

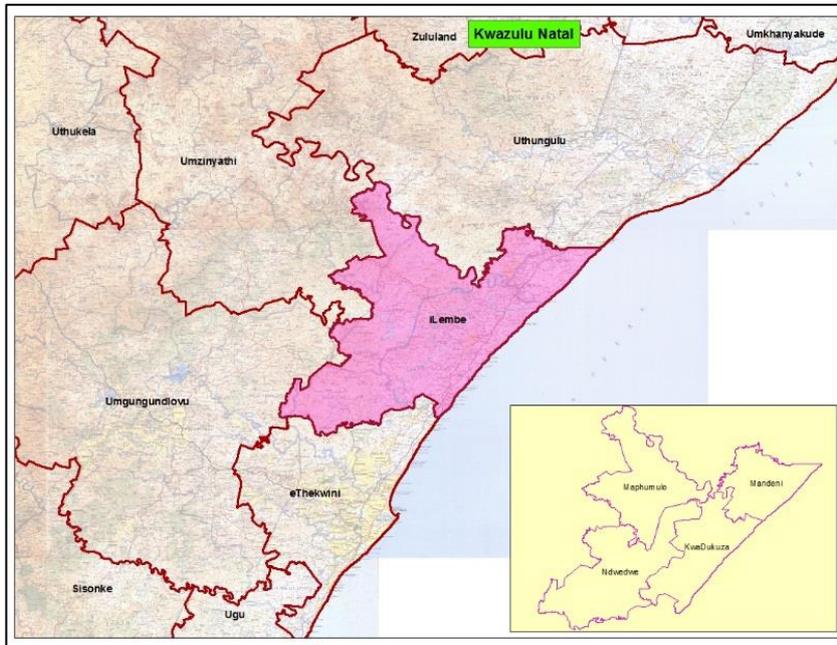
Umgeni Water



UNIVERSAL ACCESS PLAN FOR WATER SERVICES PHASE 2: PROGRESSIVE DEVELOPMENT OF A REGIONAL CONCEPT PLAN FOR BULK WATER SERVICES

REPORT ILEMBE DISTRICT MUNICIPALITY

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LIST OF ABBREVIATIONS

Ave.	Average
CoGTA	Department of Cooperative Governance and Traditional Affairs
DM	District Municipality
DWS	Department of Water and Sanitation
GIS	Geographical Information System
GRIP	Groundwater Research Information Project
HFY	Historical Firm Yield
IDP	Integrated Development Plan
IDM	iLembe District Municipality
KZN	KwaZulu Natal
l/c/d	Litres per capita per day
LM	Local Municipality
LoS	Level of Service
Max.	Maximum
Min.	Minimum
m ³	Cubic meters
PSP	Professional Service Provider

RDP	Reconstruction and Development Plan
RF	Reference Framework
TBD	TO BE DETERMINED
UAP	Universal Access Plan
UZDM	uMzinyathi District Municipality
UTDM	uThungulu District Municipality
UW	Umgeni Water
WARMS	Water Authorisation and Registration Management System
WSA	Water Service Authority
WSDP	Water Services Development Plan
WSP	Water Service Provider
WSS	Water Supply Scheme
WTW	Water Treatment Works

EXECUTIVE SUMMARY

This report presents findings of the study: Universal Access Plan Phase 2 – Progressive Development of a Regional Concept Plan for iLembe District Municipality (IDM).

The iLembe District Municipality, which encompasses an area of 3 260 square kilometres, is located immediately to the north of the metropolitan area of eThekweni and to the south of the uThungulu District Municipality. It comprises the local municipalities of KwaDukuza, Mandeni, Maphumulo and Ndwedwe. The district begins about 75 km north of the eThekweni Metro boundary and stretches some 25 km beyond the mouth of Tugela River. The western boundary of IDM runs roughly parallel to the coastline at an average distance of about 45 km from the coast.

The northern areas of Ndwedwe, the central corridor of Mandeni and KwaDukuza Municipality are the commercial farming hubs of the district. These commercial areas (31% of the land) are mainly under privately owned sugar cane.

Areas of urbanisation in the district comprise KwaDukuza / Stanger, Mandeni, the Dolphin Coast and Nkwazi. Land uses are typically urban mixed uses with high levels of infrastructural and service development and an adequate provision of social facilities and services to support the residents. Industrial development is concentrated in KwaDukuza, Isithebe and Darnall.

The existence of village centres such as Maphumulo and Ndwedwe in the west and Nyoni and Mbizimbelwa in the north depend on social services, a welfare office or a similar state service. Wholesale commercial activities have developed and the villages have emerged as supply centres and transportation hubs to the remote rural areas of iLembe.

The main urban and economic settlements are located along the R102 and north-south rail linkage, in particular at the intersection of the R102 with the R614 and R74. This includes the development of Tongaat (located outside the district) in the south, Groutville, Stanger, Darnall and Mandeni / Isithebe in the north.

iLembe District Municipality's estimated population is 606 810 people. The majority of the population in the district is located in the KwaDukuza Local Municipality which is largely an urban area, representing 38.1 percent of the total population combined; Populations in the other three Local Municipalities (Ndwedwe, Maphumulo and Mandeni) comprise 23.21, 15.94 and 22.75 percent of the total population respectively.

For the purposes of the UAP Phase 2 Study, the IDM has been divided into 17 Bulk supply zones mainly using existing and future bulk water scheme footprints and bulk water supply reservoir footprints. The Supply Zones are shown in **Figure 5**.

The water resource versus water demand balance is shown in **Table A** below. A discussion on the water balance (Yield versus Demand) for each LM is discussed thereafter.

Table A: Water Balance

Local Municipality	UAP Phase 2 Supply Zones	Existing Water Resource	Yield (Mℓ/day)	UAP Phase 2 : 30 Year Demand GAADD (Mℓ/day)	Resource Assessment		UAP Phase 2/ILDM Long Term Augmentation Option
					Water Surplus (Mℓ/day)	Water Deficit (Mℓ/day)	
Kwadukuza	4 to 9	Hazelmere Dam	49.8	221.30	-	171.50	Welverdient Dam Mvotipoort Dam Isithundu Dam
Maphumulo	10, 11 & 16	iMvutshane Dam Ngcebo Scheme	6.5	24.60	-	18.10	uMshwathi Bulk iMvutshane Dam Mvotipoort Dam
Ndwedwe	3, 12 to 15 & 17	Hazelmere Dam	5	27.00	-	22.00	uMshwathi Bulk
Mandeni	0, 1 & 2	Thukela River (Sundumbili WTW)	40	23.50	16.50	-	-

References: All Town Recon Strategies of the respective Regional Schemes
Umgeni Water Infrastructure Masterplan

Assumption: Hazelmere Dam to be utilised by Ethekeini

KWADUKUZA LOCAL MUNICIPALITY

The KwaDukuza LM which falls within Bulk Supply Zones 4 to 9 of this UAP Phase 2 study is supplied with water from Hazelmere Dam on the Mdloti River as well as an abstraction on the Mvoti River at KwaDukuza.

The existing water demand for the KwaDukuza area as at 2014 was 25.55 Ml/day from Hazelmere Dam and 17.9 Ml/day from the Mvoti River. The demand is expected to increase to 221.3 Ml/day in the thirty year planning Horizon. (UW, 2015).

Umgeni Water recently commissioned the Lower Thukela Bulk Water Supply Scheme (LTBWSS). This scheme has a water use of 110 Ml/day on the Thukela River near the town of Mandeni. The intention over the next 10 years is to supply the KwaDukuza LM from LTBWSS and free up Hazelmere Dam for the Ethekeini supply area and sections of Ndwedwe LM.

The long term plan is to develop a dam on the Lower Mvoti. Possible dam sites include Isithundu and Welverdient. From previous investigations it has been determined that the Isithundu Dam will yield 173 Ml/day with a 65m high wall (Umgeni Water, 1997). The dam on the lower Mvoti will supply the KwaDukuza LM thereby allowing LTBWSS to supply areas north of the Thukela River as far as Richards Bay.

The Isithundu Dam alone will thus not be able to supply the long term demand for KwaDukuza LM due to its yield being lower than the projected long term demand by 50 Ml/day.

Alternatives to augment supply from this dam that were included in this UAP Phase 2 study will include the development of the proposed Welverdient Dam (yield unknown at this stage) that could possibly be higher yielding than Isithundu or a combination of both dams as alluded to in previous studies (DWAf & UW, 1996) and the Mvotipoort Dam in the upper reaches of the Mvoti catchment. This estimated yield of this dam is 120 Ml/day (see section 7.2) (Umgeni Water, 1997).

MAPHUMULO LOCAL MUNICIPALITY

The Maphumulo LM falls within Zones 10, 11 & 16 of this UAP Phase 2 study and is currently supplied from a combination of the Maphumulo Bulk Water Supply Scheme that will abstract water from the iMvutshane Dam on the iMvutshane River once this dam has fully impounded, the Hlimbithwe River and the Ngcebo Scheme that abstracts water from the Thukela River.

Some sections of the central and western part of Maphumulo are supplied from boreholes with the intention to eventually link this to the Greater uMshwathi Scheme.

The long term demand for Maphumulo LM is 24.6 Mℓ/day. The Yield of the iMvutshane Dam with the additional raw water supply from Hlimbitwe River is 12 Mℓ/day. The estimated allocation from the uMshwathi Bulk Scheme for iLembe DM is 25 Mℓ/day. This allocation however includes the Maphumulo and Ndwedwe LM's. Sections of Zone 16 with a demand 6 Mℓ/day could be supplied from the uMshwathi Bulk Scheme.

The long term option for bulk water augmentation considered in this UAP Phase 2 study is the Mvotipoort Dam (see section 7.1). The estimated yield of this dam is 120 Mℓ/day. A pipeline from this dam to the upper area of Maphumulo LM will allow supply to Zones 10 & 11 under gravity.

NDWEDWE LOCAL MUNICIPALITY

The Ndwedwe LM falls within Zones 12, 13, 14 & 15 of this UAP Phase 2 study. The estimated long term demand for this area is 25 Mℓ/day. The central and eastern sections of the Ndwedwe local municipality is currently supplied from Hazelmere Dam. Umgeni Water has recently completed a study to supply the northern, central and southern sections of Ndwewe with bulk water from the uMshwathi Bulk Scheme. The intention is to link supply from the uMshwathi Bulk terminal reservoir at Nondabula to the existing pumping system that is supplied from Ndwedwe and allow supply via reverse flow to the existing reservoirs. The western section of Ndwedwe LM will be covered by the Wosiyane Scheme which will be supplied from Bruyns Hill on the uMshwathi System.

The allocation from the uMshwathi Bulk System is sufficient for the long term water demands for the Ndwedwe LM and no augmentation is deemed necessary.

