SiVEST

FINAL

MSUNDUZI MUNICIPALITY

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE BISHOPSTOWE STUDY AREA

Final Report

Issue date: September 2018
Revision No.: 1
Project No.: 14739

Date:	September 2018
Document Title:	Strategic Environmental Assessment for the Bishopstowe Study Area
Author:	Tiffany Pillay
Revision Number:	# 1
Checked by:	Tarryn Curtis
Approved:	Tarryn Curtis
Signature:	
For:	SiVEST Environmental Division

FINAL

MSUNDUZI MUNICIPALITY
STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE BISHOPSTOWE STUDY AREA
FINAL REPORT

Contents Page

FINAL

Figures

FINAL

Tables

FINAL

Glossary

TERM	*DEFINITION*
Alien invasive species	Plant or animal species that are exotic, and are invading previously pristine areas or ecological niches
Avifauna	Bird life of a particular area or habitat
Biodiversity	The variety animal and plant life in an area or particular habitat
Bush encroachment	The invasion of grasslands and savannahs by indigenous woody plant species which is as a result of overgrazing and a lack of fire management.
Conservation area	An area of land which is set aside for the preservation of biodiversity
Herpetofauna	Reptile and amphibian life of a particular area or habitat
Indigenous species	Species of plants or animals that are native to an area
Movement corridor	An area of land which is suitable for the safe movement of fauna between areas of habitats
Secondary vegetation	Vegetation that develops after disturbance.
Veld management	Management of vegetation for specific objectives related to different forms of land use.

Abbreviations

SDF – uMgungundlovu Spatial Development Framework
SEA – Strategic Environmental Assessment
GIS – Geographic Information System
ESP – Environmental Services Plan
C-plan – Conservation Plan
EIA – Environmental Impact Assessment
CSIR – Council for Scientific and Industrial Research
EMF – Msunduzi Environmental Management Framework
IEMP – Msunduzi Integrated Environmental Management Policy
NEMA – National Environmental Management Act No. 107 of 1998
DEAT – Department of Environmental Affairs and Tourism
MAP – Mean Annual Precipitation
BRU – Bioresource Unit
EKZNW – Ezemvelo KwaZulu – Natal Wildlife
LC – Least concern
IUCN – International Union for Conservation of Nature
IBA – Important Bird Areas
BSP – Bird Survey Point
HGM – Hydrogeomorphic
CVB – Channelled Valley Bottom Wetland
FP – Floodplain wetland
HS – Hillslope Seep Wetland
UCVB – Unchannelled Valley Bottom Wetland
VHS – Valley Head Seep Wetland
LMVC – Lower Mpushini Valley Conservancy
PES – Present Ecological Status
DWAF – Department of Water Affairs and Forestry
EIS – Ecological Importance and Sensitivity
GPS – Global Positioning System
IDP – Msunduzi Integrated Development Plan
ABM – Area Based Management
CBD – Central Business district
I&APs – Interested and Affected Persons
MOSS – Municipal Open Space System
NA – Northern Areas
LAP – Local Area Plan
SPLUMA – Spatial Land Use Management Act No 16 of 2013
CBA – Critically Biodiverse Area
BRT – Bus Rapid Transit
EMO's – Environmental Management Overlays

FINAL

MSUNDUZI MUNICIPALITY

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE BISHOPSTOWE STUDY AREA

FINAL REPORT

1 INTRODUCTION

1.1 Study Area and Project Context

The Bishopstowe Area is just over 6 700ha in extent and is found within the Msunduzi Local Municipality (Figure 1, 2). The Msunduzi Municipality is the second largest urban centre within the KwaZulu-Natal province and is the main economic hub within the UMgungundlovu District Municipality, as it hosts the Pietermaritzburg/Ashburton/Edendale areas which are deemed to be the most strategically located economic development nodes therein (uMgungundlovu SDF 2014: 82).

The Bishopstowe study area occupies the North-Eastern portion of the municipality and shares a common boundary with the Mkhambathini Municipality to the east; Umshwati Municipality to the north and Umgeni Municipality to the west.

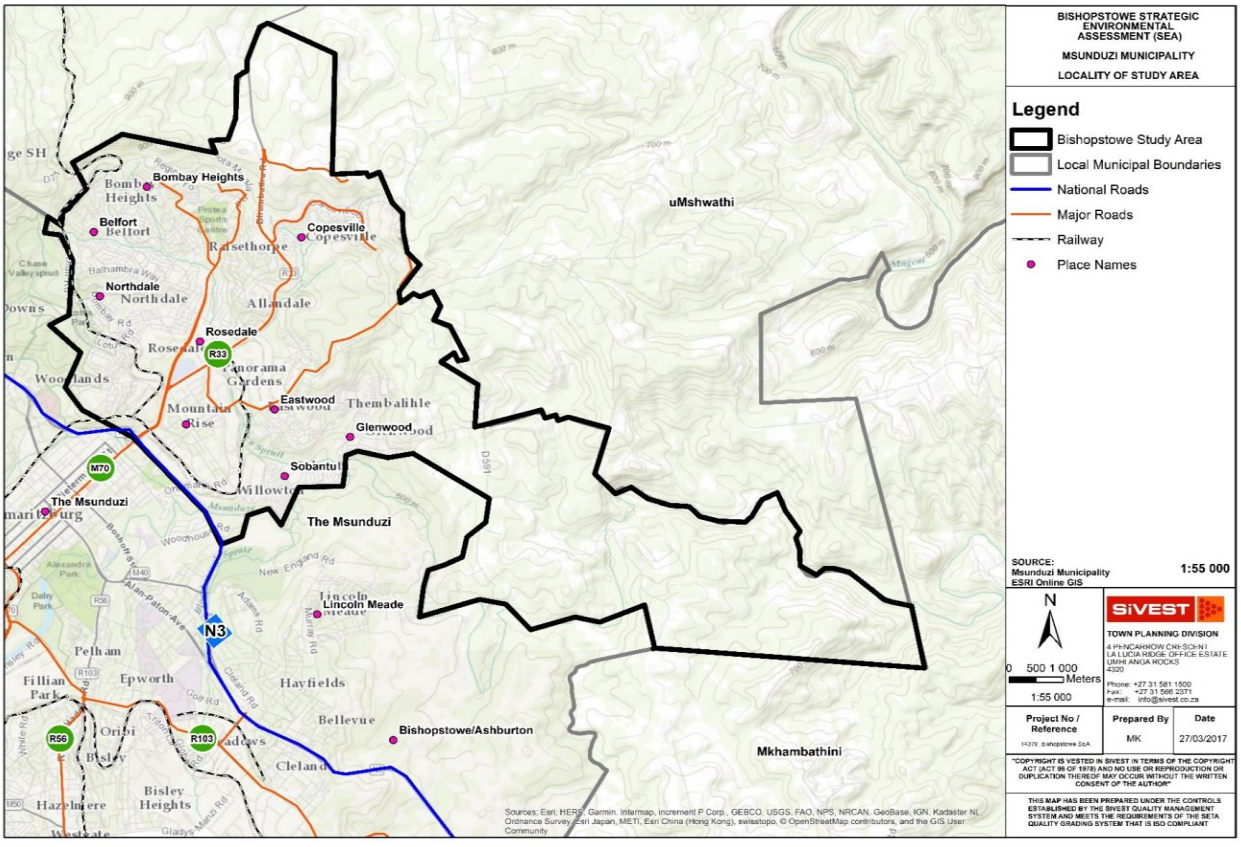

Figure 1: Study boundary for the Bishopstowe SEA

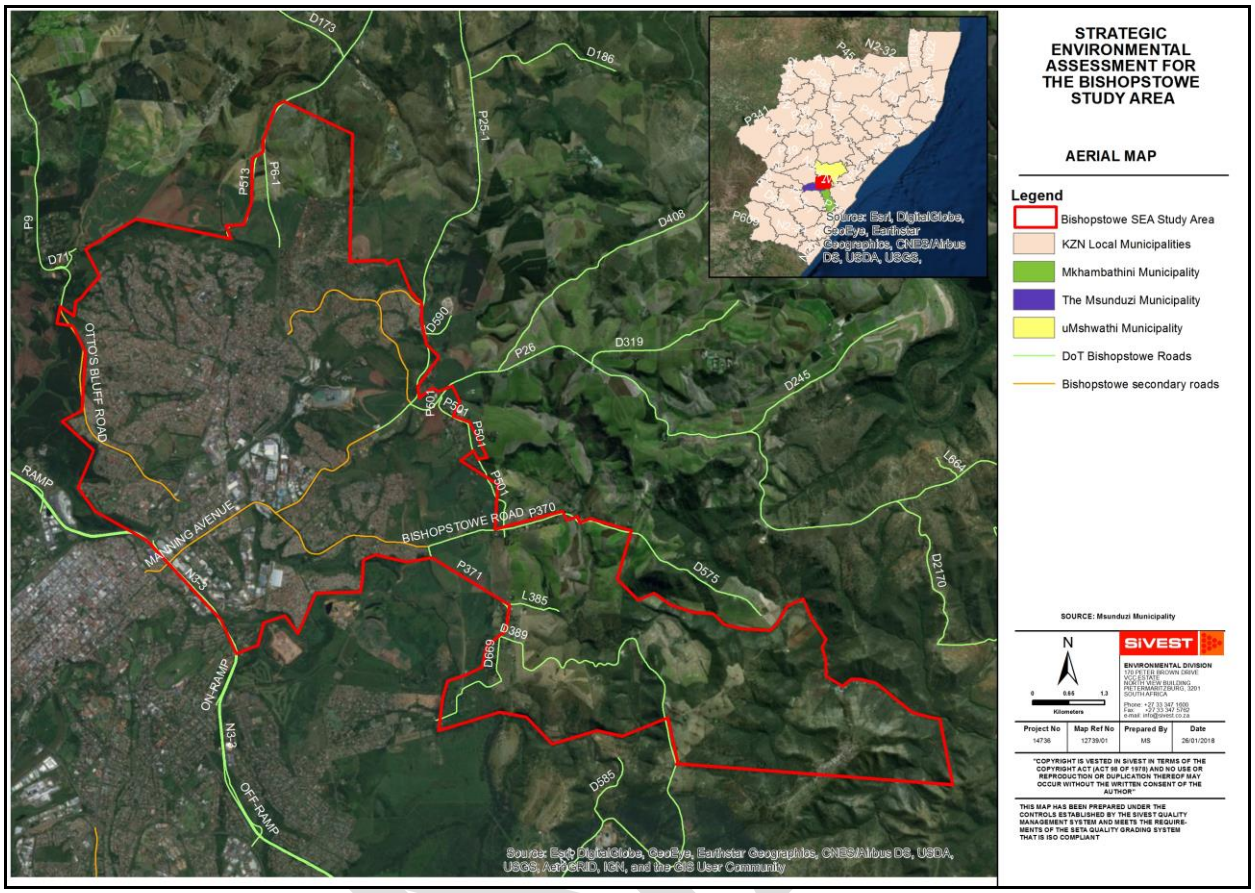

Figure 2: Aerial view of the study boundary for the Bishopstowe SEA

According to the Msunduzi Environmental Services Plan, around 27% (2,110 ha) comprises open spaces that contribute towards ecosystem services delivery. These include areas of natural ecosystems, ecosystem corridors, public and private open spaces (1,570 ha); also included are 'transformed public open spaces' (540 ha) that have limited biodiversity value but play a role in delivering other amenities / services.

The Msunduzi Municipality in 2010 appointed a consultancy to provide an 'Ecosystem Services Plan' report as well as GIS based layers to help with decision making with regards to rapid development that was occurring in the Msunduzi municipal area. This Ecosystem Services Plan (ESP) identifies areas that are required to maintain ecosystem goods and services. Such areas included: riparian areas, existing protected areas, key areas from a biodiversity perspective (C-plan), public open spaces (both transformed and untransformed) as well as terrestrial and riparian corridors. In addition to this ESP layer are a number of individual spatial layers that were largely informed by desktop assessment and analysis.

The purpose of the Strategic Environmental Assessment (SEA) is to integrate with and inform the ESP in the identification of environmental opportunities and constraints and how these impact on and are impacted on by development and land use patterns. There are several differences between an Environmental Impact Assessment (EIA) and SEA that assist in understanding the role of each. In an EIA the impact of a development on the environment is identified, however, in an SEA the opportunities and constraints that the environment poses for development in general is identified.

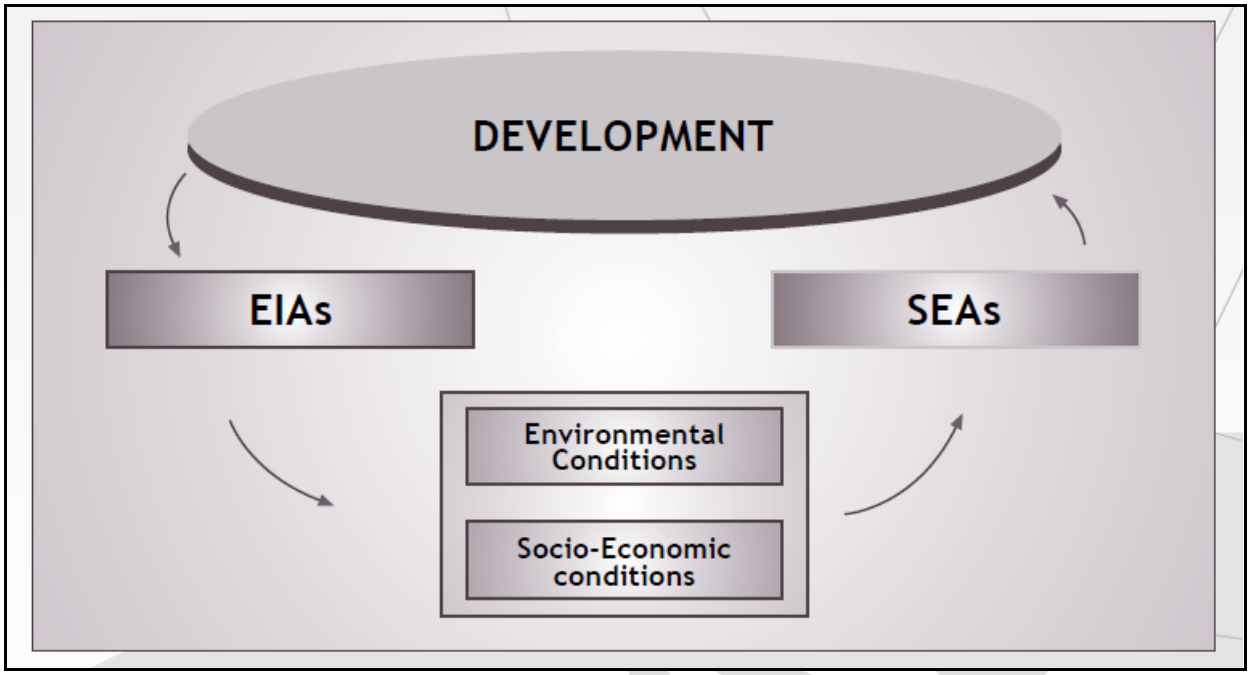

Figure 3: EIA addresses the effect of development on the existing environment and socio-economic conditions, while SEA addresses the effect of the environment and socio-economic conditions on development (adapted from CSIR, 1996)

In this way, the SEA will aid in identifying land that belongs to one of three categories:

a) Conservation zones – cannot be developed
b) Conservation with low impact development zones – can be developed with certain types of development and with authorisation
c) Development zones – can be developed.

The type of development and authorization will be determined in consultation with the Environmental Management Unit of the Msunduzi Municipality.

1.2 Legal Context

The primary purpose of Environmental Impact Assessment (EIA) is to determine and evaluate the environmental implications of development, to inform decision-making at the project level. However, there are a number of more strategic decisions that are typically made at the planning, programming and policy level that influence the nature of development. Strategic Environmental Assessment (SEA) has therefore evolved, complementary to EIA, in order to determine the environmental implications of policies, plans and programmes.

EIA focuses on the positive and negative impacts of a specific development project once it has been designed. The role of SEA, however, is to allow for the decision- maker to proactively determine the most suitable development type for a particular area, before development proposals are formulated.

South African principles for SEA are contained in the Guideline Document: Strategic Environmental Assessment in South Africa (DEAT and CSIR, 2000), and are listed below:

- SEA is driven by the concept of sustainability;
- SEA identifies the opportunities and constraints which the environment places on the development of plans and programmes;
- SEA sets the levels of environmental quality or limits of acceptable change;
- SEA is a flexible process which is adaptable to the planning and sectoral development cycle;
- SEA is a strategic process, which begins with the conceptualisation of the plan or programme;
- SEA is part of a tiered approach to environmental assessment and management;
- The scope of an SEA is defined within the wider context of environmental processes;
- SEA is a participative process;
- SEA is set within the context of alternative scenarios; and
- SEA includes the concepts of precaution and continuous improvement.

1.3 Guidelines and Policies

The SEA is based on information gathered from guidelines and policies, as follows:

- Msunduzi Environmental Management Framework (EMF)
- Draft Ecosystem Services Plan (ESP)
- Msunduzi Conservation Plan (C-Plan)
- Msunduzi Strategic Environmental Assessment (SEA)
- Msunduzi Climate Change Policy
- Msunduzi Integrated Environmental Management Policy (IEMP)
- The Pietermaritzburg Town Planning Scheme
- The Sobantu Town Planning Scheme
- Msunduzi SDF (2015)
- Northern Areas Draft Local area plan (2017)
- Local Area Plan (LAP) for the South Eastern District (SEDis) of Pietermaritzburg
- CSIR (2007) Strategic Environmental Assessment (SEA) Resource Document: Introduction to the Process, Principles and Application of SEA, CSIR Report ENV-S-C 2002-073, Version 4. Environmentek, Stellenbosch, South Africa.
- National Environmental Management Act, No. 107 of 1998 (NEMA)
- NEMA Environmental Impact Assessment (EIA) Regulations of 2006
- Local Government Municipal Structures Act 117 of 1998 (Municipal Structures Act); Municipal Systems Act 32 of 1998 (Municipal Systems Act); and Municipal Planning and Performance Management Regulations (2001)
- DEAT (2007), Strategic Environmental Assessment Guideline, Integrated Environmental Guideline Series 4, Department of Environmental Affairs and Tourism (DEAT), Pretoria.

FINAL

2 APPROACH AND METHODOLOGY FOR THE SEA

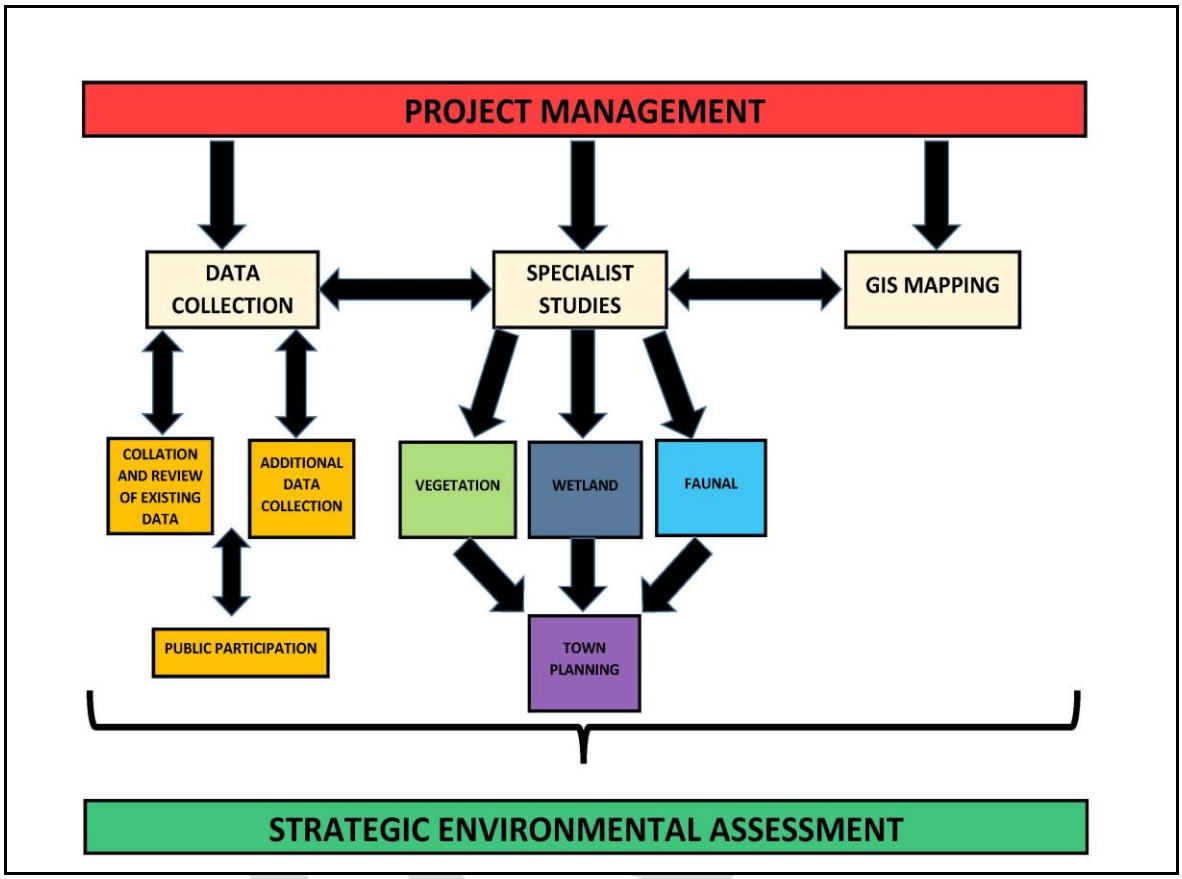

Figure 4: Methodology for the Bishopstowe SEA

SiVEST have undertaken several specialist studies to investigate the Potential Environmental Attributes identified for the SEA. These include;

- Wetland and Riparian Delineation and Functional Assessment
- Faunal Assessment
- Vegetation Assessment
- Town Planning Evaluation

Development potential zones were defined as;

- Conservation zones – cannot be developed.
- Conservation with low impact development zones – can be developed with certain types of development and with authorization.
- Development zones – can be developed.

A situational assessment through site visits with regard to the status quo of the environment within priority portions of the defined study area, was undertaken. Listed below are potential environmental attributes addressed by the various specialists. The areas excluded in the ground-truthing of the study area are those identified as “Key Areas” in the Msunduzi ESP.

Table 1: Potential Environmental Attributes to be studied.

SPECIALIST STUDY	*POTENTIAL ENVIRONMENTAL ATTRIBUTES TO BE STUDIED*	*RATE/SCORE*
Wetland and Riparian Delineation and Functional Assessment	Present Ecological State	Natural/ good/ fair/ modified/ seriously modified
	Ecosystem Services Usage	High/ medium/ low
	Riparian corridors/rivers/streams	Natural/ good/ fair/ degraded/ seriously degraded
	Wetland Functionality	Natural/ good/ fair/ modified/ seriously modified
Faunal Assessment	Degree of Functional Ecological Infrastructure	High/ medium/ low
	Connectivity/corridor and species dispersal value	High/moderate/ low
	Visual evidence of breeding, foraging, roosting, nesting, aestivation and hibernation sites	Yes/ no/indicate species if possible
Vegetation Assessment	Grassland Condition	Good/ fair/ poor/ secondary/ climax
	Forest Condition	Good/ fair/ poor/ secondary/ climax
	Biodiversity Conservation value	High/ medium/ low
	Degree of Settlement Encroachment	Severe/ high/medium/ low

Table 2 below shows “sensitive areas” identified by the Msunduzi EMF that may trigger Listing Notice 3 (as recognized by the Competent Environmental Authority).

Table 2: Spatial Layers considered “sensitive areas" in terms of the Msunduzi EMF

Environmental Management Zone	Defined Constraints Layers
	Wetland Areas
	Wetland Buffer Areas
	Protected Areas
	High Biodiversity Constraint Areas
Flood Risk Zones	High Flood Potential
	Extremely Steep Slopes
	Steep Slopes

3 CURRENT ENVIRONMENTAL STATUS QUO

3.1 Climate

The uMgungundlovu District falls predominantly within the summer rainfall area of South Africa, with the typical rainfall season extending from October to April and the highest rainfall months being December and January. The Mean Annual Precipitation (MAP) within the Bishopstowe Area is 847mm.

A Bioresource Unit is a demarcated area in which the environmental conditions such as soil, vegetation, climate and, to a lesser degree, terrain form, are sufficiently similar to permit uniform recommendations of land use and farm practices to be made, to assess the magnitude of crop yields that can be achieved, to provide a framework in which an adaptive research programme can be carried out, and to enable land users to make correct decisions.

The environmental factors defined in a BRU should give an indication of habitat suitability for both plant and animal species. On the other hand, knowing the habitat requirements of any particular species, it should be possible to map locations suitable for such species. Below is a brief summary of the seven bioresource units which occur within the Bishopstowe Area.

Table 3: Climate variables of the Bishopstowe Area per Bio Resource Unit

	Ub14	Wb12	Zb2	Yb9b	Yb9a	Vb14	TUb10
RAINFALL							
Mean rainfall (mm)	747	832	1159	910	910	785	739
TEMPERATURE							
Mean (degrees C)	18,3	17,8	17,2	17,8	17,8	18,1	18,1
Minimum (degrees C)	12	11,7	11,4	11,8	11,8	11,8	12
Maximum (degrees C)	24,6	23,9	23,1	23,8	23,8	24,5	24,4
SUNSHINE							
Mean annual (hours)	7,1	6,6	6,3	6,9	6,9	6,9	7,2

FINAL

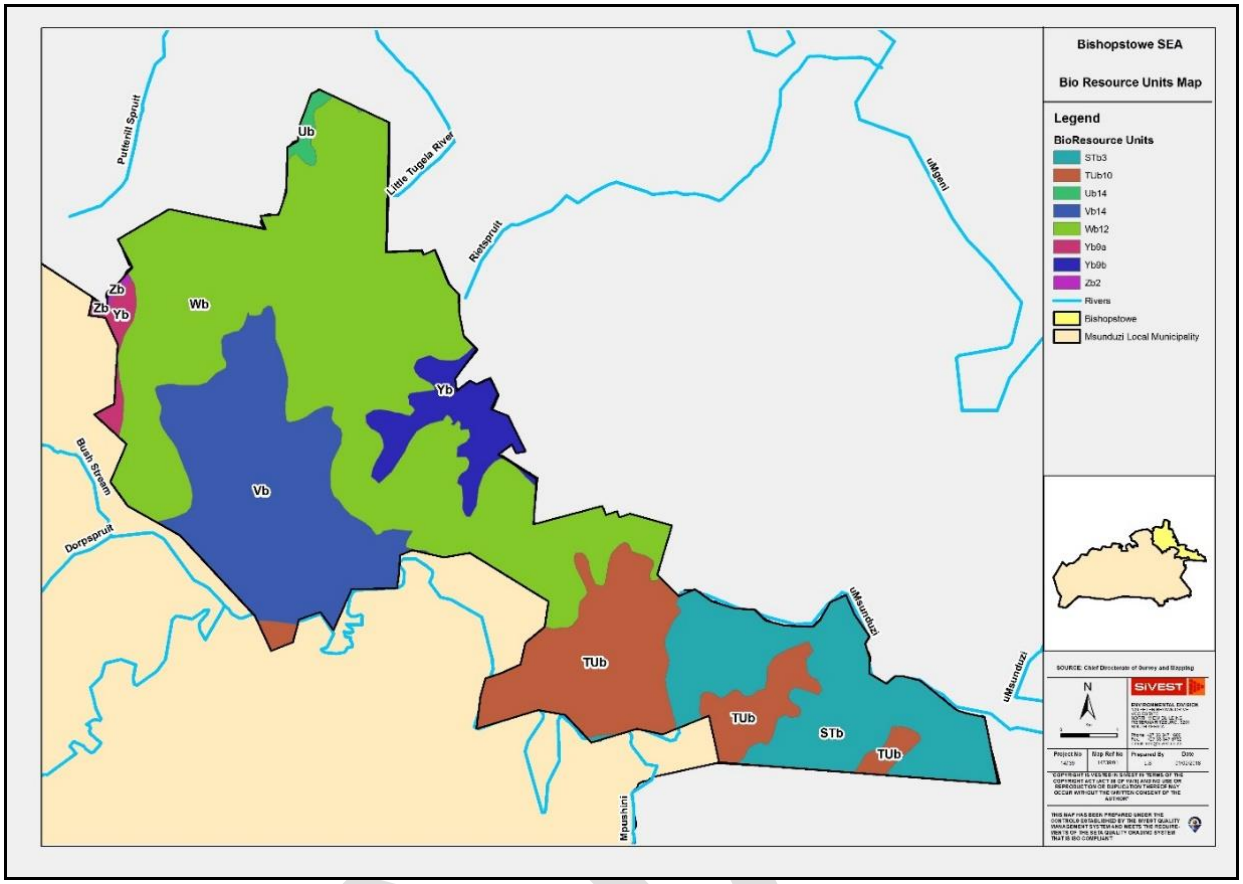

Figure 5: Bioresource Units for the Bishopstowe Area

3.2 Topography

Altitude varies from 770 to 1443 metres above sea level, with the terrain described as predominantly rolling and broken, with steep (defined as slope >12%), to moderate slopes (defined as slopes varying from 5 to 12%).

3.3 Geology

The Bishopstowe area is comprised of shallow soils, and soils of moderate to poor drainage present an erosion hazard if not managed correctly. 25,2% of the soils are shallow and 24,6% of the soils are of moderate to poor drainage. Majority of the area is clay soil, with the western region comprising Ecca group arenite.

3.4 Vegetation Biomes

The Bishopstowe Area contains a number of different vegetation types; these are grouped into four biomes, namely, Forest, Grassland, Savanna and Azonal Vegetation (wetlands) (EKZNW, 2011). These biomes provide the basic template for defining the extent of species-specific habitat that potentially supports a wide variety of biodiversity.

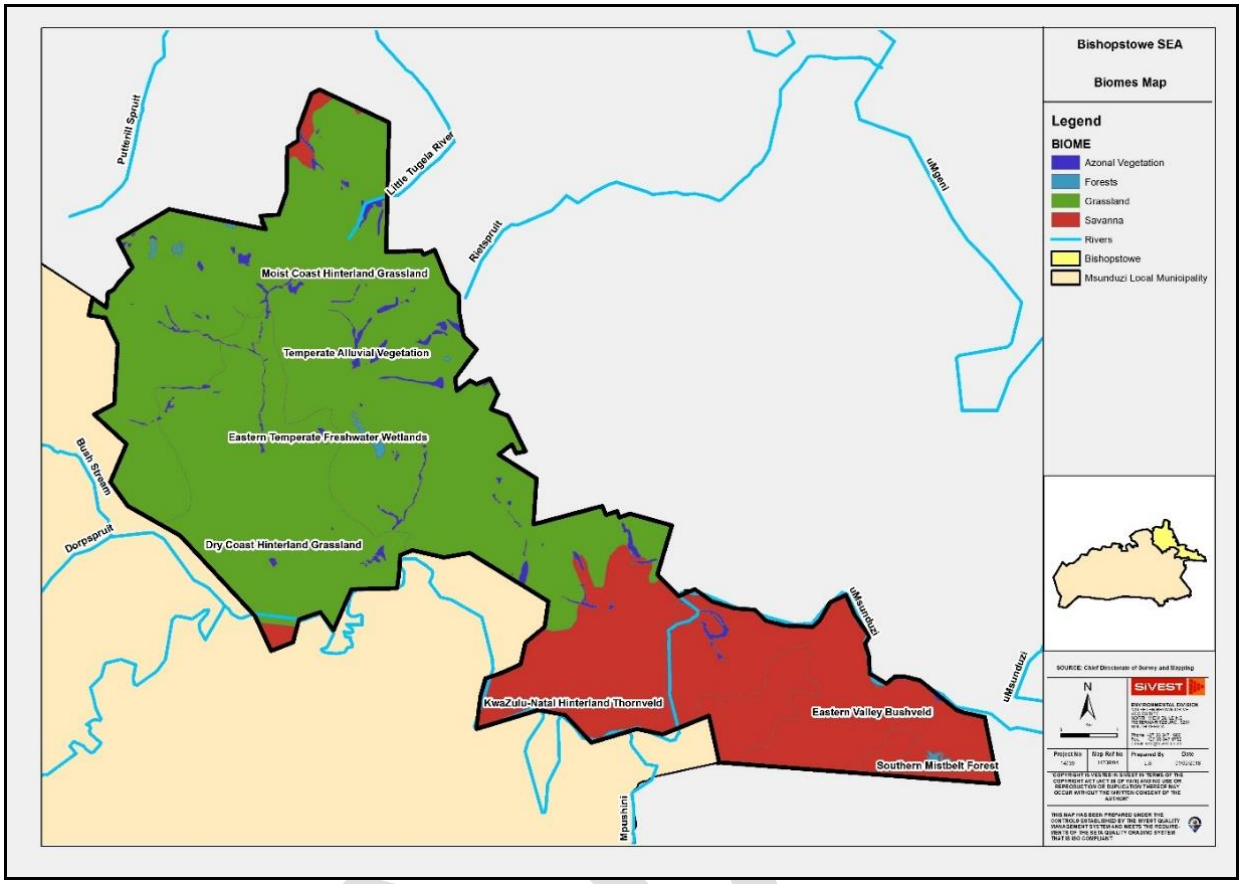

Figure 6: Biomes for the Bishopstowe Area

4 SPECIALIST ASSESSMENTS

4.1 Vegetation Assessment

SiVEST Environmental Division undertook the ground-truthing assessment of the vegetation (January – March 2018). Due to the large extent of the area to be sampled (approximately 6750 ha), the area mapped using ArcGIS 10.3 and used to interrogate the *status quo* using the most up to date aerial photography, Transformation, Ezemvelo Conservation Plan and Land Use shapefiles prior to groundtruthing. These datasets were further refined using aerial photography and following the groundtruthing exercise. Priority areas selected for groundtruth sampling were based on the following criteria:

- Environmentally sensitive areas identified by the Ezemvelo Conservation Plan;
- Environmentally sensitive areas identified by aerial photography and topography; and
- Environmentally sensitive areas identified in the Msunduzi Environmental Management Framework.

At each priority area a random vegetation sampling technique and "hotspot[1]" assessment technique was utilised, which focused the sampling effort on areas with natural vegetation or where the vegetation was dominated by indigenous species (i.e. not comprising a large proportion of alien invasive plant species). Individual plant species observed during the assessment were recorded to give an indication of species diversity and the overall species assemblage. In addition, species were photographed and their geographic location recorded, to feed into the ongoing spatial dataset.

Furthermore, each priority area was also assessed based on the environmental attributes (specific to vegetation) detailed to be studied, as per the **Scope of works** provided by Msunduzi Municipality **(Table 3 below)**.

Table 4. Relevant floral environmental attributes (adapted from the Scope of works)

	POTENTIAL ENVIRONMENTAL ATTRIBUTES TO BE STUDIED	RATE/SCORE
3.	**Grassland Condition**	**Good/ fair/ poor/ secondary/ climax**
4.	**Forest Condition**	**Good/ fair/ poor/ secondary/ climax**
5.	**Biodiversity Conservation value**	**High/ medium/ low**
6.	**Degree of Settlement Encroachment**	**Severe/ high/medium/ low**

Please note that the intensity of the sampling procedure is prescribed by budgetary, time constraints and limited access to private land. The sampling procedure proposed for this study is satisfactory for providing an assessment of the plant diversity and assemblages that occur within the demarcated sections. This methodology allows sufficient information to be gathered to make the necessary inferences as to the ecological state of the receiving environment, and to assess the possible impacts that may be imparted as a result of development.

