2014

ZNT Number:
ZNT 1786/2011 LG-1

PROJECT: DEVELOP A UNIVERSAL ACCESS PLAN ACROSS FIVE DISTRICT MUNICIPALITIES IN KZN

[REPORT: DEVELOPMENT OF UNIVERSAL ACCESS PLAN FOR WATER SERVICES FOR UMKHAYAKUDE DISTRICT MUNICIPALITY]

REPORT TITLE	Development of Universal Access Plan for Water Services in Umkhanyakude District Municipality		
CLIENT	Department of Cooperative Governance and Traditional Affairs		
FOCUS	Prepared by : _______________	Reviewed by: _______________	Approved by: _______________
MM PDNA	Prepared by : _______________	Reviewed by: _______________	Approved by: _______________
MHP GEOSPACE	Prepared by : _______________	Reviewed by: _______________	Approved by: _______________

DESCRIPTION	REVISION	DATE
Umkhanyakude District Municipality Universal Access Plan	Final	02/10/2014

TABLE OF CONTENTS

INDEX OF FIGURES

LIST OF TABLES

LIST OF MAPS

LIST OF ANNEXURES

LIST OF REFERENCES

Umkhanyakude District Municipality. (2013-2014) . *Umkhanyakude District Municipality Intergrated Development Plan.*

Umkhanyakude District Municipality. (2012) . *Umkhanyakude District Municipality Intergrated Development Plan.*

Umkhanyakude District Municipality. (2007). *Umkhanyakude District Municipality Water Services Development Plan.*

Jozini Local Municipality. (2012/13 to 2016/17). *Jozini Local Municipality Intergrated Development Plan.*

Hlabisa Local Municipality. (2013-2014). *Hlabisa Local Municipality Intergrated Development Plan.*

Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Hluhlewe Water Supply Supply Scheme Area - Big 5 False Bay & Hlabisa Local Municipality.*

Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Jozini Water Supply Supply Scheme Area - Jozini Local Municipality.*

Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Kangwanase (Manguzi) Water Supply Supply Scheme Area - Umhlabuyalingana Local Municipality.*

Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Mbazwane Water Supply Supply Scheme Area - Umhlabuyalingana Local Municipality.*

Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Mkuze Ubombo Water Supply Supply Scheme Area - Jozini Local Municipality.*

Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Mseleni Water Supply Supply Scheme Area - Umhlabuyalingana Municipality.*

Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Mtubatuba and surrounding Water Supply Supply Scheme Area - Mtubatuba Local Municipality.*

Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Shemula Water Supply Supply Scheme Area - Jozini & Umhlabuyalingana Local Municipality.*

Statistics South Africa. (n.d.). *Statistics South Africa*. Retrieved from www.statssa.gov.za

GLOSSARY

COGTA	-	Department of Cooperative Governance and Traditional Affairs
DM	-	District Municipality
DRDLR	-	The Department of Rural Development and Land Reform
DWA	-	Department of Water Affairs
GIS	-	Geographical Information System
IDP	-	Integrated Development Plan
LM	-	Local Municipality
MIG	-	Municipal Infrastructure Grant
PIG	-	Provincial Infrastructure Grant
PMU	-	Project Management Unit
RWSS	-	Regional Water Supply Scheme
TA	-	Traditional Authorities
TOR	-	Terms of reference
UAP	-	Universal Access Plan
UKDM	-	Umkhanyakude District Municipality
WARMS	-	Water Authorisation and Registration Management System
WSA	-	Water Services Authority
WSDP	-	Water Services Development Plan
WSP	-	Water Services Provider
WTW	-	Water Treatment Works
WWTW	-	Waste Water Treatment Works
WUA	-	Water User Association

1. EXECUTIVE SUMMARY

The consortium consisting of Focus, Mott Macdonald PDNA,MHP GeoSpace and Sivuno Consulting were appointed to undertake the Universal Access Plan (UAP) for water in five of the District Municipalities in KwaZulu- Natal. The report was to focus on the following:

- Assessment of water planning status quo.
- Identify existing water supply schemes.
- Identify already proposed future water supply schemes (at a conceptual level).
- Existing and proposed water supply and demand options.
- An updated geo database.
- Preparation of a Universal Access Plan (UAP) which entails collection of infrastructure backlog, verification of existing data from the various municipalities and formulating a plan with relevant milestones and associated costs to achieve Universal Access.

The following documents were viewed for information regarding the water planning status quo and assessment of all existing supply schemes as well as proposed future supply options for each of the Local Municipalities and the District Municipality:

Documents	**Latest Report**
Umkhanyakude District Municipality Integrated Development Plan	2013
Umhlabuyalingana Local Municipality Integrated Development Plan	2013
Jozini Local Municipality Integrated Development Plan	2013
The Big 5 False Bay Local Municipality Integrated Development Plan	2013
Hlabisa Local Municipality Integrated Development Plan	2013
Mtubatuba Local Municipality Integrated Development Plan	2013
Water Services Development Plan	2006
Development of Water Reconciliation Strategy for all towns in the Eastern Region for Umkhanyakude District Municipality	2011
Department of Water Affairs Priority Projects	2011

The methodology applied in the development of a Universal Access Plan for Water Services in Umkhanyakude District Municipality was as follows:-

- MM PDNA arranged meetings with the technical staff of the Umkhanyakude District Municipality in order to obtain GIS information and confirm the water backlog data, as well as confirm existing and proposed schemes in the Umkhanyakude District Municipality.

- MHP GeoSpace obtained Geographic Information System (GIS) spatial information from various sources, including the Umkhanyakude District Municipality and the Department of Water Affairs. All data has been stored in an ESRI ArcGIS 10.1 relational geodatabase, using a geographic co-ordinate system (decimal degrees). Metadata has been captured for all the data within the geodatabase. Domains or look-up tables have also been included to ensure consistency in data capture across all areas, and by all users.

- Draft water supply footprints were digitised off the latest colour aerial photography available from the Department of Rural Development and Land Reform. These were captured as polygons following settlement boundaries, and using existing water infrastructure where available. Settlement boundary datasets from the Department of Water Affairs and the Department of Rural Development and Land Reform, together with household points from Eskom (captured in 2011), were used as informants in this process. Outlying households were incorporated where possible but this was not always achievable in cases of isolated households that were located away from the more densely settled areas. In some cases these isolated households consisted of independent, privately owned farms which have their own local supply. These were excluded from the water supply footprint.

- A web mapping application was developed for the District, and served on the internet using ArcGIS Server, from the ESRI suite of GIS software products. This allowed users to view the data in their particular area, and where possible, to identify gaps in the data which could then be addressed by the project team. The engineering team had editing capabilities on this website and were able to identify and edit the attributes of any of the water supply footprints, to edit their shape if necessary, or to capture completely new water supply footprints in any area. Often these consisted of Independent farm houses with their own local supply, which were excluded from the water supply footprint.

- GIS analysis was used to calculate the high and low household numbers, as well as the high and low population counts, for each of the water supply footprints. Statistics SA were consulted on the best method in which to do this, and their census data was used to calculate the average growth rate per annum between 2001 and 2011. This data was applied to calculate the population in 2014 for each polygon. The same growth rate was applied to the number of households, which was calculated from the Eskom 2011 household point data. The table below indicates the growth rate for the Umkhanyakude District Municipality.

Census Year	**1996**	**2001**	**2011**	**% Growth from 1996 - 2001**	**% Growth from 2001 - 2011**	**% growth pa (1996 - 2001)**	**% growth pa (2001 - 2011)**
Umkhanyakude	503757	573341	625846	13.8	9.2	2.8	0.9

- The levels of service (LOS) points, supplied by the Department of Water Affairs, were mapped along with the water supply footprints. These were used to indicate which households were currently supplied with water services, and those which were not yet serviced and needed schemes to be implemented. The water backlogs in the Umkhanyakude District Municipality are presented in the table below.

Local Municipality	**Backlogs (Households)**
Umhlabuyalingana	7221
Jozini	12541
The Big 5 False Bay	4791
Hlabisa	5933
Mtubatuba	5953
Umkhanyakude	36439

- The highest number of households for each water supply footprint (whether from 2011 or 2014) was used to calculate current, future and probable water demand requirements, measured in million m^3 per annum.

- Map series at a scale of 1:20 000 were printed of the entire District Municipality, and these were given to MM PDNA so that conceptual water supply schemes could be designed. These designs were then returned to the GIS team, and captured into the geodatabase.

- Once the concept plans had been captured, they were checked for connectivity between adjacent municipalities. Attribute data, where available, was added to the geodatabase.

- Ownership information was added to each footprint polygon, using cadastral from the Surveyor-General and ownership data from the Deeds office. As the polygons did not follow cadastral boundaries, but rather the actual settlement points, the centroid of each footprint was used to determine the ownership of the property at that location. Ownership was divided into private, non-private (which included national, provincial and local municipal ownership) and land owned by the Ingonyama Trust Board.

- Each water supply footprint was checked against existing water infrastructure data to determine whether there was, or was not, short term water supply in the area.

LOCAL MUNICIPALITY	NO OF WATER SUPPLY FOOTPRINTS	NO OF WATER SUPPLY FOOTPRINTS WITH SHORT TERM SUPPLY
Umhlabuyalingana	1019	92
Jozini	1079	147
The Big 5 False Bay	342	33
Hlabisa	603	12
Mtubatuba	913	13
Umkhanyakude	3956	297

- MM PDNA undertook the conceptual design based on the water supply footprints provided by MHP GeoSpace. Where possible the concept designs were tied into the Umkhanyakude District Municipality's planned network to avoid any duplication of infrastructure and to reduce costs.

  The following assumptions were made in undertaking the conceptual designs for the un-serviced population:

- Water consumptions were based in accordance to the table below:

Description of consumer category	Household Annual Income range	Per capita cons (l/c/d)		
		Min	Ave.	Max.
Very High Income; villas, large detached house, large luxury flats	>R1 228 000	320	410	500
Upper middle income: detached houses, large flats	153 601 – 1 228 000	240	295	350
Average Middle Income: 2 - 3 bedroom houses or flats with 1 or 2 WC, kitchen, and one bathroom, shower	38 401 – 153 600	180	228	275
Low middle Income: Small houses or flats with WC, one kitchen, one bathroom	9 601– 38 400	120	170	220
Low income: flatlets, bedsits with kitchen & bathroom, informal household	1- 9600	60	100	140
No income & informal supplies with yard connections		60	70	100
Informal with no formal connection		30	70	70
Informal below 25 l/c/d		0	70	70

- Each household has an average of 6 people
- Some of the existing boreholes are functional.
- The existing water reticulation schemes are operational.
- Some of the existing water reticulation schemes have spare capacity.
- Existing water treatment works have the potential to be upgraded or rehabilitated.
- Schemes have some form of power supply.
- General pipe size range is from 25 mm to 150 mm diameter.
- Peak factor - 1.5
- Water losses were considered to be 35%
- Where there is an existing bulk line, connections to the bulk were kept to a minimum
- Reticulation mains were placed in the road reserve for maintenance purposes.
- District and provincial road crossings were kept to a minimum

➢ In viewing the water supply footprints on the GIS mapping the following parameters were used by MM PDNA to determine the type of scheme applicable to the different water supply footprints. The following scheme types were considered in the conceptual designs:

- Tie into existing schemes
- Existing boreholes and standpipes that are non-functional to be rehabilitated.
- Existing boreholes with reticulation to be rehabilitated.
- Boreholes mechanically operated for settlements with a low population.
- Boreholes electronically operated for settlements with a high population.
- Package Plants for settlements which are densely populated.
- From existing scheme pumped to new reservoir and reticulated.

Schematics and a detailed description of the various scheme types indicated above are indicated later in this document.

- The conceptual designs were quantified according to scheme types and the rates for various components of the water reticulation were provided by Umgeni Water and are stated in the document.

  The conceptual designs and cost estimates for each of the local municipalities as well as the district municipality and based on the various schemes are summarized in the following tables. The detailed costs for each scheme type are indicated in section 8.5 of this document.

Umhlabuyalingana LM	
Scheme Type	**Total**
Link to Existing Scheme	R 1 070 632 350
Existing boreholes electronically operated	R 577 788
TOTAL	**R 1 071 210 138**

Jozini LM	
Scheme Type	**Total**
Link to Existing Scheme	R 2 528 713 121
Small Package Plants	R 403 320 084
Exisiting boreholes electronically operated with Storage	R 20 045 907
New boreholes electronically operated	R 88 029 992
TOTAL	**R 3 040 109 104**

The Big 5 False Bay LM	
Scheme Type	**Total**
Link to Existing Scheme	R 152 996 527
Small Package Plants	R 466 135 491
New boreholes electronically operated	R 60 355 652
TOTAL	**R 679 487 670**

Hlabisa LM	
Scheme Type	**Total**
Link to Existing Scheme	R 505 450 827
TOTAL	**R 505 450 827**

Mtubatuba LM	
Scheme Type	**Total**
Link to Existing Scheme	R 113 856 102
Small Package Plants	R 353 309 883
TOTAL	**R 467 165 985**

The following table is a summary of all the local municipalities in the Umkhanyakude District Municipality for the various scheme types, and illustrates the total estimated cost for the District Municipality.

Umkhanyakude DM	
Scheme Type	**Total**
Link to Existing Scheme	R 4 371 648 927
Small Package Plants	R 1 222 765 458
Existing boreholes electronically operated	R 577 788
Exisiting boreholes electronically operated with Storage	R 20 045 907
New boreholes electronically operated	R 148 385 644
TOTAL	**R 5 763 423 725**

- The table below indicates the backlogs in the Umkhanyakude District Municipality and the cost per capita to eradicate the current backlog.

Local Municipality	**Backlogs (Households)**	**Cost per capita**
Umhlabuyalingana	7221	R 24 724
Jozini	12541	R 40 402
The Big 5 False Bay	4791	R 23 638
Hlabisa	5933	R 14 199
Mtubatuba	5953	R 13 079
Umkhanyakude	36439	R 24 724

- The phasing of schemes is based on the proposed plans which cover all reticulation and bulk supplies to address the water backlogs. Potential funding such as Municipal Infrastructure Grant (MIG), Provincial Infrastructure Grant (PIG), Cooperative Governance and Traditional Affairs (COGTA), Department of Water Affairs and Forestry (DWAF) etc may be applied for to undertake these projects. The table below indicates the phasing.

  An average cost for each scheme type was compared with the cost estimate for an individual scheme. If the scheme was less than or equal to the average it was assumed that the project could be untaken over a year. If the cost ratio was higher than the average cost, the ratio was used to determine the duration of the project. However, this is flexible depending on the nature and type of project.

Implementation Year	LM	Total Cost
2015/16	Umhlabuyalingana	R 210 400 710
	Jozini	R 1 242 609 410
	The Big 5 False Bay	R 522 551 163
	Hlabisa	R 274 941 408
	Mtubatuba	R 403 244 699
		R 678 186 107

Implementation Year	LM	Total Cost
2016/17	Umhlabuyalingana	R 143 647 987
	Jozini	R 478 926 566
	The Big 5 False Bay	R 51 310 856
	Hlabisa	R 83 176 578
		R 83 176 578

Implementation Year	LM	Total Cost
2017/18	Umhlabuyalingana	R 136 615 480
	Jozini	R 339 615 699
	The Big 5 False Bay	R 23 025 291
	Hlabisa	R 147 332 841
		R 147 332 841

Implementation Year	LM	Total Cost
2018/19	Umhlabuyalingana	R 580 545 961
	Jozini	R 978 957 430
	The Big 5 False Bay	R 82 600 360
	Mtubatuba	R 63 921 286
		R 1 125 479 076

- In the Umkhanyakude District Municipality, it is estimated that the existing water backlog of 36439 households can be eradicated by 2019 at a cost of R 5 360 103 641 to develop 134 schemes.

- All GIS data, including all current infrastructure, together with proposed schemes and the costs thereof have been incorporated into a structured geodatabase, with all relevant metadata. In some cases, metadata has also been captured for individual fields within particular datasets.

2. INTRODUCTION

2.1 Background of the study

In terms of the Department of Cooperative Governance and Traditional Affairs (COGTA) strategic priorities 2013/14 Programme 3 (Development Planning), the Department must prepare a UAP (Universal Access Plan) with a specific focus on water, sanitation and electricity as contained in the MEC's 2013/14 Vote 11 Budget Speech of the 30th of May 2013.

The intention of the UAP is to create service delivery liberated zones. A significant number of municipalities in KwaZulu-Natal are close to achieving universal access in key municipal infrastructure services such as water, sanitation and electricity.

Hence there is a need to formulate a plan to quantify remaining backlogs and the cost thereof.

As a result, the Municipal Infrastructure Development Business Unit of the KwaZulu - Natal Province Department of COGTA required the Focus Consortium to undertake the collection of infrastructure backlog data, verify data and compile a UAP document with relevant milestones and associated costs. The resources were selected in terms of the TOR (terms of reference) from all service providers from the PMU (Project Management Unit), provided that the requirements are met.

The consortium consisting of Focus, Mott Macdonald PDNA, MHP GeoSpace and Sivuno Consulting, and were appointed to undertake the UAP for water in five of the District Municipalities in KwaZulu-Natal. The report was to focus on the following:

- Assessment of water planning status quo.
- Identify existing water supply schemes.
- Identify already proposed future water supply schemes (at a conceptual level).
- Existing and proposed water supply and demand options.
- An updated geodatabase.
- Preparation of a UAP which entails collection of infrastructure backlog, verification of existing data from the various municipalities and formulating a plan with relevant milestones and associated costs to achieve a UAP.

2.2 Umkhanyakude District Municipality Overview

Umkhanyakude District Municipality (DM) is located in the far Northern region of KwaZulu-Natal Province in South Africa. At 12 818 km^2 and with a population totaling 625846, the District is the second largest District in KwaZulu-Natal, in terms of size, behind its neighbouring District, Umkhanyakude DM.

The district comprises five local municipalities: Umhlabuyalingana (KZ 271), Jozini (KZ 272), The Big 5 False Bay (KZ 273), Hlabisa (KZ 274) and Mtubatutba (KZ 275).

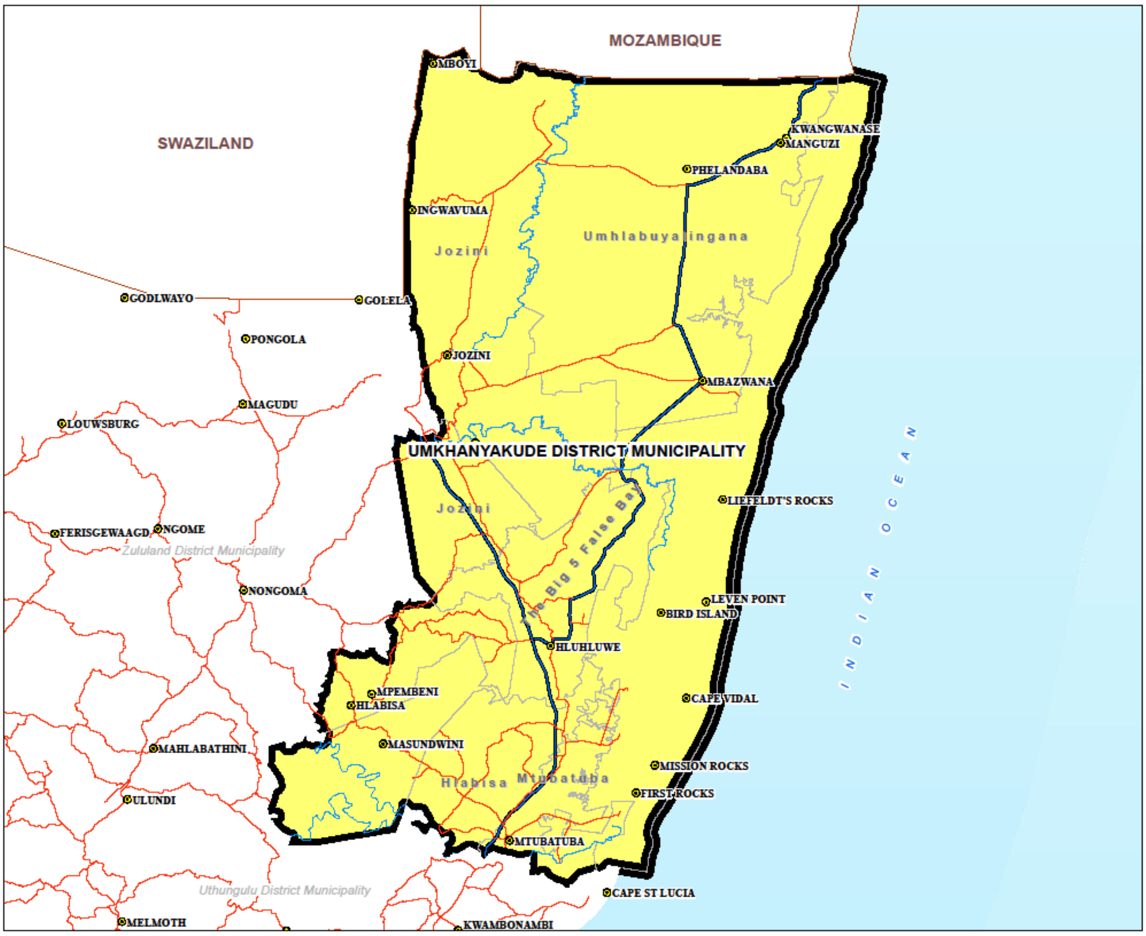


Figure 1 – Umkhanyakude District Municipality Locality Plan

The following are the local municipalities situated in the UKDM:

2.2.1 Umhlabuyalingana Local Municipality (KZ 271)

Umhlabuyalingana Local Municipality is located in northern KwaZulu-Natal along the border with Mozambique to the north, the Indian Ocean to the east, Jozini Municipality to the west and the Big Five False Bay Municipality to the south. The municipality is generally rural, with the population being spread among the 17 municipal wards and four traditional council areas (Tembe, Mashabane Mabaso and Zikhali). The total population in this municipality consists of 156736 people.

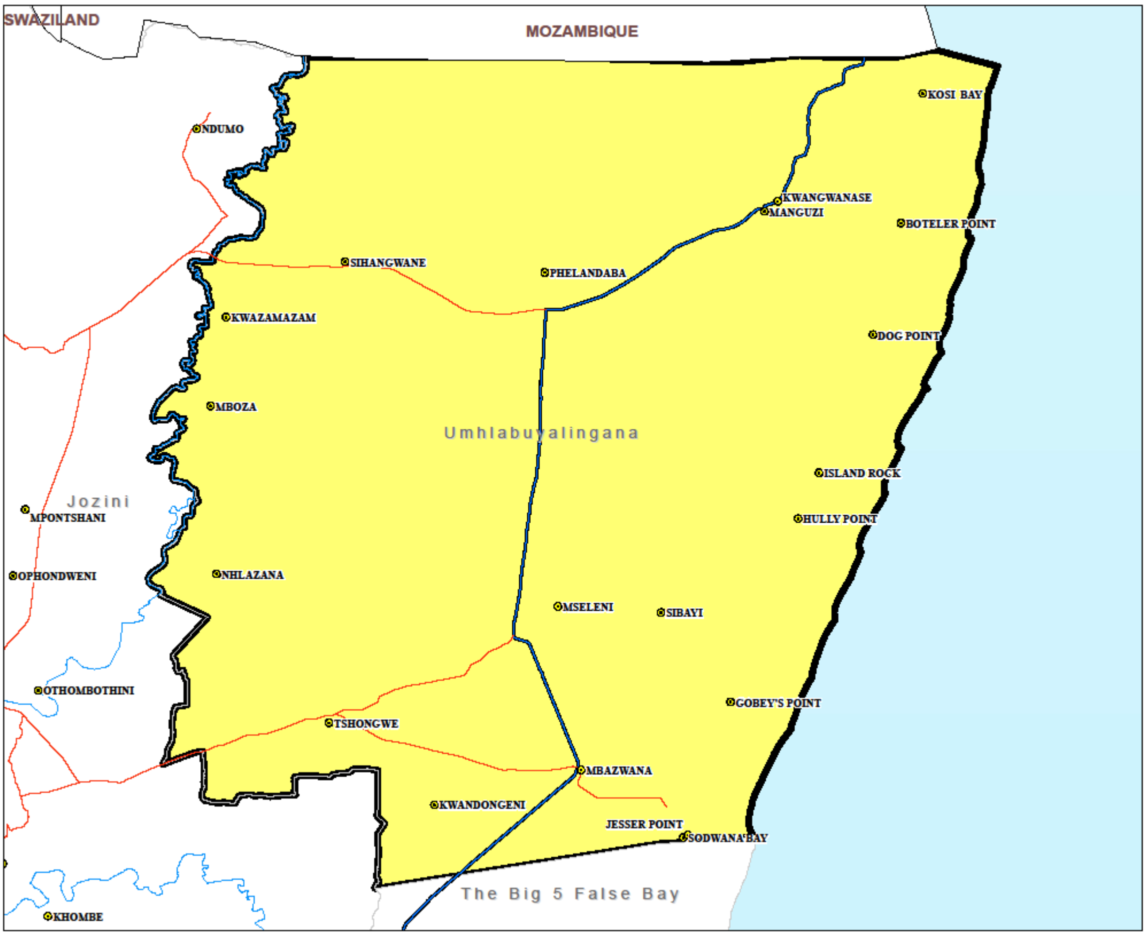


Figure 2 - Umhlabuyalingana Local Municipality

2.2.2 Jozini Local Municipality (KZ 272)

Jozini Municipality is located in the Northern Kwa-Zulu Natal and borders of Swaziland and Mozambique. Jozini Municipality covers 32% (3057 km^2) of the total area of 13859 km^2 of uMkhanyakude District Municipality. The total population consists of 186502 people. Jozini Municipality is characterized by six towns which are:

- Ingwavuma town
- Jozini town
- uBombo town
- Bhambanana town
- uMkuze town
- Ndumo town

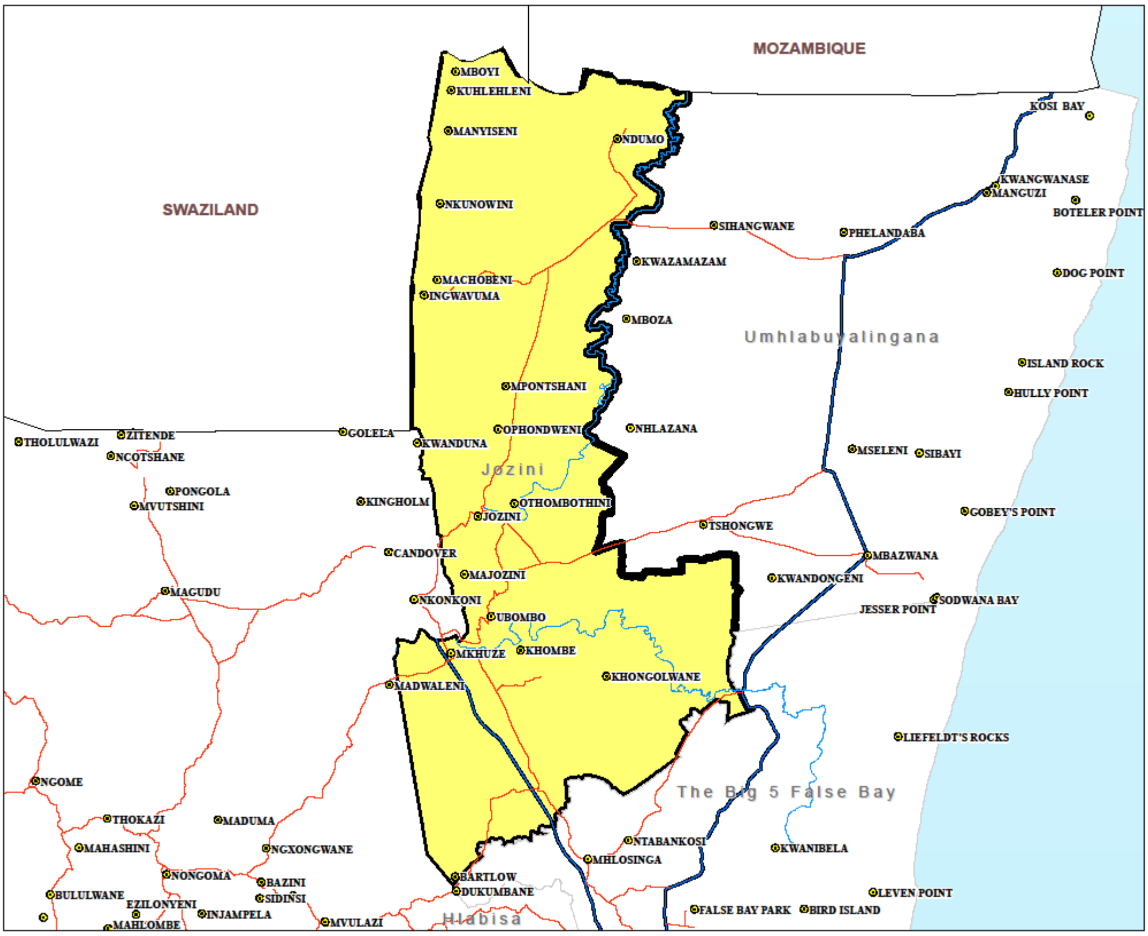


Figure 3 – Jozini Local Municipality

2.2.3 The Big 5 False Bay Local Municipality (KZ 273)

The Big 5 False Bay is a small local municipality situated within the Umkhanyakude District in northern KwaZulu-Natal. The municipality covers 2121 km^2 of the total area of 13859 km^2 of Umkhanyakude District Municipality. The total population within this municipality consists of 35258 people.

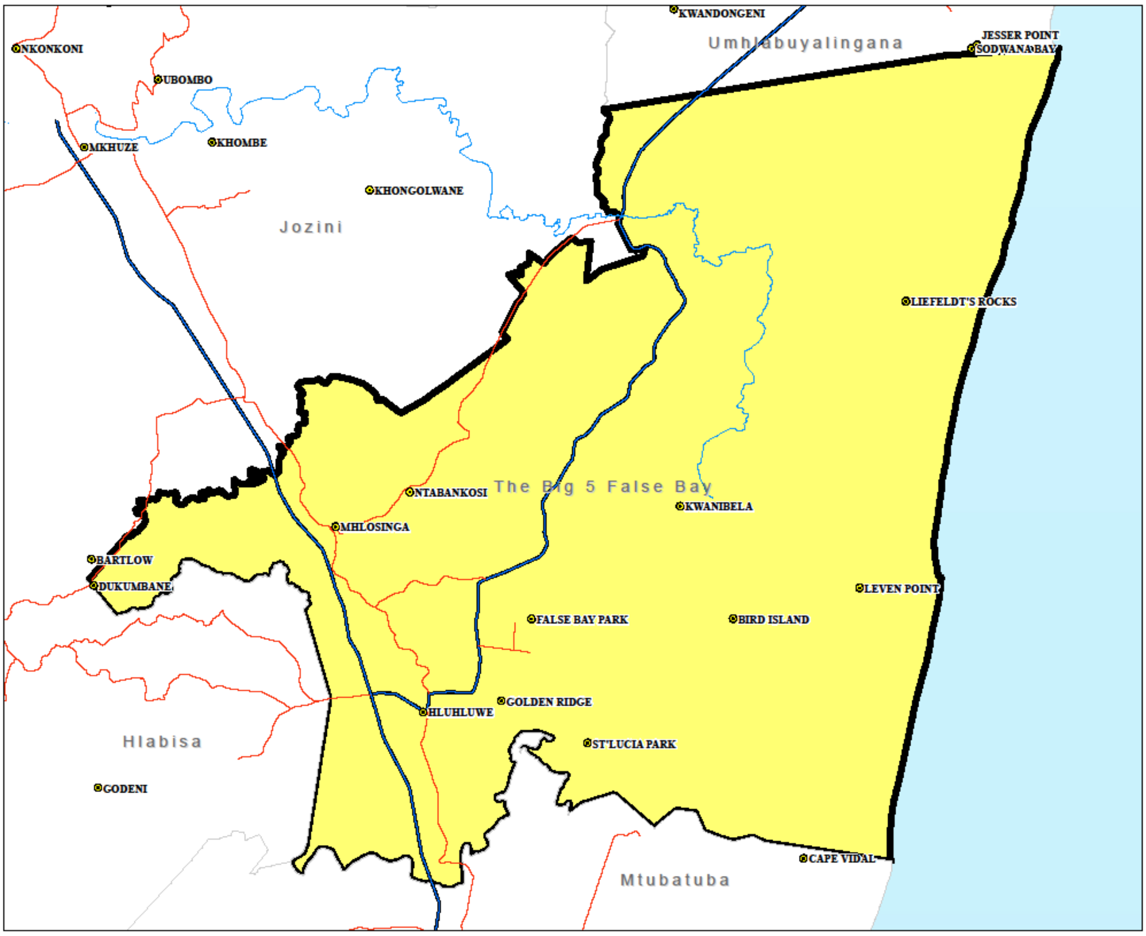


Figure 4 – The Big False Bay Local Municipality

2.2.4 Hlabisa Local Municipality (KZ 274)

Hlabisa is a small local municipality situated within the Umkhanyakude District in northern KwaZulu-Natal. The municipality covers 1555km^2 of the total area of 13859 km^2 of Umkhanyakude District Municipality. The total population within this municipality consists of 71925 people.

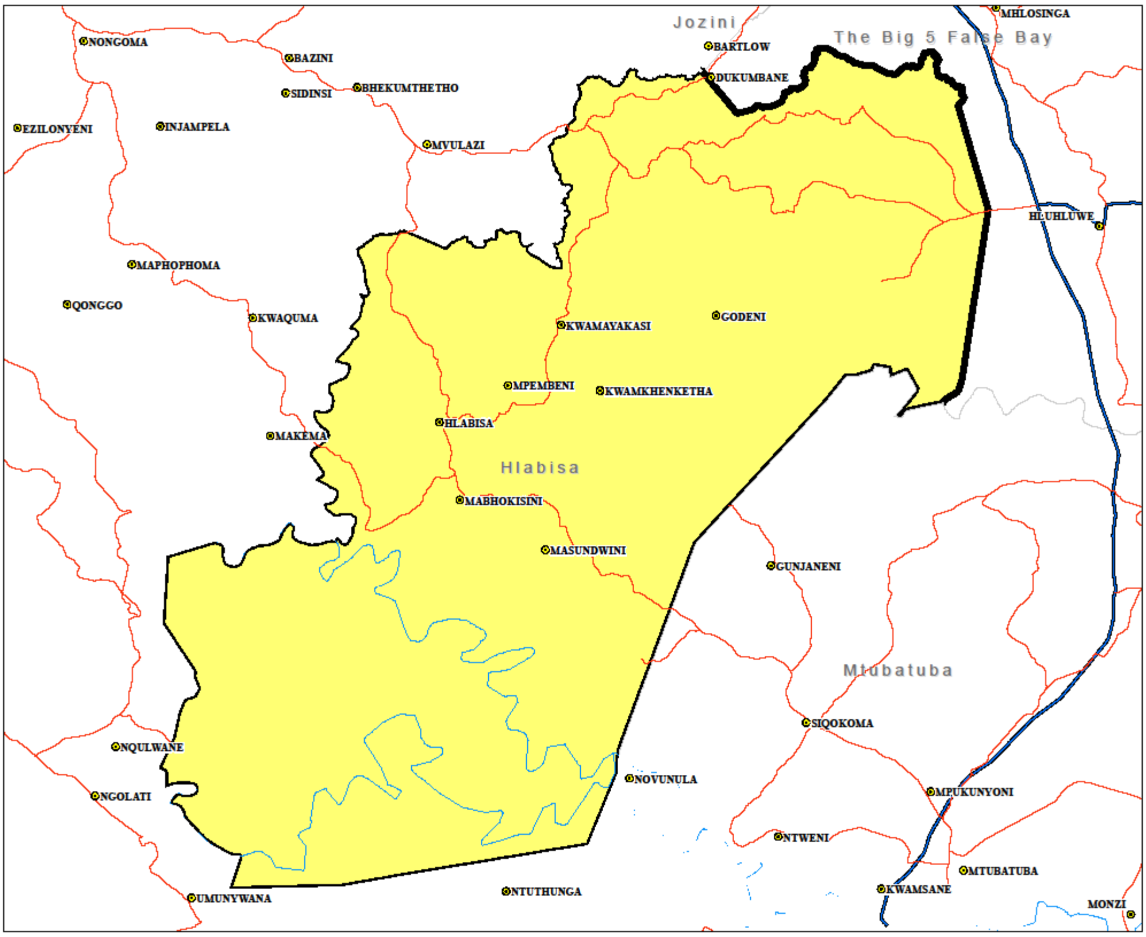


Figure 5 – Hlabisa Local Municipality

2.2.5 Mtubatuba LM (KZ 275)

Mtubatuba Municipality forms the southern end of Umkhanyakude District. The municipality is bounded to the south by Mfolozi River, which separates the municipality with Umfolozi Municipality (uThungulu District Municipality) further south. On the east, Mtubatuba Municipality is bordered by the ocean, while it is bounded by the Big Five False Bay Municipality to immediate north. Hlabisa Municipality and Hluhluwe–Imfolozi Park forms the western boundary of the municipality. The total population within this area consists of 175425 people.

