between 1000 and 1400 m). It is formally classified as a Least Threatened vegetation type (provincial conservation target is 30%). Almost 5% has already been transformed for plantations. Invasive aliens include *Solanum mauitianum, Rubus* species and several *Acacia* and *Eucalyptus* species. Uncontrolled harvesting of timber, poles and firewood, overexploitation of non-timber forest products and grasslands are considered as current major threats.

8.4.3 Habitat units and sensitivity

Four habitat units have been identified within the study area, namely the Mountain / Rocky Outcrops habitat unit, Grassland / *Acacia* Thornveld habitat unit, Riparian / Wetland habitat unit and the Transformed (Grassland) habitat unit (**Figures 32** to **36**).

Figure 32: Mountain / rocky outcrop vegetation located within the western section of the Ntabelanga Dam footprint area

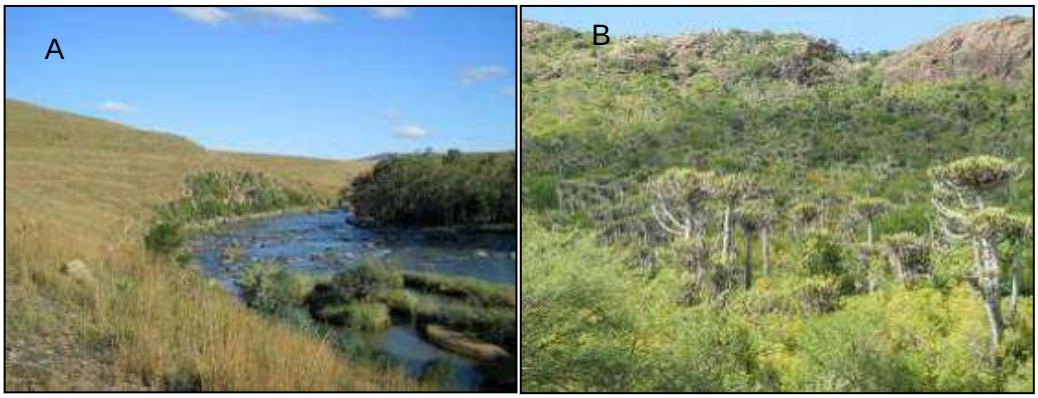


Figure 33: Mountain / rocky outcrop vegetation located within the A) western section of the Lalini Dam footprint area and B) within the eastern section at the dam wall

Figure 34: *Acacia karroo* dominating within the grassland / *Acacia* Thornveld habitat unit in the Ntabelanga Dam area

Figure 35: Riparian and wetland vegetation along the iTsitsa River and smaller tributaries

Figure 36: Transformed grassland vegetation along the proposed pipeline routes

The Vegetation Index Score (VIS) was determined for each habitat unit (**Table 17**).

Table 17: VIS for each habitat unit assessed.

Habitat unit	Score	Class	Motivation
Mountain/Rocky Outcrops habitat unit	18	**Class B – largely natural with few modifications**	This habitat unit has remained relatively undisturbed and is known to support high levels of biodiversity and is therefore considered of relatively high ecological importance. Although high levels of biodiversity and ecological importance occur within this habitat unit, transformation has occurred in transition areas between the woody mountain habitat and the open veld habitat unit. Protected tree species, *Podocarpus falcatus* and *P. latifolius* were located within this management unit
Riparian/wetland habitat unit	14	**Class C/D – moderately/largely modified**	This habitat unit is characterised by high levels of erosion associated with donga formation. Numerous drainage lines, valley bottom wetlands and seeps are located within the study area.

Habitat unit	Score	Class	Motivation
Transformed habitat unit	5	**Class E – extensive loss of natural habitat**	This habitat unit is associated primarily with community villages' historic cultivated fields and veld overgrazed and trampled by livestock. The ecological functionality and habitat integrity of the Transformed Habitat Unit is regarded as being extremely limited.
Transformed(Grassland) habitat unit	10	**Class D/E – largely modified/Extensive loss of natural habitat**	This habitat unit has undergone transformation due to over-utilisation of veld by cattle grazing and bush encroachment by *Acacia karroo*.

Figures 37 to **39** illustrate the sensitivity of the study area, based on the state and function of each habitat unit.

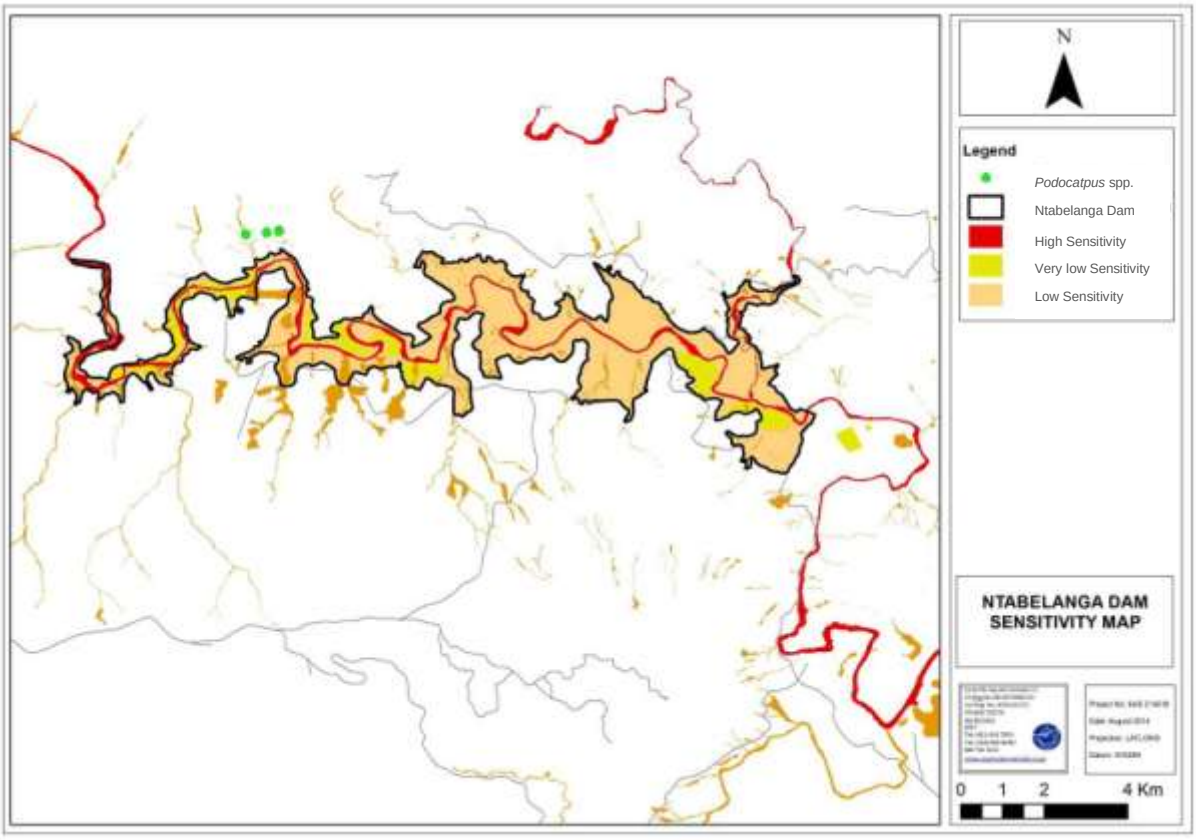


Figure 37: Floral sensitivity map for the Ntabelanga Dam area and associated infrastructure (DWS, 2014a)

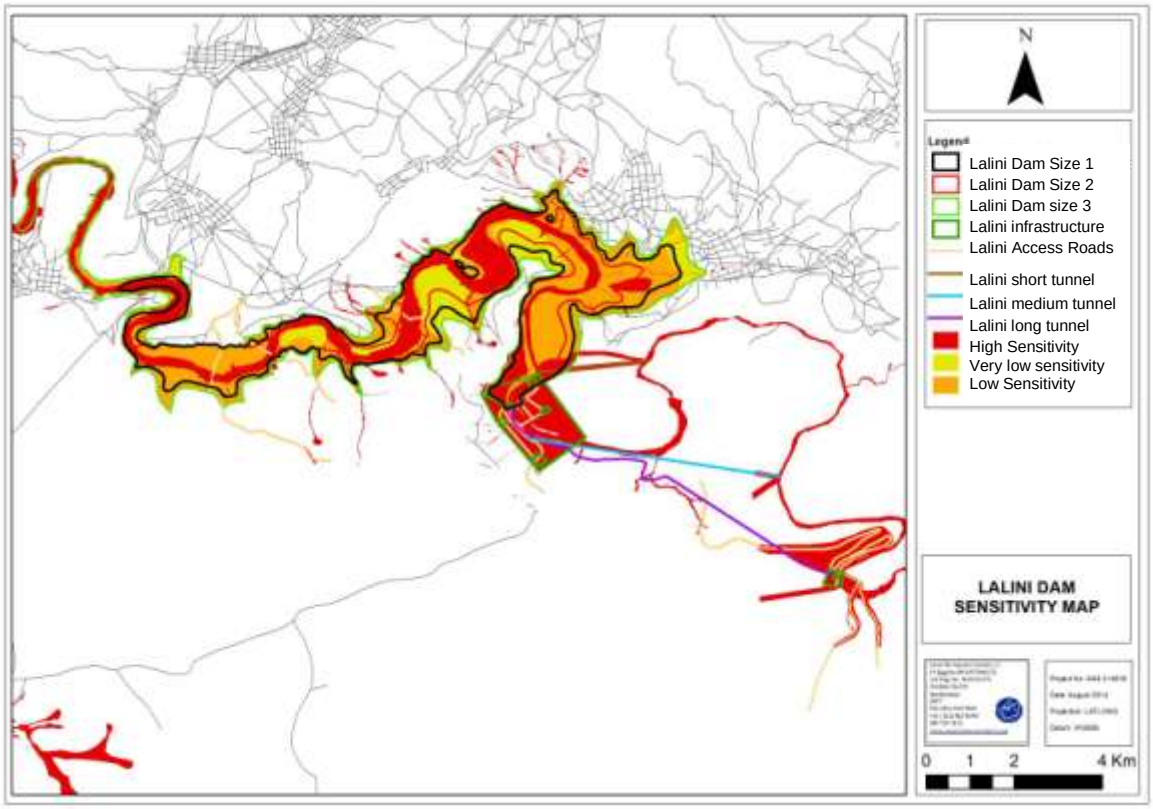


Figure 38: Floral sensitivity map for the Lalini Dam area and associated infrastructure (DWS, 2014a)

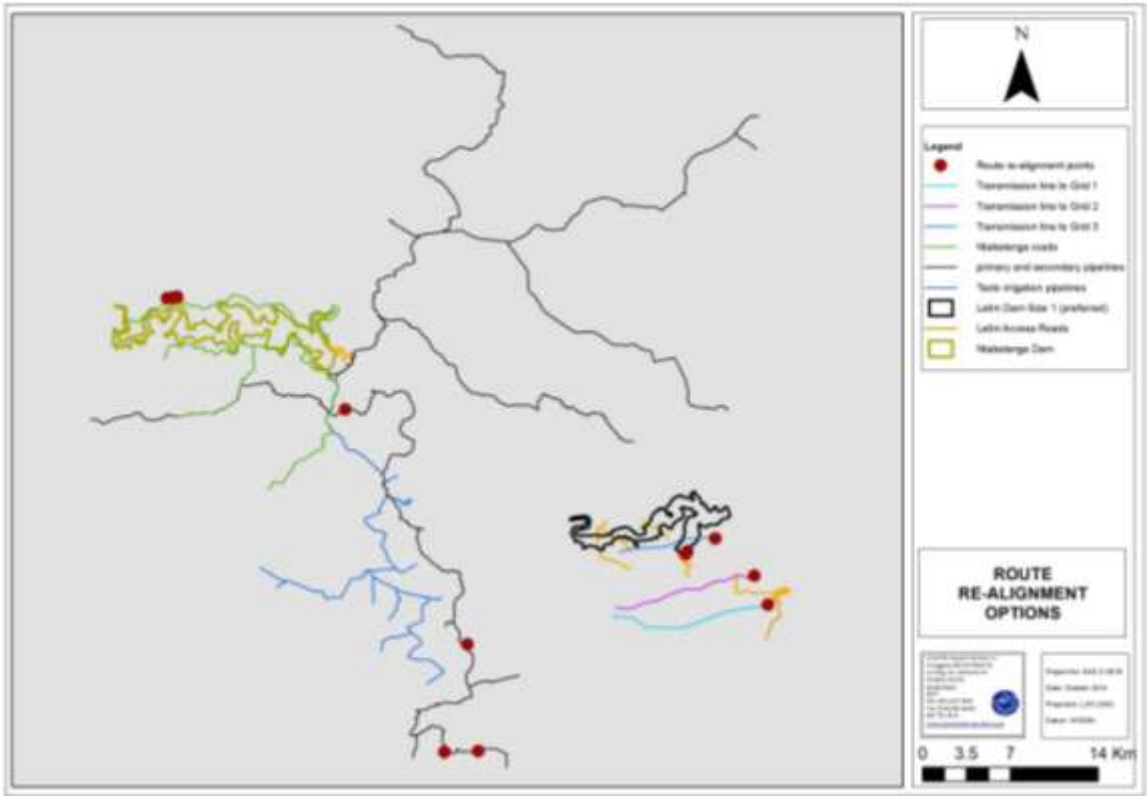


Figure 39: Route realignment areas for the proposed roads and pipelines where sensitive floral habitat or protected tree species are located (DWS, 2014a)

8.4.4 Alien and invasive plant species

A number of alien floral species occur within the study area, especially along the riparian features.

Weed species such as *Bidens pilosa*, *Cynodon dactylon, Ricinus communis* var. *communis, Nicotiana glauca* and *Tagetes minuta* are present that are associated with disturbance and agricultural activities. The transformed (Grassland) habitat unit contained mostly weed species associated with disturbance, overgrazing and trampling of veld by livestock. Very little invader floral species occurred within the Mountain / Rocky Outcrop habitat unit. The Mountain / Rocky Outcrop habitat unit are the most at risk for alien tree species to encroach into the area. These areas need to be monitored during the operational phase of the dam construction to ensure that alien invader tree species does not encroach into this habitat unit.

8.4.5 Medicinal floral species

Medicinal floral species are not necessarily indigenous species, with many of them regarded as alien invasive weeds. The medicinal species are all commonly occurring species and are no confined to the study area. A list of traditional medicinal plants identified during the field assessment and their main applications is provided in the Floral Impact Assessment (**Appendix C1**).

8.4.6 Threatened ecosystems

According to the National List of Threatened Terrestrial Ecosystems (2011), sections of the proposed infrastructure (e.g. road upgrades, pipelines and power lines) fall into a vulnerable ecosystem in terms of the original and remaining extent of the associated vegetation types (**Figure 40**). Vulnerable ecosystems have suffered a loss of structure, function and composition and any further degradation should be prevented or minimised where possible.

8.4.7 RDL species

Of the potential RDL species occurring in the area, the majority of the species are highly unlikely to occur due to the transformed vegetation from overgrazing, trampling and historic agricultural activities. The only species that have a moderate probability of occurring are *Pittosporum viridiflorum* and *Catha edulis.*

Podocarpus falcatus and *P. latifolius* were located alongside the road upgrade areas within the Ntabelanga Dam, on the northern section of the dam. More *Podocarpus* species were located on the secondary pipeline route south of the town Tsolo. These species are considered protected according to the notice of the list of protected tree species under the National Forests Act, 1998 (Act No. 84 of 1998). If they are

affected, permits for the removal of these protected tree species need to be obtained from the relevant authorities before any construction activities occur within this area.

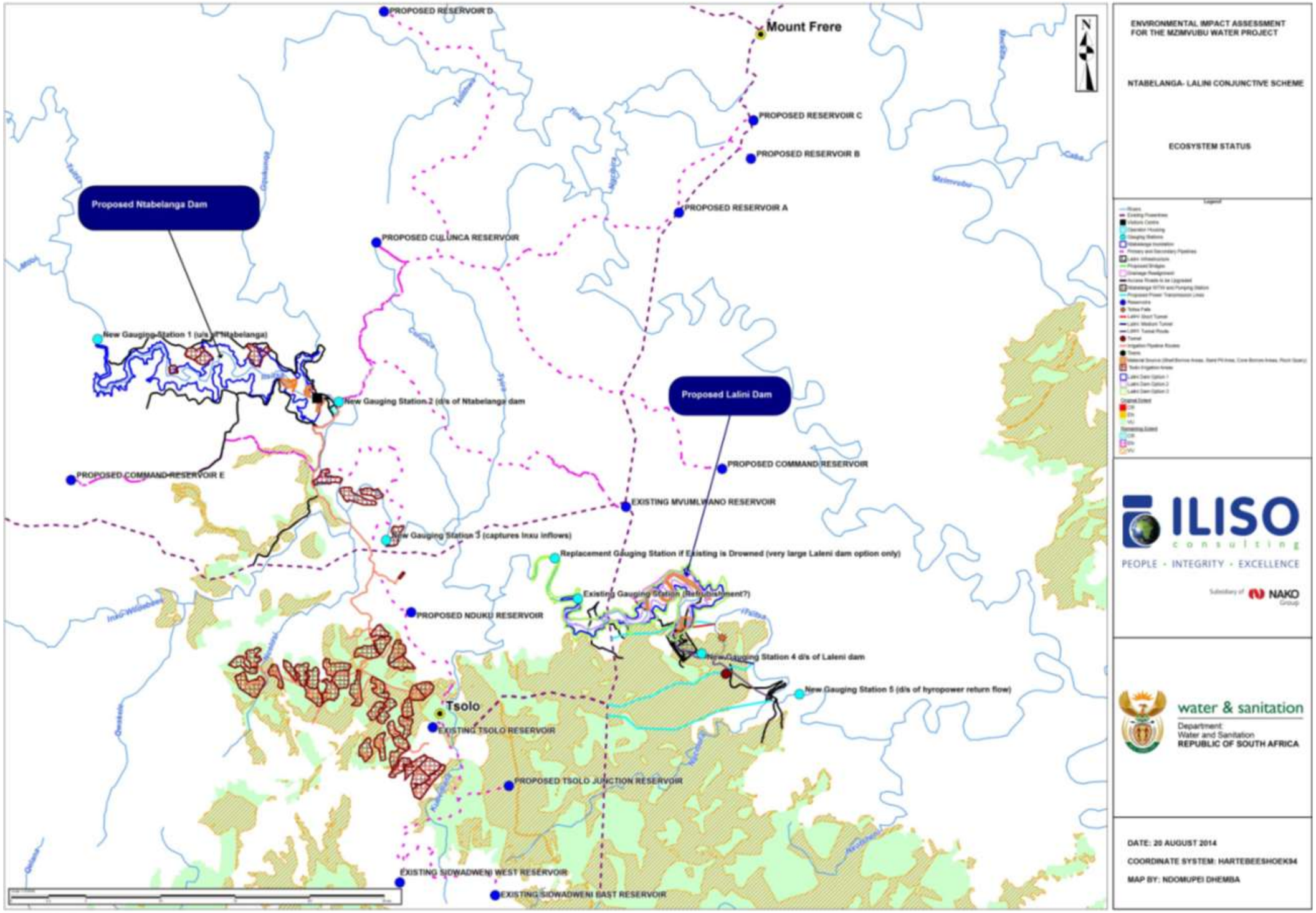


Figure 40: Threatened ecosystems

8.5 FAUNA

8.5.1 Faunal habitats

There are varying faunal habitats. These habitats vary from being anthropogenically transformed open grassland areas to largely natural rocky ridge habitats and secluded riparian areas (see section 8.3.3).