4.1.1 Site Assessment According to Wards

For ease of reference the vegetation component was assessed according to Ward demarcations that fall within the Bishopstowe Boundary (Figure 7 below).

[1] **Hotspot in this context refers to areas in the landscape, such as rocky outcrops and wetlands that supply refugia to plant species that would otherwise not exist in said landscape due to disturbance**.

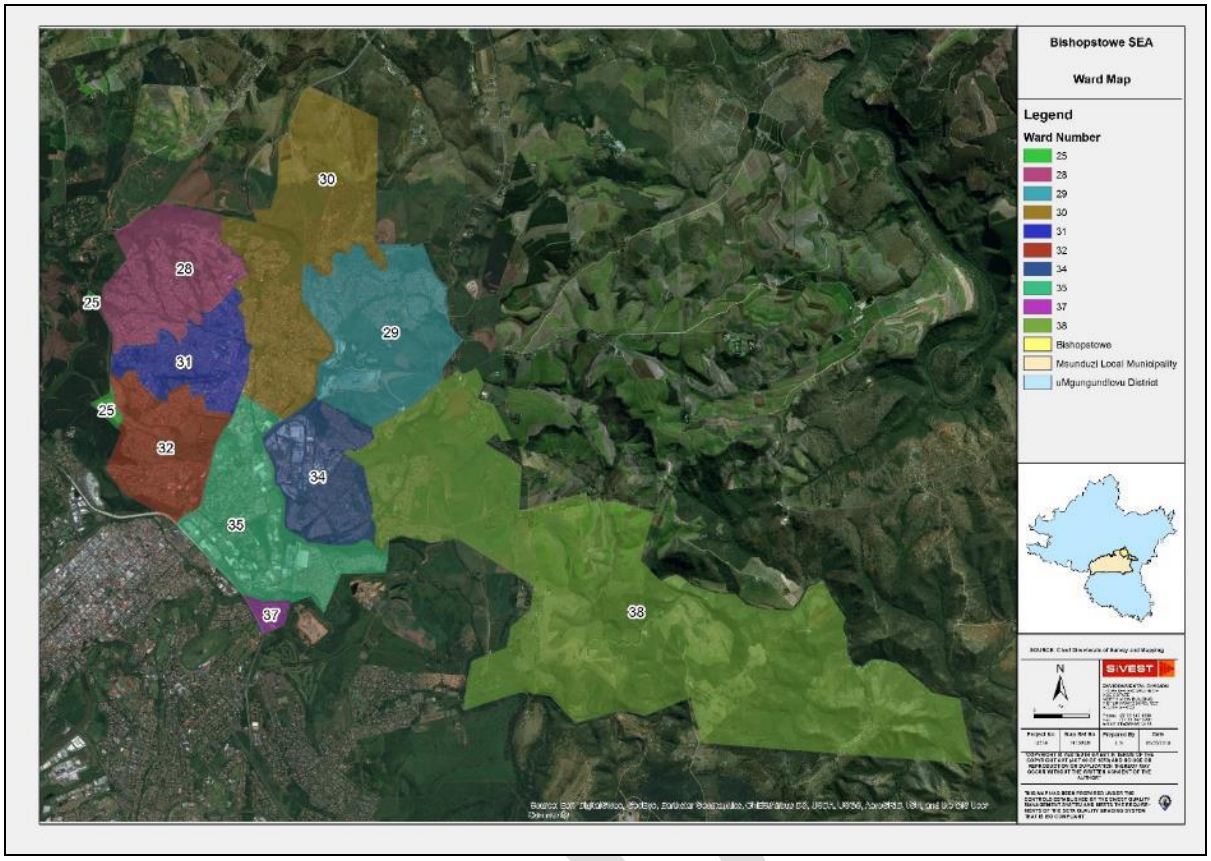

Figure 7: Wards within the Bishopstowe Area

Ward 28 and portion of Ward 25

Ward 28 comprises of the suburbs Belfort Estate, Mysore Ridge and Bombay Heights. The suburbs are intersected by a number of drainage lines that are infested with alien vegetation and impacted by illegal dumping of municipal waste. There are a number of open spaces in this ward, with the majority comprising of degraded drainage lines and grasslands that are generally secondary and poor in nature due to lack of veld management (by way of fire and alien plant control) and in some cases overgrazing by local cattle and goats. The northern portion of Ward 28 was once predominantly open space but has become heavily encroached by informal settlement on the gentler slopes, which in turn has had an impact on the grassland area which is now encroached by alien plant species. The steeper slopes support remnant patches of Southern Mistbelt Forest. The forest supports a number of large trees but it has been severely impacted on by the sugar cane farming occurring on the plateau above it. Some of the trees identified included but were not limited to *Celtis africana*, *Vepris lanceolata*, *Apodytes dimidiata* subsp. *dimidiata*, *Protorhus longifolia*, *Rapanea melanophloeos*, *Combretum kraussii, Halleria lucida*, *Clausena anisata*, *Grewia occidentalis* and *Dracaena aletriformis*. A small portion of ward 25 is made up of forestry.

Figure 8: View uphill from Regina Road- Bombay Heights.

The hillside is made up of secondary grassland that is becoming encroached by both alien and indigenous woody species. There is also a high level of informal settlements encroaching the landscape. The top of the hill becomes very steep and as such supports remnant patches of Southern Mistbelt Forest, although secondary in nature. (Indigenous species inset from top to bottom: *Combretum kraussii, Halleria lucida* and *Dracaena aletriformis.*

Figure 9: View from Woodpecker Road overlooking a drainage line onto Mysore Ridge.

Heavy dumping can be seen in the foreground, with secondary grassland that is encroached with alien vegetation (*Eucalyptus* spp.) and some indigenous grass species.

Table 5. Score of floral environmental attributes

	ENVIRONMENTAL ATTRIBUTES STUDIED	RATE/SCORE
3.	**Grassland Condition**	**Poor/ Secondary**
4.	**Forest Condition**	**Fair/Secondary**
5.	**Biodiversity Conservation Value**	**Medium**
6.	**Degree Of Settlement Encroachment**	**Severe To High**

Ward 31

Ward 31 comprises of the suburbs of Newholme and Northdale. The suburbs are intersected by three drainage lines that are heavily transformed, infested with alien vegetation and impacted by illegal dumping of municipal waste. There are a few open spaces in this ward, with the majority comprising of degraded drainage lines, school fields and municipal open spaces. The school fields that make up the open space, include H.S Ebrahim School, Raisethorpe Secondary and Northlands Primary School to name a few. Vegetation in the drainage lines comprises of grasslands that are generally secondary and poor in nature due to lack of veld management (by way of fire and alien plant control) and in some cases overgrazing by local cattle and goats. The municipal open spaces lack diversity as they are made up of predominantly lawn grasses and some have alien trees along the boundaries. Some show signs of illegal dumping. A high level of established alien invasive species can be seen such as *Saligna* gums (*Eucalyptus grandis*) and Syringa trees (*Melia azedarach*). A lack of any veld management is evident due to the established state of the alien vegetation.

Figure 10: View from Lotus Road towards Lotus Park. Alien infestation in the form of Bugweed (S. mauritianum), Saligna gums (E. grandis) and Banana trees (Musa acuminata).

Lotus Park is maintained by the municipality for the use of the public, and generally comprises of exotic garden plants, so indigenous biodiversity is lacking.

Table 6. Score of floral environmental attributes

	ENVIRONMENTAL ATTRIBUTES STUDIED	RATE/SCORE
3.	**Grassland Condition**	**Poor/ Secondary/**
4.	**Forest Condition**	**N/A**
5.	**Biodiversity Conservation Value**	**Low**
6.	**Degree Of Settlement Encroachment**	**High**

Portions of Wards 32 and 25

Wards 32 and 25 comprises of the suburbs of Lotusville and Woodlands. The suburbs are intersected by the railway line of which the servitude is heavily infested with alien vegetation and impacted by illegal dumping of municipal waste. A large portion of ward 32 is made up of the Mountain Rise Crematorium. There are a few municipal open spaces in this ward, including the Pilditch Bath Municipal swimming pool, the municipal parks comprise predominantly of lawn grasses and some have alien trees along the boundaries. School fields that make up the open space include Woodlands Primary School, Esther Payne Smith Secondary School and Forest Hill School to name a few. The vegetation along the periphery of the Bishopstowe border in Ward 32 comprises of grasslands that are generally secondary and poor in nature due to lack of veld management (by way of fire and alien plant control) and in some cases overgrazing by local cattle and goats. The municipal open spaces lack diversity as they have not received proper veld management.

Figure 11: View from Currie Road with the Pietermaritzburg CBD in the background. Note the illegal dumping, poorly managed veld and mix of indigenous and exotic species, including Bougainvillea in the left of the image.

Table 7. Score of floral environmental attributes

	ENVIRONMENTAL ATTRIBUTES STUDIED	RATE/SCORE
3.	**Grassland Condition**	**Poor/ Secondary**
4.	**Forest Condition**	**N/A**
5.	**Biodiversity Conservation Value**	**Low**
6.	**Degree Of Settlement Encroachment**	**High**

Portions of Wards 35 and 37

Wards 35 and 37 comprises of the suburbs of Rosedale, Mountain Rise, Willowton, Sobantu and Wensleydale. The suburbs are mainly made up of industrial areas with medium to high density housing. Large municipal open space areas occur between industrial complexes, which are infested with alien vegetation and are a major source of illegal dumping. Northdale Hospital has large open space comprising of lawn grasses, sports fields and a small park consisting of exotic trees. The north eastern boundary of Ward 35 is made up of the Baynespruit River, which is highly polluted, transformed and is heavily infested with alien invasive plants. The Msunduzi River forms the southern boundary of Ward 35, and intersects Ward 35 and a portion of Ward 37. The vegetation within open spaces in Ward 35 and 37 comprises of grasslands that are generally secondary and poor in nature due to lack of veld management (by way of fire and alien plant control) and in some cases overgrazing by local cattle and goats. The municipal open spaces lack diversity as they have not received proper veld management.

Figure 12: View from Bhambatha Road in Ward 35, looking into the wetlands of the Baynespruit River. Canna indica has infested parts of the wetland area, with secondary grassland occurring on the edge of the wetland area.

Table 8. Score of floral environmental attributes

	ENVIRONMENTAL ATTRIBUTES STUDIED	RATE/SCORE
3.	**Grassland Condition**	**Poor/ Secondary**
4.	**Forest Condition**	**N/A**
5.	**Biodiversity Conservation Value**	**Low**
6.	**Degree Of Settlement Encroachment**	**High**

Ward 30

Ward 30 comprises of the suburbs of Allandale, Orient Heights, Samanville, Raisethorpe, Dunvaria, Bakerville Heights, and the top portion of Copesville. Mixed land use of low to medium cost housing and agriculture is present in Ward 30. Consequently, vegetation varies from heavily encroached alien vegetation to areas with a mix of indigenous and alien species, with secondary grassland. A few patches of remnant Moist Coast Hinterland Grassland still exist, although exotic species have started to invade these extant patches. Sugar cane farming occurs at the north end close to the Bishopstowe Boundary. Poor veld management, overgrazing, dumping and informal settlements hinder species diversity and decrease veld condition in this ward. Heavy municipal dumping is evident in many of the drainage lines and municipal open spaces. Open spaces can be found with Protea Sports Centre, where lawn grasses and exotic trees line the grounds. Additionally, Northbury Park Secondary School, Dunvaria Secondary School, Springhaven Primary School and Allandale Primary School has similar vegetation to Protea Sports Centre. The Baynespruit River intersects the western side of Ward 30, with the drainage lines of Midlands Crushers providing the border of the eastern side of Ward 30.

FINAL

Figure 13: View from Chota Motala Road, looking up a ridgeline at secondary grassland interspersed with indigenous and alien species.

Table 9. Score of floral environmental attributes

	ENVIRONMENTAL ATTRIBUTES STUDIED	RATE/SCORE
3.	**Grassland Condition**	**Poor/ Secondary/**
4.	**Forest Condition**	**N/A**
5.	**Biodiversity Conservation Value**	**Low**
6.	**Degree Of Settlement Encroachment**	**High**

Ward 29

Ward 29 comprises of the suburbs of Copesville and Whispers, with Natal Crushers having a large portion of land. Land use in this ward comprises of low cost housing, informal housing, industry (through Natal Crushers) and Sugar cane farming. A portion of secondary grassland, riparian vegetation and severely transformed grassland into invasive species. American bramble (*Rubus cuneifolius*) Lantana (*Lantana camara*), Bugweed (*Solanum mauritianum*) and Blackjack (*Bidens pilosa*) have taken over remaining grasslands in the area. Sugar cane farming occurs at the eastern edge on the Table Mountain Road. Poor veld management is a major concern in the open spaces around Midlands Crushers and the eastern portion of Copesville, with overgrazing, dumping and informal settlements decreasing floral diversity of the ward. Municipal dumping occurs anywhere there is an open space next to a road. Open spaces can be found around Midlands Crushers, with large areas of land that are within the blasting exclusion zones. Within these exclusion zones, vegetation ranges from a mix of indigenous vegetation (such as *V. sieberiana, Ficus natalensis, Celtis Africana, Leonotis leonurus*) to alien invasive vegetation (mentioned above). Informal housing has crept into these exclusion zones.

FINAL

Figure 14: View from a road leading to Lamberti Shooting range. Secondary grassland invaded with L. camara, S. mauritianum, Acacia mearnsii, Eucalyptus spp. can be seen around a dam.

Table 10. Score of floral environmental attributes

	ENVIRONMENTAL ATTRIBUTES STUDIED	RATE/SCORE
3.	**Grassland Condition**	**Poor/ Secondary/**
4.	**Forest Condition**	**Poor/Secondary**
5.	**Biodiversity Conservation Value**	**Low**
6.	**Degree Of Settlement Encroachment**	**High**

Ward 34

Ward 34 comprises of the suburbs of Panorama Gardens and part of Eastwood. Land use in this ward comprises of industry and mixed residential, with open spaces occurring in drainage lines and around school grounds. A vegetated area occurs downstream of Midlands Crushers, where the vegetated area consists of dense alien infestations such as *S. mauritianum,* and *M. azedarach.* Within this open space are informal settlements. Further open spaces occur on the boundary of the Baynespruit River, close to the wetlands around Sobantu. Sports fields within Eastwood Primary School and Eastwood Secondary School, and Panorama Primary School provide lawn grasses, indigenous and exotic shade trees. The few open spaces that occur in this ward are poorly managed, with very little indigenous species occurring in drainage lines and open areas. Municipal dumping occurs anywhere there is an open space next to a road.

Figure 15: View of an overgrown invaded drainage line with the road leading to the bottom side of Midlands Crushers.

Table 11. Score of floral environmental attributes

	ENVIRONMENTAL ATTRIBUTES STUDIED	RATE/SCORE
3.	**Grassland Condition**	**poor/ secondary**
4.	**Forest Condition**	**N/A**
5.	**Biodiversity Conservation value**	**low**
6.	**Degree of Settlement Encroachment**	**high**

Ward 38

Ward 38 is the largest ward in the Bishopstowe study area. Suburbs in this ward are Eastwood, Glenwood, Bishopstowe, Lincoln Meade, and the Lower Mpushini Valley Conservancy (LMVC; declared a conservancy on the 17th February 2011). The majority of Ward consist of open spaces which range in land use from sugar cane farming, cattle farming and conservation areas. The suburbs of Eastwood and Glenwood consist of medium to high density housing, while Bishopstowe and Lincoln Meade consist of low density housing. The Msundusi River borders the southern section of the ward, with the LMVC forming the eastern border of the study area. Vegetation is restricted to drainage lines in Eastwood and Glenwood, where the drainage lines are secondary in nature and infested with alien vegetation. Between Eastwood and Bishopstowe is a grassland which is in transition from a primary to a secondary species composition, with grassland in a fair to good condition in some areas (*Kniphofia* spp. and *Erythrina latissima* were seen in this area). This is bordered by a ridgeline on the Beacon Hill Country Estate which has a mix of alien invasive Black wattle (*A. mearnsii*), with remnant patches of

indigenous forest consisting of predominantly Natal figs (*F. natalensis*). Sugar cane and cattle farming is found within the central part of this ward, where vegetation is restricted to drainage lines and is generally secondary and invasive in nature. The LMVC has portions of land which is under sugar cane and cattle farming, while the rest of the vegetation in LMVC is predominantly indigenous in nature, with alien invasive species occurring in disturbed areas along roadsides and in drainage lines. A lack of veld management techniques such as burning has led to woody plant encroachment, although this is indigenous in nature.

Figure 16: Moist Coast Hinterland Grassland within the Lower Mpushini Valley Conservancy being utilised for cattle farming.

Table 12. Score of floral environmental attributes

	ENVIRONMENTAL ATTRIBUTES STUDIED	RATE/SCORE
3.	**Grassland Condition**	**Good/fair/poor/ secondary in many areas**
4.	**Forest Condition**	**Poor**
5.	**Biodiversity Conservation value**	**High/ medium/ low**
6.	**Degree of Settlement Encroachment**	**Low**

4.1.2 Assumptions, uncertainties and limitations

Limitations in the sampling procedures restrict the data collected. It is therefore prudent to rely on other datasets such as GIS databases to assist in species occurrence where sampling limitations restrict species recorded. In the case of Bishopstowe, the following limitations were noted:

- Sampling season has an effect on the species presence as life histories of certain plants differ. As such, sampling season is restricted to warmer months (October to March). Consequently, the flowering stage of many floral species may have passed by the time that sampling occurred.
- Budgetary and time constraints, and limited access to private land would have further limited the amount of sampling.
- The “hotspot” sampling technique is useful in gathering necessary information on the ecological state of the environment. However, due to the sampling technique, budgetary and time constraints, some plant species may have been missed during the data collection phase. The sampling technique is however considered sufficient for the project.

FINAL

4.2 Faunal Study

4.2.1 Description of the Fauna on site

The Bishopstowe study area is made up of a variety of different land uses, most of which is transformed land comprising of mixed use residential (informal and formal housing, **Figure 17** and **Figure 18** respectively), industrial land and farming land (**Figure 19**). The site is almost entirely comprised of alien vegetation (**Figure 20**), due to extensive disturbance and overgrazing. Illegal dumping and burning of waste (**Figure 21**) was noted in several areas around the study site, further contributing to the land degradation. This in turn decreases available habitat for fauna.

Figure 17: Informal housing around Regina Road

Figure 18: Formal housing on the urban edge

FINAL

***Figure 19*: Cattle farming close to Bishopstowe Hall**

***Figure 20*: Alien plants in the Bishopstowe area**

***Figure 21*: Illegal dumping close to Claridge**

Fauna was analysed per sample site. At each site, any birds, mammals, reptiles or amphibians species were noted. These data were then collated and added into Table 12. Based on the species diversity and state of the habitat, and the ability for faunal movement within that habitat, a sample site was then categorised according to its conservation value, corridor connectivity and land use category.

A total of 82 bird species were seen in the Bishopstowe study area, all of which are listed on IUCN's Red List as Least Concern (LC). None of these species are listed nationally as threatened according

to Birdlife South Africa's Important Bird Areas (IBA). The birds showed a preference for areas with vegetation, with both invasive and semi-natural to natural vegetation. Few nesting sites were seen, which is likely due to nesting season coming to an end for most bird species. However, a Village Weaver colony was found in the grasslands north of Regina Road (**Figure 25**), and Fan-tailed Widowbird and Collared Widowbird males were seen displaying. The majority of intact vegetation was found in drainage lines and on the edge of the Bishopstowe boundary.

Four mammal species were seen in the Bishopstowe study area, with three of the four species being found on the urban edge, mostly in the Lower Mpushini Valley Conservancy (LMVC).

Three reptile species were found, all at BSP 7. Habitat variability at this site allowed for easy identification of reptiles, as a mix of farm dams, grassland and dead trees provides a good habitat for a range of reptiles. These species were seen during the day, with no reptiles being found during night time surveys.

Three amphibian species were seen in total, with two amphibian species (*Amietophryunus gutturalis* and *Amietophrynus rangeri*) being found during night time surveys along the road close to BPS 7. These two toad species were found in a puddle after a rainfall event, where the puddle was close to a farm dam. The painted reed frog was a chance encounter with it being found in some reeds (*Hyperolius marmoratus*) by BPS 5.

Movement corridors for fauna were found to occur along drainage lines and along the urban edge. However, highest fauna diversity was found to occur in areas with high plant diversity (even if plant species were not all indigenous). Biodiversity conservation value was estimated to be high in areas where habitat transformation was low, with relatively high faunal diversity. These areas tended to occur along the urban edge backing onto conservation areas or large farming areas (**Figure 22**).

The ability of fauna to disperse seemed to be dependent on the availability of linked intact vegetation. High corridor connectivity was limited to the linking of the urban edge to the study area; while medium corridor connectivity was found to occur in built up areas (**Figure 23**). These values are correlated to the biodiversity conservation value, and development in high corridor connectivity areas should be limited.

Land use classification (**Table 2, Figure 11**) recommends the type of development which can occur at each sample site, which is informed directly through faunal diversity, wetland and riparian corridors and indirectly through vegetation. Land use classification in terms of "A" (Conservation Zone – cannot be developed) is limited to all wetland and drainage lines as these are protected by legislation. The area around BPS 4 is classified as "A" due to a high faunal diversity, the presence of wetlands and a drainage line and the presence of intact indigenous vegetation. The Eastern portion is classified as "A" due to the open space network provided by the LMVC and farmers in the area and high species

diversity. Land use classification areas in terms of “B” (Conservation with low impact development zones – can be developed with certain types of development and with authorisation) are limited to the northern and north-eastern boundary of the Bishopstowe Study area, and comprise of medium diversity drainage lines and open areas, with a potential for low density development with authorisation. Areas belonging to land use classification “C” (Development zones – can be developed) are found within heavily transformed areas, with very little available vegetation and low species diversity. These areas are restricted to all suburbs and the majority of sugar cane and cattle farming areas.

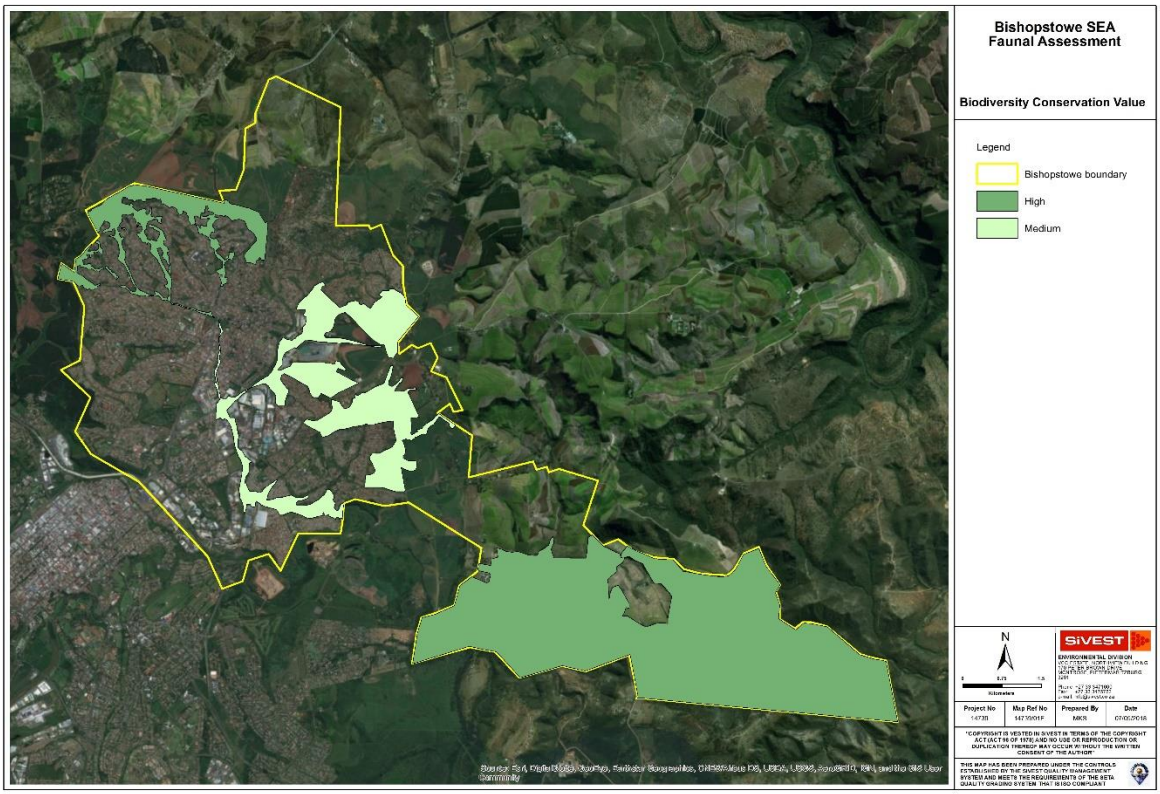

Figure 22: Biodiversity conservation values within movement corridors for the Bishopstowe Study area.

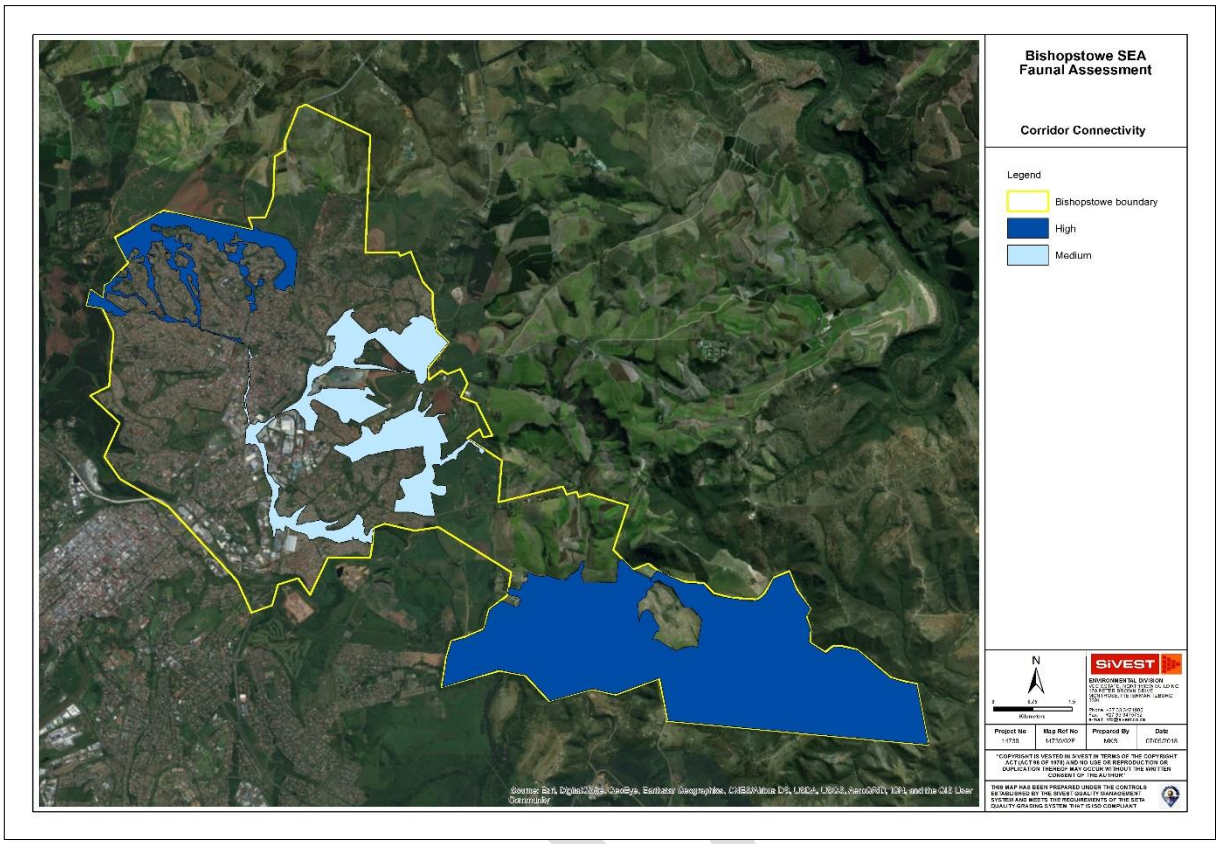

Figure 23: Corridor connectivity in the Bishopstowe study area.

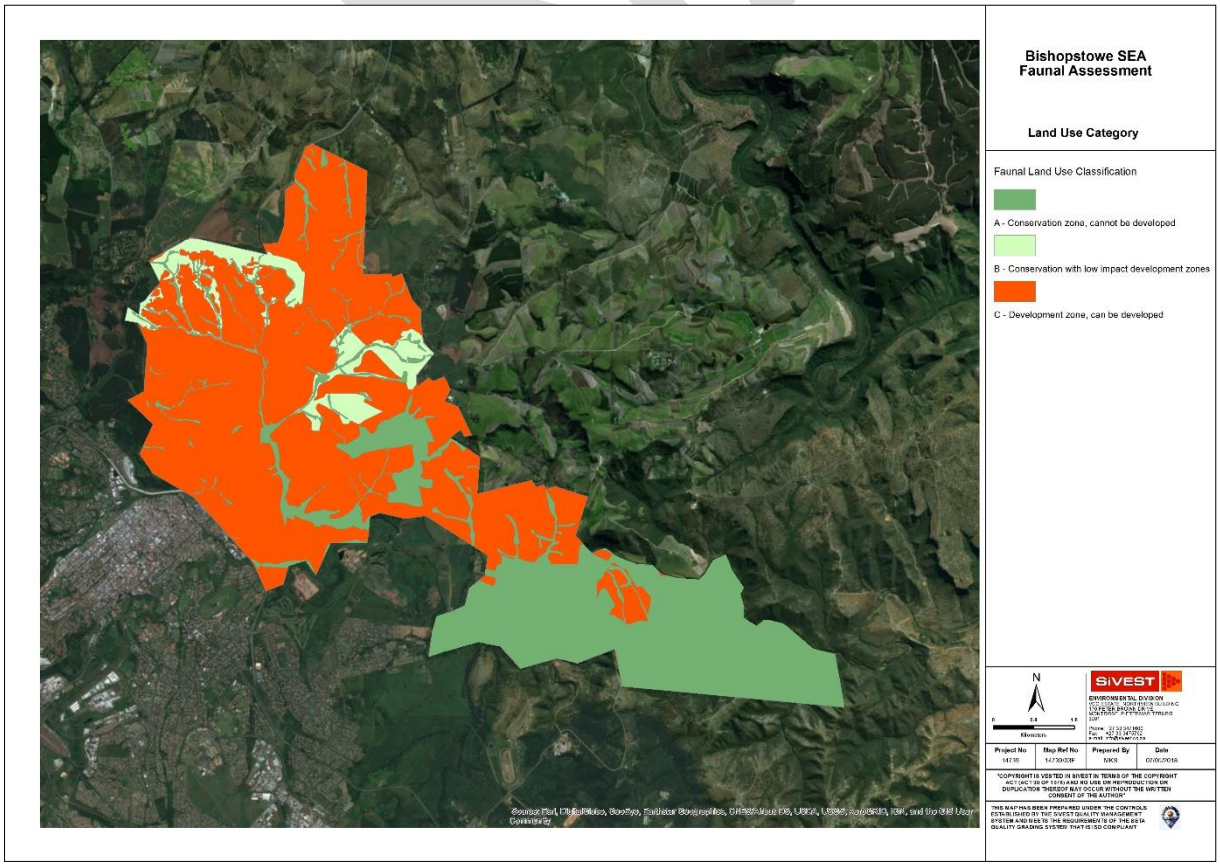

Figure 24: Land use categories for corridors in the Bishopstowe study area.

Table 13: Summary of fauna seen in Bishopstowe with their associated IUCN Status.