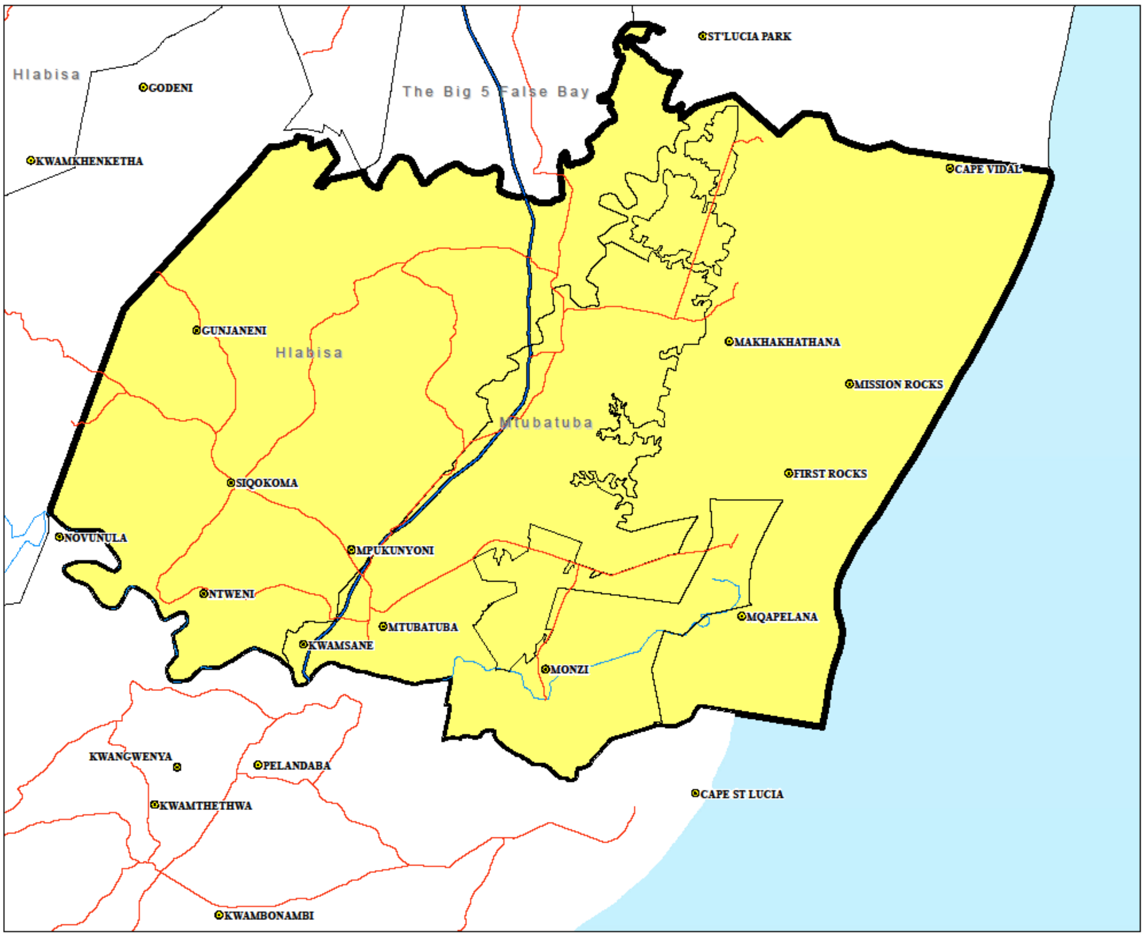


Figure 6 – Mtubatuba Local Municipality

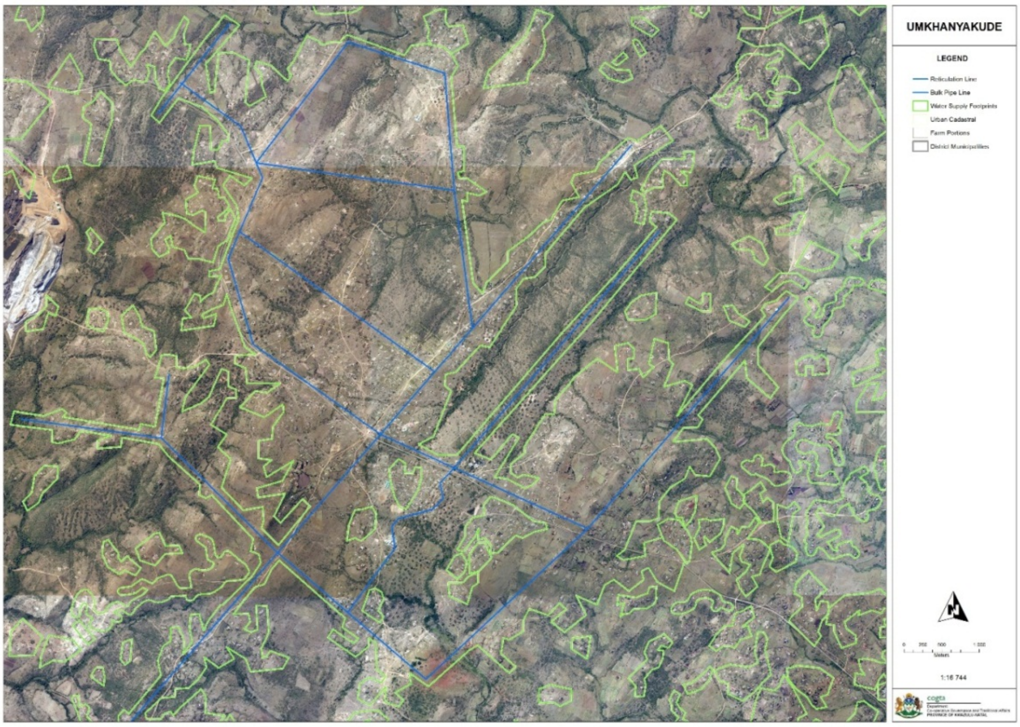
3. ASSESMENT OF WATER PLANNING STATUS QUO

In order to assess the current water and sanitation situation in Umkhanyakude District Municipality, data in the form of Geographic Information System (GIS) spatial information was obtained from various sources, including the Department of Water Affairs (DWA). Other documents are discussed in section 5 and section 7 of this report.

All spatial data has been stored in an ESRI ArcGIS 10.1 relational geodatabase. Due to the spatial location of the five District Municipalities in which work was undertaken, all data was stored in a geographic co-ordinate system i.e. decimal degrees. Where necessary, source data has been projected to the required co-ordinate system. Metadata (information about the data – e.g. Source, date, capture method) has been captured within the geodatabase.

The geodatabase also includes base data such as boundaries, roads and place names, as well as household points from the Eskom study of 2011. Domains within the geodatabase act as look-up tables, which allow the user to update the data using specific values. This ensured consistency in data capture across all team members and across all areas in terms of the way data was captured, as well as the type of data captured.

Domains include the bulk water classification, type and condition, together with the waters scheme name and maintenance requirements. Domains can be edited and updated to allow for changes in users and projects. Once all currently available data had been collated, the district local municipality was contacted to see if there was any additional data that could be obtained and added to the database. However, data was sorely lacking in this District. The only data available seems to be that owned by the Department of Water Affairs (DWA), which has been used by the project team. It will be of great value to Umkhanyakude to hand back to them a geodatabase with data that could be used for future planning and implementation of services.



Map 1 – Example of bulk water infrastructure in the Siqokoma area

4. DEVELOP CONTINUOUS WATER SUPPLY FOOTPRINT AREAS

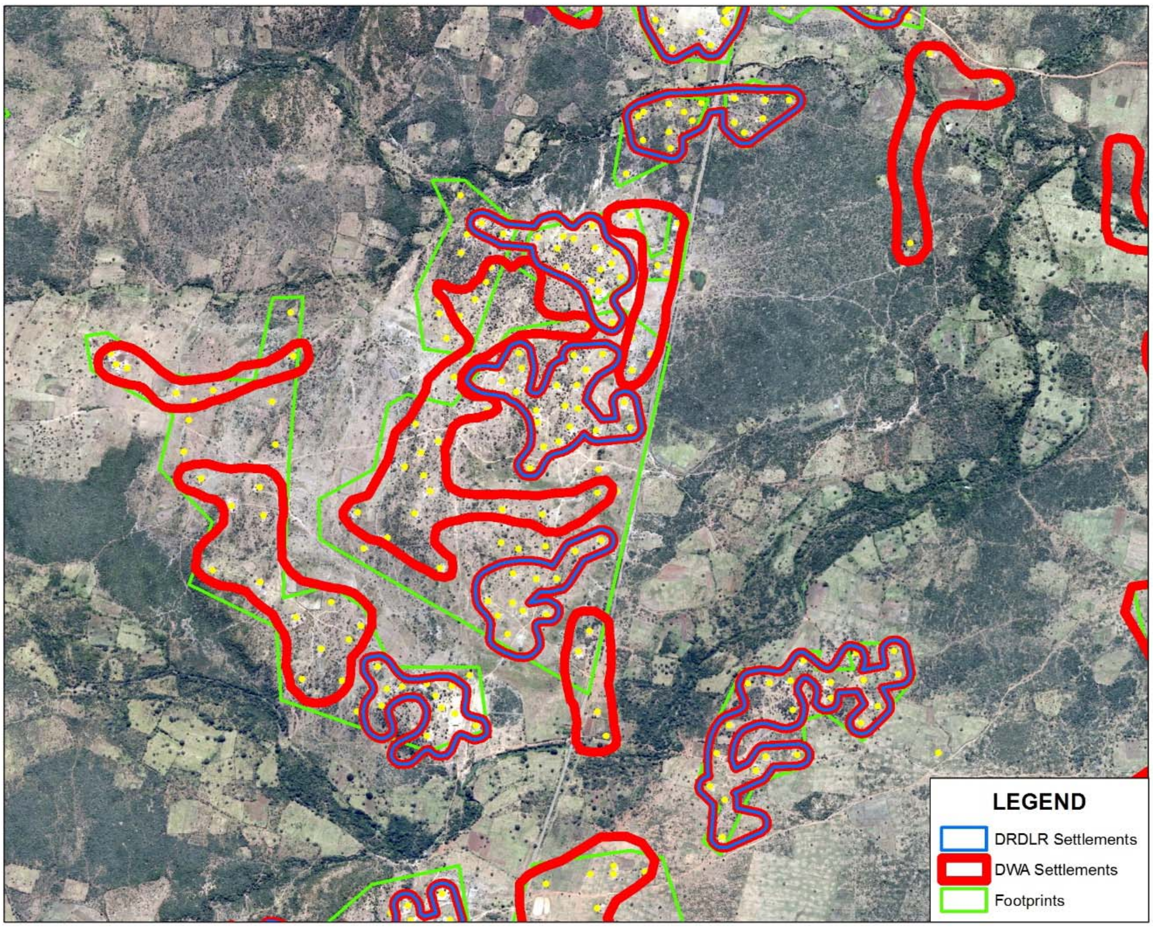
After consultation with Umgeni Water, water supply footprints in the District Municipality were captured as polygons tightly following the edge of settled areas. The data was captured on screen through heads-up digitising against the latest colour aerial photography (ranging from 2009 – 2011) available from the Department of Rural Development and Land Reform. The scale of capture was 1: 10 000, with 1: 5000 capture being done in dense areas.

Areas for capture were identified primarily using the Eskom 2011 household point data, together with additional settlement information (DWA settlements; Department of Rural Development and Land Reform settlements) and existing infrastructure data. These were overlaid onto aerial photography, and polygons were created around obvious settled areas. Outlying households were incorporated where possible but this was not always achieved in cases of isolated households that were far away from more densely settled areas. Once the above data sources had been exhausted, the whole district was panned through and any additional settlements were picked up from the aerial photography.

These water supply footprints were captured over the whole district, including areas where there was existing infrastructure and/or supply.

Map 2 – Footprint where no water reticulation exists

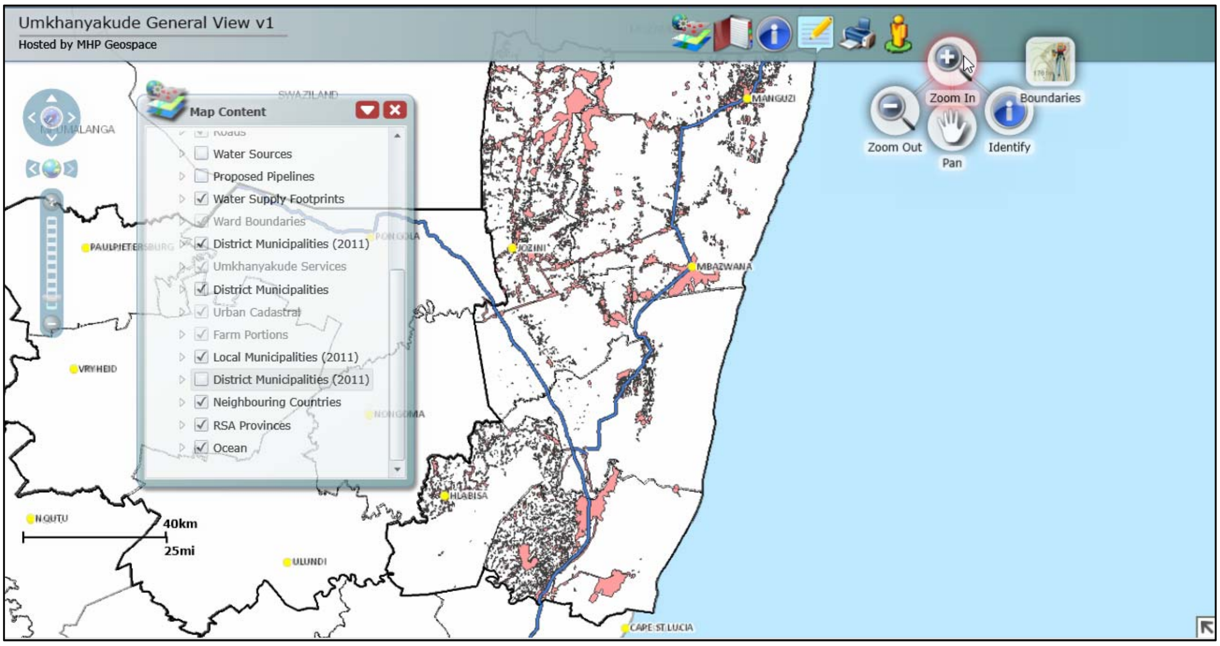
An example of the differences between the settlement boundary datasets is illustrated in Map 3. There are areas where the boundaries between the datasets are co-incident (the blue lines lie over the red lines), as well as areas where the datasets differ.



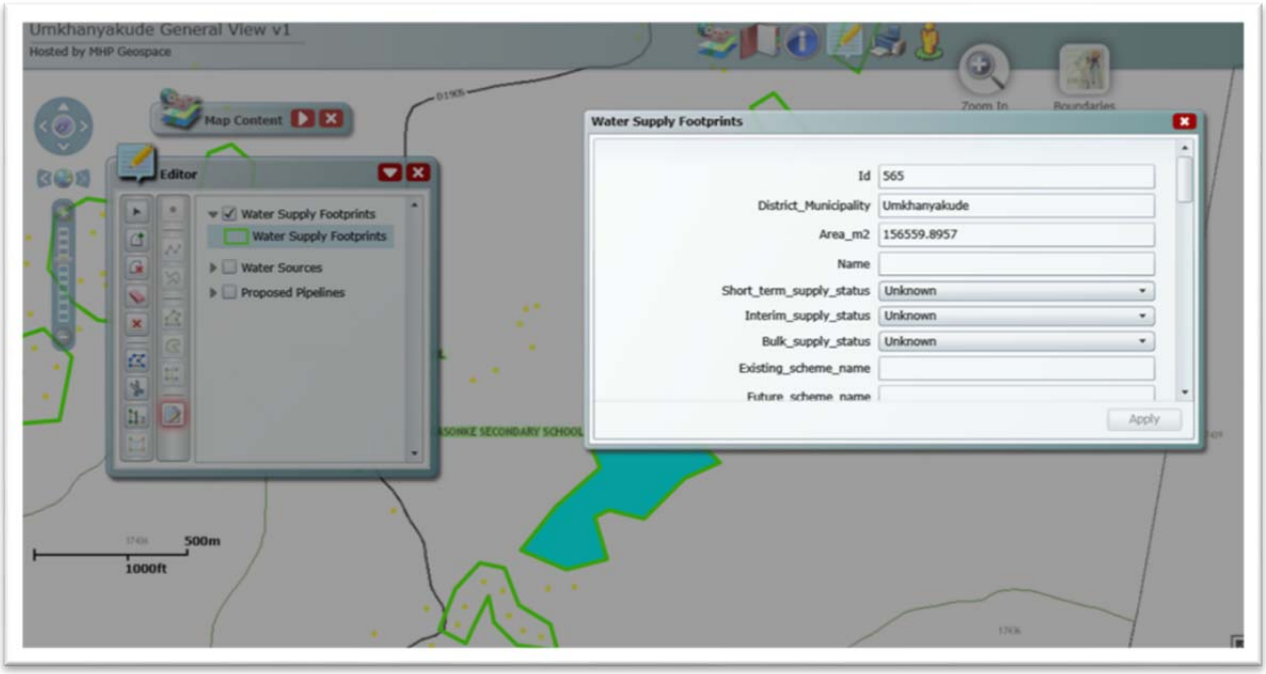
Map 3 – Example of settlement boundary datasets

Database fields were added to the attribute listing as per the attributes stipulated by Umgeni Water. A detailed list and descriptions of these fields can be found in Annexure 1.

Due to the time constraints of this project, and in an effort to make as much data as possible available to both the project team, and to the District Municipality, a web mapping application was developed for the District, and served on the internet using ArcGIS Server, from the ESRI suite of GIS software products. This allowed users to view the data in their particular area, and where possible, to identify gaps in the data which could then be addressed by the project team. The water supply footprints captured in the desktop study were included in this application.



Map 4 – Screenshot of the web mapping application



Map 5 – Screenshot of the editor capability on the web mapping application

The engineers from Mott Macdonald PDNA (MM PDNA) were given editing capabilities to the water demand area layer on the website. This allowed them to identify and edit the attributes of any of the footprints, to edit their shape if necessary, or to capture completely new areas at any location. These online edits were written back to the base database, to be verified later in the office.

In conjunction with this data capture through the web application, visits to the District Municipality were undertaken to explain the steps of the project. A brief overview of the existing data was given, together with a short demonstration of the web mapping application, with explanation of the reasons behind this application which is primarily that of onsite data capture while working with the municipal employees.

4.1 Verification of existing information received from the UKDM

MM PDNA met with a representative from UKDM. The outcomes of this meeting are summarized below.

Date:	**25/2/2014 – 26/2/2014**		
Representative:	Robert Slaughter	079 196 2538	slagter12345@gmail.com
Information received:	Study done by Bigen Africa for water Affairs		
Comments:	The officials from the UKDM did not have any information available.		

The UKDM referred MMPNA to a study done by Bigen Africa and their latest IDP. They indicated they have no information aside from that which is recorded in the reports mentioned above.

It is recommended that a detailed site investigation be undertaken as a separate appointment to confirm the information recorded in the reports.

MM PDNA unofficially met with Anthony Wagner from the UKDM who indicated that there was no information (GIS/reports) that was available for utilisation in this project.

5. EXISTING WATER SUPPLY SCHEMES

5.1 UKDM Service Policy

5.1.1 Level of Service - Water

Service levels for water supply are provided under the following categories:

- RDP and above
- Dysfunctional schemes
- Unreliable source
- No scheme

The definition of "RDP and above" is obvious and refers to that sector of the population that generally receives at least the minimum level of services or above. "Dysfunctional" means that the respective area is covered by a scheme which is dysfunctional to such an extent that the minimum RDP level of service is not achieved. It could be as a result of equipment or infrastructure failure or operational and maintenance issues. The term "unreliable source" refers to those areas which are covered under a scheme but sporadic, seasonal or continuous failure of the raw water source results in below RDP level of service.

5.1.2 Level of Service – Sanitation

The sanitation level of service presented below is as per information abstracted from the WSDP 2007. The data distinguishes between the following levels of service:

- Flush toilet – sanitation connected to sewage system
- Septic tanks – flush toilet connected to septic tank
- Chemical toilet – no water used but requires maintenance
- VIP – pit latrine with ventilation
- Pit Latrine – without ventilation
- Bucket – bucket latrine have to have designated place for waste disposal
- None

5.2 Water Resources

5.2.1 Rivers

5.2.1.1 Jozini LM

The Jozini Municipal area is bordered by the Lebombo/Ubombo Mountain Range along its western boundary. Many smaller, non-perennial rivers and their tributaries have their source within the higher-lying mountainous areas and drain in an easterly direction toward the Pongola River. Some larger rivers, such as the Nawavuma River and the Pongola River itself, cut through gorges, having originated further to the east and, together with the Great Usutu River, are considered the only perennial systems within the central to northern area.

The Pongolapoort Dam is established along the Pongola River as it flows through the Pongolapoort Gorge within this area (Jozini town). All of these rivers drain into the Pongola River (the eastern boundary of the municipal area), which drains northwards toward the Great Usutu River into Mozambique.

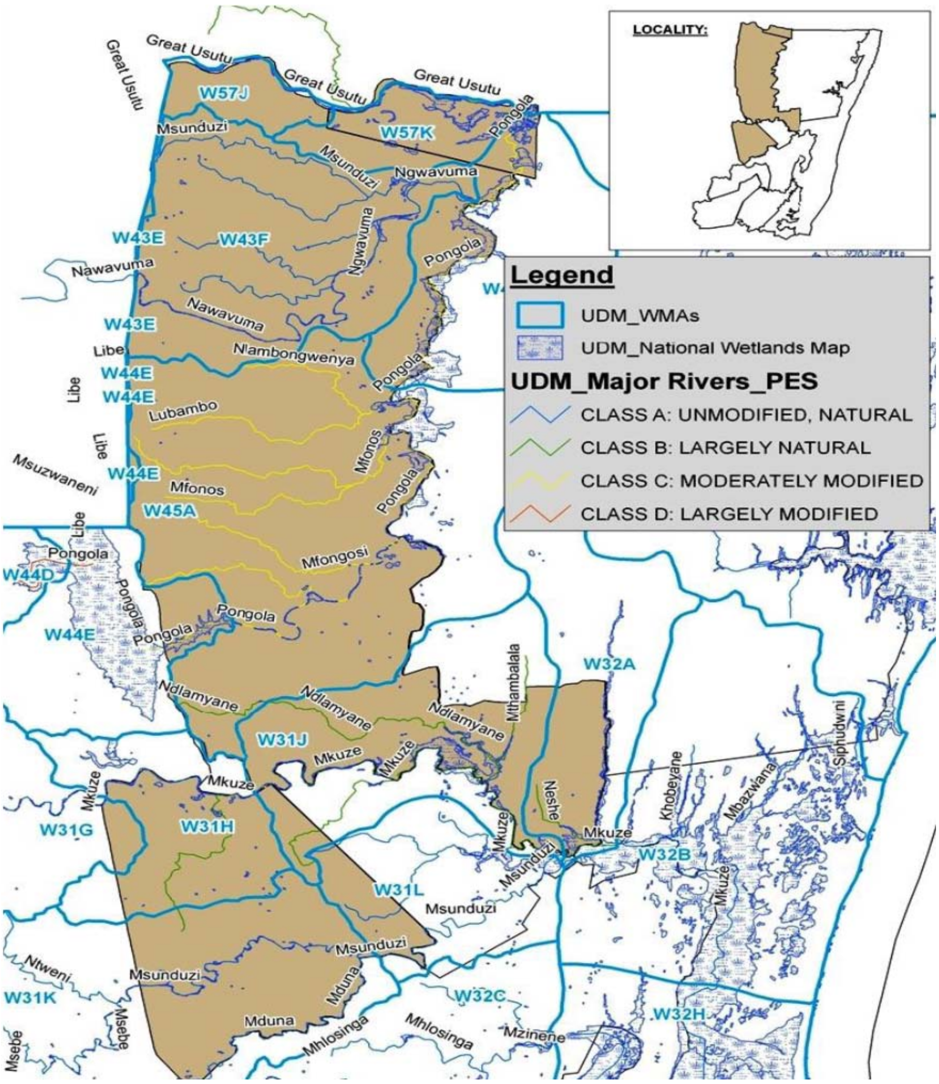


Figure 7- Major rivers & wetlands of Jozini LM

(Source: IDP 2013)

5.2.1.2 Umhlabuyalingana LM

The Umhlabuyalingana Municipal area incorporates the low-lying eastern area (the Maputuland Plain) that has a generally flat topography. This flattened, low-lying topography does not induce channel formation and therefore there is a general lack of major watercourses draining the area.

The result of which is the formation of large expanses of wetland areas. The eastern (coastal) areas are drained by smaller rivers, with the Swamanzi River being considered the only perennial system within the municipal area. This municipal area is the most rural of the UKDM.

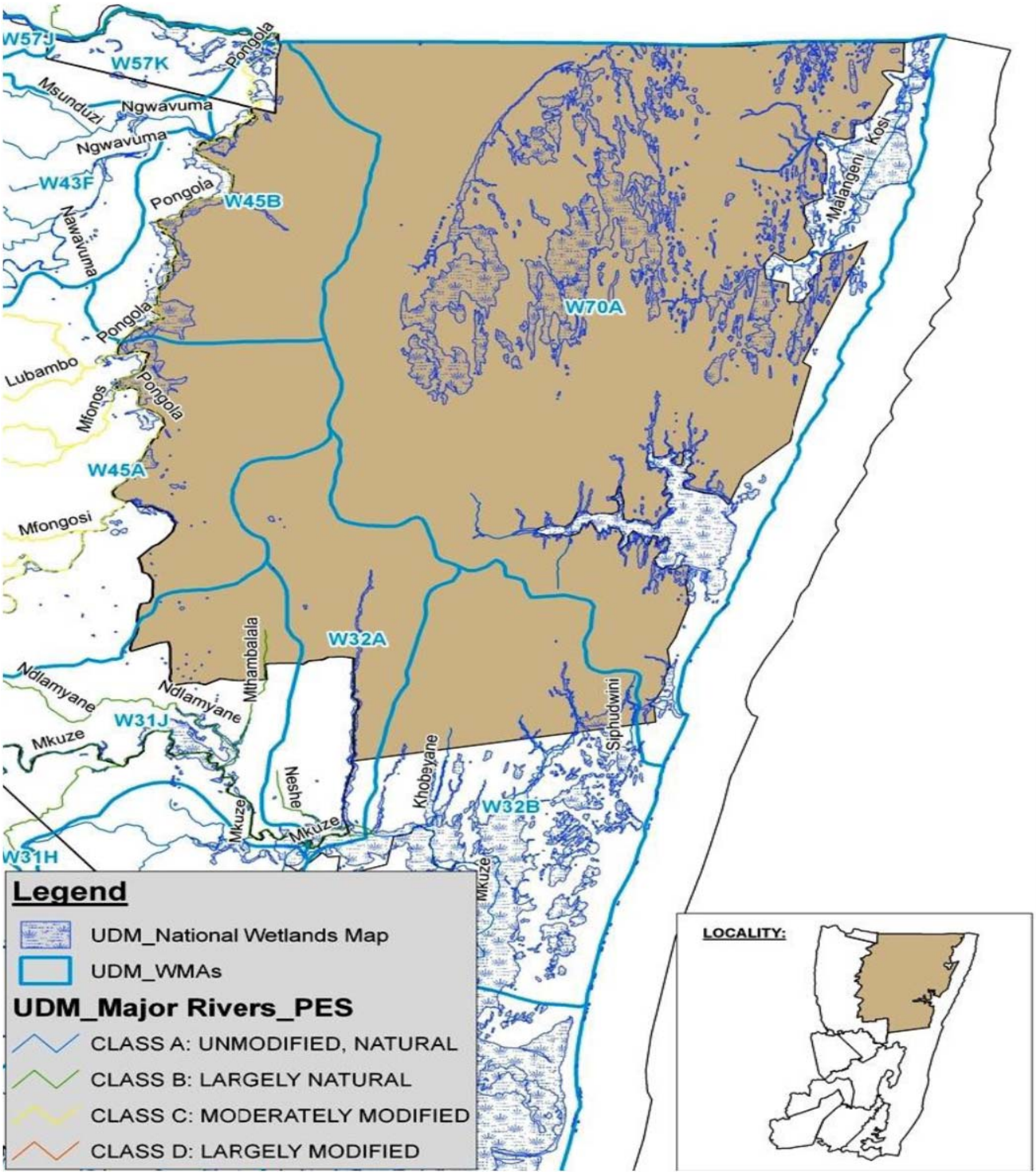


Figure 8 – Major rivers and wetlands of Umhlabuyalingana LM

(Source: IDP 2013)

5.2.1.3 The Big 5 False Bay LM

The Big 5 False Bay Municipal area has a relatively flatter topography. All of the major watercourses are regarded as being non-perennial, with the area being drained by the Mzinene River, which flows into Lake St Lucia to eventually drain into the Indian Ocean. The Hluhluwe River (a perennial system) forms the northern boundary of the municipal area, and drains eastward toward Lake St Lucia. This municipal area is also rich in wetland habitat units, including floodplain and pan-type wetland habitat units.

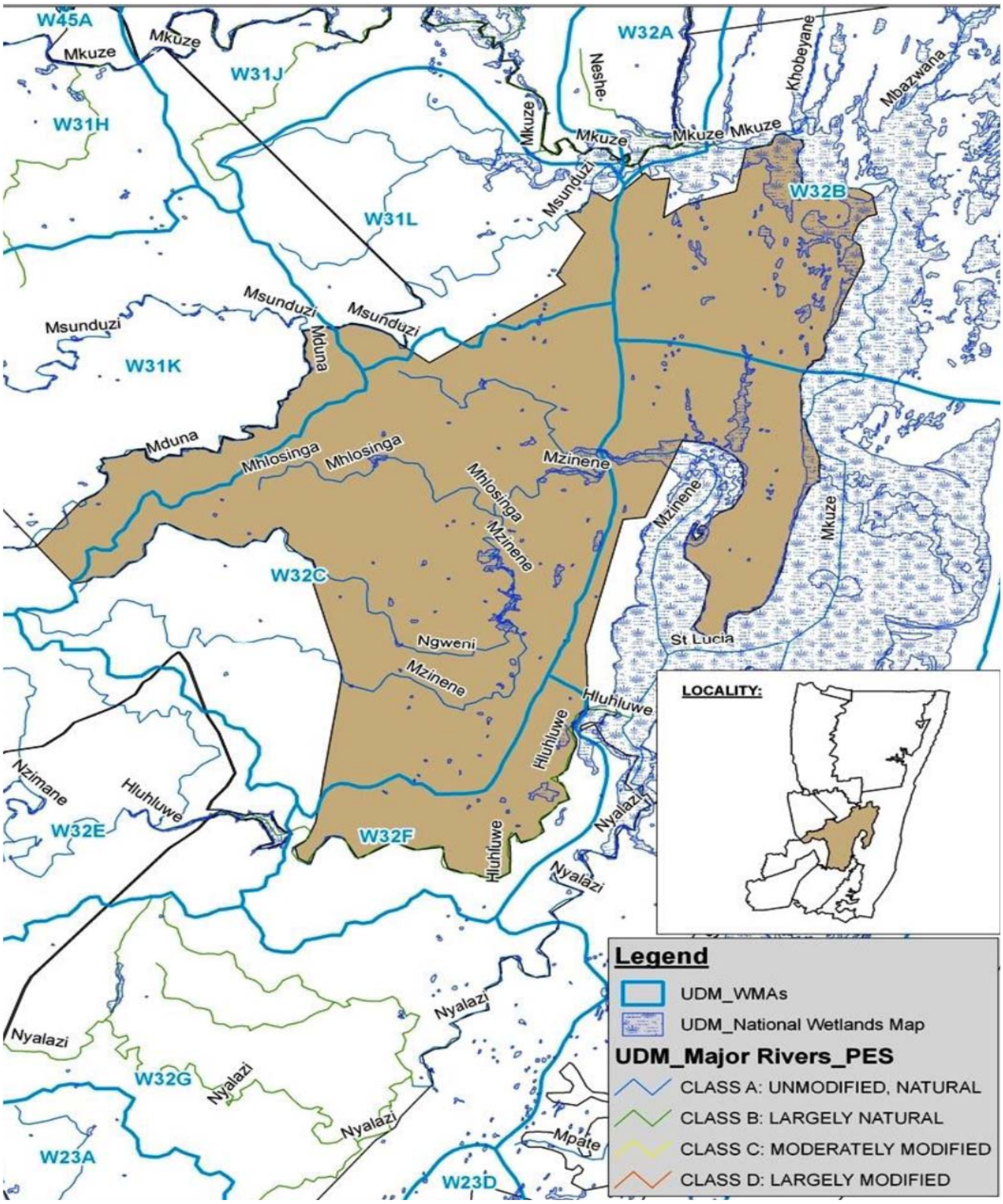


Figure 9- Major rivers and wetlands of Big Five False Bay LM
(Source: IDP 2013)

5.2.1.4 Hlabisa LM

The Hlabisa Municipality also has a relatively flatter topography and many of the river systems included within this area are regarded as being perennial. These include the Mfolozi River (forming the southern boundary of the municipal area) and the Nyalazi River (draining the central area), which also forms the eastern boundary of the area. The Nyalazi River drains northwards toward Lake St Lucia.

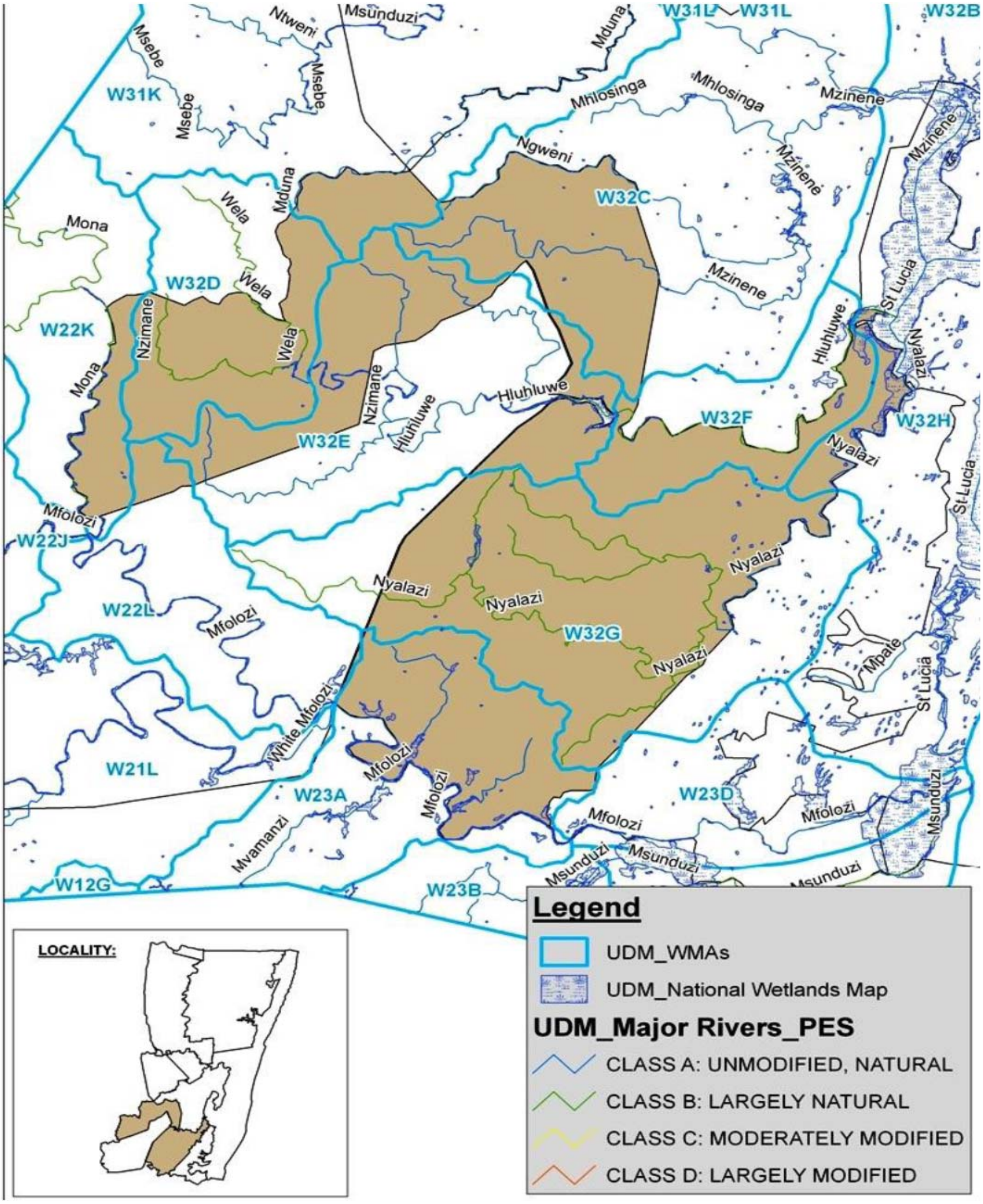


Figure 10- Major rivers and wetlands of Hlabisa LM

(Source: IDP 2013)

5.2.1.5 Mtubatuba LM

The Mtubatuba Municipality area is drained by the Mfolozi and Msunduzi Rivers in the south (both perennial systems). The western boundary is the Nyalazi River, draining northwards, and the eastern boundary is the Isimangaliso Wetland Park. This area is also rich in floodplain wetland areas.

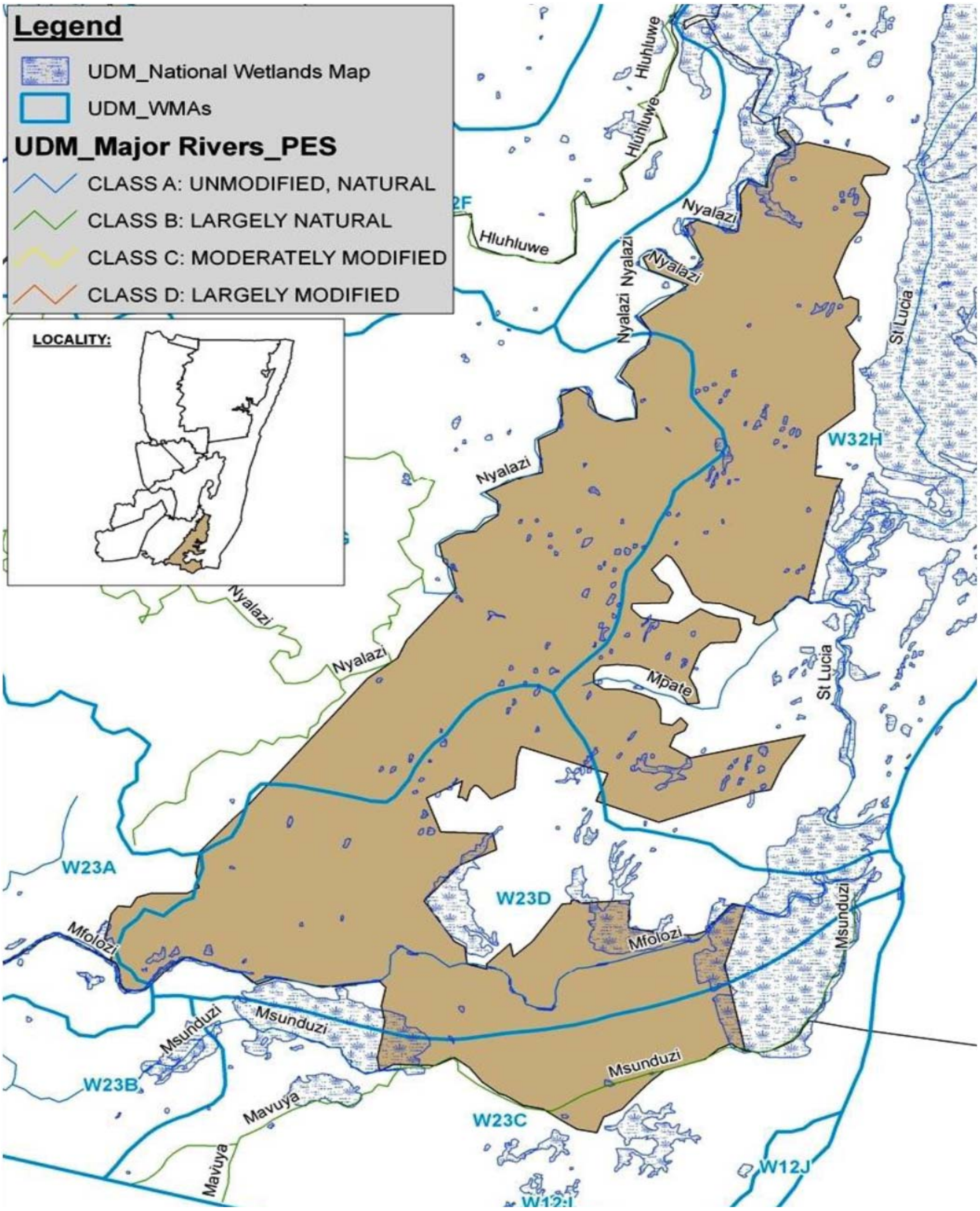


Figure 11- Major rivers and wetlands of Mtubatuba LM
(Source: IDP 2013)

Table 1 is a summary of the major river systems within for the various local municipalities within the UKDM. It also indicates the river catchment number and indicates the river type (i.e. perennial or non-perennial). This information was extracted from the IDP undertaken in 2013.