8.5.2 Mammals

The mammal species observed within and surrounding the proposed Lalini and Ntabelanga Dams are considered to be mostly common species, found throughout South Africa, that are adaptable to changing and transformed habitats, as well as being known to occur around human settlements. None of the observed species are considered to be threatened on a national level or provincial level. Currently mammal species within the study area are subjected to high levels of impact from subsistence hunting as well as habitat loss and transformation.

Figure 41: *Procavia capensis* (Rock hyrax) on the left with spoor of *Atilax paludinosus* (Water mongoose) on the right (DWS, 2014b)

8.5.3 Avifauna

A large diversity of avifaunal species was observed in the study area. The majority of avifauna observed was within the mountain bushveld, rocky outcrop and riparian habitat zones.

The mountain bushveld habitat unit located near the dam wall of the Lalini Dam is a unique habitat with a varying number of woody species, providing a large diversity of avifaunal species breeding habitat.

The flowering shrubs and aloes in these habitats provide a food source for many of the smaller specialized avifaunal feeders, notably the sunbirds as well as the small insectivorous birds such as the flycatchers.

One of the avifaunal species that is of concern is that of *Balearica regulorum* (Grey-Crowned Crane) (**Figure 42**). This species was observed foraging in the grassland/ transformed habitat units alongside the river system in the vicinity of the Ntabelanga Dam. Cranes throughout South Africa are already threatened with extinction due to habitat loss, and this will further exasperate conservation efforts to protect and

increase this species numbers. *B.regulorum* is listed as endangered by the IUCN, and with a rapidly decreasing population.

A second avifaunal species of concern within the study area and surrounds is *Gyps coprotheres* (Cape Vulture) (**Figure 42**). This species is listed as Vulnerable by the IUCN, and also listed as an endangered and protected species by NEMBA (Act 10 of 2004), and is endemic to South Africa.

Although none were observed during the time of assessment, NFEPA has indicated that the study area is a recognized breeding and foraging area for protected crane species, namely *Anthropoides paradisea* (Blue crane) and *Grus carunculatus* (Wattled crane). Both these species are listed as Vulnerable by the IUCN, and are listed protected species by NEMBA (Act 10 of 2004). *A. Paradisea* (Blue Crane) is of particular concern as it is indigenous to South Africa, as well as being South Africa's national bird.

Figure 42: On the left *Gyps coprotheres* (Cape Vulture) pair seen flying above the Lalini Dam study area; and on the right *Balearica regulorum* (Grey Crowned Crane) flock seen in the vicinity of Ntabelanga Dam study area (DWS, 2014b)

8.5.4 Reptiles

Reptiles are notoriously hard to detect in the field due to the shy nature, and as such an intensive search was undertaken within suitable reptile habitat, specifically in the mountain bushveld and rocky outcrop habitat units. Due to the habitat availability and study area location, a high diversity of reptiles was not expected to occur. The reptiles that were observed are commonly occurring species in the region. The rocky ridge outcrop and mountain bushveld habitat units are most suited to inhabitation by reptile species.

Figure 43: *Agama atra* (Southern Rock Agama) observed in the mountain bushveld habitat

8.5.5 Amphibians

A very low diversity of amphibians was observed at both the dams and surrounding areas. Although the dams presented a low diversity of amphibian species, the species that were observed were in fairly high numbers. The fairly isolated nature of the study area from surrounding amphibian populations in other active rivers, as well as the Titsa waterfall presenting an unsurpassable obstacle may be contributing factors to the low species diversity in the rivers. The mountains surrounding the river system and the waterfall would have limited amphibian colonisation of the river systems, resulting in only a few of the hardier and more far ranging common species being present in the river systems.

Figure 44: *Afrana angolensis* (Common river frog) observed throughout the study area.

8.5.6 Invertebrates

A wide variety of invertebrates was observed at both dam locations, and to a lesser extent along the proposed pipelines and power line routes as these predominantly followed existing roads. No NEMBA or Eastern Cape SoER (2004) listed invertebrates were observed during the site visit. As expected, the mountain bushveld, rocky outcrops and riparian zones provided the highest diversity of

invertebrate species, with the transformed grassland areas providing habitat for common grasshoppers and locusts that are better suited to those habitats.

Figure 45: *Onthophagus taurus* (Dung Beetle) on the left; *Zonocerus elegans* (Elegant Grasshopper) on the right.

8.5.7 Spiders and scorpions

Only four species of spiders were observed during the site visit; however it is expected that more species do inhabit the study areas. Due to their reclusive nature when faced by a threat as well as their ability to camouflage themselves well, they are very hard to locate. None of the spider species observed are considered to be threatened or of conservation value, nor are any endangered species thought to persist within the study areas.

One scorpion was located in the mountain bushveld habitat near the dam wall of the Lalini Dam (**Figure 46**). The scorpion belongs to the Genus *Hadogenes* (Rock scorpion), of which all species in this genus are listed under NEMBA (Act10 of 2004). *Hadogenes* sp fall under the category of nationally protected species, and are an indigenous species of high conservation value or national importance that require national protection. The mountain bushveld habitat located by the Lalini Dam wall will invariably provide habitat for many of these scorpions, as well as other scorpion species. When the Lalini Dam reaches full supply level, and in the process of reaching such, the habitat availability for the scorpions will be greatly reduced. At full supply level, the scorpions would be restricted to the higher rocky areas on the mountainside. Although the higher mountainside does is of suitable habitat for the *Hadogenes* (Rock scorpion), the habitat size that remains may be a limiting factor, along with the increased rates of predation on the scorpions.

Figure 46: *Hadogenes sp* (Rock scorpion) observed near the Lalini Dam wall

8.5.8 RDL species

RDL species taken into consideration for calculation of the Red Data Sensitivity Index Score (RDSIS) are listed below:

- *Balearica regulorum* (Crowned Crane);
- *Hadogenes sp.*(Rock Scorpions);
- *Eupodotis caerulescense* (Blue Korhaan);
- *Anthropoides paradiseus* (Blue Crane);
- *Gyps africanus* (Cape Vulture);
- *Ciconia ciconia* (Black Stork);
- *Tyto capensis* (Grass Owl); and
- *Sagittarius serpentarius* (Secretarybird).

The species listed above were then used to calculate the RDSIS for the entire study area, the results of which are presented in **Table 18**.

Table 18: RDSIS score attained

Red Data Sensitivity Index Score	
Average Total Species Score	**84**
Average Threatened Taxa Score	**84**
Average (Ave TSS + Ave TT/2)	**84**
% Species greater than 60% POC	**8%**
RDSIS of Site	**46%**

Table 19: Species with a probability of occurrence of >60%

Common name	Scientific Name	Threatened Status	POC
Black Stork	*Ciconia nigra*	NT	60.67
Secretary bird	*Sagittarius serpentarius*	NT	100.00
Blue Crane	*Anthropoides paradiseus*	VU	61.67
Blue Korhaan	*Eupodotis caerulescens*	NT	65.00
Grass Owl	*Tyto capensis*	VU	64.00
Cape Vulture	*Gyps coprotheres*	VU	100.00
Rock scorpion	*Hadogenes sp*	VU	100.00
Crowned crane	*Balearica regulorum*	VU	100.00

VU = Vulnerable, NT = Near Threatened, LC = Least Concern, NYBA = Not Yet Been Assessed, EN = Endangered

The RDSIS assessment of the study areas potential RDL fauna yielded a score of 46%, indicating a medium importance with regards to RDL faunal species conservation within the region. All species with a Probability of Occurrence (POC) of 60% or more have an increased probability of either permanently or occasionally inhabiting the study area. The species that have a POC of 100% are those species that were directly observed at the time of the site visit. The species listed in **Table 19** are the only species that attained a POC of greater than 60%.

The majority of the above listed species would have a greater possibility of occurring at the Lalini Dam than the Ntabelanga Dam, as the Lalini Dam site provides more intact faunal habitats with lower levels of anthropogenic activities.

8.6 SURFACE WATER RESOURCES

The study area falls within the South Eastern Uplands Aquatic Ecoregion and the Mzimvubu to Kieskamma Water Management Area (WMA) (**Figures 47** and **48**). The subWMA indicated for the study area is Mzimvubu.

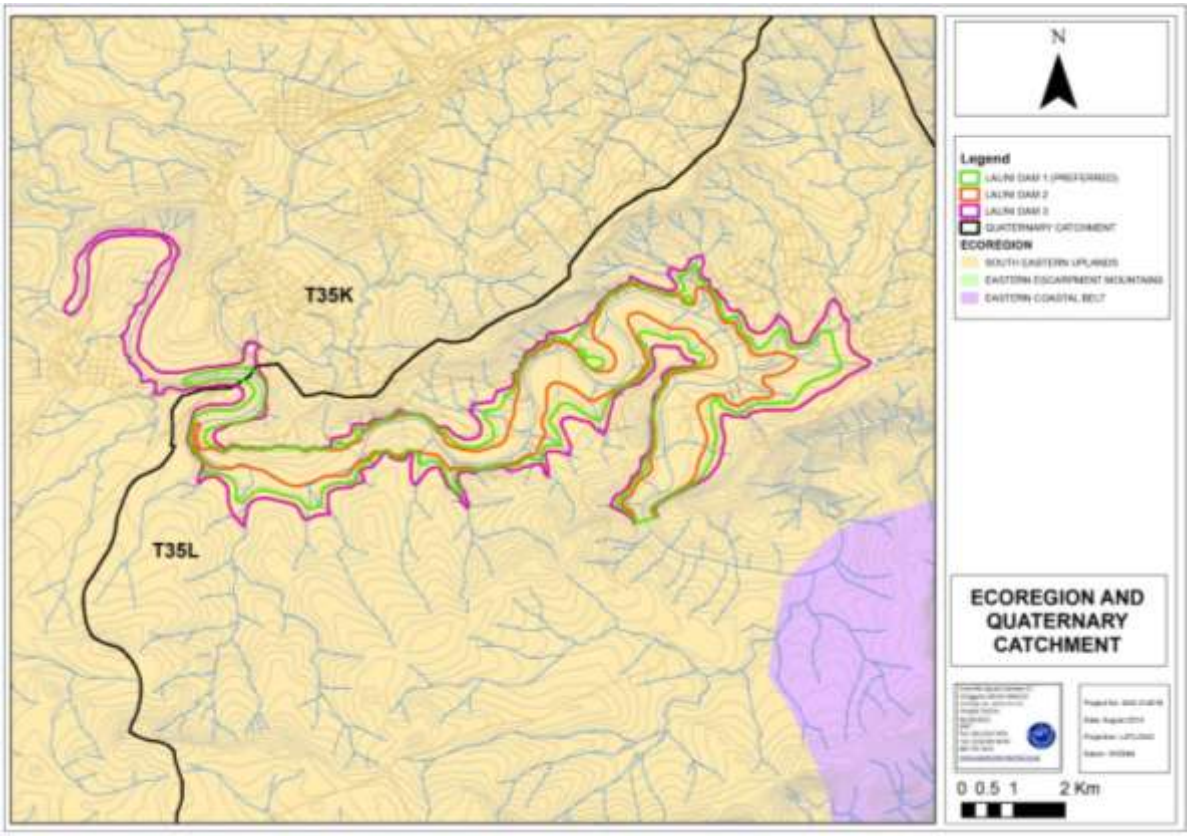


Figure 47: Aquatic Ecoregion and quaternary catchment associated with the Lalini Dam

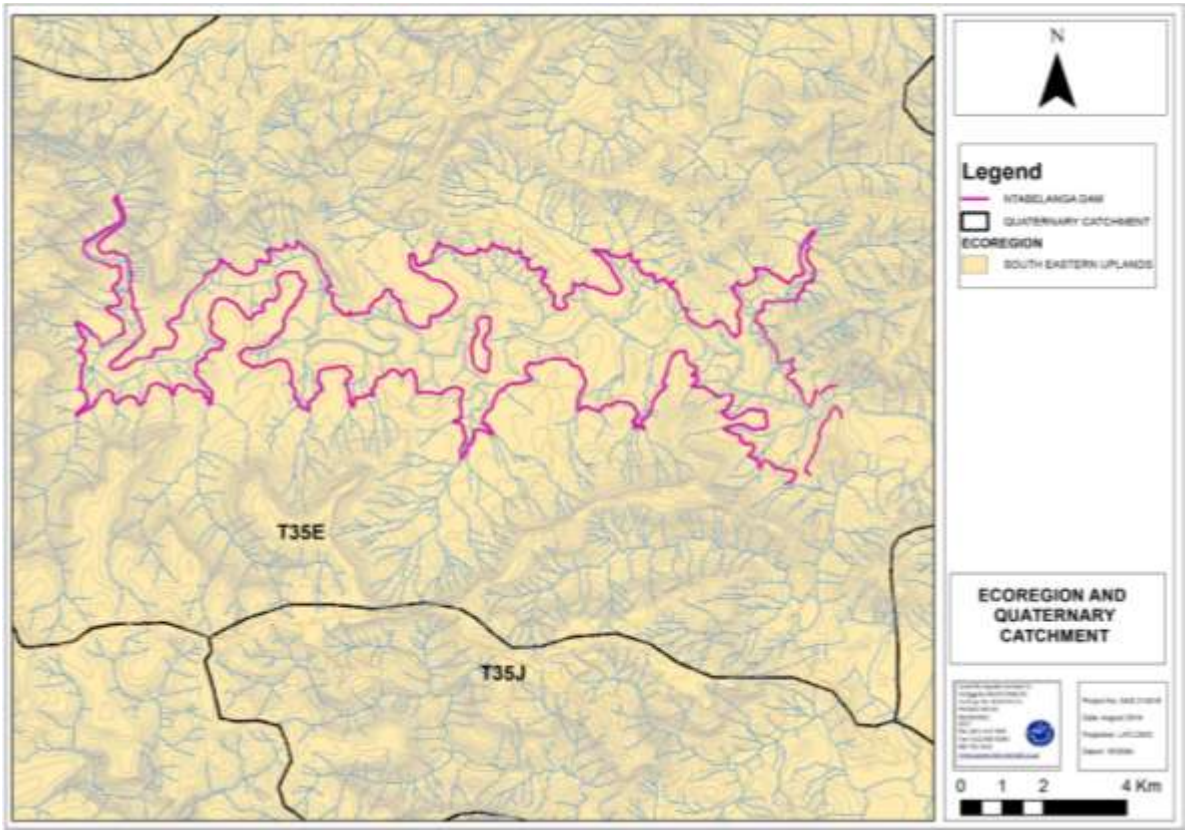


Figure 48: Ecoregion and quaternary catchment associated with the Ntabelanga Dam and the road upgrades

The Lalini Dam is located within the T35L and T35K Quaternary Catchments, whilst the Ntabelanga Dam and road upgrades are located within the T35E quaternary catchment and the particular river resource in the area is the Upper Ntata, Mzimvubu River. The pipelines traverse over several quaternary catchments, namely T20B, T34H, T34 J, T35E, T35H and T35K.

The PES Category of the various river systems in the affected quaternary catchments varies between PES B and PES C. The Tsitsa River, specifically, is classified as a PES Category B river, whilst the Inxu is considered to be in a PES Category C. All systems are considered to have a 'moderate' Ecological Importance (EI) whilst the Ecological Sensitivity (ES) varies between High to Medium sensitivity. The Tsitsa River is considered to be of moderate sensitivity whilst the Inxu River is deemed to be highly sensitive. The default Ecological Class of the river systems in these quaternary catchments, based on the median PES and highest of EI or ES means is considered to be either a Class B or a Class C. The Tsitsa River is deemed to be a Class C, and the Inxu is deemed to be a Class B system.

The Tsitsa River is tributary of the Mzimvubu River and will be partially inundated by both dams. It is a perennial river that is classified in Category C condition (Moderately modified), indicating that loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still largely unchanged.

The northern pipelines cross the Thina River which is classified as being in Category C condition (moderately modified). The Thina River is regarded as an important fish sanctuary, translocation and relocation zone and is classified as being a fish support area.

The north-eastern areas of WMA12 catchment have the highest rainfall in the Eastern Cape Province. The mountain/highland grasslands in these areas maintain high water quality and yield, which is critical for the neighbouring rural communities and also for downstream consumption. This catchment therefore provides goods (water quantity) and services (clean water) to the downstream communities. These areas are however degraded and are characterised by severe soil erosion.

Although soil erosion is a natural process, in the Mzimvubu and Tsitsa River catchments is exacerbated by human activities and affects ecosystem health. Land degradation therefore negatively impacts the majority of downstream rivers, which are characterised by high turbidity and increased siltation. This phenomenon is dominant in the catchments that will yield water to the proposed Ntabelanga dam namely T35A (Upper Tsitsana), T35D (Pott Tsitsa), T35C (Mooi River), T35B (Pott River), and T35E.