Taxa	Genus	Species	Species name	Redlist Category
Amphibian	*Amietophrynus*	*gutturalis*	Toad, Guttural	Least Concern
Amphibian	*Amietophrynus*	*rangeri*	Toad, Raucous	Least Concern
Amphibian	*Hyperolius*	*mamoratus*	Reed- Frog, Painted	Least Concern
Bird	*Apalis*	*thoracica*	Apalis, Bar-throated	Least Concern
Bird	*Lybius*	*torquatus*	Barbet, Black-collared	Least Concern
Bird	*Trachyphonus*	*vaillantii*	Barbet, Crested	Least Concern
Bird	*Batis*	*molitor*	Batis, Chinspot	Least Concern
Bird	*Euplectes*	*orix*	Bishop, Southern Red	Least Concern
Bird	*Laniarius*	*ferrugineus*	Boubou, Southern	Least Concern
Bird	*Pycnonotus*	*tricolor*	Bulbul, Dark-capped	Least Concern
Bird	*Buteo*	*rufofuscus*	Buzzard, Jackal	Least Concern
Bird	*Camaroptera*	*brachyura*	Camaroptera, Green-backed	Least Concern
Bird	*Crithagra*	*mozambica*	Canary, Yellow-fronted	Least Concern
Bird	*Cisticola*	*natalensis*	Cisticola, Croaking	Least Concern
Bird	*Cisticola*	*tinniens*	Cisticola, Levaillant's	Least Concern
Bird	*Cisticola*	*lais*	Cisticola, Wailing	Least Concern
Bird	*Cisticola*	*juncidis*	Cisticola, Zitting	Least Concern
Bird	*Centropus*	*burchellii*	Coucal, Burchell's	Least Concern
Bird	*Corvus*	*albus*	Crow, Pied	Least Concern
Bird	*Chrysococcyx*	*caprius*	Cuckoo, Diderick	Least Concern
Bird	*Chrysococcyx*	*klaas*	Cuckoo, Klaas's	Least Concern
Bird	*Streptopelia*	*senegalensis*	Dove, Laughing	Least Concern
Bird	*Streptopelia*	*semitorquata*	Dove, Red-eyed	Least Concern
Bird	*Columba*	*livia*	Dove, Rock	Least Concern
Bird	*Turtur*	*tympanistria*	Dove, Tambourine	Least Concern
Bird	*Dicrurus*	*adsimilis*	Drongo, Fork-tailed	Least Concern
Bird	*Anas*	*sparsa*	Duck, African Black	Least Concern
Bird	*Dendrocygna*	*viduata*	Duck, White-faced	Least Concern
Bird	*Lophaetus*	*occipitalis*	Eagle, Long-crested	Least Concern
Bird	*Bubulcus*	*ibis*	Egret, Cattle	Least Concern
Bird	*Lagonosticta*	*rubricata*	Firefinch, African	Least Concern
Bird	*Lanius*	*collaris*	Fiscal, Common (Southern)	Least Concern
Bird	*Melaenornis*	*pammelaina*	Flycatcher, Southern Black	Least Concern
Bird	*Alopochen*	*aegyptiaca*	Goose, Egyptian	Least Concern
Bird	*Sphenoeacus*	*afer*	Grassbird, Cape	Least Concern
Bird	*Andropadus*	*importunus*	Greenbul, Sombre	Least Concern
Bird	*Polyboroides*	*typus*	Harrier-Hawk, African	Least Concern
Bird	*Ardea*	*melanocephala*	Heron, Black-headed	Least Concern
Bird	*Upupa*	*africana*	Hoopoe, African	Least Concern
Bird	*Threskiornis*	*aethiopicus*	Ibis, African Sacred	Least Concern
Bird	*Bostrychia*	*hagedash*	Ibis, Hadeda	Least Concern
Bird	*Vidua*	*funerea*	Indigobird, Dusky	Least Concern

FINAL

Taxa	Genus	Species	Species name	Redlist Category
Bird	*Halcyon*	*albiventris*	Kingfisher, Brown-hooded	Least Concern
Bird	*Milvus*	*aegyptius*	Kite, Yellow-billed	Least Concern
Bird	*Vanellus*	*melanopterus*	Lapwing, Blacksmith	Least Concern
Bird	*Mirafra*	*africana*	Lark, Rufous-naped	Least Concern
Bird	*Lonchura*	*cucullata*	Mannikin, Bronze	Least Concern
Bird	*Riparia*	*paludicola*	Martin, Brown-throated	Least Concern
Bird	*Gallinula*	*chloropus*	Moorhen, Common	Least Concern
Bird	*Colius*	*striatus*	Mousebird, Speckled	Least Concern
Bird	*Acridotheres*	*tristis*	Myna, Common	Least Concern
Bird	*Cisticola*	*fulvicapilla*	Neddicky, Neddicky	Least Concern
Bird	*Cypsiurus*	*parvus*	Palm-swift, African	Least Concern
Bird	*Prinia*	*subflava*	Prinia, Tawny-flanked	Least Concern
Bird	*Dryoscopus*	*cubla*	Puffback, Black-backed	Least Concern
Bird	*Cossypha*	*caffra*	Robin-chat, Cape	Least Concern
Bird	*Cossypha*	*natalensis*	Robin-chat, Red-capped	Least Concern
Bird	*Psalidoprocne*	*pristoptera*	Saw-wing, Black (Southern race)	Least Concern
Bird	*Passer*	*domesticus*	Sparrow, House	Least Concern
Bird	*Passer*	*diffusus*	Sparrow, Southern Grey-headed	Least Concern
Bird	*Lamprotornis*	*nitens*	Starling, Cape Glossy	Least Concern
Bird	*Saxicola*	*torquatus*	Stonechat, African	Least Concern
Bird	*Chalcomitra*	*amethystina*	Sunbird, Amethyst	Least Concern
Bird	*Cinnyris*	*chalybeus*	Sunbird, Southern Double-collared	Least Concern
Bird	*Cinnyris*	*talatala*	Sunbird, White-bellied	Least Concern
Bird	*Hirundo*	*rustica*	Swallow, Barn	Least Concern
Bird	*Cecropis*	*abyssinica*	Swallow, Lesser Striped	Least Concern
Bird	*Apus*	*affinis*	Swift, Little	Least Concern
Bird	*Apus*	*caffer*	Swift, White-rumped	Least Concern
Bird	*Tchagra*	*senegalus*	Tchagra, Black-crowned	Least Concern
Bird	*Tchagra*	*tchagra*	Tchagra, Southern	Least Concern
Bird	*Turdus*	*olivaceus*	Thrush, Olive	Least Concern
Bird	*Tauraco*	*porphyreolophus*	Turaco, Purple-crested	Least Concern
Bird	*Streptopelia*	*capicola*	Turtle-dove, Cape	Least Concern
Bird	*Motacilla*	*capensis*	Wagtail, Cape	Least Concern
Bird	*Amblyospiza*	*albifrons*	Weaver, Thick-billed	Least Concern
Bird	*Ploceus*	*cucullatus*	Weaver, Village	Least Concern
Bird	*Zosterops*	*virens*	White-eye, Cape	Least Concern
Bird	*Vidua*	*macroura*	Whydah, Pin-tailed	Least Concern
Bird	*Euplectes*	*axillaris*	Widowbird, Fan-tailed	Least Concern
Bird	*Euplectes*	*ardens*	Widowbird, Red-collared	Least Concern
Bird	*Turtur*	*chalcospilos*	Wood-dove, Emerald-spotted	Least Concern
Bird	*Phoeniculus*	*purpureus*	Wood-hoopoe, Green	Least Concern
Bird	*Dendropicos*	*fuscescens*	Woodpecker, Cardinal	Least Concern

FINAL

Taxa	Genus	Species	Species name	Redlist Category
Bird	*Campethera*	*abingoni*	Woodpecker, Golden-tailed	Least Concern
Mammal	*Sylvicapra*	*grimmia*	Duiker, common	Least Concern
Mammal	*Cercopithecus*	*pygerythrus*	Monkey, Vervet	Least Concern
Mammal	*Tragelaphus*	*angasii*	Nyala	Least Concern
Mammal	*Equus*	*quagga*	Zebra, Plains	Least Concern
Reptile	*Pelomedusa*	*galeata*	Terrapin, South African Marsh	Least Concern
Reptile	*Varanus*	*niloticus*	Monitor, Nile	Least Concern
Reptile	*Trachylepis*	*varia*	Skink, Variable	Least Concern

Additionally, sightings of African rock python (*Python sebae*), Leopard (*Panthera pardus*) and Grass owl (*Tyto capensis*) have been seen in the Bishopstowe study area (Farnsworth, *Pers. Comm.* 2018).

For a full breakdown of species predicted to occur in the Bishopstowe study area, please refer to the full Bishopstowe Faunal Report. Please note fauna is typically mobile. As such, if the observer did not see the animal, it does not mean it doesn't occur there. A huge sample effort covering many seasons would be ideal to get an accurate account of what fauna occurs in an area. The use of atlas maps and citizen science helps in shortening this sample effort by having a large number of observers whose data get scrutinised for its accuracy.

Table 14*: *Number of fauna seen in Bishopstowe per sampling site

Survey Site	Birds	Mammals	Reptiles	Amphibians	Land use Classification
BPS 1	28	2	0	0	B
BPS 2	34	1	0	0	B
BPS 3	12	0	0	0	B
BPS 4	38	1	0	0	A
BPS 5	34	0	0	1	B
BPS 6	20	0	0	0	A
BPS 7	31	0	3	2	A
BPS 8	34	3	0	0	A

***Figure 25*: Village Weaver colony**

FINAL

***Figure 26*: American Bramble and Black Wattle**

***Figure 27*: Dam close to Midlands Crushers**

***Figure 28*: Lower Mpushini Valley Conservancy on left of the road.**

The majority of fauna in the Bishopstowe area is limited to areas where intact vegetation occurs. Intact vegetation is limited to drainage lines and the urban edge. It is important to include these areas as areas where environmental authorisation needs to be granted for any developments to occur; or, no development may occur in order to maintain the movement corridors used by the fauna. The LMVC area remains an important area for conservation around Pietermaritzburg, and the possibility of a big

five reserve being incorporated into the LMVC (Mayibuye Game reserve) in the near future means that the corridors leading to the LMVC and surrounding Bishopstowe areas need to be conserved.

4.2.2 Assumptions, uncertainties and limitations

Limitations in the sampling procedures are important to understand as these limitations often have a significant effect on the data received. It is therefore prudent to rely on other datasets such as Atlas Projects to assist in species occurrence where sampling limitations restrict species seen. In the case of Bishopstowe, the following limitations were noted:

- Sampling time was limited to the last half of the summer season, where the majority of bird species, reptile species and amphibian species have already bred. This limits the dataset required by the client as the breeding and nesting season is not sufficiently sampled.
- Sites for herpetofauna sampling are extremely difficult to locate due to most reptiles and amphibians moving to underground or rocky areas during colder periods. Additionally, locating sites without placing tracking units on herpetofauna is extremely difficult and is limited by budget and sampling seasons.
- Biodiversity conservation value was estimated by the specialist as an impression gained by looking at biodiversity on site, as well as habitat transformation, intact native vegetation and wetland / drainage line state. A full biodiversity assessment using biodiversity indices to indicate diversity could not be established due to time and budget constraints.
- Connectivity/corridor and species dispersal value was estimated based on the biodiversity on site, transformation of the vegetation, and the ability of fauna to move within the corridor. This was an estimated based on visual evidence gathered by the specialist, and was limited by time and budgetary constraints.
- Financial constraints limit the type and intensity of sampling, where sampling intensity is related to time in field, which is limited to budget, and the client's deliverable timeframes.
- A full years' worth of sampling on a monthly occurrence would be necessary to get an in depth sample of fauna occurring in the Bishopstowe area.

FINAL

4.3 Wetland & Riparian Assessment

4.3.1 Wetland & riparian delineation, classification and description

A wetland and riparian delineation assessment was undertaken for the study area. The final wetland and riparian delineation and HGM Units are provided in **Figures 30-37** below.

The wetlands within the study area are generally degraded to some degree, while some wetlands have been created through the development of industrial and housing sites, and the purposeful alteration of river courses and stormwater flows. Every wetland and riparian corridor sampled on site had some level of alien plant infestation, with some areas being comprised almost entirely of alien plant species.

Twenty-two (22) riparian zones are still present within the study area, with all of these areas being found in the eastern portion of the study area. The riparian zone within the western (residential and industrial zones) are depleted to non-existence.

One hundred and fifty-nine (159) wetland units, are located within study area. The wetland units and their HGM category (prior to modification) are provided in **Table 15** below.

Table 15: Wetland units within the Study Area and their hydro-geomorphic designations

HGM Name	HGM Type
CVB1	Channelled Valley Bottom Wetland
CVB2	Channelled Valley Bottom Wetland
CVB3	Channelled Valley Bottom Wetland
CVB4	Channelled Valley Bottom Wetland
CVB5	Channelled Valley Bottom Wetland
CVB6	Channelled Valley Bottom Wetland
CVB7	Channelled Valley Bottom Wetland
CVB8	Channelled Valley Bottom Wetland
CVB9	Channelled Valley Bottom Wetland
CVB10	Channelled Valley Bottom Wetland
CVB11	Channelled Valley Bottom Wetland
CVB12	Channelled Valley Bottom Wetland
CVB13	Channelled Valley Bottom Wetland
CVB14	Channelled Valley Bottom Wetland
CVB15	Channelled Valley Bottom Wetland
CVB16	Channelled Valley Bottom Wetland
CVB17	Channelled Valley Bottom Wetland
CVB18	Channelled Valley Bottom Wetland
CVB19	Channelled Valley Bottom Wetland
CVB20	Channelled Valley Bottom Wetland

FINAL

HGM Name	HGM Type
CVB21	Channelled Valley Bottom Wetland
CVB22	Channelled Valley Bottom Wetland
CVB23	Channelled Valley Bottom Wetland
CVB24	Channelled Valley Bottom Wetland
CVB25	Channelled Valley Bottom Wetland
CVB26	Channelled Valley Bottom Wetland
CVB27	Channelled Valley Bottom Wetland
FP1	Floodplain Wetland
FP2	Floodplain Wetland
FP3	Floodplain Wetland
FP4	Floodplain Wetland
FP5	Floodplain Wetland
FP6	Floodplain Wetland
FP7	Floodplain Wetland
FP8	Floodplain Wetland
FP9	Floodplain Wetland
FP10	Floodplain Wetland
FP11	Floodplain Wetland
FP12	Floodplain Wetland
HS1	Hillslope Seep Wetland
HS2	Hillslope Seep Wetland
HS3	Hillslope Seep Wetland
HS4	Hillslope Seep Wetland
HS5	Hillslope Seep Wetland
HS6	Hillslope Seep Wetland
HS7	Hillslope Seep Wetland
HS8	Hillslope Seep Wetland
UCVB1	Unchannelled Valley Bottom Wetland
UCVB2	Unchannelled Valley Bottom Wetland
UCVB3	Unchannelled Valley Bottom Wetland
UCVB4	Unchannelled Valley Bottom Wetland
UCVB5	Unchannelled Valley Bottom Wetland
UCVB6	Unchannelled Valley Bottom Wetland
UCVB7	Unchannelled Valley Bottom Wetland
UCVB8	Unchannelled Valley Bottom Wetland
UCVB9	Unchannelled Valley Bottom Wetland
UCVB10	Unchannelled Valley Bottom Wetland
UCVB11	Unchannelled Valley Bottom Wetland
UCVB12	Unchannelled Valley Bottom Wetland
UCVB13	Unchannelled Valley Bottom Wetland
UCVB14	Unchannelled Valley Bottom Wetland
UCVB15	Unchannelled Valley Bottom Wetland
UCVB16	Unchannelled Valley Bottom Wetland
UCVB17	Unchannelled Valley Bottom Wetland

FINAL

HGM Name	HGM Type
UCVB18	Unchannelled Valley Bottom Wetland
UCVB19	Unchannelled Valley Bottom Wetland
UCVB20	Unchannelled Valley Bottom Wetland
UCVB21	Unchannelled Valley Bottom Wetland
UCVB22	Unchannelled Valley Bottom Wetland
UCVB23	Unchannelled Valley Bottom Wetland
UCVB24	Unchannelled Valley Bottom Wetland
UCVB25	Unchannelled Valley Bottom Wetland
UCVB26	Unchannelled Valley Bottom Wetland
UCVB27	Unchannelled Valley Bottom Wetland
UCVB28	Unchannelled Valley Bottom Wetland
UCVB29	Unchannelled Valley Bottom Wetland
UCVB30	Unchannelled Valley Bottom Wetland
UCVB31	Unchannelled Valley Bottom Wetland
UCVB32	Unchannelled Valley Bottom Wetland
UCVB33	Unchannelled Valley Bottom Wetland
UCVB34	Unchannelled Valley Bottom Wetland
UCVB35	Unchannelled Valley Bottom Wetland
UCVB36	Unchannelled Valley Bottom Wetland
UCVB37	Unchannelled Valley Bottom Wetland
UCVB38	Unchannelled Valley Bottom Wetland
UCVB39	Unchannelled Valley Bottom Wetland
UCVB40	Unchannelled Valley Bottom Wetland
UCVB41	Unchannelled Valley Bottom Wetland
UCVB42	Unchannelled Valley Bottom Wetland
UCVB43	Unchannelled Valley Bottom Wetland
UCVB44	Unchannelled Valley Bottom Wetland
UCVB45	Unchannelled Valley Bottom Wetland
UCVB46	Unchannelled Valley Bottom Wetland
UCVB47	Unchannelled Valley Bottom Wetland
UCVB48	Unchannelled Valley Bottom Wetland
UCVB49	Unchannelled Valley Bottom Wetland
UCVB50	Unchannelled Valley Bottom Wetland
UCVB51	Unchannelled Valley Bottom Wetland
UCVB52	Unchannelled Valley Bottom Wetland
UCVB53	Unchannelled Valley Bottom Wetland
UCVB54	Unchannelled Valley Bottom Wetland
UCVB55	Unchannelled Valley Bottom Wetland
UCVB56	Unchannelled Valley Bottom Wetland
UCVB57	Unchannelled Valley Bottom Wetland
UCVB58	Unchannelled Valley Bottom Wetland
UCVB59	Unchannelled Valley Bottom Wetland
UCVB60	Unchannelled Valley Bottom Wetland
UCVB61	Unchannelled Valley Bottom Wetland

FINAL

HGM Name	HGM Type
UCVB62	Unchannelled Valley Bottom Wetland
UCVB63	Unchannelled Valley Bottom Wetland
UCVB64	Unchannelled Valley Bottom Wetland
UCVB65	Unchannelled Valley Bottom Wetland
VHS1	Valley Head Seep Wetland
VHS2	Valley Head Seep Wetland
VHS3	Valley Head Seep Wetland
VHS4	Valley Head Seep Wetland
VHS5	Valley Head Seep Wetland
VHS6	Valley Head Seep Wetland
VHS7	Valley Head Seep Wetland
VHS8	Valley Head Seep Wetland
VHS9	Valley Head Seep Wetland
VHS10	Valley Head Seep Wetland
VHS11	Valley Head Seep Wetland
VHS12	Valley Head Seep Wetland
VHS13	Valley Head Seep Wetland
VHS14	Valley Head Seep Wetland
VHS15	Valley Head Seep Wetland
VHS16	Valley Head Seep Wetland
VHS17	Valley Head Seep Wetland
VHS18	Valley Head Seep Wetland
VHS19	Valley Head Seep Wetland
VHS20	Valley Head Seep Wetland
VHS21	Valley Head Seep Wetland
VHS22	Valley Head Seep Wetland
VHS23	Valley Head Seep Wetland
VHS24	Valley Head Seep Wetland
VHS25	Valley Head Seep Wetland
VHS26	Valley Head Seep Wetland
VHS27	Valley Head Seep Wetland
VHS28	Valley Head Seep Wetland
VHS29	Valley Head Seep Wetland
VHS30	Valley Head Seep Wetland
VHS31	Valley Head Seep Wetland
VHS32	Valley Head Seep Wetland
VHS33	Valley Head Seep Wetland
VHS34	Valley Head Seep Wetland
VHS35	Valley Head Seep Wetland
VHS36	Valley Head Seep Wetland
VHS37	Valley Head Seep Wetland
VHS38	Valley Head Seep Wetland
VHS39	Valley Head Seep Wetland
VHS40	Valley Head Seep Wetland

FINAL

HGM Name	HGM Type
VHS41	Valley Head Seep Wetland
VHS42	Valley Head Seep Wetland
VHS43	Valley Head Seep Wetland
VHS44	Valley Head Seep Wetland
VHS45	Valley Head Seep Wetland
VHS46	Valley Head Seep Wetland
VHS47	Valley Head Seep Wetland

Northdale, Raisthorpe, Woodlands, Rosedale and Orient Heights

The residential areas of Northdale, Raisthorpe, Woodlands, Rosedale and Orient Heights all share similar levels of disturbance to wetland and riparian habitat. Most of the wetlands within these residential areas drain towards the centre of the residential area, and then flow towards the Msunduzi River, which flows along the most of the southern and eastern boundaries of the study area. In essence the above residential areas form a large drainage basin, and generally the wetland systems can be characterised by seep wetlands along the upper reaches of the systems. These systems then progress towards the valley bottoms, and should generally be unchannelled valley bottom wetlands. As these systems near the Msunduzi River there is more floodplain wetland habitat, and the wetlands are generally channelled valley bottom wetlands. These wetland and riparian systems are generally of a poor quality, with associated low health scores, and low to medium ecosystem services being provided. The major impacts on these systems include the historical infilling of wetland systems for housing development, and well as increases in stormwater flows associated with the increase in hardened surfaces within residential areas. The increased flows have led to extreme erosion of wetland habitat in many areas, and the creation of channels in previously unchannelled systems. Additionally, there is a high prevalence of alien plant species within the wetlands and riparian corridors, and high levels of domestic waste dumping within these systems. There is strong evidence that sewer overflows are occurring within all of these systems, and this exacerbates the alien plant infestation by providing extremely high levels of nitrogen and phosphate that are best exploited by alien invasives. The extreme nature of pollution within these systems, and the low level of ecosystem services provided by these systems, is evidenced by the extremely low water quality of the Baynespruit River which drains the majority of the water from the residential basin.

Willowton, Eastwood and Copesville

The residential and industrial areas of Willowton, Eastwood and Copesville, all share similar characteristics, and similar levels of disturbance. These systems have generally not been as heavily impacted by infilling of actual wetland habitat, and there are still some wetland and riparian areas that are of a low to medium health and medium ecosystem services delivery. These system also drain from the higher lying ground in the Northern portion of the study area, towards the Msunduzi River that runs along much of the southern boundary of the study area. The wetland and riparian habitat within these

FINAL

areas also show increased stormwater impacts from the increased hardened surfaces within these areas, and this has led to erosion of many areas through scouring. The upper reaches of some of the systems within Copeville are relatively intact in terms of geomorphology and hydrology, but alien vegetation is still very prevalent. The greatest impact that the systems in this area are exposed to is the pollution of water resources through a number of inputs. The informal nature of much of Copesville means that there are few sewer lines within the area, and much of the sewerage produced by the area is flowing into the groundwater through pit latrines, or through direct release into surface water resources. Additionally, there are high levels of illegal dumping within wetland and riparian systems throughout the area, and grazing of cattle has an additional impact. Further downstream the systems are impacted upon by the stone quarry that dominates the centre of the study area, as well as the industrial sites and associated factories that form the Willowton area. These industrial and mining activities are impacting the wetland and riparian systems through the release of effluent from the processes undertaken within the factories and quarry. The quarry has a buffer zone around it (due to safety considerations), and this exclusion zone has allowed a few small systems to remain relatively healthy, but lower lying system downstream of the site show increased siltation through the dust created during blasting and processing of the rock and stone from the quarry site. Some of the factories that form Willowton produce industrial effluent, and the cumulative impact of these inputs is the high levels of pollution that are recorded in the Baynespruit River (as noted above). The residential area of Eastwood is surrounded by some open areas. Wetlands and riparian corridors within this area are generally low to medium health, but the upper reaches of some system have not been as heavily impacted by development, dumping and pollution. The greatest impact to some of these systems is the overuse of the systems for grazing and browsing by cattle and goats, and the high prevalence of alien plant species within these systems. The lower reaches of the systems within Eastwood have been impacted in much the same way as the other residential areas noted above, with increased stormwater impacts from more hardened surfaces, and the associated erosion that occurs. These systems have also been impacted by illegal dumping in the lower reaches and increased sewerage inputs.

Farmlands and Mpushini Valley

The area to the east of Eastwood is generally comprised of small holdings and commercial farms, with the emphasis on production of sugarcane. Large portions of the study area within this eastern region are currently undeveloped, and border the Msunduzi River as it loops northwards and then eastwards again. The majority of this undeveloped land has been incorporated in the Lower Mpushini Valley Conservancy (LMVC) area, and is managed for biodiversity and conservation. There are a few portions of commercial agriculture within the LMVC, but these are confined to the higher lying areas away from the Msunduzi River and associated wetland and riparian habitat. The wetlands within the farming area have generally been impacted upon the least, but still have only medium health and medium ecosystem services. The majority of impacts to the wetlands on site are related to the clearing of the wetland and riparian systems for sugarcane production, and the creation of channels to aid in removing water from the site at a higher rate. The level of alien vegetation infestation tends to be lower since individual

landowners are more likely to control alien species within a farming context. The wetlands are the least impacted by waste and pollution, and increases in phosphate and nitrogen levels are likely to only occur when the farmer fertilises the fields. In addition, erosion is less of an issue, with the greatest impacts normally associated with purposely dug drains, and the increased siltation loads that may periodically occur during the interval between harvesting of the sugarcane, and the planting of the next crop.

In general, the wetlands and riparian corridors within the study area have medium to low health, and provide low to medium ecosystem services. The majority of impacts to wetland and riparian areas within the western portion of the study area relate to the infilling of wetland, increased hard surfaces, and pollution of the wetland through illegal dumping, sewer inputs and industrial effluent streams. The majority of wetlands within the eastern portion of the study area have better health and ecosystem services provision, but are impacted by the historical use of the system for sugarcane production. All of the systems noted within the study area ultimately flow into the Msunduzi River, which defines most of the southern and eastern boundary of the study area.

4.3.2 Riparian Zones

The riparian system within the residential areas in the western portion of the study area have historically been encroached upon, and in all cases have been completed cleared of all natural vegetation. In addition, the stream edge has been encroached upon to such a degree, that it has been necessary to canalise portions of the some of the streams to stop them eroding the properties that bound these streams. The increased hard surfaces within the catchment have also had a marked influence on the flood peaks that most of these streams experience, and thus bank erosion, through increased volumes and velocities, has been widespread, and exceptionally detrimental to riparian and wetland systems alike.

4.3.3 Streams and Rivers

There are a number of streams and rivers within the study area, but the majority of the systems in the western areas have been extensively eroded, with evidence of subsequent deposition of sandy materials from the higher reaches of the catchment. These systems appear to have contained wetland historically, but subsequently portions of these wetland materials have been eroded or over-capped by other materials. In addition, some stream systems have been created artificially to try and deal with the increased stormwater flows from the increased hard surfaces within the catchment. Thus, many of the stream systems are highly eroded and have degraded much of the wetland within their immediate vicinity.

The use of many of these western systems as a rubbish dump has led to increased levels of pollution within the streams, and the system health is therefore notoriously poor. Downstream of the residential area are a number of informal housing settlements that have added sewerage discharge to the systems,

FINAL

as well as industrial stands that have historically allowed effluent to leave factory sites and flow into the river and stream systems.

The rivers and streams in the eastern portion of the study area are generally in a better state, but have still been impacted upon by the historical farming practices, and subsequent erosion that often occurs.