Municipality	WMA	Major Rivers	PES	River Type
Umhlabuyalingana	W70A	Swamanzi	A	Perennial
	W32B	Malangeni	A	Perennial
	W32B	Siphudweni	A	Non-Perennial
	W32B	Khobeyane	A	Non-Perennial
	W32J	Mathabalala	B	Non-Perennial
Jozini	W57J & W57K	Great Usutu	B	Perennial
	W43F	Msunduzi	A	Non-Perennial
	W43F	Ngwavuma	A	Perennial
	W45B & W45A	Pongola	C	Perennial
	W43F	Nawavuma	A	Perennial
	W45A	Nlambongwenya	C	Non-Perennial
	W45A	Lubambo	C	Non-Perennial
	W45A	Mfonos	C	Non-Perennial
	W45A	Mfongosi	C	Non-Perennial
	W45A & W31J	Ndlamyane	B	Non-Perennial
	W31H & W32J	Mkuze	B	Non-Perennial
	W31K	Msunduzi	A	Perennial
The Big Five False Bay	W31K	Mduna	A	Non-Perennial
	W32C	Mhlosinga	A	Non-Perennial
	W32C	Mzinene	A	Non-Perennial
	W32C	Ngweni	A	Non-Perennial
Hlabisa	W32C	Mzinene	A	Non-Perennial
	W32D	Wela	B	Perennial
	W32E	Nzimane	B	Perennial
	W23A	Mfolozi	A	Perennial
	W32G	Nyalazi		
Mtubatuba	W32A & W23D	Mfolozi	A	Perennial
	W23C	Msunduzi	B	Perennial
	W32H	St lucia	A	Perennial

Table 1- Major river systems within UKDM

(Source: IDP 2013)

5.3 Existing Water Supply Schemes

In undertaking the design of new and additional reticulation for the various local municipalities the available capacities of the various treatment plants were required. With the growth in population there was a need to determine when interventions were required i.e. extension of existing water treatment works or construction of new plant to serve the new/additional demands.

The information indicated in the Department of Water Affairs Reconciliation Strategies undertaken in 2011, covers the identification of the different catchments in the water management areas that were experiencing water supply deficits and a reconciliation strategy was developed particularly for the major economic areas, as well as the growing non-agricultural sectors.

Another objective of the study was to develop a water reconciliation strategy to enable effective and efficient use of the water supplies, while determining optimal and sustainable ways to source additional water supply for selected towns.

According to reports outlining the reconciliation strategies for the various water schemes in the UKDM, the availability of water resources is outlined below.

5.3.1.1 Kangwanase (Manguzi) Water Supply Scheme (Umhlabuyalingana LM)

(Source: First Stage Reconciliation Strategy for Kangwanase Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

The Kwangwanase (Manguzi) Water Supply Scheme for residential and non-residential consumption covers Kwangwanse (Manguzi) town and areas to North West and southwest of the town. These include Thandizwe, Thengani, Kwa-George and Kwazibi which are in Tembe Tribal Authority area.

The Kwangwanase (Manguzi) Water Supply Scheme has two water treatment works, the main one being located at Manguzi Hospital and a potable plant at Kanini. The total peak hydraulic capacity of the two treatment works is 1.5 ML/d with the average annual flow rate of 1.0 ML/d.

The current average treated water production for the WTW is estimated to be 1.0 ML/d with the groundwater contributing an additional 2.2 ML/d to make up the 3.2 ML/d bulk water supply into the Kwangwanase Water Supply Scheme area. The area is supplied with house and yard connections in the Kwangwanase (Manguzi) town and standpipes and kiosks in the surrounding villages of Tembe Tribal Authority.

Raw water abstraction infrastructure

The Kwangwanase (Manguzi) WTW abstracts raw water directly from the Gezisa Stream which is located to the south of the town. Raw water is pumped to the treatment plant located near the hospital where it is treated to potable drinking water quality standards (see Figure 12). The design capacity of the rising main or the size of the pipeline is not known. It is however assumed that the existing raw water abstraction works is sufficient to meet the peak hydraulic capacity of the existing treatment works.

The other WTW is situated in the Kanini River where it receives water from the Kanini River. The raw water is pumped from an abstraction works in the river to a treatment works off the river banks.

Water Treatment Works

Kwangwanase (Manguzi) Water Supply Area is serviced by the Kwangwanase (Manguzi) WTW which has a peak hydraulic design capacity of is 1.2 ML/d while the Kanini WTW is a package plant with a peak hydraulic capacity of 0.26 ML/d. This is illustrated in Table 2 below.

The Kwangwanase (Manguzi) WTW is a conventional treatment plant comprising the following process components:

Flocculation channels: The raw water is pumped from the Kwangwanase (Manguzi) Dam with chemicals added in as the water flows into flocculation channels where coagulation after polyelectrolyte dosing takes place to form the flocs.

(i) Clarification (sedimentation) tanks: The flocs that have formed in the flocculation channels are then settled in the sedimentation tanks under gravity. The settled sludge is frequently removed by de-sludging the tanks and sent to the sludge lagoons where the sludge is dried while the supernatant water is discharged back into the river. The plant was not designed for recycling of the wastewater.

(ii) Rapid Gravity Sand Filtration: The clarified water is then filtered through a set of rapid gravity sand filters as a final polishing before chlorination of the treated water.

(iii) *Chorine contact tank*: The filtered water is then stored in the chorine contact tanks where chlorination takes place before pumping the water to the command reservoirs in Tembe Tribal Authority Area for distribution to the Kwangwanase (Manguzi) town and the surrounding villages.

As illustrated in Table 2 below, the average annual capacity of the water treatment works is not sufficient to meet the current water requirements as the plants are operating at their peak hydraulic capacity. The current utilisation of 100% clearly indicates that the treatment plant is currently running at full capacity.

Any future increases in water requirements may require increasing the capacity of the treatment works. If this is not done this may result in some water quality problems, particularly filter breakthrough.

Treatment Work Name	Type of plant	Raw water source	Hydraulic Design capacity (ML/d)	Average Design capacity (ML/d)	Treated water production (ML/d)	Utilisation(% of ave. design capacity)
Kwangwanase (Manguzi) WTW	Conventional treatment	Gezisa River	1.2	0.85	No information available	No information available
Kanini WTW	Package plant	Kanini River	0.3	0.2	No information available	No information available
Total			1.5	1.05	1.00	100%

Table 2- Water Treatment Works in operation in Kwangwanase (Manguzi) Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Kangwanase Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

According to the WSDP (2007), there are any operational problems at the treatment works particularly with seasonal changes to the quality of the river water. The plant is also not very well maintained. It is likely that there is high turbidity levels that can be experienced in summer when abstracting from the river. The condition and performance of the water treatment works infrastructure is in a very poor state.

The estimated raw water abstraction for treatment at the Kwangwanase (Manguzi) WTW in 2008 was estimated as 1.2 million m^3/a (3.2 ML/d) with the treated water production estimated to be 1.1 million m^3/a (2.9 ML/d) raw water abstraction works. Therefore approximately 11% of the raw water abstracted is lost between the raw water abstraction works and the treatment works.

Treated water bulk supply infrastructure
The treated water from the Kwangwanase (Manguzi) WTW is pumped from the clearwater tanks to the three main reservoirs each at 0.134 ML and directly into the bulk supply network in Kwangwanase (Manguzi).

Water is then pumped from the main service reservoirs to service reservoirs supplying the villages of Thengani, Kwa-George and Mnyayiza (see Figure 2). It is not known whether the pumping systems have standby capacity.

Bulk Storage
The Kwangwanase (Manguzi) Water Supply Scheme area has a total reservoir storage capacity of 2.5 Ml supplying the various water supply areas of the town. The capacities of the reservoirs range from 0.05 ML tanks to 0.5 ML reinforced concrete (RC) service reservoir in the various water supply areas (see Figure 2).

The service storage capacity provides for a 20.88-hour storage based on the current gross average annual daily demand, but in summer months this reduces to approximately a 13.92-hour storage capacity, based on present water requirements (see Table 3). The total reservoir storage capacity of Kwangwanase (Manguzi) scheme is therefore not sufficient based on the accepted norm of 48 hours of summer peak requirement for urban areas.

The existing storage capacity cannot meet the following requirements:

- balance the fluctuating demands from the distribution system, permitting the source to give a steady or differently phased output;

- provide a supply during a failure or shutdown of treatment plant, pumps or bulk mains leading to the reservoir; and

- provide a reserve of water to meet fire and other emergency demands.

Additional service storage capacity is required in order to meet the future summer peak requirements of the supply area, at some time in the near future.

Parameters	**Kwangwanase (Manguzi) Water Supply Scheme Area**
Total Storage capacity (ML)	2.50
Storage Ratio on present annual average consumption (Hours)	20.88
Storage Ratio on present average peak week consumption (Hours)	13.92

Table 3 - Service Storage Reservoirs in Kanganase Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Kangwanase Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

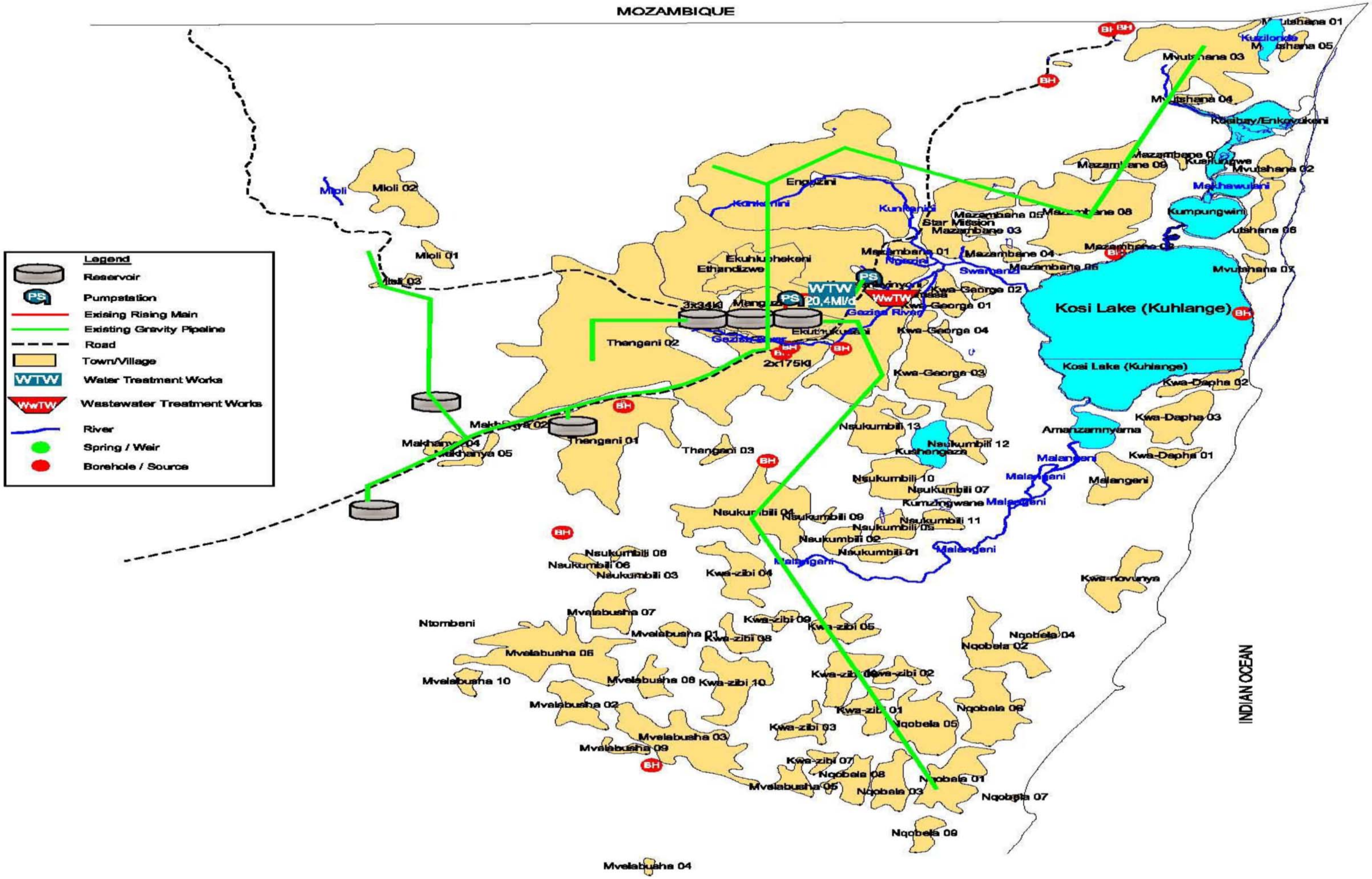


Figure 12- Schematic layout of Kwanganase Water Scheme Area

(Source: First Stage Reconciliation Strategy for Kangwanase Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

5.3.1.2 Hluhluwe Water Supply Scheme (Big 5 False Bay & Hlabisa LM)

(Source: First Stage Reconciliation Strategy for Hluhluwe Water Supply Scheme Area Big 5 False Bay & Hlabisa Municipality, 2011)

The Hluhluwe Water Supply Scheme supplies potable water to the residential and non-residential areas from the Mdletshe villages to the North West, Hluhluwe town and the township to the north east.

The Hluhluwe Water Supply Scheme has one water treatment works which was recently upgraded from a peak hydraulic capacity of 1.98 Ml/d to 6.1 ML/d. The current average treated water production for the WTW is estimated to be 3.7 ML/d, which supplies the area with house and yard connections in the Hluhluwe town and metered standpipes and kiosks in the surrounding villages of Mdletshe Tribal Authority.

The Hluhluwe WTW is a conventional treatment plant comprising the following process components:

(i) Flocculation channels: The raw water is pumped from the Hluhluwe Dam into flocculation channels where coagulation, after polyelectrolyte dosing, takes place to form the flocs.

(ii) Clarification (sedimentation) tanks: The flocs that have formed in the flocculation channels are then settled in the sedimentation tanks under gravity. The settled sludge is removed frequently by de-sludging the tanks and sending the sludge to the sludge lagoons where it is dried while the supernatant water is discharged back into the river. The plant was not designed for recycling of the wastewater.

(iii) Rapid Gravity Sand Filtration: The clarified water is then filtered through a set of rapid gravity sand filters as a final polishing before chlorination of the treated water.

(iv) Chorine contact tank: The filtered water is then stored in the chorine contact tanks where chlorination takes place before pumping the water to the command reservoir, from where it gravitates to the Hluhluwe town and the surrounding Tribal Authority villages.

As illustrated in Table 4, the water treatment works is operating near to its capacity since the current utilisation is already 93%. The water treatment plant cannot meet its current demand of 4.11 ML/d and any significant future increases in water requirements will require increasing the capacity of the treatment works. If this is not done this may result in some water quality problems, particularly filter breakthrough.

Treatment Work Name	Type of plant	Raw water source	Hydraulic Design capacity (ML/d)	Average Design capacity (ML/d)	Treated water production (ML/d)	Current utilisation (% of average design capacity)
Hluhluwe WTW	Conventional treatment	Hluhluwe River	6.0	4.0	3.70	93%

Table 4- Water Treatment Works in operation in Hluhluwe Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Hluhluwe Water Supply Scheme Area Big 5 False Bay & Hlabisa Municipality, 2011)

It is not known whether, there are any operational problems at the water treatment works, particularly with any seasonal changes to the quality of the water from the Hluhluwe River and the overloading of the plants. Turbidity levels increase significantly after floods have entered the Dam, hampering purification. In the summer, algal problems are possible. No information is available on the condition and performance of the water treatment works infrastructure.

The raw water abstraction for treatment at the Hluhluwe WTW in 2008 was estimated as 1.5 million m^3/a (4.11 ML/d) with the treated water production estimated to be 1.35 million m^3/a (3.70 ML/d). Therefore approximately 12% of the raw water abstracted is lost between the raw water abstraction works and the treatment works.

Treated water bulk supply infrastructure
The treated water from the Hluhluwe WTW is pumped from the clearwater tanks to the main 5 ML Reinforced Concrete (RC) service reservoir and then gravitated directly into the bulk supply network in Hluhluwe. Water is then pumped from the main service reservoir to three other service reservoirs supplying the villages of Nyakane, Mdletshe and Mthekwini (see Figure 13). It is not known whether the pumping systems have standby capacity.

Bulk Storage
The Hluhluwe Water Supply Scheme area has a total reservoir storage capacity of 8.0 ML. The capacities of the reservoirs in the various water supply areas range from 0.5 ML tanks to a 5.0 ML reinforced concrete (RC) main service reservoir (see Figure 13).

The service storage capacity provides for a 51.9-hour storage based on the current gross average annual daily demand, but in summer months this reduces to approximately a 34.60-hour storage capacity, based on present water requirements (see Table 5). The total reservoir storage capacity of the Hluhluwe Water Supply Scheme area is therefore not sufficient, based on the accepted norm of 48 hours of summer peak requirement for urban areas. The existing storage capacity cannot meet the following requirements:

- balance the fluctuating demands from the distribution system, permitting the source to give a non-steady or differently phased output;

- provide a supply during failures or shutdowns of treatment plant, pumps or bulk mains leading to the reservoir; except for relatively short failures at present levels of consumption; and

- provide a reserve of water to meet any significant fire and other emergency demands. Additional service storage capacity is required in order to meet the summer peak requirements of the Hluhluwe Water Supply Scheme area.

Parameters	**Hluhluwe Water Supply Scheme Area**
Total Storage capacity (ML)	8.00
Storage Ratio on present annual average consumption (Hours)	51.90
Storage Ratio on present average peak week consumption (Hours)	34.60

Table 5 - Service Storage Reservoirs in Hluhluwe Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Hluhluwe Water Supply Scheme Area Big 5 False Bay & Hlabisa Municipality, 2011)

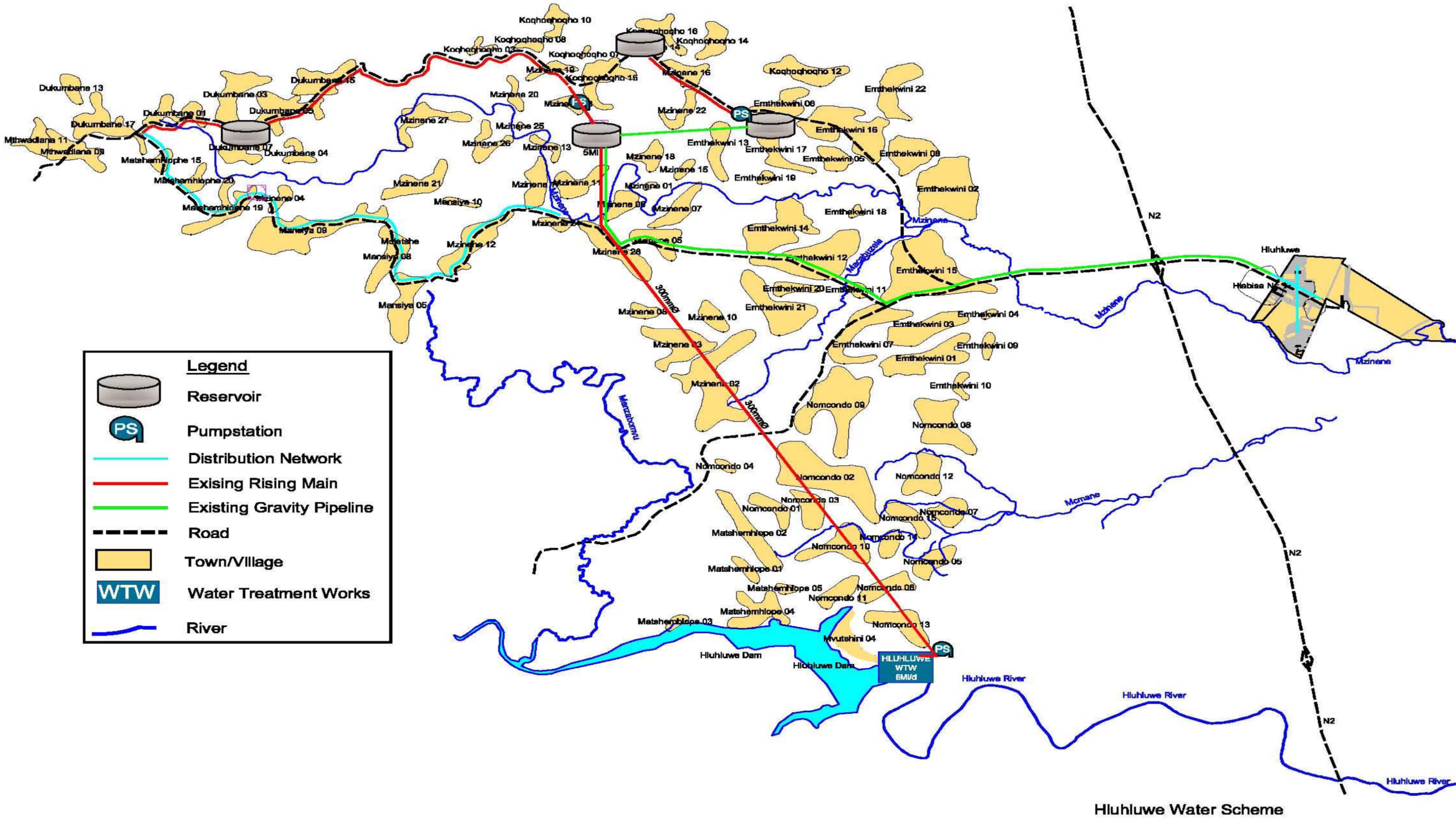


Figure 13- Schematic layout of Hluhluwe Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Hluhluwe Water Supply Scheme Area Big 5 False Bay & Hlabisa Municipality, 2011)

5.3.1.1 Jozini Water Supply Scheme (Jozini LM)

(Source: First Stage Reconciliation Strategy for Jozini Water Supply Scheme Area Jozini Municipality, 2011)

The Jozini-Malobeni Water Supply Scheme supplies potable water to the residential and non-residential areas such as Sibhoweni, Biva, Sibonokuhle, Ezinyokeni and other areas as shown in Figure 14 below.

The Jozini-Malobeni Water Supply Scheme is supplied from Jozini WTW and three package plants (A, B and C) in Makhathini. The current average treated water production for the WTW and the package plants is estimated to be 7.11 ML/d (2.60 million m^3/a), which supplies the area with house and yard connections in the Jozini-Malobeni town and metered standpipes and kiosks in the surrounding areas.

Raw water abstraction infrastructure

The Jozini WTW and the Makhatini package plants abstract raw water from the Makhatini Flats irrigation canal fed from the Pongolapoort Dam. Raw water is pumped to the treatment plants where it is treated to potable drinking water quality standards. The design capacities of the rising mains or the sizes of the pipelines are not known. It is however assumed that the capacities of the various existing raw water abstraction works are sufficient to meet the hydraulic capacities of the various existing treatment works.

Water Treatment Works

The Jozini-Malobeni Water Supply Area is serviced by the Makhathini Package Plants and Jozini WTW which is a conventional treatment plant comprising the following process components:

(i) Flocculation channels: The raw water is pumped from the Pongolapoort Dam and boreholes into flocculation channels where coagulation, after polyelectrolyte dosing, takes place to form the flocs.

(ii) Clarification (sedimentation) tanks: The flocs that have formed in the flocculation channels are then settled in the sedimentation tanks under gravity. The settled sludge is removed frequently by de-sludging the tanks and sending the sludge to the sludge lagoons where it is dried while the supernatant water is discharged back into the river. The plant was not designed for recycling of the wastewater.

(iii) Rapid Gravity Sand Filtration: The clarified water is then filtered through a set of rapid gravity sand filters as a final polishing before chlorination of the treated water.

(iv) Chorine contact tank: The filtered water is then stored in the chorine contact tanks where chlorination takes place before pumping the water to the command reservoirs for distribution to the Jozini-Malobeni area and the surrounding villages.

The Malobeni WTW is a package plant and water is treated using pressure filtration before it is chlorinated in the chlorine contact tanks.

As illustrated in Table 6 below the average annual capacity of the water treatment works is not sufficient to meet the current water requirements as the plants are operating at their peak hydraulic capacity.

The current utilisation of the two water treatment works is nearly two one and a half times the annual average flow rate of the water treatment works. This is not sustainable as there is potential for water quality problems due to filter breakthrough. The capacity of the existing treatment works is not sufficient to meet the current and future water requirements of the Jozini-Malobeni Water Supply Scheme.

Treatment Work Name	Type of plant	Raw water source	Hydraulic Design capacity (ML/d)	Average Design capacity (ML/d)	Treated water production (ML/d)	Current utilization (% of average design capacity)
Jozini WTW	Conventional treatment	Pongolapoort Dam	5.0	3.7	Not stated	Not stated
Makhatini A Plant	Pressure filter	Pongolapoort Dam	1.2	0.9	Not stated	Not stated
Makhatini B Plant	Pressure filter	Pongolapoort Dam	0.2	0.15	Not stated	Not stated
Makhatini C Plant	Pressure filter	Pongolapoort Dam	0.4	0.3	Not stated	Not stated
Total			**6.8**	**5.05**	**7.12**	**141%**

Table 6- Water Treatment Works in operation in Jozini Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Jozini Water Supply Scheme Area Jozini Municipality, 2011)

The total raw water abstraction for treatment at the WTW in 2008 was estimated as 2.89 million m^3/a (7.92 ML/d) with the treated water production estimated to be 2.60 million m^3/a (7.11 ML/d).

It is not known whether, there are any operational problems at the treatment works, particularly with any seasonal changes to the quality of the water released from the Pongolapoort Dam and the possible overloading of the plants. It is reported that the water quality in the dam is naturally good but it is possible that the turbidity levels can increase in the summer together with algal problems arising from abstracting from the irrigation canals.

No information is available on the condition and performance of the water treatment works components.

Treated water bulk supply infrastructure
The treated water from the Jozini WTW and Makhathini WTW is pumped from the clearwater tanks to the main Reinforced Concrete (RC) reservoir and directly into the bulk supply network in Jozini area.

Water is then pumped from the main service reservoir to other service reservoirs supplying the areas of Biva, Sibonokuhle, Sibhoweni, Ezinyokeni, Gedleza and other areas (see Figure 14). It is not known whether the pumping systems have standby capacity.

Bulk Storage

The Jozini-Malobeni Water Supply Scheme area has a total reservoir storage capacity of 2.26 ML supplying the various water supply areas of the town including . The capacities of the reservoirs in the various water supply areas range from 0.13 ML tanks to a 0.8 ML reinforced concrete (RC) service reservoir.

The service storage capacity provides for a 7.6-hour storage based on the current gross average annual daily demand, but in summer months this reduces to approximately a 5.1-hour storage capacity, based on present water requirements (see Table 7).

The total reservoir storage capacity of the Jozini-Malobeni Water Supply Scheme area is therefore way below the accepted norm of 48 hours of summer peak requirement for urban areas. The existing storage capacity cannot meet the following requirements:

- balance the fluctuating demands from the distribution system, permitting the source to give a non-steady or differently phased output;
- provide a supply during failures or shutdowns of the treatment plant, pumps or bulk mains leading to the reservoir, except for very short failures; and
- provide a reserve of water to meet any significant fire and other emergency demands.

Additional service storage capacity is urgently required in order to meet the summer peak requirements of the Jozini-Malobeni Water Supply Scheme area.

Parameters	**Jozini-Malobeni Water Supply Scheme Area**
Total Storage capacity (ML)	2.26
Storage Ratio on present annual average consumption (Hours)	7.63
Storage Ratio on present average peak week consumption (Hours)	5.1

Table 7 - Service Storage Reservoirs in Jozini Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Jozini Water Supply Scheme Area Jozini Municipality, 2011)

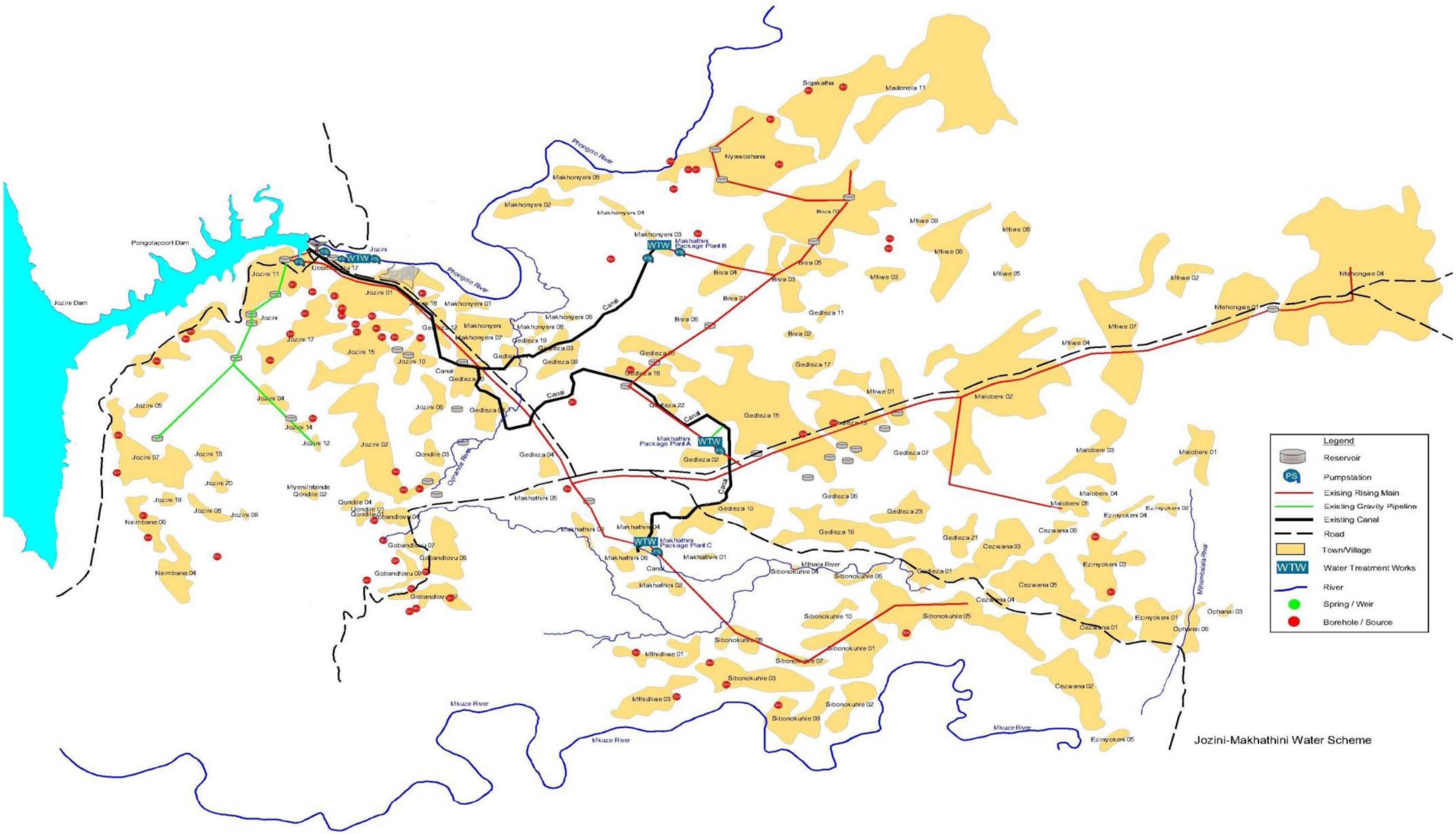


Figure 14- Schematic layout of Jozini Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Jozini Water Supply Scheme Area Jozini Municipality, 2011)

5.3.1.2 Mbazwane Water Supply Scheme (Umhlabuyalingana LM)

(Source: First Stage Reconciliation Strategy for Mbazwane Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

The schematic layout of the infrastructure to supply treated water from the Mbazwana Water Supply Scheme for residential and non-residential consumption in the town and the surrounding communities is shown in Figure 15 below.

The Mbazwana Water Supply Scheme is the main source of domestic water supplies to Mbazwana and the surrounding areas although there is groundwater use in some of the rural villages. There is a water treatment works which gets its raw water from Lake Sibaya. Raw water is pumped from Lake Sibaya to the Mbazwana WTW which is located 12.5 km from the dam on the outskirts of the Mbazwana (see Figure 15).

The current average treated water production for Mbazwana Water Supply Scheme is 1.53 ML/d (0.56 million m^3/a). The current raw water abstraction including any groundwater use for the scheme was estimated to be as 1.74 ML/d (0.63 million m^3/a) based on the average per capita consumption and the estimated water losses.

The Mbazwana WTWs has a registered water use from Lake Sibaya of 1.83 million m^3/a.

Raw water abstraction infrastructure

The abstraction facilities at Lake Sibaya for the Mbazwana Water Treatment Works include an intake structure with screens, a raw water pumping station with a rated capacity of 33.5 l/s (or 2.65 ML/d assuming 22 hour pumping). The raw water is pumped to the Mbazwana WTW where it is treated to potable drinking water quality standards. There are two raw water rising mains consisting of 12.5 km of a 150 mm dia. and 250 mm dia. pipelines. The raw water abstraction infrastructure is sufficient to meet the capacity requirements of the existing Mbazwana WTW.

Water Treatment Works

There is one WTW in the Mbazwana Water Supply Scheme, namely the Mbazwana WTW which comprises pressure filters and chlorination facilities. The peak hydraulic design capacity of the treatment works is 120 kl/hr (or 2.64 ML/d) (WSDP, 2007). The average annual flow rate of the treatment work is estimated to be 2.0 ML/d.

The Mbazwana WTW is a pressure filtration system comprising the following process components:

(i) Pressure Filtration: The raw water from Lake Sibaya is pumped through the three (3) pressure filters each with a rated capacity of 40 kl/hr. Water is then filtered through a set of filter media similar in bed construction to open rapid gravity filters except that the media is contained in a steel pressure vessel. Perforated pipes with nozzles are used for collecting the filtered water to the chlorination facilities.

(ii) Chorine contact tank: The filtered water is then stored in the chorine contact tanks where chlorination takes place before pumping the water to the two command reservoirs for distribution to the town and the rural areas.

As illustrated in Table 9 , the current utilisation of the Mbazwana Water Treatment works is less than the average annual flow rate of the water treatment works. The capacity of the existing treatment works is therefore sufficient to meet the current water requirements of the Mbazwana Water Supply Scheme, but will not be able to meet the future water requirements on a sustainable basis without increasing its capacity.

Treatment Work Name	**Type of plant**	**Raw water source**	**Hydraulic Design capacity (ML/d)**	**Average flow rate (ML/d)**	**Treated water production (ML/d)**	**Current utilisation (% of average design capacity)**
Mbazwana	Filtration plant	Lake Sibaya	2.64	2.03	1.64	81%

Table 8- Water Treatment Works in operation in Mbazwane Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Mbazwane Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

It is not known whether, there are any operational problems at the treatment works. It is however unlikely that there are any major seasonal changes to the quality of the water in the Lake Sibaya, as it is a natural freshwater lake and the turbidity levels are unlikely to change even in summer. No information is available on the condition and performance of the water treatment works infrastructure.

The raw water abstraction in 2008 was estimated as 0.63 million m^3/a (1.74 ML/d) with the treated water production estimated to be 0.56 million m^3/a (1.53 ML/d) which is 11% of the total raw water abstraction.

Treated water bulk supply infrastructure
The treated water from the Mbazwana WTW is pumped from the clearwater tanks to two command reservoirs, which supply Mbazwana town and the rural areas (see Figure 15). Besides the clearwater pumping station there are booster pumping station which pump water from the main service reservoir to the elevated reservoirs supplying the villages of Manzimbovu and Mbumbeni. All pumping systems have standby capacity.

Bulk Storage
The Mbazwana Water Supply Scheme area has a total reservoir storage capacity of 2.4 ML supplying the various water supply areas of the water supply scheme including the surrounding communities The capacities of the reservoirs range from 0.20 ML tanks to a 1.0 ML reinforced concrete (RC) service reservoir in the various water supply areas (see Figure 15).

The capacity of the elevated pressed steel storage tanks are 0.2 ML which have been included in the total storage capacity. The service storage capacity provides for a 1.6-day or 38-hour storage based on the current gross average annual daily demand, but in summer months this reduces to approximately a 25-hour storage capacity or 1.1-day storage, based on present treated water requirements (see Table 9).

The reservoir storage capacity of Mbazwana Water Supply Scheme is therefore less than the accepted norm of 48 hours of summer peak requirement for urban areas. This norm has been determined to meet the following requirements:

- balance the fluctuating demands from the distribution system, permitting the source to give a steady or differently phased output;

- provide a supply during a failure or shutdown of treatment plant, pumps or bulk mains leading to the reservoir; and

- provide a reserve of water to meet fire and other emergency demands.

Additional service storage capacity is therefore expected to be required in the near future to meet the future summer peak requirements.