MANDENI LOCAL MUNICIPALITY

The Mandeni LM falls within Zones 0, 1 & 2 of this UAP Phase 2 study. The estimated long term demand for this area is 23.5 Mℓ/day. The Mandeni LM is supplied with abstractions on the Thukela River with treatment at the Sundumbili WTP. The plant and abstraction has recently been upgraded to 40 Mℓ/day which is assumed to be the approved water use on the Thukela for this plant and supply area. The Sundumbili WTP supplies the proposed Macambini and Ndulinde Water Schemes that are currently in implementation. The town of Mandeni is also

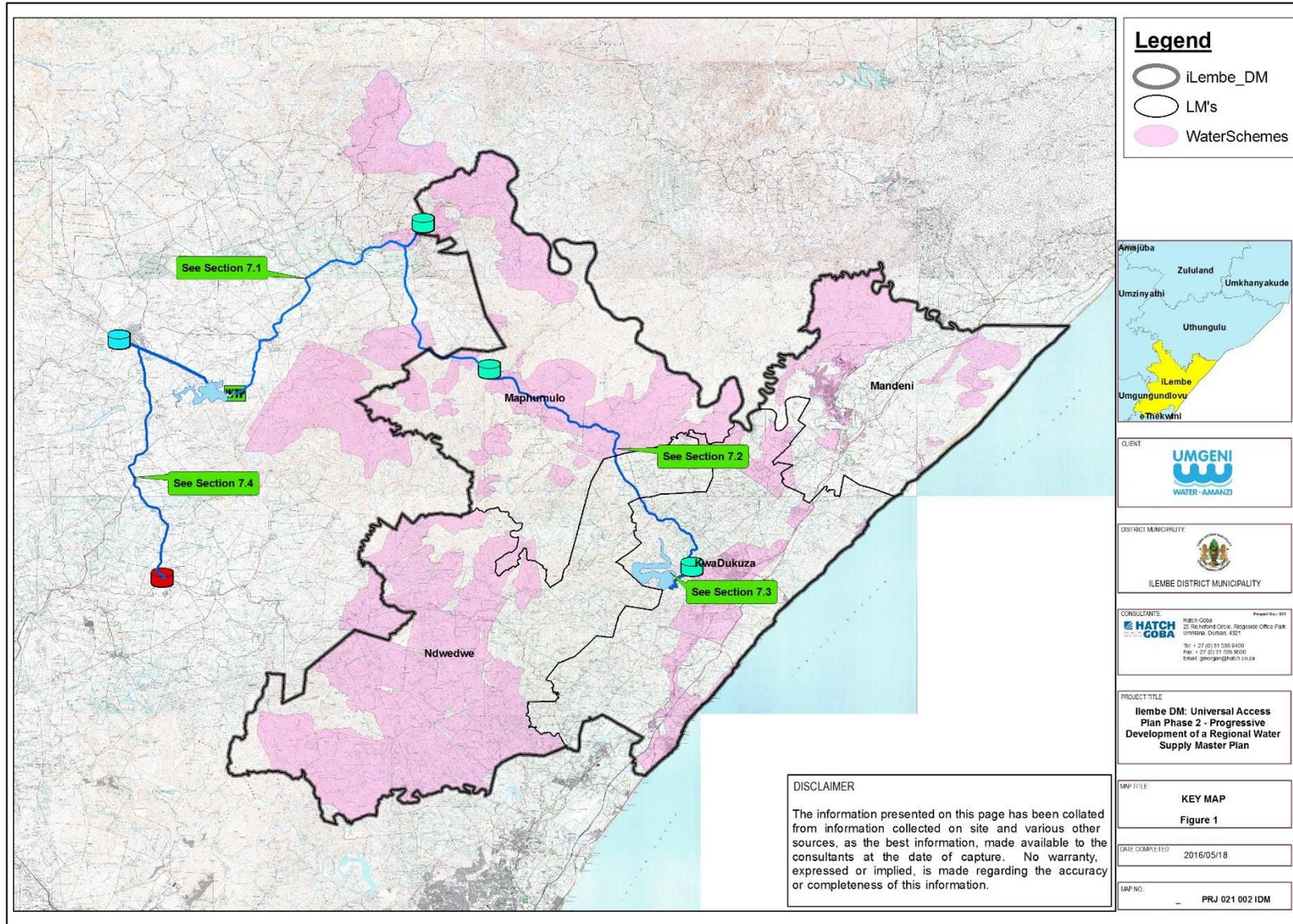
supplied from the Thukela River but via a separate abstraction of 6.6 Mℓ/day and treatment by Sappi.

The current approved water use on the Thukela is sufficient to meet the long term needs of Mandeni LM and no further augmentation is deemed necessary.

For the purposes of the UAP Phase 2 study, investigations have been carried out on existing bulk water supply schemes, the schemes which are currently in planning as well as other smaller schemes. The possible options of extending the existing and planned schemes were then evaluated to determine the feasibility of smaller “stand alone” schemes to be incorporated into the larger regional schemes. Four other possible new regional scheme options were investigated as follows:

- Option 1: Proposed Bulk Water Supply from Mvotipoort Dam to Maphumulo Command Reservoir
- Option 2: Proposed Bulk Supply from Welverdiend Dam to Kwadukuza WTP
- Option 3: Proposed Bulk Water Supply from Greytown Reservoir to Dalton Reservoir (Mvotipoort Dam link to uMshwathi system to supply iLembe DM)
- Option 4: Proposed Bulk Water Supply from Maphumulo Command Reservoir to Kwadukuza Regional Reservoir.

The above options are shown in the Overall Map in **Appendix D** and the relevant section in this report that each option is discussed in shown in the **Project Key Map - Figure 1**.



RECOMMENDATIONS

- It is recommended that a detailed feasibility study into the Mvotipoort Dam be undertaken as this dam has the potential to supply both Maphumulo, Ndwedwe and Kwadukuza LM's as well as the uMshwathi LM thereby reducing the load on Mgeni system
- It is also recommended that the investigation of the lower Mvoti system, i.e. Isithundu Dam and Welverdient Dam, be completed in detail as an option to augment current raw water supply to the growing water demands to KwaDukuza LM.
- A reconciliation and optimal configuration of the bulk infrastructure using the Mvotipoort and Welverdient Dams options needs to be undertaken. The scheduling of implementation of the dams and associated bulk distribution infrastructure needs to be determined. This order of implementation should take water demand growth into account. The reconciliation should include the possible future use of the Lower Thukela Bulk Water Scheme to supply northern KwaZulu-Natal. (Refer to Uthungulu UAP Phase 2 Report)

1. OBJECTIVES AND METHODOLOGY

1.1. BACKGROUND

The Department of Co-operative Governance and Traditional Affairs (CoGTA) in association with Umgeni Water initiated the development of a Universal Access Plan (UAP) for bulk water supply in the KwaZulu-Natal province in 2013. The study focused on the ten WSA's in the KwaZulu-Natal Province and constituted Phase 1 of the project. The outcome of this Phase 1 plan provided good base information in some of the WSA's with regards to water supply in KwaZulu-Natal.

Upon completion of UAP Phase 1, Umgeni Water (UW) initiated a second stage of the UAP project with the main objective being the progressive development of a regional bulk water supply concept plans for the iLembe District Municipality that would address bulk water supply backlogs in the long term. The intention is to review existing and planned Bulk Water Supply Schemes and present other possible options for consideration in future detailed studies.

Umgeni Water has appointed Hatch Goba, in association with JTN Consulting (Pty) Ltd , to investigate and review the Phase 1 of UAP project in the form of developing UAP – Phase 2, for Harry Gwala District Municipality (HGDM), iLembe District Municipality (IDM), uMzinyathi District Municipality (UZDM), uThungulu District Municipality (UTDM) all located in the KwaZulu-Natal province. This report documents the findings of UAP Phase 2 for IDM.

1.2. PURPOSE AND OBJECTIVES

The purpose of this study is to investigate water demands, already proposed regional schemes as well as defining new possible schemes that could provide an integrated bulk water supply by linking into existing schemes and also provide water to areas that are not serviced thereby addressing backlogs.

The objective of this study which was carried out at a reconnaissance level of detail is to verify and validate the following:

- Identify existing water services backlogs
- Calculate water demand
- The identification and status of the existing bulk water supply infrastructure;
- The availability of sustainable water resources;
- The extent and status of existing and future regional bulk projects
- Investigate possible bulk water supply schemes
- Investigate augmentation schemes where possible
- Determine optional scheme configuration to allow bulk water supply to targeted areas.

1.3. SPECIFIC TARGETS OF THE INTERVENTION

The Specific Targets of the Intervention are summarised as follows:

- Promoting knowledge sharing between all stakeholders namely, the WSA, local municipalities within the WSA's area of jurisdiction, Department of Water and Sanitation (DWS) and Umgeni Water;
- Using existing information and comparing it as much as possible as a basis for current and future demand and infrastructure requirements;
- Identification of gaps in bulk water supply schemes.
- Determine possible options of bulk water scheme to supply the consumers in Ilembe DM and thereby address water services backlogs.

1.4. STUDY PROCESS

The study process involved the following steps

- Meetings with Ilembe District Municipality to confirm information on the existing and planned schemes
- Gathering GIS information on existing and planned schemes from other service providers
- Determining water supply zones and calculating water demands,
 - Water supply zones were determined using the following:
 - Topography
 - Settlement densities,
 - Footprints of existing water supply schemes
 - Most suitable command reservoir positioning for maximum supply via gravity
- Investigating possible water resources
- Selecting the scheme options and suitable pipe routes and optimal configuration for lowest possible operation and maintenance costs.

1.5. DATA SOURCES

The background information pertinent to this report is presented in Table 1.

Table 1: Source Documents

Document	Compiler(s)	Document Owner (Client)	Date
iLembe District Municipality: First stage reconciliation strategy for Mandeni and Tugela water supply scheme area – Mandeni Local Municipality	Water for Africa (Pty) Ltd in association with Aurecon (Pty) Ltd.	Department of Water Affairs	June 2011
iLembe District Municipality Water Services Development Plan (WSDP) - Customer Profile	NME	iLembe District Municipality	January 2015
iLembe District Municipality Water Services Development Plan (WSDP) - Infrastructure	NME	iLembe District Municipality	January 2015
iLembe District Municipality Water Services Development Plan (WSDP) - Institutional	NME	iLembe District Municipality	January 2015
iLembe District Municipality Water Services Development Plan (WSDP) – Legislation	NME	iLembe District Municipality	January 2015
iLembe District Municipality Water Services Development Plan (WSDP) – Service Levels	NME	iLembe District Municipality	January 2015
Bulk Infrastructure Master Plan for iLembe District Municipality 2014/2015 – 2044/2045	Umgeni water	Umgeni water	June 1, 2014
iLembe District Municipality Integrated Development Plan 2015/2016 Review	iLembe DM	iLembe DM	2015/2016
Development and Implementation of Water Conservation/Water Demand Management in iLembe District Municipality	Hatch Goba & Department of Water and Sanitation	iLembe DM	May 2015

2.3. PHYSICAL CHARACTERISTICS OF STUDY AREA

iLembe District Municipality is situated on the eastern coast of KwaZulu-Natal. It comprises of four local municipalities: KwaDukuza, Mandeni, Maphumulo and Ndwedwe. The seat of iLembe is KwaDukuza.

iLembe District Municipality is surrounded by the eThekweni Municipality to the south, uThungulu DM to the north, uMzinyathi DM to the north-west and uMgungundlovu DM to the south west. iLembe DM consists of four Local Municipalities, namely KwaDukuza, Mandeni, Maphumulo and Ndwedwe. The DM covers the total population of 606 810 (Statistics South Africa Census, 2011).

The northern areas of Ndwedwe, the central corridor of Mandeni and KwaDukuza Municipality are the commercial farming hubs of the district. These commercial areas (31% of the land) are mainly under privately owned sugar cane.

Areas of urbanisation in the district comprise KwaDukuza / Stanger, Mandeni, the Dolphin Coast and Nkwazi. Land uses are typically urban mixed uses with high levels of infrastructural and service development and an adequate provision of social facilities and services to support the residents. Industrial development is concentrated in KwaDukuza, Isithebe and Darnall.