Wetlands in the project area provide important ecological services in the way of sediment trapping, nutrient cycling and toxicant assimilation, flood attenuation and biodiversity maintenance. In view of the extensive erosion within the catchment, sediment trapping is especially important.

Water quality is currently not a major concern in this catchment.

The subWMA, in which the proposed Lalini Dam will be located, is regarded as important with regards to fish corridors for movement of threatened fish between habitats and for the conservation of crane species and falls within the Sub-escarpment Savanna wetland vegetation group. The wetlands in the vicinity of the proposed Lalini Dam are classified as channelled-valley bottom wetlands in Category Z1 condition (critically modified) (**Figure 49**). This sub-WMA is classified as a FEPA system, with a rank of 2 indicating that the majority of its area is within a sub-quaternary catchment that has sightings or breeding areas for threatened *Balearica regulorum (*Grey Crowned Crane) and *Anthropoides paradiseus* (Blue Crane).

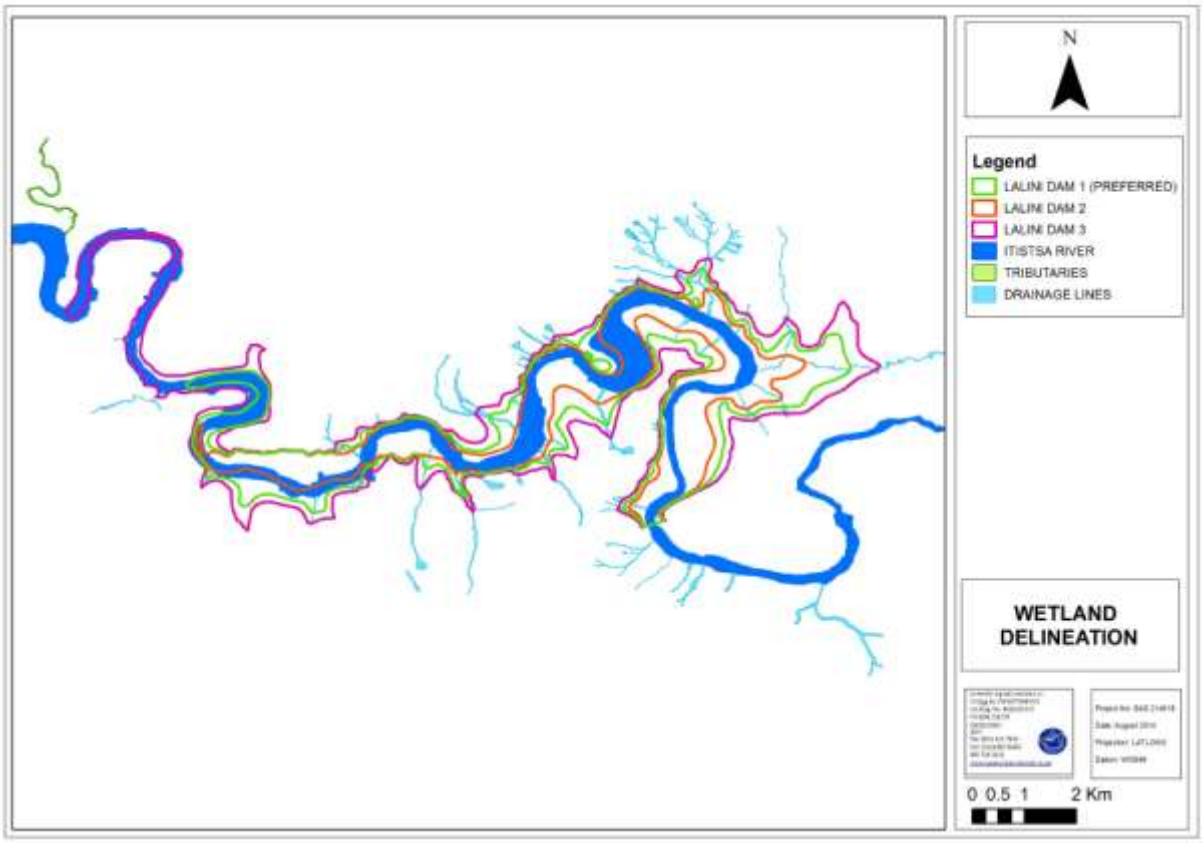


Figure 49: Wetland features identified within the study area, in relation to the proposed Lalini Dam site (DWS, 2014d)

The subWMA, in which the proposed Ntabelanga Dam will be located, is regarded as important in terms of the conservation of crane species and the wetland vegetation group is identified by the as Sub-escarpment Grassland Group 6. Wetland features identified in the Ntabelanga Dam area are indicated in **Figure 50**.

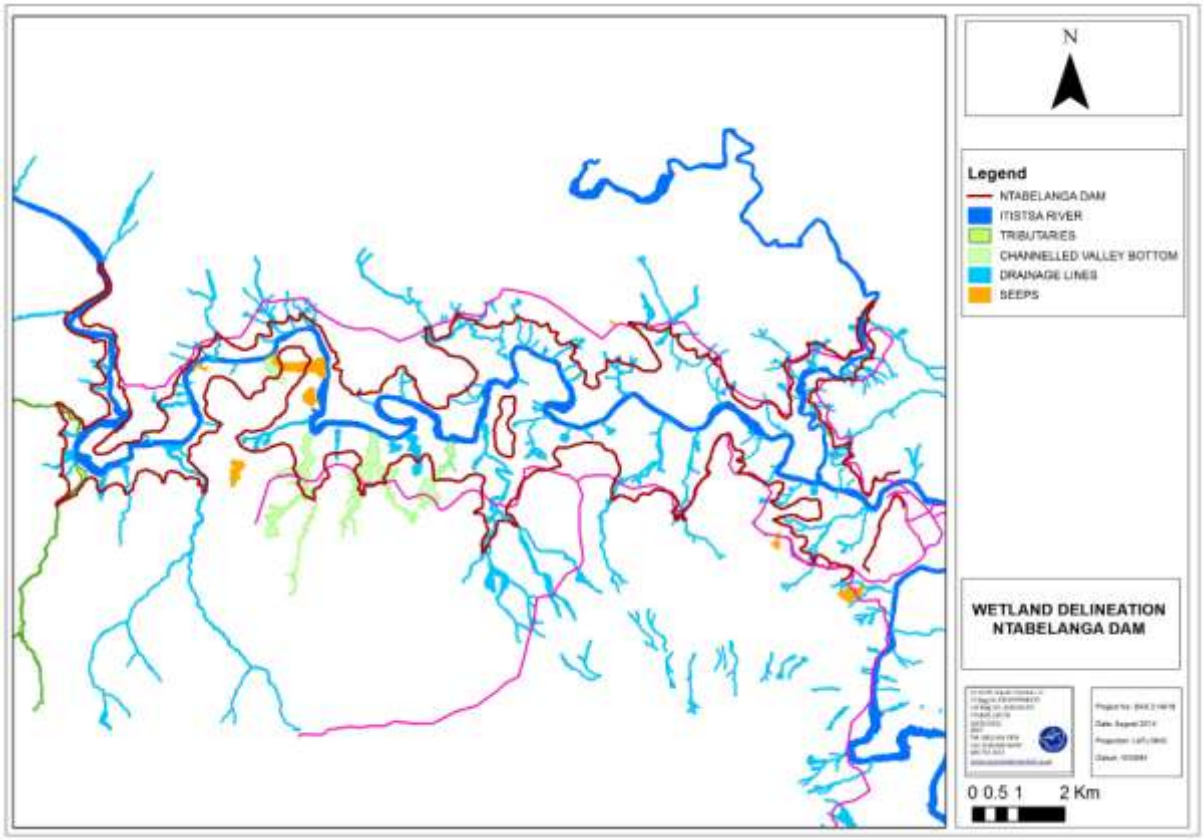


Figure 50: Wetland features identified within the study area, in relation to the proposed Ntabelanga Dam site (DWS, 2014d)

Roads and pipelines traverse wetland features. Effective mitigation (such as ensuring the design of crossings allows for the retention of wetland soil conditions) is therefore necessary to reduce the level of impacts on the wetland features. Wetland sensitivity maps are included in **Figures 51** and **52**.

The Ntabelanga and Lalini Dams will have the greatest impact on wetland and riparian habitat, as wetland habitat will be permanently due to inundation. This will lead to loss of habitat for wetland-dependent faunal and floral taxa and/or alteration of the aquatic and riparian resources. Due to the nature of the development, this cannot be avoided.

The anticipated cumulative loss of riparian and wetland habitat arising from the construction of the dams is estimated to be 1034.30 hectares; overall this is deemed to be a relatively insignificant fraction of the wetland resources within the Mzimvubu subWMA.

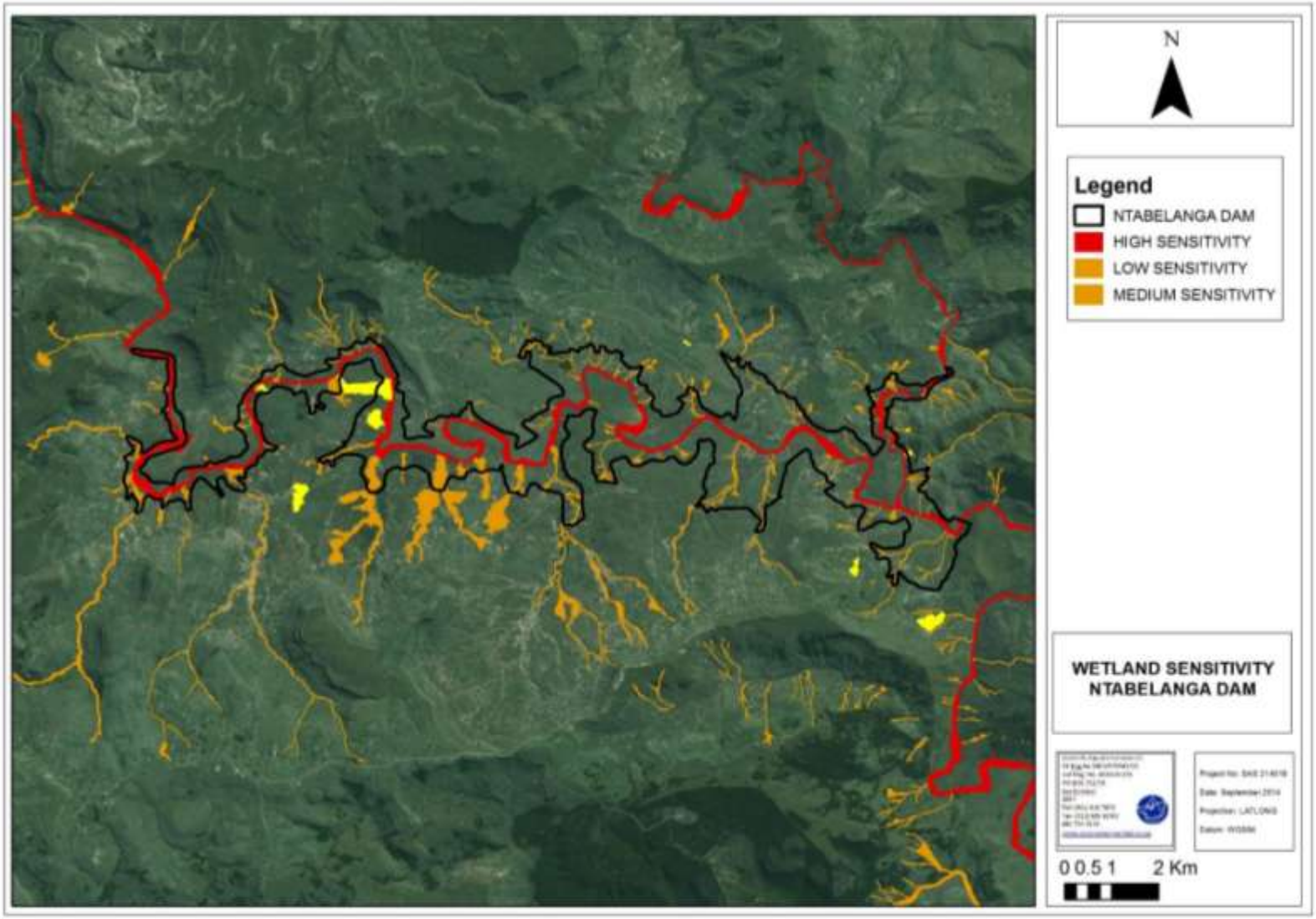


Figure 51: Conceptual representation of the sensitivity of wetland and riparian features associated with the proposed Ntabelanga Dam (DWS, 2014d)

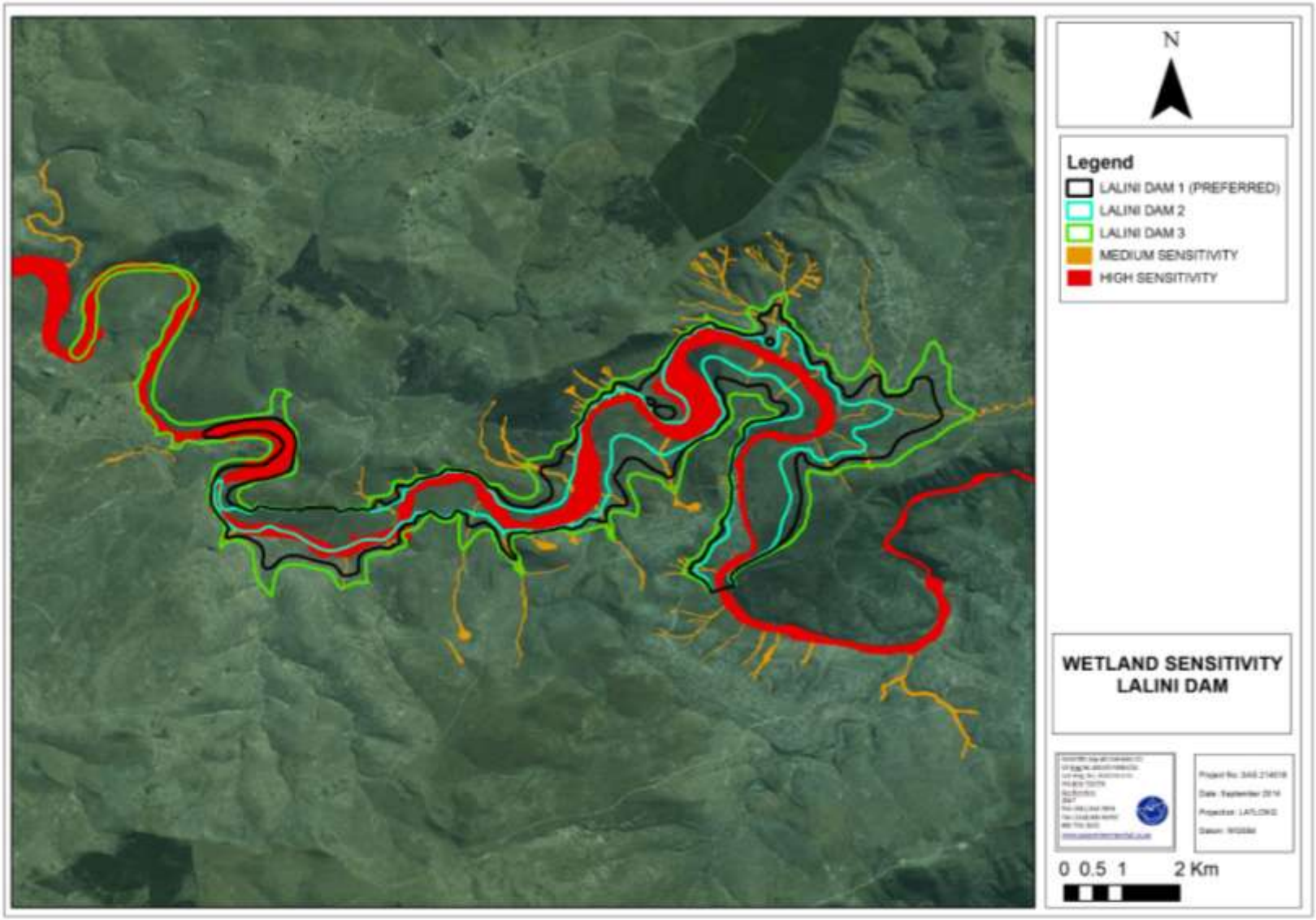


Figure 52: Conceptual presentation of the sensitivity of the wetland and riparian features associated with the proposed Lalini Dam (DWS, 2014d)

8.7 CONSERVATION IMPORTANCE

The Eastern Cape Biodiversity Conservation Plan (ECBCP) (2007) is a broad scale-biodiversity plan based on identifying Critical Biodiversity Areas (CBAs) and associated land use guidelines. It recommends limits to the total amount of land transformation that should be allowed if biodiversity is to be conserved. The approach rests on the concept of Biodiversity Land Management Classes (BLMCs). Each BLMC sets out the desired ecological state that an area should be kept in to ensure biodiversity persistence. Only land use types that are compatible with maintaining this desired state should be allowed.

Large areas within the project area have been identified as Critical Biodiversity Areas (CBAs) in terms of the ECBCP (**Figures 53** and **54**). These areas are of conservation importance due to the presence of Red Data species, endemic species and potential habitat for these species to occur.

The bulk of the project area falls within a Terrestrial CBA 2 (BLMC 2 - *Near Natural landscape)* while sections of the pipelines traverse terrestrial and aquatic CBAs 1 (BLMC 1- *Natural Landscape*).

According to the ECBCP's land use guidelines, while the conversion of virgin land to irrigated agriculture is not permissible in areas identified as CBAs 2, irrigated agriculture on existing and fallow cultivated land is allowed, on condition that an Environmental Authorisation is granted. Most of the areas earmarked for irrigated agriculture are cultivated, although many fields have not been planted in the recent past (DWA, 2013a).