Parameters	**Mbazwana Water Supply Scheme area**
Total Storage capacity (ML)	2.4
Storage Ratio on present annual average consumption (Hours)	38
Storage Ratio on present average peak week consumption (Hours)	25

Table 9 - Service Storage Reservoirs in Mbazwane Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Mbazwane Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

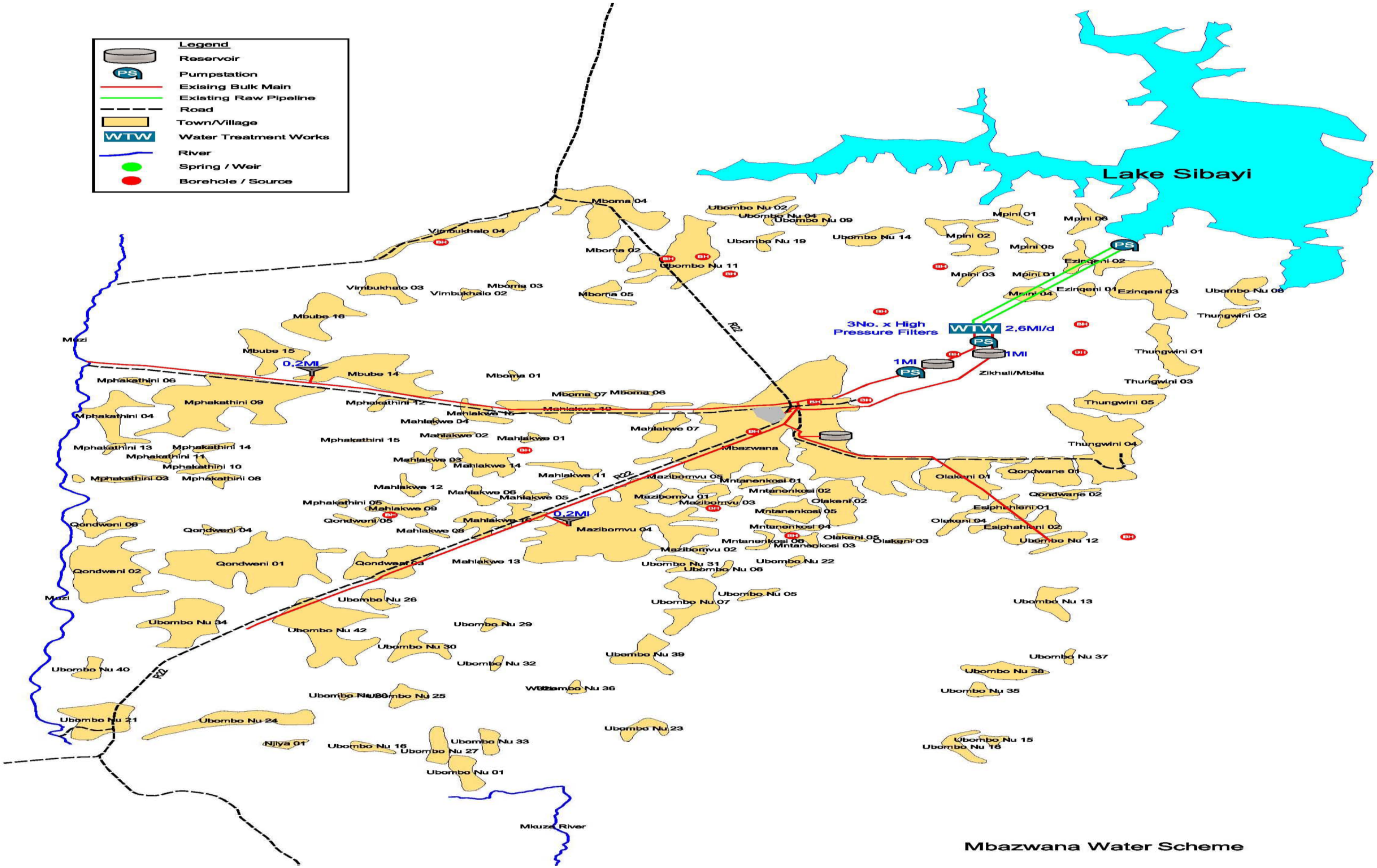


Figure 15- Schematic layout of Mbazwana Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Mbazwane Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

5.3.1.3 Mkuze Umbombo Water Supply Scheme (Jozini LM)

(Source: First Stage Reconciliation Strategy for Mkuze Umbombo Water Supply Scheme Area Jozini Municipality, 2011)

The schematic layout of the infrastructure to supply treated water from the Mkuze Ubombo Water Supply Scheme for residential and non-residential consumption in the town is shown in Figure 16 below.

The Mkuze Ubombo Water Supply Scheme is the only source of domestic water supplies to Mkuze and the surrounding areas including Ubombo. There are two water treatment works which are supplied with raw water from the purchase of raw water from the allocation to the Charl Senekal Trust from the Pongolapoort Dam. Raw water is pumped from the Blackie Dam, which is on a tributary of the Mkuze River and has a capacity of about 0.83 million m3, to the Mkuze WTW which is located on the outskirts of the town. There is also a small water treatment works downstream of the Blackie Dam which supplies Ubombo town and the surrounding communities (see Figure 16 below), using water released from the Blackie Dam and abstracted from the Mkuze River.

The current (2008) average treated water production for Mkuze and Ubombo is 2.72 ML/d (1.0 million m^3/a). The current raw water abstraction from the Blackie Dam and from the Mkuze River for the Mkuze and Ubombo WTWs was provided as 3.1 ML/d (1.13 million m^3/a) based on the historical records provided by the DWA.

Although the two WTWs have a water use entitlement through the Charl Senekal Trust, Umkhanyakude District Municipality needs to register its future water requirement, or preferably, the volume equivalent to the average annual design capacity of the WTW.

Raw water abstraction infrastructure

The Mkuze WTW abstracts raw water from the Blackie Dam through a raw water pumping station at the outlet works of the dam. The raw water is pumped to the Mkuze WTW where it is (or should be) treated to potable drinking water quality standards. The design capacity of the pumps and rising main or the size of the pipeline is not known. It is however assumed that the existing raw water abstraction works including the raw water pumps is sufficient to meet the capacity requirements of the existing WTW, but which is heavily overloaded at present.

The Ubombo WTW which was recently refurbished abstracts raw water from the Mkuze River. The raw water is pumped to the WTW where it is intended to be treated to potable drinking water quality standards. The capacity of the raw water abstraction infrastructure (i.e. abstraction works, pumps and raw water pumping main or the size of the pipeline) is not known. It is however assumed that it is sufficient to meet the capacity of the existing treatment works, but which is heavily overloaded at present.

Water Treatment Works

The Mkuze Ubombo Water Supply Scheme comprises of two water treatment works, namely the Mkuze WTW and a package plant supplying Ubombo and surrounding communities. The peak hydraulic design capacity of the two treatment works is 1.84 ML/d (WSDP, 2007). The average annual flow rate of the treatment work is estimated to be 1.42 ML/d.

The Mkuze WTW is a conventional treatment plant comprising of the following process components:

(i) Flocculation channels: The raw water is pumped from the Blackie Dam with chemicals added as the water flows into the flocculation channels where coagulation after polyelectrolyte dosing takes place to form the flocs.

(ii) Clarification (sedimentation) tanks: The flocs that have formed in the flocculation channels are then settled in the sedimentation tanks under gravity. The settled sludge is removed by frequent de-sludging of the tanks and sent to the sludge lagoons where the sludge is dried while the supernatant water is discharged back into the river. The plant was not designed for recycling of the wastewater.

(iii) Rapid Gravity Sand Filtration: The clarified water is then filtered through a set of rapid gravity sand filters as a final polishing before chlorination of the treated water.

(iv) Chorine contact tank: The filtered water is then stored in the chorine contact tanks where chlorination takes place before pumping the water to the command reservoirs in Mkuze for distribution.

The Ubombo WTW is a package plant which was recently refurbished to increase the treatment capacity of the Mkuze Ubombo Water Supply Scheme. Water is treated using pressure filtration before it is chlorinated in the chlorine contact tanks before pumping the water to the command reservoirs in Ubombo for distribution.

Treatment Work Name	**Type of plant**	**Raw water source**	**Hydraulic Design Capacity (ML/d)**	**Average Design Capacity (ML/d)**	**Treated water production (ML/d)**	**Current utilization (%)of average design capacity)**
Mkuze WTW	Conventional treatment	Charl Senekal Trust	1.54	1.18	2.22	187%
Ubombo WTW	Package plant	Charl Senekal Trust	0.30	0.23	0.50	217%
Total			1.84	1.42	2.72	192%

Table 10- Water Treatment Works in operation in Mkhuze Umbombo Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Mkuze Umbombo Water Supply Scheme Area Jozini Municipality, 2011)

As illustrated in Table 11 above, the current utilisation of the two treatment works is nearly two times the average annual design capacity of the water treatment works. This is not sustainable as there is potential for water quality problems due to filter breakthrough. The capacity of the existing treatment works is not sufficient to meet the current and future water requirements of the Mkuze Ubombo Water Supply Scheme.

It is not known whether, there are any operational problems at the two WTWs, particularly with seasonal changes to the quality of the water in the Blackie Dam and in the Mkuze River, particularly the high turbidity levels that can be experienced in summer. No information is available on the condition and performance of the water treatment works infrastructure

The total raw water abstraction for treatment in 2009 was given as 1.20 million m^3/a (3.30 ML/d) with the treated water production estimated to be 1.06 million m^3/a (2.9 ML/d) raw water abstraction works.

Treated water bulk supply infrastructure
The treated water from the Mkuze WTW is pumped from the clearwater tanks to a command reservoir in Mkuze town before distribution to the town (see Figure 16).

Water is also supplied to Ubombo to supplement the Ubombo WTW however the position of the bulk pipeline is not known. Besides the clearwater pumping station there is a booster pumping station which pumps water from the main service reservoir to a 500 m^3 elevated reservoir supplying the low pressure sections of the town. All pumping systems have standby capacity.

The treated water from the Ubombo WTW is pumped to a service reservoir in Ubombo from where the treated water is distributed into the reticulation system of the town as well as the surrounding communities.

Bulk Storage
The Mkuze Ubombo Water Supply Scheme area has a total reservoir storage capacity of 5.5 ML supplying the various water supply areas of the town including Ubombo and the surrounding communities The capacities of the reservoirs in the various water supply areas (see Figure 6.1 above) range from 0.25 ML tanks to a 4.0 ML reinforced concrete (RC) service reservoir. The capacity of the elevated pressed steel storage tank is 0.5 ML, which has been included in the total storage capacity.

The service storage capacity provides for a 2-day or 48-hour storage based on the current gross average annual daily treated water demand, but in summer months this reduces to approximately a 32-hour storage capacity or 1.4-day storage, based on present treated water use (see Table 11)

The reservoir storage capacity in the Mkuze Ubombo Water Supply Scheme area is therefore less than the accepted norm of 48 hours of summer peak requirement for urban areas. This norm has been determined to meet the following requirements:

- balance the fluctuating demands from the distribution system, permitting the source to give a steady or differently phased output;
- provide a supply during a failure or shutdown of treatment plant, pumps or bulk mains leading to the reservoir; and
- provide a reserve of water to meet fire and other emergency demands.

Additional service storage capacity is however expected to be required in the near future to meet the future summer peak requirements.

Parameters	**Mkuze Umbombo Water Supply Scheme area**
Total Storage capacity (ML)	5.5
Storage Ratio on present annual average consumption (Hours)	48
Storage Ratio on present average peak week consumption (Hours)	32

Table 11 - Service Storage Reservoirs in Mkuze Umbombo Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Mkuze Umbombo Water Supply Scheme Area Jozini Municipality, 2011)

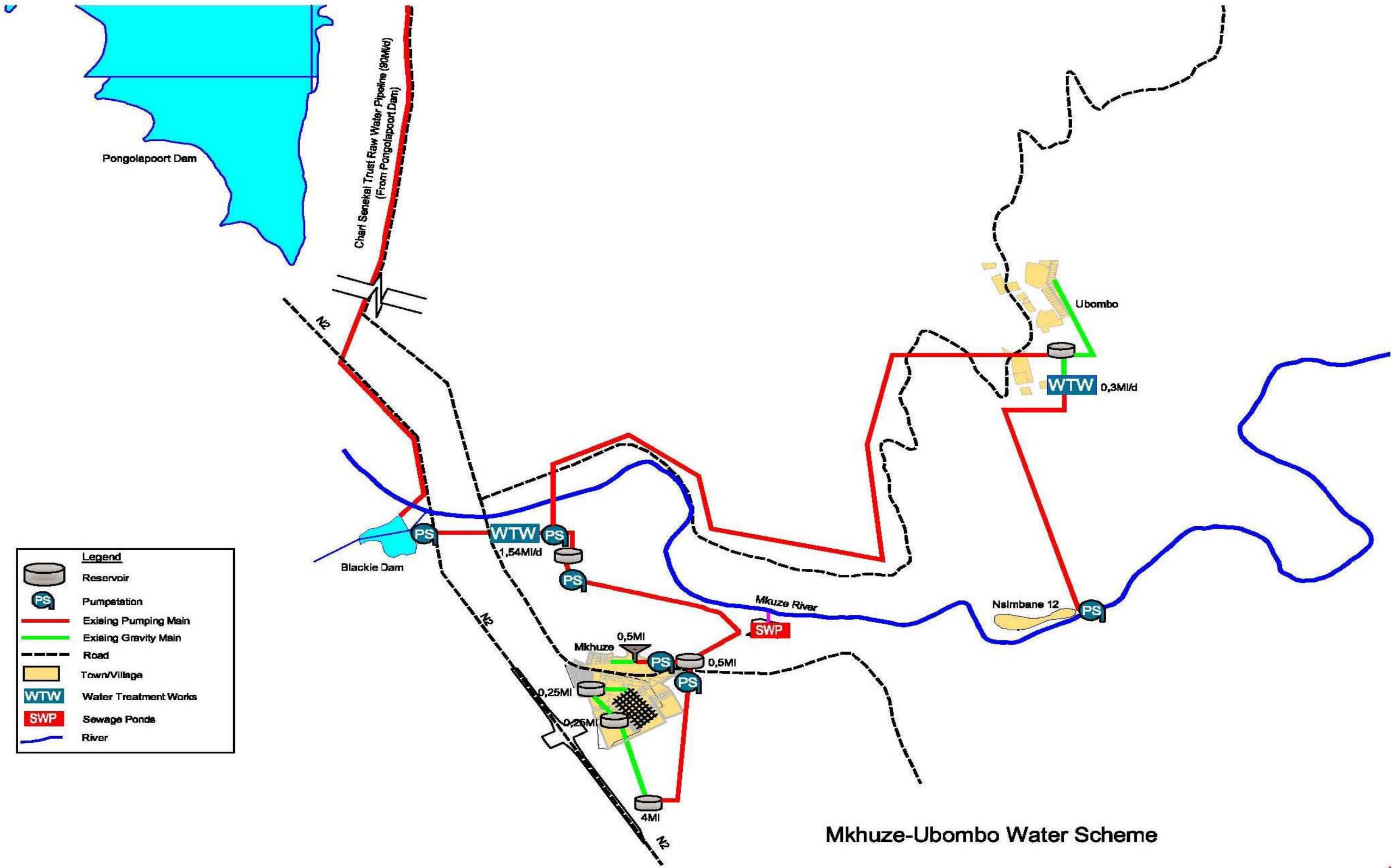


Figure 16- Schematic layout of Mkuze Umbombo Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Mkuze Umbombo Water Supply Scheme Area Jozini Municipality, 2011)

5.3.1.4 Mseleni Water Supply Scheme (Umhlabuyalingana LM)

(Source: First Stage Reconciliation Strategy for Mseleni Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

The schematic layout of the infrastructure to supply treated water from the Mseleni Water Supply Scheme for residential and non-residential consumption in the rural town and the surrounding communities is shown in Figure 17 below.

The Mseleni Water Supply Scheme is the main source of domestic water supply to Mseleni and the surrounding areas. The scheme comprises surface water supply from Lake Sibaya and boreholes which have been connected to the scheme.

Raw water is pumped from Lake Sibaya to the Mseleni WTW which is located near the lake (see Figure 17 below).

The current average treated water production for Mseleni Water Supply Scheme is 1.31 ML/d (0.48 million m^3/a). The current raw water abstraction including the boreholes connected to the scheme was estimated to be as 1.49 ML/d (0.54 million m^3/a) based on the average per capita consumption and the estimated water losses.

The Mseleni WTWs has a registered water use from Lake Sibaya of 0.15 million m^3/a.

Raw water abstraction infrastructure

The abstraction facilities at Lake Sibaya for the Mseleni Water Treatment Works include an intake structure with screens and a raw water pumping station. The capacity of raw water abstraction infrastructure is not known. It is however assumed that the capacity is sufficient to meet the peak raw water requirements of the WTW.

The raw water is pumped to the Mseleni WTW approximately 200 m from the lake (WSDP, 2007) where it is treated to potable drinking water quality standards. There are two raw water rising mains, whose capacities are not known. The raw water pumping system is sufficient to meet the capacity requirements of the existing Mseleni WTW.

Water Treatment Works

The Mseleni WTW which comprises pressure filters and chlorination facilities. The peak hydraulic design capacity of the treatment works is 0.30 ML/d (WSDP, 2007). The average annual flow rate of the treatment work is estimated to be 0.23 ML/d.

The Mseleni WTW is a pressure filtration system comprising the following process components:

(i) Pressure Filtration: The raw water from Lake Sibaya is pumped through the three (3) pressure filters each with a rated capacity of 40 kl/hr. Water is then filtered through a set of filter media similar in bed construction to open rapid gravity filters except that the media is contained in a steel pressure vessel. Perforated pipes with nozzles are used for collecting the filtered water to the chlorination facilities.

(ii) Chorine contact tank: The filtered water is then stored in the chorine contact tanks where chlorination takes place before pumping the water to the two command reservoirs for distribution to the town and the rural areas.

Groundwater

The capacity of Mseleni WTW is very limited and cannot meet the current water requirements of the supply area. Several boreholes have been drilled and connected to the water supply scheme. There were a number of boreholes identified in the Mseleni Water Supply Scheme area. However, it is not known which of the boreholes have been connected to the scheme. The one that has been assumed to be connected to the scheme is near Mseleni which has a yield of 14 l/s, estimated to be pumping 22 hours (i.e. 1.1 ML/d).

Treatment Work Name	Type of plant	Raw water source	Hydraulic Design capacity (ML/d)	Average flow rate (ML/d)	Treated water production (ML/d)	Current utilisation (% of ave.flow rate)
Mseleni WTW	Filtration plant	Lake Sibaya	0.30	0.23	0.27	115%
Boreholes	-	Ground water	-	1.11	1.11	100%
Total			**0.30**	**1.34**	**1.38**	**102.6%**

Table 12- Water Treatment Works in operation in Mseleni Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Mseleni Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

As illustrated in Table 13 above, the current utilisation of the Mseleni Water Supply Scheme is comparable to the average annual flow rate of the bulk water supply capacity. The capacity of the existing treatment works is therefore sufficient to meet the current water requirements of the Mseleni Water Supply Scheme, but will not be able to meet the future water requirements on a sustainable basis without increasing its capacity.

It is not known whether, there are any operational problems at the treatment works. It is however unlikely that there are any major seasonal changes to the quality of the water in the Lake Sibaya, as it is a natural freshwater lake and the turbidity levels are unlikely to change even in summer. No information is available on the condition and performance of the water treatment works infrastructure. .

The raw water abstraction in 2008 was estimated as 0.54 million m^3/a (1.49 ML/d) with the treated water production estimated to be 0.48 million m^3/a (1.31 ML/d) which is 11% of the total raw water abstraction.

Treated water bulk supply infrastructure
The treated water from the Mseleni WTW is pumped from the clearwater tanks to a command reservoir in Mseleni Water Supply Scheme area (see Figure 17 above). Besides the clearwater pumping station there are three booster pumping stations which pump water from the main service reservoir to the many service reservoirs supplying the communities of Kwamlamula, Kwamasonto, Manaba, Vimba and Mboma. All pumping systems have standby capacity.

Bulk Storage
The Mseleni Water Supply Scheme area has a total reservoir storage capacity of 2.17 ML supplying the various areas of the water supply scheme, including the surrounding communities The capacities of the reservoirs range from 25kl tanks to a 1.8 ML reinforced concrete (RC) service reservoir in the various water supply areas (see Figure 17 below).

The service storage capacity provides for a 1.7-day or 40-hour storage based on the current gross average annual daily demand, but in summer months this reduces to approximately a 27-hour storage capacity or 1.1-day storage, based on present treated water requirements (see Table 13).

The reservoir storage capacity of Mseleni Water Supply Scheme is therefore less than the accepted norm of 48 hours of summer peak requirement for urban areas. This norm has been determined to meet the following requirements:

- balance the fluctuating demands from the distribution system, permitting the source to give a steady or differently phased output;
- provide a supply during a failure or shutdown of treatment plant, pumps or bulk mains leading to the reservoir; and
- provide a reserve of water to meet fire and other emergency demands.

Additional service storage capacity is therefore expected to be required in the near future to meet the future summer peak requirements.

Parameters	**Mseleni Water Supply Scheme area**
Total Storage capacity (ML)	2.17
Storage Ratio on present annual average consumption (Hours)	40
Storage Ratio on present average peak week consumption (Hours)	27

Table 13 -Service Storage Reservoirs in Mseleni Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Mseleni Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

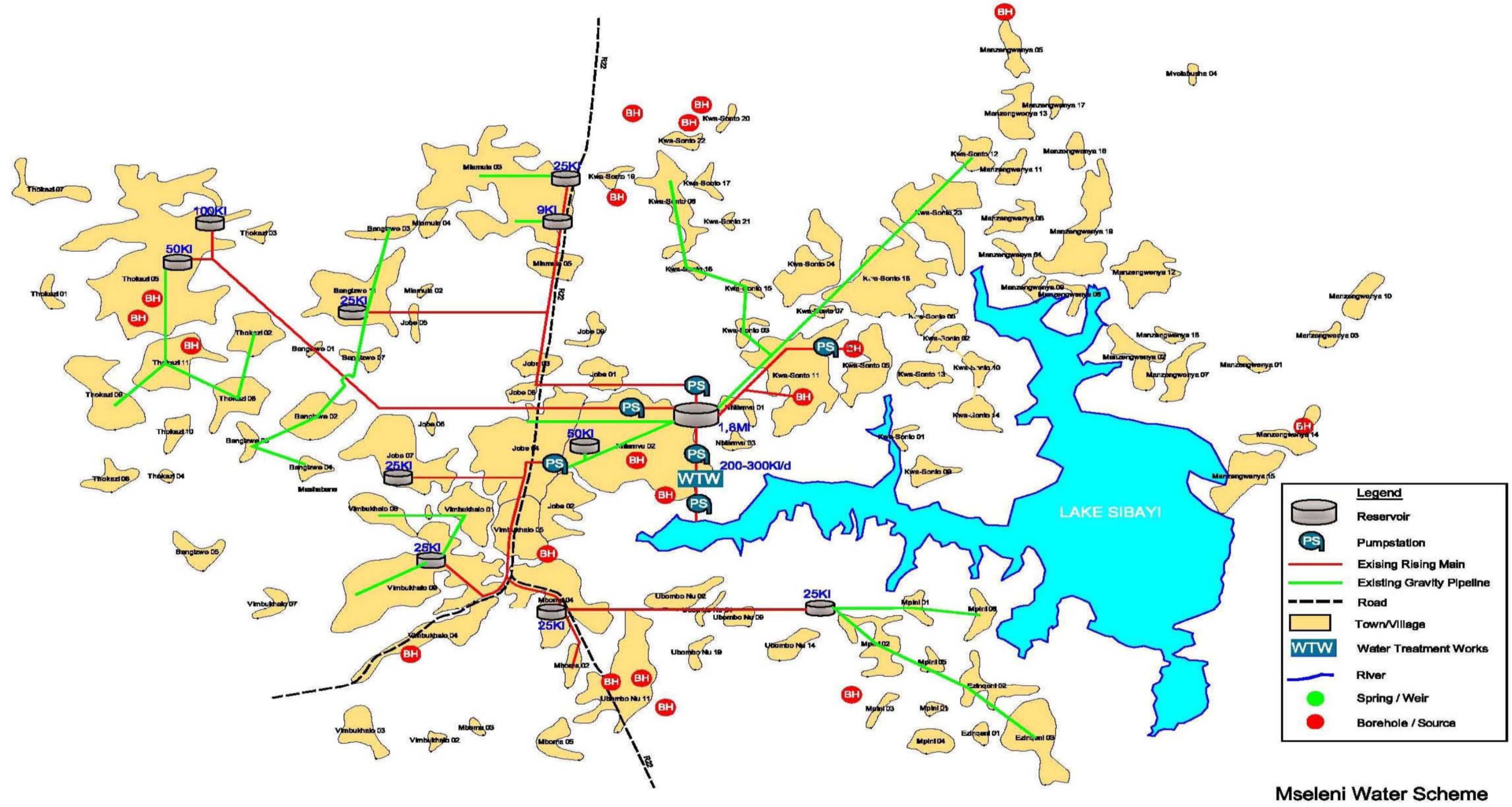


Figure 17- Schematic layout of Mseleni Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Mseleni Water Supply Scheme Area Umhlabuyalingana Municipality, 2011)

5.3.1.5 Mtubatuba Water Supply Scheme (Mtubatuba LM)

(Source: First Stage Reconciliation Strategy for Mtubatuba Water Supply Scheme Area Mtubatuba Municipality, 2011)

Water Treatment Capacity

Figure 18 below illustrates the supply area of the Mtubatuba Water Supply Scheme. The Mtubatuba WTW is a conventional water treatment works comprising a chemical dosing and flocculation unit, clarifiers and rapid gravity filters. The treatment works has an annual average design capacity of 10 ML/d average throughput, with a peak day flow rate of 15 ML/d.

The current annual average treated water production is 11.9 ML/d, meaning the utilisation of the treatment works is approximately 119% of the average design capacity of the plant. The water treatment works is to be upgraded to a design capacity of 20 ML/d, commencing in October 2009.

Funding will be provided through the Municipal Infrastructure Grant (MIG), the DWA and a Development Bank of Southern Africa (DBSA) loan.

The average treatment capacity of 10 ML/d is less than the total annual average raw water abstractions from the Mfolozi River of 12.64 ML/d (4.6 million m^3/a). Therefore the capacity of the treatment plant is one of the limiting factors in providing a sufficient and reliable supply of water to the area.

Bulk supply mains

Figure 18 below illustrates the layout and diameters of the bulk water distribution network. Mtubatuba has three pumps on the Mfolozi River which supply the water treatment works, near the river. Treated water is then pumped via a 450 mm diameter rising main, reducing to 400 mm and 350 mm diameter, which tees into a 300 mm diameter main between the town and the 20 ML storage reservoir on the hill, to the west of the N2 and feeds Mtubatuba and Monzi, as well as St Lucia, some 25 km away. This 300 mm diameter main serves as a rising and a gravity main, depending on the demand in Mtubatuba and the level of the reservoir.

A second 200 mm diameter main from the treatment works also supplies the reservoir, from where KwaMsane, west of the N2, is fed. The lowest offtake is a 100 mm diameter main across the railway bridge to Umfolozi Village on the South side of the river.

At the Monzi break pressure tank, the diameter of the main increases to 375 mm and supplies the town of St Lucia, with a branch North, to Khula. At the break pressure tank, a 250 mm line feeds a 1.5 ML reservoir near Monzi, from where a smaller line feeds Dukuduku South. Because of non-payment to Eskom there is no electricity supply and the Dukuduku line, which was supposed to be boosted by pumping, flows under gravity with very little water and many illegal connections. Similar conditions apparently apply to the line to Khula.

The Umfolozi Sugar Mill (Pty) Ltd. (previously owned by Illovo), also has an abstraction and purification works 200m downstream of the municipal works, with a capacity of 6 ML/d, abstracting

3 ML/d on average. Apart from their own use, the mill also supplies the part of the Riverview residential area, which used to belong to the mill, but now falls under the municipality.

Storage

The total storage capacity is approximately 23.5 ML. The storage on annual average consumption is equivalent to 1.97 days and 1.31 days on the peak month consumption.

The current storage capacity is not sufficient to meet the recommended standard of 2 days summer peak requirement, to balance the fluctuating requirements from the distribution system. The summer peak requirement would enable the source to provide a steady weekly output, as well as emergency storage to supply water during a failure or shutdowns of the water treatment works or clear water pump stations.

Additional storage will be required in the near future to balance the fluctuating requirements from the distribution system.

.

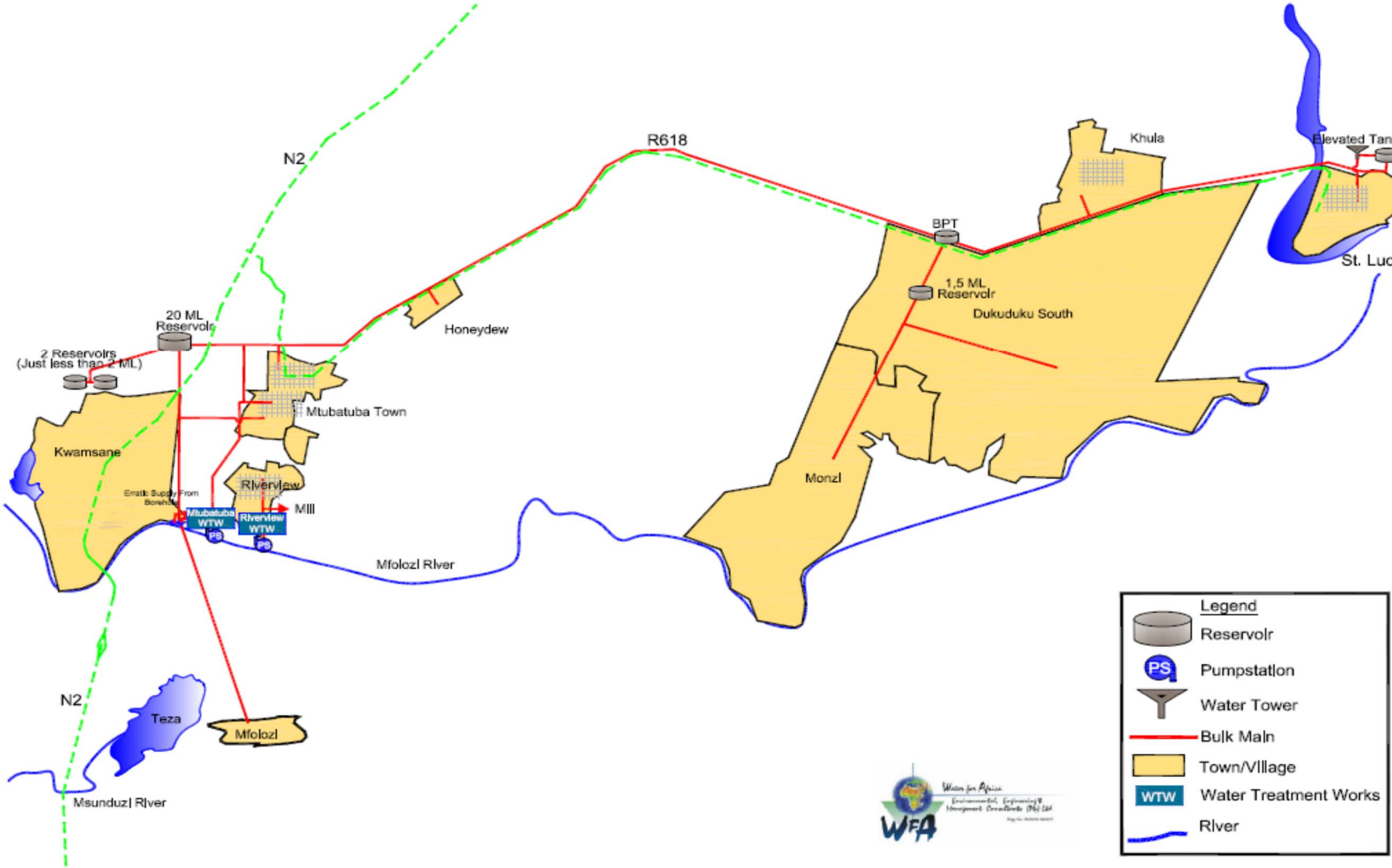


Figure 18- Schematic layout of Mtubatuba Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Mtubatuba Water Supply Scheme Area Mtubatuba Municipality, 2011)

5.3.1.6 Shemula Water Supply Scheme (Umhlabuyalingana & Jozini LM)

(Source: First Stage Reconciliation Strategy for Shemula Water Supply Scheme Area Umhlabuyalingana & Jozini Municipality, 2011)

The schematic layout of the infrastructure to supply treated water from the Shemula Water Supply Scheme for residential and non-residential consumption in the area and its surrounds, is provided in Figure 19. The scheme supplies potable water for the areas from the Mabhudu villages to the east, Mbadleni / Ekukhanyeni to the north, Ingwavuma town to the west and Kwashukela villages to the south.

The Shemula Water Supply Scheme has one water treatment works which was recently upgraded from a peak hydraulic capacity of 2.4 ML/d to 6.9 ML/d. The current average treated water production for the WTW is 4.6 ML/d (1.68 million m^3/a) which supplies the area with yard connections, metered standpipes and kiosks.

Raw water abstraction infrastructure
The Shemula WTW abstracts raw water directly from the Phongolo River into a raw water reservoir, from which the works are fed. Raw water is pumped to the treatment plants where it is treated to potable drinking water quality standards (see Figure 19 below). The design capacity of the rising main or the size of the pipeline is not known. It is however assumed that the existing raw water abstraction works is sufficient to meet the peak hydraulic capacity of the existing treatment works.

Water Treatment Works
The supply area of the Shemula Water Supply Scheme is serviced by the Shemula WTW. The treatment works has a peak hydraulic design capacity of 6.9 ML/d (WSDP, 2007) after being upgraded from 2.4 ML/d recently. This is illustrated in Table 15 below.

The Shemula WTW is a conventional treatment plant comprising the following process components:

(i) *Flocculation channels*: The raw water is pumped directly from the Phongolo River into a raw water reservoir, from where enters the flocculation channels, where coagulation takes place after polyelectrolyte dosing to form the flocs;

(ii) *Clarification (sedimentation) tanks*: The flocs that have formed in the flocculation channels are then settled in the sedimentation tanks under gravity. The settled sludge is removed frequently by de-sludging the tanks and sending the sludge to the sludge lagoons where it is dried while the supernatant water is discharged back into the Pongolo River. The plant was not designed for recycling of the wastewater.

(iii) *Slow Sand Filtration*: The clarified water is then filtered through a set of slow sand filters as a final polishing before chlorination of the treated water.

(iv) *Chorine contact tank*: The filtered water is then stored in the chlorine contact tanks where chlorination takes place before pumping the water to the command reservoirs in the area supplied by the Shemula Water Supply Scheme for distribution.

As illustrated in Table 15 below, the average annual capacity of the water treatment works is not sufficient to meet the current water requirements as the plant is operating beyond its peak hydraulic capacity. The current utilisation of 143% clearly indicates that the plant is being overloaded, which may result in some water quality problems, particularly filter breakthrough.

Treatment Work Name	**Type of plant**	**Raw water source**	**Hydraulic Design capacity (ML/d)**	**Average Design capacity (ML/d)**	**Treated water production (ML/d)**	**Current utilisation (%of average design capacity)**
Shemula WTW	Conventional treatment	Phongolo River	6.9	4.6	6.58	143%

Table 14- Water Treatment Works in operation in Shemula Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Shemula Water Supply Scheme Area Umhlabuyalingana & Jozini Municipality, 2011)

It is not known whether, there are any operational problems at the treatment works, particularly with any seasonal changes to the quality of the water released from the Pongolapoort Dam and with seasonal changes to the quality of the river water and the overloading of the plant. It is likely that high turbidity levels can be experienced in summer, when abstracting from the river.

No information is available on the condition and performance of the water treatment works components.

The raw water abstraction for treatment at the Shemula WTW in 2008 was estimated as 2.67 million m^3/a (7.31 ML/d) with the treated water production estimated to be 2.40 million m^3/a (6.58 ML/d). Therefore approximately 10% of the raw water abstracted is lost between the raw water abstraction works and the treatment works.

Treated water bulk supply infrastructure
The treated water from the Shemula WTW is pumped from the clearwater tanks to the main reservoir and directly into the bulk supply network in Shemula as well as the villages supplied from the scheme before distribution (see Figure 19 below). The treated water is also pumped to Ingwavuma town and Mosveldt Hospital reservoirs for distribution.

It is not known what the capacities of these rising mains are and whether the pumping systems have standby capacity.

Bulk Storage
The supply area of the Shemula Water Supply Scheme has a total reservoir storage capacity of 1.26 ML supplying the various water supply areas of the town. The capacities of the reservoirs range from an elevated (See Figure 19) 0.025 ML tank to 0.57 ML reinforced concrete reservoirs in the various water supply areas (see Figure 19).

The service storage capacity provides for a 4.6-hour storage based on the current (2008) gross average annual daily demand of 6.58 ML, but in summer months this reduces to approximately a 3.06-hour storage capacity, based on present water requirements (see Table 15).
The total reservoir storage capacity in the supply area of the Shemula Water Supply Scheme is therefore far below the accepted norm of 48 hours of summer peak requirement for urban areas. The existing storage capacity cannot meet the following requirements:

- balance the fluctuating demands from the distribution system, permitting the source to give a non-steady or differently phased output;

- provide a supply during failures or shutdowns of the treatment plant, pumps or bulk mains leading to the reservoir, except for very short failures; and

- provide a reserve of water to meet any significant fire and other emergency demands.

Additional service storage capacity is urgently required in order to meet the summer peak requirements of the supply area of the Shemula Water Supply Scheme.