The existence of village centres such as Maphumulo and Ndwedwe in the west and Nyoni and Mbizimbelwa in the north depend on social services, a welfare office or a similar state service. Wholesale commercial activities have developed and the villages have emerged as supply centres and transportation hubs to the remote rural areas of iLembe.

The main urban and economic settlements are located along the R102 and north-south rail linkage, in particular at the intersection of the R102 with the R614 and R74. This includes the development of Tongaat (located outside the district) in the south, Groutville, Stanger, Darnall and Mandeni / Isithebe in the north.

2.4. CLIMATE

The mean annual temperature distribution for iLembe varies widely from a mean annual temperature of 21°C in places along the coast to 16°C inland at higher altitudes. It is evident however that as one moves away from the coast inland to slightly higher altitudes, the average

minimum temperatures during winter begin to approach 12°C at what is still a relatively low altitude.

iLembe falls within the South African summer rainfall region with mean annual precipitation (MAP) ranging from 650mm to 1200mm depending on the local area in question. MAP generally declines from the coast to inland areas. The majority of the District receives relatively high rainfall in excess of 900mm, with even the drier inland areas usually receiving in excess of 750mm.

2.5. TOPOGRAPHY, GEOLOGY AND SOILS

The geology of the study area varies quite a bit and includes sediments of the Karoo Supergroup which has Dwyka tillites, mudstones and lesser sandstones of the Adelaide and Tarkastad Subgroups (Beaufort Group) with intrusions of Dolorite. There is also Ecca Group shale present. In some areas Ordovician Natal Group Sandstones dominate and in others have layered quartz-feldspar metasediments (Mapumulo Group, mokolian). Along the coast dunes of Aeolian deposited sands dominate.

Shallow sandy (Glenrosa and Mispah) soils are formed over Ordovician Natal Group Sandstone. Where there is Dwyka-tillite the soils tend to be compact, clayey soils. Land types are Fa, Fb with some Ca, Bd, and Ac where these soils are found. Where the Karoo Supergroup is found the soils are acid, leached heavy soils including Glenrosa and Mispah soils. The land types found here are Fa, Ab, Ac and Aa. Apedal, and plinthic soils develop over Ecca Group (Karoo Supergroup). The dominant land type here is Ac and Fa where Ac is dominant. Karoo Sedimentary rocks give rise to nutrient poor, leached and shallow soils.

2.6. ENVIRONMENTAL

It can be argued that the land administration within the District affects the way we use natural resources and the effects these natural resources pose on settlement patterns. Therefore, the settlement patterns within the District defines the varying environmental sensitive features (biological diversity) occurring in various areas of the District as well as the pressures exerted on these features by various human activities. Environmental sensitive features found within the District include estuaries; rivers; coastal public property; vegetation type; biomes; terrestrial; freshwater ecosystem; coastal forest and dune areas; the remaining natural vegetation of the coastal flats and the vegetation of the incisive river valleys.

Human activities, such as agricultural activities, livestock overgrazing, human settlement and development, invasion by alien species, urbanisation, uncontrolled and unplanned rural

settlements, lack of understanding of biodiversity data, sewer disposal and management, sand mining, air pollution by industries, and temperature rise due to climate change, have been identified as the most common driving forces impacting on the District's environmental assets.

It is vital for the District to protect its natural resources for the benefit of the future generations as envisaged by the National Environmental Management Act, (Act 107) of 1998 and other international initiatives such as Agenda 21, Millennium Developmental Goals (Goal 7), Rio Declaration on Environment and Development, Statement on Forest Principles, United Nations Framework Convention on Climate Change, and United Nations Convention on Biological Diversity. The main intention of these legal tools is to implement objectives of the sustainable development through recognizing the importance of cooperative governance in protecting environmental assets and through the implementation of the Strategic Priorities of the National Strategy for Sustainable Development which are as follows:

- a) Enhancing systems for integrated planning in meeting sustainable development objectives
- b) Sustaining our ecosystems and using natural resources efficiently
- c) Responding effectively to climate change
- d) Towards a green economy
- e) Building sustainable communities (2015/2016 IDP Review)

3. DEMOGRAPHICS

3.1. EXISTING POPULATION AND DISTRIBUTION

During the Professional Service Provider (PSP) Inception Meeting with Umgeni Water, it was proposed and accepted to standardise the data source and methodology to apply for the demographics and water requirements. The Census 2011 small areas layer will be used as base data for the demographics and water requirements/demand model with predefined classes for water consumption categories. The growth rates for each Local Municipality and water supply area would differ according to each Local Municipality's characteristics and settlement patterns as per Census 2011 figures. The population and number of households for each of the five local municipalities under IDM are presented in **Table 2**.

The UAP Phase 1 study used a low and high scenario for the population and household counts utilising the information at hand (see next section). The Integrated Development Plan (IDP) of 2014/2015 utilised the 2011 Census information for demographic analysis. The DWS RF Geodatabase (March 2014) utilised adjusted 2011 Census figures based on growth rates.

3.1.1. Population Sources

UAP Phase 1

The UAP Phase 1 study utilised the following data sources in defining the demand areas:

- 2011 Census for population figures
- 2011 Eskom household counts
- 2001 Census for population growth analysis

However, the study did not specify the outcome of the low and high count scenario for each Local Municipality.

Census 2011

The demographics from the Census 2011 are presented in the **Table 2** below.

Table 2: Census Population and Households (2011)

Municipality	Population	Household size	PP/HH
Maphumulo	96 726	19 971	4.8
Mandeni	138 078	38 235	3.6
KwaDukuza	231 186	70 284	3.3
Ndwedwe	140 820	29 199	4.8
Total	606 810	157 689	3.8

Source: Census 2011

Population	606 810
Age Structure	
Population under 15	33.80%
Population 15 to 64	61.30%
Population over 65	5.00%
Dependency Ratio	
Per 100 (15-64)	63.20
Sex Ratio	
Males per 100 females	90.90
Population Growth	
Per annum	0.80%
Labour Market	
Unemployment rate (official)	30.60%
Youth unemployment rate (official) 15-34	37.20%
Education (aged 20 +)	
No schooling	15.40%
Higher education	6.00%
Matric	26.70%
Household Dynamics	
Households	157 692
Average household size	3.80
Female headed households	45.80%
Formal dwellings	64.40%
Housing owned	56.50%
Household Services	
Flush toilet connected to sewerage	22.50%

Weekly refuse removal	34.40%
Piped water inside dwelling	23.70%
Electricity for lighting	71.40%

Census 2011 Municipal Fact Sheet, published by Statistics South Africa.

DWS Reconciliation Strategy 2011

The DWS Reconciliation Strategy (2011) looked at high, medium and low population growth scenarios from 2008 to 2030. The findings from the analysis is summarised in **Table 3**.

Table 3: DWS Reconciliation strategy Population growth scenarios (2011)

Mandeni Water Supply Scheme (Mandeni LM)		2010	2015	2020	2025
Future requirements without WCWDM	High growth (Mℓ/day)	3.75	4.35	5.07	5.88
	Median growth (Mℓ/day)	3.65	4.07	4.47	4.87
	Low growth (Mℓ/day)	3.59	3.85	3.98	4.09
Sundumbili Water Supply Scheme (Mandeni LM)		2010	2015	2020	2025
Future requirements without WCWDM	High growth (Mℓ/day)	23.64	29.23	35.64	43.08
	Median growth (Mℓ/day)	22.76	26.56	30.03	33.67
	Low growth (Mℓ/day)	21.91	24.15	25.33	26.38
Masibambisane and Maqumbe Water Supply Scheme (Maphumulo LM)		2010	2015	2020	2025
Future requirements without WCWDM	High growth (Mℓ/day)	4.16	4.83	5.62	6.52
	Median growth (Mℓ/day)	4.05	4.52	4.95	5.40
	Low growth (Mℓ/day)	3.98	4.27	4.42	4.53

Source: DWS Reconciliation strategies 2011

It should be noted that these figures are based on populations supplied per water scheme (Supply Area) and therefore do not necessarily capture the entire population within the IDM.

3.2. SOCIAL AND ECONOMIC INDICATORS

Enterprise iLembe has been tasked with the co-ordination of economic growth and development and is constantly involved in the roll-out of a host of projects, which will ensure that the economic opportunities currently presenting themselves bring about sustainable employment opportunities for its residents. According to the IDP there are vast differences in wealth across the District, with small developed nodes along the coast contrasted by large areas of extreme underdevelopment in the hinterland. The main challenges for the iLembe Municipality in the IDP relate to socio-economic, economic, infrastructure, spatial and housing issues as well as the issues around social facilities and services.

3.3. COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL DEVELOPMENT

iLembe has experienced rapid growth in urban development over the years. Urban development has been dominant in KwaDukuza local municipality. A number of residential estates are being built and some are currently at planning stage. The municipality might be faced with overdevelopment of residential areas and increase in the demand of community and social facilities such as schools, hospitals and recreational facilities.

Residential development has impacted on other land uses. There has been a loss of agricultural land to urban development. The loss of agricultural land has negative impact on sugar cane farmers. There will also be job losses because some of the mills will have to close down if there is not enough sugar to process.

There are opportunities for commercial development in iLembe because there has been a great deal of focus on residential developments. The residential developments that are taking place provides for a significant demand for office developments and light industrial developments to provide places of work for residents. Commercial development is developed in KwaDukuza therefore further attention needs to be directed to the other local municipalities in order to develop their commercial development nodes.

Industrial estate development opportunities in the iLembe District have been identified and packaged. Some locations for the development of industrial estates in the District has been identified, however, certain areas are being identified for further assessment. The areas identified include:

- Areas surrounding the proposed new Eskom Peaking Plant (inland of Shaka's Kraal);
- Compensation Flats;
- The development of a second phase around Isithebe;

- Areas surrounding Darnall; and
- Potential in the Ndwedwe Municipality.

In 2007 Trade and Investment KwaZulu-Natal suggested that the Province must develop a further 4 000 hectares of industrial land in order to meet current demand. The iLembe District at the time indicated that it will make a 1 000 ha contribution to fulfilling this demand. To place this in context, the Isithebe Industrial Estate is approximately 440ha in size. The new Imbonini Park developed in the vicinity of Ballito, currently the biggest industrial / service park development in iLembe is 35 ha in extent.

3.4. POPULATION GROWTH SCENARIOS

The future population is envisaged to increase at a growth rate of 0.5% to 2.5%. **Table 4** sets out the growth assumptions for the iLembe DM.

Table 4: Population Projections (2015 – 2045)

Year	Mandeni	KwaDukuza	Maphumulo	Ndwedwe
2015	146 625	248 284	102 731	149 293
2020	154 104	278 181	107 971	156 909
2025	160 361	311 677	113 479	164 913
2030	170 227	349 207	119 268	173 325
2035	178 910	391 257	125 352	182 166
2040	188 036	438 369	125 352	191 458
2045	197 628	491 154	138 466	201 225

4. WATER DEMANDS

4.1. LEVEL OF SERVICE

Each of the previous studies adopted a different basis of unit consumption for the determination of water demands:

UAP Phase 1

The UAP Phase 1 study provided the following categories: of water service policy.

- RDP and Above – referring to the population or area that receives at least the minimum level of service or above
- Dysfunctional Schemes – referring to the population or area that is covered by a scheme which is dysfunctional to an extent that even minimum RDP level of service is not achieved
- Unreliable source – referring to the population or area that is covered under a scheme but sporadic, seasonal or experiences continuous failure of raw water source resulting in supply that is below the RDP level of service.

Table 5 below categorises the per capita demands for water supply as defined by DWS.