There are no formal or informal protected areas within the project area. However, the National Protected Areas Expansion Strategy (NPAES) identified two Focus Areas in the north and east of the project area: Pondoland and Southern Berg Griqualand. A gauging station, and possibly a section of the Lalini Dam tunnel and the power line fall within the Pondoland Focus Area, while a section of the secondary distribution lines in the north of the study area falls within the Southern Berg Griqualand Focus Area (**Figure 55**).

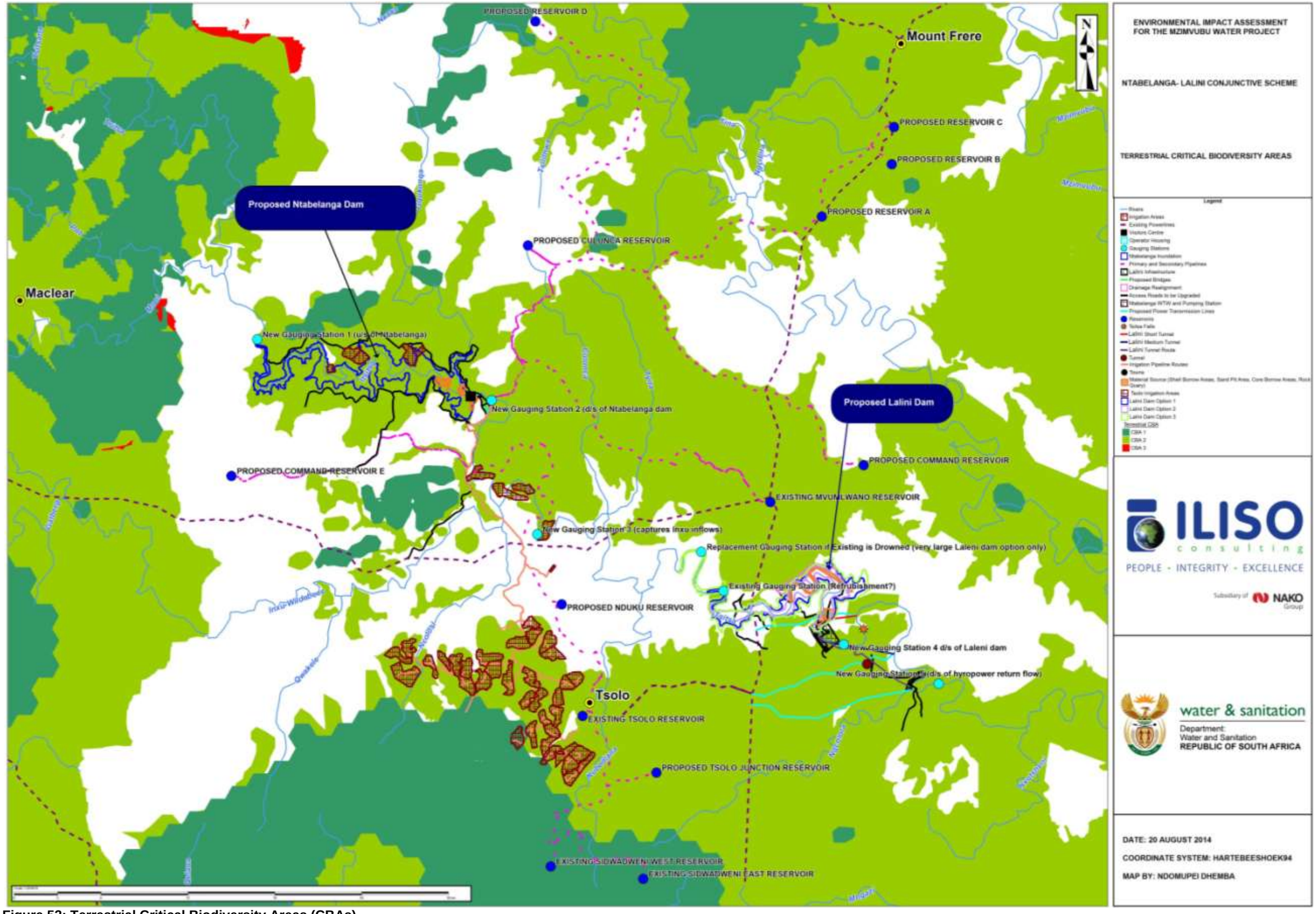


Figure 53: Terrestrial Critical Biodiversity Areas (CBAs)

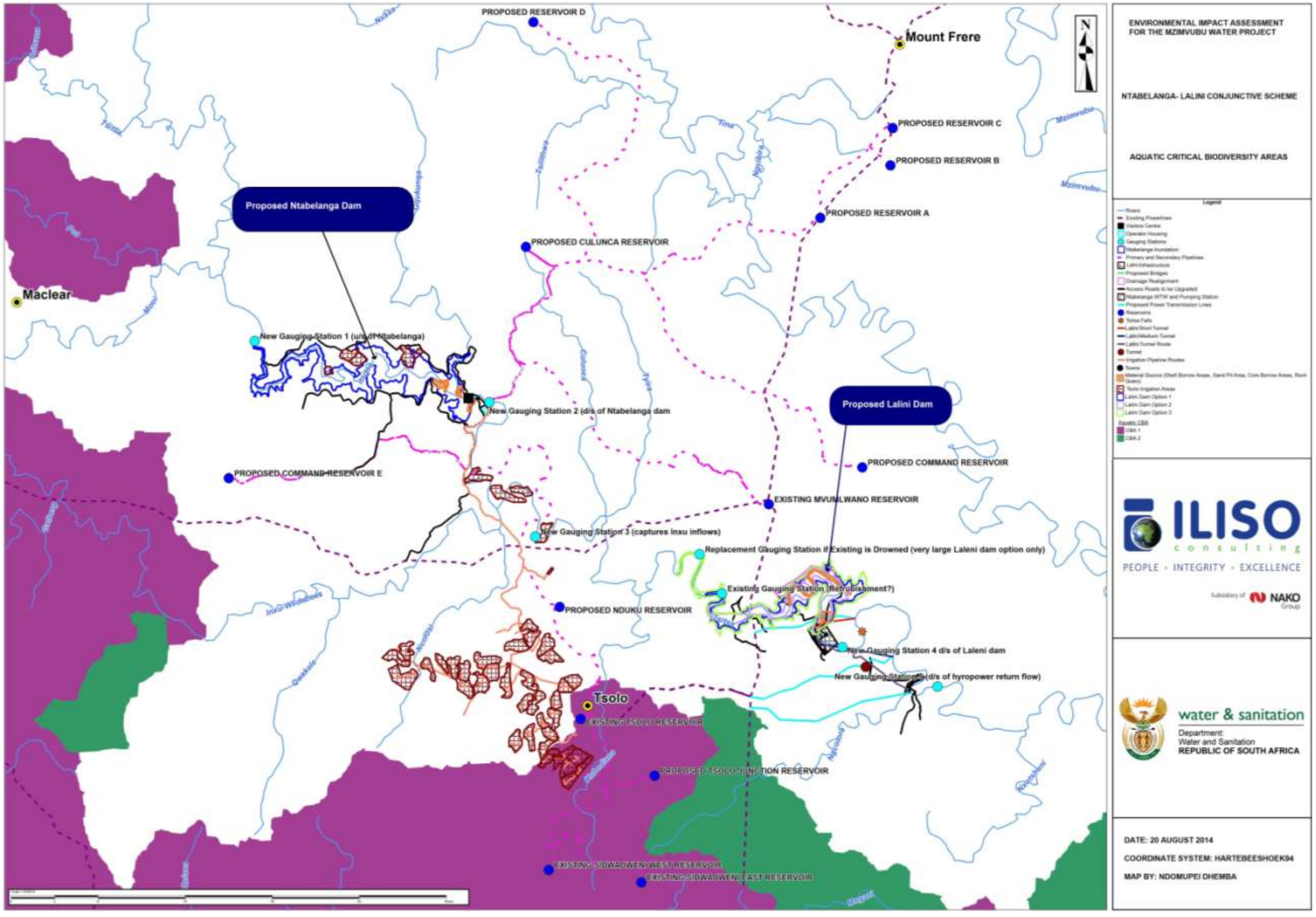


Figure 54: Aquatic Critical Biodiversity Areas (CBAs)

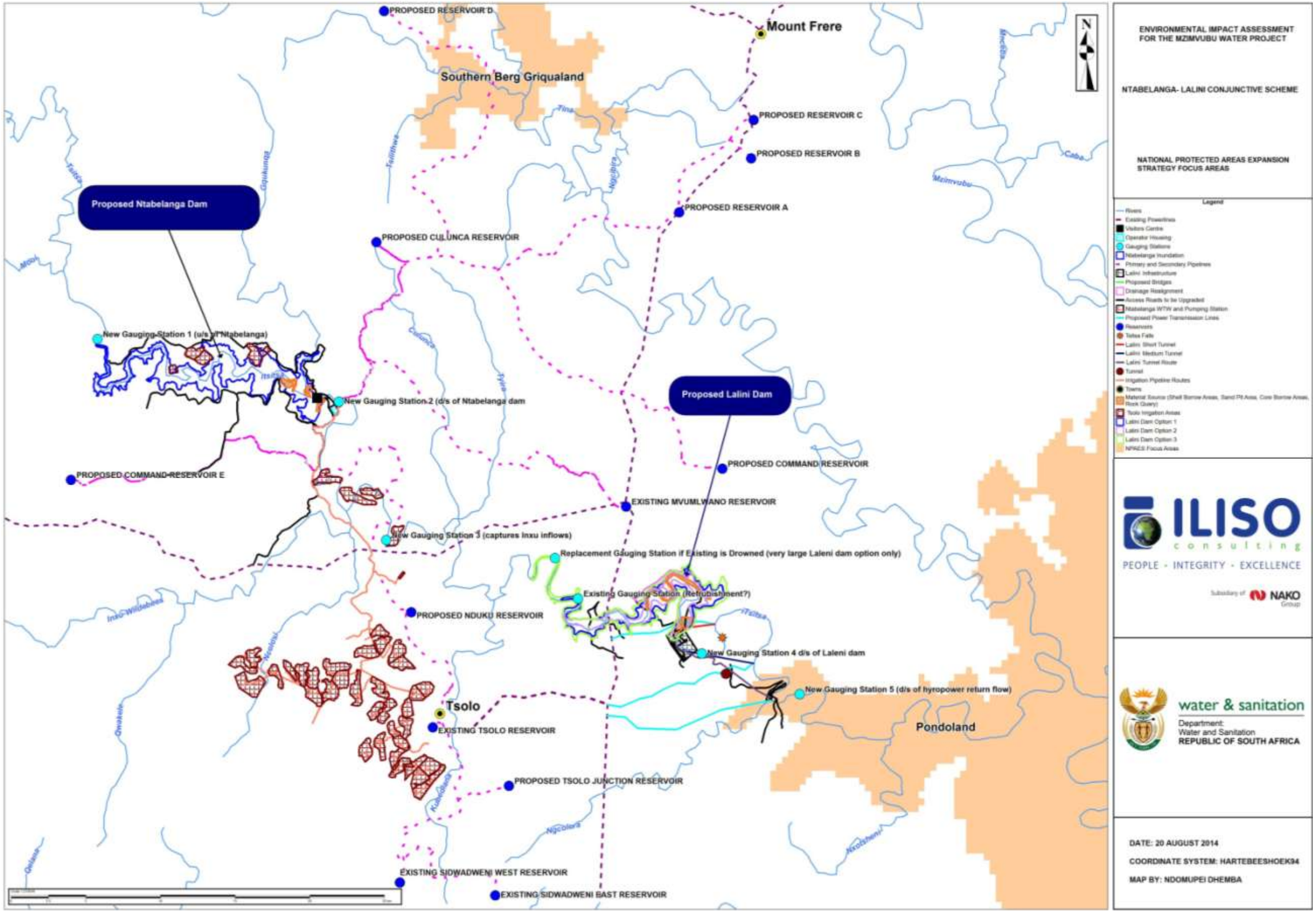


Figure 55: National Protected Areas Expansion Strategy Focus Areas

8.8 HERITAGE RESOURCES

Heritage resources may be tangible, such as buildings and archaeological artefacts, or intangible, such as landscapes and living heritage. Their significance is based upon their aesthetic, architectural, historical, scientific, social, spiritual, linguistic, economic or technological values; their representivity of a particular time period; their rarity; and their sphere of influence.

Literature and database reviews, complemented by a field investigation, indicate that the following heritage resource types are present in the study area.

8.8.1 Archaeological sites

All locations in the study area in which archaeological sites might reasonably be expected have been subject to ploughing, thus compromising the integrity of such sites. Furthermore, potential locations of Iron Age archaeological sites remain preferred crop production fields today, and the presence of standing crops hindered the identification of such sites.

One archaeological site of medium significance was identified in the proposed Ntabelanga Dam basin another site of medium to high significance was identified in the proposed Lalini Dam basin. These sites will be destroyed by inundation and appropriate mitigation was recommended in that regard.

8.8.2 Places, buildings and structures

Structures associated with unoccupied homesteads are located within the proposed Ntabelanga Dam basin. None were identified within the proposed Lalini Dam basin. For the purposes of this report all these structures are assumed to be older than sixty years, thus constituting heritage resources. All of these structures have low significance.

8.8.3 Graves and traditional burial places

Numerous traditional burial places are known to occur within and adjacent to the project area. Such burials comprise one or more ancestral graves, typically located within or close to homestead precincts, rather than in formal cemeteries managed by a local authority. Graves usually comprise stone-packed mounds, with or without a headstone, although older graves may be less readily identifiable due to the deflation of the mound and scattering of the stone covering. Numerous abandoned homesteads that probably predate the mid 1960s are present in the study area. These homesteads may well be the locations of ancestral graves.

Ancestral graves were identified in the proposed Ntabelanga Dam basin. None were identified within the proposed Lalini Dam basin. All human remains have high heritage significance.

8.9 VISUAL ASPECTS

Visual impacts are determined based on a number of factors, namely the topography, vegetation cover, land use, visibility, landscape diversity and landscape character.

The first three elements are described in more detail in sections 8.2, 8.4 and 8.11 respectively and are not further discussed here.

8.9.1 Ntabelanga Dam

Visibility

The visibility is contained within the valleys by the surrounding rising landforms and valley slopes and limits views to approximately 1.5 - 5.0 km. Intermittent views are possible up to 7 km away from the higher landforms (see **Figure 56**).

Critical views are from the surrounding local villages such as Luxeni Bongweni, Komkulu, KuQulungashe and Siqungqwini, as well as from the surrounding access roads.

Visibility is generally uninterrupted throughout the viewshed. None of these views should be negatively impacted as the views will not detract from the existing aesthetic appeal of the area nor will it affect any land-use that relies on the visual environment for it to exist

Landscape Diversity

Landscape diversity within the viewshed is primarily based on the topographical features as the vegetation, namely grasslands, is relatively uniform in texture and height. The landscape exhibits a great degree of horizontal and vertical scale due to the surrounding hills and ridges that provide a scape in proportion to the scale of the dam.

The study area is already modified by human activity such as the various scattered settlements, roads and ploughed, terraced lands which add to a more diverse landscape.

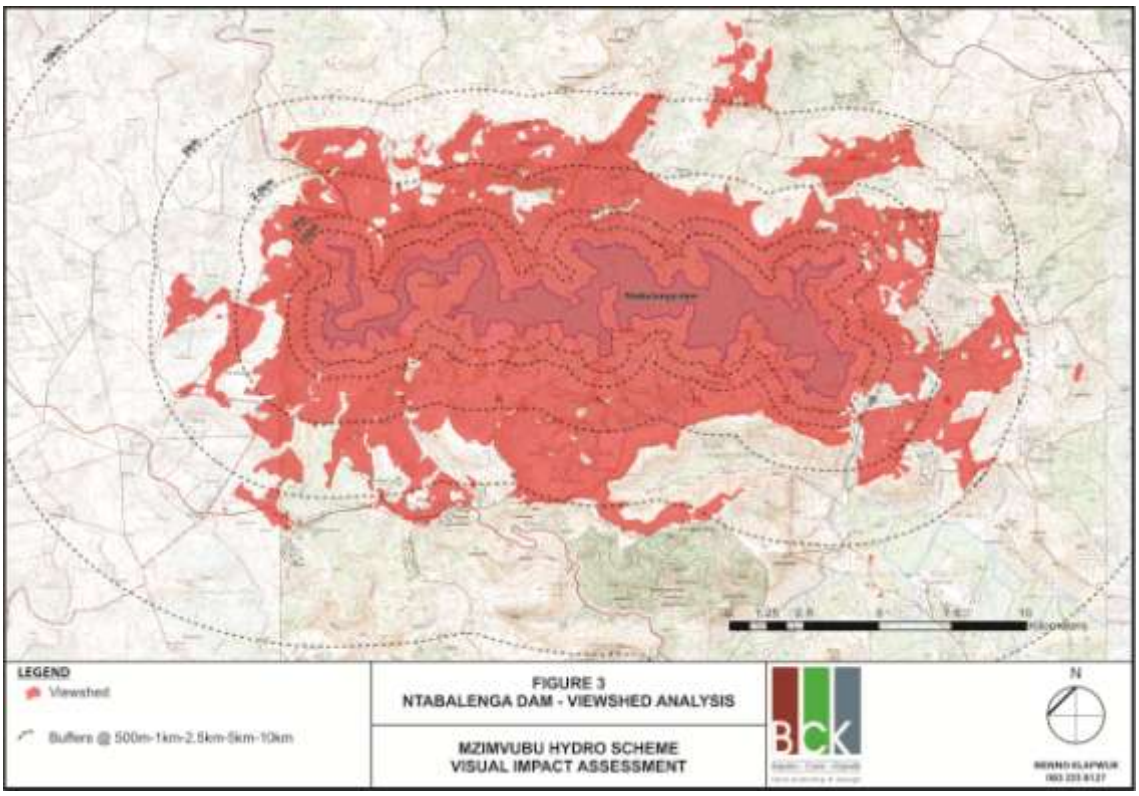


Figure 56: Ntabelanga Dam Viewshed (DWS, 2014f)

The low visual diversity of the open and uniform vegetation together with the diversity of the human activity and the rising landforms adds towards a low to moderate diversity

The lack of visual diversity will result in a low Visual Absorption Capacity (VAC) and will in turn result in any large scale structure to be highly visible due to the lack of screening and the high visual contrast.