FINAL

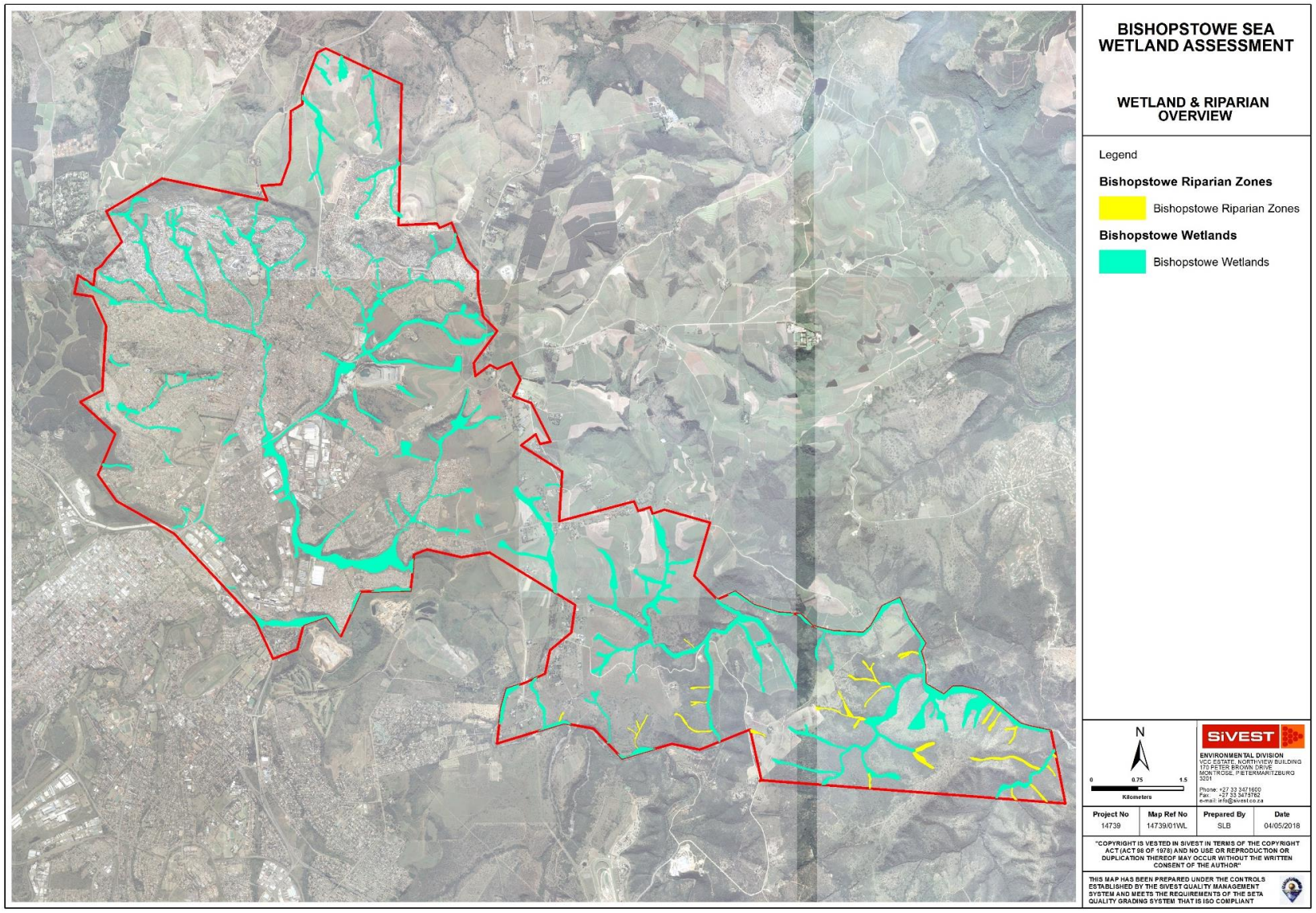

Figure 29: Overview of Wetland and Riparian Habitat Delineation

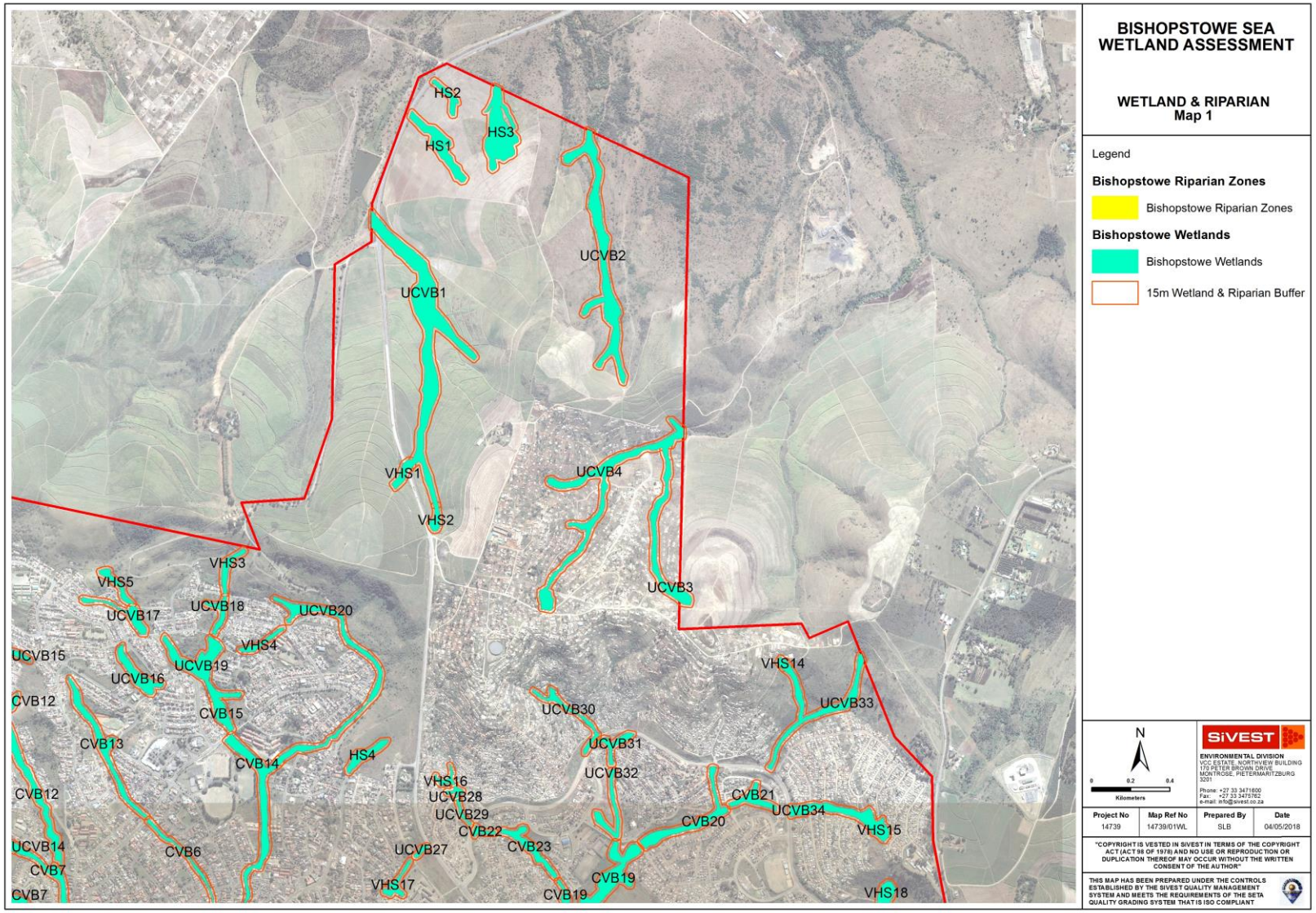

Figure 30: Wetland and Riparian Delineation with HGM units

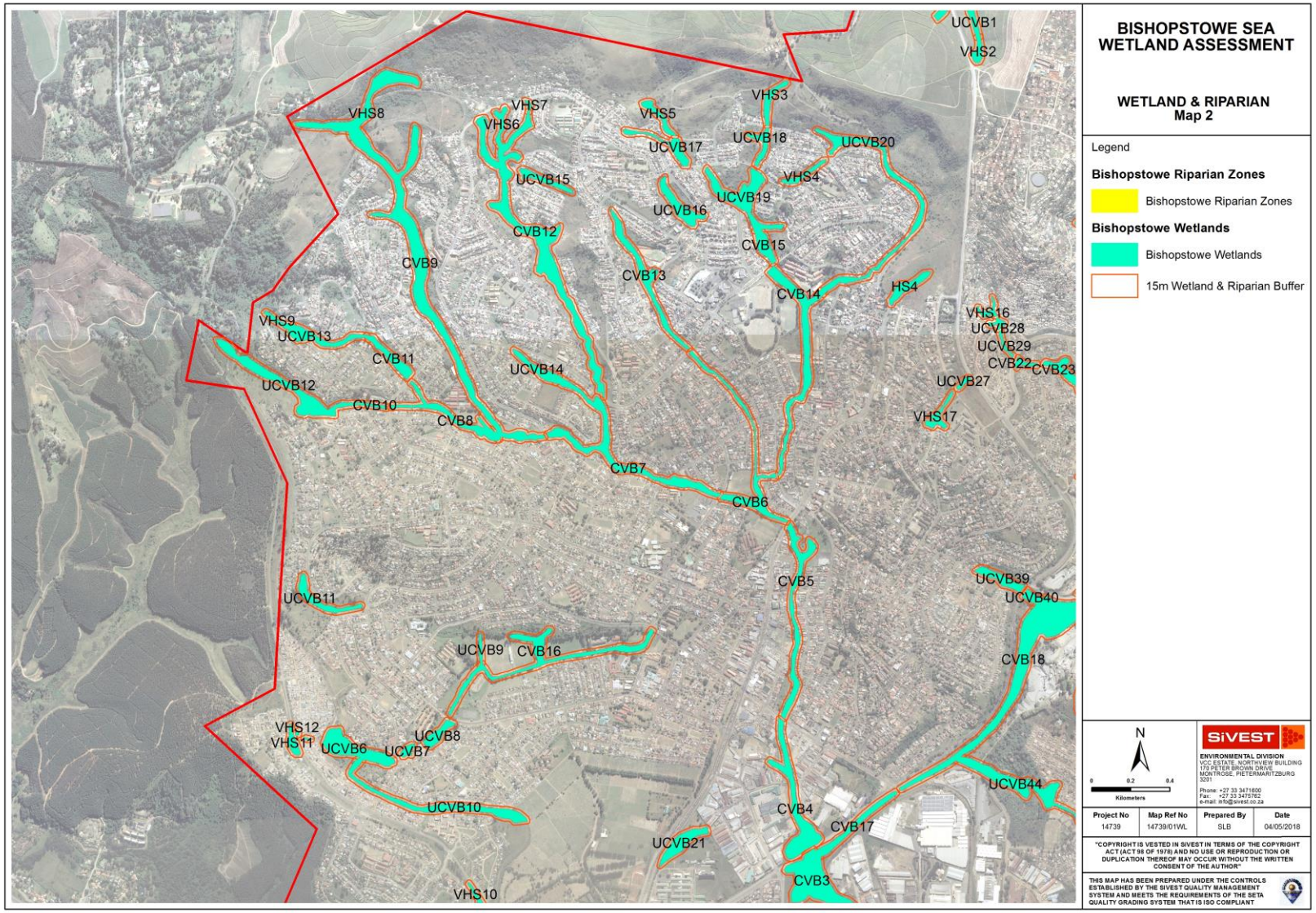

Figure 31: Wetland and Riparian Delineation with HGM units

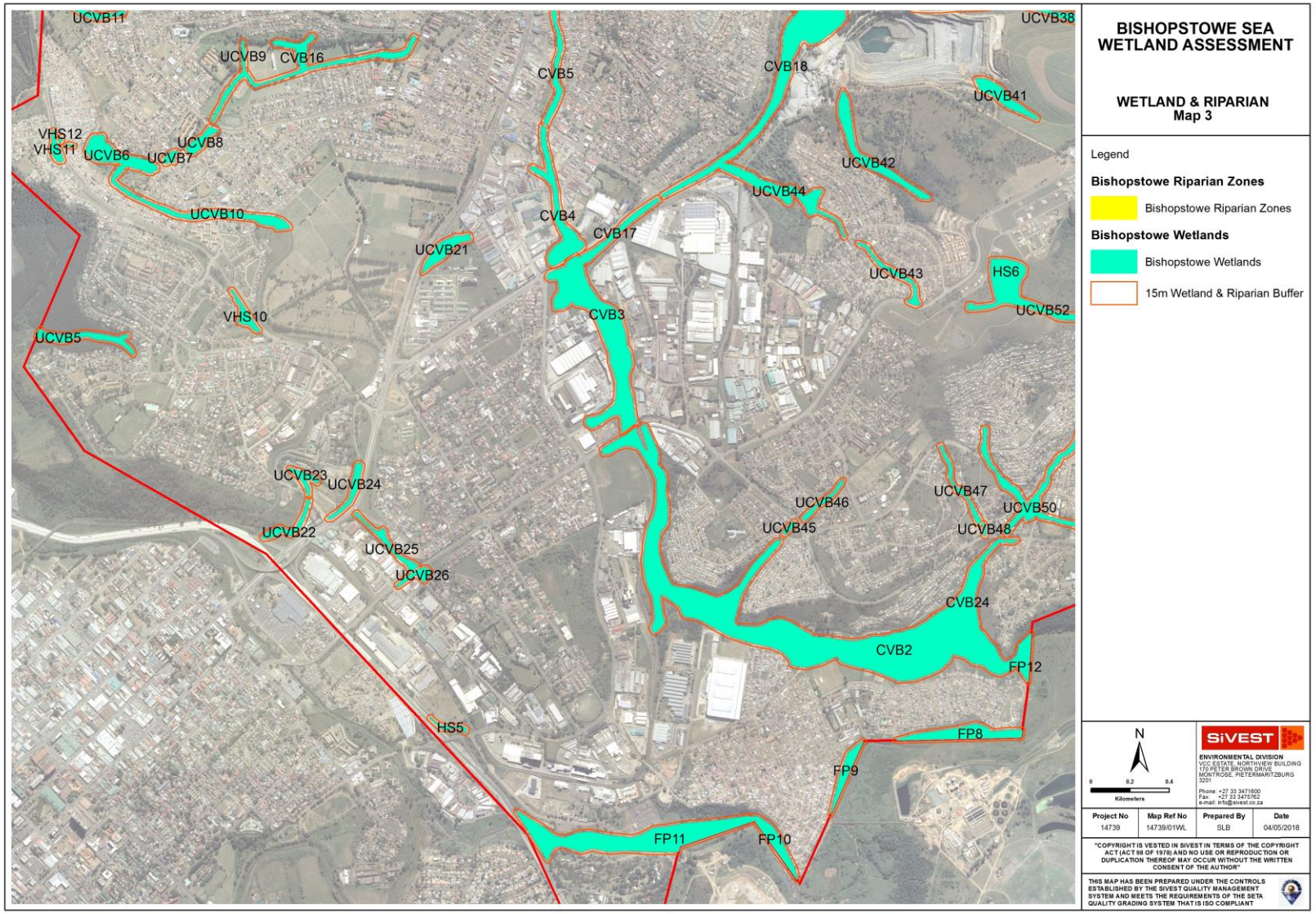

Figure 32: Wetland and Riparian Delineation with HGM units

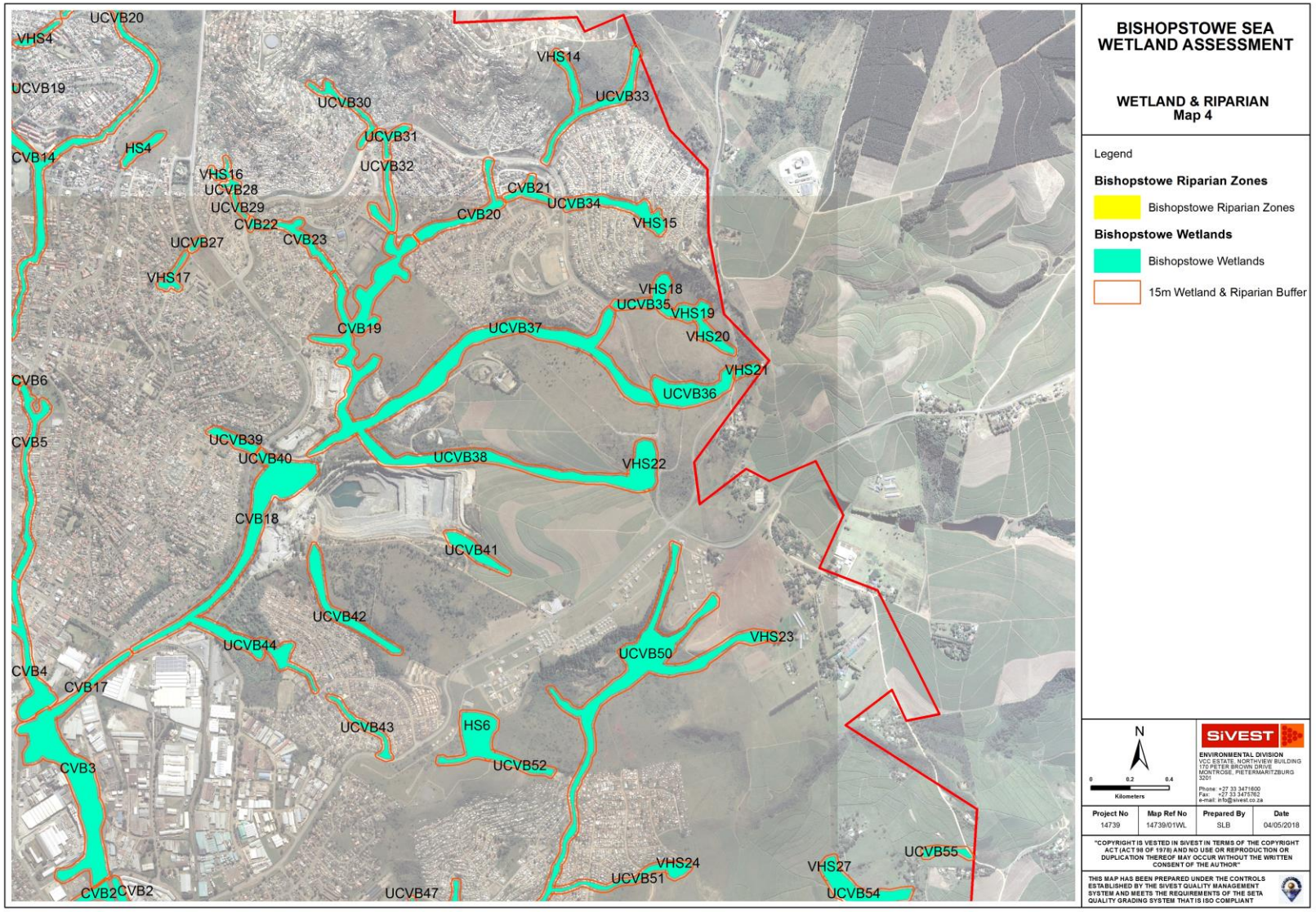

Figure 33: Wetland and Riparian Delineation with HGM units

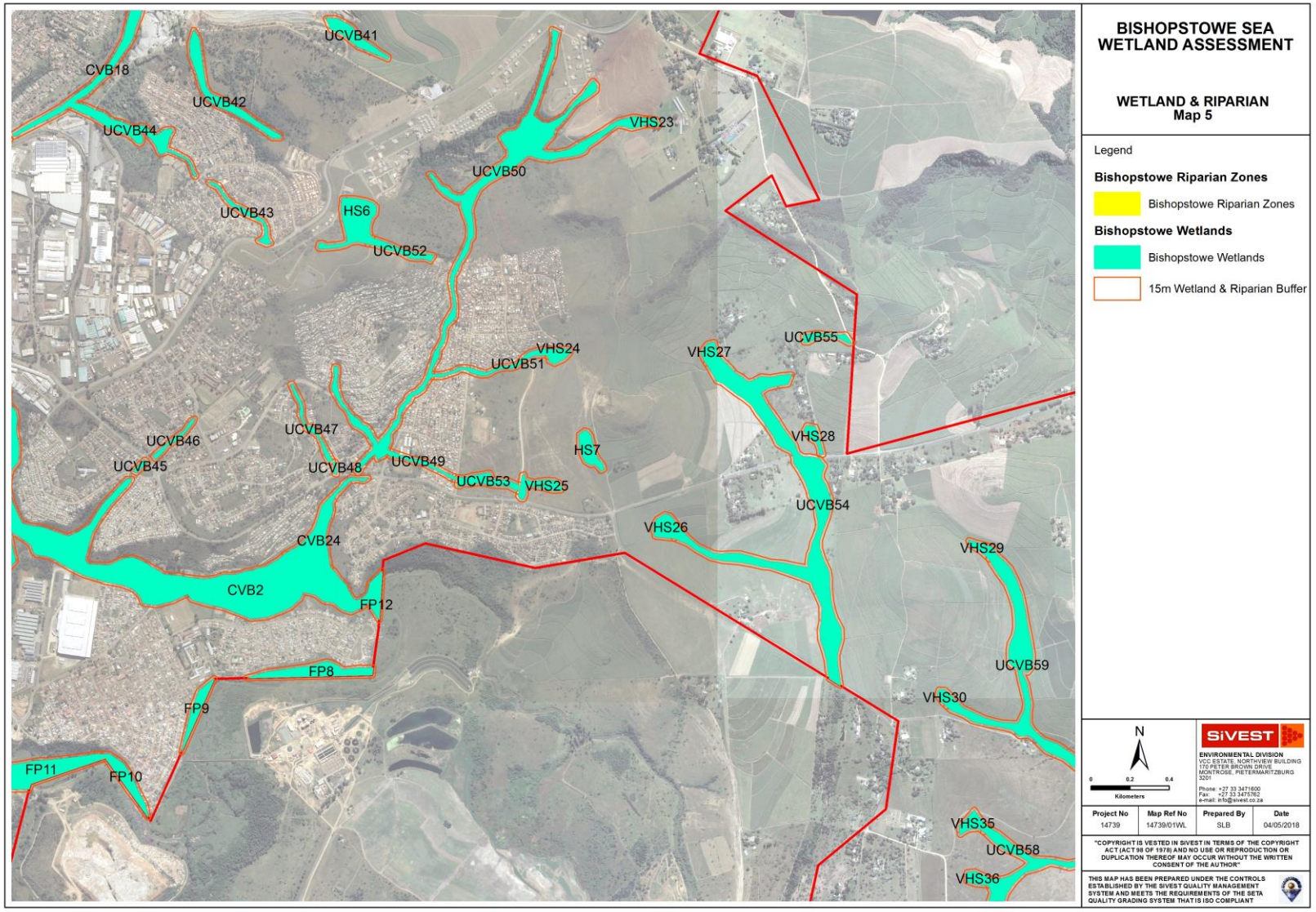

Figure 34: Wetland and Riparian Delineation with HGM units

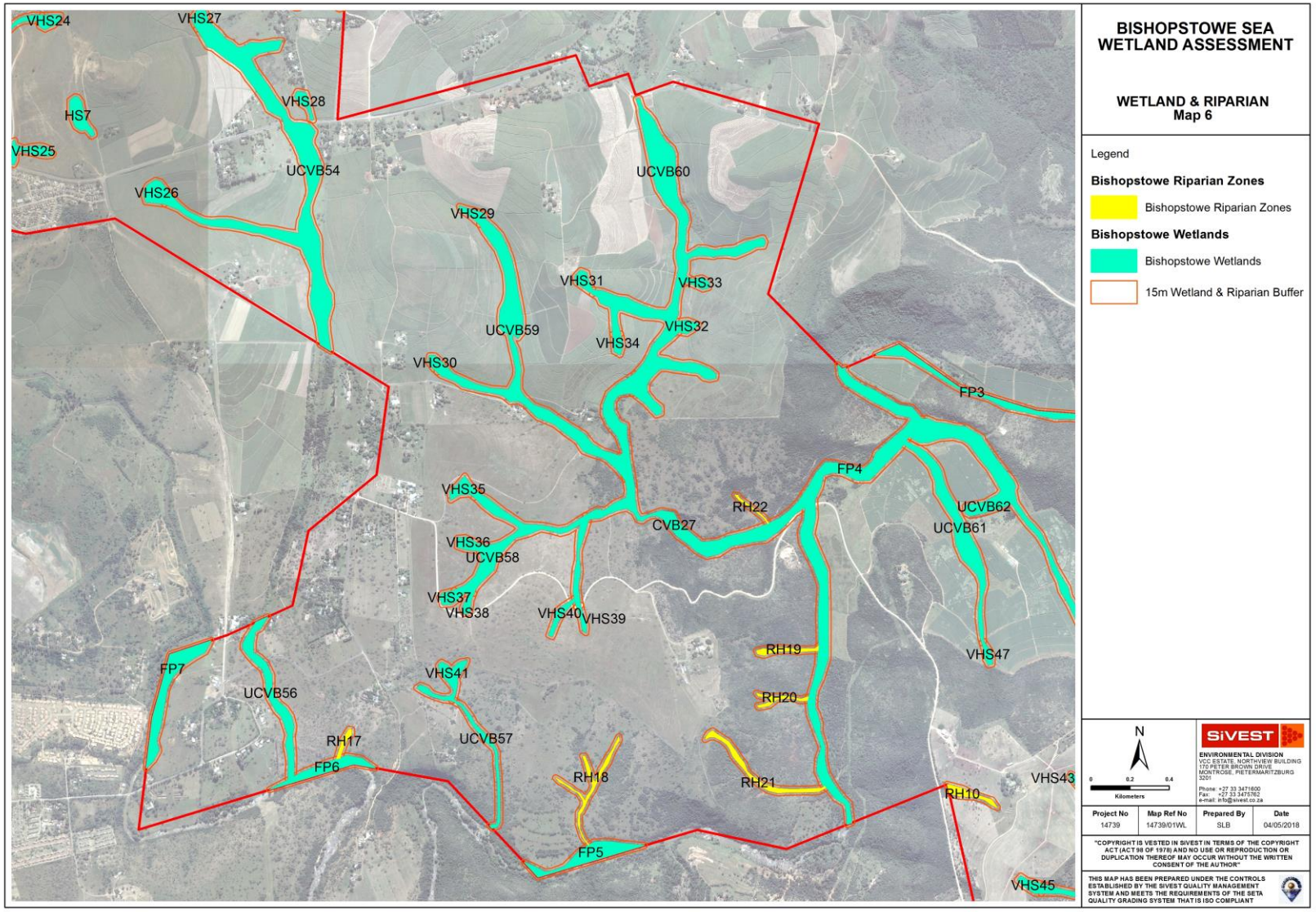

Figure 35: Wetland and Riparian Delineation with HGM units

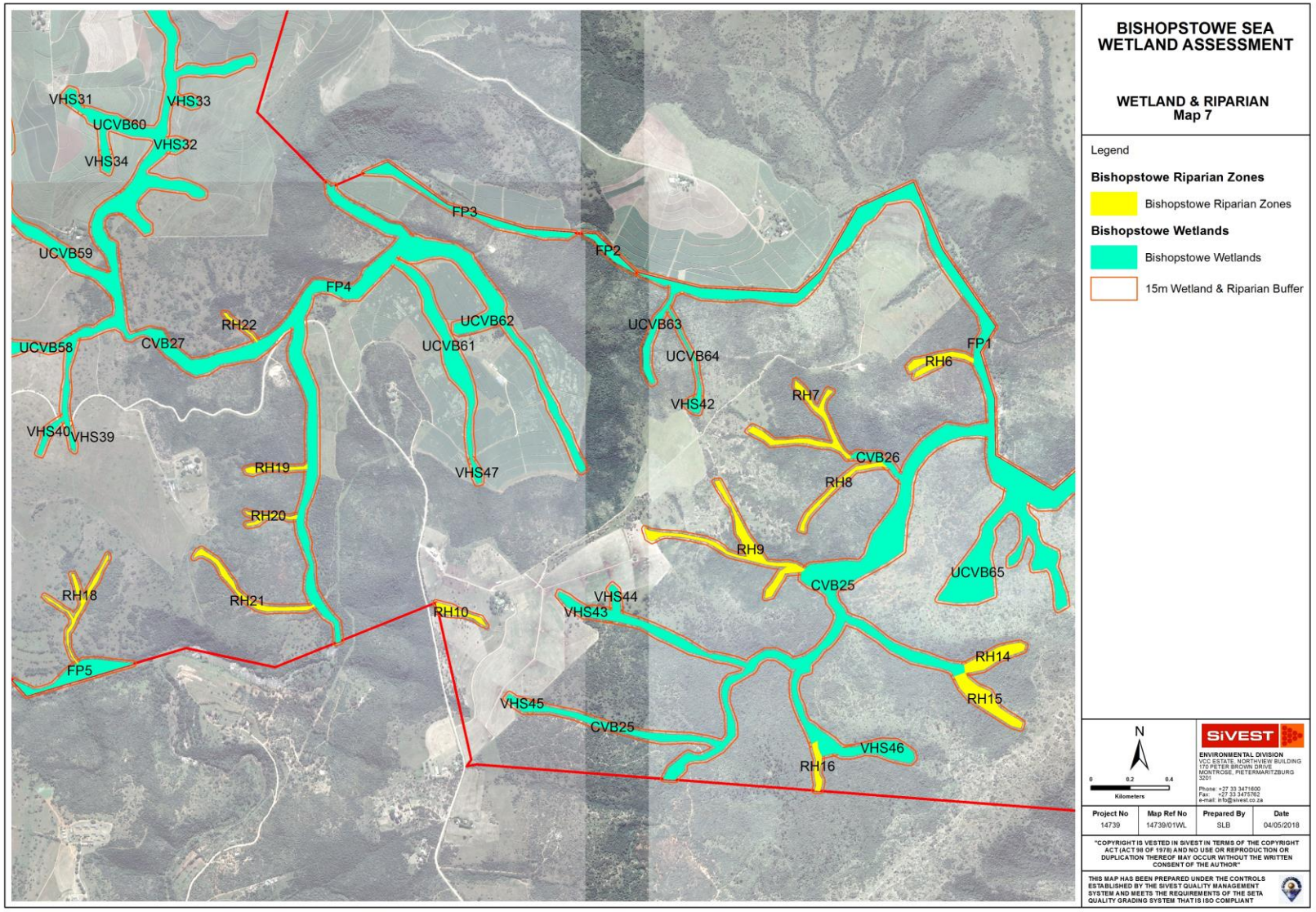

Figure 36: Wetland and Riparian Delineation with HGM units

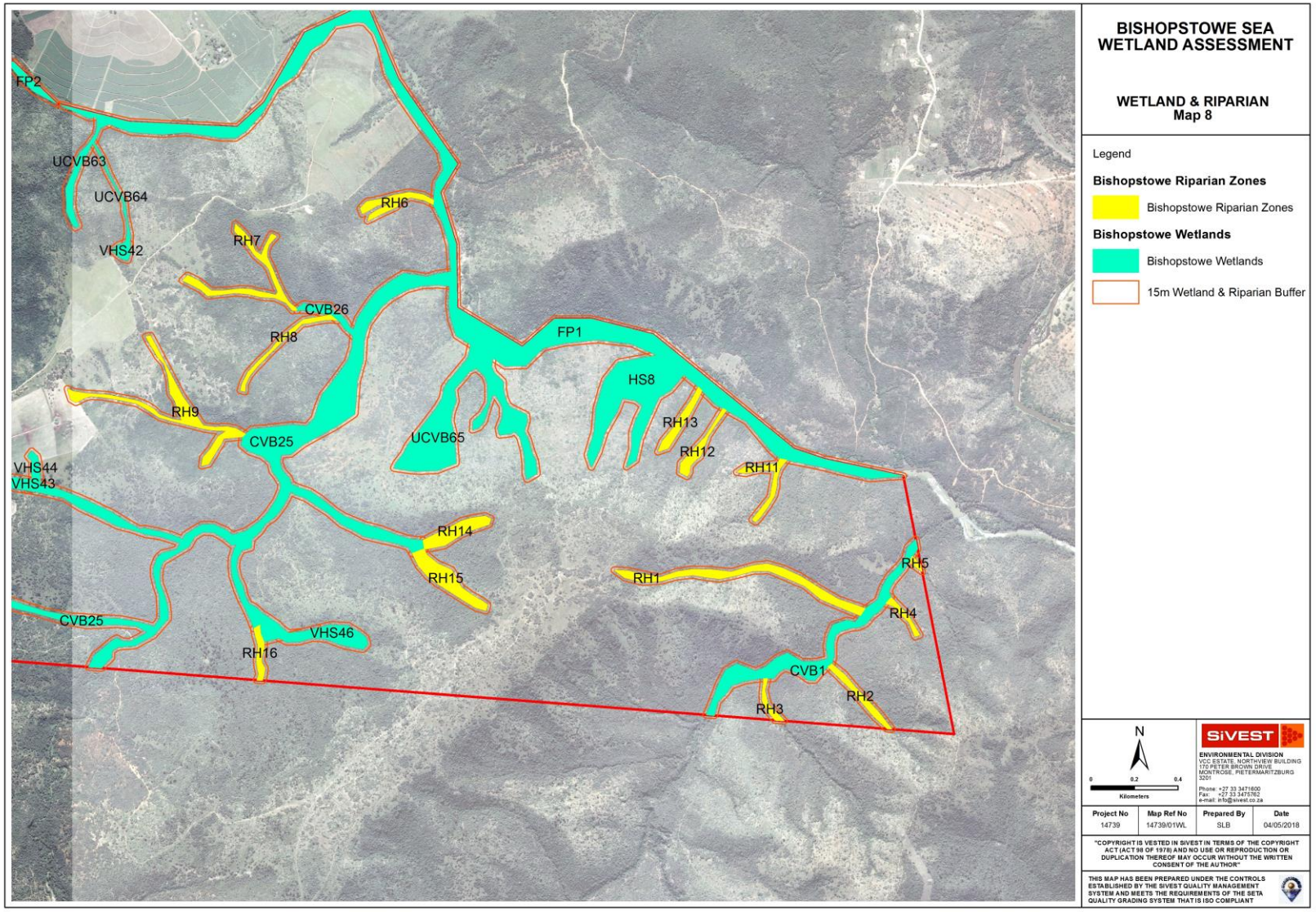

Figure 37: Wetland and Riparian Delineation with HGM units

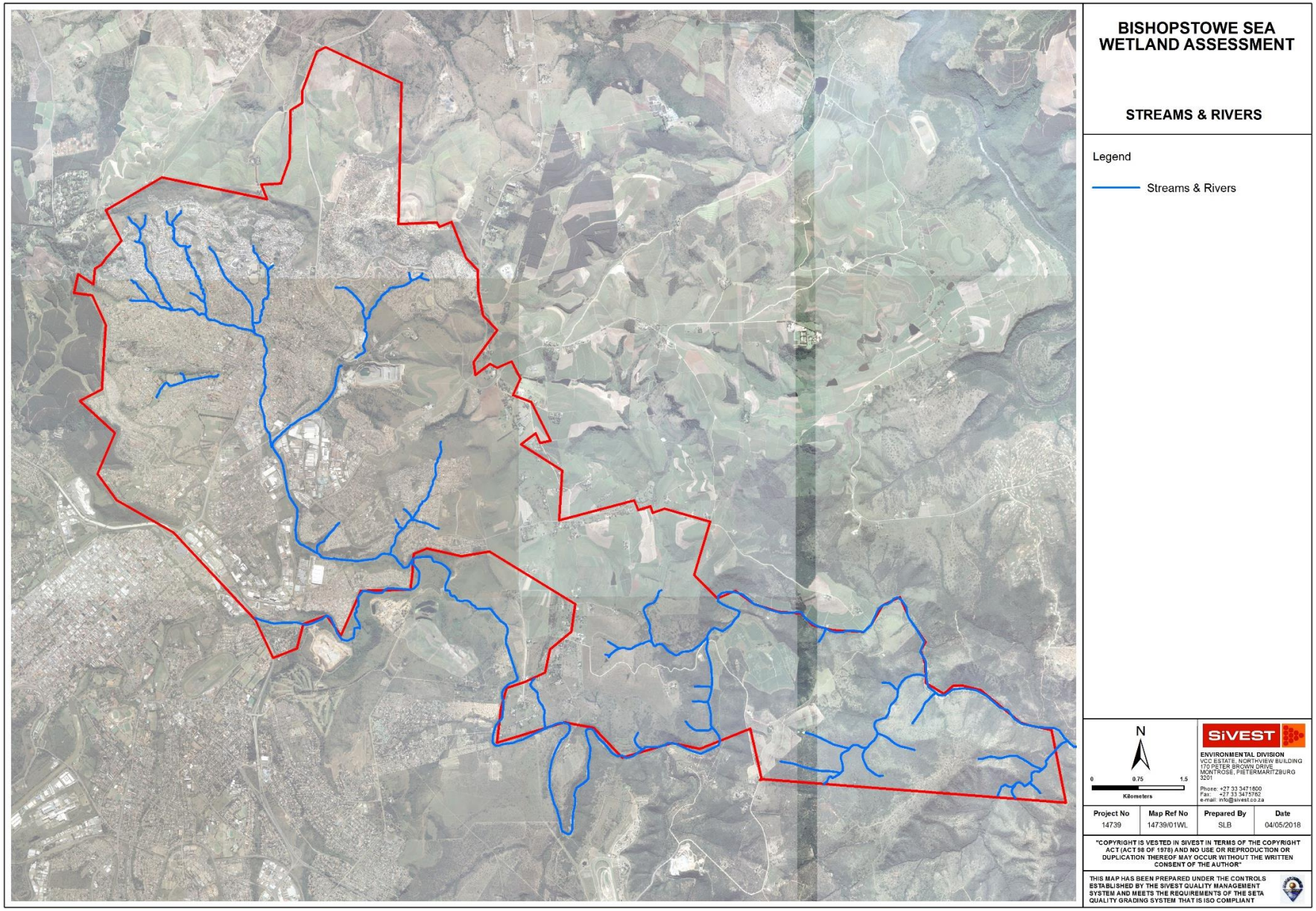

Figure 38: Streams & Rivers within the study area

4.3.4 Wetland health (PES)

In order to predict the potential impacts that a particular activity will have on a wetland system, it is important to first obtain a clear understanding of the current baseline health of the affected wetland. Thereafter, the effect of potential impacts i.e. the degree of change in a system, can be more scientifically and pragmatically assessed.

The formal health assessment of the wetland units indicates that the vast majority of the wetlands are **Largely Modified** resulting from past and current land uses and activities. While some of the wetlands within the western portion of the study area are **Seriously Modified**, and some of the wetlands within the eastern portion of the study area considered **Moderately Modified** or **Largely Natural**.

A summary of the Present Ecological Status (PES) based on results from the WET-Health Tool is provided in **Table 15** below.

Table 16: WET-Health Scores

HGM Unit	PES Score	PES Category
CVB1	1.5	B (Largely Natural)
CVB2	6.3	E (Seriously Modified)
CVB3	7.2	E (Seriously Modified)
CVB4	6.1	E (Seriously Modified)
CVB5	6.2	E (Seriously Modified)
CVB6	4.7	D (Largely Modified)
CVB7	5.3	D (Largely Modified)
CVB8	5.1	D (Largely Modified)
CVB9	5.2	D (Largely Modified)
CVB10	5.6	D (Largely Modified)
CVB11	5.5	D (Largely Modified)
CVB12	5.5	D (Largely Modified)
CVB13	4.9	D (Largely Modified)
CVB14	5.7	D (Largely Modified)
CVB15	5.8	D (Largely Modified)
CVB16	4.2	D (Largely Modified)
CVB17	4.6	D (Largely Modified)
CVB18	4.7	D (Largely Modified)
CVB19	4.6	D (Largely Modified)
CVB20	4.2	D (Largely Modified)
CVB21	4.1	D (Largely Modified)
CVB22	4.1	D (Largely Modified)

HGM Unit	PES Score	PES Category
CVB23	4.2	D (Largely Modified)
CVB24	4.3	D (Largely Modified)
CVB25	1.6	B (Largely Natural)
CVB26	1.5	B (Largely Natural)
CVB27	1.8	B (Largely Natural)
FP1	1.8	B (Largely Natural)
FP2	2.1	C (Moderately Modified)
FP3	1.7	B (Largely Natural)
FP4	1.4	B (Largely Natural)
FP5	1.6	B (Largely Natural)
FP6	2.2	C (Moderately Modified)
FP7	2.4	C (Moderately Modified)
FP8	3.4	C (Moderately Modified)
FP9	4.1	D (Largely Modified)
FP10	4.3	D (Largely Modified)
FP11	4.2	D (Largely Modified)
FP12	3.9	C (Moderately Modified)
HS1	5.2	D (Largely Modified)
HS2	5.5	D (Largely Modified)
HS3	4.4	D (Largely Modified)
HS4	3.8	C (Moderately Modified)
HS5	6.2	E (Seriously Modified)
HS6	4.2	D (Largely Modified)
HS7	4.6	D (Largely Modified)
HS8	1.1	B (Largely Natural)
UCVB1	5.7	D (Largely Modified)
UCVB2	5.2	D (Largely Modified)
UCVB3	5.5	D (Largely Modified)
UCVB4	5.2	D (Largely Modified)
UCVB5	3.8	C (Moderately Modified)
UCVB6	4.3	D (Largely Modified)
UCVB7	4.4	D (Largely Modified)
UCVB8	4.6	D (Largely Modified)
UCVB9	4.7	D (Largely Modified)
UCVB10	5.1	D (Largely Modified)
UCVB11	5.3	D (Largely Modified)
UCVB12	5.6	D (Largely Modified)
UCVB13	4.8	D (Largely Modified)
UCVB14	4.2	D (Largely Modified)
UCVB15	5.3	D (Largely Modified)

HGM Unit	PES Score	PES Category
UCVB16	5.5	D (Largely Modified)
UCVB17	5.5	D (Largely Modified)
UCVB18	5.6	D (Largely Modified)
UCVB19	5.7	D (Largely Modified)
UCVB20	6.2	E (Seriously Modified)
UCVB21	6.3	E (Seriously Modified)
UCVB22	5.7	D (Largely Modified)
UCVB23	5.5	D (Largely Modified)
UCVB24	5.5	D (Largely Modified)
UCVB25	5.7	D (Largely Modified)
UCVB26	4.9	D (Largely Modified)
UCVB27	4.8	D (Largely Modified)
UCVB28	5.1	D (Largely Modified)
UCVB29	5.3	D (Largely Modified)
UCVB30	5.4	D (Largely Modified)
UCVB31	5.2	D (Largely Modified)
UCVB32	5.4	D (Largely Modified)
UCVB33	4.2	D (Largely Modified)
UCVB34	5.3	D (Largely Modified)
UCVB35	4.6	D (Largely Modified)
UCVB36	4.1	D (Largely Modified)
UCVB37	4.2	D (Largely Modified)
UCVB38	4.4	D (Largely Modified)
UCVB39	5.2	D (Largely Modified)
UCVB40	5.1	D (Largely Modified)
UCVB41	4.7	D (Largely Modified)
UCVB42	4.9	D (Largely Modified)
UCVB43	5	D (Largely Modified)
UCVB44	5.1	D (Largely Modified)
UCVB45	5.3	D (Largely Modified)
UCVB46	4.5	D (Largely Modified)
UCVB47	4.4	D (Largely Modified)
UCVB48	4.6	D (Largely Modified)
UCVB49	5.6	D (Largely Modified)
UCVB50	6.1	E (Seriously Modified)
UCVB51	5.8	D (Largely Modified)
UCVB52	6.1	E (Seriously Modified)
UCVB53	6.2	E (Seriously Modified)
UCVB54	5.4	D (Largely Modified)
UCVB55	5.8	D (Largely Modified)

HGM Unit	PES Score	PES Category
UCVB56	5.5	D (Largely Modified)
UCVB57	4.8	D (Largely Modified)
UCVB58	5.7	D (Largely Modified)
UCVB59	5.8	D (Largely Modified)
UCVB60	5.9	D (Largely Modified)
UCVB61	5.5	D (Largely Modified)
UCVB62	5.6	D (Largely Modified)
UCVB63	1.7	B (Largely Natural)
UCVB64	1.6	B (Largely Natural)
UCVB65	1.4	B (Largely Natural)
VHS1	5.6	D (Largely Modified)
VHS2	4.8	D (Largely Modified)
VHS3	3.5	C (Moderately Modified)
VHS4	4.8	D (Largely Modified)
VHS5	4.2	D (Largely Modified)
VHS6	4.7	D (Largely Modified)
VHS7	5.1	D (Largely Modified)
VHS8	4.3	D (Largely Modified)
VHS9	4.1	D (Largely Modified)
VHS10	4	D (Largely Modified)
VHS11	4.2	D (Largely Modified)
VHS12	4.4	D (Largely Modified)
VHS13	4.5	D (Largely Modified)
VHS14	4.3	D (Largely Modified)
VHS15	4.6	D (Largely Modified)
VHS16	5.1	D (Largely Modified)
VHS17	5.2	D (Largely Modified)
VHS18	4.7	D (Largely Modified)
VHS19	4.5	D (Largely Modified)
VHS20	4.5	D (Largely Modified)
VHS21	4.7	D (Largely Modified)
VHS22	4.6	D (Largely Modified)
VHS23	4.1	D (Largely Modified)
VHS24	4.2	D (Largely Modified)
VHS25	4.2	D (Largely Modified)
VHS26	4.8	D (Largely Modified)
VHS27	4.5	D (Largely Modified)
VHS28	4.6	D (Largely Modified)
VHS29	4.4	D (Largely Modified)
VHS30	4.8	D (Largely Modified)

HGM Unit	PES Score	PES Category
VHS31	4.1	D (Largely Modified)
VHS32	4.7	D (Largely Modified)
VHS33	5.1	D (Largely Modified)
VHS34	4.2	D (Largely Modified)
VHS35	3.7	C (Moderately Modified)
VHS36	3.2	C (Moderately Modified)
VHS37	3.4	C (Moderately Modified)
VHS38	3.5	C (Moderately Modified)
VHS39	3.1	C (Moderately Modified)
VHS40	2.7	C (Moderately Modified)
VHS41	2.8	C (Moderately Modified)
VHS42	1.8	B (Largely Natural)
VHS43	3.1	C (Moderately Modified)
VHS44	2.8	C (Moderately Modified)
VHS45	2.7	C (Moderately Modified)
VHS46	1.1	B (Largely Natural)
VHS47	2.9	C (Moderately Modified)

4.3.5 Riparian health (PES)

The Index of Habitat Integrity tool (Kleynhans, 1996) was used to determine the integrity of the riparian zones. The results have been provided in Tables 16. The results for the system show a PES category of B: "*Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged*." The key change is the removal of indigenous vegetation due to settlement encroachment, the conversion of riparian edges and infestation by alien invasive plant species.