Table 5: Unit Demands

Category	Description of Consumer Category	Household Annual Income range	Per capita cons (l/c/d)		
			Min	Ave.	Max.
1	Very High Income: villas, large detached house, large luxury flats	>R1 228 000	320	410	500
2	Upper middle income: detached houses, large flats	R153 601 – R1 228 000	240	295	350
3	Average Middle Income: 2 - 3 bedroom houses or flats with 1 or 2 WC, kitchen, and one bathroom, shower	R38 401 – R153 600	180	228	275
4	Low middle Income: Small houses or flats with WC, one kitchen, one bathroom	R9 601– R38 400	120	170	220
5	Low income: flatlets, bedsits with kitchen & bathroom, informal household	R1 - R9600	60	100	140
6	No income & informal supplies with yard connections		60	80	100
7	Informal with no formal connection		30	50	70
8	Informal below 25 l/c/d		25	25	25
9a	Non Residential - Rural		As per Red Book Guidelines		
9b	Non Residential - Urban		As per Red Book Guidelines		
9c	Non Residential - Industrial		As per Red Book Guidelines		

Census 2011

The water service levels (piped water) and water sources from Census 2011 are presented in **Table 6**.

Table 6: Water Service levels (piped water) per Local Municipality

Local Municipality	Piped (tap) water inside dwelling/institution	Piped (tap) water inside yard	Piped (tap) water on community stand: distance less than 200m from dwelling/institution	Piped (tap) water on community stand: distance between 200m and 500m from dwelling/institution	Piped (tap) water on community stand: distance between 500m and 1000m (1km) from dwelling /institution	Piped (tap) water on community stand: distance greater than 1000m (1km) from dwelling/institution	No access to piped (tap) water	Number of Households
Maphumulo	1 260	1 563	4 098	1 158	693	495	10 704	19 971
Mandeni	9 852	10 902	6 489	2 250	1 251	864	6 627	38 235
KwaDukuza	23 580	11 562	22 593	6 003	2 112	348	4 083	70 284
Ndwedwe	2 727	8 187	6 348	2 007	837	336	8 760	29 199
Total	37 419	32 214	39 528	11 418	4 893	2 043	30 174	157 689

Source: Census 2011

Further meetings and discussions with Umgeni Water during the course of the study resulted in three scenarios being adopted for the purposes of water demand projections. These scenarios are presented in **Table 7**.

Table 7: Water Demand Scenarios

Scenario 1	Urban			Rural			WSA Targets
	Portion to Convert	Start Year	End Year	Portion to Convert	Start Year	End Year	
Convert from No Service to RDP LOS	100%	2015	2020	100%	2015	2020	All pop. without supply converted to RDP level of service by 2020
Convert from <RDP LOS to RDP LOS	100%	2015	2020	100%	2015	2020	All pop with <RDP LOS converted to RDP level of service by 2020
Convert from RDP LOS to Yard Conn.	50%	2020	2030	50%	2020	2030	50% of Pop with RDP LOS in 2020 converted to YC LOS between 2020 and 2030
Convert from Yard Conn. to House Conn.	10%	2020	2035	10%	2025	2035	10% of pop with YC LOS converted to HC LOS between 2020 and 2035 for urban and between 2025 and 2035 for Rural

Scenario 2	Portion to Convert	Start Year	End Year	Portion to Convert	Start Year	End Year	KZN Prov Growth and Dev Plan (PGDP)
Convert from No Service to RDP LOS	100%	2015	2020	100%	2015	2020	All pop. without supply converted to RDP level of service by 2020
Convert from <RDP LOS to RDP LOS	100%	2015	2020	100%	2015	2020	All pop with <RDP LOS converted to RDP level of service by 2020
Convert from RDP LOS to Yard Conn.	100%	2015	2030	100%	2015	2030	100% of Pop with RDP LOS in converted to YC LOS by 2030
Convert from Yard Conn. to House Conn.	30%	2020	2035	10%	2025	2035	30% of pop with YC LOS in Urban areas and 10% in Rural Areas converted to HC LOS between 2020 and 2035 for Urban and between 2025 and 2035 for Rural

Scenario 3	Portion to Convert	Start Year	End Year	Portion to Convert	Start Year	End Year	Realistic Achievable Estimate
Convert from No Service to RDP LOS	100%	2015	2020	100%	2015	2020	All pop. without supply converted to RDP level of service by 2020
Convert from <RDP LOS to RDP LOS	90%	2015	2020	80%	2015	2020	90% of Urban pop and 80% of Rural pop with <RDP LOS converted to RDP level of service by 2020
Convert from RDP LOS to Yard Conn.	80%	2020	2035	50%	2020	2035	80% of Urban pop and 30% of Rural pop with RDP LOS converted to YC LOS by 2035
Convert from Yard Conn. to House Conn.	40%	2020	2035	20%	2025	2035	40% of Urban pop and 20% of Rural pop with YC LOS converted to HC LOS between 2020 and 2035 for Urban and between 2025 and 2035 for Rural

4.2. WATER DEMAND CALCULATION

For the purposes of water demand calculations, the scenarios presented above will not be appropriate for the whole of iLembe DM because a large section of KwaDukuza LM and some sections of Mandeni LM consist of urban areas with water demands up to 500ℓ/c/d with commercial and industrial water use that would influence water demands hugely. Scenario 2 is deemed to be the most probable scenario in the rural areas in iLembe District Municipality. This can be seen as the 30 year demand figures that were projected using this criteria are low when compared to the Umgeni water 30 year projection in the latest master plan where historical consumption figures are probably used to make future projections. For the purposes of infrastructure needs for each LM, the Umgeni Water 30 year demands were used. The water demands using the demand model and Umgeni Water’s 30 year demand projection for each local municipality is presented in **Table 8**.

Table 8: Demand Calculation

Local Municipality	Households	Population	Demand Model	UW 30 year Projection	Notes
			30 YEAR DEMAND Mℓ/day	30 YEAR DEMAND Mℓ/day	
ILEMBE DISTRICT MUNICIPALITY					
MANDENI	9025	54152	25.20	23.5	Not in UW supply area
KWADUKUZA	18826	112956	117.60	221.3	
MAPHUMULO	4484	26905	16.50	24.6	
NDWEDWE	8575	51450	22.20	27	
TOTAL			181.50	296.4	

5. EXISTING WATER SUPPLY INFRASTRUCTURE

5.1. WATER RESOURCES AND AVAILABILITY

The IDP, Reconciliation strategy and Umgeni Water's Infrastructure Masterplan studies and information obtained from other service providers working in iLembe DM, further describe the status of the water sources found in the Municipality as follows:

Maphumulo LM

The intention ultimately is that the southern, western and eastern section of Maphumulo LM is supplied with water from iMvutshane Dam. The yield of the iMvutshane River with additional water transfer from Hlimbitwa River is 12 Ml/day and this will be insufficient to supply the demand of the recently constructed reticulation networks in the area.

The rapid growth in demand, within the Maphumulo region over the last nine months, has necessitated the need to urgently consider supplementing the temporary iMvutshane River abstraction with a supply from the Hlimbithwe River with an additional 4-6 Ml/day. It is expected that the yield of the iMvutshane River will be inadequate to sustain the current demand during the low rainfall periods until the iMvutshane Dam which has been constructed is fully impounded.

An extensive water reticulation implementation plan is underway by iLembe DM to distribute water to consumers. This programme is scheduled for completion in 2018. Layout plans of the reticulation plans sourced from *MSW Engineers via Bosch Stemele* who are working on the iLembe Water Masterplan are attached in **Annexure A**.

The northern section of Maphumulo is supplied from the Ngcebo Scheme and the southern section of Maphumulo is currently supplied from boreholes with the intention of connecting these schemes to the uMshwathi Bulk Scheme when this is commissioned.

Mandeni LM

The Mandeni Local Municipality receives its raw water supplies from the Tugela River. The water is treated at the Sundambili Waterworks and distributed to Mandeni LM. The Sundambili Waterworks has recently been upgraded to 40 Ml/day and the proposed Macambini Masterplan intends supplying the section between the R102 and the coast in Mandeni LM with bulk potable

water. A layout plan of the Macambini masterplan that Hatch Goba is involved in is attached in **Annexure B**.

The Ndulinde Scheme that is currently in implementation will supply the area above the R102 in Mandeni LM. The Mandeni and Tugela Water Supply Scheme includes the Mandeni town and areas surrounding the town. Water is supplied from the Tugela River by SAPPI which is located south of the town and treated at the Mandeni Water Treatment Plant. The total peak hydraulic capacity is 6.6 Ml/day. (All Towns strategy, 2011). The All Towns Strategy (2011) stated that the existing bulk water supply infrastructure is sufficient to meet the current water requirements.

The Sundumbili Water Supply Scheme is supplied with potable water from a water treatment works (WTW) which gets raw water from Tugela River system.

The total raw water that was expected to be abstracted for treatment at the Sundumbili WTW in 2008 was 7.6 million m³/a (20.7 Ml/day). This includes water services backlogs in the supply area. Based on the raw water requirements, the treated water production with 8% losses was 7.0 million m³/a (19.1 Ml/day). The Sundumbili works was however recently upgraded to 40 Ml/day.

KwaDukuza LM

The KwaDukuza LM is supplied with a combination of the Mdloti and Mvoti Rivers.

The town of KwaDukuza relies on run- of-river abstractions from Mvoti River, supported by water transfers from the Mdloti catchment.

According to the Mvoti to Mzimkhulu ISP (DWA, 2004) the water balance of the Mvoti region is in deficit of 56 million m³/annum. Umgeni Water applied for an abstraction licence of 6.57 million m³/annum (18 Ml/day) from the Mvoti River for the Mvoti WTP; this should be reviewed as demands increase. KwaDukuza is also supplied from Hazelmere Dam on the Mdloti River, as described further below.

The KwaDukuza LM is supplied with water from the Hazelmere Dam and Waterworks on the Mdloti River. Hazelmere Dam currently has a yield of 54.8 Ml/day which will increase to 75 Ml/day after the dam wall has been raised. Water is pumped from Hazelmere Waterworks which has a capacity of 75 Ml/day, to the Avondale Reservoir via a 700mm \varnothing pipeline. This reservoir is a strategic bulk distribution point of bulk water to all towns along the north coast. Two bulk pipelines, North Coast Phase 1 (NCP1), a 350mm \varnothing pipeline, and North Coast Phase

2, a 1000mm \varnothing pipeline supply water to the Honolulu Reservoir and to several towns in-between. The operating rules of these two pipelines were optimised when the North Coast Phase 2 was commissioned in 2009. The Salt Rock Pumpstation was decommissioned effectively dividing the NCP1 into two segments. NCP is now used as a secondary bulk supplying consumers from Honolulu Reservoir feeding Umhlali and from Avondale Reservoir, it supplies up to Shakas Head.

From the Honolulu Reservoir, water is supplied to KwaDukuza as an augmentation to the current abstraction on the Umvoti River via a 350mm \varnothing pipeline reducing to 200mm \varnothing pipeline. The areas of Etete and Groutville are supplied en-route. A new 800mm \varnothing pipeline was commissioned in 2013 to augment supply to KwaDukuza and to also supply the areas of Darnall and Zinkwazi further north. A schematic layout of the North Coast System sourced from the *Umgeni Water Infrastructure Masterplan 2015/16 to 2045/46* is shown in **Figure 3**.