Parameters	**Shemula Water Supply Scheme area**
Total Storage capacity (ML)	1.26
Storage Ratio on present annual average consumption (Hours)	4.60
Storage Ratio on present average peak week consumption (Hours)	3.06

Table 15 - Service Storage Reservoirs in Shemula Water Supply Scheme area
(Source: First Stage Reconciliation Strategy for Shemula Water Supply Scheme Area Umhlabuyalingana & Jozini Municipality, 2011)

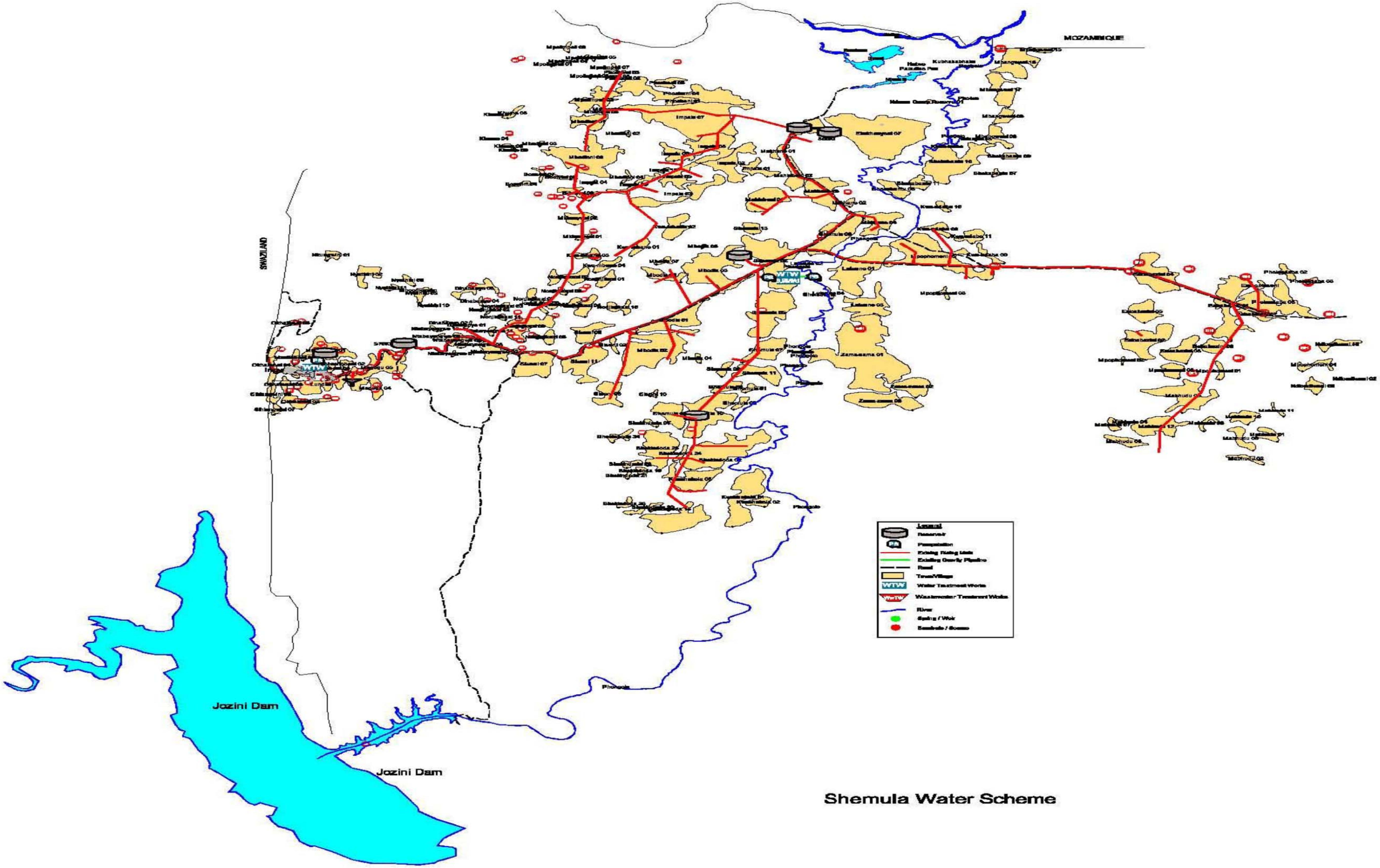


Figure 19- Schematic layout of Shemula Water Supply Scheme area

(Source: First Stage Reconciliation Strategy for Shemula Water Supply Scheme Area Umhlabuyalingana & Jozini Municipality, 2011)

6. RECONCILIATION OF EXISTING AND PROPOSED WATER SUPPLY AND DEMAND OPTIONS

GIS analysis was used to calculate both high and low household counts, as well as high and low population counts, for each water demand area. While the calculation of the household counts for each area was a simple GIS query, the population statistics, and projection thereof, required more detailed analysis.

Household Counts:

Unique ID numbers were given to all the demand areas, which could then be used to link data from other sources. A spatial join was performed on the Eskom 2011 household points falling within each polygon. This gave each household point the unique ID of the polygon in which it fell. This data could then be summarised and a count done of the number of households in each footprint. This count was then added to the water demand attribute table.

Table

footprint_pop_2014

OID	UID	Cnt_UID	Sum_HH_2011
2918	Umkhanyakude_3276	17	94.01
2919	Umkhanyakude_3277	14	78.88
2920	Umkhanyakude_3278	30	158.16
2921	Umkhanyakude_3279	44	249.36
2922	Umkhanyakude_328	5	32.55
2923	Umkhanyakude_3280	11	57.86
2924	Umkhanyakude_3281	11	61.71
2925	Umkhanyakude_3282	20	112.2
2926	Umkhanyakude_3283	9	58.86
2927	Umkhanyakude_3284	30	175.72
2928	Umkhanyakude_3285	17	111.18
2929	Umkhanyakude_3286	15	98.1
2930	Umkhanyakude_3287	9	58.86
2931	Umkhanyakude_3288	6	39.24
2932	Umkhanyakude_3289	9	58.86
2933	Umkhanyakude_329	6	37.92
2934	Umkhanyakude_3290	25	163.5
2935	Umkhanyakude_3291	16	104.64
2936	Umkhanyakude_3292	10	65.4
2937	Umkhanyakude_3293	13	85.02
2938	Umkhanyakude_3294	11	71.94
2939	Umkhanyakude_3295	5	32.7
2940	Umkhanyakude_3296	1	6.45
2941	Umkhanyakude_3297	13	85.02

Table 16 – Example of household data with unique footprint identifier

These figures were used as the "Low" count, until the "High" had been calculated. The high count was obtained by extrapolating the growth rate for each ward from the Census 2001/2011 figure through to 2014. This information was obtained using the online Statistics SA Superweb application. Statistics SA was consulted on the best method in achieving these calculations. The 68 wards falling within Umkhanyakude District Municipality were selected, and the population figures for both 2001 and 2011 were added to the table. These two figures were used to calculate the percentage growth over that ten year period. The result was divided by 10 to get an average growth rate per annum for each ward.

This growth rate was then applied to the household count for each subsequent year (2012, 2013, 2014), and the result was used to populate the "High" values for both population and number of households in the attribute table. Once the high count had been completed, the two figures could be compared. Where "Low" > "High", the figures were swapped. Since the calculations for high and low demand for water were based on the required million m³ per annum, the number of decimal places in the household count was significant, and the project team made the decision to keep this to two decimal places.

Table

hholds_with_UID_pop_growth_hhold_size

Id	DM	UID	GrPA_2	Pop2012	Pop2013	Pop2014	Av_HHSize	OH_Cmmts	HH_2012	HH_2013	HH_2014
364	Umkhanyakude	Umkhanyakude_3649	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
364	Umkhanyakude	Umkhanyakude_3649	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
364	Umkhanyakude	Umkhanyakude_3649	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
364	Umkhanyakude	Umkhanyakude_3649	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
364	Umkhanyakude	Umkhanyakude_3649	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
374	Umkhanyakude	Umkhanyakude_3745	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29
377	Umkhanyakude	Umkhanyakude_3771	0.78	11990.8044	12084.332674	12178.590469	6.14		6.19	6.24	6.29

Population Numbers:

Census 2011 data was used for the population figures. The Supercross programme was used to extract the household sizes and the total population counts for each subplace within the District. The total population was divided by the number of households (from the Eskom 2011 point data) to get the average household size.

This household size data was then linked to the household points, again using a spatial join in ArcGIS. Using the unique ID, the data was summarised and the number of people (a sum of the household size in each footprint) was calculated. This was joined to the demand area attribute table, and used as the low population count. In the same way as the growth of the number of households was calculated, the growth rate was applied to the population figures, and the result was again summarised, population figures summed, and this data added as the high population figure.

DM	HH_Low	HH_High	Pop_Low	Pop_High
Umkhanyakude	9	9	44	45
Umkhanyakude	4	4	20	20
Umkhanyakude	9	9	44	45
Umkhanyakude	5	5	24	25
Umkhanyakude	3	3	15	15
Umkhanyakude	4	4	20	20
Umkhanyakude	28	29	187	190
Umkhanyakude	598	607	2953	3003
Umkhanyakude	4	4	22	23
Umkhanyakude	3	3	18	19
Umkhanyakude	9	10	60	64
Umkhanyakude	4	4	24	26
Umkhanyakude	5	5	26	27
Umkhanyakude	3	3	16	16
Umkhanyakude	10	10	53	55
Umkhanyakude	4	4	21	22
Umkhanyakude	6	6	32	33
Umkhanyakude	4	4	21	22
Umkhanyakude	14	14	74	77
Umkhanyakude	4	4	21	22
Umkhanyakude	22	22	93	95
Umkhanyakude	9	9	42	42
Umkhanyakude	20	20	85	86
Umkhanyakude	8	8	43	44
Umkhanyakude	14	14	76	77
Umkhanyakude	13	13	70	72
Umkhanyakude	15	15	81	83
Umkhanyakude	23	24	124	127
Umkhanyakude	4	4	22	22
Umkhanyakude	56	57	260	265
Umkhanyakude	10	10	47	48
Umkhanyakude	32	33	135	138
Umkhanyakude	5	6	22	25

Table 17 – Example of low and high household and population statistics

Water Demand Forecasts

The higher of the two household counts was used to calculate the low demand forecast (million m³ pa), using the figures supplied by the Department of Water Affairs using the All Town Study. The high demand forecast (million m³ pa) was calculated in the same way. The probable demand forecast (million m³ pa) was the average of these two figures.

DM	LowDemandForecast	HighDemandForecast	ProbableDemand	CurrentWaterRequirements	FutureWaterRequirements
Umkhanyakude	0.001927	0.003614	0.00273	0.00273	0.003614
Umkhanyakude	0.000876	0.001606	0.001241	0.001241	0.001606
Umkhanyakude	0.001927	0.003614	0.00273	0.00273	0.003614
Umkhanyakude	0.001051	0.002008	0.001489	0.001489	0.002008
Umkhanyakude	0.000657	0.001205	0.000931	0.000931	0.001205
Umkhanyakude	0.000876	0.001606	0.001241	0.001241	0.001606
Umkhanyakude	0.008191	0.015257	0.011603	0.011603	0.015257
Umkhanyakude	0.129341	0.241141	0.183234	0.183234	0.241141
Umkhanyakude	0.000964	0.001847	0.001365	0.001365	0.001847
Umkhanyakude	0.001183	0.001907	0.001498	0.001498	0.001907
Umkhanyakude	0.002628	0.005139	0.003723	0.003723	0.005139
Umkhanyakude	0.001577	0.00261	0.001997	0.001997	0.00261
Umkhanyakude	0.001139	0.002168	0.001613	0.001613	0.002168
Umkhanyakude	0.000701	0.001285	0.000993	0.000993	0.001285
Umkhanyakude	0.002321	0.004417	0.003289	0.003289	0.004417
Umkhanyakude	0.00092	0.001767	0.001303	0.001303	0.001767
Umkhanyakude	0.001402	0.00265	0.001986	0.001986	0.00265
Umkhanyakude	0.00092	0.001767	0.001303	0.001303	0.001767
Umkhanyakude	0.003241	0.006183	0.004592	0.004592	0.006183
Umkhanyakude	0.00092	0.001767	0.001303	0.001303	0.001767
Umkhanyakude	0.004073	0.007628	0.005771	0.005771	0.007628
Umkhanyakude	0.00184	0.003373	0.002606	0.002606	0.003373
Umkhanyakude	0.003723	0.006906	0.005274	0.005274	0.006906
Umkhanyakude	0.001883	0.003533	0.002668	0.002668	0.003533
Umkhanyakude	0.003329	0.006183	0.004716	0.004716	0.006183
Umkhanyakude	0.003066	0.005782	0.004344	0.004344	0.005782
Umkhanyakude	0.003548	0.006665	0.005026	0.005026	0.006665
Umkhanyakude	0.005431	0.010198	0.007694	0.007694	0.010198
Umkhanyakude	0.000964	0.001767	0.001365	0.001365	0.001767
Umkhanyakude	0.011388	0.02128	0.016133	0.016133	0.02128
Umkhanyakude	0.002059	0.003854	0.002916	0.002916	0.003854
Umkhanyakude	0.005913	0.011081	0.008377	0.008377	0.011081
Umkhanyakude	0.000964	0.002008	0.001365	0.001365	0.002008
Umkhanyakude	0.000745	0.001365	0.001055	0.001055	0.001365
Umkhanyakude	0.008103	0.015177	0.011479	0.011479	0.015177

Water Supply Status and Water Source

The supply status of each area was assessed using all available spatial water infrastructure data (boreholes, reservoirs, springs, pipelines etc.) and intersections with the water supply footprint polygons. Where there were intersections (i.e. there was some form of water supply within, or very close to a footprints) it was assumed that there was short term supply to that area. Assessments were checked manually to ensure that very close water supplies to settlement boundaries were taken into account.

Similarly, analysis using existing mapped boreholes and other water sources was used to populate the existing water source field.

LOCAL MUNICIPALITY	NO OF WATER SUPPLY FOOTPRINTS	NO OF WATER SUPPLY FOOTPRINTS WITH SHORT TERM SUPPLY
Umhlabuyalingana	1019	92
Jozini	1079	147
The Big 5 False Bay	342	33
Hlabisa	603	12
Mtubatuba	913	13
Umkhanyakude	3956	297

6.1 Water and Sanitation Backlogs

Table 18 indicates the total number of households as well as water backlogs within the various local municipalities in the UKDM.

Water	Total Households	Backlogs
Umhlabuyalingana	26123	7221
Jozini	31084	12541
The Big 5 False Bay	5876	4791
Hlabisa	11988	5933
Mtubatuba	29238	5953
Total	**104308**	**36439**

Table 18 - Water Backlogs

(Source: Eskom study 2011 and Stats SA)

According to the IDP (2012/14) the sanitation backlog is 24%, (Excluding future low income housing)

Sanitation	Total Households	Backlogs
Umhlabuyalingana	26123	6269
Jozini	31084	7460
The Big 5 False Bay	5876	1410
Hlabisa	11988	2877
Mtubatuba	29238	7017
Total	**104308**	**25034**

Table 19 - Sanitation Backlogs

(Source: IDP 2013/14 and Stats SA)

7. ALREADY PROPOSED FUTURE SUPPLY OPTIONS

7.1 Existing proposals for future supply

One of the long term options that is also being investigated by the Umkhanyakude DM is bringing a bulk water supply pipeline from the treatment works downstream of the Pongolapoort Dam to supply the areas of Hluhluwe and Mpukonyoni. This bulk water supply scheme can be enlarged and extended to supply Mtubatuba and surrounding areas. Figure 20 on page 72 indicates the existing water supply schemes as well as the proposed regional bulk water supply schemes for the UKDM.

Figure 21 on page 73 indicates the additional projects which have been proposed by the UKDM to address the water backlogs. The figure covers various project areas and indicates the number of households to be supplied by the proposed schemes. It also provides a cost estimate for the proposed bulk and reticulation infrastructure.

Figure 20 and Figure 21 have been sourced from the UKDM IDP which was undertaken in 2013.

Table 20 on page 74 indicate the Municipal Infrastructure Grant (MIG) allocations for the various proposed water and sanitation projects until the year 2016.

Table 21 on page 76 and 76 contains information on the budgets required to undertake the various water and sanitation projects within the local municipalities. It also indicates the MIG allocation as well as the budget allocation over a 3 year period starting from 2012 to 2015. The table also provides an indication of the status of the project. This information was extracted from the IDP undertaken in 2013.

The maps on pages 77-80 indicate the various projects in each Local Municipality, the funding agent, status of the projects and total project cost. These drawings were sourced from Bigen Africa.

The quantification and pricing undertaken in this report is based on UAP proposals only and does not take into consideration the future infrastructure already planned by the UKDM as it is assumed that funding for these proposals have already been secured by UKDM.

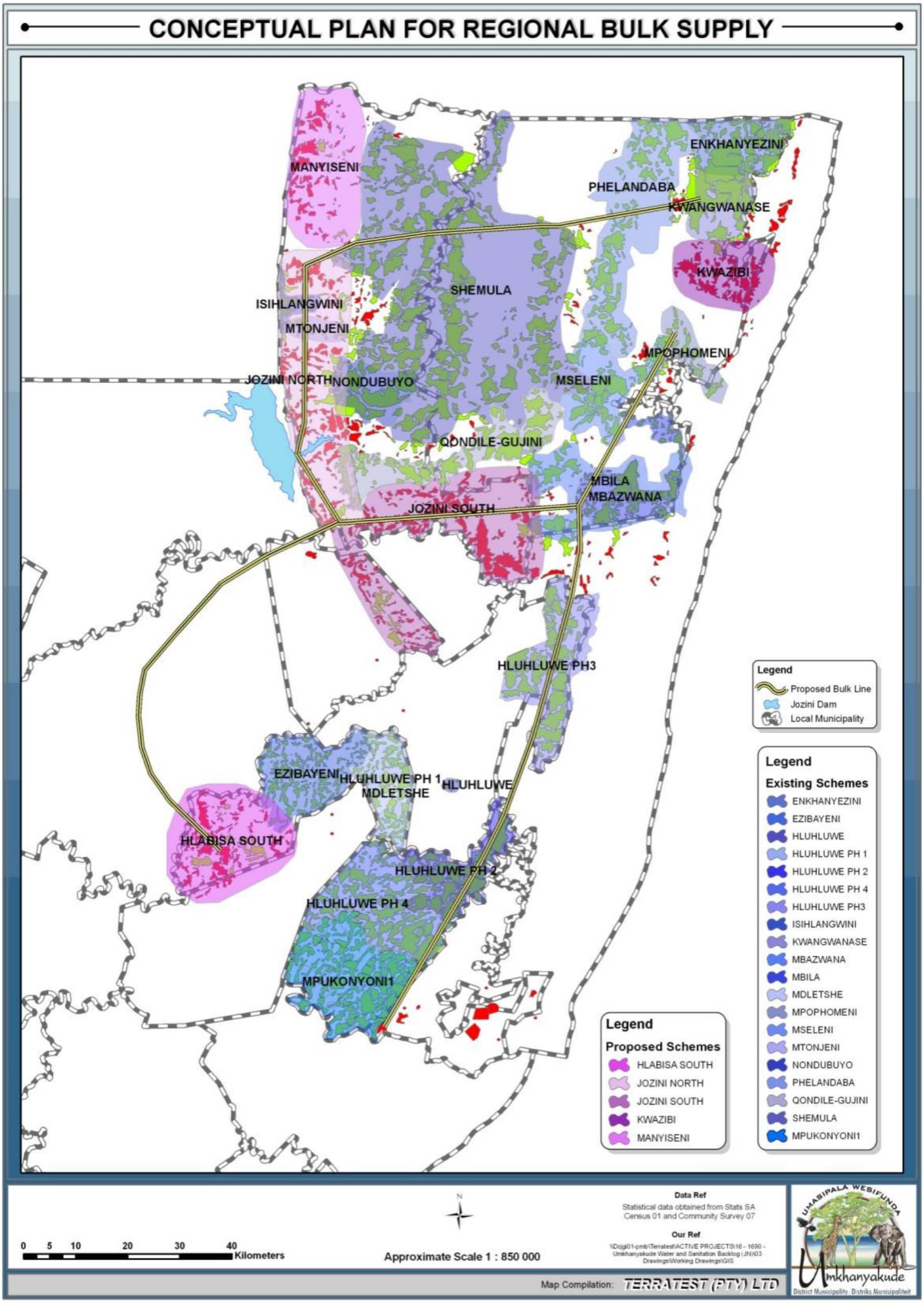


Figure 20 – Conceptual Plan for Regional Bulk Supply

(Source: First Stage Reconciliation Strategy for Mtubatuba Water Supply Scheme Area Mtubatuba Municipality, 2011)

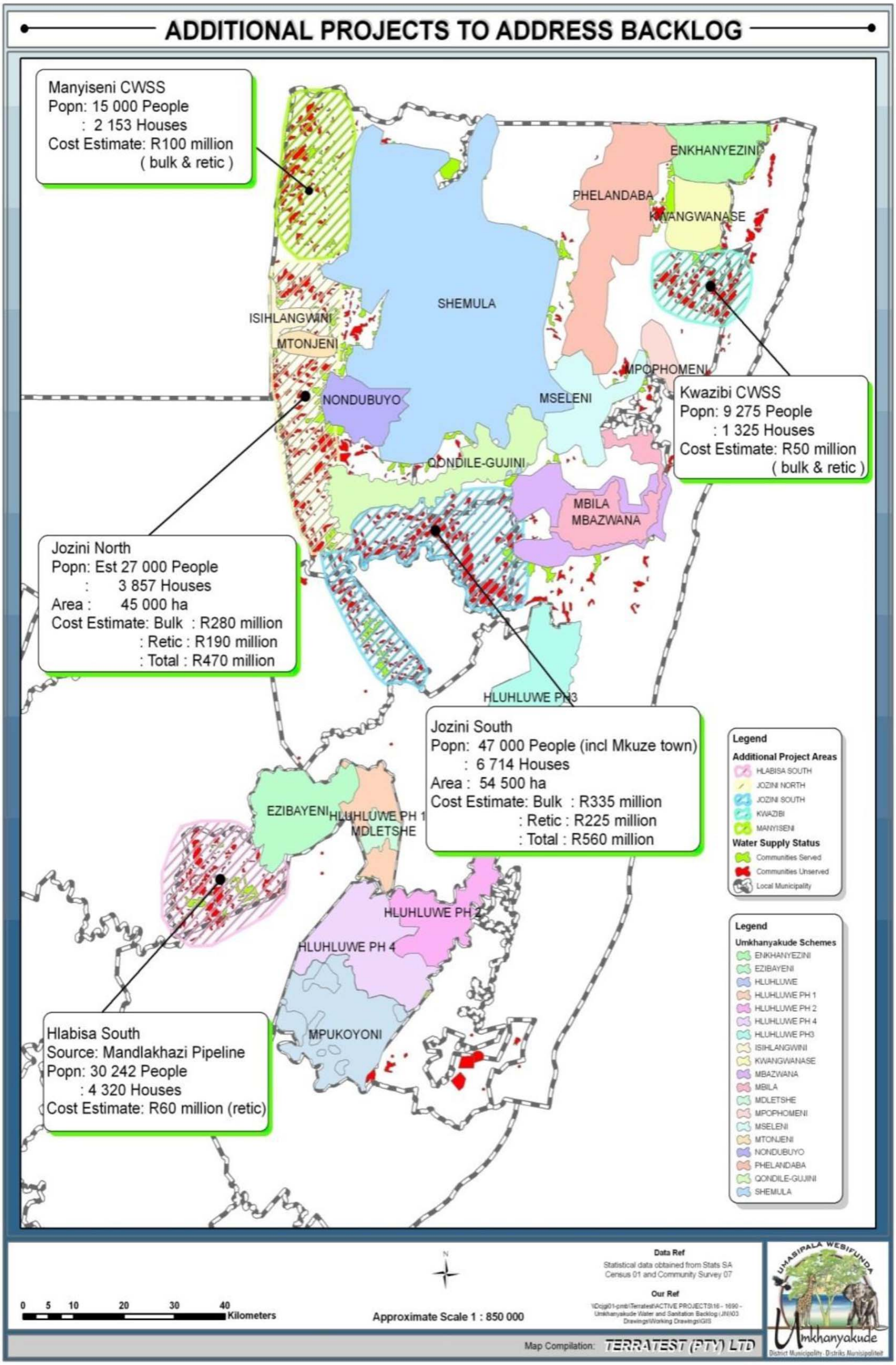


Figure 21 – Additional Projects to address backlogs

(Source: IDP 2013)

MUNICIPAL INFRASTRUCTURE GRANT			
Details	**2013/2014**	**2014/2015**	**2015/2016**
KwaJobe Community Water Supply	R 20 000 000	R 30 000 000	R 25 000 000
Jozini Regional Bulk Community Water Supply Scheme	R 30 000 000	R 46 700 000	R 56 700 000
Mkuze Water Treatment Works Upgrade	R 20 000 000		
Ingwavuma Sanitation	R 10 000 000	R 17 000 000	R 20 000 000
Thembalethu Sanitation	R 22 000 000	R 30 000 000	R 27 263 000
Hluhluwe Water Upgrade	R 7 000 000		
Hlabisa Mandlakazi Bulk & Reticulation	R 16 000 000		
Mtubatuba Sanitation	R 17 000 000	R 30 000 000	R 40 000 000
KwaMpukunyuni Community Water Supply	R 14 297 000		
Disaster Management Centre	R 14 000 000		
Shemula Water Supply Scheme	R 40 000 000	R 52 456 000	R 50 000 000
Mtubatuba Works Upgrade	R 5 000 000		
TOTAL	**R 215 297 000**	**R 206 156 000**	**R 218 963 000**

Table 20 - Infrastructure Projects (New Projects) - 2014-2016 (MIG)

(Source: IDP 2013)

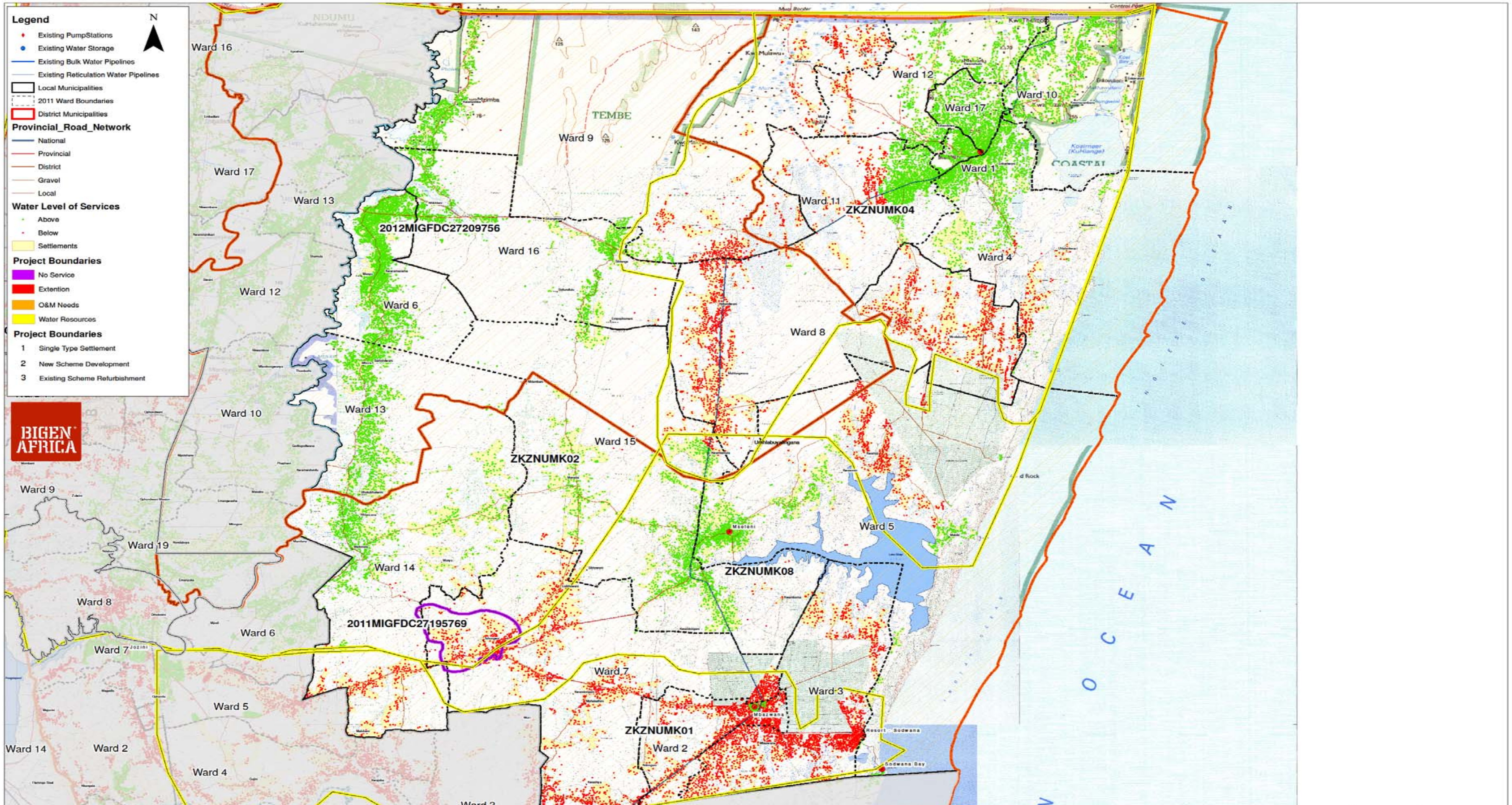
No	Project Name	Total Budget Required	MIG Approved Budget	12/13 Allocation	13/14 Allocation	14/15 Allocation	Status
UMHLABUYALINGANA LOCAL MUNICIPALITY							
1	Shemula Water Supply Scheme	R475m	R86.8m	R35m	R50m	R60m	Construction Stage
2	Rudimentary Schemes / Extension to existing infrastructure		R21.6m	R5.4m	R5.4m	R10.8m	Planning Stage
JOZINI LOCAL MUNICIPALITY							
1	KwaJobe Water Supply Project	R160.2m	R160.2m	R20m	R30m	R25m	Construction Stage
2	Jozini Regional Bulk Community Water Supply Scheme		R244.3m	R30m	R46.7m	R56.7m	Procurement Stage
3	Mkuze Water Treatment Works	R27m	R20m	R20m			Design Evaluation Stage
4	Ingwavuma Sanitation	R143m	R143m	R15m	R17m	R20m	Construction Stage
5	Thembalethu Sanitation	R100m	R100m	R20m	R30m	R20m	Construction Stage
6	Rudimentary Schemes / Extension to existing infrastructure		R21.6m	R5.4m	R5.4m	R10.8	Planning Stage
7	Ndumo Water Supply Project		R8.2m	R8.2m			Procurement Stage
8	Jozini Ingwavuma Water Supply Project	R1.399b (RBIG)	R798m	R189m			Construction Stage
BIG 5 FALSE BAY LOCAL MUNICIPALITY							
1	Hluhluwe Water Upgrade	R39m	R39m	R7m			Construction Stage
2	Rudimentary Schemes/ Extension to existing infrastructure		R21.6m	R5.4m	R5.4m	R10.8m	Planning Stage

HLABISA LOCAL MUNICIPALITY							
1	Hlabisa / Mandlakazi Bulk & Reticulation Project	R113m	R113m	R16m			Construction Stage
2	Rudimentary Schemes / Extension to existing infrastructure		R21.6m	R5.4m	R5.4m	R10.8m	Planning Stage
3	Hlabisa Bulk Water Supply	R183m (RBIG)	R183m	R20m			Construction Phase
MTUBATUBA LOCAL MUNICIPALITY							
1	Upgrade of Mtubatuba Water Works	R73.5m	R73.5	R7m			Construction Stage
2	Rudimentary Schemes / Extension to existing infrastructure		R21.6m	R5.4m	R5.4m	R10.8m	Planning Stage
3	Mtubatuba Sanitation	R96m	R96m	R17m	R30m	R40m	Construction Stage
4	KwaMpukunyuni Community Water Supply Scheme	R93m	R93m	R12m			Construction Stage
5	Dukuduku Resettlement Project	R139m	R139m	R30m			Construction Stage
6	Nsezi Feasibility Study						Feasibility Stage

Table 21 – Infrastructure Projects per Municipality

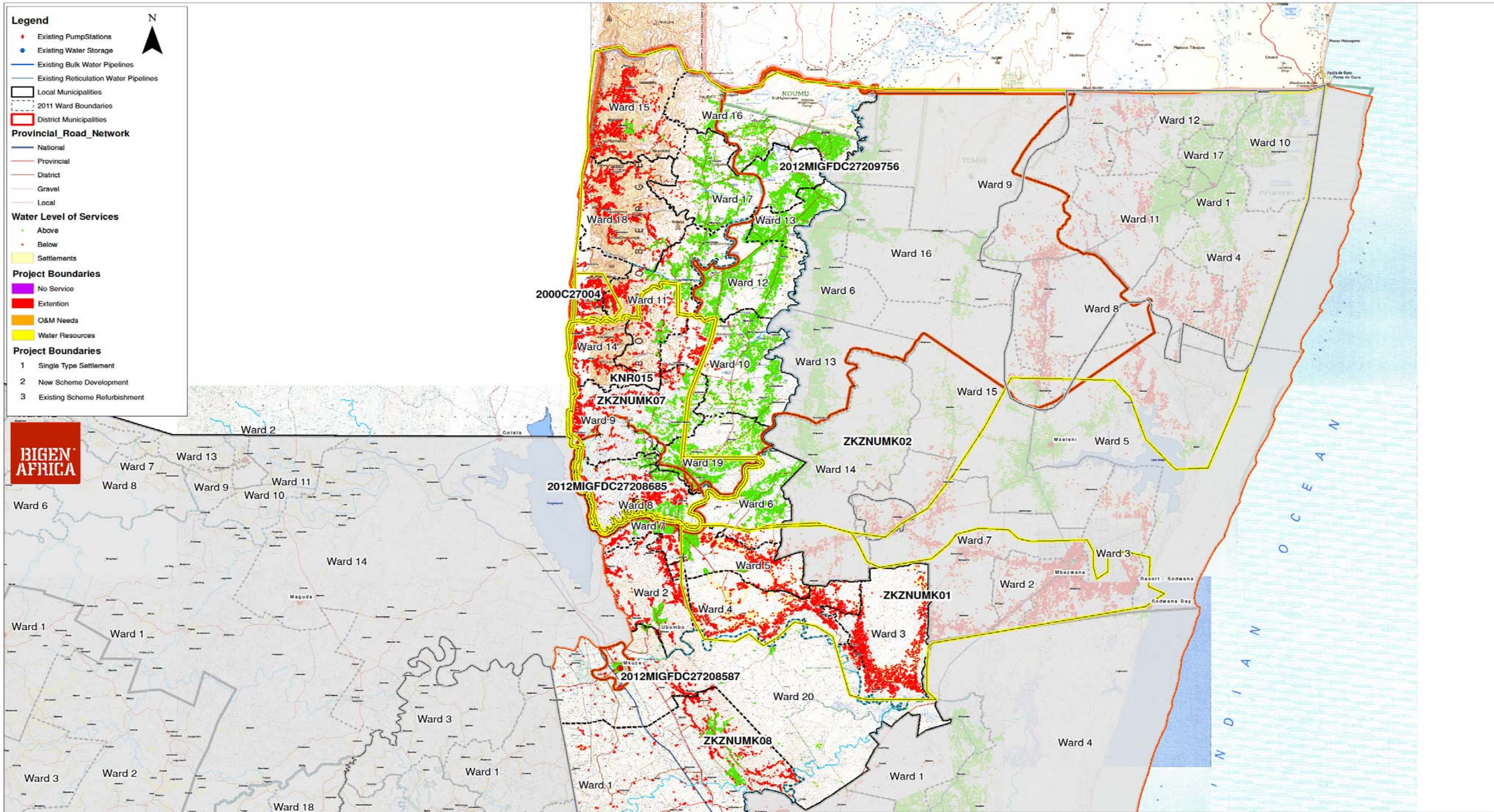
(Source : IDP 2013)

UMKHANYAKUDE - UMHLABUYALINGANA



Project Number	APPSClass	IPClass	Project Name	Project Status	Project Origin	Total Project Cost
2011MIGFDC27195769	1	2	KwaJobe Community Water Supply Scheme (Ntshongwe/Malobeni)	Construction	MIG	R 160 194 178.00
2012MIGFDC27208656	3	3	Mpukunyoni Community Water Supply Scheme: Remedial works and Upgrade	Construction	MIG	R 92 351 248.00
ZKZNUMK01	4	2	Jozini WTW and Bulk Supply Upgrade	Feasibility	Other	R 550 000 000.00
ZKZNUMK02	4	2	Shemula WTW upgrade and bulk Supply to Kwamkwanase	Feasibility	Other	R 1 600 000 000.00
ZKZNUMK04	4	3	Shemul upgrade to Ndumo and Manyeseni	Feasibility	Other	R 100 000 000.00
ZKZNUMK08	3	2	District Wide WCDM	Planning	23DM	R 168 500 000.00