Table 17: PES category using the Index of Habitat Integrity tool (Kleynhans, 1999) for riparian systems

Riparian Area	PES Category
RH1	B (Largely Natural)
RH2	B (Largely Natural)
RH3	B (Largely Natural)
RH4	B (Largely Natural)
RH5	B (Largely Natural)
RH6	B (Largely Natural)
RH7	B (Largely Natural)
RH8	B (Largely Natural)
RH9	C (Moderately Modified)

RH10	C (Moderately Modified)
RH11	B (Largely Natural)
RH12	B (Largely Natural)
RH13	B (Largely Natural)
RH14	B (Largely Natural)
RH15	B (Largely Natural)
RH16	B (Largely Natural)
RH17	C (Moderately Modified)
RH18	C (Moderately Modified)
RH19	B (Largely Natural)
RH20	B (Largely Natural)
RH21	C (Moderately Modified)
RH22	B (Largely Natural)

4.3.6 Wetland Eco-services and importance

An understanding of a wetland's health does not necessarily give an indication of the wetland's value, although health and value are inextricably linked. For this reason, it is important to undertake an assessment of the importance of the ecosystem services provided by a wetland unit to gain an understanding of the conservation value of said wetland unit.

4.3.7 Wetland Units Eco-services

The wetland units were assessed as being of medium to moderately-high importance in terms of ecosystem service provision. The ability of the wetlands to trap additional sediment is of medium importance, while its tourism and cultural services are of low importance. The wetlands ability to attenuate floods and stream flow are generally considered of mediuim importance. Similarly, the ability of the wetlands to store carbon, and maintain biodiversity is of medium importance. The phosphate, Nitrate and toxicant removal ability is of medium high importance.

4.3.8 Wetland EIS Scores

During the site visit, minimal faunal activity was noted, and the possibility of wetland faunal and avi-faunal species being present at different times of the day and season is probably limited. The confidence levels for the assessment were generally moderate. The EIS scores, based on the **DWAF** (**1999**) scoring method, showed that the assessed units all fall into an EIS **Category B** or **C**, which corresponds to a High to Moderate importance and sensitivity in terms of the wetland.

4.3.11 Assumptions, uncertainties and limitations

With regards to the assessment of the importance of the wetland unit, it is important to note that the WET-EcoServices tool utilised in this assessment is a rapid assessment that gives a general indication of the level of ecosystem services provided by wetland.

Similarly, the WET-Health assessment tool utilised to determine the present state of the wetland units is also a rapid assessment tool. This assessment is also considered satisfactory for the purposes of this assessment. It is also important to note that the two assessments were used to assess the state and importance of the wetland units that may be impacted upon.

GPS accuracy is 3m or better, and therefore the mapped wetland edge may vary from on ground conditions. Additionally, the boundary of the wetland has been interpolated between sampling points using contours, and thus the mapped wetland edge may vary from the on ground conditions.

4.3.9 Wetland and Riparian Summary and way forward

SiVEST were appointed by Msunduzi Municipality to undertake a specialist wetland & riparian health and functionality assessment for the study area.

The wetlands within the study area were generally degraded to some degree, while some wetlands having been created through the development of industrial and housing sites, and the purposeful alteration of river courses and stormwater flows. Every wetland and riparian corridor sampled on site had some level of alien plant infestation, with some areas being comprised almost entirely of alien plant species.

The residential areas of Northdale, Raisthorpe, Woodlands, Rosedale and Orient Heights all share similar levels of disturbance to wetland and riparian habitat. Most of the wetlands within these residential areas drain towards the centre of the residential area, and then flow towards the Msunduzi River, which flows along the most of the southern and eastern boundaries of the study area. In essence the above residential areas form a large drainage basin, and generally the wetland systems can be characterised by seep wetlands along the upper reaches of the systems. These systems then progress towards the valley bottoms, and should generally be unchannelled valley bottom wetlands. As these systems near the Msunduzi River there is more floodplain wetland habitat, and the wetlands are generally channelled valley bottom wetlands. These wetland and riparian systems are generally of a poor quality, with associated low health scores, and low to medium ecosystem services being provided. The major impacts on these

systems include the historical infilling of wetland systems for housing development, and well as increases in stormwater flows associated with the increase in hardened surfaces within residential areas. The increased flows have led to extreme erosion of wetland habitat in many areas, and the creation of channels in previously unchannelled systems. Additionally, there is a high prevalence of alien plant species within the wetlands and riparian corridors, and high levels of domestic waste dumping within these systems. There is strong evidence that sewer overflows are occurring within all of these systems, and this exacerbates the alien plant infestation by providing extremely high levels of nitrogen and phosphate that are best exploited by alien invasives. The extreme nature of pollution within these systems, and the low level of ecosystem services provided by these systems, is evidenced by the extremely low water quality of the Baynespruit River which drains the majority of the water from the residential basin.

The residential and industrial areas of Willowton, Eastwood and Copesville, all share similar characteristics, and similar levels of disturbance. These systems have generally not been as heavily impacted by infilling of actual wetland habitat, and there are still some wetland and riparian areas that are of a low to medium health and medium ecosystem services delivery. These systems also drain from the higher lying ground in the Northern portion of the study area, towards the Msunduzi River that runs along much of the southern boundary of the study area. The wetland and riparian habitat within these areas also show increased stormwater impacts from the increased hardened surfaces within these areas, and this has led to erosion of many areas through scouring. The upper reaches of some of the systems within Copesville are relatively intact in terms of geomorphology and hydrology, but alien vegetation is still very prevalent. The greatest impact that the systems in this area are exposed to is the pollution of water resources through a number of inputs. The informal nature of much of Copesville means that there are few sewer lines within the area, and much of the sewerage produced by the area is flowing into the groundwater through pit latrines, or through direct release into surface water resources. Additionally, there are high levels of illegal dumping within wetland and riparian systems throughout the area, and grazing of cattle has an additional impact. Further downstream the systems are impacted upon by the stone quarry that dominates the centre of the study area, as well as the industrial sites and associated factories that form the Willowton area. These industrial and mining activities are impacting the wetland and riparian systems through the release of effluent from the processes undertaken within the factories and quarry. The quarry has a buffer zone around it (due to safety considerations), and this exclusion zone has allowed a few small systems to remain relatively healthy, but lower lying system downstream of the site show increased siltation through the dust created during blasting and processing of the rock and stone from the quarry site. Some of the factories that form Willowton produce industrial effluent, and the cumulative impact of these inputs is the high levels of pollution that are recorded in the Baynespruit River (as noted above). The residential area of Eastwood is surrounded by some open areas. Wetlands and riparian corridors within this area are generally low to medium health, but the upper reaches of some

system have not been as heavily impacted by development, dumping and pollution. The greatest impact to some of these systems is the overuse of the systems for grazing and browsing by cattle and goats, and the high prevalence of alien plant species within these systems. The lower reaches of the systems within Eastwood have been impacted in much the same way as the other residential areas noted above, with increased stormwater impacts from more hardened surfaces, and the associated erosion that occurs. These systems have also been impacted by illegal dumping in the lower reaches and increased sewerage inputs.

The area to the east of Eastwood is generally comprised of small holdings and commercial farms, with the emphasis on production of sugarcane. Large portions of the study area within this eastern region are currently undeveloped, and border the Msunduzi River as it loops northwards and then eastwards again. The majority of this undeveloped land has been incorporated in the Lower Mpushini Valley Conservancy (LMVC) area, and is managed for biodiversity and conservation. There are a few portions of commercial agriculture within the LMVC, but these are confined to the higher lying areas away from the Msunduzi River and associated wetland and riparian habitat. The wetlands within the farming area have generally been impacted upon the least, but still have only medium health and medium ecosystem services. The majority of impacts to the wetlands on site are related to the clearing of the wetland and riparian systems for sugarcane production, and the creation of channels to aid in removing water from the site at a higher rate. The level of alien vegetation infestation tends to be lower since individual landowners are more likely to control alien species within a farming context. The wetlands are the least impacted by waste and pollution, and increases in phosphate and nitrogen levels are likely to only occur when the farmer fertilises the fields. In addition, erosion is less of an issue, with the greatest impacts normally associated with purposely dug drains, and the increased siltation loads that may periodically occur during the interval between harvesting of the sugarcane, and the planting of the next crop.

In general, the wetlands and riparian corridors within the study area have medium to low health, and provide low to medium ecosystem services. The majority of impacts to wetland and riparian areas within the western portion of the study area relate to the infilling of wetland, increased hard surfaces, and pollution of the wetland through illegal dumping, sewer inputs and industrial effluent streams. The majority of wetlands within the eastern portion of the study area have better health and ecosystem services provision, but are impacted by the historical use of the system for sugarcane production. All of the systems noted within the study area ultimately flow into the Msunduzi River, which defines most of the southern and eastern boundary of the study area.

Any development within 500m of a wetland requires a water use license from the Department of Water and Sanitation, and it is recommended that a meeting be sought to discuss any proposed projects with the Department of Water and Sanitation to determine any license requirements relating to a given project.

5 PUBLIC PARTICIPATION

The SEA has undergone an extensive consultative and public participation process. This included;

- Advertisements in two local newspapers in English and isiZulu;
    - The English advert appeared in the Witness on 23rd February 2018.
    - The isiZulu advert was placed in the Echo on 1st March 2018.
- The second draft of the SEA was circulated to Interested and Affected Parties and stakeholders for comment on 2nd August 2018, and underwent a 30-day comment period. The document was circulated to the following identified IAPs/ stakeholders;

NAME	ORGANISATION/INTEREST
Dominic Wiener	Ezemvelo KZN Wildlife
Michele Schmidt	Department of Transport
Nandipha Sontangane	Department of Agriculture, Forestry and Fisheries.
Ishaan Ramklown	SANRAL
Claudell Milany Chetty	Ward 28 councillor
Spha Sydney Madlala	Ward 29 councillor
Renesha Jugmohan	Ward 30 councillor
Rooksana Ahmed	Ward 31 councillor
Clive Otis Lots	Ward 32 councillor
Sandile Wellington Dlamini	Ward 35 councillor
Mr. Neville Durow	Treasurer Lower Mpushini Valley Conservancy
Ian Felton	Assistant Director: Environmental Planning:Environmental Management Inspector
Pandora Long	Interested party
Nora Choveaux	Interested party
Alfred Miskey	Homeowner
James Hackland	Cloud Hill Farm

- Furthermore, the document was circulated within the Msunduzi Municipality for comment.
- Comments received from I&APs as well as relevant authorities were included in the final SEA report.
- A presentation on the SEA Report was given to the Sustainable Development & City Enterprises Portfolio Committee.
- No formal objections to the SEA were lodged or noted during the Public Participation Process.
- Furthermore, The Msunduzi Town Planning Unit have commented that the SEA is in agreement with current spatial planning policies.

6 POLICY ANALYSIS

The purpose of this section is to set out the policy directives of the Msunduzi Municipality with regard to the environmental and development objectives. These may be captured as follows:

6.1 Msunduzi Integrated Development Plan (IDP) Review 2017/2022

The Integrated Development Plan for the Msunduzi Municipality is a documented approach to regional development within the boundaries of the Msunduzi Municipality. This document attempts to addresses the social, economic, environmental and spatial inequalities within the Municipality.

The IDP is a five-year plan, which attempts to address these inequalities whilst at the same time guiding development and growth. The IDP envisions the Msunduzi to be a ***"A safe, vibrant city in which to live, learn, raise a family, work, play and do business"*** (The Msunduzi IDP Review 2017/2022: 21). It also noted that the municipality intends to be a *"City of Choice, second to none, by developing a city where the entire citizenry can: -*

- Own a financially viable and well governed city
- Live in peacefully;
- Move about freely and in a cost-effective manner;
- Work to earn a living, thereby reducing unemployment, poverty, and inequality; and
- Play to lead a healthy lifestyle, thus increasing life expectancy (Ibid).

The Msunduzi IDP (2017/2022: 47) is underpinned by the following principles: -

- Compaction;
- Encouraging settlement at existing and proposed sustainable urban centres and settlement corridors and promoting densification in order to discourage urban sprawl. Channelling future settlement and economic development opportunities into activity corridors and urban centres/hubs that are adjacent to or that link the main growth centre;
- The direction of new development towards logical infill areas;
- Focusing development/investment on localities with economic growth and/or economic potential;
- Planning and subsequent development must strive to provide the highest level of accessibility to resources, services, and opportunities;
- Balance between urban and rural land development in support of each other;
- Prime and unique agricultural land, the environment, and other protected lands must be protected and land must be safely utilised;

- Providing low- income housing in close proximity to areas of opportunity; and
- Promoting the principle of self-sufficiency by reducing the need to travel and an assessment of each area's unique competencies towards its own self- reliance.

Implications for Bishopstowe Study Area

The IDP calls for the packaging of geographic localities within its jurisdiction into lower order plans through the use of Area Based Management (ABM). These ABM's are aligned to the municipalities development vision and trajectory whilst promoting and coordinating sustainable development which responds to the economic, environmental and social needs/challenges facing the municipality.

To this end, the IDP has established the Northern Areas ABM of which the Bishopstowe Study Area falls squarely within. The Northern Areas ABM consists of portions of the CBD, Clarendon, Montrose, Chase Valley, Woodlands, Northdale, Raisethorpe, and Bishopstowe (IDP Review 2017/2022: 63). The Northern Areas ABM (2017) unpack the desired environmental, spatial and land use directives within the study area.

6.2 Msunduzi Strategic Environmental Assessment (SEA) (2010: 1-54)

Strategic Environmental Assessment (SEA) refers to a process that integrates sustainability considerations into the formulation, assessment and implementation of policies, plans and programmes within an area. The introduction of SEA has emanated from the limitations of project specific Environmental Impact Assessment (EIA's) and the need to ensure that environmental issues are proactively addressed in policies, plans and programs. EIA's can only consider the effect any proposed development may have on the biophysical and socioeconomic environment (SEA 2010: 1-2).

SEA's in contrast strategically determine the opportunities and constraints that the environment poses to future development. This enables planners to identify areas where development would be sustainable, and therefore the requirements for impact mitigation lower, and areas where development should be limited. To this end an SEA should:

- Identify issues, conflicts and proposed/ potential alternatives;
- Define the required level of environmental quality through stakeholder engagement;
- Explore environmental opportunities and constraints; and
- Provide a framework to assess the sustainability of existing and / or future plans and programs (ibid).

The Msunduzi SEA advances a sustainability appraisal matrix which is tasked with comparing the extent to which the municipal SDF scenario/land use intentions and the current status of the various ABMs in the municipality contribute towards, or detract from, sustainability within Msunduzi. Such a sustainability appraisal matrix entailed defining the sustainability criteria which was measured against of biophysical, social, economic and governance factors in so far as municipal assets are concerned against the proposals of the then SDF. The comparison was undertaken for each of the ABM areas. To this end, it is well worth noting that the following salient points may be drawn in so far as the Northern Areas and the intentions of the SDF are concerned:

a) The ABM broadly hosts steep slopes and a highly transformed aquatic system. The area is also characterised by a large amount of open space opportunities of which its associated use is limited by the lack of social facilities and security concerns. The associated infrastructural capacity underpinning the area has almost reached capacity constraints whilst the space to upgrade same remains limited.
b) Broadly the area hosts residential developments coexisting with economic activities in the form of Cascades Shopping Centre and surrounding areas.
c) Residential development in the Woodlands and Eastwood areas;
d) Activity spines from Liberty Midlands Mall to Cascades and along the Old Greytown Road;
e) An in-situ upgrade of the existing informal housing at Sobantu;
f) Identification of key nodal areas and their associated potential upgrades, i.e.:
    - ‘’A community node which requires consolidation and upgrading in the vicinity of the Cascades Shopping centre;
    - A new administrative node within the Town Hill Hospital grounds
    - Two community nodes on the Old Greytown Road, that require consolidation and upgrading; and
    - Two economic activity nodes at The Liberty Midlands Mall and opposite the Northdale Hospital’’

The SEA suggests that the proposals advanced by the SDF, in the event of bearing environmental implications may be addressed through site specific design (SEA 2010: 53). It further suggests that by setting aside areas of restricted use through open spaces and areas of environmental significance, the SDF by default promotes the protection of sensitive habitats inclusive of the goods and services offered by ecosystems found in environmentally sensitive areas (ibid).

Implications for Bishopstowe Study Area

The SEA advances that the development proposals advanced by the then SDF on the overall biophysical environment may be mitigated against through site specific design where applicable. It notes that most of the areas which comprise of critical environmental elements must be set aside for environmental purposes and development should not encroach therein.

6.3 Msunduzi Integrated Environmental Management Policy (IEMP) 2016

The Integrated Environmental Management Policy guides the Msunduzi Municipality's integrated approach in relation to environmental governance and sustainability in the jurisdictional area of the Municipality.

Msunduzi has a diversity of land uses, inclusive of residential, industrial, commercial, agricultural as well as natural (environmental) open spaces. In an attempt to promote sustainable development, the IEMP is a step toward promoting development in an economically and environmentally sustainable manner. It is vital to sustain a balance between the economic, social and environmental spheres, and to protect ecological infrastructure in order to promote sustainable development. The IEMP addresses the sustainable use of ecological infrastructure and ecosystem goods and services.

The Environmental vision for Msunduzi is to gradually achieve its environmental policy to ensure that Msunduzi will:

- Be a safe, clean and hygienic environment with an integrated open space system;
- Have environmentally responsible citizens;
- Achieve legislated minimum ambient air quality standards and waste management practices;
- Achieve minimum pollution by industries through implementing policies and compliance procedures;
- Have a variety of approaches to ensure environmental sustainability;
- Achieve a balance between the economic, social and environmental factors;
- Develop the city's tourism potential;
- Be socially responsible and give practical considerations to support environmental services and promote sustainable development, inclusivity, environmental justice and equitable access to environmental services.

In order to achieve the Environmental vision, the IEMP outlines a set of goals and development ranking matrix (Msunduzi IEMP: 2016) which are briefly shown in Figure 39 as follows.

Water Resources and Riparian Areas	•To have access to healthy, functioning water resources and riparian areas . Provide residents with internationally accredited quality potable water. To develop and implement good catchment management strategies
Climate Change Resilience	•Ensuring that risks associated with climate change impacts are identified, and that mitigation and adaption options are put in place .
Green Design	•Planning and constructing new buildings and existing buildings in a resource-efficient manner through sustainable green building principles.
Landscapes and Townscapes	•To improve the quality of vacant land and sustainable use of land available for development.
Environmental Offsets	•To ensure unavoidable cumulative loss of ecological infrastructure is mitigated.
Waste	•To promote an environment that is not detrimental to human health and wellbeing through the implementation of an integrated waste management and minimization strategy.
Economy	•To promote the sustainable use by residents of ecosystem goods and services provided by ecological infrastructure and encourage the provision of green jobs through a green economy.
Environmental Education	•To promote environmental education and awareness that enhances the understanding of environmental rights, responsibilities and the appreciation of the environment.
Cultural Heritage	•To ensure the long-term protection and maintenance of cultural heritage areas and buildings.
Environmental Education	•To promote environmental education and awareness that enhances the understanding of environmental rights, responsibilities and the appreciation of the environment.
Environmental Compliance and Enforcement	•To have trained EMI's within the Municipality who actively enforce compliance with the Municipalities environmental management bylaws and gazetted EMF.
Integrated and Cooperative Local Environmental Governance	•To create an operational, suitably resourced and coordinated institutional framework able to support the implementation of this policy.
Environmental Management of Sensitive Areas and Ecological Infrastructure	•To ensure the long-term functionality and protection of Msunduzi's biodiversity and ecological infrastructure through the protection and management of such areas.
Biodiversity and Open Spaces	•To ensure the long-term sustainability and protection of Msunduzi's biodiversity by the formalization and adoption of an open space system.
Indigenous Trees and Forests	•To ensure the protection of indigenous trees and to restore Msunduzi to its 'Garden City' status.
Air Quality	•To live in an environment that is not detrimental to human health and wellbeing with respects to air pollution.

Figure 39: Consolidated Ranking Matrix

Implications for Bishopstowe Study Area

Similarly, to the climate change policy, the IEMP assists in the establishment of environmental goals and a development ranking matrix which ensures that proposed activities within the study area do not adversely affect the natural environment thus meeting the core objectives of sustainability.

6.4 Msunduzi Environmental Management Framework (EMF) 2010

The EMF stemmed from the Msunduzi Municipality's recognition to support sustainable social, economic and environmental development whilst ensuring the need for adoption and implementation of an appropriate policy to inform development planning and approval (EMF 2010: 1).

The purpose of the greater Msunduzi EMF is to provide for informed decision making framework against which plans, programs and policies can be assessed in terms of future development proceedings within the municipality's area of jurisdiction. In this regard the EMF puts forward the following broad objectives, which are to:

- Identify areas both suitable and unsuitable for development;
- Provide information to assist decision making (such as development applications) and thereby streamline the process;
- Identify environmentally sensitive areas that require protection so as to ensure ecosystem service delivery; and
- Provide environmental goals and mechanisms to achieve the objectives as stated. (The Msunduzi EMF 2010:1-2)

In line with the Msunduzi Municipality's SEA's sustainability criteria, the EMF (2010: 17-18) has advanced a set of environmental management priorities which are summarised in Table 17 as follows:

Table 18: Environmental Management Priorities

Objective	Criteria
Biophysical	
Efficient and sustainable use of natural resources	Degraded areas are identified and rehabilitated Aquatic ecosystems are in a healthy state Areas of high biological diversity, are utilised and managed Alien invasive species are controlled and managed Wetland areas, streams and rivers are preserved, rehabilitated and managed to maintain ecological function

Objective	Criteria
	Flood prone areas are managed Areas of geotechnical or geological risk or instability are delineated High potential agricultural land is used for sustainable agricultural production Minimum air quality standards are maintained The use of renewable resources is promoted A carbon neutral state is achieved through appropriate greenhouse gas emission reductions, the use of alternative technology and carbon off-setting schemes
Social	
Basic human needs must be met to ensure resources necessary for long- term survival are not destroyed for short term gain	A basic level of water supply is provided to all Access to appropriate, secure and affordable housing; and have access to public services Communities vulnerable to environmental risk are identified Recovery, re-use and recycling of materials undertaken. Efficient and effective liquid waste management An efficient, safe, integrated and convenient network of public transport, and non-motorised transport Services, amenities, buildings, facilities, community parks and open spaces are accessible to all people Safe, clean and pleasant environments are provided. High quality, affordable formal education is available and accessible Indigenous ecological and cultural knowledge is developed Cultural and natural heritage resources are protected and maintained
Economic	
Socio- economic systems are embedded within, and dependent upon, eco-systems	Development is informed by social needs and the improvement of quality of life Alternative sustainable livelihood strategies are promoted. An equitable and broad range of employment opportunities exist Infrastructure and facilities are well-maintained Most of the daily food needs of Msunduzi are sustainably grown, processed and packaged Green design principles are used Clean, renewable and efficient energy sources are promoted City finances are managed responsibly The cost of ecosystem goods and services are integrated into development planning
Governance	
An enabling environment for ongoing dialogue between all role-players is	Environmental issues are prioritised and are integrated with municipal planning Decision-making processes are defensible, clear and transparent Participation in LA21 is increased Capital investment projects adhere to legislated requirements and Integrated Environmental Management principles Msunduzi is prepared to respond rapidly and to deal effectively with known hazards and

Objective	Criteria
created.	emerging threats, Access to environmental information is facilitated and encouraged Regular monitoring is undertaken Communities are informed, empowered and involved in the process of democratic governance

In order to bring the aforementioned objectives to realisation, the Msunduzi EMF (2010: 19-26) advances a set of environmental management zones which act as a development and environmental encumbrance to development and the associated land uses therein. To this end the EMF advances the following set of environmental management zones which may be summarised as follows:

- **Wetland Conservation and Buffer Zones**: comprises of environmental wetland areas which consist of biodiversity and water conservation properties. The municipality has introduced broad environmental wetland categorisations which include wetland areas, wetland buffer areas and areas off low constraint.
- **Biodiversity Conservation Zones**: comprise of high biodiversity areas which are prized for their intrinsic value and the ecosystem goods and services that they provide. A number of key biodiversity areas that support ecosystem goods and services were identified the municipality. These areas were identified during through the development of a fine resolution Conservation Plan (C-Plan) for the Municipality.
- **Flood Risk Zone**: These areas were identified through previous flood line studies within the municipality as well as indicative flood zones around the major rivers within the Msunduzi River catchment. These flood zones represent the high developmental constraint within a possible flood zone. In cases where the flood zone width was less than the National Environmental Management Act (NEMA) recommended environmental development buffer of 32m, the 32m buffer were used to establish these zones.
- **Agricultural Zone**: these include identified areas of potentially high agricultural value due to soil properties, climatic conditions and slopes. The EMF has identified four broad agricultural categorisations which include high agricultural potential, good agricultural potential, low agricultural potential and agricultural potential lost due to transformation.
- **Slopes**: these comprise of extremely steep, steep, moderate, gentle and unknown slopes which act as key development informants in terms of the associated development proceedings within the municipality's area of jurisdiction. Generally, extremely steep and steep slopes present unfavourable development potential.
- **Air Quality**: comprises of high, medium and low quality constraint areas of which the associated development initiatives should proactively take cognisance of and propose alternate mitigation measures should the need arise (i.e. industrial land uses in high air quality areas).

- **Water Quality**: comprises of high, moderate and low water quality constraints within the jurisdiction of the municipality of which the associated development proposal need to duly take cognisance of and interrogate the associated potential therein.
- **Cultural Heritage Zones:** comprises of areas of Cultural Heritage which aided in their associated categorisation which include, namely the cultural heritage zone and low cultural heritage significance areas.
- **Service Delivery zones**: these include areas comprising of servicing capacity and associated lack thereof in terms of bulk infrastructure including water, sanitation, roads, electricity, waste and storm water. Furthermore, these areas also include future infrastructural expansion areas within the municipality. Broadly the municipality categorised these areas as low service delivery zones, medium service delivery zones, high service delivery zones and very high service delivery zones.

The environmental elements as advanced by the EMF are broken down as follows:

Type of EMF Input	Breakdown
Wetland Conservation and Buffer Zones	**Ha**
No Wetland Area Identified	6174
Identified Wetland Area	314
Identified Wetland Buffer Area	245
Biodiversity Zones	**Ha**
High Development Constraints	805
Development Constraints	2139
No Constraints	3659
Flood Risk Zones	
None	6551
Within Flood Zone	176
Agricultural Potential	**Ha**
None	6603
Reserve for Agriculture	197
Investigation for Agricultural Potential	881
Slopes	**Ha**
Extremely Flat	391
Moderate Slope	2158.22
Steep	1629
Extremely Steep	1608

Not Surveyed	842.34
Air Quality	**Ha**
Low Air Quality Constraints	1157
Temporal Air Quality Constraints	1821
High Quality Constraints	3756
Water Quality	**Ha**
Catchment Management Intervention Required	3891
No Catchment Management Required Prior Development	2481
Not Surveyed	362
Cultural Heritage Zones	**Ha**
Base	6644
Zone of Cultural Significance (Royston Road and Apollo Road)	8
Zone of Historical and Cultural Significance (Sobantu)	81
Archaeological Site	0.09
Forest Hill Primary School	0
Environmental Service Delivery Zones/Areas	**Ha**
Very High Service Levels	4574
High Service Levels	564
Medium Service Levels	1268
Low Service Levels	329

The aforementioned zones and elements through the use of the Msunduzi EMF shapefile data (2010) area are spatially represented as follows:

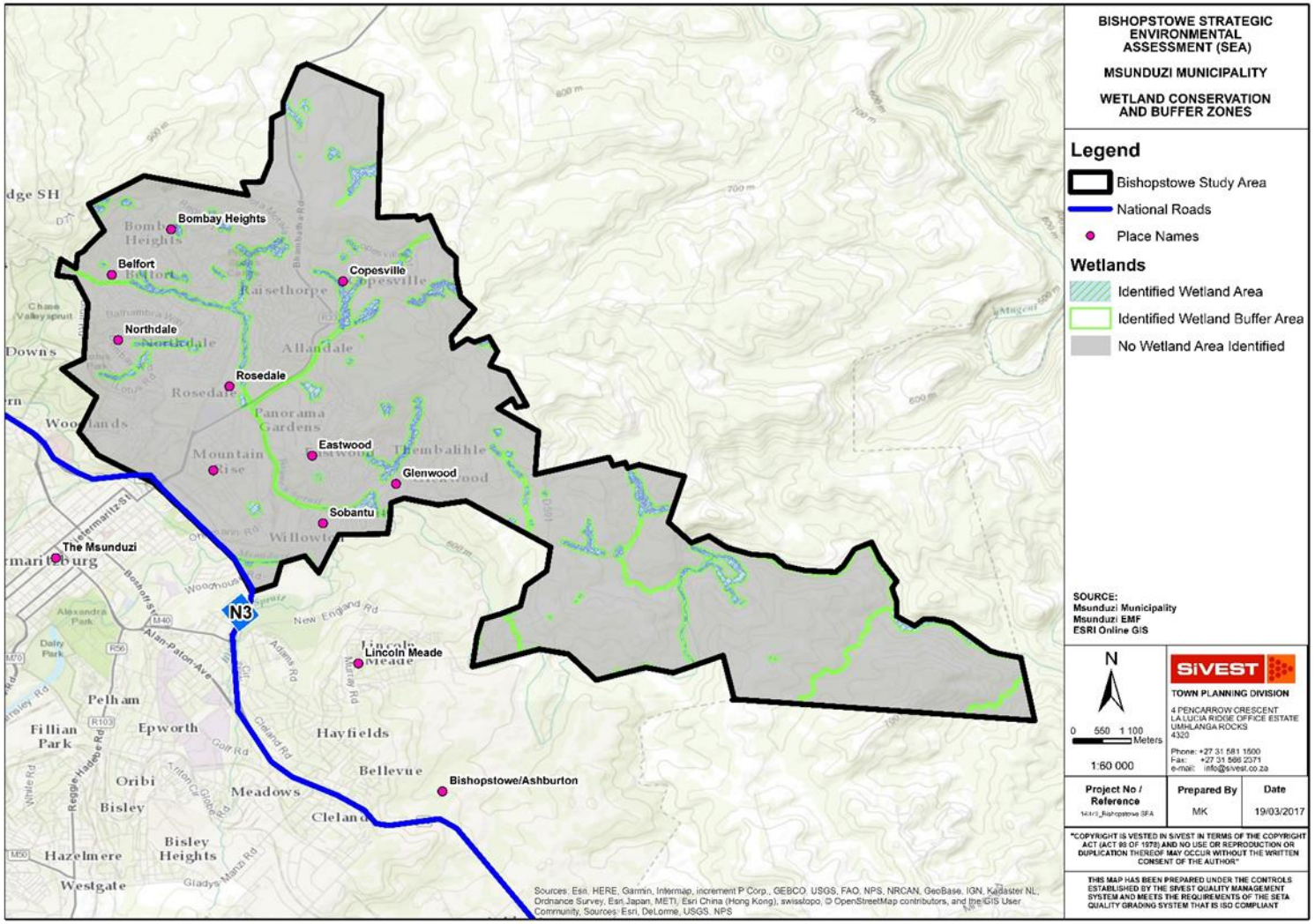

Figure 40: Identified Wetland Conservation and Buffer Zones Within Bishopstowe Study Area

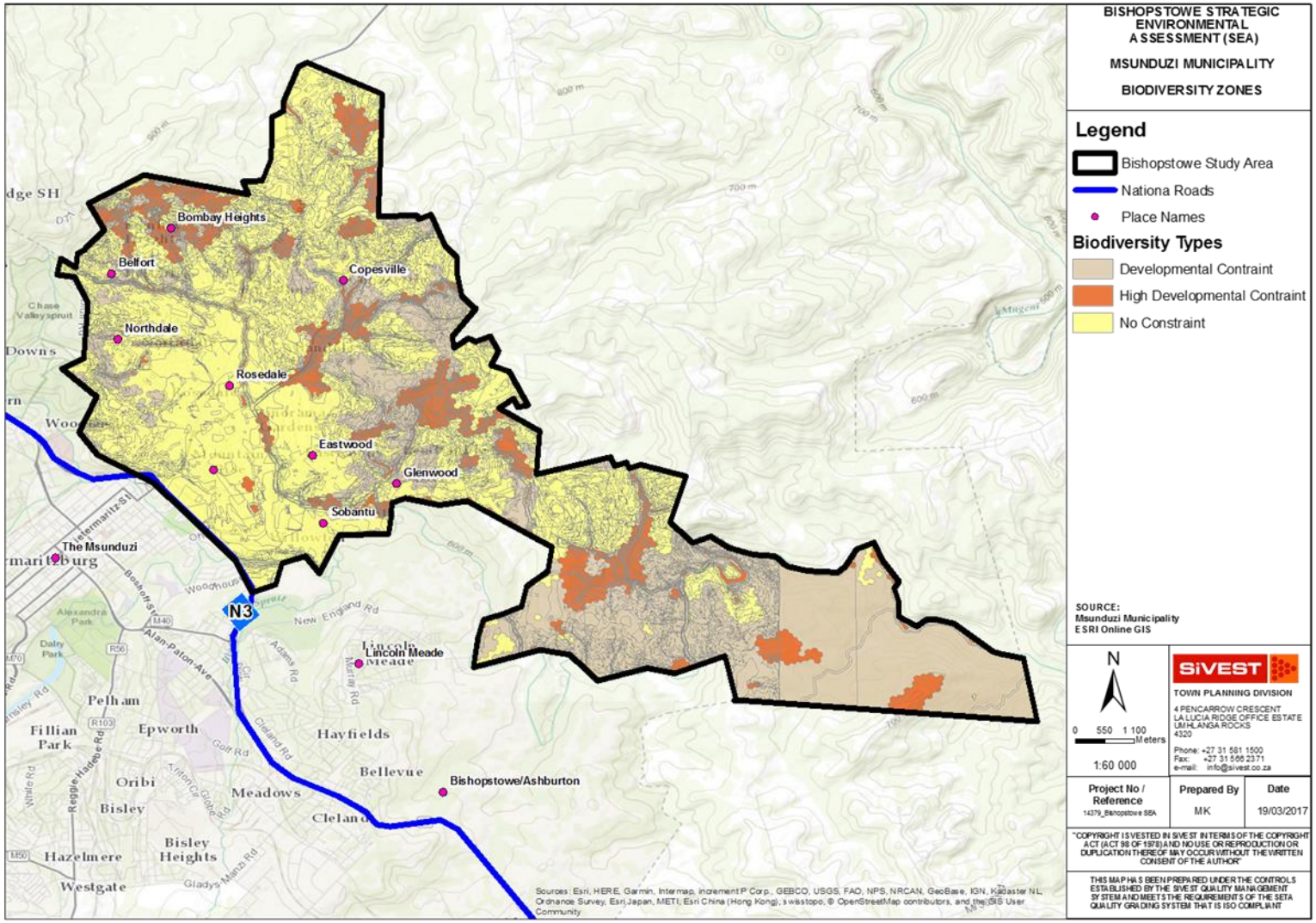

Figure 41: Identified Biodiversity Zones Within Bishopstowe Study Area

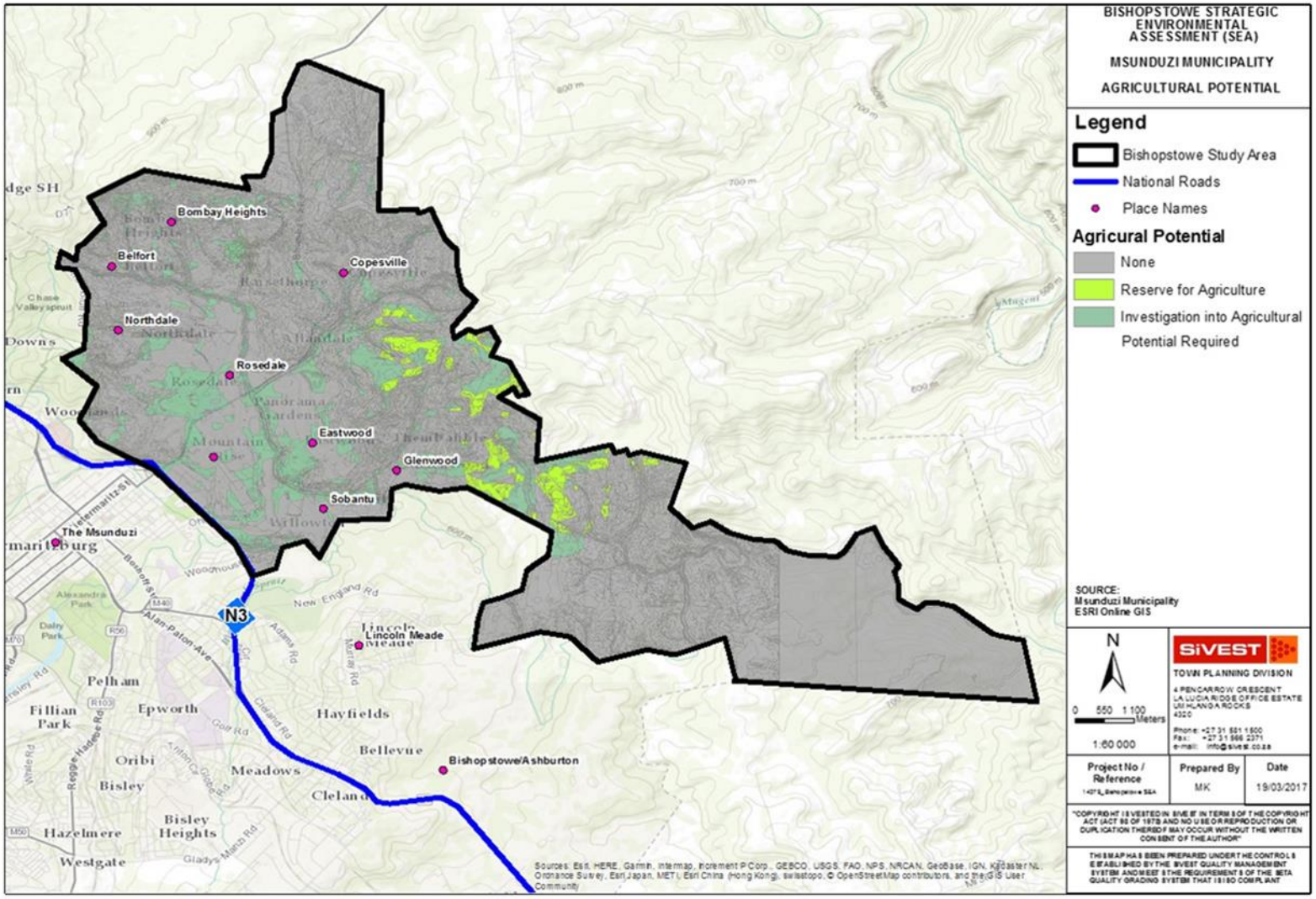

Figure 42: Identified Areas of Agricultural Potential Within Bishopstowe Study Area