Landscape Character

The hills and ridges exhibit a well-defined and vivid sense of spatial definition with a moderate scenic quality due to the combination of low gentle valleys, open grasslands. The character of the landscape can be regarded as rural agriculture predominantly stock grazing and subsistence farming.

The introduction of a dam within this landscape will alter the character considerably due to the size and scale of it. The dam will considerably alter the sense of place and Genius Loci of the study area. However, the change in character is not considered to be significantly negative and aesthetically unpleasing.

The introduction of this element in the landscape has the potential to promote tourist-based enterprises that rely on the high scenic quality as the basis for their business.

8.9.2 Lalini Dam

Visibility

The visibility is contained within the valleys by the surrounding rising landforms and valley slopes and limits views to approximately 1.5 - 5.0 km. Intermittent views are possible up to 8 km away from the higher landforms (**Figure 57**).

Critical views are from the surrounding local villages such as Mhlabathi, Upper Rosa, Shawbury, Mtshazi, Lolana and Mahoyana, as well as from the surrounding access roads.

Visibility is generally uninterrupted throughout the viewshed. None of these views should be negatively impacted as the views will not detract from the existing aesthetic appeal of the area nor will it affect any land-use that relies on the visual environment for it to exist

Landscape Diversity

Landscape diversity within the viewshed is primarily based on the topographical features as the vegetation, namely grasslands, is relatively uniform in texture and height. The landscape exhibits a great degree of horizontal and vertical scale due to the surrounding hills and ridges that provide a scape in proportion to the scale of the dam

The study area is already modified by human activity such as the various scattered settlements, roads and ploughed, terraced lands which add to a more diverse landscape

The low diversity of the open and uniform vegetation together with the diversity of the human activity and the rising landforms adds towards a low to moderate diversity

The lack of visual diversity within this Grassveld landscape biome will result in a low VAC and will in turn result in any large scale structure to be highly visible due to the lack of screening and the high visual contrast. The hills and ridges together with the scattered settlements display a slightly higher visual diversity due to the more diverse topography and the odd patches of trees. However, this still does not provide sufficient diversity to raise the VAC to moderate for this area.

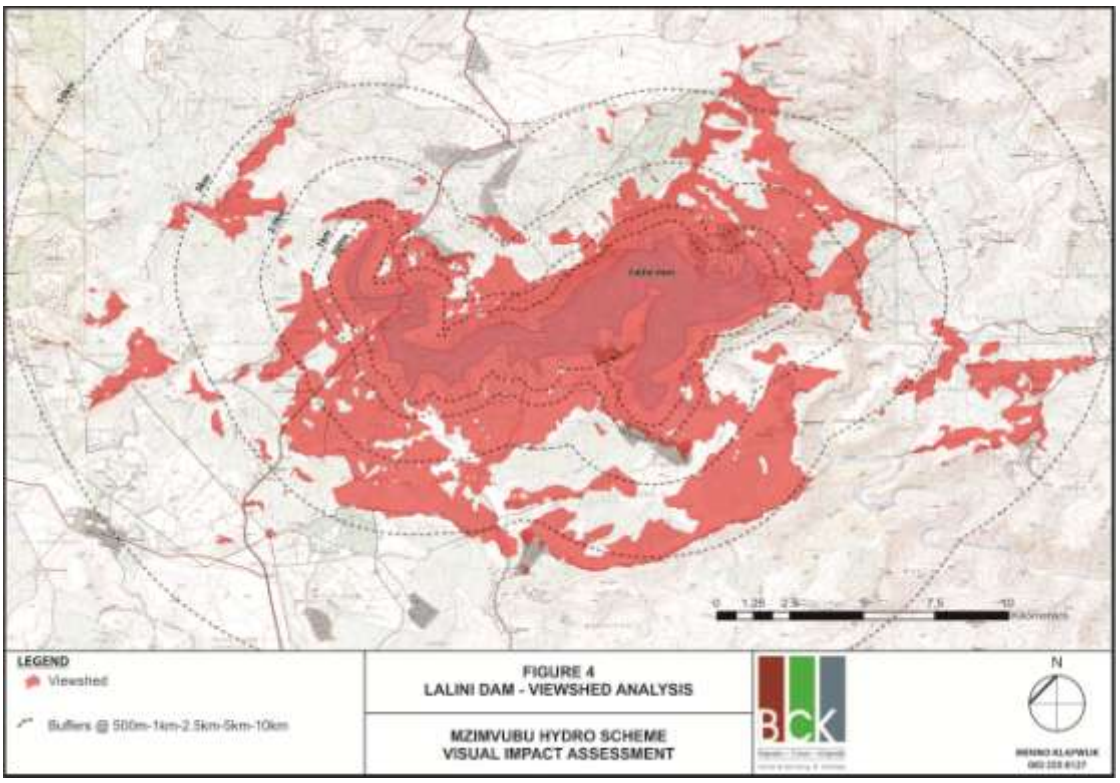


Figure 57: Lalini Dam Viewshed

Landscape Character

The hills and ridges exhibits a well-defined and vivid sense of spatial definition with a moderate scenic quality due to the combination of low gentle valleys, open grasslands and the scattered settlements. The character of the landscape can be regarded as rural agriculture predominantly stock grazing and subsistence farming.

The introduction of a dam within this landscape will alter the character considerably due to the size and scale of it. The dam will considerably alter the sense of place and Genius Loci of the study area. However, the change in character is not considered to be significantly negative and aesthetically unpleasing.

The introduction of this element in the landscape has the potential to promote tourist-based enterprises that rely on the high scenic quality as the basis for their business, especially with the Tsitsa Falls in close proximity.

8.9.3 Power lines

Visibility

The visibility within the valley is contained by the surrounding rising landforms to approximately 1 km. As the transmission lines rise up out to the valley they become very exposed and are visible for many kilometres (**Figures 57, 58** and **59**).

Power line 1 is the closest to the dam wall and the Tsitsa Falls. Although it is the shortest of the routes the visual exposure extends at least 7.5 km to the north east as

well as to the south east. The hydro-station will be located is a relative unspoilt treed valley where the slopes of the valley limit views to approximately1.5 - 5.0 km. Although the pylons are well screened within the valley the servitude that will need to be cleared for access will greatly contrast with the surrounding vegetation and be visually obvious. Intermittent views are possible up to 8 km away from the higher landforms.

Power line 2 is more contained by the landscape than Power line 3 and is generally limited as a continuous view to approximately 3 km. Views occurred from the higher lying areas to the north are Intermittent and up to a distance of 10km

Power line 3 rises out of the valley further down the river and runs along the edge of the plateau next to a valley where it stands out proud in the open landscape. The visual exposure is uninterruptedly visible northwards for at least 5 km with sporadic views possible up to 10 km. Views to the south are more scattered but also extend to at least 10 km.

Critical views are from the surrounding local villages such as Mhlabathi, Upper Rosa, Shawbury, Mtshazi, Lolana, and Mahoyana. Critical views are also those from the surrounding access roads.

Although the power line routes are very visible and exposed within the open and low vegetation the rolling topography created by the surrounding landscape assists in containing the view impact to generally no more than 5 km.

The valley that runs parallel to Powerline 3 would greatly assist in reducing the visual exposure of the line if places within the valley than rather on top along the edge of the escarpment.

Landscape Diversity
Landscape diversity within the viewshed is similar to the dam study sites and is primarily based on the topographical features and human interventions as the vegetation, namely grasslands, is relatively uniform in texture and height.

The landscape exhibits a great degree of horizontal and vertical scale in the vicinity of the Tsitsa River due to the surrounding hills, ridges and steep-sided valley bottom that provide a scale in proportion to the scale of the pylons. However, once the lines rise out of the valley they traverse an open rolling landscape that is already modified by human activity such as the various scattered rural settlements, roads and ploughed, terraced lands which add to a more diverse landscape.

The low diversity of the open and uniform vegetation together with the diversity of the human activity and the rising landforms adds towards a low to moderate diversity, resulting in a low to moderate VAC. The hills and ridges together with the scattered

settlements display a slightly higher visual diversity due to the more diverse topography and the odd patches of trees. However, this still does not provide sufficient diversity and will still result in any large scale structure to be highly visible due to the lack of screening and the high visual contrast.

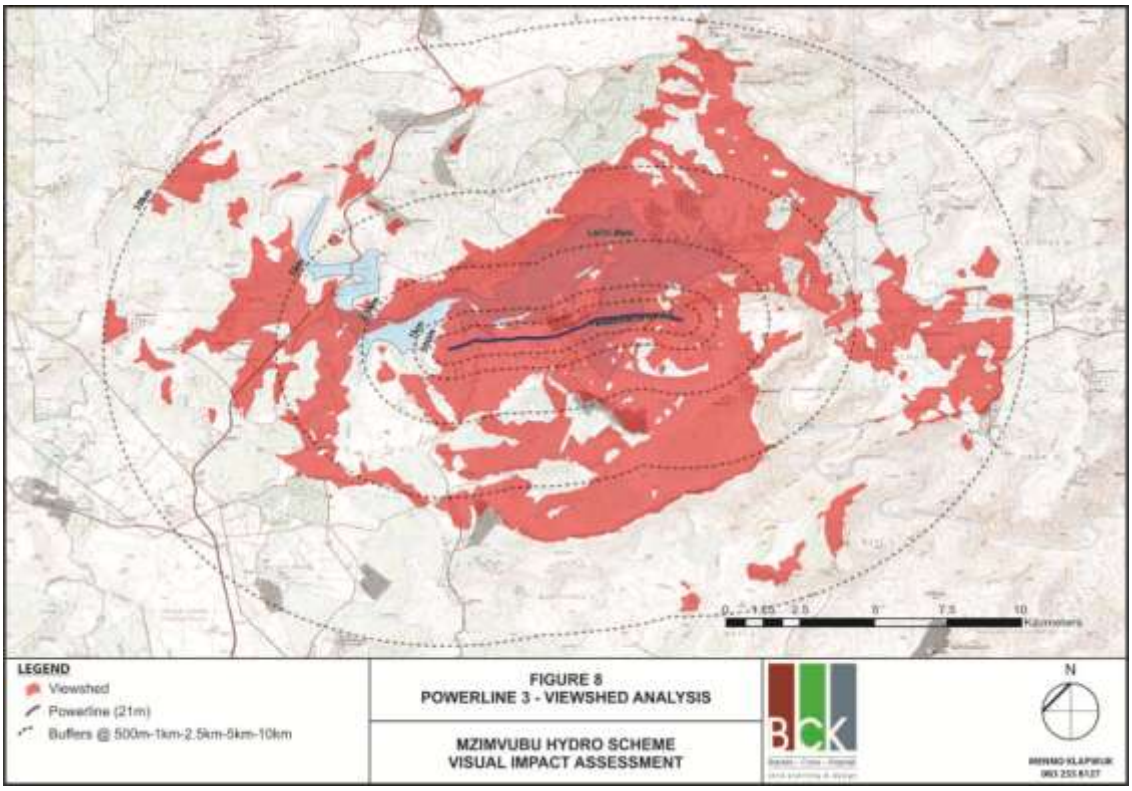


Figure 58: Power line 1 Viewshed

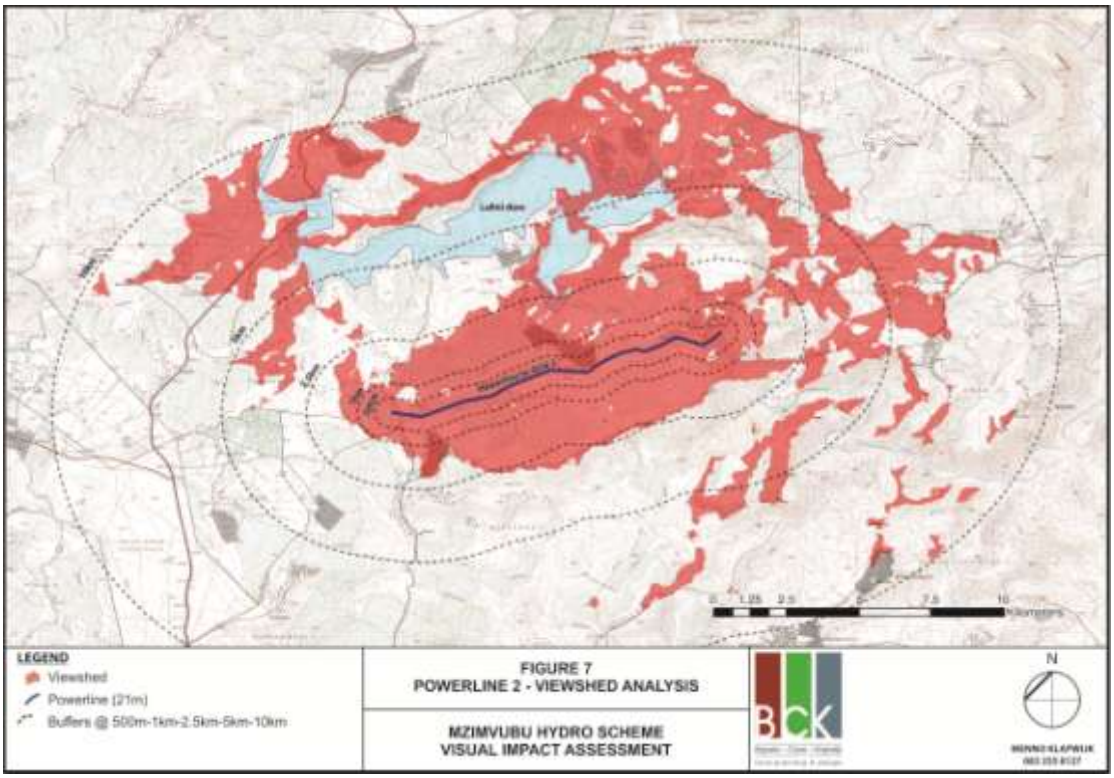


Figure 59: Power line 2 Viewshed

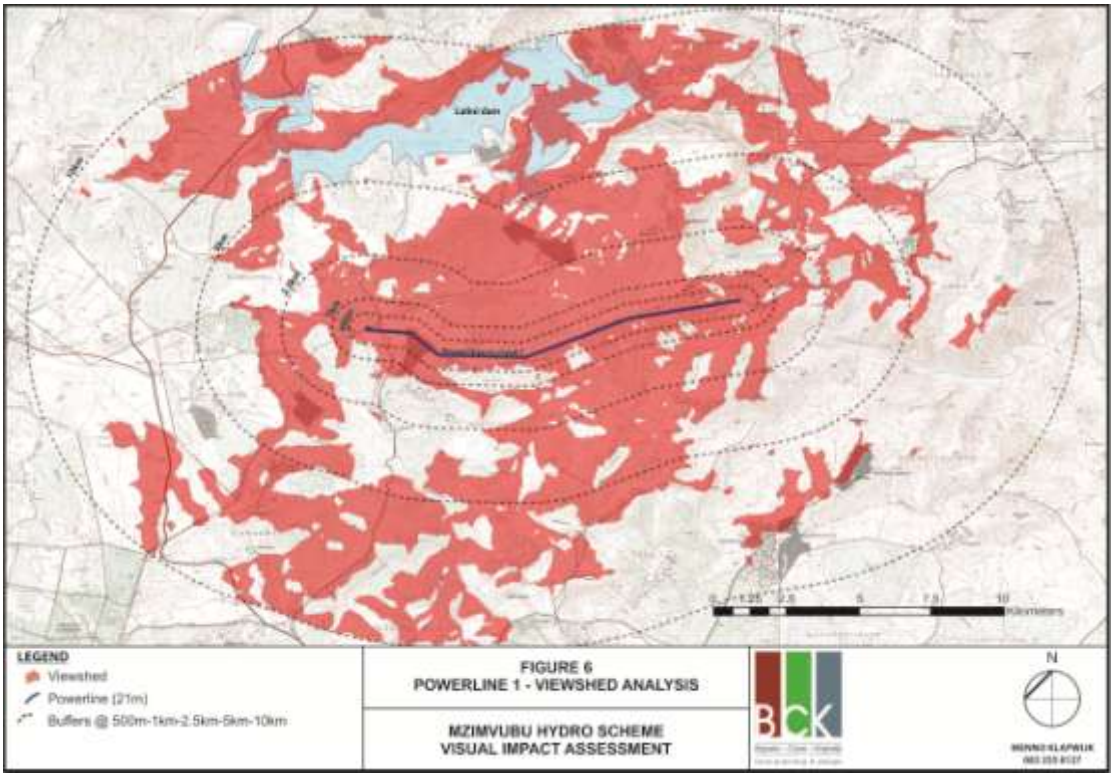


Figure 60: Power line 3 Viewshed

Notwithstanding the low to moderate VAC, the area has already been modified by human interaction in the form of settlements, roads and arable agriculture and is thus able to visually accommodate the industrial nature of the lines.

Landscape Character

The hills and ridges exhibits a well-defined and vivid sense of spatial definition with a moderate scenic quality due to the combination of low gentle valleys, open grasslands and the scattered settlements. The character of the landscape can be regarded as rural agriculture predominantly stock grazing and subsistence farming.

The introduction of a dam within this landscape will alter the character considerably due to the size and scale of it. The dam will considerably alter the sense of place and Genius Loci of the study area. However, the change in character is not considered to be significantly negative.

The introduction of this element in the landscape has the potential to promote tourist-based enterprises that rely on the high scenic quality as the basis for their business, especially with the Tsitsa Falls in close proximity.

8.9.4 Irrigation Scheme

Visibility

Views in the Tsolo area are limited in the west to between 500m and 5 km and between 1 and 8 km in the east. Views along the Tsitsa River area are generally between 1 and 2.5 km while the area around the Ntabelanga Dam is visible between 2.5 and 6.5 km (**Figure 60**).

Critical views are from the R 396 that links the N2 with Maclear through Tsolo. Critical views also include the surrounding local villages such as Tsolo, Bantubabi, Prince, Duka, KuGubengxa, St. Cuthberts and Godini in the Tsolo area; the village of Machibini along the Tsitsa River area and the villages of eLugolweni. Coba Vale, Coba, Luxeni and Mpetsheni in the Ntabelanga Dam area.