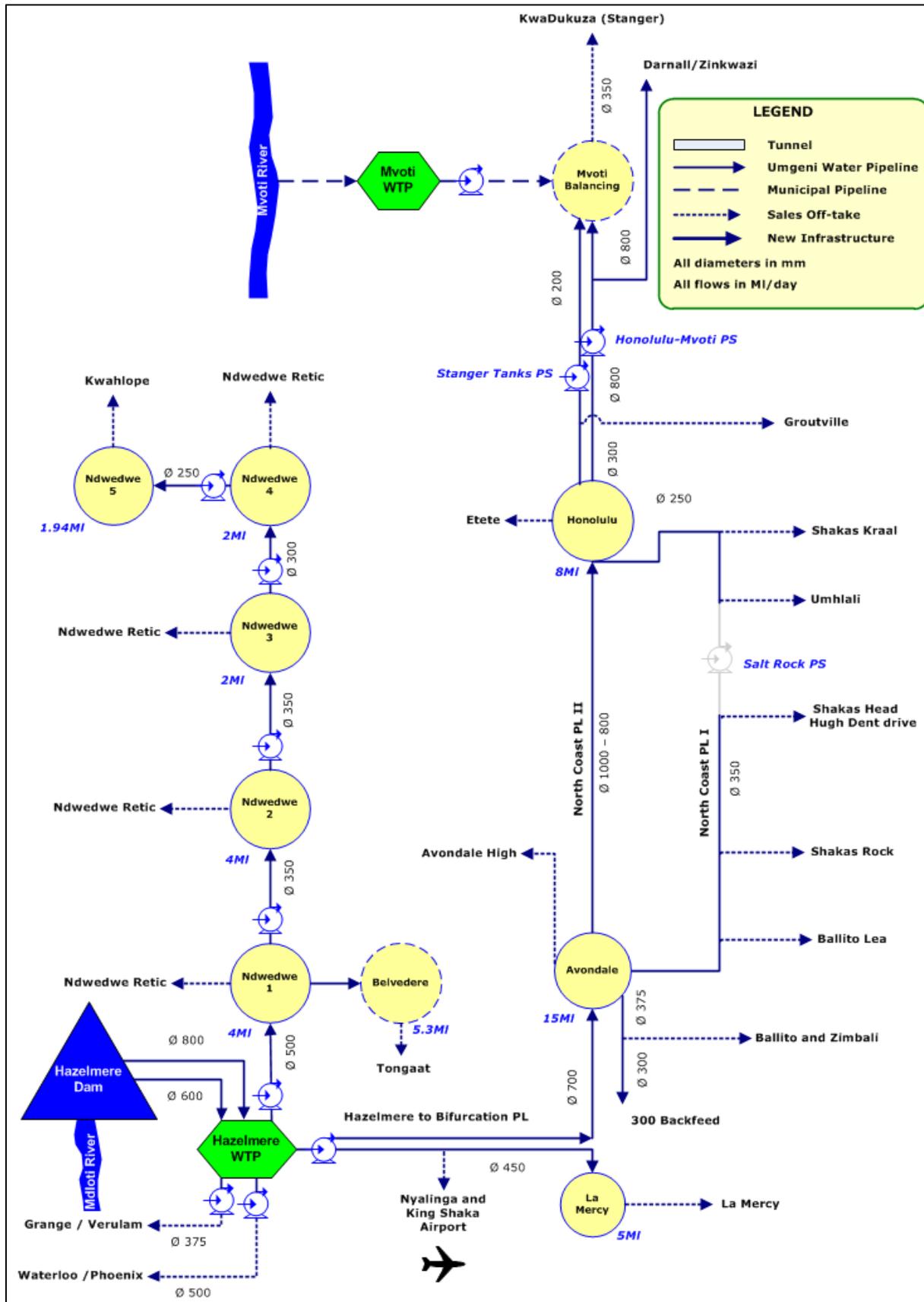


Figure 3: Umgeni Water North Coast System (Source: Umgeni Water Master Plan, 2015)

Ndwedwe LM

The central and eastern areas of Ndwedwe LM receive its bulk water from a sequential pumping system to a series of 6 reservoirs, from Hazelemere Water Works.

The current demand projection is 16 Ml/day with only 9 Ml/day available from Hazelemere WTP. (Umgeni Water, 2014). A study has just been completed to supply the northern central and southern Ndwedwe from the Nondabula reservoir that will be the terminal point of the uMshwathi Bulk Water supply scheme. This option will allow water to be supplied to these reservoirs via reverse flow from the Nondabula Reservoir thus eliminating the need to pump from Hazelemere Water Works. The Wosiyane scheme intends supplying the western section of Ndwedwe from the Bruyns Hill reservoir on the uMshwathi System.

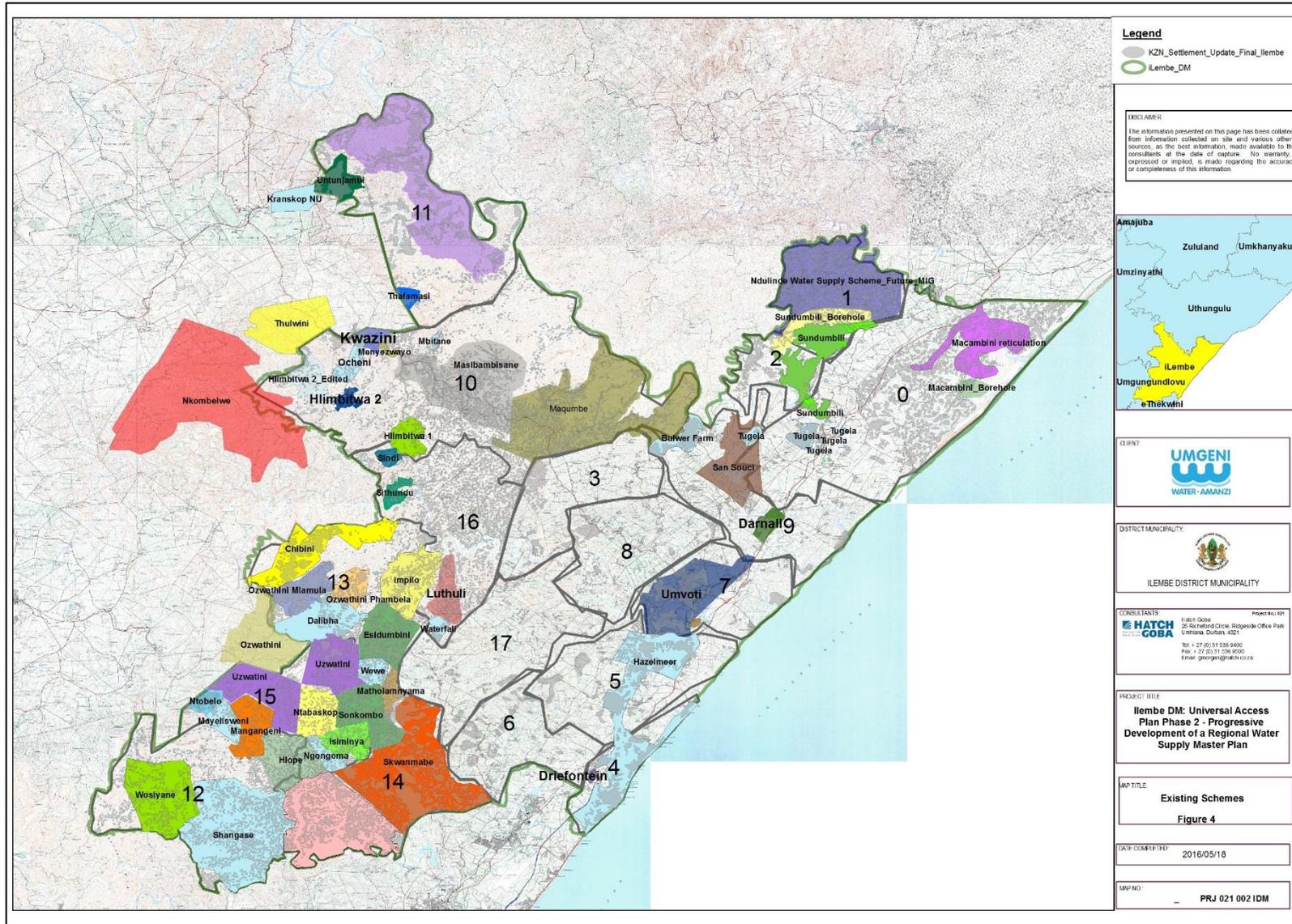
5.2. BULK WATER SUPPLY SCHEMES AND CONSTRAINTS

The existing schemes of Ilembe District Municipality are summarised in **Table 9** below showing the All Towns Reconciliation Study water supply scheme areas, treatment works and their capacity, abstraction sources and supply areas.

A map showing the existing schemes is shown in **Figure 4**.

Table 9: Summary of Existing Infrastructure per Water Supply Scheme

Scheme Area	Source	Infrastructure	
		Abstraction	WTW
Mandeni and Tugela	Tugela River	Rising main design capacity not known	Mandeni and Tugela WTW - 6.6 Ml/day conventional plant
Sundumbili	Tugela River	Rising main design capacity not known	Sundumbili WTW - 40.00 Ml/day conventional plant
Masibambisane and Maqumbe	Mvoti River		Masibambisane WTW - 1.50 Ml/day conventional plant
Southern & Central Maphumulo	iMvutshane Dam	12 Ml/day Rising main design capacity not known	12 Ml/day
iLembe North Coast up to Zinkwazi & Southern Ndwedwe	Mdloti River (Hazelmere Dam)	75 Ml/day	75 Ml/day



6. BULK WATER SUPPLY INTERVENTIONS CURRENTLY IN PLANNING (AND IMPLEMENTATION)

Planned infrastructure information has been collated from service providers working in IDM in various drawing formats and transferred to GIS.

The information below was obtained from All Towns Reconciliation Study undertaken by DWS (2011) as well as information that was obtained from service providers working in IDM.

6.1. MASIBAMBISANE AND MAQUMBE WSS

The main source of supply for Masibambisane and Maqumbe Water Supply Scheme currently is from surface water supplies and groundwater with potential to supply from the Mvoti River, based on the Umgeni Water planning.

6.2. NDULINDE SUB-REGIONAL WATER SUPPLY SCHEME

The Ndulinde Sub-Regional Water Supply Scheme fall within wards 5, 6 and 11 of Mandeni Local Municipality. The scheme is intended to provide potable water supply to the community that is currently being served through boreholes that are equipped with hand pumps and some springs that are within the area. The source of water is Sundumbili Water Works, which is situated on the northern banks of the Thukela River. The scheme will serve a total of 42,752 people residing in some 10,691 households. The scheme is estimated to cost R 116,579,664 and is implemented in phases until 2015/2016 financial year when it will be fully commissioned.

6.3. MACAMBINI SUB-REGIONAL WATER SUPPLY SCHEME

The Macambini Sub-Regional Water Supply Scheme fall within wards 1, 2, 3, 8 and 9 of Mandeni Local Municipality. The scheme is intended to provide potable water supply in house connections the community that is currently being served through boreholes that are equipped with hand pumps and some springs that are within the area. The scheme will also augment the current supply from the Mlalazi Water Scheme that is under UThungulu District Municipality who act as a bulk water provider to iLembe DM. During dry seasons, UThungulu DM is unable to meet iLembe DM's demand and this often results in shortage of water to the community of Macambini. The source of water is the Sundumbili Water Works, which is situated on the northern banks of the Thukela River that has been upgraded from 27 Ml/day to 40 Ml/day in order to increase the capacity of water works. The scheme will serve a total of 58,480 people residing in some 7,310 households. The scheme is estimated to cost R 544 000,000.00 and will be implemented in phases until 2017/2018 financial year when it will be fully commissioned.