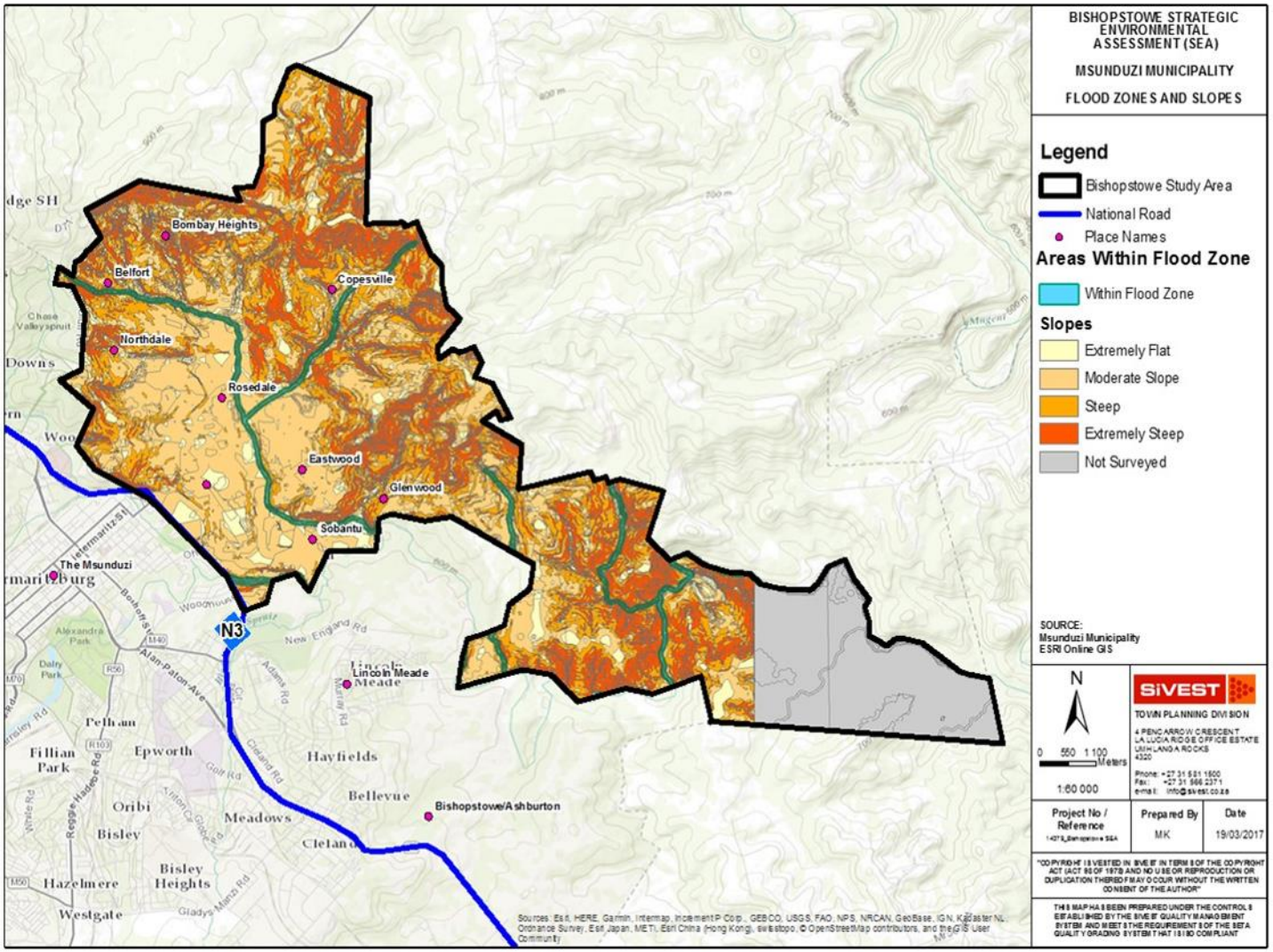

Figure 43: Identified Flood Zones and Slopes Within Bishopstowe Study Area

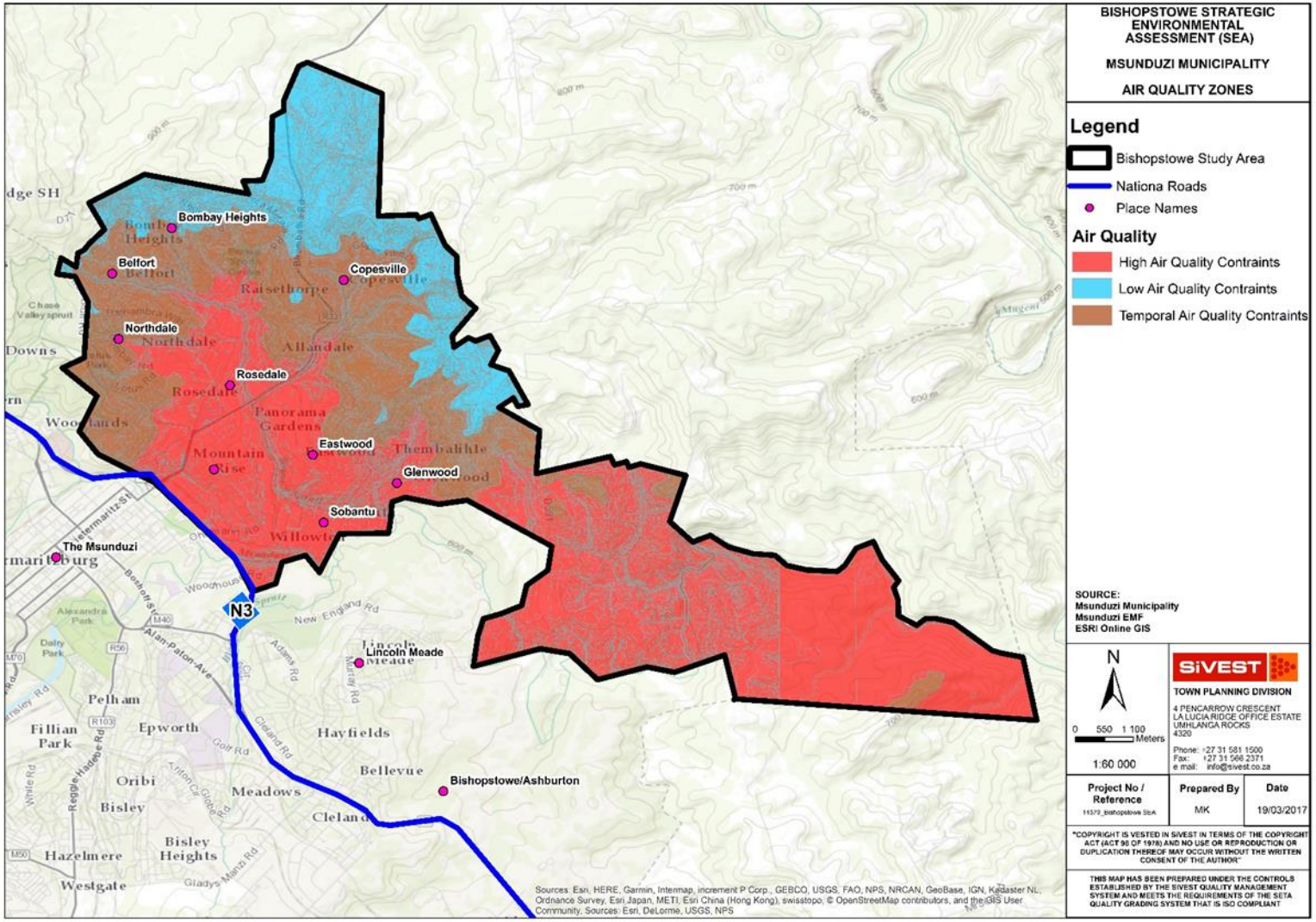

Figure 44: Identified Air Quality Zones Within Bishopstowe Study Area

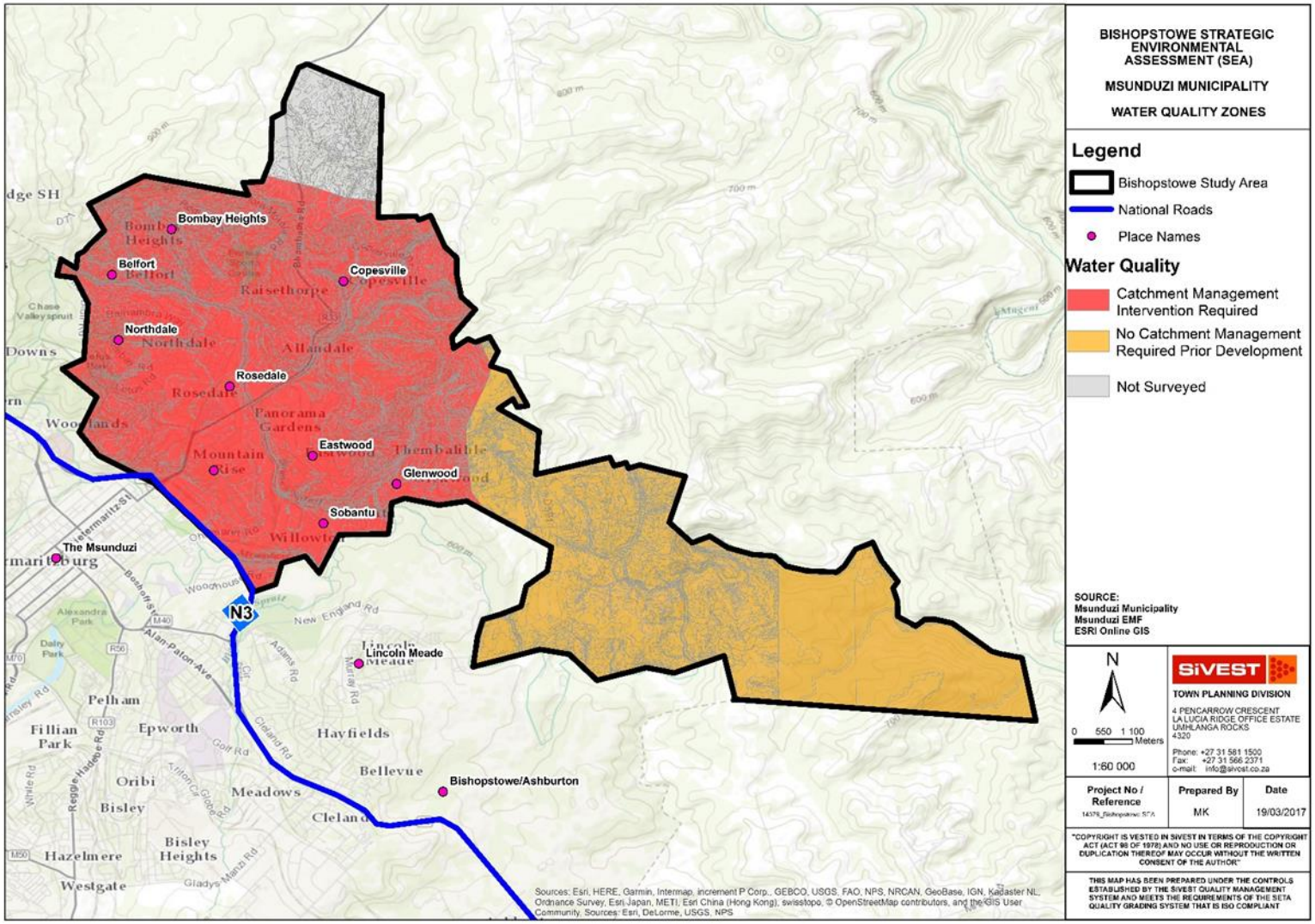

Figure 45: Identified Water Quality Zones and Slopes Within Bishopstowe Study Area

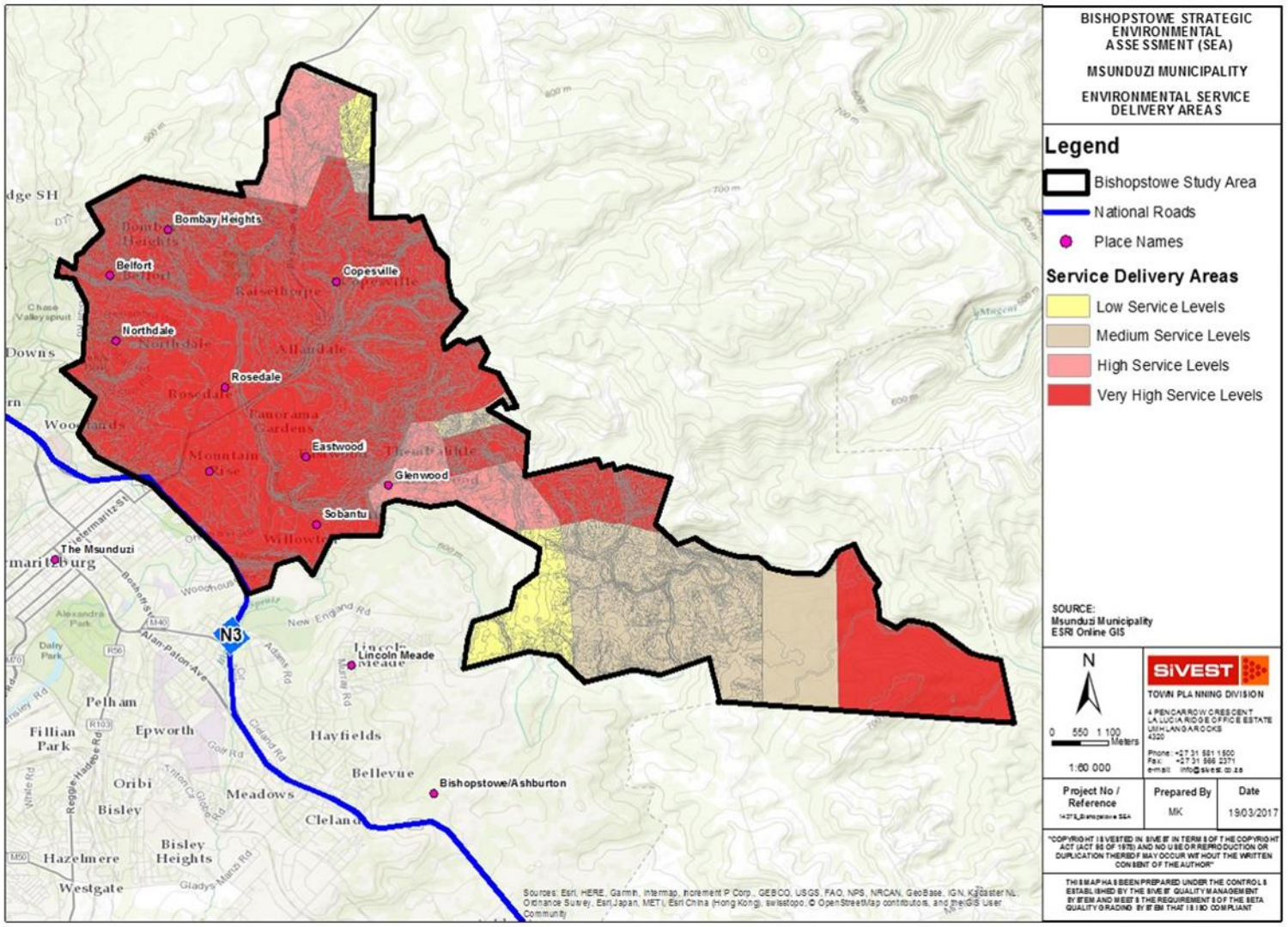

Figure 46: Identified Environmental Service Delivery Zones/Within Bishopstowe Study Area

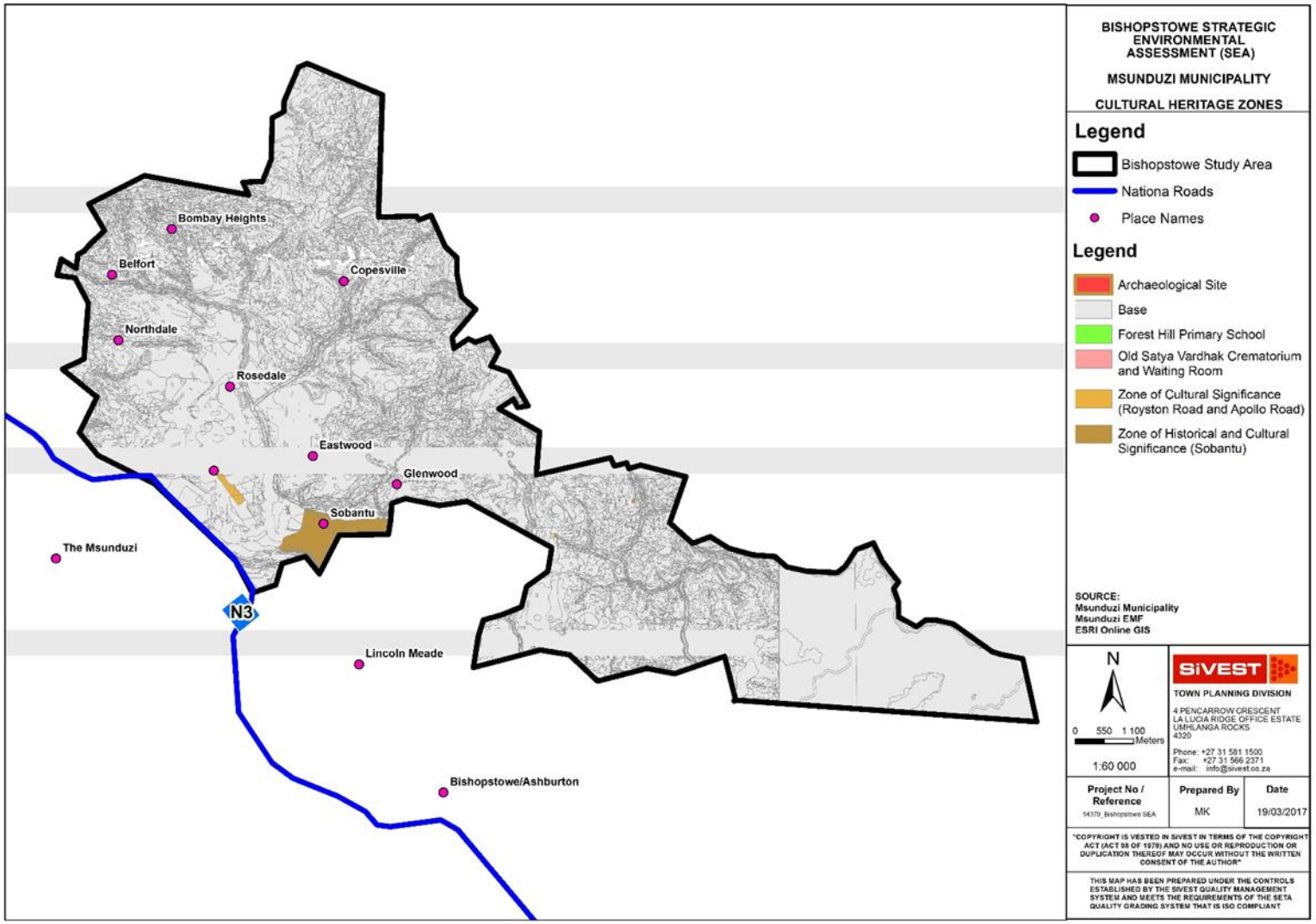

Figure 47: Identified Cultural Heritage Zones/Areas Within Bishopstowe Study Area

Implications for Bishopstowe Study Area

Based on the aforementioned, the Bishopstowe study area possesses three types of identified biodiversity zones, i.e. high development constraints, development constraints and no constraints. It is suggestive that the Bishopstowe area has the most amount of no constraints areas located in the developed western region whilst the remainder of the study area may be deemed as a high constraint area. With regard to slope, the study area hosts moderate–steep slopes. Further, it is well worth mentioning that in terms of environmental service zones, the study area possesses mostly high-medium environmental services therein. From an agricultural perspective, the study area mostly comprises of no agricultural potential as most of the area is developed. Approximately 197 ha have been identified within the EMF as areas which must be reserved for agricultural productivity. These areas are mostly located between the developed area and the eastern portion of the study area.

6.5 Msunduzi Environmental Services Plan (ESP): 2010

The intention of the ESP is to provide an awareness of the ecosystem goods and services, and to specifically highlight that the areas designated for management under this plan, need not be isolated from other types of development but rather be managed to ensure that the ecosystem goods and services they supply are not compromised. The underlying assumption is the maintenance and management ecosystem goods and services by the promotion of sustainable development.

The key objective of the ESP, is to design an open space system that will maximise the ecological viability of ecosystems and to ensure the persistence of biodiversity for the future (long term). The purpose ESP was to create an Open Space System, that was built on the connectivity of ecosystem services and that appropriately recognised key priority ecosystem services hence excluding areas that were less important.

The ESP was therefore created by incorporating different environmental services and features which has been identified in the figure 48;

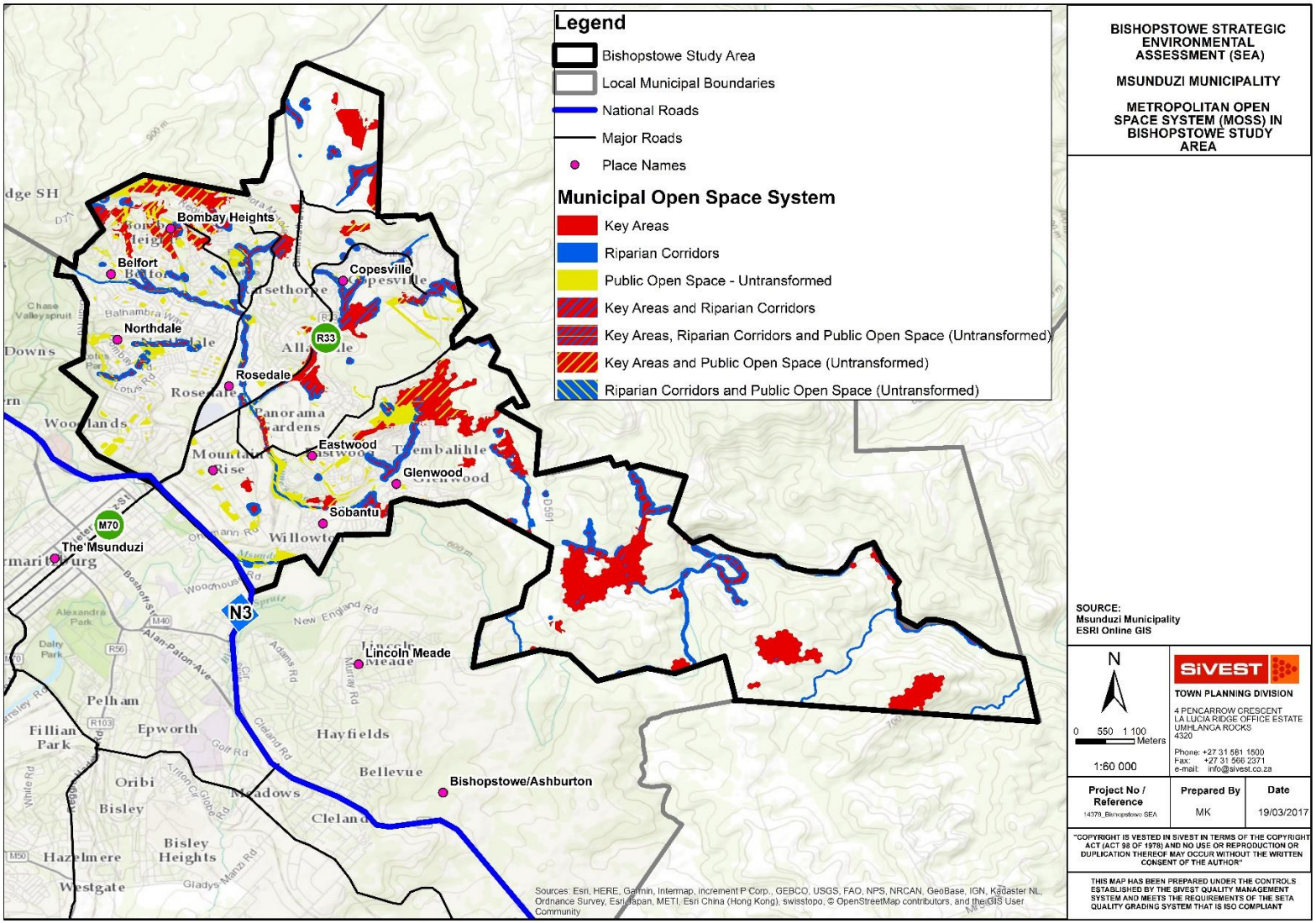

Figure 48: ESP Mapping for Municipal Open Space System (MOSS) within Bishopstowe Study Area

The Bishopstowe Study Area hosts approximately 1811 ha of identified municipal open space systems which are key areas for environmental protection that offer a variety of social and ecological services therein. The total municipal open space system accounts for approximately 20723.5 ha which suggests that the Bishopstowe study area hosts approximately 8.74 % of the total municipal open space systems therein.

According to the Msunduzi ESP (2010), the Bishopstowe Study Area hosts key areas; *riparian corridors; public open space (untransformed); key areas and riparian corridors; key areas, riparian corridors and public open space (untransformed); key areas and public open space (untransformed) and riparian corridors and public open space (untransformed).*

The Municipal Open Space System applicable to the Bishopstowe Study Area may is summarized as follows:

Table 19: Extent of features included in ESP Mapping in Bishopstowe Study Area

Legend	Municipal Open Space System _Area Breakdown	Ha	%
	Key Areas	366,57	20
	Riparian Corridors	834, 67	46
	Public Open Space - Untransformed	186, 31	10
	Key Areas and Riparian Corridors	221, 63	12
	Key Areas, Riparian Corridors and Public Open Space (Untransformed)	30,25	2
	Key Areas and Public Open Space (Untransformed)	125,93	7
	Riparian Corridors and Public Open Space (Untransformed)	45, 71	3
TOTAL		**1811,07**	**100**

The criteria identified for the intended use of the Public Open Space (in terms of its prioritization) inclusive of function and use includes the following activities:

- Recreation such as walking, picnicking, playing sport (formal and informal) or dog walking
- Education such as information centres;
- Providing a sense of place and visual relief such as sites of urban greening or buffers between industrial or commercial areas and residential areas; and
- Accordingly, a functioning ranking table was created in terms of the use/ frequency of use within the above-listed areas.

Implications for Bishopstowe Study Area

a) The study area hosts approximately 8.74 % of the total municipal open space systems within its delineated region.
b) Identified key areas (inclusive of untransformed areas hosting riparian corridors and public open spaces) should be preserved to maintain open space connectivity.

6.6 Msunduzi Climate Change Policy 2014

The Msunduzi Climate Change policy "is intended to be a comprehensive approach to managing climate change in the City of Pietermaritzburg" by "setting the direction in which strategies should be established and enabling action by key stakeholders" (The Msunduzi Climate Change Policy 2014:16). The policy provides adaptation and mitigation measures that affects various units within the municipality in attempting to cope with the impacts of climate change.

The Msunduzi Climate Change policy's vision is to "ensure that plans, policies and strategies are in place which aim at reducing risks and vulnerabilities posed by climate change". According to the policy this can be achieved by "encouraging and supporting the investigation and development of strategies and plans which aim at reducing risks and exploring opportunities posed by climate change on the city, communities and Msunduzi Municipality's operations and in so doing, enable climate change resilience for the future" (Ibid).

Essentially the policy is intended to ensure that business units within the municipality take cognisance of the environmental impacts of their activities/plans in order to ensure that suitable strategies are put in place to enable cooperative and coordinated environmental management throughout municipal structures and activities (The Msunduzi Climate Change Policy 2014:13)

Implications for Bishopstowe Study Area

The climate change policy assists in the establishment of an environmental framework which comprises of mitigation and adaptation measures that assist municipal line departments in assessing the environmental impacts of proposed activities and developments within the study area. Various sectors have been identified which will be the most impacted on by climate change / climate change related impacts in Msunduzi, these are as follows:

- Impacts on biodiversity, ecosystems and sensitive natural environments
- Changes and impacts to water resources particularly water availability, quality and quantity
- Impacts on food provision and agricultural sustainability
- Impacts on human health due to temperature extremes and prevalence / occurrence of vector borne diseases
- Impacts on storm water infrastructure and other infrastructure located in areas of flood potential
- Waste management
- Increased energy utilisation and impacts on electricity infrastructure
- Impacts on the transportation sector and infrastructure

6.7 Msunduzi Spatial Development Framework (SDF) 2014/2015

The principles of the IDP in turn lay the foundation for the SDF proposals and strategies that give direction to a range of spatial outcomes relating to growth and development within the Msunduzi Municipality. The vision for the SDF is informed by the municipal IDP vision, and is driven by a need to pursue a more sustainable future. To this end, the SDF is premised on a Sustainable Urbanism ideology which presents a wide view of 'conventional' sustainability whilst embracing the traditional three-tiered notion of ecological, economic, and social development. Sustainable Urbanism seeks to move toward a more collective view of sustainability.

The municipal vision is deeply rooted in the whole notion of Sustainable Urbanism, which founded on the following 7 principles (The Msunduzi SDF Review 2014/15:26-28);

- **Global Connectivity**: refers to well performing cities as those that are globally connected both physical via road and rail, and non-physical via digital connectivity.
- **Productive Systems**: refers to sustainable cities are productive cities, which are economically sustainable. Economic production involves the development and encouragement of new businesses and providing for jobs to create an employed and healthy population.
- **Ecological Infrastructure**: refers to the valuable services delivered to people by natural, functioning ecosystems which is an important component of sustainable urbanism.
- **Sustainable Transport**: refers to well performing environments which are those that provide maximum choice in terms of both vehicular and pedestrian movement levels.
- **Quality Urbanism**: refers to establishing the timeless qualities of 'good urbanism' that create opportunities, facilitate choice, and promote a sense of place and safety. Key aspect of quality urbanism is encouraging density, compactness and complexity.

- **Social Inclusivity**: refers to the notion of people centred cities, whereby citizens are part and parcel of shaping their futures.
- **Sustainable Services**: refers to services that are based on low impact solutions such as the use of appropriate forms of energy, minimising waste, adaptive use and harvesting of by-products.

The Municipality has outlined six focal areas, which are aimed at addressing the SDF vision:

Figure 49: Msunduzi SDF Focal Areas

The following interventions are identified in the SDF with regards to the principles of sustainable urbanism and as a way to enhance growth and guide development within the municipality (The Msunduzi SDF Review 2014/15:44-120);

Table 20: SDF Interventions

SDF PRINCIPLES	DESCRIPTION
1. Global Connectivity	▪ Enhancing Connectivity to the N3 ▪ Improve Regional Connectivity ▪ Re-Envisage the Rail Routes ▪ Support the Airport Precinct ▪ Bridge the Digital Divide

SDF PRINCIPLES	DESCRIPTION
2. Productive Systems	Land release along the N3 corridor Consolidate and revive the CBD Strengthening Centres of economic Activity Introducing new economic zones and centres Incorporate productive agricultural
3. Ecological Infrastructure	Securing the natural resource base Protect and enhance open space cores Creating an integrated open space system Enhancing the Msunduzi River as a regional parkway
4. Sustainable Transport	Equitable movement structure An enhanced public transport backbone Review the rail network Promoting NMT routes
5. Quality Urbanism	Create functional residential neighbourhoods Build polycentric city Create sustainable urban centres Promote densification Enhance public place making
6. Social Inclusivity	Establish new housing opportunities Address informal housing Equitable distribution of public amenities
7. Sustainable Services	Enhancing existing and future infrastructure Focused investment on corridors and sustainable urban centres.