Although the irrigated areas are close to critical view from the villages and well within the viewsheds the impact is considered low as these area are mostly existing arable lands then are being converted to irrigation and as such the visual image will not significantly change.

Landscape Diversity

Landscape diversity within the viewshed is similar to the dam study sites and is primarily based on the topographical features and human interventions as the vegetation, namely grasslands, is relatively uniform in texture and height.

The landscape exhibits a great degree of horizontal and vertical scale in the vicinity of the Tsitsa River due to the surrounding hills, ridges and steep-sided valley bottom that provide a scale in proportion to the scale of the pylons. However, once the lines rise out of the valley they traverse an open rolling landscape that is already modified by human activity such as the various scattered rural settlements, roads and ploughed, terraced lands which add to a more diverse landscape.

The low diversity of the open and uniform vegetation together with the diversity of the human activity and the rising landforms adds towards a low to moderate diversity, resulting in a low to moderate VAC. The hills and ridges together with the scattered settlements display a slightly higher visual diversity due to the more diverse topography and the odd patches of trees. However, this still does not provide sufficient diversity and will still result in any large scale structure to be highly visible due to the lack of screening and the high visual contrast.

Notwithstanding the low to moderate VAC, the area has already been modified by human interaction in the form of settlements, roads and arable agriculture and is thus able to visually accommodate the industrial nature of the lines

Landscape Character

The hills and ridges exhibits a well-defined and vivid sense of spatial definition with a moderate scenic quality due to the combination of low gentle valleys, open

grasslands and the scattered settlements. The character of the landscape can be regarded as rural agriculture predominantly stock grazing and subsistence farming.

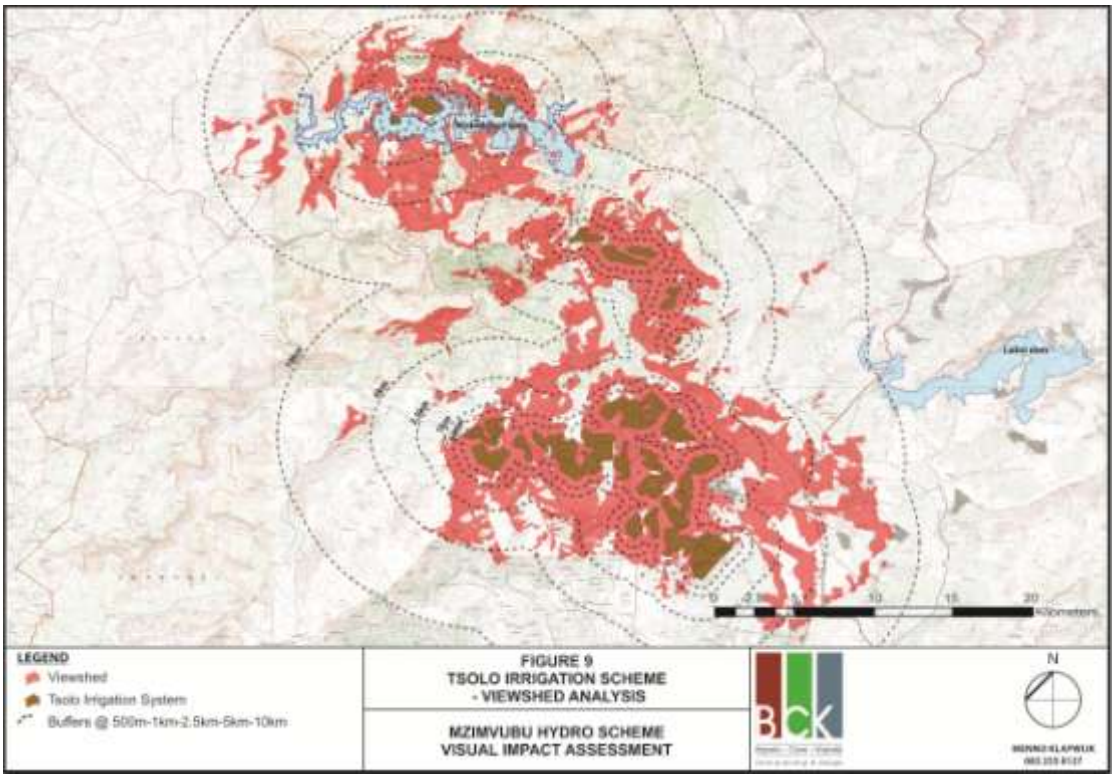


Figure 61: Irrigation scheme

8.9.5 Access roads

Visibility

Critical views are from the R 396 that links the N2 with Maclear through Tsolo. Critical views also include the surrounding local villages such as KwaNogemani, Zilandana, KwaMsobomva, Kombulu, Bongweni, Sinxago, KuQulungashe, Sinqungweni, Sinqungini and Mcedu.

It will not be possible to adequately screen the roads from the surrounding areas due to the short grasslands that do not offer a screening function.

Landscape Diversity

Landscape diversity within the viewsheds is based primarily on the topographical features and human interventions such as rural settlements, ploughed and terraced lands and a network of access roads. This diversity is tempered by the vegetation, namely grasslands that is relatively uniform in texture and height.

The low diversity of the open and uniform vegetation together with the diversity of the human activity and the rising landforms adds towards a low to moderate diversity. This diversity does allow some form of visual compatibility which incorporates the

roads in the landscape as the introduction of new roads is not visually out of place and in contrast with the existing sense of place.

Landscape Character

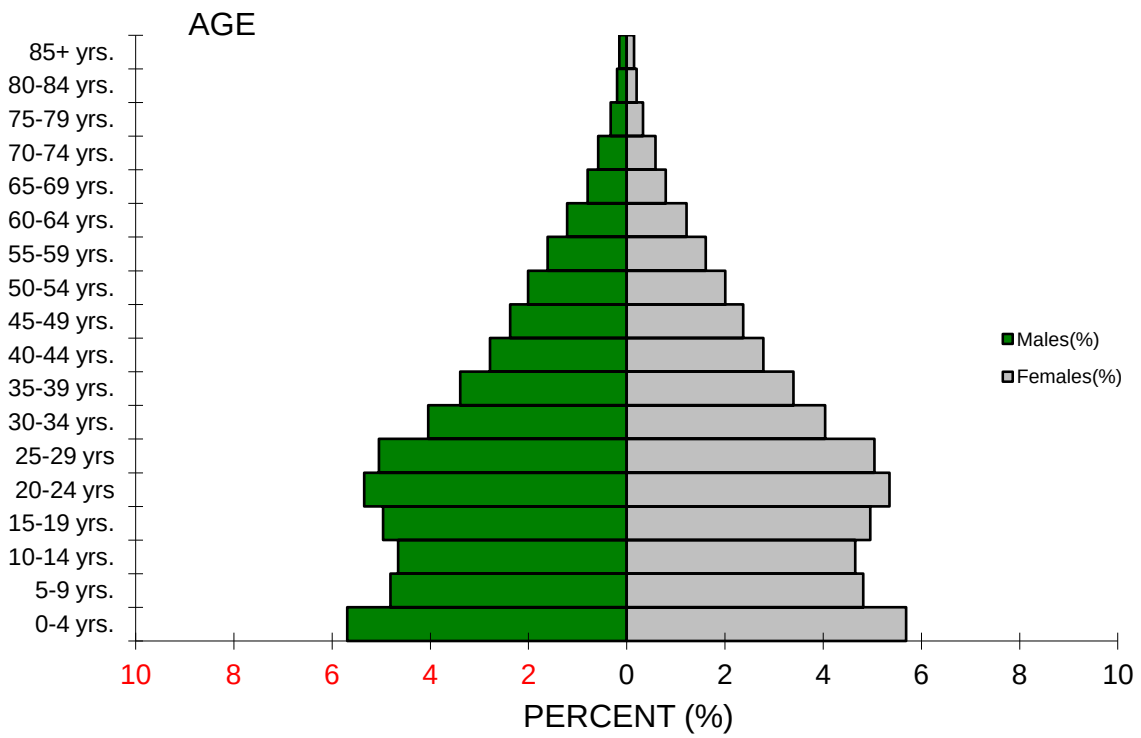
The hills and ridges exhibits a well-defined and vivid sense of spatial definition with a moderate scenic quality due to the combination of low gentle valleys, open grasslands and the scattered settlements. The character of the landscape can be regarded as rural agriculture predominantly stock grazing and subsistence farming.

The introduction of new access roads will not detract from this sense of place as images of roads already exist within this landscape.

8.10 SOCIO-ECONOMICS OF THE EASTERN CAPE PROVINCE

8.10.1 Demography

The Eastern Cape Province covers an area of 168 966 km^2 making it the second largest province by geographical area, covering 13.8% of South Africa's total land mass. This is only surpassed by the Northern Cape which covers an area of 372 889 km^2 accounting for 30.5% of the total land area of the country. The total population of the province stood at 6 562 053 people in 2011 (Statistics South Africa, 2012) and was estimated at 6 620 100 people in June, 2013 (Statistics South Africa, 2013, p. 3). Consequently, the province is ranked third in respect of population size and has a population density of 39/km^2. This makes it the sixth densely populated province in South Africa. In respect of age structure, 33.0% of the population is under 15 years of age, while 60.2% is between 15 and 64 years with 6.7% being over the age of 65 years. The population pyramid of the province is illustrated in **Figure 61.**



Data source: (Statistics South Africa, 2012)

Figure 62: Population pyramid Eastern Cape Province

In the Eastern Cape Province, 86.3% of the population are black African, 8.3% are coloured, 4.7% are white and 0.4% are Indian or Asian people. IsiXhosa is spoken by 78.8% of the population, followed by Afrikaans (10.6%), English (5.6%), and Sesotho (2.5%).

The 2011 Census indicated that there were 1,687,385 households in the province with an average household size of 3.9. Of these households, 49.6% were female headed, 63.2% lived in formal dwellings and 59.6% either owned or were paying off their dwelling.

The 2011 Census also indicated that 40.4% of households in the province had flush toilets connected to the sewerage system, while 41% had their refuse removed on a weekly basis. Piped water was delivered to 32.8% of households and 75% of Eastern Cape households used electricity as a means of energy for lighting.

The sex ratio across the study area indicates a higher number of females compared to males.

8.10.2 Unemployment

In the 4th quarter of 2013 the official unemployment rate in the province was 27.8%, the second highest rate of unemployment in the country (after the Free State). It increased to 30.4% in the 2nd quarter of 2014.

The expanded unemployment rate (which includes disillusioned work seekers) in the 4th quarter of 2013 was however 43.3%, and increased to 44.4% in the 2nd quarter of 2014, thus giving the province the highest expanded rate of unemployment in the country. The LMs in the study area have unemployment rates of between 40 and 50% (*The Local Government Handbook*, 2014).

8.10.3 Poverty

Although there have been some improvements across the province, the study area remains one of the poorest parts of the country, characterised by high poverty and out-migration resulting in sex ratio imbalances, a high proportion of female headed households and a low or even negative population growth rate. At large the population lacks basic amenities and relies heavily on subsistence farming which is not highly successful.

The proportion of households owning household goods across the area is lower than that of the province.

The study area is characterised by a high dependency ratio which indicates the burden of supporting children under 15 years and people over 65 years placed on the working population aged 15–64 years.

8.10.4 Health

In addition to HIV AIDS, a further issue concerning health in the province relates to cancer. It is indicated that "[t]*he rate of the cancer in the Eastern Cape is six times the national average*" (Stassen, 2011) and new research is linking this with the processing of home-grown maize and the silica from the grid stones that may cause throat irritations (Sewram, 2011).

8.10.5 Education

The situation regarding schooling in the area improved somewhat between 2001 and 2011. Notwithstanding this, all the district and local municipalities within the study area (with the exception of uMzimvubu LM) are above the provincial level (10.5%) in terms of the percentage of the population with no education.

8.11 MUNICIPAL DESCRIPTION

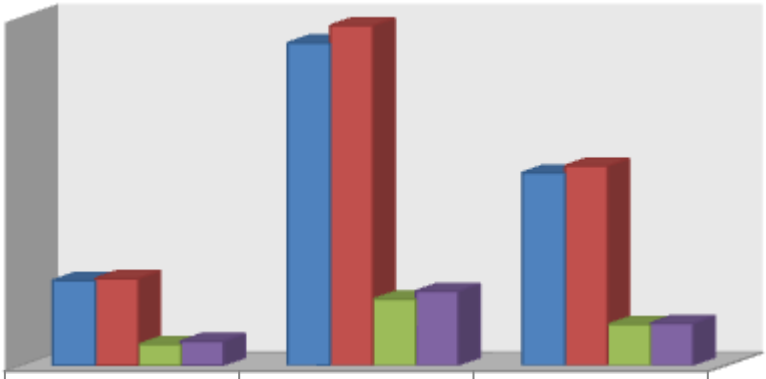
The project impacts the three district municipalities of Joe Gqabi, O. R. Tambo and Alfred Nzo. Of these districts Joe Gqabi covers the greatest land area and has the lowest population density across the region at 14 people/km^2 while O. R. Tambo has the largest population and the highest population density at 110 people/km^2. With regard to population group, black African people are the dominant group across all districts at over 90%. Xhosa is the dominant language spoken in the area ranging between 70.5 and 94.2 percent. This data is represented below in **Table 12**.

Table 20: Demographic data district level

	Joe Gqabi DC14	O. R. Tambo DC15	Alfred Nzo DC 44
Geographical area	25,663 km^2	12,096 km^2	10,731 km^2
Population	349,768	1,364,943	801,344
Density	14/km^2	110/km^2	75/km^2
	Population group		
Black African	93.8%	99.0%	99.1%
Coloured	3.5%	0.5%	0.4%
Indian/Asian	0.2%	0.2%	0.1%
White	2.4%	0.2%	0.2%
	Language		
Xhosa	70.5%	94.2%	84.6%
Sotho	20.2%	0.27%	8.8%
English	1.4%	2.7%	2.3%
Afrikaans	5.9%	0.17%	0.84%
Zulu	0.25%	0.49%	1.2%
Other	1.8%	3.1%	3.1%

Data source: (Statistics South Africa, 2012)

The difference between the populations and households of the districts as they occurred in 2001 and 2011 are compared **Figure 62.**



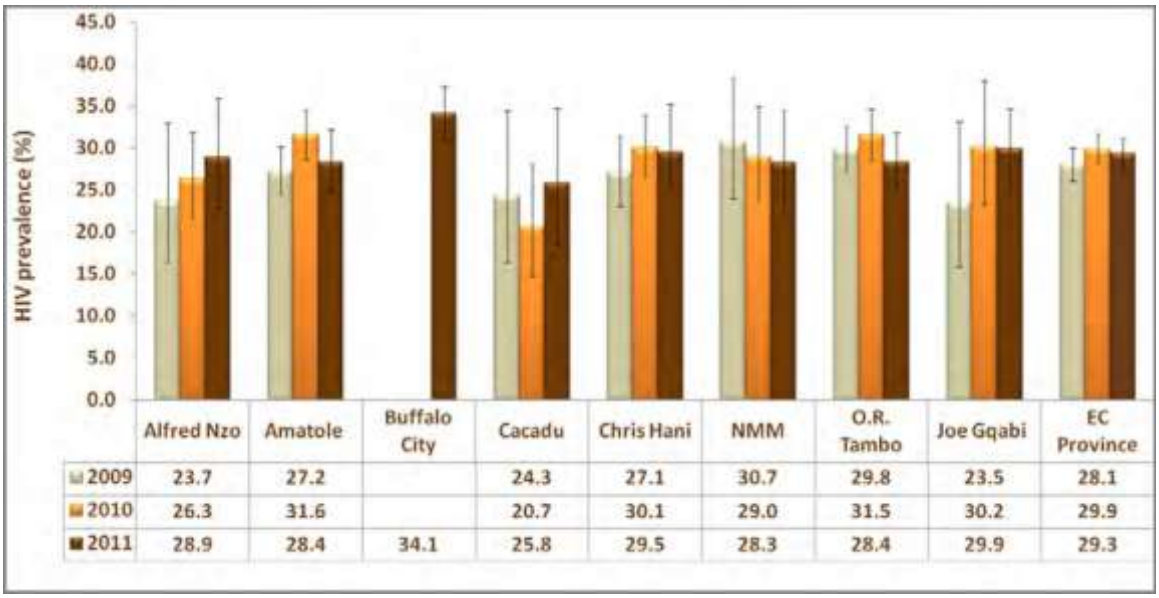
	DC14	DC15	DC44
Population 2001	341 750	1 295 145	773 708
Population 2011	349 768	1 364 943	801 344
Households 2001	84 835	266 709	164 667
Households 2011	97 775	298 229	169 261

Data source: (Statistics South Africa, 2012)

Figure 63: Population and households 2001 and 2011 across districts

8.11.1 Health

Concerning the HIV prevalence rate amongst antenatal women in 2011 as assessed across the affected districts, Joe Gqabi had the highest prevalence rate at 29.3%. This is followed by the Alfred Nzo District Municipality at 28.9% and O. R. Tambo at 28.4%. Across both metropolitan and district municipalities in the Eastern Cape Province, Buffalo City had the highest prevalence rate at 34.1% while Cacadu had the lowest at 25.8%. This is illustrated in **Figure 63**.