However the first household connections will be achieved in 2015/16. Once these two schemes have been commissioned, the backlogs for water in Mandeni will be eliminated.

6.4. LOWER THUKELA REGIONAL BULK WATER SCHEME

The Lower Thukela Regional Bulk Water Scheme that will ultimately have a capacity of 110 ML/day is intended to initially serve the area of KwaDukuza with potable water supply. The demand for water on the coastal area of KwaDukuza has increased and the currently supply from the Umdloti and Umvoti river systems are insufficient to meet the projected water demand. The project is implemented jointly by iLembe District Municipality and Umgeni Water and will cater for the:

- current demand,
- future private developments of commercial, industrial and residential nature,
- low cost housing developments, - rural areas currently served as stand-alone schemes, and
- Rural areas that are currently un-served.

The scheme will serve a total of 64,239 bulk connections to commercial and private units, 28,567 low cost housing units, augmentation of bulk to 3,349 rural households and bulk and reticulation to 3,083 rural households without services. The scheme is expected to cost a total of R 1,283,580,681.00 and is implemented in phases, subject to availability of funding. The iLembe District Municipality is also exploring the idea of a desalination plant to augment the above water schemes. The first phase of the scheme is due for commissioning in 2016 Subject to funding being made available, this scheme is estimated to be fully commissioned in 2020.

The intention is to eventually supply the area along the coast, south of the Thukela from the Lower Thukela Water supply Scheme, via backfeed to Honolulu and Avondale Reservoirs. This will allow the current supply from Hazelmere to either be commissioned or used as a backup. The iLembe District currently has a programme in place to connect all the necessary supply areas to the Lower Thukela scheme via secondary bulk pipelines. A layout plan for this that was received from *Bosch Stemele* is attached in **Annexure C**.

It is understood from Umgeni Water's latest Infrastructure Masterplan that the current long term plan is to develop a water source on the Mvoti River and use this source to supply the area south of KwaDukuza. The Lower Thukela Scheme will then be able to supply the areas to the north into Uthungulu DM. The timing of this will be influenced by demand uptake, the feasibility of a source on the lower Umvoti and the feasibility of supply further north into Uthungulu DM.

6.5. UMSHWATHI PIPELINE

The proposed uMshwathi Pipeline is being implemented by Umgeni Water to augment the water supply to Ndwedwe Ozwathini area that is currently being served through borehole supply. These areas fall within wards 4, 5, 6, 8, and 9 of Ndwedwe Local Municipality. The project will be implemented in 3 phases. Phase 1 is already underway from PMB to Swayimane, Phase 2 is from Swayimane to Wartburg and Phase 3 is from Wartburg to Ndwedwe. It is anticipated that the project will be complete by 2017. In the interim the municipality has implemented the Nsuze bulk abstraction to augment water supply to the above wards.

6.6. BALCOM/KWASIZABANTU SUB-REGIONAL WATER SUPPLY SCHEME

The Balcom/Kwasizabantu Sub-Regional Water Supply Scheme falls within Maphumulo Local Municipality of iLembe DM area. The water scheme will cover wards 3, 5 and 6 of Maphumulo Local Municipality with potable water supply at a level of house connections.. The scheme is an extension of the Maphumulo/KwaDukuza Sub-Regional Water Scheme and is extended to cover the areas of Balcom and KwaSizabantu with water supply. The source of water is the Mvutshane River where a dam and purification plant are currently under construction and water will be pumped to a number of storage reservoirs. The Water Supply Scheme will serve approximately 3,532 households (28,256 people) in Balcom and Kwasizabantu areas. The scheme also makes provision for the adjacent Magongo area in Ward 3. The scheme is estimated to cost R 450, 000, 000 and will be implemented in phases until 2015/2016 financial year.

6.7. MAPHUMULO/KWADUKUZA SUB REGIONAL WATER SCHEME.

The scheme is co funded by iLembe District Municipality and Umgeni Water, where Umgeni Water will focus on the implementation of the bulk system (including the dam) and iLembe District Municipality will focus on the reticulation networks up to yard connections. The scheme will cover wards 4, 7, 8, 9, 10 and 11 of Maphumulo Local Municipality and ward 1, 2, 3, 4 and 7 of Ndwedwe Local Municipality. The extent of the scheme is from Maphumulo to KwaDukuza. The scheme will serve a total of 77,900 people residing in some 17,084 households. iLembe District Municipality will contribute R326, 474,169 towards this scheme. The scheme is expected to be complete by 2016/2017 financial year.

An upgrade to Maphumulo System has been implemented as a result of the low flow in the iMvutshane river. This includes the new weir, abstraction works, pump station on the Hlimbitwe

River to transfer raw water into the existing abstraction point on the iMvutshane Dam to allow for future demands.

7. BULK WATER SUPPLY INTERVENTIONS CONSIDERED IN THIS STUDY

Using available information, the following regional schemes have been investigated as options to supply the bulk water in iLembe District Municipality. It must be noted that viability of these options are dependent on many factors such as:

- Water resource availability
- Existing infrastructure availability
- Technical matters
- Environmental matters
- Financial, Economic and social matters

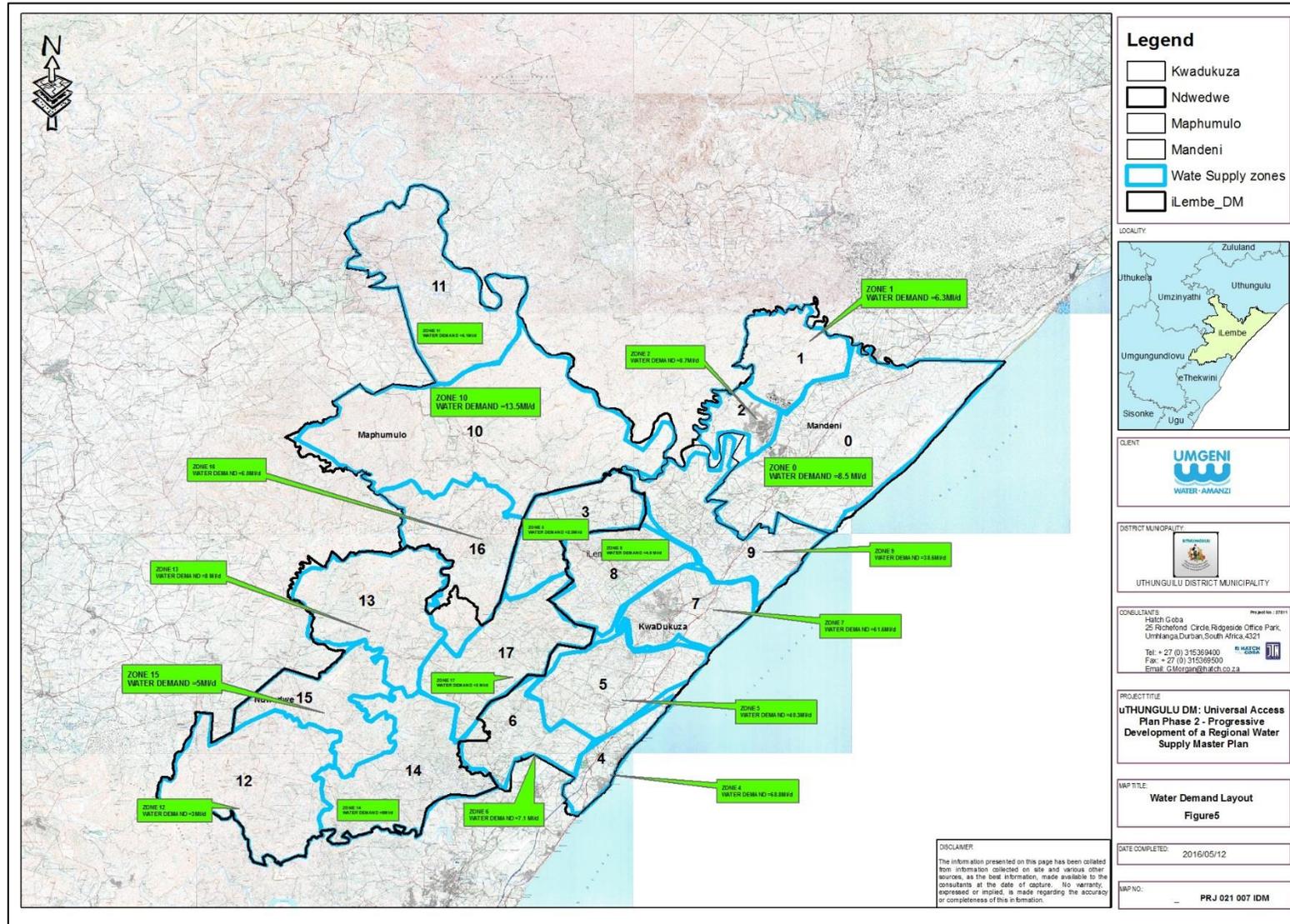
All options that were investigated are presented in this report and the viability and possible further investigation of each option is discussed after the option is presented.

Using the methodology presented in section 1.4, the iLembe District Municipality was broken up into 17 Bulk Supply Zones with possible or existing command reservoir positions in each zone.

These zones together with the demand for each zone are shown in **Figure 5** and summarised in **Table 10**.

Refer to the Scheme Map, shown in **Figure 4**, in conjunction with the information below, where existing and planned supply is depicted within their respective LM.

A water balance is presented in **Table 11** highlighting either the adequacy or need for augmentation of the water resources for each LM.