The aforementioned spatial principles are represented as follows within the Study Area:

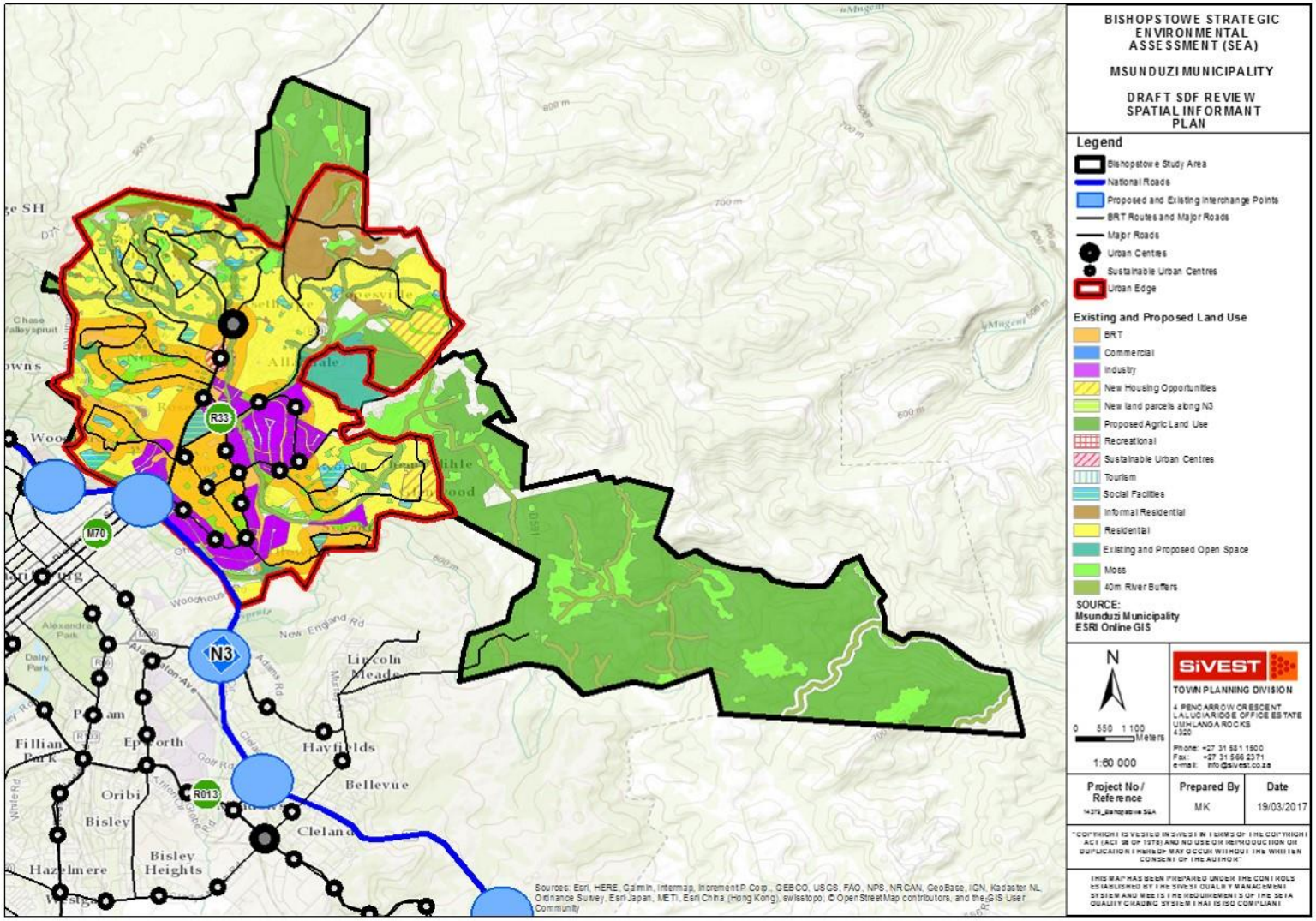

Figure 50: Draft SDF Review 2017/2018 Spatial Informants within Bishopstowe Study Area

Implications for Bishopstowe Study Area

The developed portion of the study area predominantly falls within the urban edge which lends itself useful for future development opportunities. The remainder of the study area is identified for environmental protection purposes through identified environmental and conservation uses which comprise of ''Municipal Open Space System (MOSS)'' and ''Major and Minor River Buffers''.

6.8 Northern Areas Local Area Plan 2017

The Northern Areas (NA) Local Area Plan (LAP) attempts to scale down the spatial objectives of the SDF into an area specific locality for the entire northern areas of the Msunduzi Municipality. The LAP identifies the role; development and land use vision; development principles; development design and guidelines applicable to the northern areas.

The NA LAP also intends to align the N3 Strategic Corridor Development Plan with the goals and objectives contained in the KZN Provincial Growth and Development Plan. It further attempts to align the current social, economic, agricultural and industrial opportunities with the N3 whilst connecting several local economies within Msunduzi (NA LAP 2014: 1). The NA LAP (2014: 1-4) advances a number of key development principles to bring its core objectives to fruition:

- **Promoting an Equitable City**-through ensuring that land use management decision making reflects cognisance of the past spatial injustices and is equitable thus addressing such injustices.

- **Promoting an Efficient City**-through ensuring the optimisation of land use management and development opportunities which calls for efficiency in institutional arrangements and operations, adopted procedures, the settlement form or pattern, and the utilization of man-made or natural resources with regard to land development and planning.

- **Promoting a Sustainable City**-which intends to ensure that resources which make up the natural and built environment are utilised and managed sustainably whilst ensuring that land use and development decisions promote a harmonious relationship between the built and natural environment.

- **Promoting an Integrated City**- which intends to combine and coordinate the separate and diverse elements involved in development planning and land use in a harmonious manner.

With regard to the development goals advanced by the NA LAP (2017: 5-7) the following salient points remain noteworthy:

- ***Goal 1: To promote a sustainable settlement pattern***- through advocating the case for compaction and mixed use developments within areas of opportunity.

- ***Goal 2: To Improve Connectivity and Circulation-***by advocating the case for efficient public transportation and pedestrian environments (i.e. through proposed Integrated Rapid Public Transport Network).

- ***Goal 3: To create Opportunities for Economic Activities***-through promoting small scale agriculture and tourism in naturally and environmentally significant areas and promoting mixed use precincts in key nodal areas and corridors such as Dr Chota Motala Road and its surrounds.

- ***Goal 4: To Promote Infrastructural Development***-by ensuring adequate infrastructural supply to facilitate economic development and growth.

- ***Goal 5: To promote environmental integrity***-through advocating the sustainable approach to municipal servicing; securing critical ecological infrastructure; using the natural environment sustainably to grow the green economy.

The NA LAP encapsulates its core objectives, development principles and goals in a conceptual development framework which highlights the desired spatial form, which predominantly comprises of the Bishopstowe study area. In this regard, the role the western portion of the study area is identified as playing a mixed land use role while the eastern portion of the area is identified for agricultural and tourism related use. The conceptual framework is represented in Figure 51:

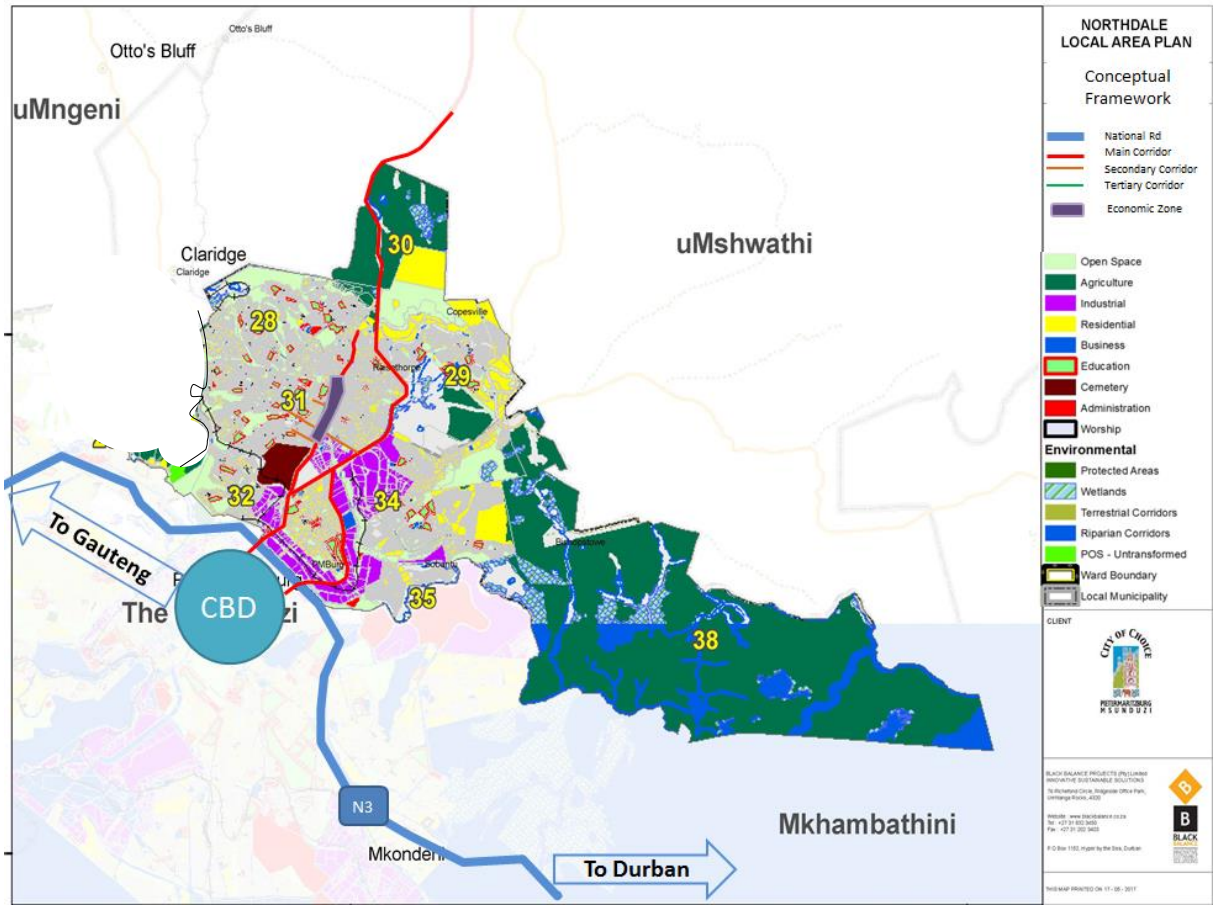

Figure 51: NA LAP Conceptual Development Framework

Implications for Bishopstowe Study Area

The Bishopstowe study area is identified as playing a dualistic role within the municipalities jurisdiction. The developed area located within the western portion of the study area is predominantly identified for residential, industrial and business uses whilst the eastern portion is identified for agricultural uses.

7 APPLICABLE LAND USE SCHEME AND LAND USES

The study area comprises of the erstwhile Sobantu and Pietermaritzburg Town Planning scheme. These two town planning schemes are currently being reviewed and consolidated into one land use scheme, namely the Msunduzi Land Use Scheme. Approximately 38 km^2 of the study area falls within the Msunduzi Land Use Scheme whilst the remainder may be deemed to be land outside a land use scheme which accounts for approximately 30km^2.

The Municipality has also embarked on a process to establish a Rural Land Use Management Policy which is due in 2019. The establishment of a Rural Land Use Management Policy marks an incremental approach towards meeting the legal requirements of establishing a wall-wall scheme for the entire Msunduzi Municipality in terms of the provisions of the Spatial Land Use Management Act (SPLUMA) No 16 of 2013.

With regard to areas which fall within a land use scheme, it is noteworthy that the project area comprises of the following land use zones:

- Active Open Space
- Agriculture 2
- Cemetery
- Educational
- Existing Road and Lane (Reservation)
- Extractive Industry
- Forestry
- Garage and Petrol Filling Station
- General Industry
- General Residential 3
- Health and Welfare
- Institutional
- Intermediate Residential
- LFTEA
- Low Impact Mixed Use
- Medium Impact Residential
- Multi-Purpose Retail and Office
- Municipal Office and Government
- Passive Public Open Space
- Private Open Space
- Public Housing
- Railway Purposes (Reservation)
- Special Area
- Special Business Area
- Special Residential 1-4
- Transitional Zone 1
- Undetermined
- Worship

Areas which fall within or outside a formal land use scheme (inclusive of land use zones) are spatially represented as follows:

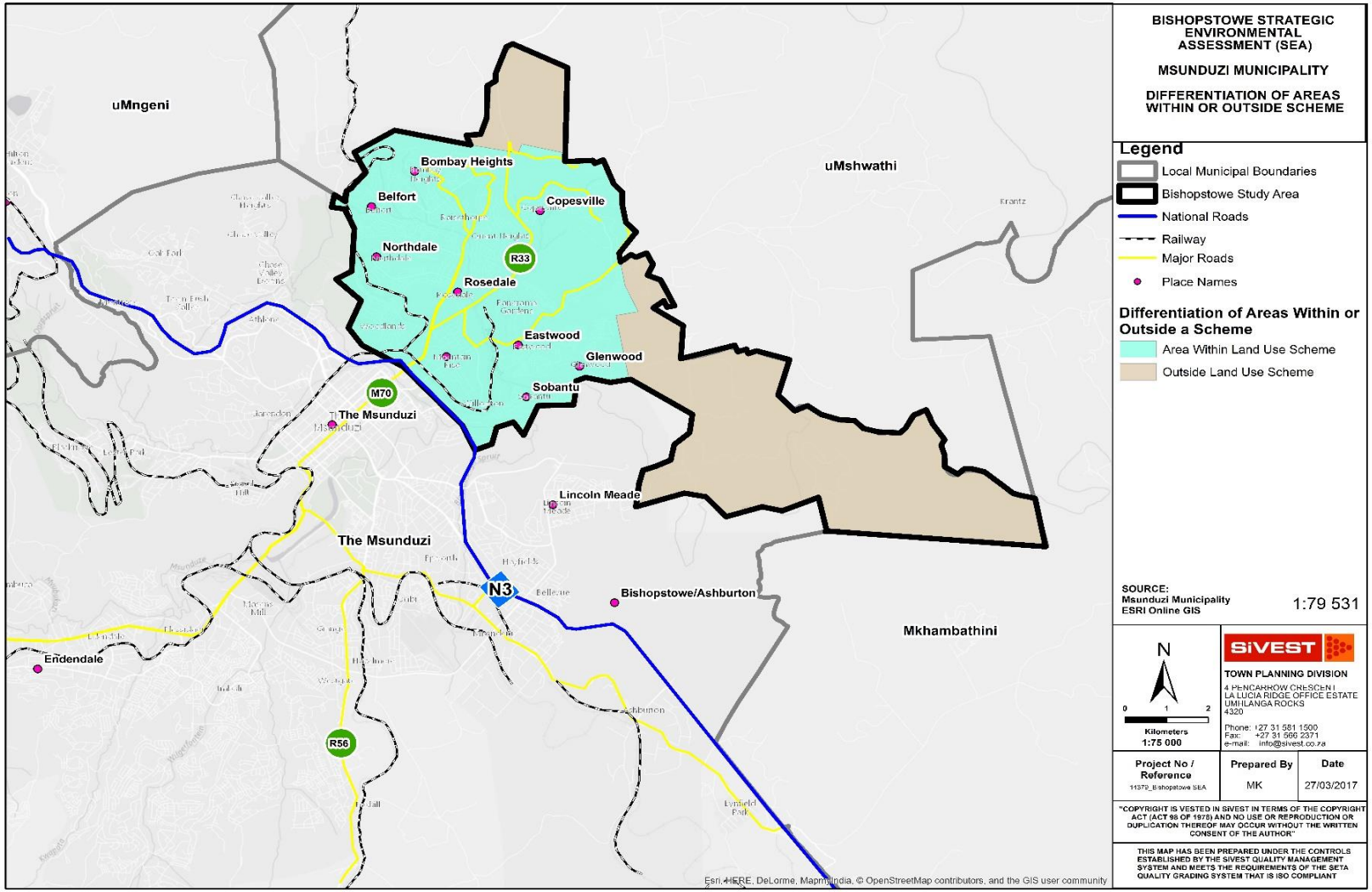

Figure 52: Differentiation Between Areas Which Fall Within or Outside a Land Use Scheme

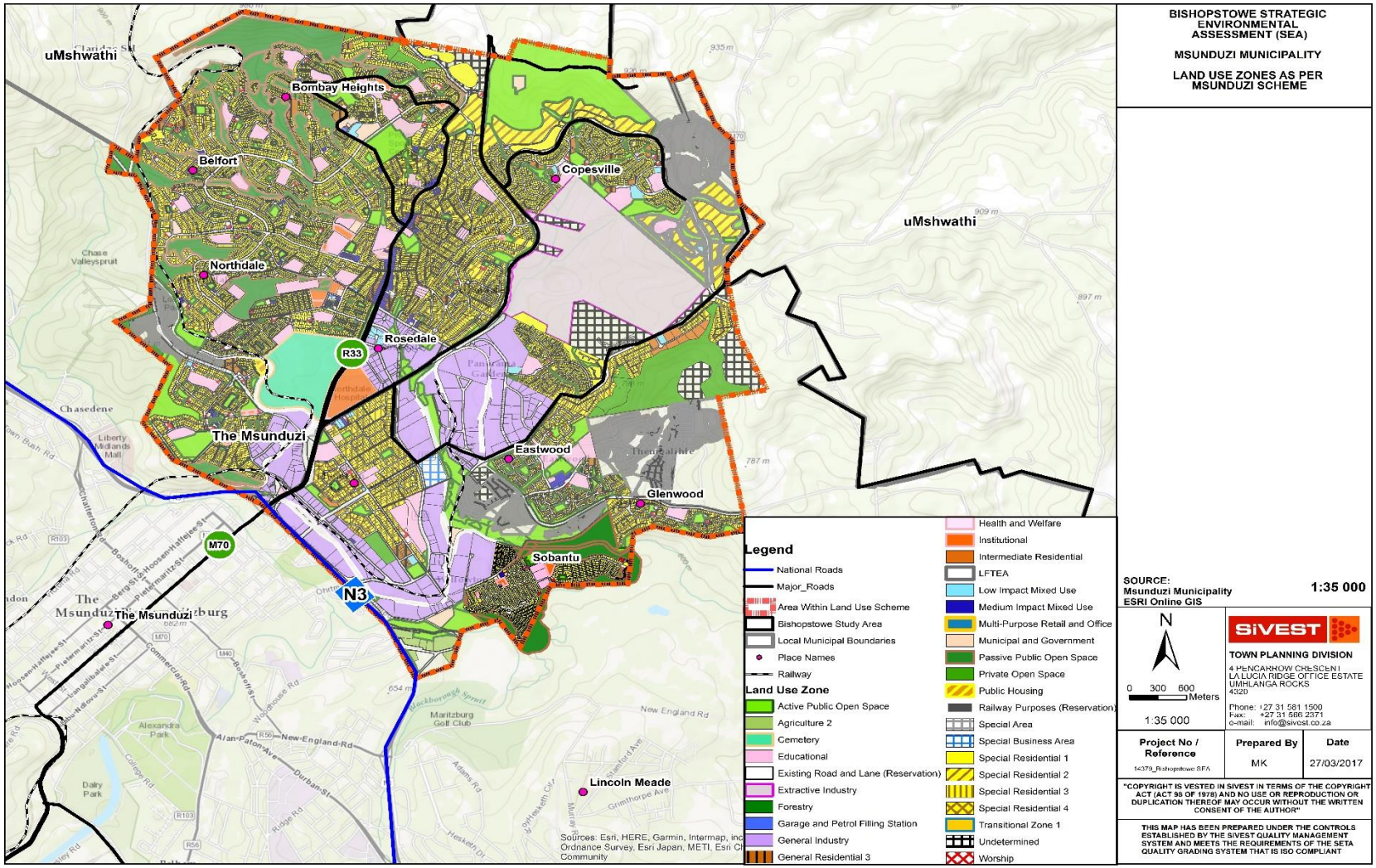

Figure 53: Area Within Msunduzi Land Use Scheme and its Associated Zones

7.1 Development rights applicable to areas within and outside land use scheme

The current development within the study area is attributed to the following factors:

- **The study area hosts an area which falls within a formal land use scheme. It is suggestive that such an area is developed based on the land use zones applicable to each parcel of land therein. These land use zones effectively award legal development rights on each parcel of land within the scheme area.**

- **In terms of the land use scheme, the use zones comprise of <u>permitted, consent and precluded</u> <u>uses</u> inclusive of development controls which introduces a regulatory development mechanism for the municipality to assess development applications in order to meet the environmental, social, economic and land use directive derived from the Msunduzi municipal suite of plans, i.e. SDF and NA LAP.**

- **With regard to the portions of the study area which fall outside a land use scheme, such land, by default, is deemed un-zoned. In order to source development rights on these parcels of land, an applicant would rely on obtaining permission from the Minister of Agriculture in terms of the Subdivision of Agricultural Land Act, 70 of 1970 (Act 70 of 1970).**

- **Title deed conditions are those which enable a property owner to effectively utilise a parcel of land in accordance with the use conditions. Whilst the extent of such conditions remain unknown, it is common knowledge that title deeds generally award a set of use rights applicable to each property.**

With the establishment of SPLUMA, it is anticipated that future development within the study area will be facilitated through the Msunduzi Spatial Planning and Land Use Management By-Law (Municipal Notice 122 of 2016). The Msunduzi land use management by-law is a tool which bestows the core function of land use and environmental planning with local government through enabling governmental cohesion with regard to assessing and administering development applications.

Sections 3, 4 and 7 of The Msunduzi Land Use Management By-Law also lends themselves useful in terms of providing an interim measure for assessing and administering development applications for areas which falls outside a land use scheme, until such a time, that the municipality establishes a wall-wall land use scheme

7.2 Land Uses

The Msunduzi Municipality is currently developing a land use policy for areas which lie outside a land use scheme. In this regard, a land use land use verification process was undertaken and the following land uses were observed in these areas:-

- residential,
- agricultural, and
- natural vegetation and open spaces.

In so far as the areas located within the Scheme area, these are governed by the respective zones that are in force and effect. No land use survey was undertaken in these areas however it would appear that the area appears to be developed in accordance with the existing zoning provisions. There may however be anomalies which have not been tested as part of this exercise.

Figure 54 spatially represents the outcomes of the on-site verification process of the Rural Policy as follows within the Bishopstowe Study Area for those areas falling outside the scheme boundary:

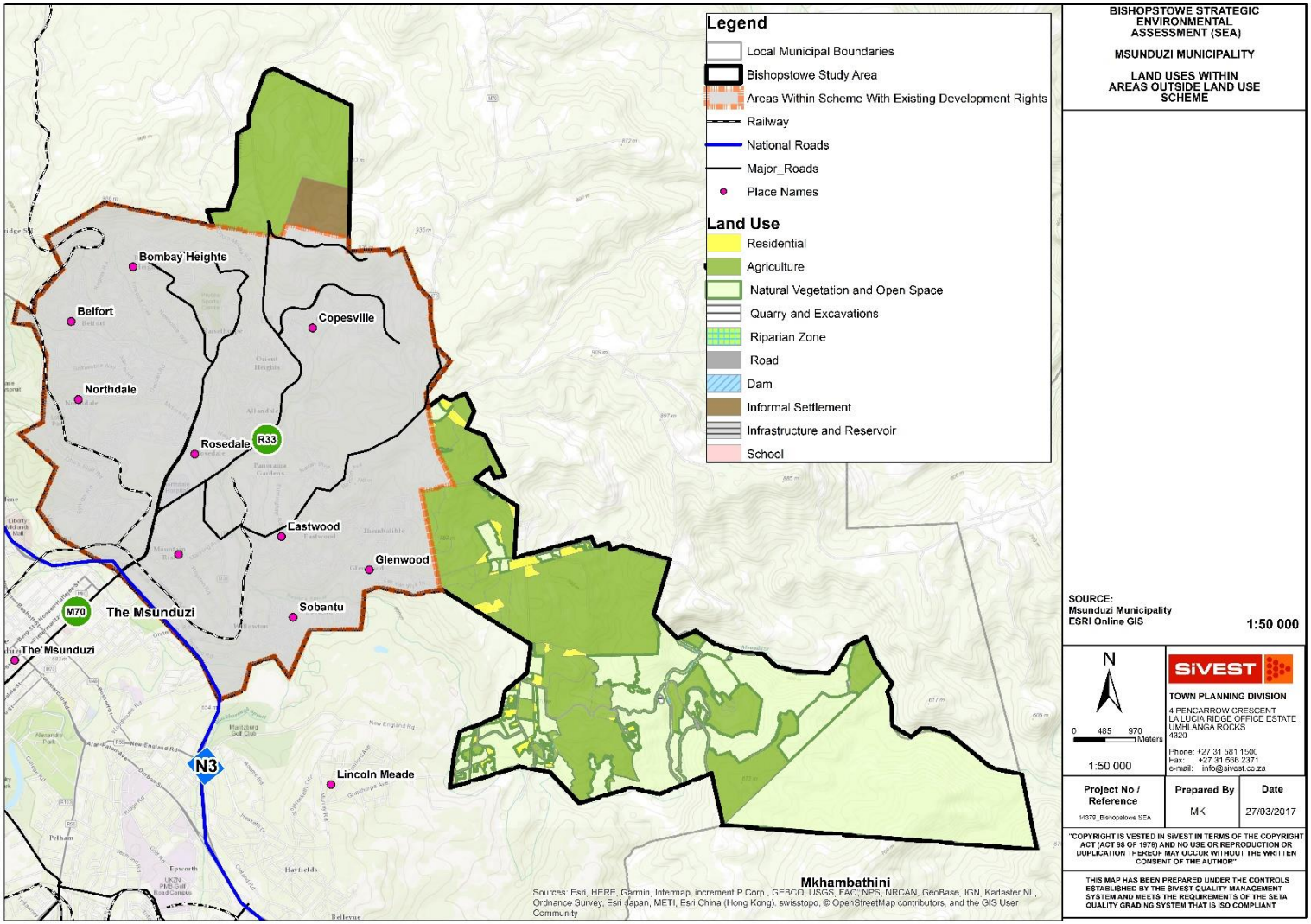

Figure 54: Areas Under Land Use Scheme and Applicable Land Uses

8 ENVIRONMENTAL ELEMENTS

The following environmental shape file data was furnished to the town planning division for the purposes of this report:

- Faunal corridors and high/low biodiversity and connectivity points/areas.
- Wetlands and Riparian Corridors.

The town planning division also found it prudent to utilise the KZN Wildlife Ezemvelo 2016 Critical Biodiversity Area (CBA) and Protected Areas Data to effectively highlight the areas of natural, environmental and biodiversity significance in relation to the study area.

The overall intention of this section is to set up a framework in which the aforementioned environmental elements and its associated implications for development will be assessed from a town planning perspective. These are summarised as follows:

8.1 Faunal and Wetland/Riparian Corridors

The following remains noteworthy in terms of the assessment of both faunal and wetland/riparian corridor data:

- **Faunal Corridors:** are predominantly located in areas within a land use scheme. These corridors comprise of Vidua Macroura; Bubulis Ibis; Apus Affinis; Apus Caffer; and Equuss Quagga which are of high biodiversity and connectivity significance. The south eastern portion of the study area also possesses two high biodiversity and connectivity areas. With regard to low biodiversity and connectivity areas, these are located within the eastern portion the scheme area and are made up of Colius Striatus and Corvus Albus. The linkages to these faunal corridors have been maintained through the regulatory framework of the land use scheme, however some of these have been compromised as a result of the built up nature of the area in relation to driving development.

- **Wetland Riparian Corridor:** In terms of the Wetland/Riparian Corridors, these are generally made up of water bodies and rivers which run in the valley lines of the study area. The

wetland/Riparian Corridors are scattered throughout the study area. It is noteworthy that most wetland/riparian corridors situated within a land use scheme fall within land parcels that are zoned either ‘’Passive or Active Public Open Spaces’’. Figure 55, illustrates the faunal and wetland/riparian corridors applicable to the study area.

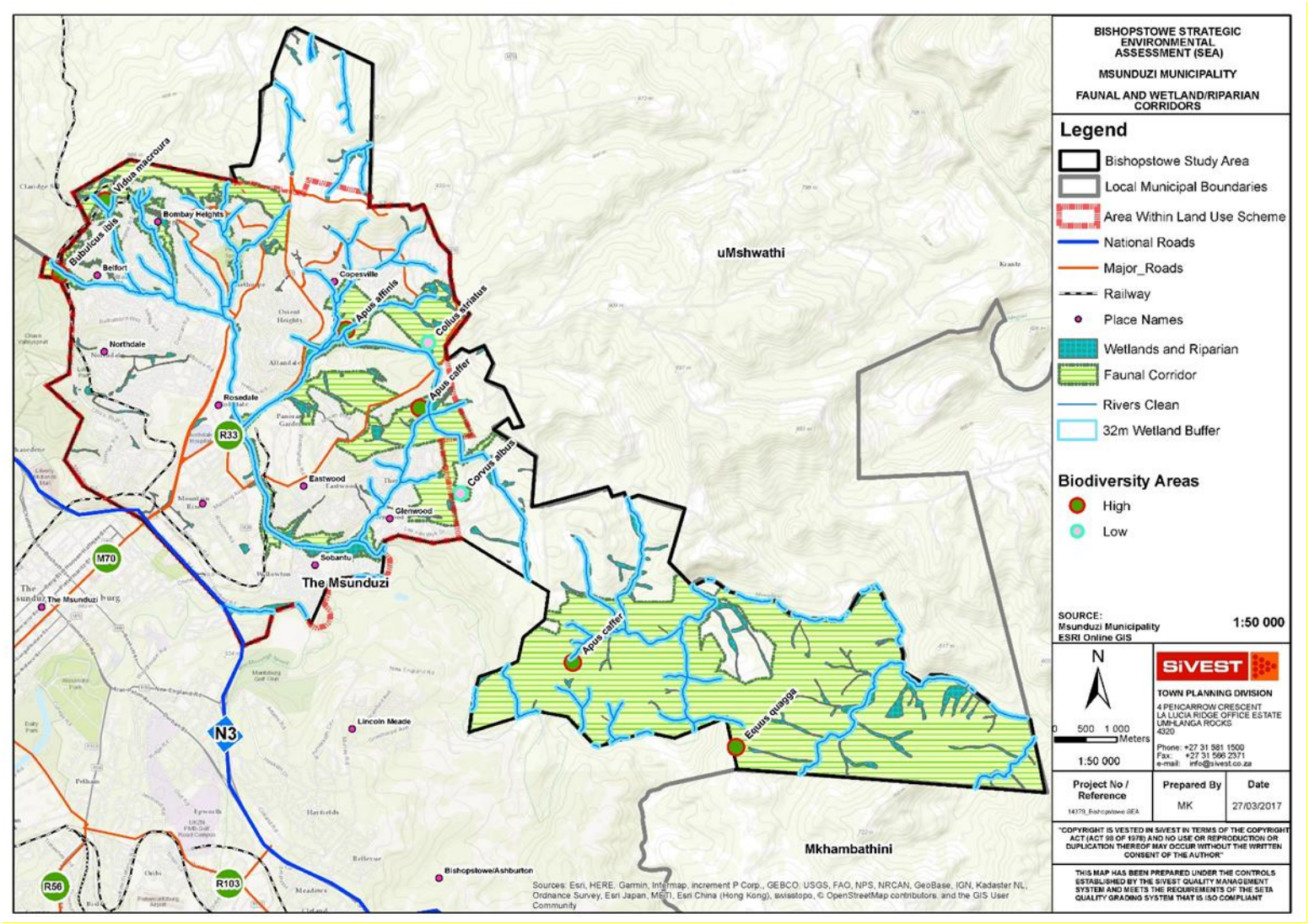

Figure 55: Faunal and Wetland/Riparian Corridors

8.2 Biodiversity and Protected Areas

The biodiversity and protected areas applicable to the study area were identified through using Ezemvelo KZN Wildlife (2016) CBA and Protected Area Shapefile Data.

The outcomes of the interrogation of such data may be summarised as follows:

- **CBA Irreplaceable Areas:** The south eastern portion of the study predominantly hosts CBA Irreplaceable areas. The overall character of this area comprises of low intensity land uses in the form of residential, agricultural and small holdings. This may be deemed to be aligned to the overall spatial directive provided by the NA LAP and the inherent biodiversity characteristics of the area. Furthermore, the north western portion of the study area hosts CBA Irreplaceable areas and is consistently zoned ''Active and Passive Open Spaces'' or ''Special Residential 1'' which is indicative of adherence to the concept of environmental protection.

- **CBA Optimal Areas:** There are three notable occurrences of CBA Optimal areas within the study area. The first is located on the south eastern portion and sits within a land use scheme. This area sits between the Eastwood residential area and R33. There is also a presence of a CBA Optimal area located between the Glenwood and Sobantu communities and is predominantly zoned ''Passive Public Open Space''. Lastly, the other portion of the study area which hosts CBA Optimal areas is located on the north western portion of the study area which is characterised by an increased level of residential development.

- **Protected Areas:** The south eastern boundary of study area lies contiguous to the ''Mpushini Proclaimed and Protected Environment''. The National Environmental Management Act (NEMA) prescribes a 5km Buffer to such areas. The applied 5km Buffer area occupies approximately 23km^2 of the study area. It is noticeable that the land uses in this region comprise of residential; agricultural and natural vegetation and open spaces which are aligned to the overall spatial objectives of the municipality as per the NA LAP and SDF.

Figure 56, illustrates the biodiversity and protected areas applicable to the study area.

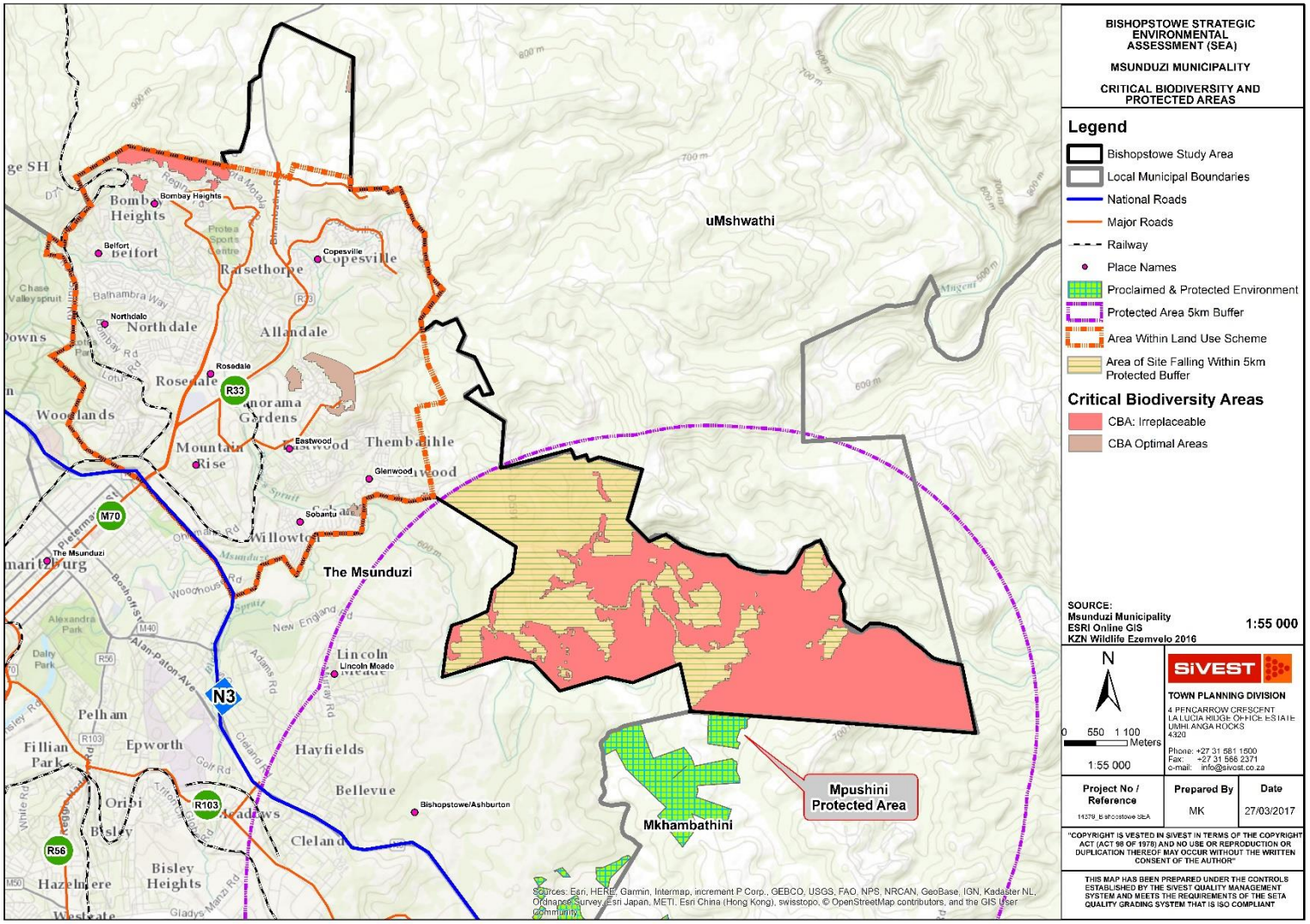

Figure 56: Biodiversity and Protected Areas

9 EVALUATION OF ENVIRONMENTAL ELEMENTS AGAINST TOWN PLANNING FRAMEWORK AND RECOMMENDATIONS

The purposes of this section is to summarise the applicability of environmental elements on a property specific scale throughout the study area whilst also highlighting the associated implications thereof.