Source: (National Department of Health, 2012, p. 23)

Figure 64: HIV prevalence trends: Antenatal women by district 2009 – 2011

8.11.2 Local Municipalities

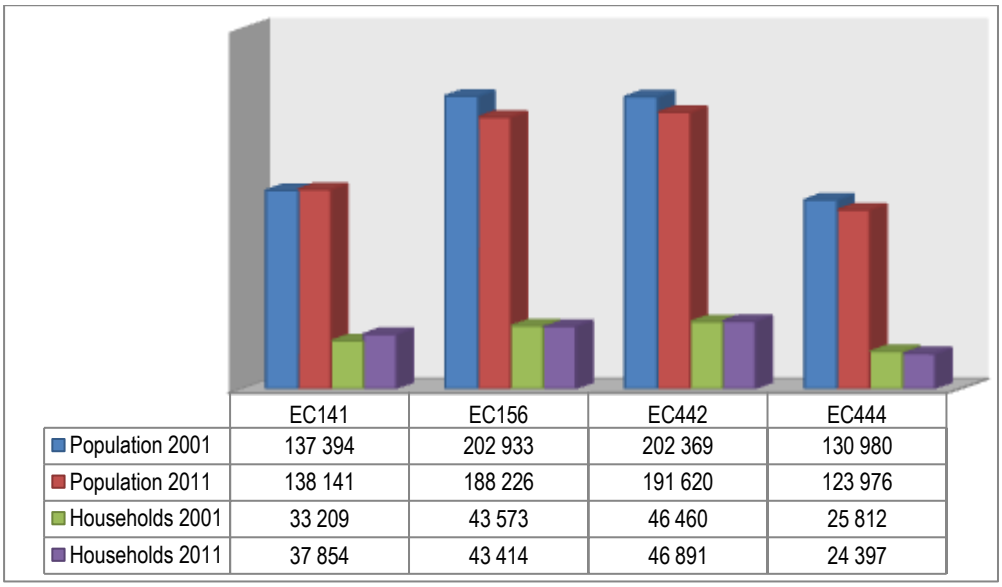
At the local municipal level the project impacts the following 4 local municipalities, Elundini, Mhlontlo, Umzimzubu and Ntabankulu. Of these municipalities Elundini covers the greatest geographical area at 5,065 km^2 and Ntabankulu the smallest area at 1,385 km^2. With a population of 123,976 people Ntabankulu the highest population density at 90 people/km^2. Umzimvubu has the highest population with 191,620 people living within the municipal area. At over 98% Black African people are the biggest population group across all municipalities and Xhosa is the dominant language spoken. This data is represented in **Table 13**.

Table 21: Demographic data local municipalities

	Elundini EC141	Mhlontlo EC156	Umzimvubu EC442	Ntabankulu EC444
Geographical area	5,065 km^2	2,826 km^2	2,577 km^2	1,385 km^2
Population	138,141	188,226	191,620	123,976
Density	27/km^2	67/km^2	74/km^2	90/km^2
	Population group			
Black African	98.1%	99.4%	99.4%	99.4%
Coloured	1.0%	0.2%	0.3%	0.4%
Indian/Asian	0.1%	0.1%	0.1%	0.1%
White	0.7%	0.2%	0.1%	0.1%
	Language			
Xhosa	70.1%	94.9%	93.1%	95.2%
Sotho	24.8%			
English	1.6%	2.3%	2.6%	1.4%
Afrikaans	1.7%			
Zulu				
Other	1.8%	2.8%	4.3%	3.4%

Data source: (Statistics South Africa, 2012)

The difference between the populations and households of the local municipalities as they occurred in 2001 and 2011 are compared in **Figure 64**.



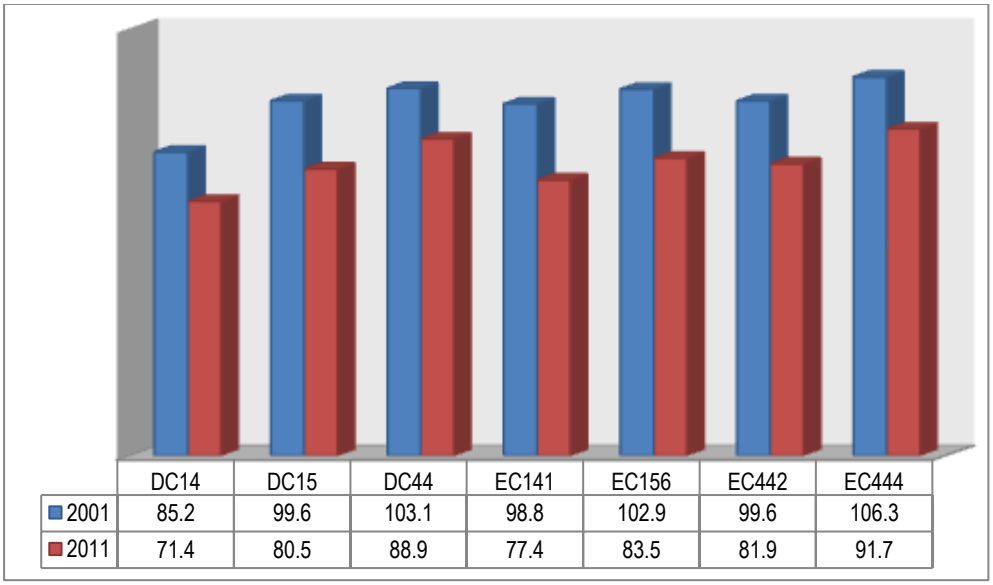
	EC141	EC156	EC442	EC444
Population 2001	137 394	202 933	202 369	130 980
Population 2011	138 141	188 226	191 620	123 976
Households 2001	33 209	43 573	46 460	25 812
Households 2011	37 854	43 414	46 891	24 397

Data source: (Statistics South Africa, 2012)

Figure 65: Population and households 2001 and 2011 across municipalities

8.11.3 Dependency Ratio

The study area is characterised by a high dependency ratio which indicates the burden of supporting children under 15 years and people over 65 years placed on the working population aged 15–64 years. Although there has been some improvement across all areas between 2001 and 2011 the burden still remains heavy with it being greatest in Ntabankulu at 91.7 and lowest being across the Joe Gqabi District Municipality at 71.4. This data is illustrated in **Figure 65**.



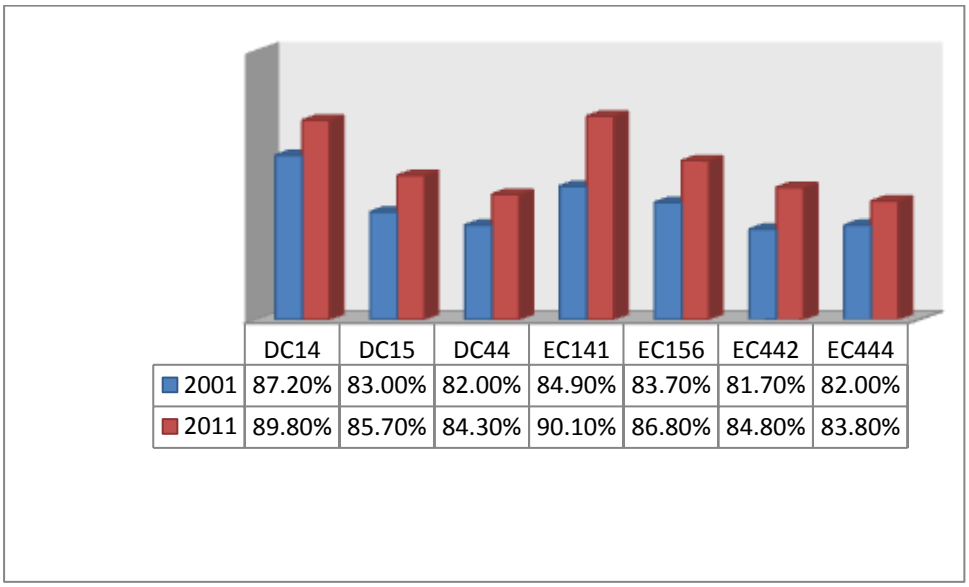
	DC14	DC15	DC44	EC141	EC156	EC442	EC444
2001	85.2	99.6	103.1	98.8	102.9	99.6	106.3
2011	71.4	80.5	88.9	77.4	83.5	81.9	91.7

Data source: (Statistics South Africa, 2012)

Figure 66: Dependence ratio district and local municipalities

8.11.4 Gender

The sex ratio across all areas indicates a higher number of females compared to males with Ntabankulu having the highest proportion of females to males and Elundini the lowest at 90.10% as illustrated in **Figure 66**.

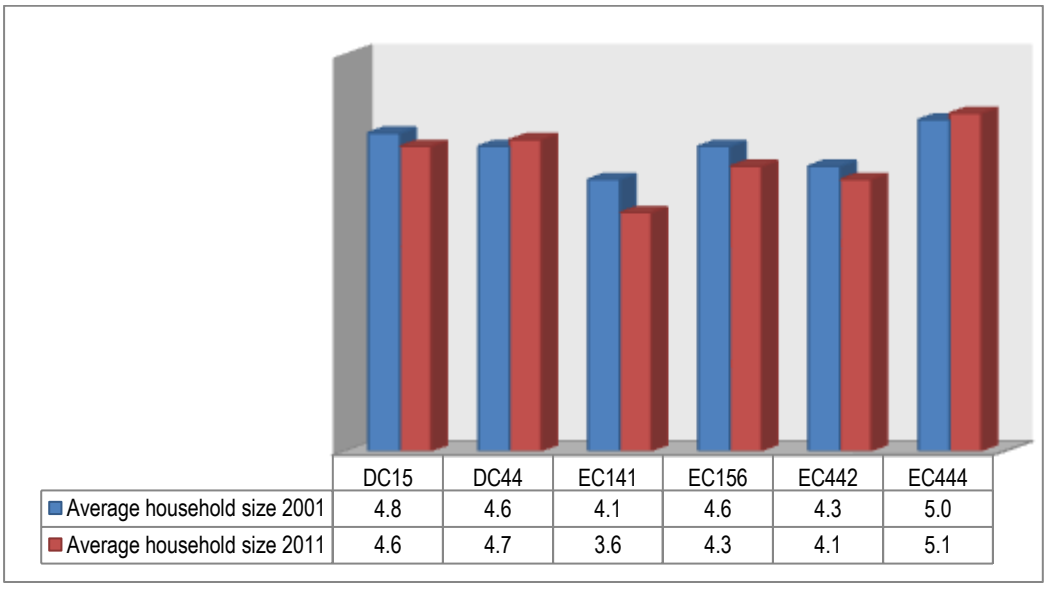


Data source: (Statistics South Africa, 2012)

Figure 67: Sex ratio district and local municipalities

8.11.5 Household size

The average size of households in the area range between 3.6 in Elundini and 5.1 in Ntabankulu and is illustrated in **Figure 67**.



Data source: (Statistics South Africa, 2012)

Figure 68: Average household size

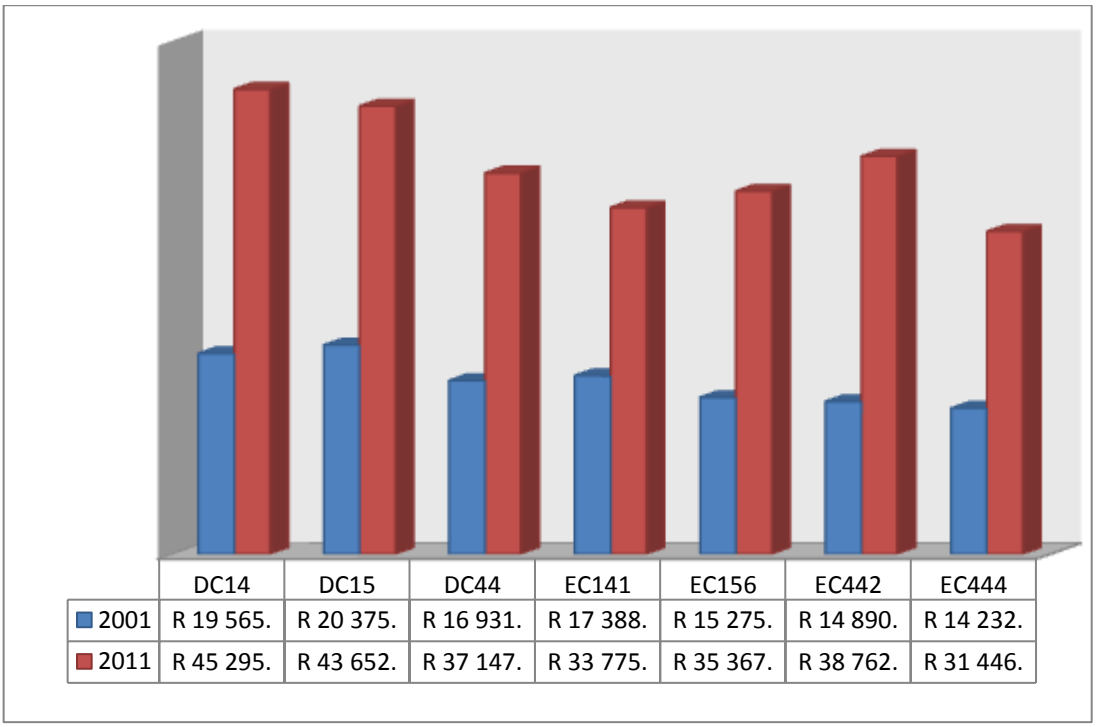
8.11.6 Household dynamics

Apart from the Joe Gqabi district, where 49.3% of the households are female headed, all other areas have a higher percentage of female than male headed households with the greatest percentage of female headed households at 60.4% being found in Ntabankulu.

When compared on a provincial level with the Eastern Cape Province at 1.0%, the study area has a relatively high percentage of child headed households. In the O.R. Tambo and Alfred Nzo districts 1.9% of households are headed by children under 18 years of age while in the Joe Gqabi district the figure is 1.2%. The percentage of child headed households is marginally lower across the local municipalities, ranging between 1.4 and 1.8 percent,

Regarding household income, with an average household income of R37 147 per annum Alfred Nzo has the lowest average household income in respect of all district municipalities. Amongst the local municipalities Ntabankulu has an average household income of R31 446 making it the municipality with the lowest average income overall. The highest average income, at R45 295, is found in the Joe Gqabi district as illustrated in **Figure 68**.

Most formal dwellings are found in the Joe Gqabi district with the lowest percentage of formal dwellings at 24.3% being found in Ntabankulu. At 64.4% the local municipality of Ntabankulu has the highest percentage of housing being owned or being paid off with the lowest percentage, 53.9%, being found in Mhlontlo.



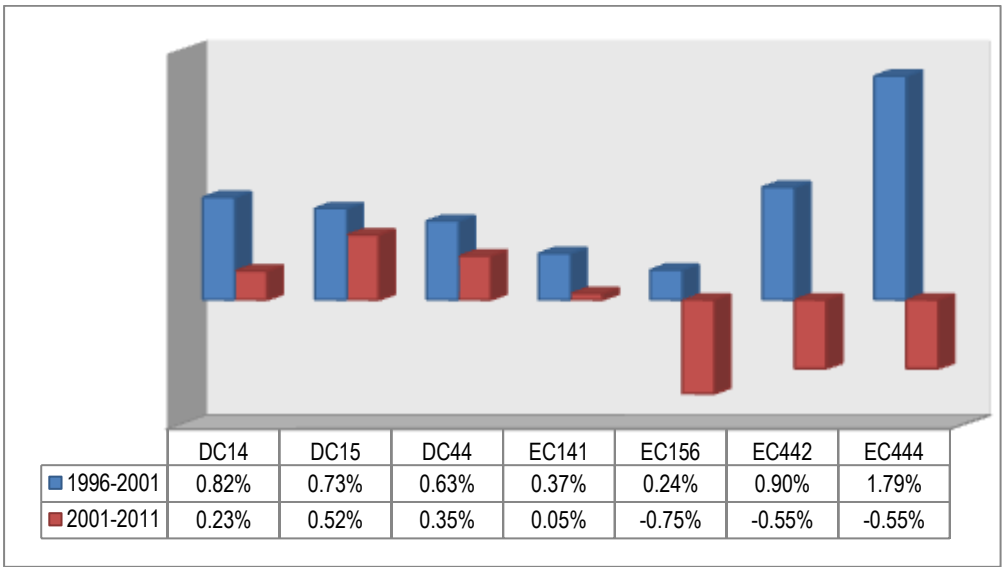
	DC14	DC15	DC44	EC141	EC156	EC442	EC444
2001	R 19 565.	R 20 375.	R 16 931.	R 17 388.	R 15 275.	R 14 890.	R 14 232.
2011	R 45 295.	R 43 652.	R 37 147.	R 33 775.	R 35 367.	R 38 762.	R 31 446.

Data source: (Statistics South Africa, 2012)

Figure 69: Average household income

8.11.7 Population Growth

Between 2001 and 2011 Mhlontlo, Umzimzubu and Ntabankulu all showed a negative population growth with the O. R. Tambo district having the highest population growth at 0.52%. This is illustrated in below in **Figure 69**.



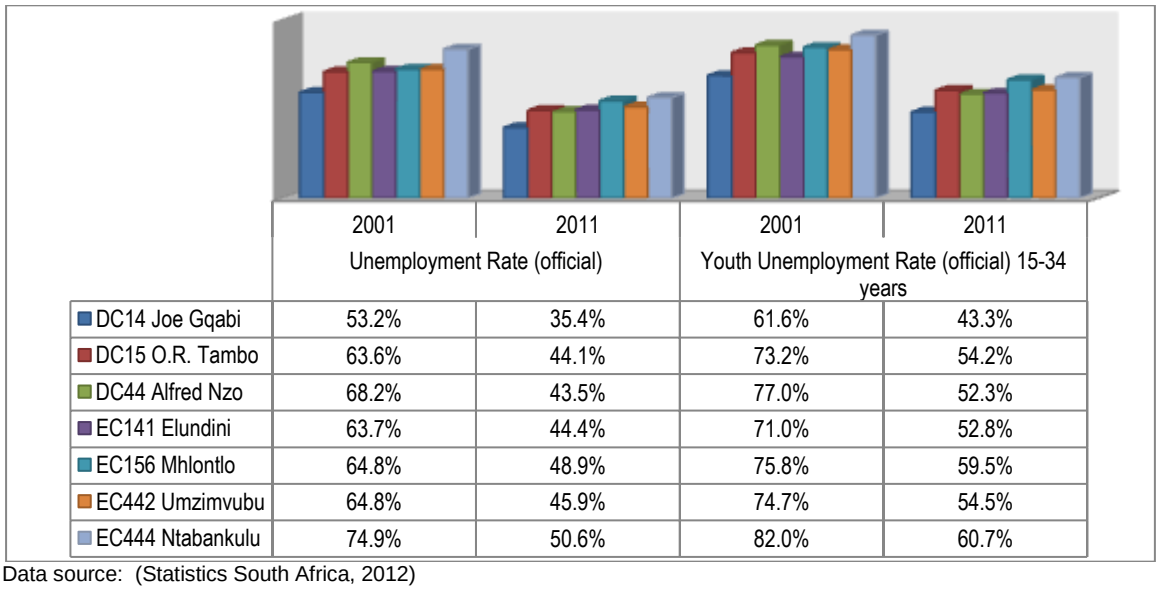
	DC14	DC15	DC44	EC141	EC156	EC442	EC444
1996-2001	0.82%	0.73%	0.63%	0.37%	0.24%	0.90%	1.79%
2001-2011	0.23%	0.52%	0.35%	0.05%	-0.75%	-0.55%	-0.55%

Data source: (Statistics South Africa, 2012)

Figure 70: Population growth % p.a.