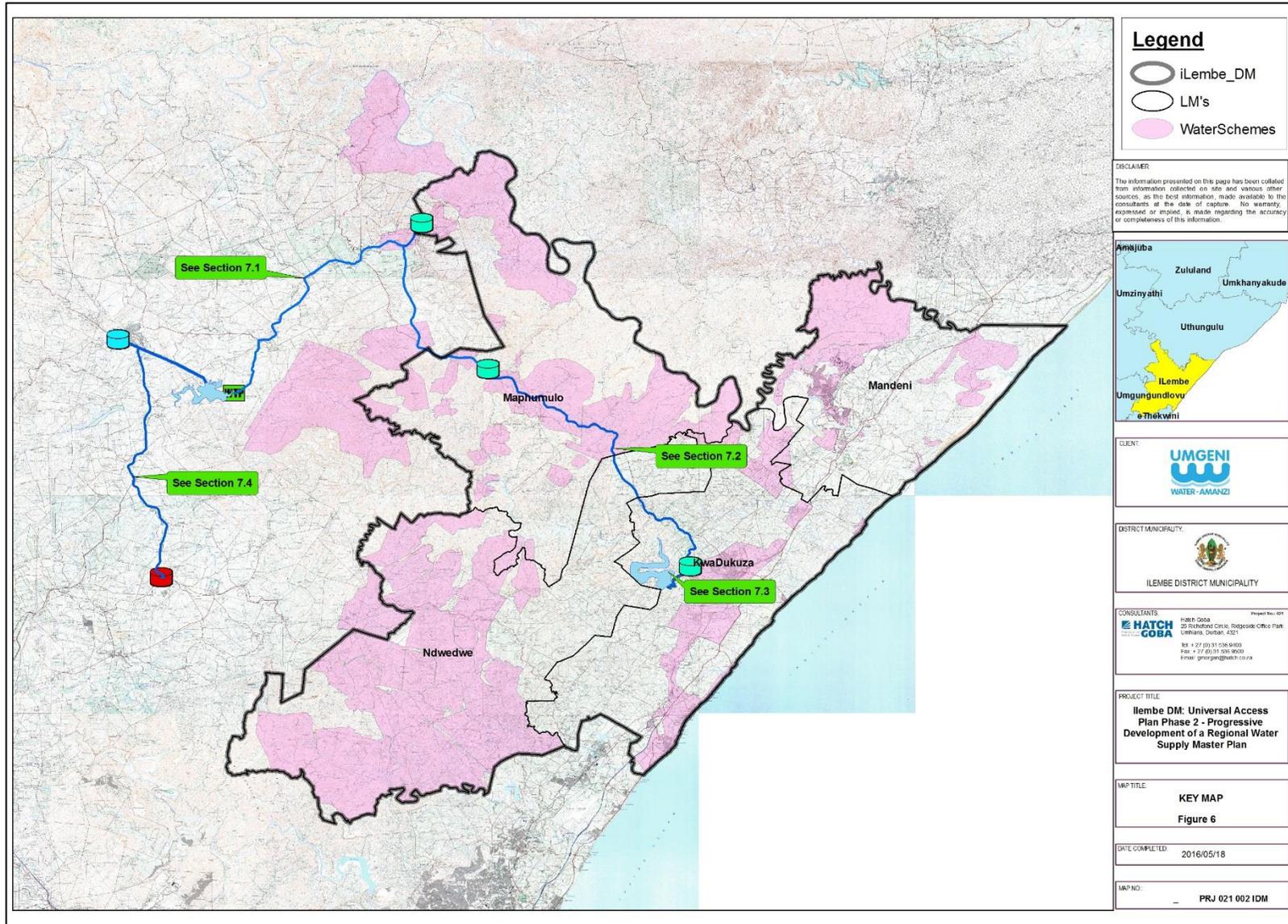


Table 10: Projected Demands per Zone

Zone	Population 2015	Population 2045	Mℓ/day 2015	Mℓ/day 2045	Local Municipality	Comments
0	52 409	70 639	6.29	8.5	Mandeni	Not in UW Area
1	38 906	52 440	4.67	6.3	Mandeni	Not in UW Area
2	53 859	72 594	6.46	8.7	Mandeni	Not in UW Area
3	10 568	14 244	1.27	2.0	Ndwedwe	
4	30 364	60 067	18.22	68.8	Kwadukuza	
5	71 832	142 098	12.93	40.3	Kwadukuza	
6	17 802	35 215	2.56	7.1	Kwadukuza	
7	83 892	165 955	20.13	61.6	Kwadukuza	
8	10 121	20 020	1.46	4.9	Kwadukuza	
9	28 691	56 757	4.13	38.6	Kwadukuza	
10	56 044	75 539	6.73	13.5	Maphumulo	
11	21 157	28 516	2.54	5.1	Maphumulo	
12	16 497	22 235	1.98	3.0	Ndwedwe	
13	43 464	58 583	5.22	8.0	Ndwedwe	
14	35 919	48 414	4.31	6.0	Ndwedwe	
15	23 897	32 209	2.87	5.0	Ndwedwe	
16	24 513	33 040	2.94	6.0	Maphumulo	
17	17 471	23 548	2.10	3.0	Ndwedwe	
TOTALS	637 406	1 012 112	106.80	296.4		

Table 11: Water Balance

Local Municipality	UAP Phase 2 Supply Zones	Existing Water Resource	Yield (Mℓ/day)	UAP Phase 2 : 30 Year Demand GAADD (Mℓ/day)	Resource Assessment		UAP Phase 2/ILDM Long Term Augmentation Option
					Water Surplus (Mℓ/day)	Water Deficit (Mℓ/day)	
Kwadukuza	4 to 9	Hazelmere Dam	49.8	221.30	-	171.50	Welverdiend Dam Mvotipoort Dam Isithundu Dam
Maphumulo	10, 11 & 16	Imvutshane Dam Ngcebo Scheme	6.5	24.60	-	18.10	uMshwathi Bulk iMvutshane Dam Mvotipoort Dam
Ndwedwe	3, 12 to 15 & 17	Hazelmere Dam	5	27.00	-	22.00	uMshwathi Bulk
Mandeni	0, 1 & 2	Thukela River (Sundumbili WTW)	40	23.50	16.50	-	-

References: All Town Recon Strategies of the respective Regional Schemes
Umgeni Water Infrastructure Masterplan

Assumption: Hazelmere Dam to be utilised by Ethekwini

7.1. OPTION 1 : PROPOSED BULK WATER SUPPLY FROM MVOTIPOORT DAM TO MAPHUMULO COMMAND RESERVOIR

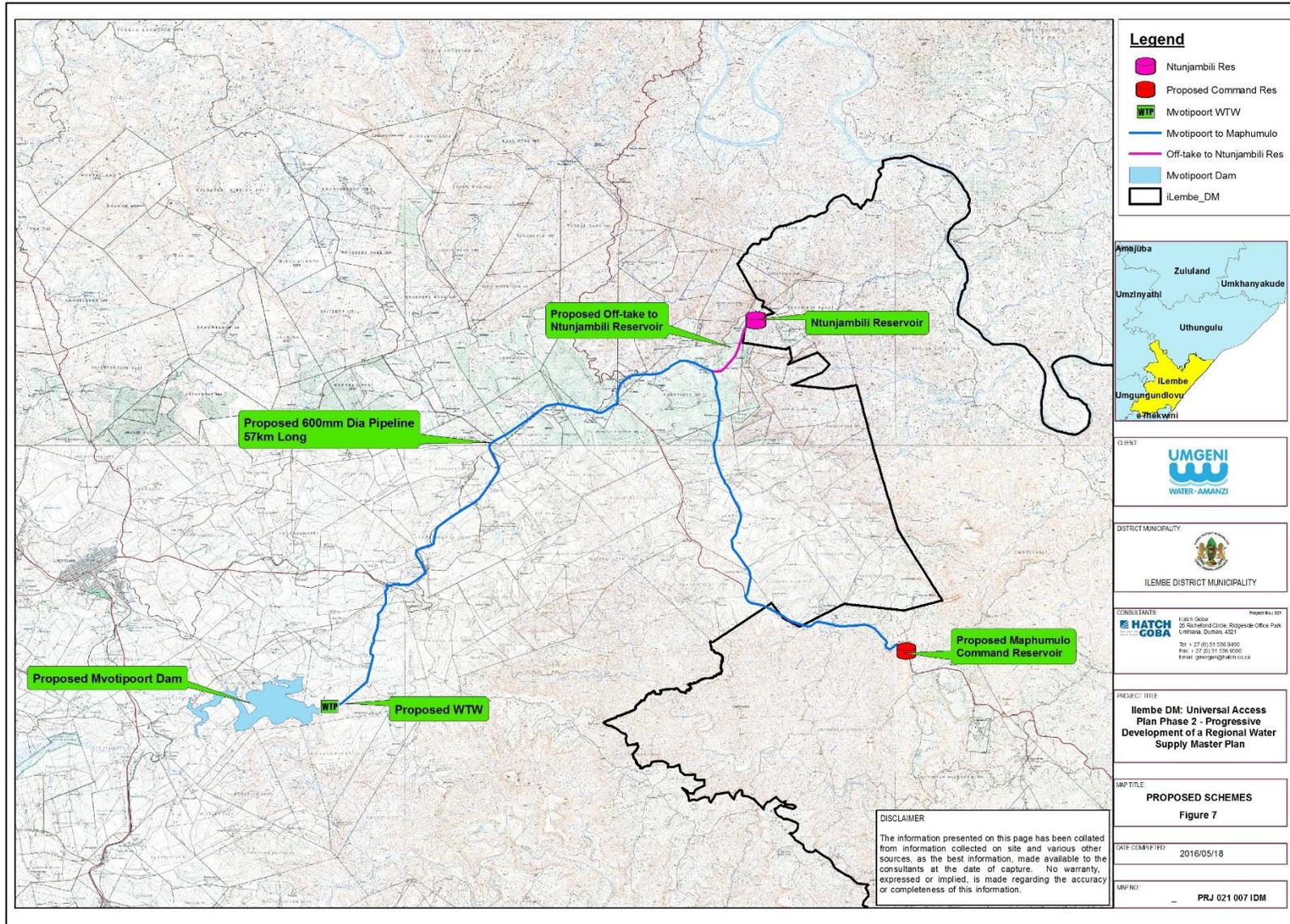
The feasibility and development of the Mvotipoort Dam will allow for supply to a number of nodes. The yield of Mvotipoort Dam was investigated to be 120 Ml/day. The possibility of supply from this Dam to the Maphumulo Local Municipality, (Zones 10, 11, 16 & a section of Zone 3) is one such option. This will however require a 56km, 600mm \varnothing pipeline from a water works at the dam along the R74 to a command position at elevation 1060m in Maphumulo where there is an existing reservoir. Two stage pumping for a static head of 320m to a reservoir at elevation 1250 will however be required, from where it will be possible to supply water under gravity to the Maphumulo Command Reservoir.

It will be possible to supply Matimatolo as well as Kranskop in the Umzinyathi DM en-route. From the Maphumulo Command Reservoir, it will be possible to supply water under gravity to most of the consumers that are currently being supplied from the iMvutshane Dam and waterworks.

It will also be possible to connect to the Ngcebo scheme at Zone 11 and supply all the current reservoirs under gravity via back feed.

An alternate configuration to this option will be to upgrade and utilise the existing Greytown Waterworks. A raw water pipeline will be required from the Mvotipoort Dam to the waterworks situated at an elevation of 1150m from where water can be supplied to Maphumulo.

The configuration with a new waterworks at the dam together with pipeline route is shown in **Figure 7**. A longitudinal section is shown in **Figure 7a** and the capital costs are presented in **Table 12**.