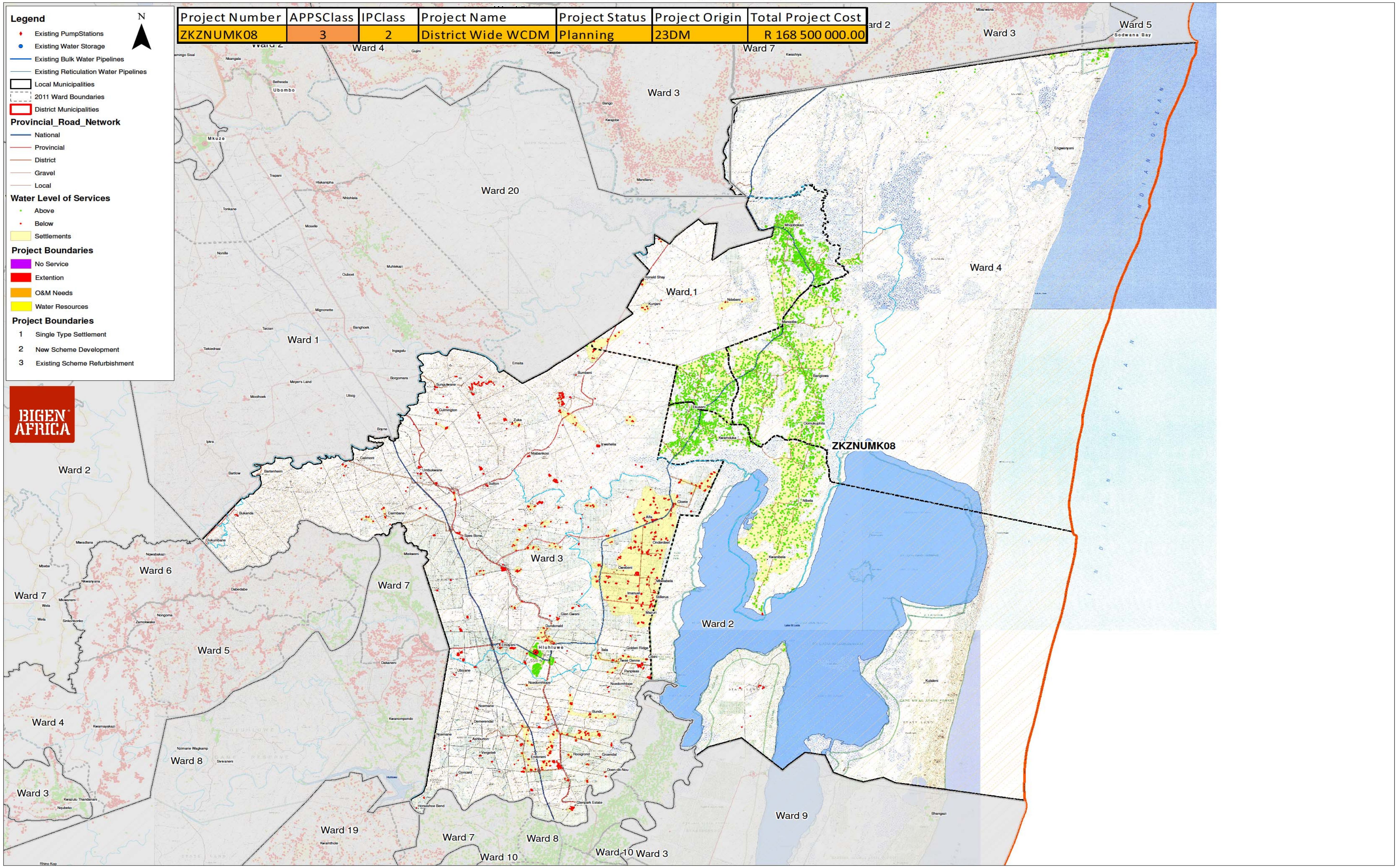
UMKHANYAKUDE - JOZINI



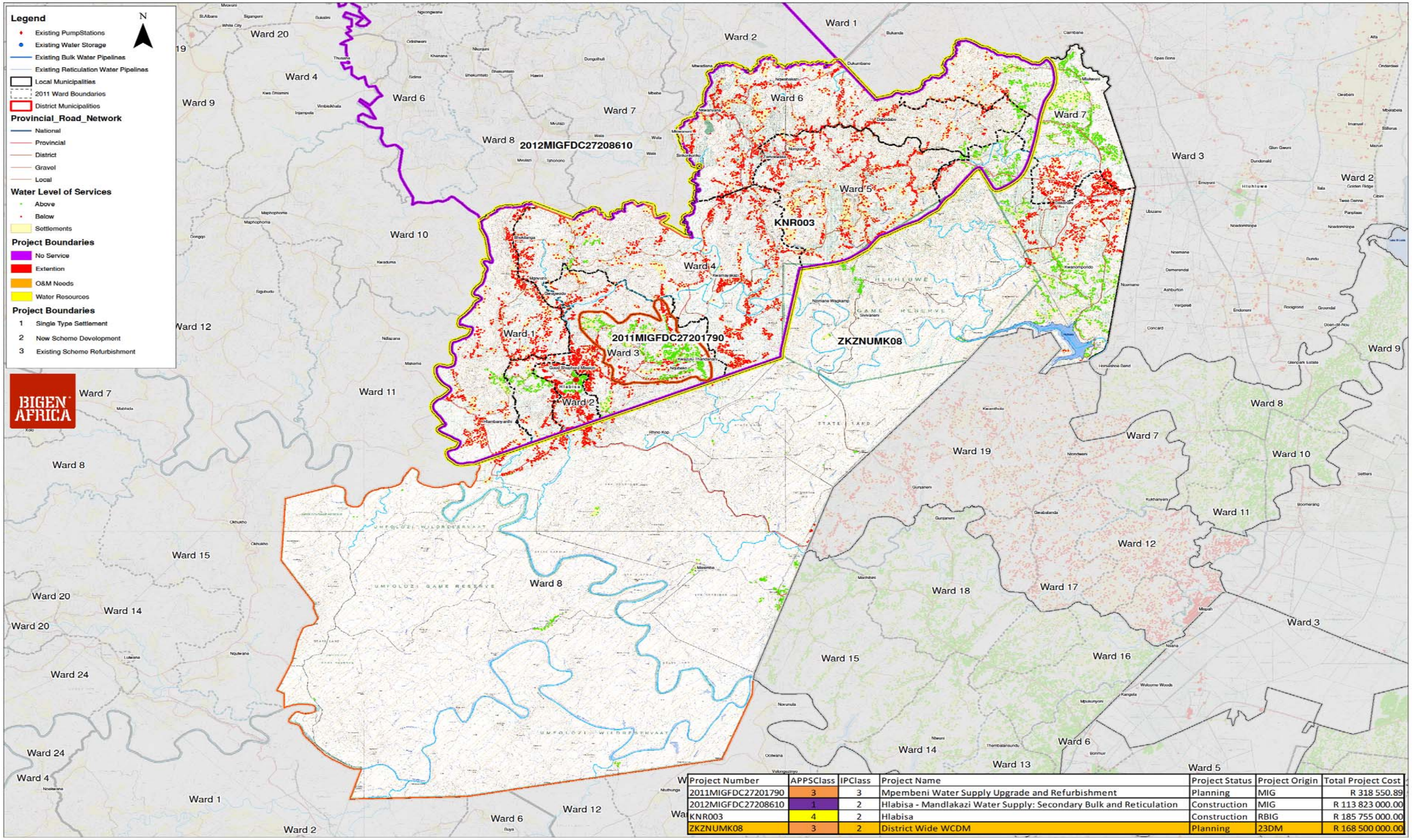
Project Number	APPSClass	IPClass	Project Name	Project Status	Project Origin	Total Project Cost
2000C27004	4	2	Ingwavuma Water Reservoir	Construction	MIG	R 900 000.00
2012MIGFDC27208587	3	3	Mkhuze WTW Upgrade and refurbishment	Design	MIG	R 25 115 245.64
2012MIGFDC27208685	3	3	Jozini Regional Community Water Supply Scheme Phase 1A	Construction	MIG	R 255 877 297.80
2012MIGFDC27209756	3	3	Shemula Water Supply Scheme - Upgrade	Design	MIG	R 86 811 000.00
KNR015	4	2	Pongolapoort Water Supply	Construction	RBIG	R 1 376 048 000.00
ZKZNUMK01	4	2	Jozini WTW and Bulk Supply Upgrade	Feasibility	Other	R 550 000 000.00
ZKZNUMK02	4	2	Shemula WTW upgrade and bulk Supply to Kwamkwanase	Feasibility	Other	R 1 600 000 000.00
ZKZNUMK07	4	2	Ingwavuma Water Distribution	Planning	23DM	R 81 816 000.00
ZKZNUMK08	3	2	District Wide WCDM	Planning	23DM	R 168 500 000.00

UMKHANYAKUDE - BIG 5 FALSE BAY

Project Number	APPSClass	IPClass	Project Name	Project Status	Project Origin	Total Project Cost
ZKZNUMK08	3	2	District Wide WCDM	Planning	23DM	R 168 500 000.00



UMKHANYAKUDE - HLABISA



Project Number	APPSClass	IPClass	Project Name	Project Status	Project Origin	Total Project Cost
2011MIGFDC27201790	3	3	Mpembeni Water Supply Upgrade and Refurbishment	Planning	MIG	R 318 550.89
2012MIGFDC27208610	1	2	Hlabisa - Mandlakazi Water Supply: Secondary Bulk and Reticulation	Construction	MIG	R 113 823 000.00
KNR003	4	2	Hlabisa	Construction	RBIG	R 185 755 000.00
ZKZNUMK08	3	2	District Wide WCDM	Planning	23DM	R 168 500 000.00

8. DEVELOPMENT OF CONCEPTUAL PLANS

8.1 Water Treatment Works Situation Analysis

Reconciliation Strategies undertaken in 2011 indicated the capacities of the WTW within the various local municipalities. These capacities were used to determine how many of the backlogs could be alleviated based on the UAP intent of delivering at least 70l/c/d of water.

The calculations indicated below were undertaken to determine if the existing WTW within the various local municipalities can meet the demand of the backlogs. In addition, these calculations provide an indication that the link to existing scheme type can be undertaken immediately as the need for elaborate infrastructure is minimal.

Umhlabuyalingana and Jozini Local Municipality

Current Population	= 343238
Consumption based on 70l/c/d	= 24.02 ML/d

Umhlabuyalingana and Jozini Local is served by Kwangwanase WTW (1.2 ML/d), Kanini WTW (0.3 ML), Mbazwana WTW (2.64 ML/d), Mseleni WTW (0.3 ML/d), Boreholes (1.11 ML/d), Jozini WTW (5.0 ML/d), Makhatini A plant WTW (1.2 ML/d), Makhatini B plant WTW (0.2 ML/d), Makhatini C plant WTW (0.4 ML/d), Mkuze WTW (1.54 ML/d), Umbombo WTW (0.3 ML/d), Shemula WTW (6.9 ML/d)

Total Capacity of existing water treatment works	= 21.09 ML/d

Hence the calculation above indicates that there is insufficient water treatment capacity in the Umhlabuyalingana and Jozini Local Municipality currently.

The Big 5 False Bay and Hlabisa Local Municipality

Current Population	= 107183
Consumption based on 70l/c/d	= 7.50 ML/d

The Big 5 False Bay and Hlabisa Local Municipality is served by Hluhluwe WTW (6 ML/d)

Total Capacity of existing water treatment works	= 6.0 ML/d

Hence the calculation above indicates that there is insufficient water treatment capacity in the Big 5 False Bay and Hlabisa Local Municipality currently.

<u>Mtubatuba Local Municipality</u>

Current Population = 175425

Consumption based on 70l/c/d = 12.28 ML/d

Mtubatuba Local Municipality is served by Mtubatuba WTW (20.0ML/d).

Total Capacity of existing water treatment works = 20.0 ML/d

Hence the above calculation indicates that there is sufficient water treatment capacity in the Mtubatuba Local Municipality currently.

8.2 Design Parameters

MM PDNA undertook the conceptual design for the entire District Municipality and divided this into each Local Municipality. The following assumptions were made in undertaking the conceptual design:

- Water consumptions were based in accordance to the Table 22 below:

Description of consumer category	Household Annual Income range	Per capita cons (l/c/d)		
		Min	Ave.	Max.
Very High Income; villas, large detached house, large luxury flats	>R1 228 000	320	410	500
Upper middle income: detached houses, large flats	153 601 – 1 228 000	240	295	350
Average Middle Income: 2 - 3 bedroom houses or flats with 1 or 2 WC, kitchen, and one bathroom, shower	38 401 – 153 600	180	228	275
Low middle Income: Small houses or flats with WC, one kitchen, one bathroom	9 601– 38 400	120	170	220
Low income: flatlets, bedsits with kitchen & bathroom, informal household	1- 9600	60	100	140
No income & informal supplies with yard connections		60	70	100
Informal with no formal connection		30	70	70
Informal below 25 l/c/d		0	70	70

Table 22 - Water Consumptions

- Each household has an average of 6 people
- Some of the existing boreholes are functional.
- The existing water reticulation schemes are operational.
- Some of the existing water reticulation schemes have spare capacity.
- Existing water treatment works have the potential to be upgraded or rehabilitated.
- Schemes have some form of power supply.
- General pipe size range is from 25 mm to 150 mm diameter.
- Peak factor - 1.5
- Water losses were considered to be 35%
- Where there is an existing bulk line, connections to the bulk were kept to a minimum
- Reticulation mains were placed in the road reserve for maintenance purposes
- District and provincial road crossings were kept to a minimum

8.3 Scheme Types

MM PDNA assessed some of the existing water supply options that the UKDM currently implements and applied the same scheme types to supply the un-serviced polygons. The following schemes were adopted by MM PDNA to determine the scheme type applicable to the different settlements and their associated. These costs were was provided by Umgeni Water.

- Tie into existing schemes
- Existing boreholes and standpipes that are non-functional to be rehabilitated.
- Existing boreholes with reticulation to be rehabilitated.
- Boreholes mechanically operated for settlements with a low population.
- Boreholes electronically operated for settlements with a high population.
- Package Plants for settlements which are densely populated.
- From existing scheme pumped to new reservoir and reticulated.
- Where the existing borehole schemes are indicated but the settlement households are still indicated as un-serviced. It was assumed that there was an issue with the existing boreholes; therefore it was linked to the contiguous water supply schemes. Figure 22 below indicates this principle.

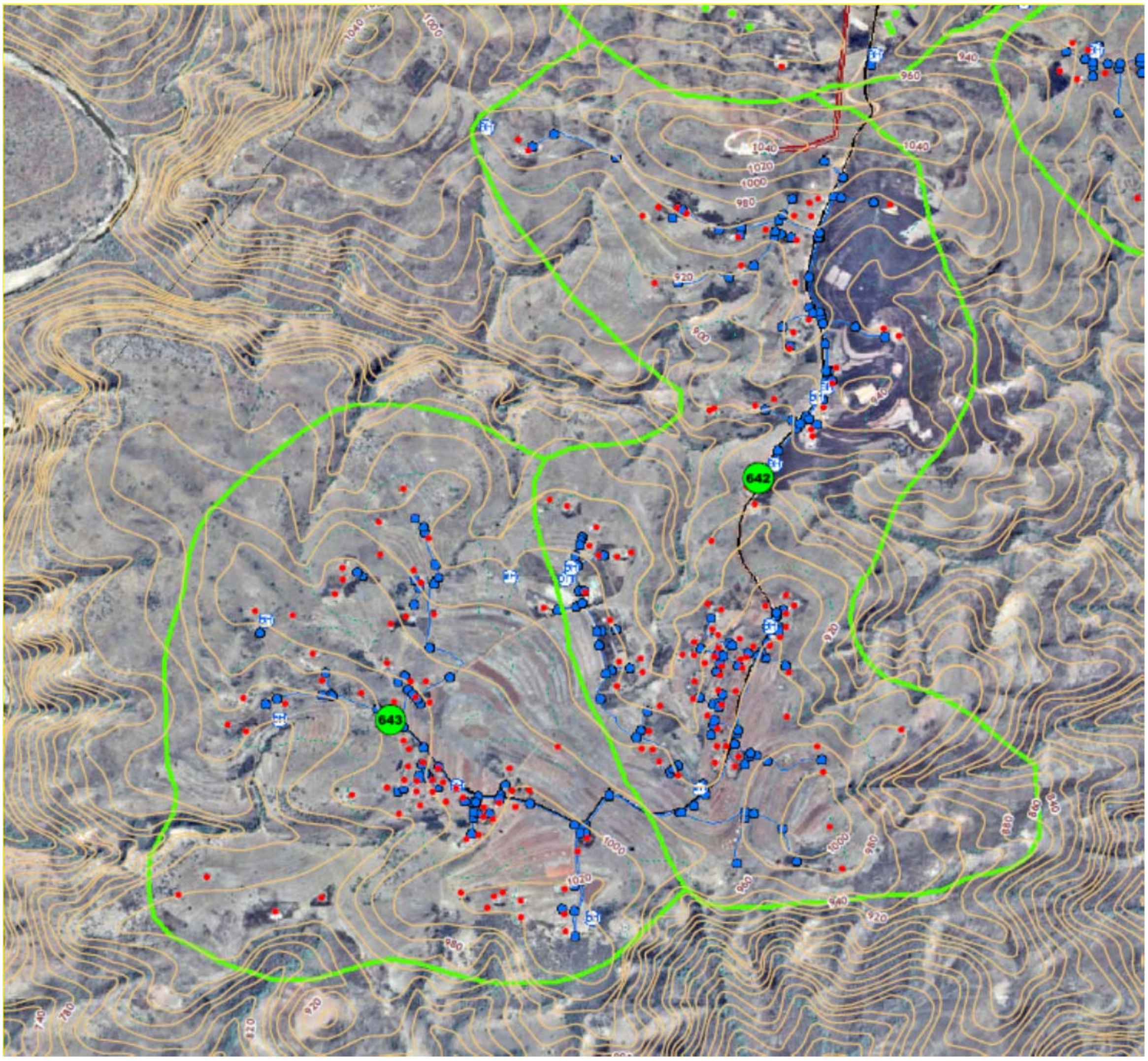


Figure 22 - Existing Borehole Schemes not in operation

8.3.1 Link to existing scheme

Areas currently without supply that are located adjacent to existing water mains could be supplied by extending the existing reticulation to the adjacent, currently unserviced area.

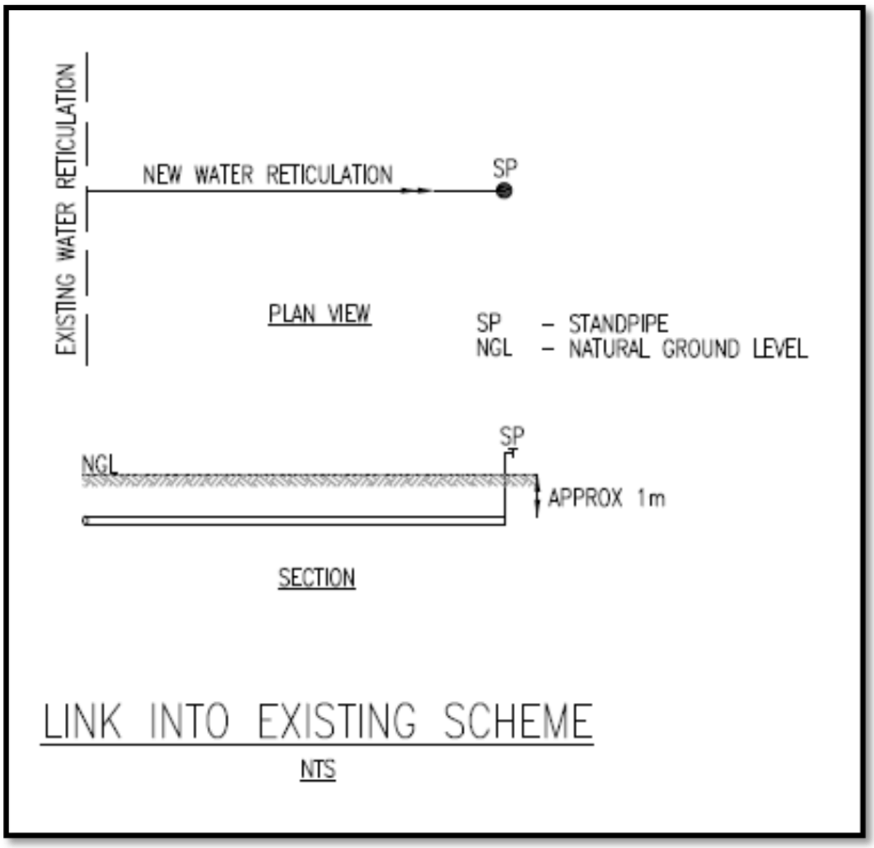
- During the assessment of the reticulation needs for the polygons, it was noted that several of the schemes contain boreholes which are not currently supplying the surrounding households. It was therefore assumed that these particular boreholes are non-functional and as such MM PDNA provided alternative supply sources to these schemes.

  The GIS information indicated a bulk supply line indicated contiguous to the community which was used to supply the area.

- In some cases the GIS information indicates that there is an existing bulk line, however there are un-serviced households contiguous to the bulk line. It was assumed that they are un-serviced due to the households being at a higher elevation.

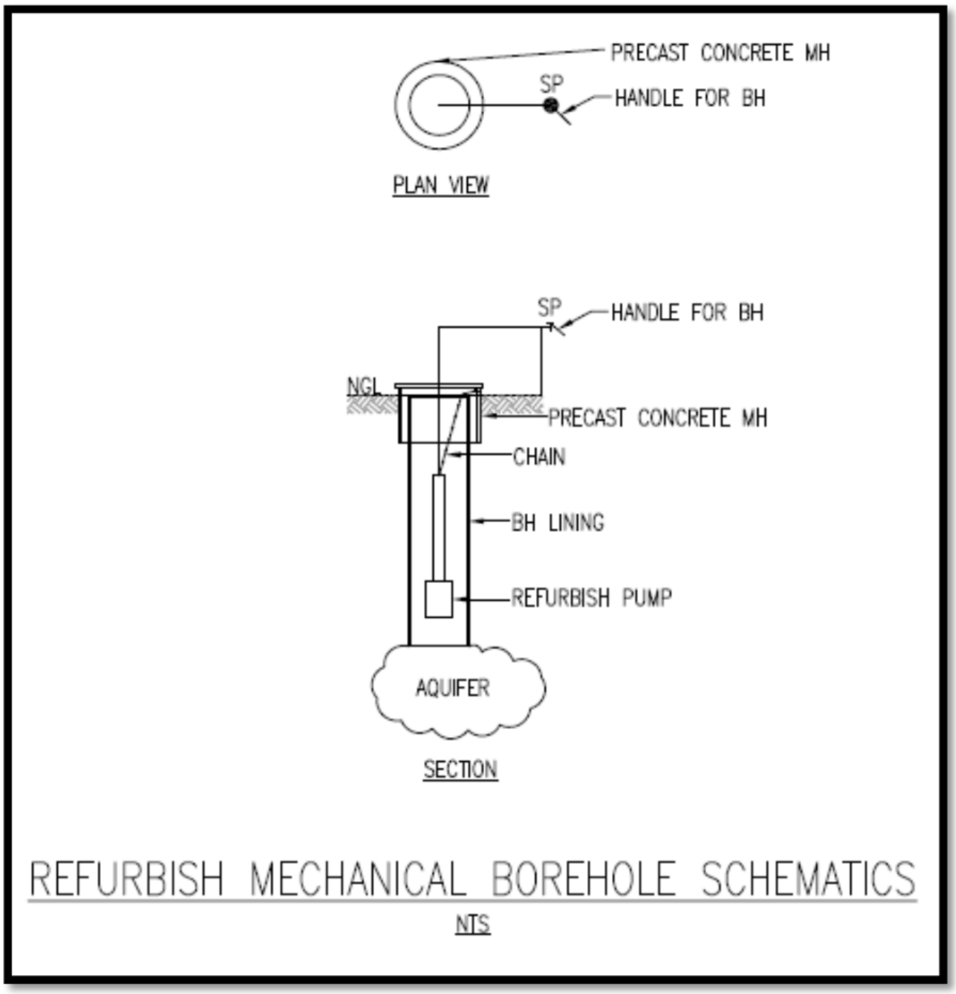
  These households were serviced by undertaking a pumping main from the existing bulk to a new reservoir at a higher elevation where it can be gravity fed to the households. This was deemed to be the cost effective option.

  In areas where the static head exceeds 100m, break pressure tanks should be constructed to reduce the pressure and also create additional storage.



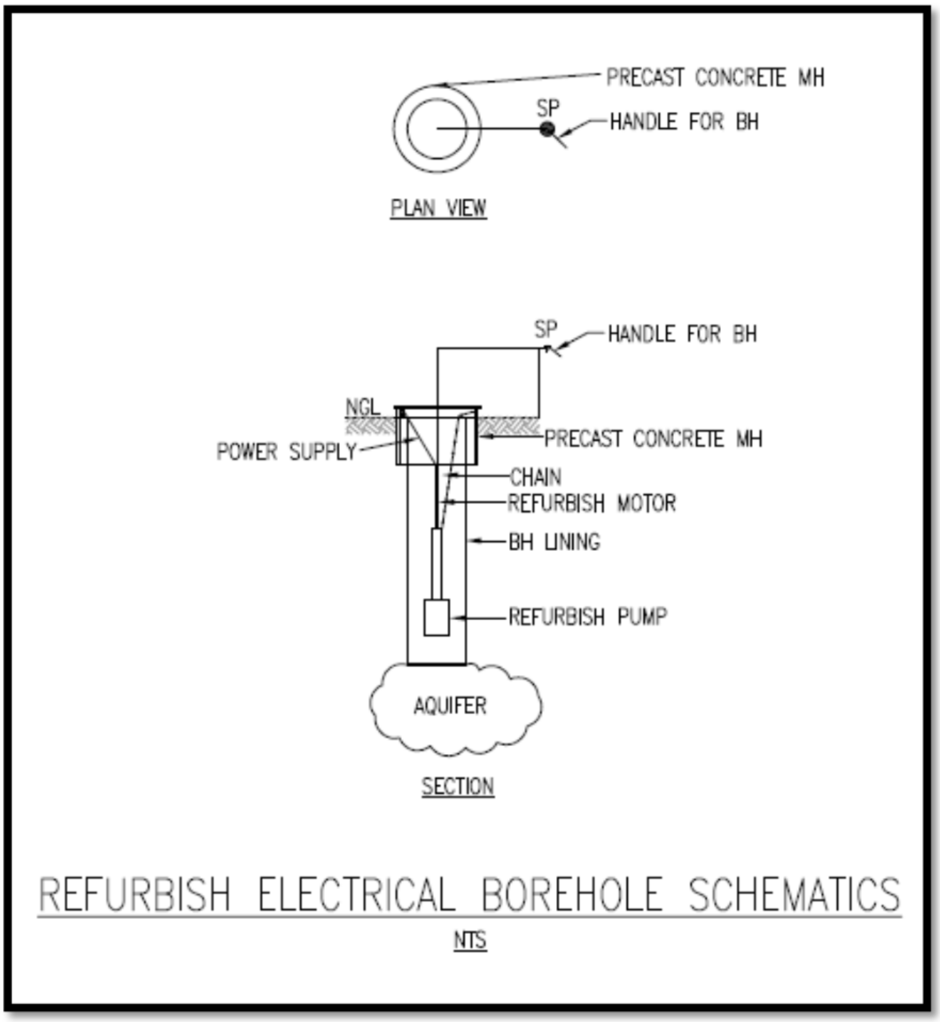
8.3.2 Refurbishment of Mechanical Boreholes

The existing mechanical boreholes that previously supplied water to a community are now defunct as the pumps are no longer functioning. Hence a replacement pump needs to be installed to ensure the continued delivery of water.



8.3.3 Refurbishment of Electrical Boreholes

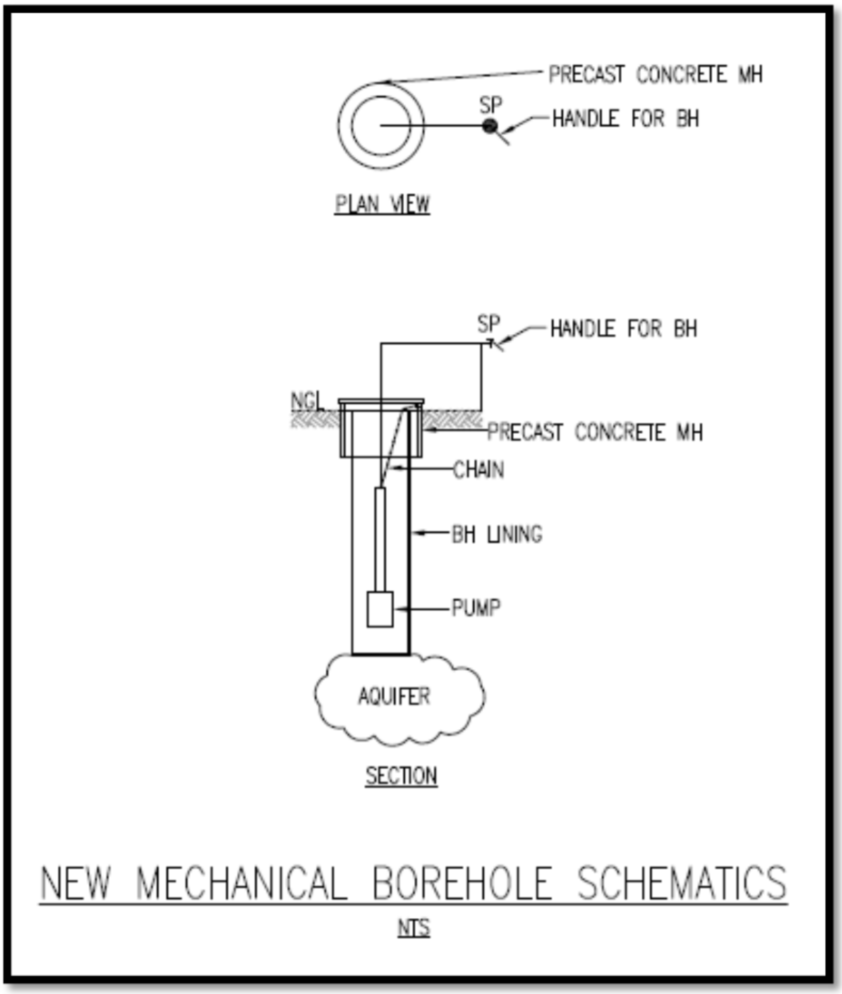
The existing electrical boreholes that previously supplied water to a community are now defunct as the pumps or motors are no longer functioning. Hence replacement pumps or motors need to be installed to ensure the continued delivery of water.



8.3.4 New Mechanical Boreholes

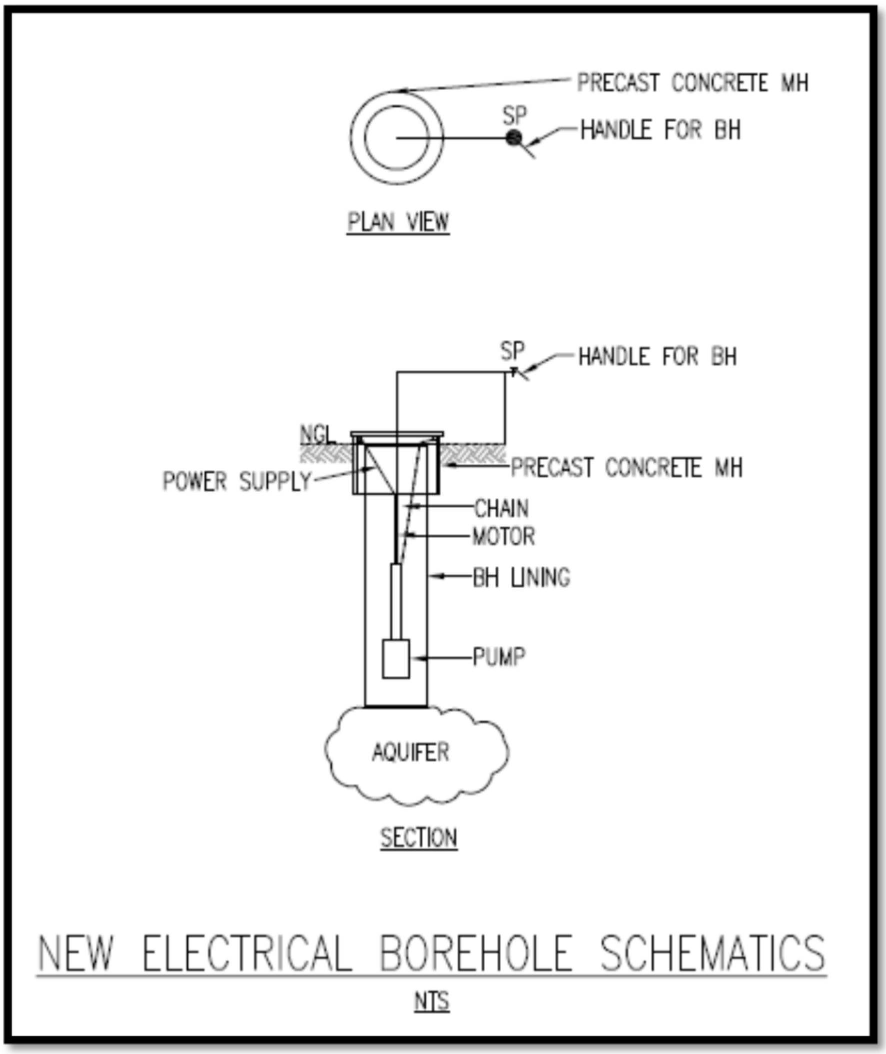
Mechanical boreholes are installed in remote rural areas where there is no available water reticulation and electrical supply.

The view adopted by MM PDNA was, where the population was in the region of 20-30 people mechanical boreholes would be the most cost effective supply of water. The alternative considered to a mechanical borehole system was the installation of a wind powered borehole system.



8.3.5 New Electrical Boreholes

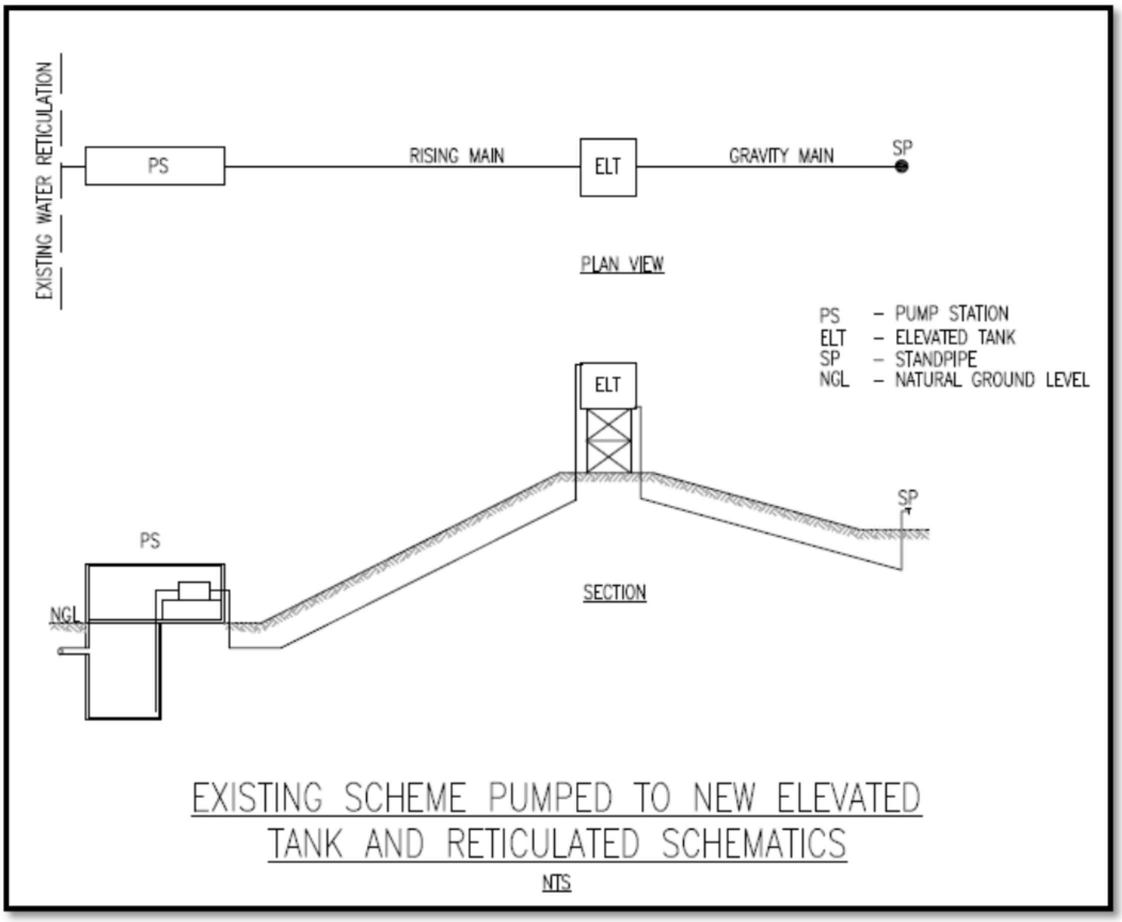
Electrical boreholes are installed in remote rural areas where there is no available water reticulation, but where electrical supply is available.



8.3.6 Existing Scheme Pumped to New Elevated Tank and Reticulated

There are areas at elevations higher than the existing reticulation without supply, which cannot be supplied by the existing reticulation due to the height difference.

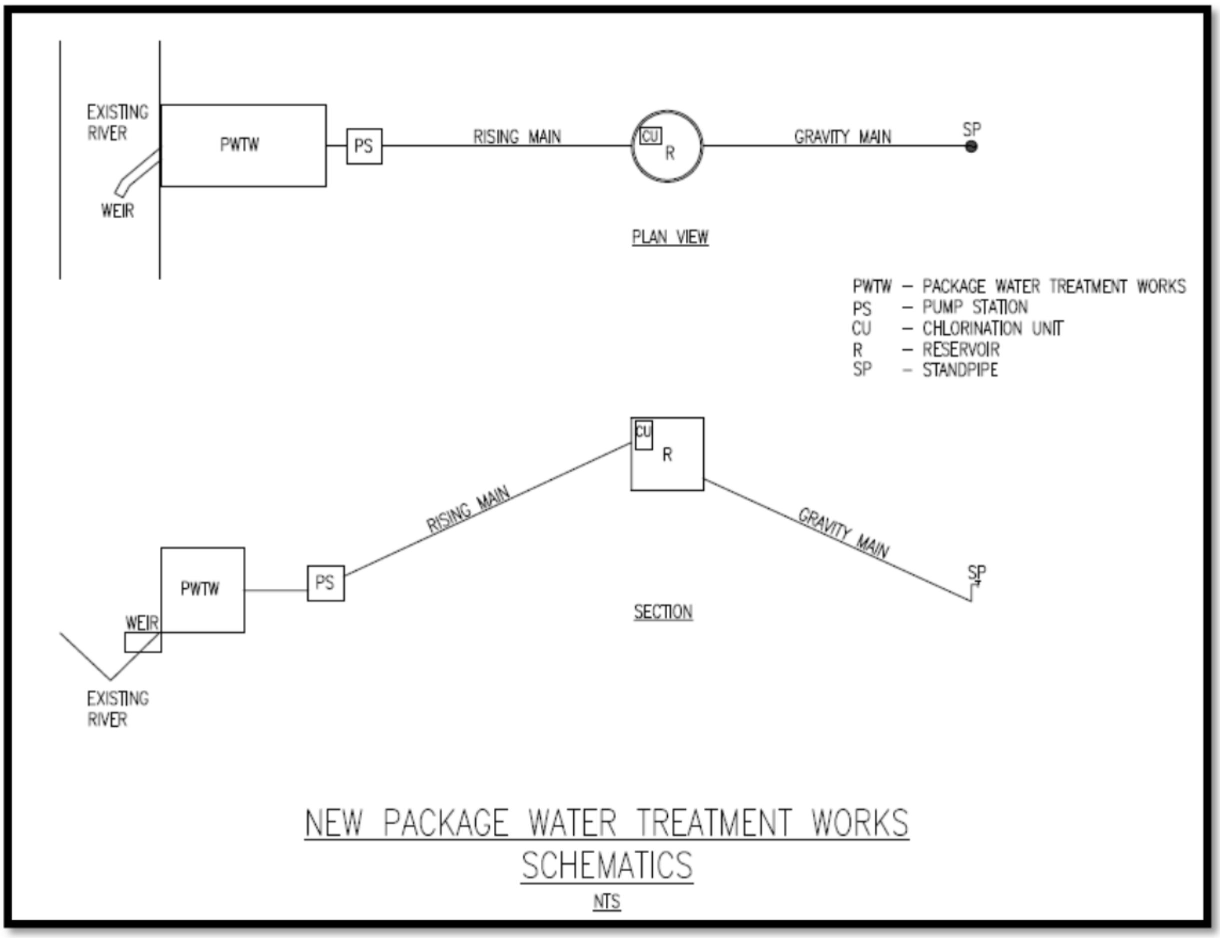
This alternative proposes to supply the houses at these higher elevations by obtaining water from the existing mains and installing a wet well and a pump station as well as an elevated reservoir.



8.3.7 New Package Water Treatment Works

Areas which are located close to a river source can be supplied by a containerized package treatment plant, which could abstract water from the river.