8.11.8 Employment

In respect of the labour market, at 50.6% the highest level of official unemployment is found in Ntabankulu with the lowest level being found in the Joe Gqabi district at 35.4%. Amongst the youth between 15 and 34 years of age Ntabankulu also has the highest rate of unemployment at 60.7% with Joe Gqabi again having the lowest at 43.3% as illustrate below in **Figure 70**.



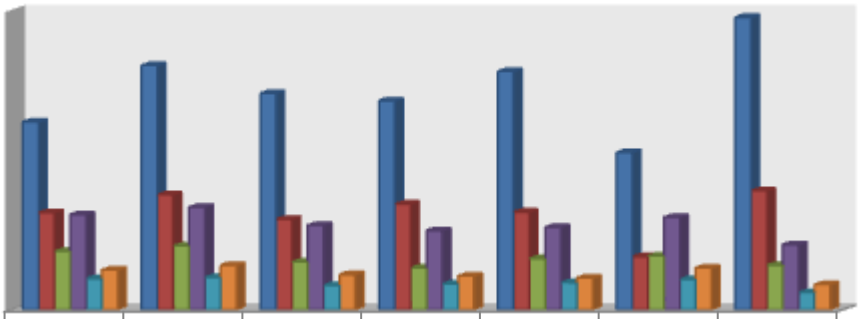
	2001 Unemployment Rate (official)	2011 Unemployment Rate (official)	2001 Youth Unemployment Rate (official) 15-34 years	2011 Youth Unemployment Rate (official) 15-34 years
DC14 Joe Gqabi	53.2%	35.4%	61.6%	43.3%
DC15 O.R. Tambo	63.6%	44.1%	73.2%	54.2%
DC44 Alfred Nzo	68.2%	43.5%	77.0%	52.3%
EC141 Elundini	63.7%	44.4%	71.0%	52.8%
EC156 Mhlontlo	64.8%	48.9%	75.8%	59.5%
EC442 Umzimvubu	64.8%	45.9%	74.7%	54.5%
EC444 Ntabankulu	74.9%	50.6%	82.0%	60.7%

Data source: (Statistics South Africa, 2012)

Figure 71: Official unemployment and youth unemployment rate

8.11.9 Education

The situation regarding schooling in the area improved somewhat between 2001 and 2011. Notwithstanding this, however, there is still a need to improve the situation further with areas such as Ntabankulu and the O. R. Tambo district still having over 17% of the population over 20 years of age having no schooling. At a provincial level 10.5% of the population aged over 20 years have no schooling, 19.8% have a matric and 8.7% have a higher education. This places all the district and local municipalities below the provincial level of education with only Umzimvubu, at 8%, having a lower percentage of the population with no education. Education across the area is illustrated in **Figure 71**.



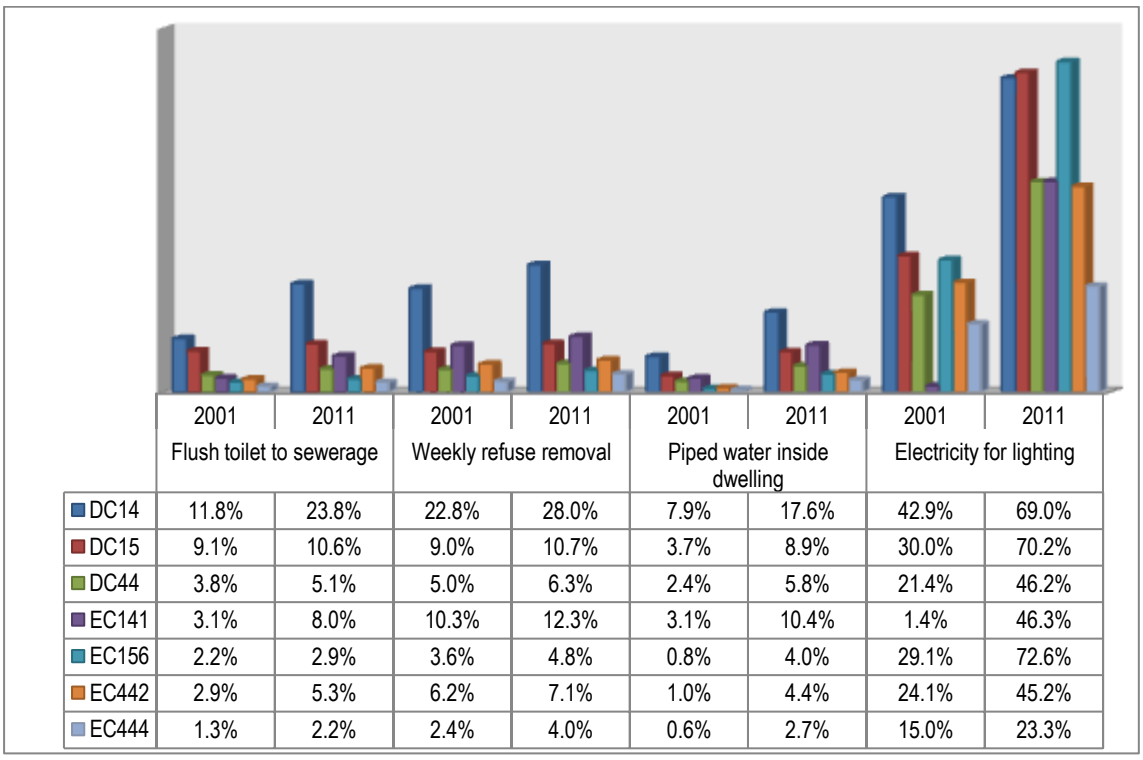
	DC14	DC15	DC44	EC141	EC156	EC442	EC444
No Schooling 2001	28.2%	36.7%	32.5%	31.4%	35.8%	23.6%	43.9%
No Schooling 2011	14.6%	17.3%	13.6%	15.9%	14.7%	8.0%	17.9%
Matric 2001	8.8%	9.6%	7.2%	6.3%	7.7%	8.1%	6.7%
Matric 2011	14.3%	15.4%	12.7%	11.9%	12.4%	13.9%	9.8%
Higher Education 2001	4.7%	4.9%	3.7%	3.9%	4.1%	4.6%	2.6%
Higher Education 2011	6.0%	6.7%	5.3%	5.1%	4.8%	6.3%	3.8%

Data source: (Statistics South Africa, 2012)

Figure 72: Education over 20 years of age

8.11.10 Services

In respect of household services, apart from electricity as a source of lighting, where it is surpassed by both the Mhlontlo local and O. R. Tambo district municipalities, on a general basis the Joe Gqabi District Municipality has the highest level of service delivery. Ntabankulu has the lowest level of service delivery across all indicators. The indicators of household services are illustrated in **Figure 72.**



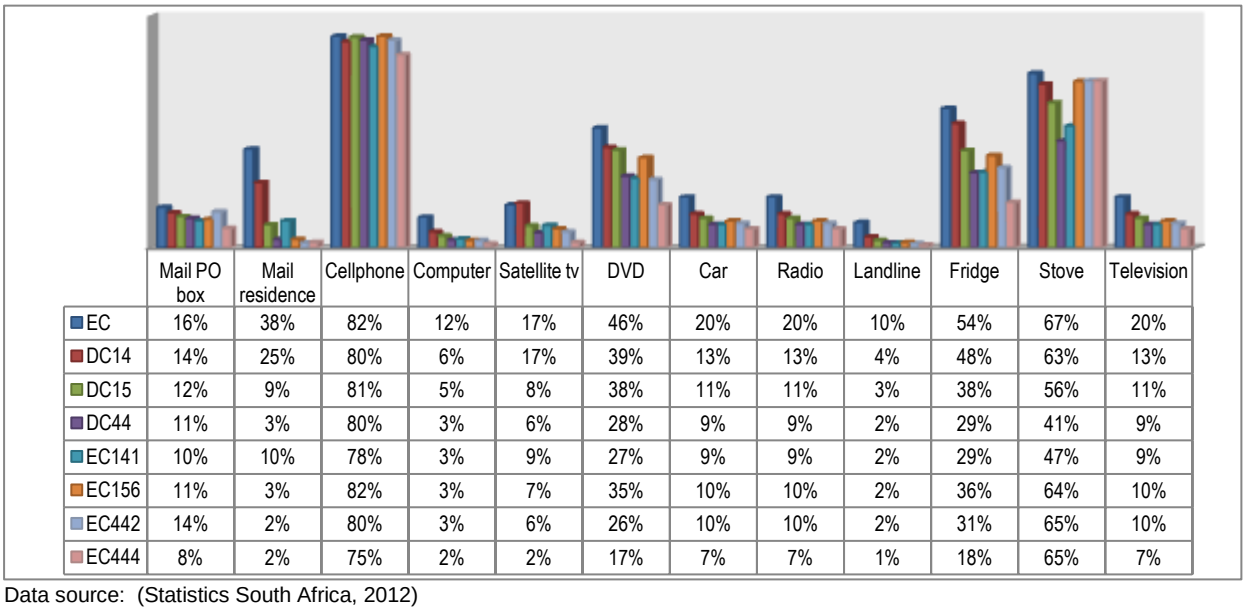
	2001	2011	2001	2011	2001	2011	2001	2011
	Flush toilet to sewerage		Weekly refuse removal		Piped water inside dwelling		Electricity for lighting	
DC14	11.8%	23.8%	22.8%	28.0%	7.9%	17.6%	42.9%	69.0%
DC15	9.1%	10.6%	9.0%	10.7%	3.7%	8.9%	30.0%	70.2%
DC44	3.8%	5.1%	5.0%	6.3%	2.4%	5.8%	21.4%	46.2%
EC141	3.1%	8.0%	10.3%	12.3%	3.1%	10.4%	1.4%	46.3%
EC156	2.2%	2.9%	3.6%	4.8%	0.8%	4.0%	29.1%	72.6%
EC442	2.9%	5.3%	6.2%	7.1%	1.0%	4.4%	24.1%	45.2%
EC444	1.3%	2.2%	2.4%	4.0%	0.6%	2.7%	15.0%	23.3%

Data source: (Statistics South Africa, 2012)

Figure 73: Household services

8.11.11 Household Goods

The proportion of households owning household goods across the area is lower than that of the province. On a general basis, households in the Joe Gqabi municipality own a greater proportion of household goods than those across the other municipalities with households in Ntabankulu owning the lowest proportion of household goods. The distribution of household goods across the study area is illustrated in **Figure 73**.



	Mail PO box	Mail residence	Cellphone	Computer	Satellite tv	DVD	Car	Radio	Landline	Fridge	Stove	Television
EC	16%	38%	82%	12%	17%	46%	20%	20%	10%	54%	67%	20%
DC14	14%	25%	80%	6%	17%	39%	13%	13%	4%	48%	63%	13%
DC15	12%	9%	81%	5%	8%	38%	11%	11%	3%	38%	56%	11%
DC44	11%	3%	80%	3%	6%	28%	9%	9%	2%	29%	41%	9%
EC141	10%	10%	78%	3%	9%	27%	9%	9%	2%	29%	47%	9%
EC156	11%	3%	82%	3%	7%	35%	10%	10%	2%	36%	64%	10%
EC442	14%	2%	80%	3%	6%	26%	10%	10%	2%	31%	65%	10%
EC444	8%	2%	75%	2%	2%	17%	7%	7%	1%	18%	65%	7%

Data source: (Statistics South Africa, 2012)

Figure 74: Distribution of household goods

Although there have been some improvements across the region the area remains one of the poorest parts of the country, characterised by high poverty and out-migration resulting in sex ratio imbalances, a high proportion of female headed households and a low population growth rate. At large the population lacks basic amenities and relies heavily on subsistence farming which is not highly successful.

8.12 LAND USE AND TENURE

The study area is rural, characterised by low densities and generally low levels of economic activity. The main land uses are pastoral stock and subsistence crop farming (**Figure 74**). Land cover in the broader study area is shown in **Figure 75**.

Figure 75: Typical midrange housing structures and crop planting activities

The proposed project is located on state-owned land which is administered by traditional authorities. The land is therefore currently subject to communal land tenure arrangements. Under this system the State owns the land, but it is managed and allocated to community members by the Traditional Leaders.

Agricultural practices

About 37.7% of households in the Eastern Cape engaged in agricultural activities over the period June 2011- June 2012. Of these households 24.8% were involved with poultry production, 20.5% with livestock production, 19 % with grains and food crops, 19.9% with fruit and vegetables and only 0.2% with industrial crops (Statistics South Africa, 2012, pp. 2-3). Of the households in the province involved with different

crop planting activities, 23.8% were in backyard gardens, 0.2% in communal gardens and 0.1% in school gardens. The percentage of households classified as food access adequate was 72% while 19.4% were food access inadequate and 8.8% food access severely inadequate. Although in this respect there are no statistics specific to the study area, it is unlikely that the situation in the study area will be significantly different.

An aerial inspection of the immediate area shows that much less crop production is currently practised than in the past, it is estimated that about 20% of the previously contoured lands are currently still cultivated. Before 1994, communal farmer support structures were very active in the region and most of the families produced enough maize (a staple diet food) for their own consumption. This is not happening currently and the area is a maize import area.

The *Agricultural assessment and irrigation water use* study (AsgiSA EC, 2009) concluded that: “Substantial potential exists in the study area for the development of new agricultural enterprises under rain-fed conditions and for the improvement of existing agricultural practices and productivity. Whilst opportunity exists for small irrigation scheme developments, there are several limiting factors with respect to large irrigation schemes …. An initial focus on the upgrading of rain-fed cultivation and livestock farming can bring great gains at moderate investment”.

Commercial irrigation farming is not the traditional farming method in the area and extensive public consultation will be required to obtain buy in from traditional leaders and communities and facilitate the transformation of this sector.

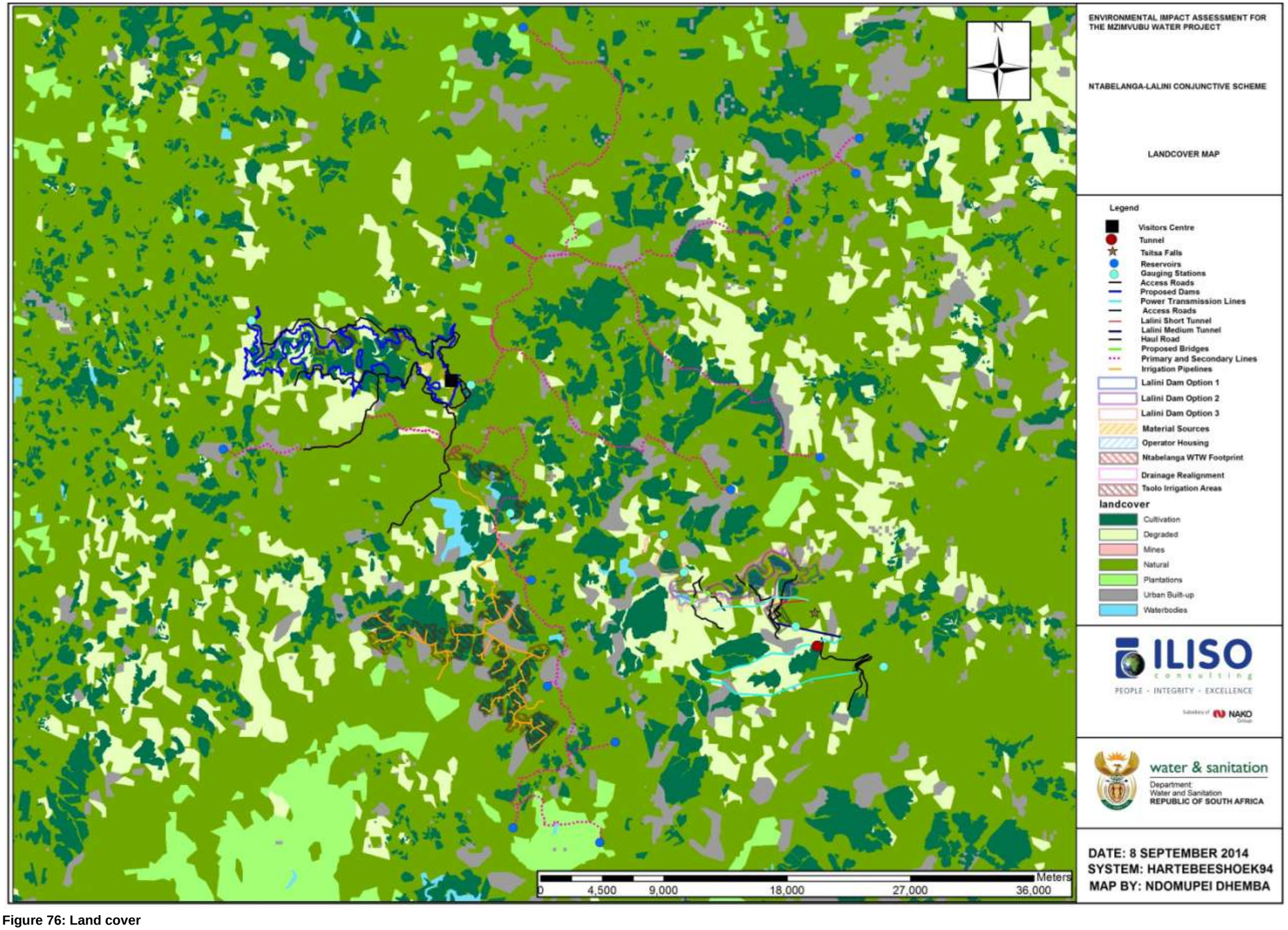


Figure 76: Land cover