9.1 Methodology

The process of identifying environmentally affected properties within the study area was undertaken through utilising GIS Software and complimentary shapefile data. The identification of such properties involved the following:

a) The use of associated ArcGIS shape files that included wetlands and riparian corridors; CBA (inclusive of Irreplaceable areas); and faunal corridors.
b) The environmental attributes were overlaid on the municipalities cadastral shapefile data and intersected using ArcGIS to identify the properties affected by the respective environmental features.
c) These properties were then exported on Microsoft Excel spreadsheet to indicate their spatial locality within the study area. The intention of the exercise is to create a spatial and environmental planning tool for the municipality that summarises the varying combinations to which the environmental elements exist inclusive of the existing zoning rights (i.e. where applicable).

The aforementioned methodology is diagrammatically represented as follows:

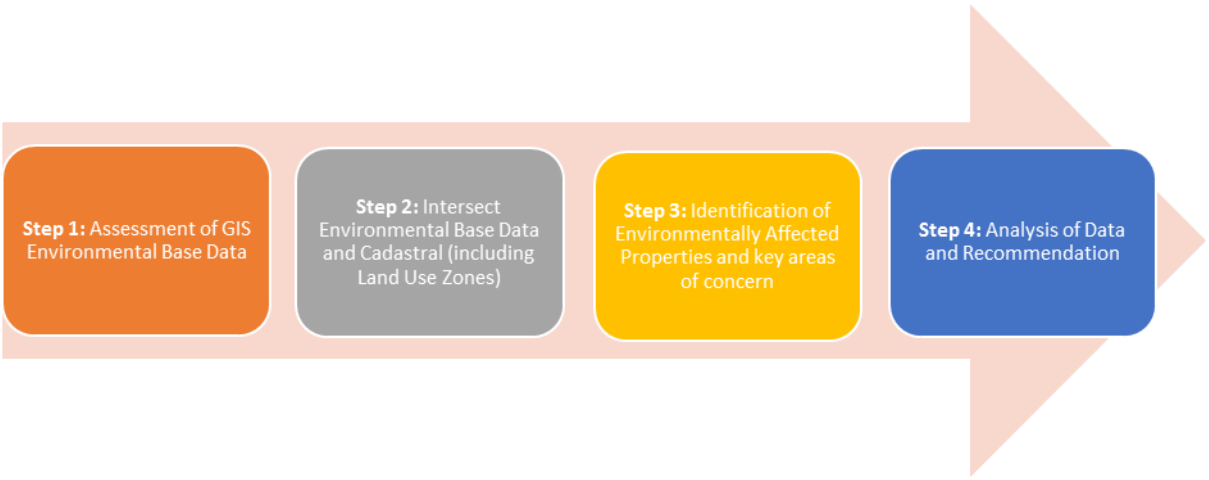

Figure 57: Methodology

Whilst it is accepted that the advanced approach does not indicate the exact extent to which these properties are environmentally affected, it provides at a minimum, the identification thereof. The associated outcome of the exercise yielded three broad environmental categories within the study area which are summarised as follows:

- **Category 1: Development Zones**-these are properties which host **one** environmental attribute, i.e. faunal corridors; wetland and riparian corridors; biodiversity areas (i.e. CBA) or protected areas.
- **Category 2: Conservation with low Impact development zones**- these are properties which host a combination of **two** environmental attributes, i.e. Wetland and Riparian Corridors and CBA Irreplaceable areas/ Faunal Corridors and CBA Optimal areas/ Faunal Corridors and Wetland and Riparian Corridors for example.
- **Category 3: Conservation Zones**- these are properties which host a combination of **all three** environmental attributes, i.e. Faunal Corridors; Wetland and Riparian Corridors and CBA Irreplaceable/and/or Optimal Areas.

9.2 Identification and Evaluation of Environmentally Affected Properties against Town Planning Framework

As previously noted, approximately 38km^2 of the study area falls within a formal land use scheme and may be deemed to be developed. This area plays a significant role within the municipality's jurisdiction in terms of hosting mixed land uses intended to create economic activity and employment opportunities.

The remainder of the study area (i.e. the eastern portion) mainly comprises of agricultural and residential uses which are in line with the areas proximity to the Mpushini Proclaimed Area. The study area plays a dualistic role within the broader Msunduzi Municipality, i.e. mixed land uses and agricultural/nature based activity uses as identified by the SDF (2015) and NA LAP (2017).

Development within the study area has to demonstrate alignment with the overall spatial trajectory provided by the municipality whilst ensuring appropriate level responses to the natural environment.

There are approximately 1551 properties which host environmental elements within the study area. The extent and combination at which these elements exist vary from property to property and may be summarised as follows:

- 74 properties fall within **Category 3** and are predominantly located within the western portion of the study area which is the area that falls within a land use scheme.
- 340 properties fall within **Category 2** and are located throughout the study area, particularly within the eastern portion which sits outside a land use scheme.
- 1137 properties fall within **Category 1** with the highest concentration thereof located within the western portion of the study area (Refer to Annexure 1: Summary of Environmentally Affected Properties)

Based on the aforementioned, it is suggestive that the Category 3 and Category 1 properties are mainly located in an area which has been developed, and where applicable, the environmental sensitivities have been catered for through the land use scheme and zones. The eastern portion of the study area which hosts Category 2 properties predominantly sits within the 5km Buffer of the Mpushini Proclaimed Area.

Future development on the parcels of land identified as environmentally affected properties is subject to the municipalities discretion and must demonstrate alignment with the spatial directive of the NA LAP and SDF. Furthermore, the evaluation of environmentally affected properties assisted in the identification of areas of conflict, which are parcels of land that have intense zoning rights (i.e. industrial zones) within the scheme area and are identified as Category 3 Parcels of land.

Figure 58 spatially represents the environmentally affected properties inclusive of the areas of concern as follows:

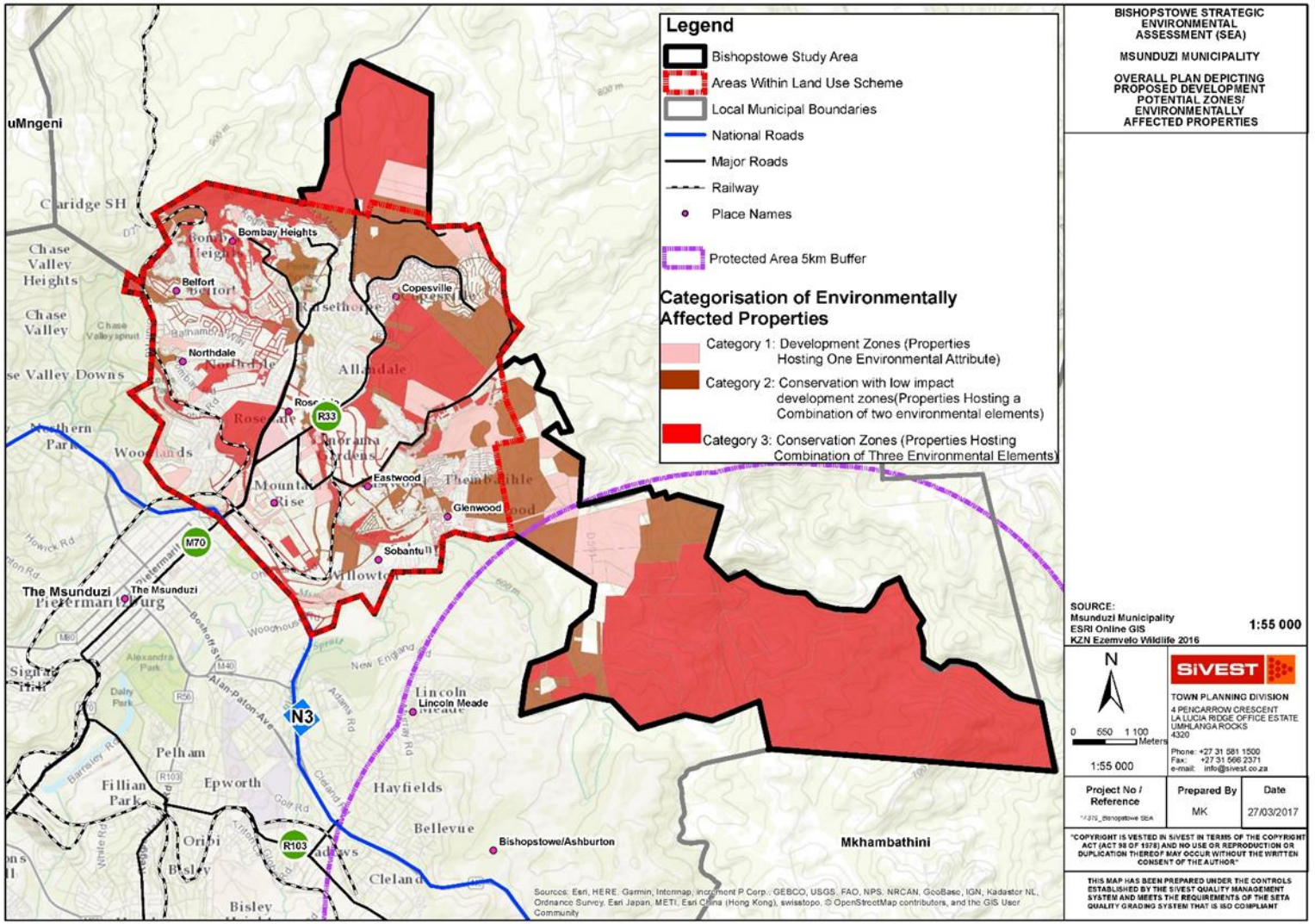

Figure 58: **Environmentally Affected Properties**

9.3 Evaluation of Environmentally Affected Properties Against SDF, NA LAP and Msunduzi Land Use Scheme

The Category 2 and 3 Properties were superimposed on the existing Spatial Plans (i.e. inclusive of the SDF and NA LAP spatial Informants) and Land Use Scheme to establish the spatial directive from the municipality's suite of plans.In this regard, the following is noteworthy:

- **Category 2 and 3 Properties Against Spatial Plans:** Category 2 properties are predominantly located in the south eastern portion of the study area and in terms of the SDF's spatial informants, this portion is identified for agricultural and MOSS use. Furthermore, some Category 2 properties are located within the area of the scheme, where these are identified for new housing opportunities and informal residential. With regard to Category 3 Properties, these predominantly sit in a land use scheme. Category 3 properties have been identified within the SDF as areas earmarked for agriculture, 40m river buffers and MOSS (i.e. in the north western portion of the study area). This demonstrates alignment with the objectives of the SDF in terms of environmental protection. Furthermore, in terms of areas earmarked for development prospects falling within a land use scheme, **1 Category 3 Property** falls squarely within an identified Bus Rapid Transit (BRT) route which is Chota Motala Road/M33.

- **Category 2 and 3 Properties Against the Land Use Scheme:** Category 2 properties predominantly fall outside the scheme area and their associated evaluation is limited. In terms of the portion of the study area which is covered by a scheme, Category 3 Properties predominantly sit in areas which are identified as ''active or public open space'' zones. This demonstrates alignment to achieving environmental protection. However, it also appears that there are Category 3 Properties which sit on parcels of land identified for higher intensity uses or uses which may be deemed to have a negative impact on the natural environment (i.e. areas of concern). These Category 3 properties are zoned Cemetery, Extractive Industry and General Industry which may be deemed to be encroaching on land that should be set aside as environmental assets. Bearing in mind that these parcels of land enjoy legal development rights, it is useful to limit the expansion thereof through appropriate development controls at the discretion of the municipality.

Figure 59 and 60 spatially represents the outcomes of the two evaluations against the SDF and Scheme.

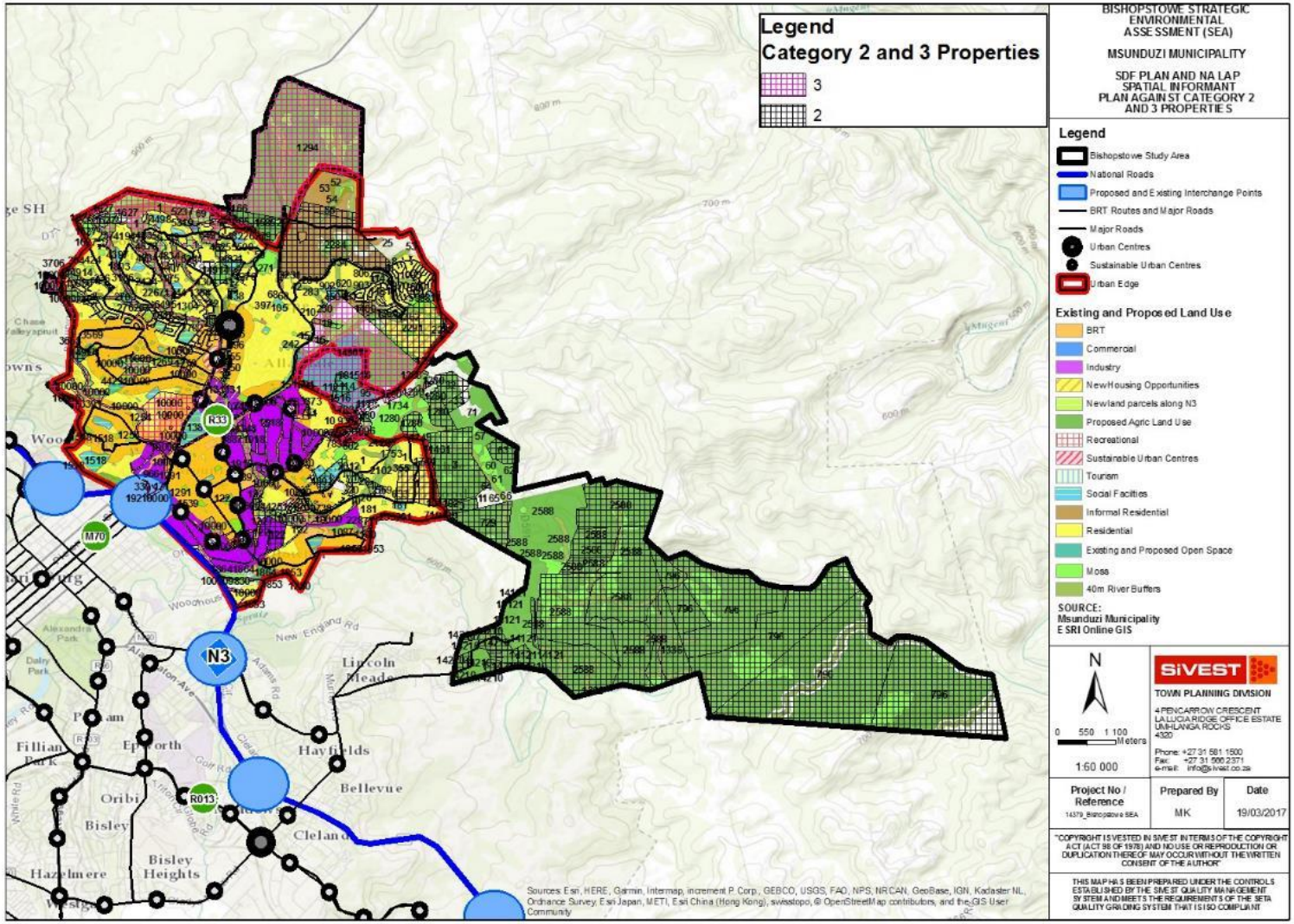

Figure 59: Category 2 and 3 Property Against Municipal Spatial Plans

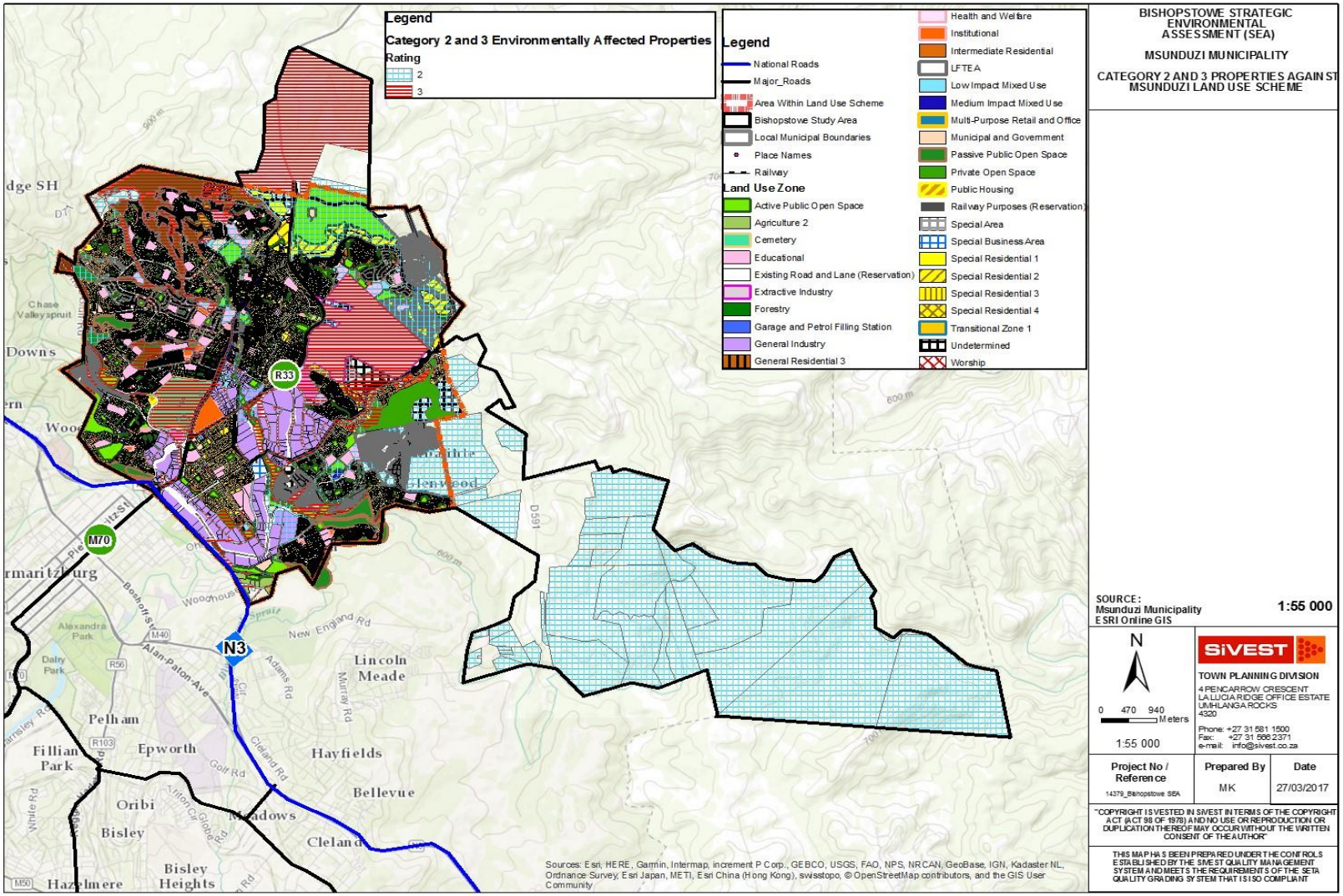

Figure 60: Category 2 and 3 Property Against Msunduzi Land Use Scheme

9.4 Evaluation of Category 3 Properties as Areas of Concern

As previously noted, the assessment of the environmentally affected properties revealed some areas of concern. These are generally properties which fall within the scheme and comprise of zoning or development rights which permit an intensified land use, referred to as *''Category 3''*.

The outcomes of the assessment of the data revealed that there are instances where properties identified as Category 3 host or are zoned for industrial purposes. In certain instances, these properties are already developed and it is presumed that the necessary development rights are in place inclusive of the appropriate environmental authorisations. These are summarised as follows:

- **Portion of Erf 783 Panorama Gardens:** The property directly fronts on the corner of Birmingham Road and Navan Boulevarde. The site hosts 4 zones, i.e. General Industry, Educational, Worship and Low Impact Mixed Use. Whilst the portion of the site which is zoned general industry is vacant, it is prudent to note that the site hosts wetland and riparian corridors; CBA Optimal Areas and Faunal Corridors.

- **Natal Crushers Site:** The property is located Chief Mhlabunzima and Bhambatha Road. It hosts an existing quarry thereon inclusive of environmental elements which would lend themselves useful in categorising the site as a Category 3 Property. It is useful to note that the site is zoned Extractive Industry to permit the existing operations thereon.

Any proposed development on sites that are identified as Category 3 sites and host an industrial zone, is subject to the municipality's (inclusive of line departments) discretion/approval and environmental authorisations/clearances.

Figure 61 spatially highlights examples of areas of conflict and their associated zoning.

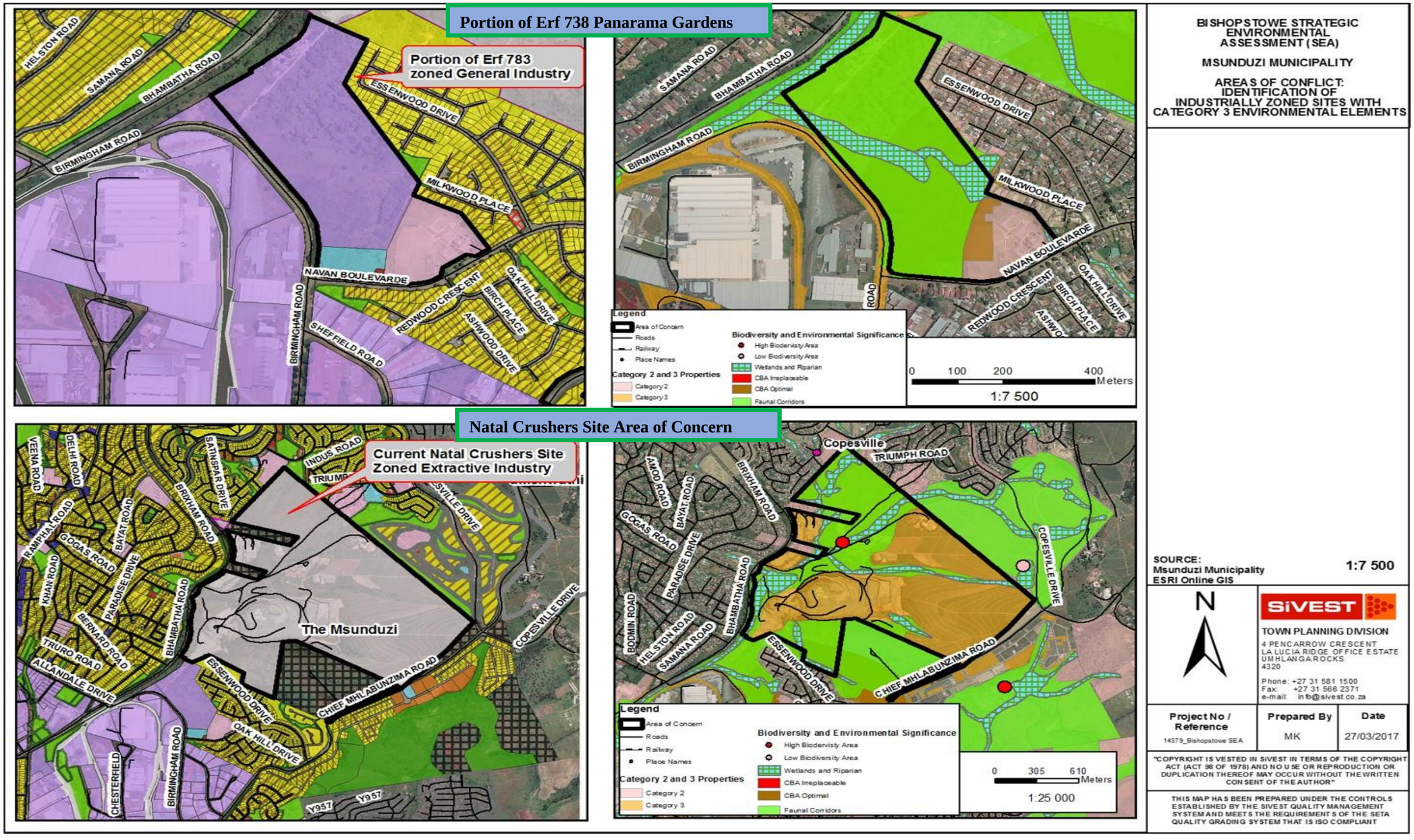

Figure 61: Areas of Conflict Identified as Category 3 Properties.

9.5 Further Spatial and Environmental Instruments Available to Preserving Areas of Environmental Sensitivity

Whilst it is noted that the key development filters in terms of shaping development proceedings within the study area are firmly embedded on the SDF and NA LAP, it is recommended that the use of Environmental Management Overlays (EMO's) is advanced therein as encapsulated by the Msunduzi Land Use Scheme and Rural Land Use Management Policy.

EMO's are spatial and environmental planning tools which are created to protect and enhance natural corridors, wetlands, rivers, the MOSS layer inclusive of the 5km buffer around the Protected areas as per NEMA EIA Regulations.

The reiteration and use thereof within the study area will further ensure that there is minimal biophysical disturbance to the natural environment.

9.6 Most Desirable Land Uses

The most desirable land uses are drawn from the municipality's suite of plans, more specifically the SDF and the NA LAP, which derives its spatial form from the Municipal IDP.A review and comparison of the NA LAP, suggests that other than the commercial core area (suggested along Chotta Motala Road) and its associated residential densification within the vicinity of the commercial core area, the remainder of the NA LAP, in terms of its current land use, as well as future or proposed land use, remains the same as the SDF.

The following shows the key elements of both the SDF and the NA LAP. In terms of properties situated within the urban edge, all of which falls within the Msunduzi Town Planning Scheme (adopted on: June 2018), and by implication all desirable uses are portrayed within said Town Planning Scheme, as per the applicable zone, listed as the permitted uses.

In terms of area situated outside the urban edge (predominantly the eastern portion of the Bishopstowe SEA), the said area does not sit within a Town Planning Scheme, and by implication as with all areas situated outside the Scheme area, those portions of land are deemed as Agricultural. The SDF and Municipal Environmental Plans (like the EMF, IEMP, and SEA, together with the applicable National legislation) demarcates within said area, all land that is environmentally

sensitive. These would include: areas of indigenous vegetation, riverine systems and associated buffers, wetlands and associated buffers etc. It should be noted that environmentally sensitive areas are meant to be protected, and conserved, thereby limiting human impact on fragile ecosystems, and consequently mitigating the need for rehabilitation. These areas form part of the MOSS.

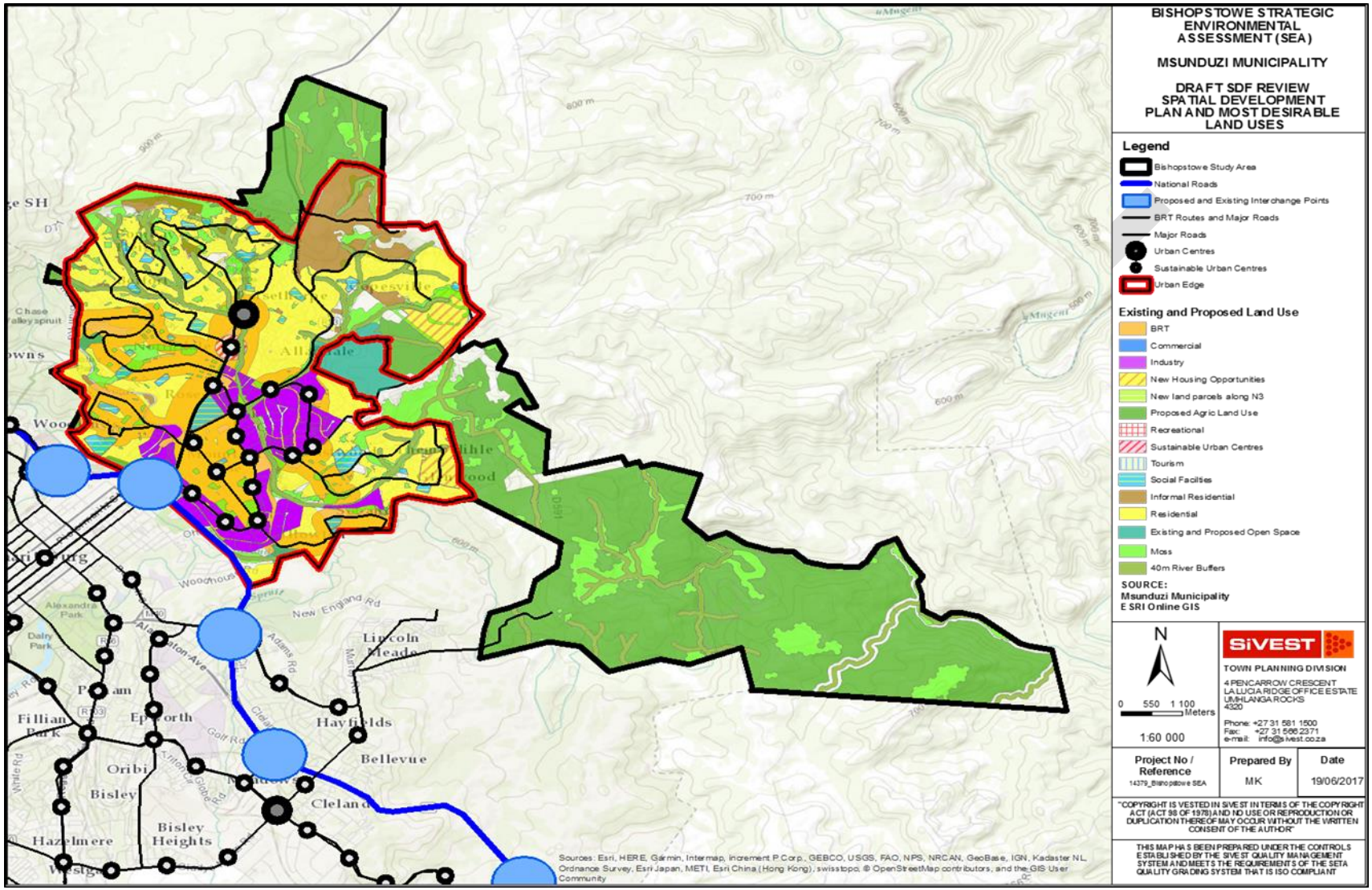

Figure 62: Most Desirable Land Uses as per the Msunduzi Municipality's SDF and NA LAP

10 DEVELOPMENT IMPLICATIONS AND RECOMMENDATIONS

The implications for development on any property identified as environmentally affected, is that such a development must comply with the applicable legislative provisions of the National Environmental Management Act (NEMA) and all other applicable legislative provisions including, but not limited to the Municipality's adopted bylaws.

Approximately 50% of the study area falls within a formal land use scheme and is governed by the applicable provisions. From a land use perspective, the area within the scheme appears largely developed.

It would appear that the municipality has demonstrated its commitment towards preserving environmentally sensitive areas within the scheme by having certain properties zoned ''Active or Passive Public Open Spaces''. These comprise both government and privately owned properties. Open Space Systems are a linkage of various ecological systems (i.e. marine, terrestrial and freshwater) ensuring that the interaction between plants, animals, energy, water nutrients and genetic material can occur in a dynamic and relatively undisturbed manner. It is both a means to conserve indigenous flora and fauna, and an important step in maintaining ecological balance within the city. Open Spaces consists of two main types namely urban open spaces and natural open spaces. Msunduzi Municipality adopts a NO NET LOSS of areas zoned open space / public open space / conservation. Hence it is advisable that future developments adhere to the concept of no-net-loss of open space.

Apart from the open space designations referred to hereinabove which, to some extent are intended to preserve certain land parcels, there are other properties that contain zones which ordinarily could be developed but are subject to certain environmental considerations. In this regard, the implications for any development on such properties are that the requisite environmental authorisations/clearances need to be obtained despite such sites having zones that normally would permit development in accordance with the applicable development controls.

A zone sets out what the maximum permissible development potential of a property comprises, however, the extent to which the development potential may be fully exercised is also dependent on the ability of a proposal to comply with all other legislative and or municipal provisions. To this extent, certain properties may very well be partially sterilized by virtue of the prevailing environmental conditions or legislative provisions.

With regard to properties located outside the scheme area, the municipality is in the process of developing a Land Use Policy to serve as a development framework firstly, to provide guidance on how the Municipality ought to deal with development applications in such areas and

secondly, as an incremental approach to ultimately developing a wall-wall scheme as per the requirements of the Spatial Planning Land Use Management Act (SPLUMA) No 16 of 2013.

Notwithstanding the policy, any development outside of the scheme is similarly subject to the applicable legislative provisions and for those that are identified as comprising environmental sensitivities or being considered a trigger in terms of NEMA and the Municipality's bylaws, the appropriate authorisation/s is required.

In summary, the implications for any development irrespective of whether a property is zoned or not, is that where the subject property requires an environmental authorisation (of any sort) no development may be contemplated until such time that a successful authorisation has been received, together with any other relevant approvals that may be required.

11 CONCLUSION

Based on the foregoing, the following may be concluded with regard to the Bishopstowe study area.

- The spatial suite of plans applicable to the study area suggests that the area plays a dualistic role within the municipality. The first, being for those areas located within the scheme, will develop in accordance with the scheme provisions and secondly, for the areas outside the scheme, these have been identified predominantly for agriculture and nature based tourism activities. In essence, the areas outside of the scheme appear to be advanced for low intensity type development.

- Approximately 38km^2 (just over 50%) of the study area is already built up and appropriate interventions to set aside environmentally sensitive areas have been put in place through appropriate land use scheme mechanisms and zones. Notwithstanding this, even where a property may enjoy zoning rights, should such property be subjected to any environmental requirements, the extent to which the property may be developed to its maximum potential will be dependent on the ability to comply with all other laws, which may have the impact of sterilizing a portion or the whole property.

- In regards to areas that are located outside the scheme boundary, more particularly, the eastern portion of the study area, it is recommended that the area maintains its agricultural and natural character as advanced by the Municipality's adopted strategic plans. Particular reference is made to the Mpushini Proclaimed Area and the associated 5km Buffer.

- The Municipality's strategic documents and associated environmental datasets comprise sufficient detail and information to assist it in making informed choices and decisions particularly with regards to promoting environmentally sustainable and conscious development initiatives. On this basis, the Bishopstowe study area if developed in accordance with the adopted plans will result in sustainable, environmentally conscious and purposeful initiatives that balances economic needs, the Municipality's vision and ecological and environmentally conscious development.

FINAL

SiVEST Environmental Division
VCC Estate, North View Building, 170 Peter Brown Drive, Montrose
PO Box 707, Msunduzi, 3231
South Africa

Tel + 27 33 347 1600
Fax +27 33 347 5762
Email info@sivest.co.za
www.sivest.co.za

FINAL