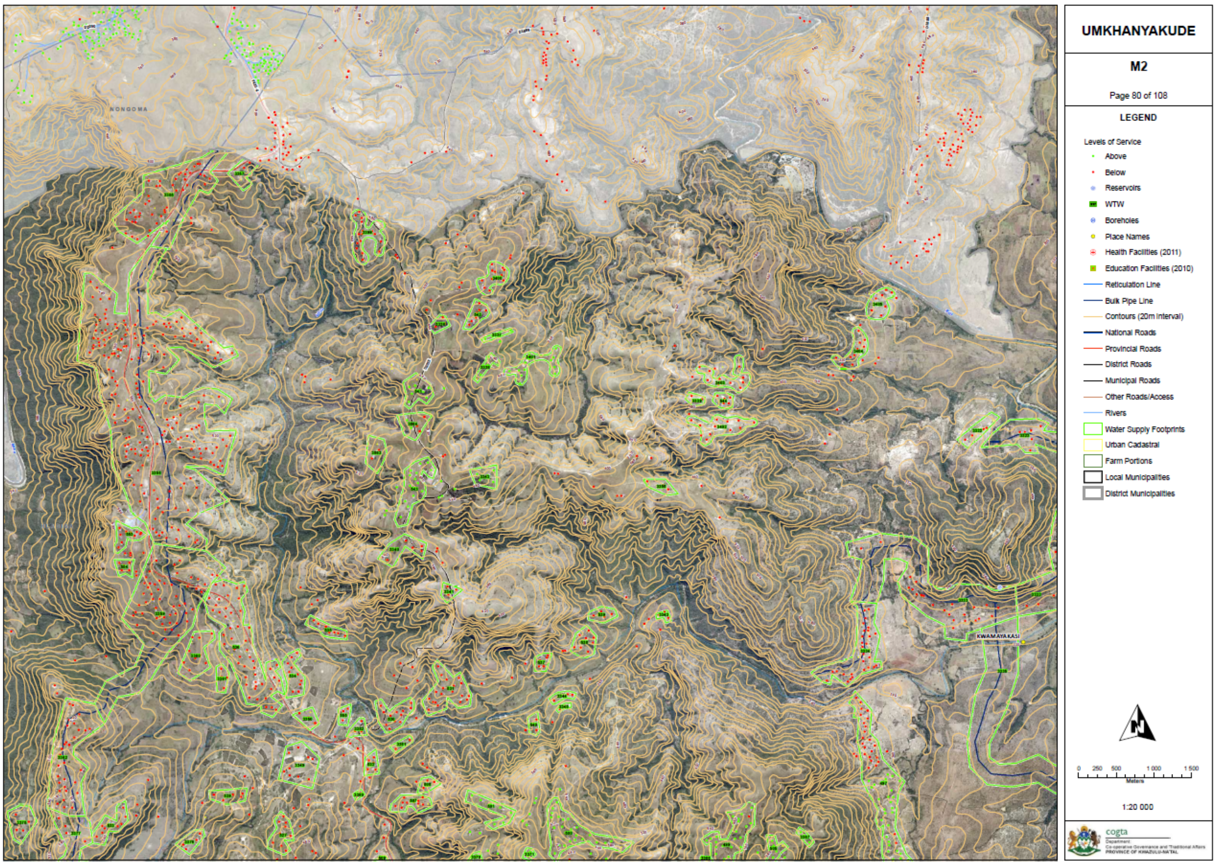
This alternative proposes to abstract water from the river through the package plant which has flocculation units, clarification units and filtration units. The water would then be pumped via a pump station to the storage reservoir which will require a chlorination unit to be installed.


EXISTING
RIVER
WEIR
PWTW
PS
RISING MAIN
CU
R
GRAVITY MAIN
SP
PLAN VIEW
PWTW – PACKAGE WATER TREATMENT WORKS
PS – PUMP STATION
CU – CHLORINATION UNIT
R – RESERVOIR
SP – STANDPIPE
RISING MAIN
GRAVITY MAIN
SECTION
NEW PACKAGE WATER TREATMENT WORKS
SCHEMATICS
NTS

8.4 Description and Mapping of Supply Schemes

Concept layouts of the proposed infrastructure have been included in the GIS database. The names and costs of the schemes are indicated in the tables in section 8.5. These tables refer to individual water supply footprints and have been indicated on the aforementioned database. A detailed description of the geodatabase is continued in section 9 of the report.

The Umkhanyakude District Municipality was plotted in a map series produced at a scale of 1:20 000. Existing and proposed infrastructure, together with the footprints and contour information (20m intervals) were overlaid onto aerial photography and both exported to pdf and plotted.

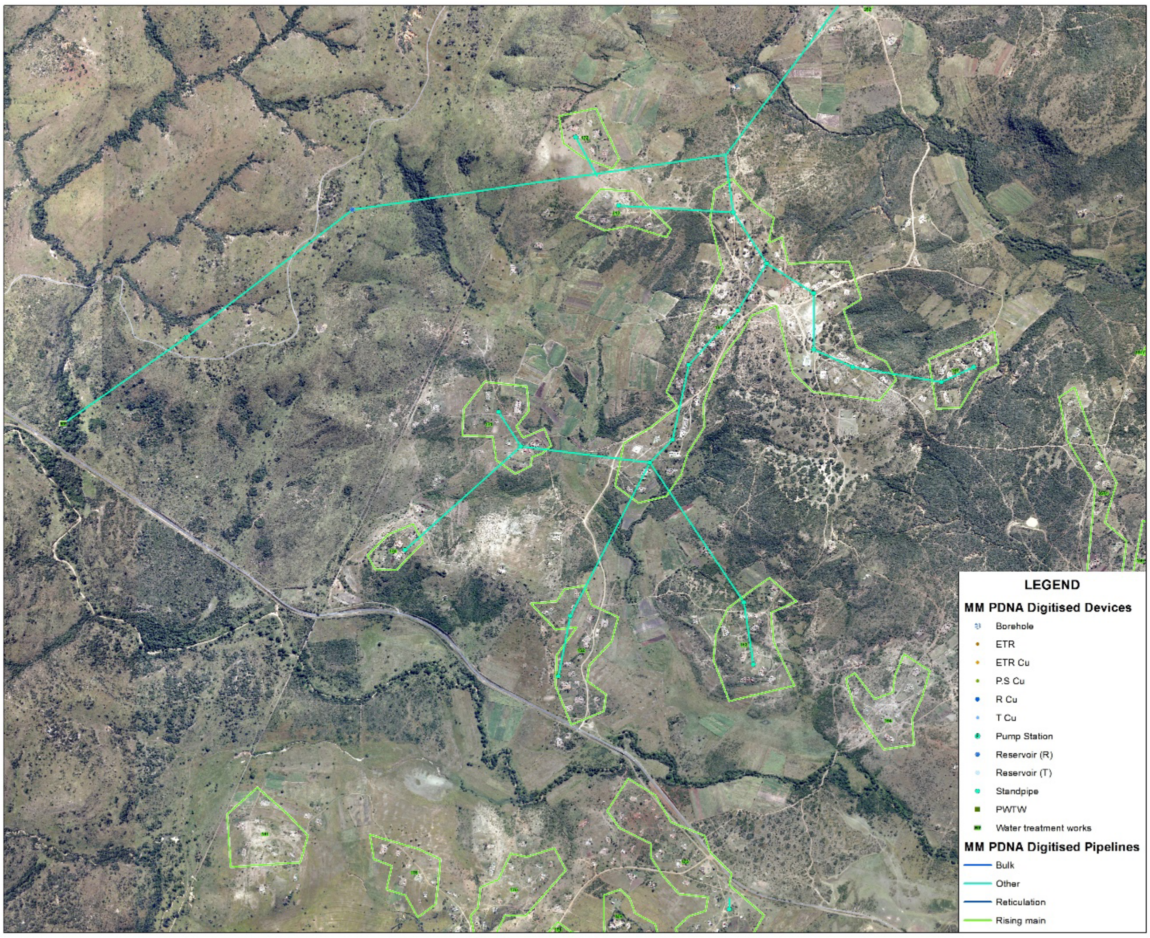


Map 6 – Example of map series sheet

These maps were used, together with the population statistics already calculated, by the engineers at MM PDNA, who designed conceptual water supply schemes directly onto the hard copy maps. These maps were returned to MHP GeoSpace, and the concept water pipelines and other infrastructure (standpipes, boreholes, reservoirs etc.) were digitised into the GIS.

New feature classes were added to the geodatabase and lookup tables assigned to fields within the feature classes. This ensured consistency throughout the data capture process, as it meant that there would be no difference in the type of features captured by different users. The digitised infrastructure was checked to ensure that there was consistency between and across the different map sheets, as well as between the adjacent district municipalities in our project area, namely Zululand to the west. Each individual map sheet was also checked to ensure that all data had been captured.

Where the conceptual water infrastructure was designed and captured (i.e. where there was no existing supply infrastructure) the settlement (water demand) polygon was assigned a unique identifier. This identifier was captured to a separate data set (costed water supply areas) which could later be linked back to the costing model used by the engineers.



Map 7 – Example of data captured from engineers drawings

8.5 Cost Estimates for Proposed Infrastructure

The rates provided by Umgeni Water are shown on the tables below:

Reservoir

0.25	ML	R 1 381 197
0.5	ML	R 2 243 761
0.75	ML	R 2 980 166
1	ML	R 3 645 000
1.25	ML	R 4 261 226
1.5	ML	R 4 841 294
1.75	ML	R 5 392 922
2	ML	R 5 921 320
2.25	ML	R 6 430 212
2.5	ML	R 6 922 382
2.75	ML	R 7 399 978
3	ML	R 7 864 705
3.25	ML	R 8 317 942
3.5	ML	R 8 760 828
3.75	ML	R 9 194 316
4	ML	R 9 619 213
4.25	ML	R 10 036 211
4.5	ML	R 10 445 910
4.75	ML	R 10 848 834
5	ML	R 11 245 442
5.25	ML	R 11 636 143
5.5	ML	R 12 021 299
5.75	ML	R 12 401 237
6	ML	R 12 776 250
6.25	ML	R 13 146 603
6.5	ML	R 13 512 537
6.75	ML	R 13 874 271
7	ML	R 14 232 007
7.25	ML	R 14 585 930
7.5	ML	R 14 936 210
7.75	ML	R 15 283 004
8	ML	R 15 626 457
8.25	ML	R 15 966 705
8.5	ML	R 16 303 873
8.75	ML	R 16 638 079
9	ML	R 16 969 431
9.25	ML	R 17 298 034
9.5	ML	R 17 623 983
9.75	ML	R 17 947 368
10	ML	R 18 268 275
10.25	ML	R 18 586 783

Pump Station (Civil, Mech and Elec)

0.25	MW	R 11 000 000
0.5	MW	R 18 000 000
0.75	MW	R 25 000 000
1	MW	R 33 000 000
1.25	MW	R 44 000 000
1.5	MW	R 55 000 000
1.75	MW	R 66 000 000
2	MW	R 77 000 000

Pump Station Expansion (Mech and Elec)

0.25	MW	R 3 750 000
0.5	MW	R 7 500 000
0.75	MW	R 11 250 000
1	MW	R 15 000 000
1.25	MW	R 18 750 000
1.5	MW	R 22 500 000
1.75	MW	R 26 250 000
2	MW	R 30 000 000

Water Works

0-50	ML/d	R 4 000 000
50-100	ML/d	R 2 500 000
100-1000	ML/d	R 2 000 000

Water Works Augmentation

0-50	ML/d	R 1 800 000
50-200	ML/d	R 1 500 000

Pipes Steel (mm Ø)

150	mm	R 550
200	mm	R 600
300	mm	R 700
350	mm	R 800
400	mm	R 900
450	mm	R 1 300
500	mm	R 1 650
600	mm	R 1 980
700	mm	R 2 500
800	mm	R 3 200
850	mm	R 3 350
1000	mm	R 3 971

10.5	ML	R 18 902 970
10.75	ML	R 19 216 906
11	ML	R 19 528 659
11.25	ML	R 19 838 293
11.5	ML	R 20 145 870
11.75	ML	R 20 451 447
12	ML	R 20 755 080
12.25	ML	R 20 056 820
12.5	ML	R 21 356 719
12.75	ML	R 21 654 824
13	ML	R 21 951 180
13.25	ML	R 22 245 832
13.5	ML	R 22 538 820
13.75	ML	R 22 830 185
14	ML	R 23 119 964
14.25	ML	R 23 408 196
14.5	ML	R 23 694 914
14.75	ML	R 23 980 153
15	ML	R 24 263 945
15.25	ML	R 24 546 322
15.5	ML	R 24 827 313
15.75	ML	R 25 106 948
16	ML	R 25 385 254
16.25	ML	R 25 662 259
16.5	ML	R 25 937 989
16.75	ML	R 26 212 467
17	ML	R 26 485 720
17.25	ML	R 26 757 769
17.5	ML	R 27 028 638
17.75	ML	R 27 298 349
18	ML	R 27 566 923
18.25	ML	R 27 834 379
18.5	ML	R 28 100 739
18.75	ML	R 28 366 021
19	ML	R 28 630 244
19.25	ML	R 28 893 426
19.5	ML	R 29 155 585
19.75	ML	R 29 416 737
20	ML	R 29 676 900
20.25	ML	R 29 936 088
20.5	ML	R 30 194 319
20.75	ML	R 30 451 606
21	ML	R 30 707 965
21.25	ML	R 30 963 410
21.5	ML	R 31 217 955

1100	mm	R 4 075
1200	mm	R 4 500
1300	mm	R 6 065
1400	mm	R 6 900
1600	mm	R 8 500
1800	mm	R 9 563

Pipes Plastic (mm Ø)

75	mm	R 100
100	mm	R 140
200	mm	R 250
300	mm	R 350

Fittings and Auxiliaries

Pipes Installation (mm Ø)

150	mm	R 858
200	mm	R 936
300	mm	R 1 091
350	mm	R 1 247
400	mm	R 1 403
450	mm	R 2 027
500	mm	R 2 573
600	mm	R 3 087
700	mm	R 3 898
800	mm	R 4 990
850	mm	R 5 224
1000	mm	R 6 192
1100	mm	R 6 354
1200	mm	R 7 017
1300	mm	R 9 457
1400	mm	R 10 759
1600	mm	R 13 254
1800	mm	R 14 910

21.75	ML	R 31 471 614
22	ML	R 31 724 399
22.25	ML	R 31 976 325
22.5	ML	R 32 227 402
22.75	ML	R 32 477 644
23	ML	R 32 727 062
23.25	ML	R 32 975 668
23.5	ML	R 33 223 474
23.75	ML	R 33 470 489
24	ML	R 33 716 726
24.25	ML	R 33 962 195
24.5	ML	R 34 206 906
24.75	ML	R 34 450 869
25	ML	R 34 694 093
25.25	ML	R 34 936 589
25.5	ML	R 35 178 366
25.75	ML	R 35 419 432
26	ML	R 35 659 798
26.25	ML	R 35 899 471
26.5	ML	R 36 138 460
26.75	ML	R 36 376 774
27	ML	R 36 614 421
27.25	ML	R 36 851 408
27.5	ML	R 37 087 744
27.75	ML	R 37 323 436
28	ML	R 37 558 493
28.25	ML	R 37 792 920
28.5	ML	R 38 026 726
28.75	ML	R 38 259 917
29	ML	R 38 492 501
29.25	ML	R 38 724 484
29.5	ML	R 38 955 873
29.75	ML	R 39 186 675
30	ML	R 39 416 895

8.5.1 Proposed Short Term Supply Schemes

The tables below show the cost estimate for short term schemes which tie into the existing reticulation.

Scheme Name	Cost
A9-1	R 7 081 223

A9 – Refers to the drawing number (i.e. drawings on the attached CD)
1 – Refers to the scheme number on the associated drawing
Each scheme number has an associated cost which is also captured on the GIS database.

The cost estimates are based on providing a UAP service only. The upgrading of existing works or rehabilitation of existing water infrastructure have not been included in the cost estimates. The estimates exclude all operational and maintenance costs.

The cost estimates cover the price of undertaking the construction of the water scheme as well as professional fees for the following: geotechnical engineering fees, environmental fees and engineering fees.

In some cases the GIS picked up single scattered houses which are shown to be un-serviced within a polygon which is serviced. It is assumed that these houses came about after the construction of the water supply in that area. For the purpose of the conceptual design and cost estimates, it was proposed that these houses be supplied with standpipes by connecting into the existing water reticulation infrastructure.

8.5.1.1 Umhlabuyalingana Local Municipality

Scheme Name	Cost
Link to existing	
A9-1	R 7 081 223
A10-1	R 1 686 033
B8-1	R 3 896 805
B8-2	R 136 615 480
B9-1	R 8 292 506
B10-1	R 646 517
C6-1	R 4 035 693
C7-1	R 4 929 173
C8-1	R 82 992 494
C8-2	R 53 081 093
C9-1	R 2 585 231
D7-1	R 161 858 901
D9-1	R 16 219 351
E7-1	R 5 961 541
E8-1	R 4 296 314

E8-2	R 60 655 493
E8-6	R 6 083 274
D6-2	R 577 788
D6-3	R 577 788
E6-1	R 4 430 914
E9-1	R 1 131 911
F6-1	R 418 687 060
F6-2	R 715 246
F7-1	R 3 355 549
F8-1	R 37 940 537
H6-1	R 38 069 419
H8-1	R 4 229 015
TOTAL	**R 1 070 632 350**

8.5.1.2 Jozini Local Municipality

Scheme Name	Cost
Link to existing	
B3-2	R 219 732 955
E3-3	R 82 761 652
G3-2	R 84 142 662
G3-3	R 106 520 362
I4-1	R 99 627 702
H3-1	R 66 064 584
H4-2	R 126 424 915
J4-4	R 55 984 882
A3-2	R 60 669 789
A5-1	R 5 470 430
A6-1	R 1 267 939
B3-1	R 3 614 740
B4-1	R 14 655 734
B5-1	R 25 878 502
B6-1	R 3 896 805
C4-2	R 13 714 968
C5-1	R 20 507 615
D3-1	R 146 353 587
D3-2	R 18 274 081
D4-1	R 50 273 530
D5-1	R 6 329 490
E3-1	R 24 203 379
E3-2	R 42 599 280
E3-4	R 11 850 482
E3-5	R 1 688 892
E3-6	R 731 857 806

E4-1	R 40 202 004
E5-1	R 11 708 954
F4-1	R 17 202 674
F5-1	R 8 942 630
G3-1	R 11 737 656
G4-1	R 24 037 549
G5-1	R 186 884 919
I3-1	R 15 220 523
I4-2	R 1 956 565
H3-2	R 4 426 625
H3-3	R 6 036 868
H3-4	R 3 604 733
H4-1	R 5 893 692
H4-3	R 577 788
H5-1	R 152 730 780
J4-5	R 13 182 399
TOTAL	**R 2 528 713 121**

8.5.1.3 The Big 5 False Bay Local Municipality

Scheme Name	Cost
Link to existing	
L4-5	R 4 995 251
M4-1	R 82 600 360
L4-1	R 3 470 134
L4-3	R 11 457 021
L4-4	R 2 920 300
L4-6	R 30 066 807
L5-1	R 12 270 335
L5-2	R 2 641 095
M4-2	R 2 575 224
TOTAL	**R 152 996 527**

8.5.1.4 Hlabisa Local Municipality

Scheme Name	Cost
Link to existing	
L3-1	R 147 332 841
L3-2	R 20 631 768
M2-1	R 83 176 578
M2-2	R 13 666 363
M3-1	R 58 416 130
M3-2	R 54 528 365
N1-1	R 25 373 205

N2-1	R 31 666 494
N2-2	R 59 322 366
N3-1	R 11 336 717
TOTAL	**R 505 450 827**

8.5.1.5 Mtubatuba Local Municipality

Scheme Name	Cost
Link to existing	
M5-1	R 9 257 685
M5-2	R 2 227 290
O5-1	R 5 393 123
O5-2	R 990 163
O5-3	R 1 402 539
O5-4	R 10 506 248
N5-1	R 63 921 286
N5-2	R 8 911 180
N5-3	R 2 512 213
O4-1	R 4 980 748
O3-1	R 3 753 628
TOTAL	**R 113 856 102**

Summary of short term supply

Municipality	Total Cost
Umhlabuyalingana	R 1 070 632 350
Jozini	R 2 528 713 121
The Big 5 False Bay	R 152 996 527
Hlabisa	R 505 450 827
Mtubatuba	R 113 856 102
Total	**R 4 371 648 927**

8.5.2 Proposed Long Term Supply Schemes

The costing of the proposed infrastructure was based on information/rates provided by Umgeni Water.

8.5.2.1 Umhlabuyalingana Local Municipality

Scheme Name	Cost	Total
Existing boreholes electronically Operated		**R 577 788**
D6-1	R 577 788	
TOTAL		**R 577 788**

Cost per capita = R 24 724

8.5.2.2 Jozini Local Municipality

Scheme Name	Cost	Total
Small Package Plant		**R 403 320 084**
C3-1	R 96 215 057	
F3-1	R 116 155 477	
J3-1	R 107 072 090	
J5-1	R 83 877 460	
Existing Borehole electronically operated with storage		**R 20 045 907**
A3-1	R 7 975 219	
A4-1	R 12 070 688	
New Borehole electronically operated		**R 88 029 992**
C4-1	R 3 768 240	
J3-2	R 3 079 518	
J3-3	R 3 836 969	
J4-1	R 3 148 247	
J4-2	R 3 148 247	
J4-3	R 3 148 247	
J5-2	R 27 366 669	
K3-1	R 3 216 976	
K3-2	R 3 630 781	
K3-3	R 3 769 669	
K4-1	R 3 148 247	
K4-2	R 3 079 518	
K4-3	R 3 285 706	
K4-4	R 3 216 976	
K4-5	R 3 285 706	
K4-6	R 3 148 247	

K4-7	R 4 043 157	
K4-8	R 3 354 435	
K4-9	R 3 354 435	
TOTAL		**R 511 395 984**

Cost per capita = R 40 402

8.5.2.3 The Big 5 False Bay Local Municipality

Scheme Name	Cost	Total
Small Package Plant		**R 466 135 491**
K6-1	R 466 135 491	
New Borehole electronically operated		**R 60 355 652**
I6-1	R 3 216 976	
I6-2	R 3 079 518	
J6-1	R 3 630 781	
K5-1	R 23 025 291	
K5-2	R 21 244 049	
K6-2	R 3 079 518	
L6-1	R 3 079 518	
TOTAL		**R 526 491 143**

Cost per capita = R 23 638

8.5.2.4 Mtubatuba Local Municipality

Scheme Name	Cost	Total
Small Package Plant		**R 353 309 883**
N4-1	R 353 309 883	
TOTAL		**R 353 309 883**

Cost per capita = R 13 079

Summary of long term supply

Municipality	Total Cost
Umhlabuyalingana	R 577 788
Jozini	R 511 395 984
The Big 5 False Bay	R 526 491 143
Mtubatuba	R 353 309 883
Total	**R 1 391 774 798**

8.6 Phasing of scheme options

The phasing includes proposed plans to address the water backlogs. Various potential funding such as MIG, PIG etc. may be applied for to undertake these projects. The phasing is based on both the short and long term proposals.

An average cost for each scheme type was compared with the cost estimate for an individual scheme. If the scheme was less than or equal to the average it was assumed that the project could be untaken over a year. If the cost ratio was higher than the average cost, the ratio was used to determine the duration of the project. However, this is flexible depending on the nature and type of project.

An example of the above explanation is demonstrated as follows for the scheme type link to existing for the The Big 5 False Bay Local Municipality.

Scheme Name	Cost
Link to existing	
L4-5	R 4 995 251
M4-1	R 82 600 360
L4-1	R 3 470 134
L4-3	R 11 457 021
L4-4	R 2 920 300
L4-6	R 30 066 807
L5-1	R 12 270 335
L5-2	R 2 641 095
M4-2	R 2 575 224
TOTAL	**R 152 996 527**

The total number of schemes is 10.

The total cost of the 10 schemes is R 152 996 527.

The average cost per scheme is R 152 996 527 / 10 = R 15 299 652.

To phase scheme L4-5 which costs R 4 995 251, is R 4 995 251 / R 15 299 625 = 0.3, hence scheme L4-5 is phased to be undertaken in one year.

To phase scheme L4-6 which costs R 30 066 807, is R 30 066 807 / R 15 299 652 = 1.9, hence scheme L4-6 is phased over two years.

The phasing of the schemes is indicated in Table 23.

Implementation Year	LM	Total Cost
2015/16	Umhlabuyalingana	R 210 400 710
	Jozini	R 1 242 609 410
	The Big 5 False Bay	R 522 551 163
	Hlabisa	R 274 941 408
	Mtubatuba	R 403 244 699
		R 678 186 107

Implementation Year	LM	Total Cost
2016/17	Umhlabuyalingana	R 143 647 987
	Jozini	R 478 926 566
	The Big 5 False Bay	R 51 310 856
	Hlabisa	R 83 176 578
		R 83 176 578

Implementation Year	LM	Total Cost
2017/18	Umhlabuyalingana	R 136 615 480
	Jozini	R 339 615 699
	The Big 5 False Bay	R 23 025 291
	Hlabisa	R 147 332 841
		R 147 332 841

Implementation Year	LM	Total Cost
2018/19	Umhlabuyalingana	R 580 545 961
	Jozini	R 978 957 430
	The Big 5 False Bay	R 82 600 360
	Mtubatuba	R 63 921 286
		R 1 125 479 076

Table 23 - Phasing of Schemes

9. DEVELOP AN UPDATED GEO DATABASE INCLUDING META DATA OF ALL RELEVANT INFORMATION

All the GIS infrastructure data, both existing and proposed, together with the water demand and costed water supply areas has been incorporated into a structured geodatabase. All fields requested in the terms of reference, whether populated or not, have been included in the attribute tables of each dataset. Metadata for each dataset has been captured (for the entire dataset), and within the attribute table, metadata fields applicable to specific fields have also been included. These include metadata on the source of the population statistics, the water source data, and the connection type data.

A “completeness” field has also been included in the feature class for the water supply footprints. This field gives a snapshot view of the percentage completeness of all the fields in the dataset for each area.

Other data included in the geodatabase are administrative boundaries (wards, local municipalities, district municipalities) together with locality features such as place names and neighbouring countries. Both urban and cadastral data from the Surveyor General’s Office has been included. Social facilities including health facilities and schools have been provided, both to assist with water planning needs, as well as informing about the area in which the user is working.

All household information has been added to the geodatabase – Eskom household points as well as the DRDLR settlement boundaries. Topography in the form of 20m contours from the 1:50 000 topographic map series were used in the planning process, and can be found in the geodatabase. Rivers and road network data has also been included.

Along with the data received from outside sources, the geodatabase also contains the data which has been captured during this project. The water supply footprints, proposed water pipelines and proposed water features (boreholes, standpipes etc.) have been added to the geodatabase.
A detailed list of all the datasets, along with their metadata can be found in Annexure 1. An outline of the GIS methodology can be found in Annexure 2.

DVD’s containing all spatial information, along with files of all working maps, as well as the map series showing the planned service infrastructure, have been provided along with this report. A series of A0 maps have also been prepared and exported to pdf which can be viewed in Annexure 3 . One map shows the entire district municipality, with others showing each of the local municipalities within the district.

10. CONCLUSION AND RECOMMENDATIONS

10.1 Total cost of proposed schemes in the Umkhanyakude District Municipality

The following table gives an indication in the form of a summary of the proposed conceptual scheme types and the associated costs which need to be undertaken to alleviate the current water backlog of 36439 households in the Umkhanyakude District Municipality.

Umkhanyakude DM	
Scheme Type	**Total**
Link to Existing Scheme	R 4 371 648 927
Small Package Plants	R 1 222 765 458
Existing boreholes electronically operated	R 577 788
Exisiting boreholes electronically operated with Storage	R 20 045 907
New boreholes electronically operated	R 148 385 644
TOTAL	**R 5 763 423 725**

10.2 Total cost of phases of schemes in the Umkhanyakude District Municipality

An average cost for each scheme type was compared with the cost estimate for an individual scheme. If the scheme was less than or equal to the average it was assumed that the project could be untaken over a year. If the cost ratio was higher than the average cost, the ratio was used to determine the duration of the project. However, this is flexible depending on the nature and type of project. A detailed description of the phasing can be viewed in section 8.6 of the report.

The proposed conceptual design schemes may be phased according to the tables below.

Implementation Year	LM	Total Cost
2015/16	Umhlabuyalingana	R 210 400 710
	Jozini	R 1 242 609 410
	The Big 5 False Bay	R 522 551 163
	Hlabisa	R 274 941 408
	Mtubatuba	R 403 244 699
		R 678 186 107

Implementation Year	LM	Total Cost
2016/17	Umhlabuyalingana	R 143 647 987
	Jozini	R 478 926 566
	The Big 5 False Bay	R 51 310 856
	Hlabisa	R 83 176 578
		R 83 176 578

Implementation Year	LM	Total Cost
2017/18	Umhlabuyalingana	R 136 615 480
	Jozini	R 339 615 699
	The Big 5 False Bay	R 23 025 291
	Hlabisa	R 147 332 841
		R 147 332 841

Implementation Year	LM	Total Cost
2018/19	Umhlabuyalingana	R 580 545 961
	Jozini	R 978 957 430
	The Big 5 False Bay	R 82 600 360
	Mtubatuba	R 63 921 286
		R 1 125 479 076

10.3 Proposed Future Work

It is recommended that the concept designs covered in this report be advanced to preliminary designs.

It is recommended that the link to existing schemes for the various local municipalities be undertaken first due to the existing water treatment and bulk infrastructure. The table below is a summary of the cost of the link to existing schemes that can be undertaken.

Link to existing schemes	
Local Municipality	**Total**
Umhlabuyalingana	R 1 070 632 350
Jozini	R 2 528 713 121
The Big 5 False Bay	R 152 996 527
Hlabisa	R 505 450 827
Mtubatuba	R 113 856 102
TOTAL	**R 4 371 648 927**

11. ANNEXURES

Annexure 1 - Database Design and attribute table

GEODATABASE STRUCTURE/DATA DICTIONARY			
BASE DATA			
FEATURE DATASET	**FEATURE CLASSES**	**DESCRIPTION**	**SOURCE**
Administration	District Municipalities 2011	District municipality boundaries from 2011	Demarcation Board
	Local Municipalities 2011	Local municipality boundaries from 2011	Demarcation Board
	Neighbouring Countries	Borders of neighbouring countries	SA Atlas
	Ocean	Dataset created to show ocean next to KZN coast	MHP GeoSpace
	Place Names	Main place names within KZN	SA Atlas
	RSA	Provincial boundaries	Demarcation Board
	Subplace Names	Subplace names from centroids of poylgon data	Statistics SA
	Wards 2011	Ward boundaries from 2011	Demarcation Board
Cadastral	Urban cadastral	Urban cadastral data	Surveyor General's Office, PMB
	Farm portions cadastral	Farm portion cadastral data	Surveyor General's Office, PMB
Facilities	Education facilities	Point dataset showing location of all schools	KZN Department of Education
	Health facilities	Point dataset showing location of all health facilities	KZN Department of Health
Hydrology	Major rivers	Major rivers within KwaZulu-Natal	Department of Water Affairs
	Minor rivers	Minor rivers within KwaZulu-Natal	Department of Water Affairs
Settlement	Households	2011 household points	Eskom
Topography	Contours 20m	Contours at 20m intervals	National Geospatial Information

Transport	DOT 2014	All roads (major and minor) from 2014	Department of Transport

INFRASTRUCTURE			
Infrastructure	Pumps	Point dataset showing existing pumps	Department of Water Affairs; District and Local Municipalities
	Supply Source	Point dataset showing existing water sources including boreholes and springs	Department of Water Affairs; District and Local Municipalities
	Waste Water Treatment Works	Point dataset showing existing waste water treatment works	Department of Water Affairs; District and Local Municipalities
	Water Meters	Point dataset showing existing water meters	Department of Water Affairs; District and Local Municipalities
	Water Pipelines	Line dataset showing existing water pipelines – bulk and reticulation	Department of Water Affairs; District and Local Municipalities
	Water Reservoirs	Point dataset showing existing reservoirs	Department of Water Affairs; District and Local Municipalities
	Water Treatment Works	Point dataset showing existing water treatment works	Department of Water Affairs; District and Local Municipalities
UAP			
UAP	UAP Demand Areas	Digitised footprints around settlements in the District Municipalities within the project	MHP GeoSpace
	UAP Water Nodes	Digitised water nodes (boreholes, standpipes etc) captured off hard copy maps	MM PDNA/MHP GeoSpace
	UAP Water Lines	Digitised water pipelines captured off hard copy maps	MM PDNA/MHP GeoSpace

WATER SUPPLY FOOTPRINTS ATTRIBUTES

Field Name	Alias	Description	Units/Values/Field Type
DM	District Municipality	Name of the municipality in which the area falls	Text
Area_m2	Area in square metres	GIS calculated	Number
Name	Name	Name of area if known	Text
Short_SS	Short term supply status	Is there an existing supply?	Y/N lookup table
Interim_SS	Interim supply status	Is there an interim supply?	Y/N lookup table
Bulk_SS	Bulk supply status	Is there a bulk supply?	Y/N lookup table
ST_Supply	Sustainable supply	Is the supply sustainable?	Y/N lookup table
Sust_2016	Sustainable to 2016	Is existing supply sustainable to 2016?	Y/N lookup table
Not_2016	Not sustainable to 2016	If N, What needs to be done to ensure sustainable supply to 2016?	Text
ExistPlans	Existing plans	Are there existing plans to ensure sustainably beyond 2016?	Y/N lookup table
Horizon30	30 year horizon plans	If Y, are these plans for 30 year horizon?	Y/N lookup table
Plans30yr	Detail of plans	If Y, what are these plans.	Text
Sust2046	Sustainable to 2046	If N, What needs to be done to ensure sustainable supply to 2046?	Text
Schm_E	Existing scheme name	Name of any existing supply scheme	Text
Schm_F	Future scheme name	Name of any future proposed scheme	Text
Sou_E	Existing source	Existing water source from lookup table	Lookup table (eg borehole, reservoir)

Sou_F	Future source	Future water source from lookup table	Lookup table (eg borehole, reservoir)
WatNam_E	Existing source name	Name of existing source	Text
WatNam_F	Future source name	Name of future source	Text
Proj_Typ	Project type	Type of project from lookup table	Lookup table (eg MWIG, BIG)
SuppDate	Scheme supply date	Date of proposed intervention	Text
Treat	Treatment type	Existing treatment type from lookup table	Lookup table (eg WTP, sand filter)
WTP_Nam	WTP name	Name of water treatment plant	Text
Conn	Connection	Type of water connection from lookup table	Lookup table (eg yard, house, community standpipe)
Design_E	Existing design demand	Demand for which this scheme has been designed	Number (million m^3 p.a.)
LowDemandForecast	Demand Low	Low demand forecast	Number (million m^3 p.a.)
HighDemandForecast	Demand High	High demand forecast	Number (million m^3 p.a.)
ProbableDemand	Probable demand	Probable demand forecast	Number (million m^3 p.a.)
Supp_E	Existing supply	Current water supply capacity	Number (million m^3 p.a.)
CurrentWaterRequirements	Water requirements	Current water requirements	Number (million m^3 p.a.)
FutureWaterRequirements	Future water requirements	Future water requirements	Number (million m^3 p.a.)
Proj_ID	Project ID	ID of project if known	Text
HH_Low	Households low	Lowest estimate of households served	Number
HH_High	Households high	Highest estimate of households served	Number
Pop_Low	Population low	Lowest estimate of number of people	Number
Pop_High	Population high	Highest estimate of number of people	Number

Capturer	Capturer	Person who captured the area from lookup table	Lookup table (eg MHP Geospace, Mlungisi Dimba MMPDNA)
Sanitation	Type of sanitation scheme	Type of sanitation scheme from lookup table	Lookup table (eg septic tank, VIP)
Comments	Comments	General comments	Text
Assumptions	Assumptions	Assumptions made about existing infrastructure	Lookup table (eg Existing water scheme has enough capacity to be extended)
Assumptions_Other	Other Assumptions	Any other assumptions made about the area	Text
PopStats_Source	Population Statistics Source	The data source for the population statistics	Lookup table (eg Census 2011, Eskom 2011)
Source_Metadata	Metadata on water source	Information on whether the population data has been edited or verified	Lookup table (eg. Spatial calculation, Verified)
Connection_Metadata	Metadata on connection type	Information on whether the population data has been edited or verified	Lookup table (eg. Spatial calculation, Verified)
Completeness	Completeness of data	A percentage showing the number of fields populated per rectod	Number
SettlementType	Settlement Type	Settlement type (rural, urban etc) where available	Text
SanitationLOS	Sanitation Level of Service	The current sanitation level of service where data is available	Text

WATER PIPELINE ATTRIBUTES

Field Name	Alias	Description
Pipeline_Type	Pipeline type	Type of pipeline from lookup table
Project_Type	Project type	Project type from lookup table
Supply_Type	Supply type	Supply type from lookup table
Water_Source	Water source	Water source from lookup table
Capturer	Capturer	Data capturer from lookup table
Comments	Comments	General comments

WATER NODE ATTRIBUTES

Field Name	Alias	Description
Node_Type	Type of facility	Type of facility from lookup table
Capturer	Data capturer	Data capturer from lookup table
Comments	Comments	General comments

LOOK UP TABLES

DOMAIN NAME AND CODES	DESCRIPTION
Capturer	**Name of data capturer**
0	Not updated
1	Juan Wood (MMPDNA)
2	Petrus Buthelezi (MMPDNA)
3	Mlungisi Dimba (MMPDNA)
4	MHP GeoSpace
5	District Municipality
6	MMPDNA Data Capturers
7	MMPDNA Team 2
Connection	**Water connection type**
0	Unknown
1	Yard connection
2	House connection
3	Community standpipe
4	Jojo tank
5	Reservoir
Metadata	**Metadata**
Calculated	Calculated
Verified	Verified
Captured	Captured by MHP GeoSpace
Quality Assured	QA by MHP GeoSpace

PopStats_Source	Source of population stats
Eskom	Eskom household points 2011
Census	Stats SA Census 2011
Project_Type	**Project Type**
0	Unknown
1	BIG
2	Umgeni Water
3	MWIG
4	Umhlathuze Water
5	CMIP
6	MIG 1
7	MIG 2
8	MIG 3
9	MIG 4
10	MIG 5
Sanitation_Type	**Type of Sanitation**
0	Unknown
1	VIP
2	Septic tank
3	Chemical
4	Waterborne
5	None
Treatment_Type	**Treatment Type**
0	Unknown
1	WTP
2	Chlorination
3	Sand filter
4	Package plant
5	None
Water_Source	**Water Source**
0	Unknown
1	Local water scheme
2	Borehole
3	Water tanker
4	Regional water scheme
5	Spring
6	Abstraction
7	Reservoir
8	Water Works

Yes_No	Yes No
0	Unknown
1	Yes
2	No
Assumptions	**Assumptions about water schemes**
Capacity can be extended	Existing water scheme has enough capacity to be extended
Scheme to be upgraded	Existing water scheme has to be upgraded in order to have capacity to extend
Supplied with electricity	The area is fully supplied with electricity
Functional boreholes	All existing boreholes are functional
Raw water sources have capacity	Raw water source has enough capacity to abstract from
Other	Other assumptions
Node_Type	**Type of water point captured**
0	Unknown
1	Reservoir
2	Pumpstation
3	Raw extraction
4	Water treament works
5	Waste water treatment works
6	Package plant
7	Borehole
Pipeline_Type	**Type of water pipeline captured**
1	Bulk
2	Reticulation
0	Unknown

Annexure 2 – GIS Methodology

GIS METHODOLOGY

WATER SUPPLY FOOTPRINTS

- Settlement data (DWA settlements; Department of Rural Development and Land Reform settlements; Eskom household points) overlaid on aerial photography
- Polygons digitized around settlement clusters with outlying households being incorporated where possible
- Polygons captured over whole district, including areas with existing supply
- Fields added to attribute table as per Umgeni Water requirements
- Web mapping application developed so polygons could be edited, updated, created by users outside of the office environment

POPULATION STATISTICS

- Census 2011 data extracted using the SuperCross application from StatsSA
- Household counts calculated for each polygon using a spatial join between the demand polygons and the Eskom 2011 household points
- Population growth rate calculated by extrapolating the growth rate for each ward from 2001 to 2014 using census data from 2001 and 2011
- Growth rate applied to the household count to obtain figures for the highest possible household number in 2014
- Total population was divided by the number of households per sub-place to get the average household size per house per sub-place
- Household size data linked to demand areas (spatial join) and summarized to get the number of people in each demand area
- Growth rate (as calculated previously) applied to these numbers to reach a best possible approximated population figure for 2014 per demand area
- Water demand forecasts (high and low) calculated by using these population figures multiplied by the estimated water consumption appropriate to each settlement type as advised by the engineers in accordance with the Department of water Affairs standard.

CURRENT WATER INFORMATION

- All available water data from the municipalities – boreholes, reservoirs, springs, pipelines, water treatment works etc – added to ArcGIS project along with the demand area polygons
- Demand areas selected according to data falling within their boundaries (select by location tool) and attribute table updated accordingly
- Where no data was available from the municipality, the spatial information from Umgeni Water and the Department of Water Affairs was used in this query
- Additional data was received towards the end of the project for Amajuba, Ugu and uThukela District Municipalities requiring the spatial queries to be rerun and the attribute tables updated accordingly

CONCEPT DESIGNS AND COSTING

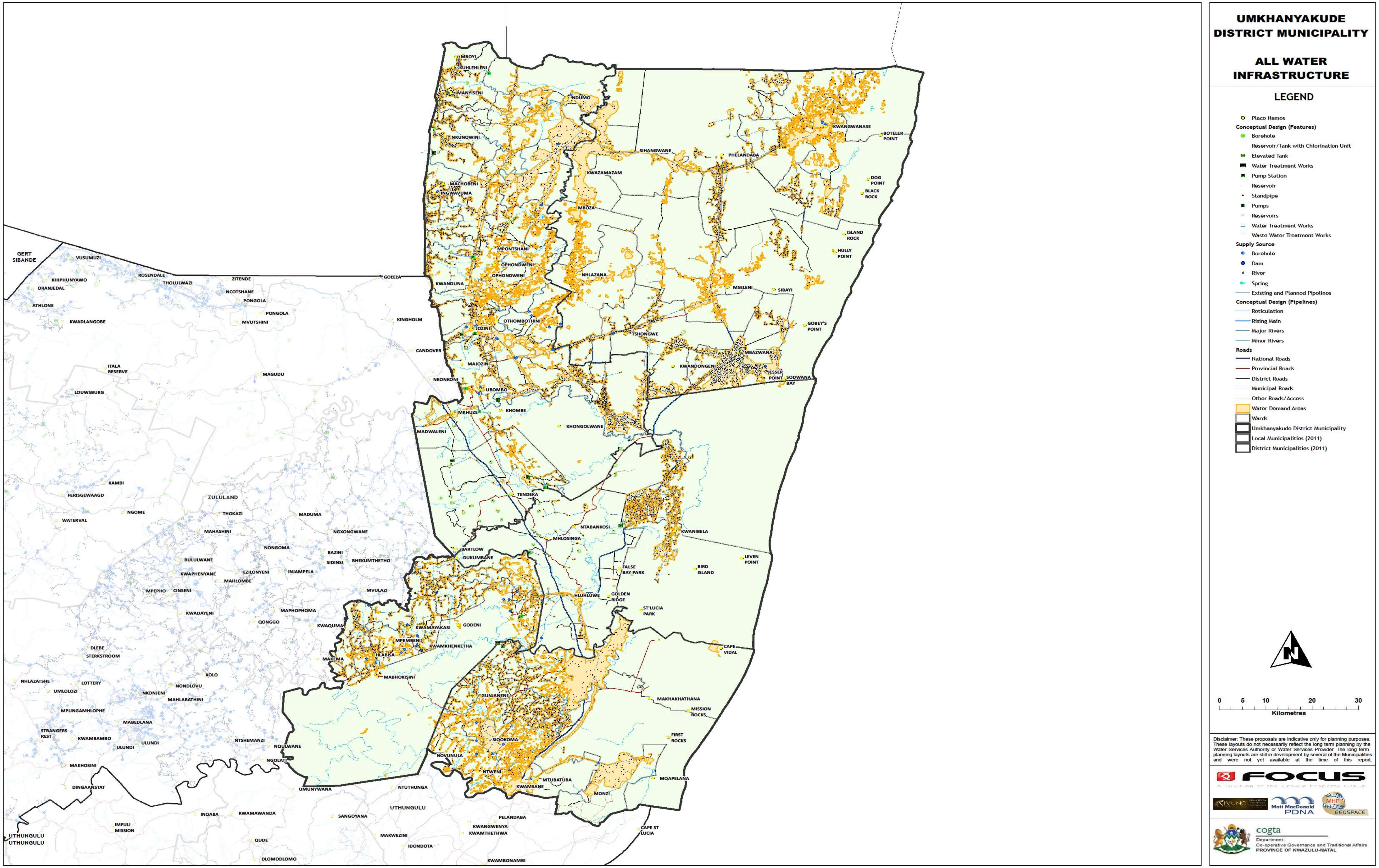
- All water infrastructure data and the water demand areas plotted on A1 maps at 1:20 000 scale

- Engineers produced concept designs hand drawn onto these maps
- Hard copy maps then scanned and georeferenced
- Concept designs digitized off the georeferenced scans
- Geodatabase with feature datasets for lines and points with available attribute information; domains used to reduce data capture time and possibility of errors
- Digitized data checked at map edges to ensure continuity of data
- All concept data (digitized) for each district merged to one dataset in the geodatabase
- Proposed water schemes given a unique ID by the engineers
- These ID captured into the GIS to link to the costing table from the engineers

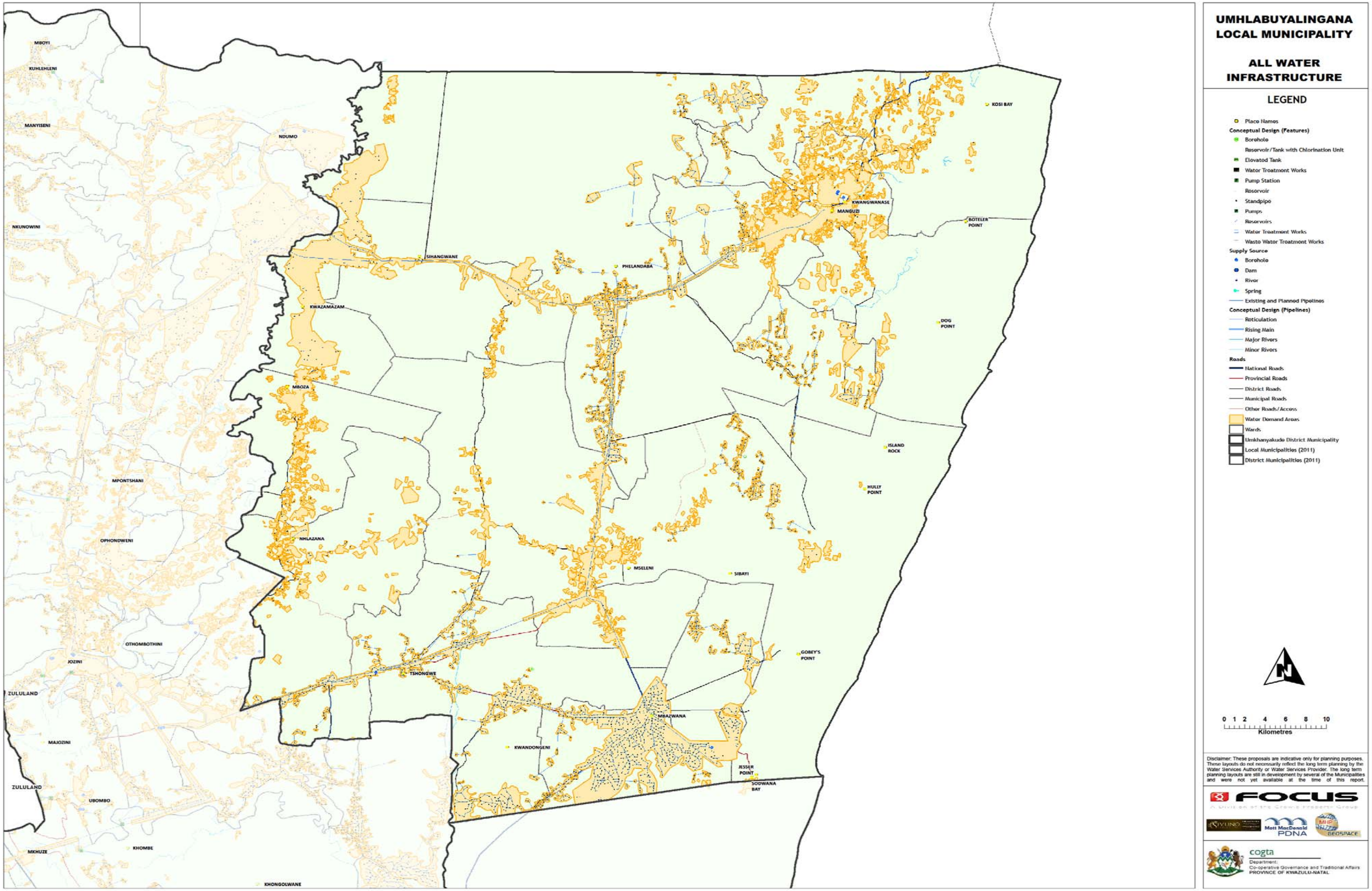
METADATA

- Three geodatabases have been prepared:
    1. Base Data:
        - Roads, rivers, place names, administrative boundaries etc
        - Settlement data – Eskom household points
        - Cadastral data – urban and rural
        - Social facilities – health, education
        - Topography – 20m contours
    2. Infrastructure:
        - Existing pipelines, reservoirs, boreholes etc
    3. UAP:
        - Pipelines, standpipes, boreholes etc
        - Water supply footprints
- Metadata created for each dataset using ArcCatalog
- Data stored in WGS 1984

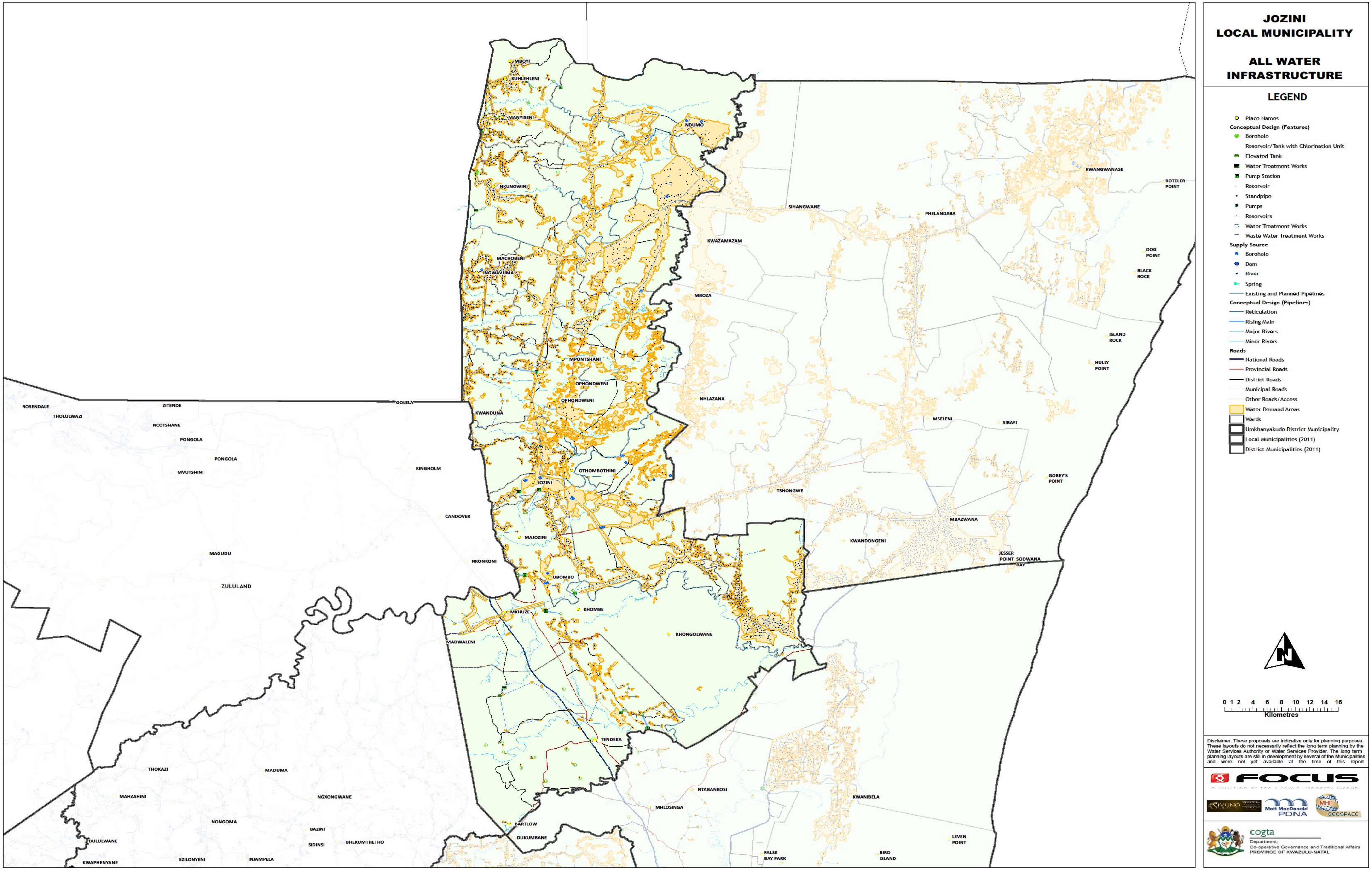
Annexure 3 – Planned Infrastructure Maps

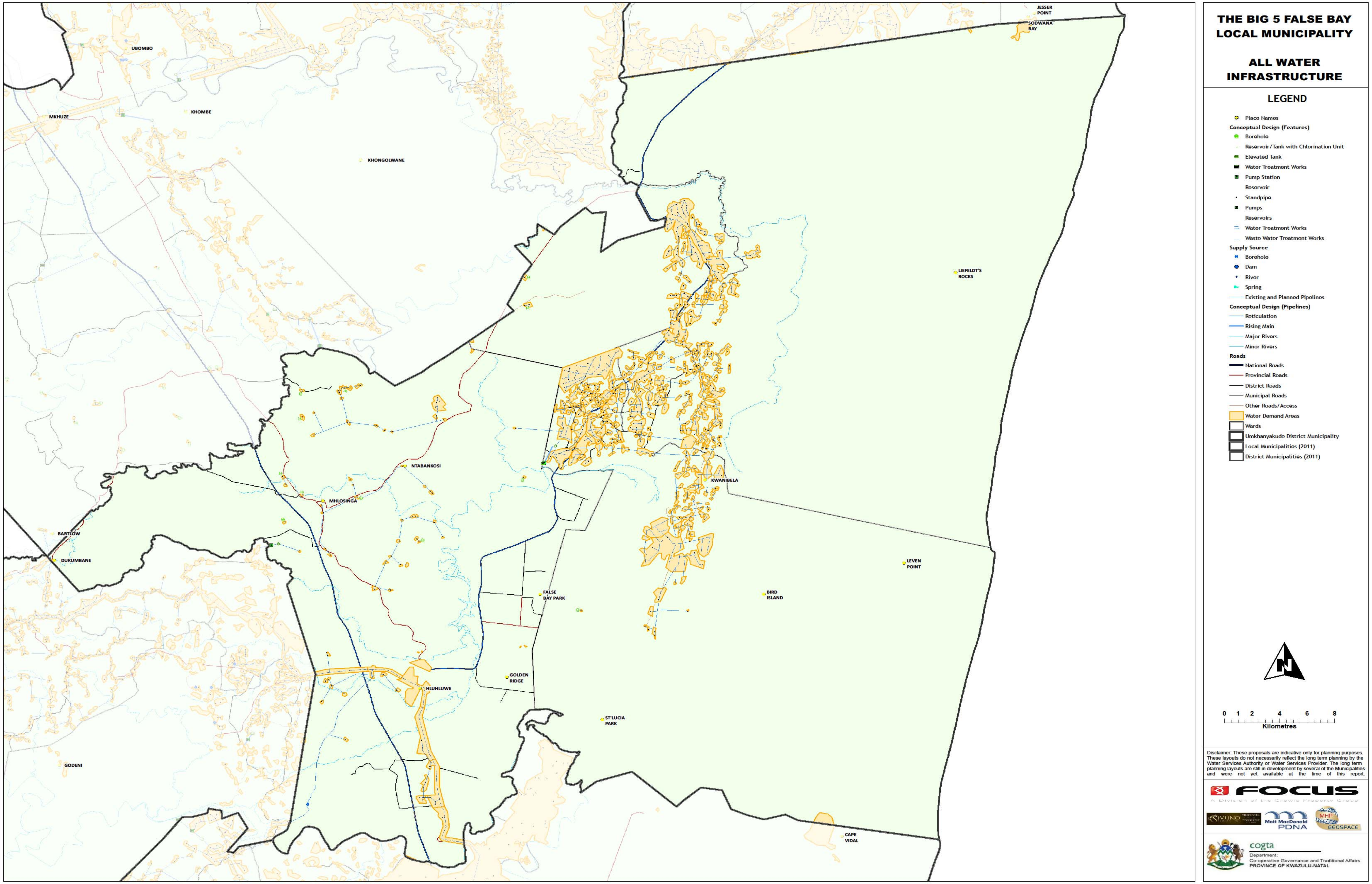


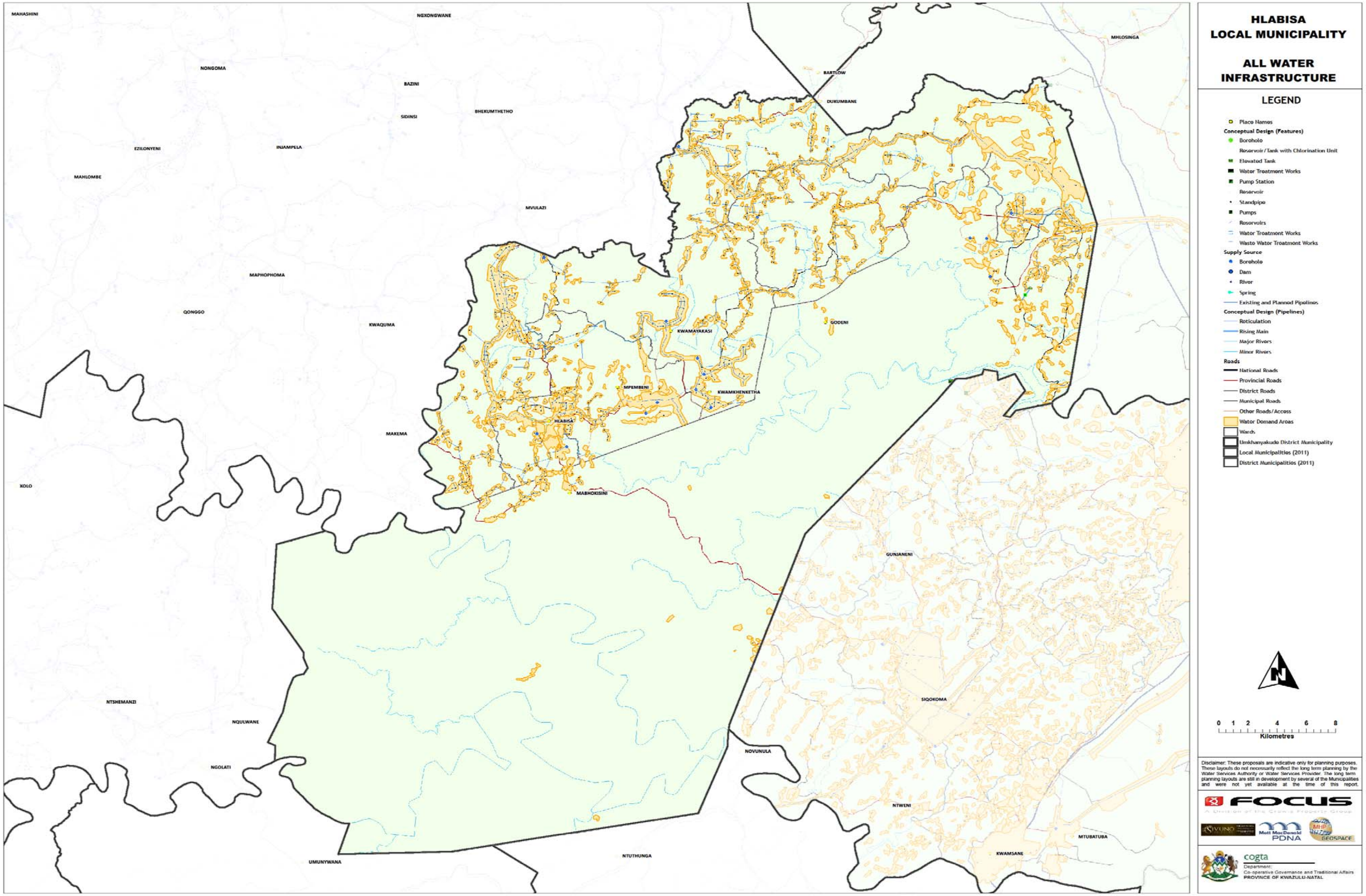
UMKHANYAKUDE DISTRICT MUNICIPALITY
ALL WATER INFRASTRUCTURE
LEGEND
Place Names
Conceptual Design (Features)
Borehole
Reservoir/Tank with Chlorination Unit
Elevated Tank
Water Treatment Works
Pump Station
Reservoir
Standpipe
Pumps
Reservoirs
Water Treatment Works
Waste Water Treatment Works
Supply Source
Borehole
Dam
River
Spring
Existing and Planned Pipelines
Conceptual Design (Pipelines)
Reticulation
Rising Main
Major Rivers
Minor Rivers
Roads
National Roads
Provincial Roads
District Roads
Municipal Roads
Other Roads/Access
Water Demand Areas
Wards
Umkhanyakude District Municipality
Local Municipalities (2011)
District Municipalities (2011)
0 5 10 20 30
Kilometres
Disclaimer: These proposals are indicative only for planning purposes. These layouts do not necessarily reflect the long term planning by the Water Services Authority or Water Services Provider. The long term planning layouts are still in development by several of the Municipalities and were not yet available at the time of this report.
FOCUS
Mott MacDonald PDNA
MHP GEOSPACE
cogta
Department: Co-operative Governance and Traditional Affairs
PROVINCE OF KWAZULU-NATAL
KWANGWANASE
MBAZWANA
SODWANA BAY
JOZINI
MKHUZE
HLUHLUWE
ST LUCIA PARK
CAPE VIDAL
MTUBATUBA
ZULULAND
UTHUNGULU

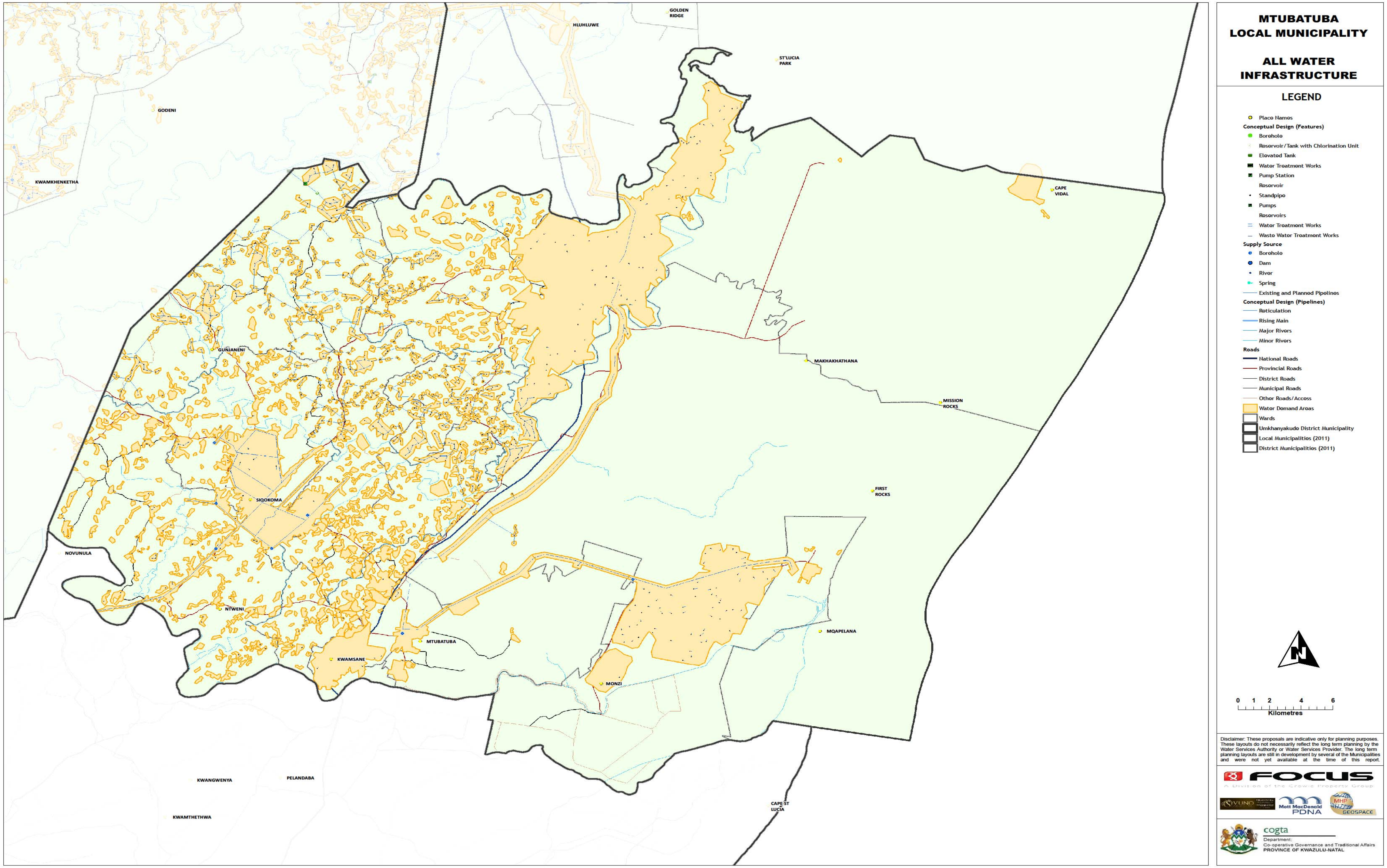


UMHLABUYALINGANA LOCAL MUNICIPALITY
ALL WATER INFRASTRUCTURE
LEGEND
Place Names
Conceptual Design (Features)
Borehole
Reservoir/Tank with Chlorination Unit
Elevated Tank
Water Treatment Works
Pump Station
Reservoir
Standpipe
Pumps
Reservoirs
Water Treatment Works
Waste Water Treatment Works
Supply Source
Borehole
Dam
River
Spring
Existing and Planned Pipelines
Conceptual Design (Pipelines)
Reticulation
Rising Main
Major Rivers
Minor Rivers
Roads
National Roads
Provincial Roads
District Roads
Municipal Roads
Other Roads/Access
Water Demand Areas
Wards
Umkhanyakude District Municipality
Local Municipalities (2011)
District Municipalities (2011)
0 1 2 4 6 8 10
Kilometres
Disclaimer: These proposals are indicative only for planning purposes. These layouts do not necessarily reflect the long term planning by the Water Services Authority or Water Services Provider. The long term planning layouts are still in development by several of the Municipalities and were not yet available at the time of this report.
FOCUS
Mott MacDonald PDNA
MHP GEOSPACE
cogta
Department:
Co-operative Governance and Traditional Affairs
PROVINCE OF KWAZULU-NATAL
MBOYI
KUHLEHLENI
MANYISENI
NDUMO
NKUNOWINI
MPONTSHANI
OPHONDWENI
OTHOMBOTHINI
JOZINI
ZULULAND
MAJOZINI
ZULULAND
UBOMBO
MKHUZE
KHOMBE
KHONGOLWANE
KOSI BAY
KWANGWANASE
MANGUZI
BOTELER POINT
SIHANGWANE
PHELANDABA
KWAZAMAZAM
DOG POINT
MBOZA
ISLAND ROCK
HULLY POINT
NHLAZANA
MSELENI
SIBAYI
GOBEY'S POINT
TSHONGWE
MBAZWANA
KWANDONGENI
JESSER POINT
SODWANA BAY


JOZINI
LOCAL MUNICIPALITY
ALL WATER
INFRASTRUCTURE
LEGEND
Place Names
Conceptual Design (Features)
Borehole
Reservoir/Tank with Chlorination Unit
Elevated Tank
Water Treatment Works
Pump Station
Reservoir
Standpipe
Pumps
Reservoirs
Water Treatment Works
Waste Water Treatment Works
Supply Source
Borehole
Dam
River
Spring
Existing and Planned Pipelines
Conceptual Design (Pipelines)
Reticulation
Rising Main
Major Rivers
Minor Rivers
Roads
National Roads
Provincial Roads
District Roads
Municipal Roads
Other Roads/Access
Water Demand Areas
Wards
Umkhanyakudo District Municipality
Local Municipalities (2011)
District Municipalities (2011)
0 1 2 4 6 8 10 12 14 16
Kilometres
Disclaimer: These proposals are indicative only for planning purposes. These layouts do not necessarily reflect the long term planning by the Water Services Authority or Water Services Provider. The long term planning layouts are still in development by several of the Municipalities and were not yet available at the time of this report.
FOCUS
A Division of the Growth Property Group
SIVUNO
Mott MacDonald PDNA
MHP GEOSPACE
cogta
Department:
Co-operative Governance and Traditional Affairs
PROVINCE OF KWAZULU-NATAL
MBOYI
KUHLEHLENI
MANYISENI
NDUMO
NKUNOWINI
MACHOBENI
INGWAVUMA
KWANGWANASE
BOTELER POINT
SIHANGWANE
PHELANDABA
KWAZAMAZAM
DOG POINT
BLACK ROCK
MBOZA
ISLAND ROCK
HULLY POINT
MPONTSHANI
OPHONDWENI
NHLAZANA
MSELENI
SIBAYI
ROSENDALE
ZITENDE
GOLELA
THOLULWAZI
KWANDUNA
NCOTSHANE
PONGOLA
KINGHOLM
MVUTSHINI
OTHOMBOTHINI
JOZINI
GOBEY'S POINT
TSHONGWE
CANDOVER
MBAZWANA
MAJOZINI
KWANDONGENI
MAGUDU
JESSER POINT
SODWANA BAY
NKONKONI
ZULULAND
UBOMBO
MKHUZE
KHOMBE
MADWALENI
KHONGOLWANE
TENDEKA
THOKAZI
MADUMA
NTABANKOSI
MAHASHINI
NGXONGWANE
KWANIBELA
MHLOSINGA
NONGOMA
BARTLOW
BAZINI
DUKUMBANE
LEVEN POINT
BULULWANE
SIDINSI
BHEKUMTHETHO
FALSE BAY PARK
BIRD ISLAND
KWAPHENYANE
EZILONYENI
INJAMPELA


THE BIG 5 FALSE BAY LOCAL MUNICIPALITY
ALL WATER INFRASTRUCTURE
LEGEND
Place Names
Conceptual Design (Features)
Borehole
Reservoir/Tank with Chlorination Unit
Elevated Tank
Water Treatment Works
Pump Station
Reservoir
Standpipe
Pumps
Reservoirs
Water Treatment Works
Waste Water Treatment Works
Supply Source
Borehole
Dam
River
Spring
Existing and Planned Pipelines
Conceptual Design (Pipelines)
Reticulation
Rising Main
Major Rivers
Minor Rivers
Roads
National Roads
Provincial Roads
District Roads
Municipal Roads
Other Roads/Access
Water Demand Areas
Wards
Umkhanyakude District Municipality
Local Municipalities (2011)
District Municipalities (2011)
0 1 2 4 6 8
Kilometres
Disclaimer: These proposals are indicative only for planning purposes. These layouts do not necessarily reflect the long term planning by the Water Services Authority or Water Services Provider. The long term planning layouts are still in development by several of the Municipalities and were not yet available at the time of this report.
UBOMBO
MKHUZE
KHOMBE
KHONGOLWANE
JESSER POINT
SODWANA BAY
LIEFELDT'S ROCKS
NTABANKOSI
MHLOSINGA
KWANIBELA
BARTLOW
DUKUMBANE
LEVEN POINT
FALSE BAY PARK
BIRD ISLAND
GOLDEN RIDGE
HLUHLUWE
ST'LUCIA PARK
GODENI
CAPE VIDAL


HLABISA
LOCAL MUNICIPALITY
ALL WATER
INFRASTRUCTURE
LEGEND
Place Names
Conceptual Design (Features)
Borehole
Reservoir/Tank with Chlorination Unit
Elevated Tank
Water Treatment Works
Pump Station
Reservoir
Standpipe
Pumps
Reservoirs
Water Treatment Works
Waste Water Treatment Works
Supply Source
Borehole
Dam
River
Spring
Existing and Planned Pipelines
Conceptual Design (Pipelines)
Reticulation
Rising Main
Major Rivers
Minor Rivers
Roads
National Roads
Provincial Roads
District Roads
Municipal Roads
Other Roads/Access
Water Demand Areas
Wards
Umkhanyakude District Municipality
Local Municipalities (2011)
District Municipalities (2011)
N
0 1 2 4 6 8
Kilometres
Disclaimer: These proposals are indicative only for planning purposes. These layouts do not necessarily reflect the long term planning by the Water Services Authority or Water Services Provider. The long term planning layouts are still in development by several of the Municipalities and were not yet available at the time of this report.
FOCUS
Mott MacDonald
PDNA
MHP
GEOSPACE
cogta
Department:
Co-operative Governance and Traditional Affairs
PROVINCE OF KWAZULU-NATAL
MAHASHINI
NGXONGWANE
NONGOMA
BAZINI
SIDINSI
BHEKUMTHETHO
EZILONYENI
INJAMPELA
MAHLOMBE
MVULAZI
MAPHOPHOMA
QONGGO
KWAQUMA
MAKEMA
XOLO
NTSHEMANZI
NQULWANE
NGOLATI
UMUNYWANA
NTUTHUNGA
NOVUNULA
NTWENI
KWAMSANE
MTUBATUBA
SIQOKOMA
GUNJANENI
MABHOKISINI
HLABISA
MPEMBENI
KWAMKHENKETHA
KWAMAYAKASI
GODENI
DUKUMBANE
BARTLOW
MHLOSINGA


GOLDEN RIDGE
HLUHLUWE
ST'LUCIA PARK
GODENI
KWAMKHENKETHA
CAPE VIDAL
GUNJANENI
MAKHAKHATHANA
MISSION ROCKS
SIQOKOMA
FIRST ROCKS
NOVUNULA
NTWENI
MTUBATUBA
MQAPELANA
KWAMSANE
MONZI
KWANGWENYA
PELANDABA
CAPE ST LUCIA
KWAMTHETHWA
MTUBATUBA LOCAL MUNICIPALITY
ALL WATER INFRASTRUCTURE
LEGEND
Place Names
Conceptual Design (Features)
Borehole
Reservoir/Tank with Chlorination Unit
Elevated Tank
Water Treatment Works
Pump Station
Reservoir
Standpipe
Pumps
Reservoirs
Water Treatment Works
Waste Water Treatment Works
Supply Source
Borehole
Dam
River
Spring
Existing and Planned Pipelines
Conceptual Design (Pipelines)
Reticulation
Rising Main
Major Rivers
Minor Rivers
Roads
National Roads
Provincial Roads
District Roads
Municipal Roads
Other Roads/Access
Water Demand Areas
Wards
Umkhanyakude District Municipality
Local Municipalities (2011)
District Municipalities (2011)
N
0 1 2 4 6
Kilometres
Disclaimer: These proposals are indicative only for planning purposes. These layouts do not necessarily reflect the long term planning by the Water Services Authority or Water Services Provider. The long term planning layouts are still in development by several of the Municipalities and were not yet available at the time of this report.
FOCUS
A Division of the Crowie Property Group
SIVUNO CONSULTING
Mott MacDonald PDNA
MHP GEOSPACE
cogta
Department:
Co-operative Governance and Traditional Affairs
PROVINCE OF KWAZULU-NATAL

12. ACKNOWLEDGEMENT AND DISCLAIMER

This report was prepared by the consortium consisting of Focus, Mott Macdonald PDNA, MHP GeoSpace and Sivuno Consulting with the technical support from Umkhanyakude District Municipality under the direction and review from COGTA and Umgeni Water.

The information and data obtained in this report was obtained from Umkhanyakude District Municipality Infrastructure Development Plans (IDP's), Water Services Development Plans (WSDP) and mainly engagements with Umkhanyakude District Municipality staff.

Neither the consortium nor any of its employees assume any liability or responsibility for any third party use of any information discussed in this report.

The primary contact regarding questions or comments on this document is:

Department of Cooperative Governance and Traditional Affairs
Contact Person: Muzi Ngwane
Email address: muziwesipho.ngwane@misa.gov.za