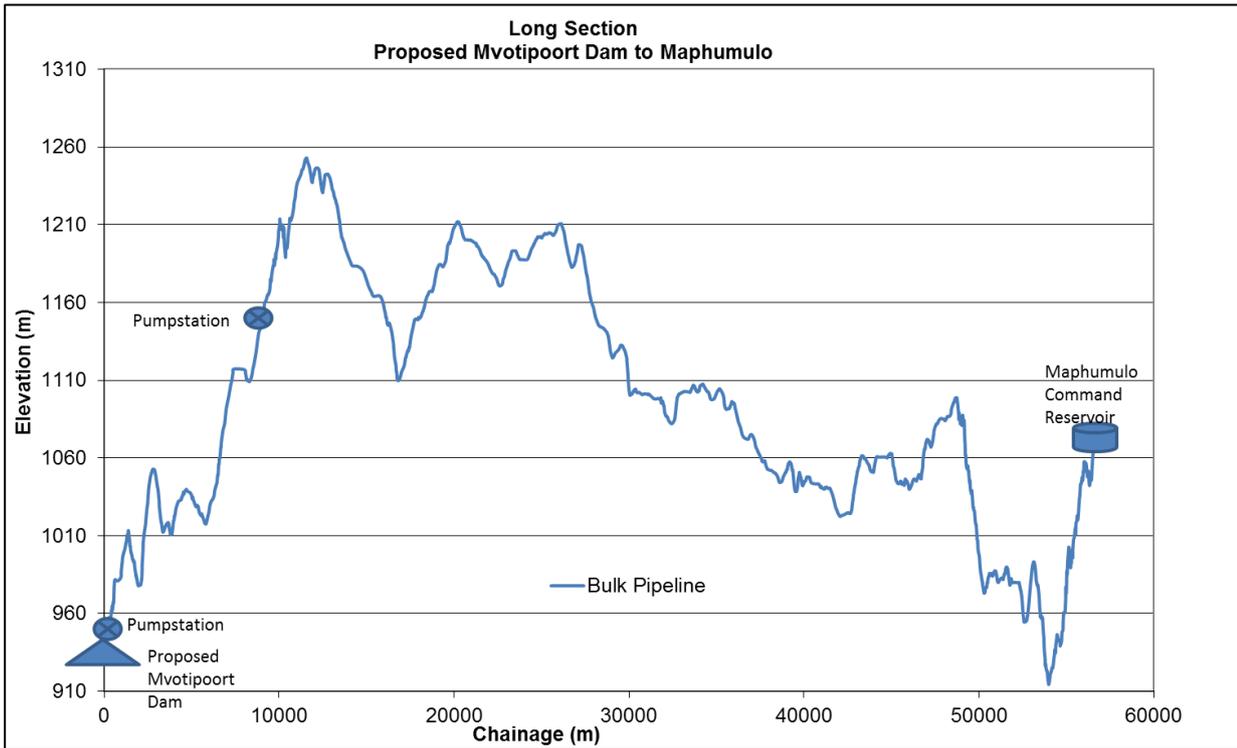


Figure 7a: Long Section of Mvotipoort to Maphumulo

Table 112: Capital Costs – Mvotipoort Dam to Maphumulo Reservoir

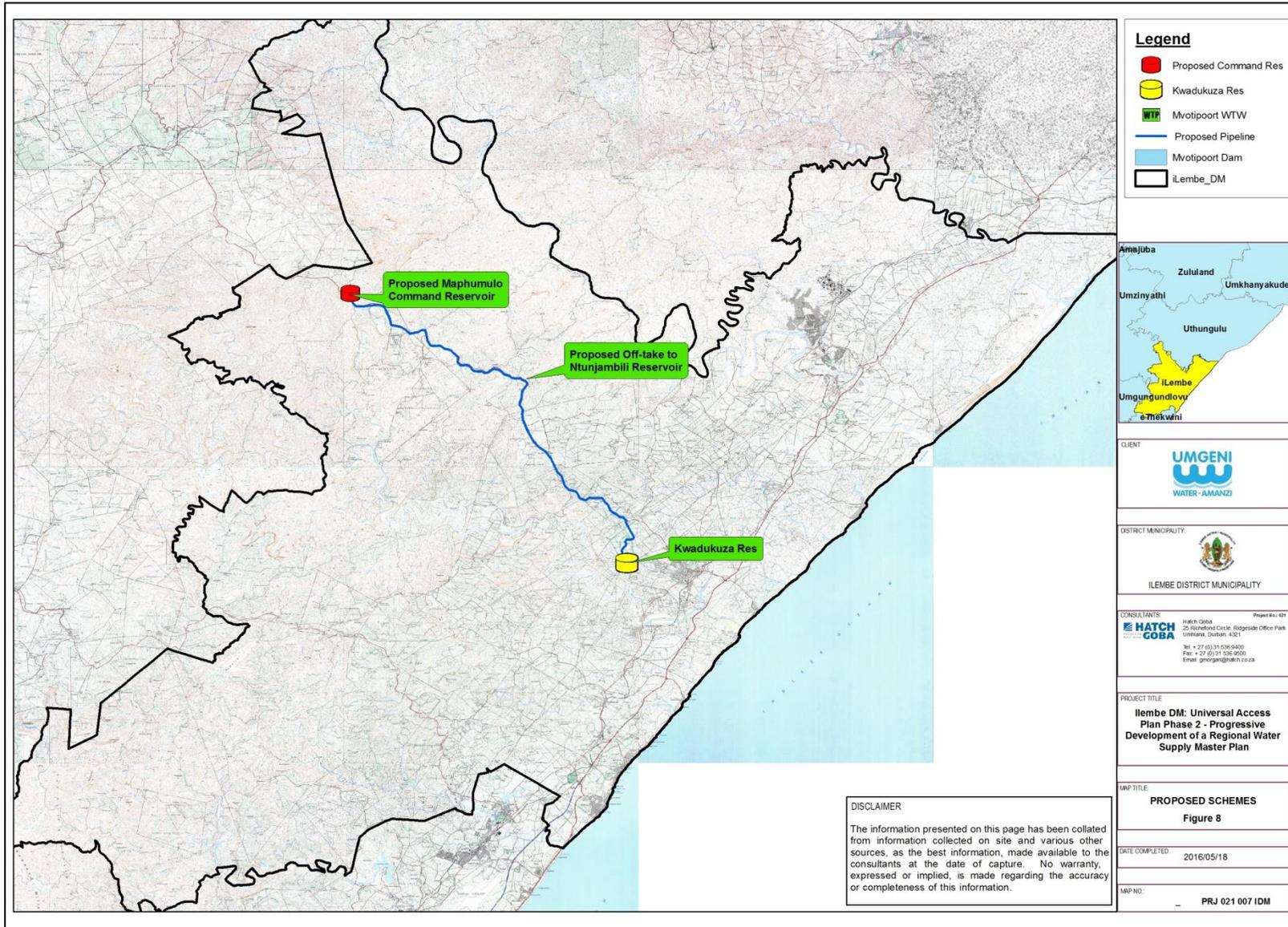
Consultants	
Design and Tender Documentation	190 491 515
Geotech Survey	3 000 000
Land Survey	457 083
Cathodic Protection	5 000 000
Construction Monitoring	10 665 270
Construction	
Pipe Supply	150 837 390
Pipeline Construction	268 797 931
Pipe Bridge/Jack	0
Pumpstation	48 114 000
Water Works	3 341 250
Reservoir	140 481 814
Dam	1 500 000 000
Abstraction	5 000 000
Land Acquisition - 7.5%	158 742 929
Environmental, Community Liaison	7 000 000
Health & Safety, Quality Assurance	21 165 724
Project Office	74 080 033
Contingencies	1 293 587 469
Sub total	3 880 762 408
VAT (14%)	543 306 737
Grand total	4 424 069 145

Electricity Capital Costs Excluded

7.2. OPTION 2 : PROPOSED MAPHUMULO COMMAND RESERVOIR TO KWADUKUZA REGIONAL RESERVOIR

Whilst the Maphumulo command reservoir will allow for the Maphumulo LM to be supplied from the proposed Mvotipoort Dam, the option of extending this supply further to KwaDukuza was investigated. To allow for the long term demand of 222.3 Ml/day on the proposed KwaDukuza Reservoir, For Zones 4 to 9 to be supplied, a 53km long 1400mm \varnothing pipeline will be required. This pipeline sizing will however have to be investigated in detail and optimised depending on the possible long term conjunctive of use of the Lower Thukela Bulk Water System to supply KwaDukuza LM. It will be possible to supply all demands en-route as well as the KwaDukuza Reservoirs under gravity.

The pipeline route along the R74 is shown in **Figure 8** and the longitudinal section is shown in **Figure 8a**. Capital costs are presented in **Table 13**.



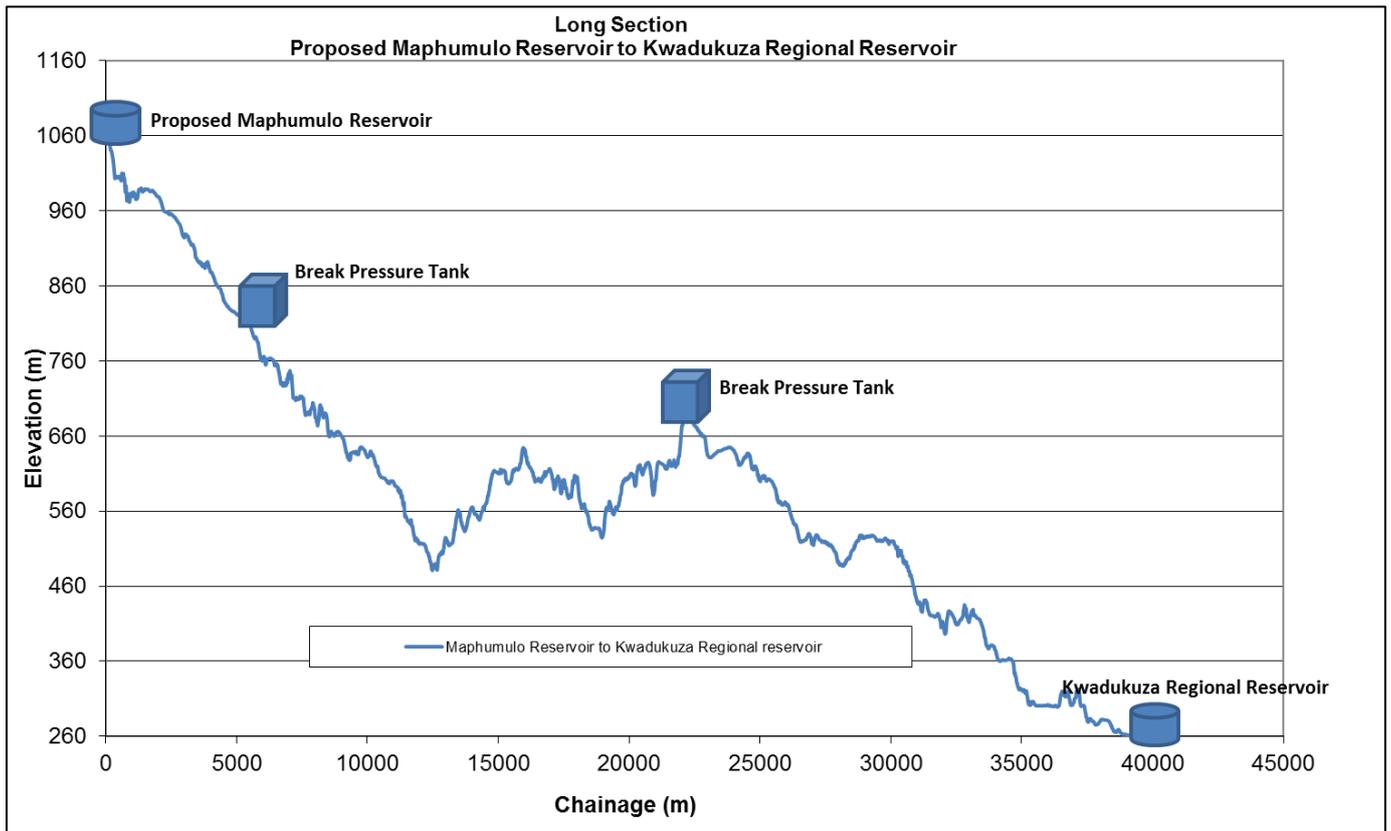


Figure 8a: Long Section of Maphumulo Command to KwaDukuza Regional Reservoir

Table 123: Capital Costs – Maphumulo Command to KwaDukuza Regional Reservoir

Consultants	
Design and Tender Documentation	92 454 387
Geotech Survey	3 000 000
Land Survey	425 007
Cathodic Protection	5 000 000
Construction Monitoring	9 916 830
Construction	
Pipe Supply	318 755 250
Pipeline Construction	568 033 904
Pipe Bridge/Jack	0
Pumpstation	0
Water Works	0
Reservoir	140 481 814
Dam	0
Abstraction	0
Land Acquisition - 7.5%	77 045 323
Environmental, Community Liaison	5 000 000
Health & Safety, Quality Assurance	10 272 710
Project Office	35 954 484
Contingencies	631 669 854
Sub total	1 895 009 563
VAT (14%)	265 301 339
Grand total	2 163 310 902

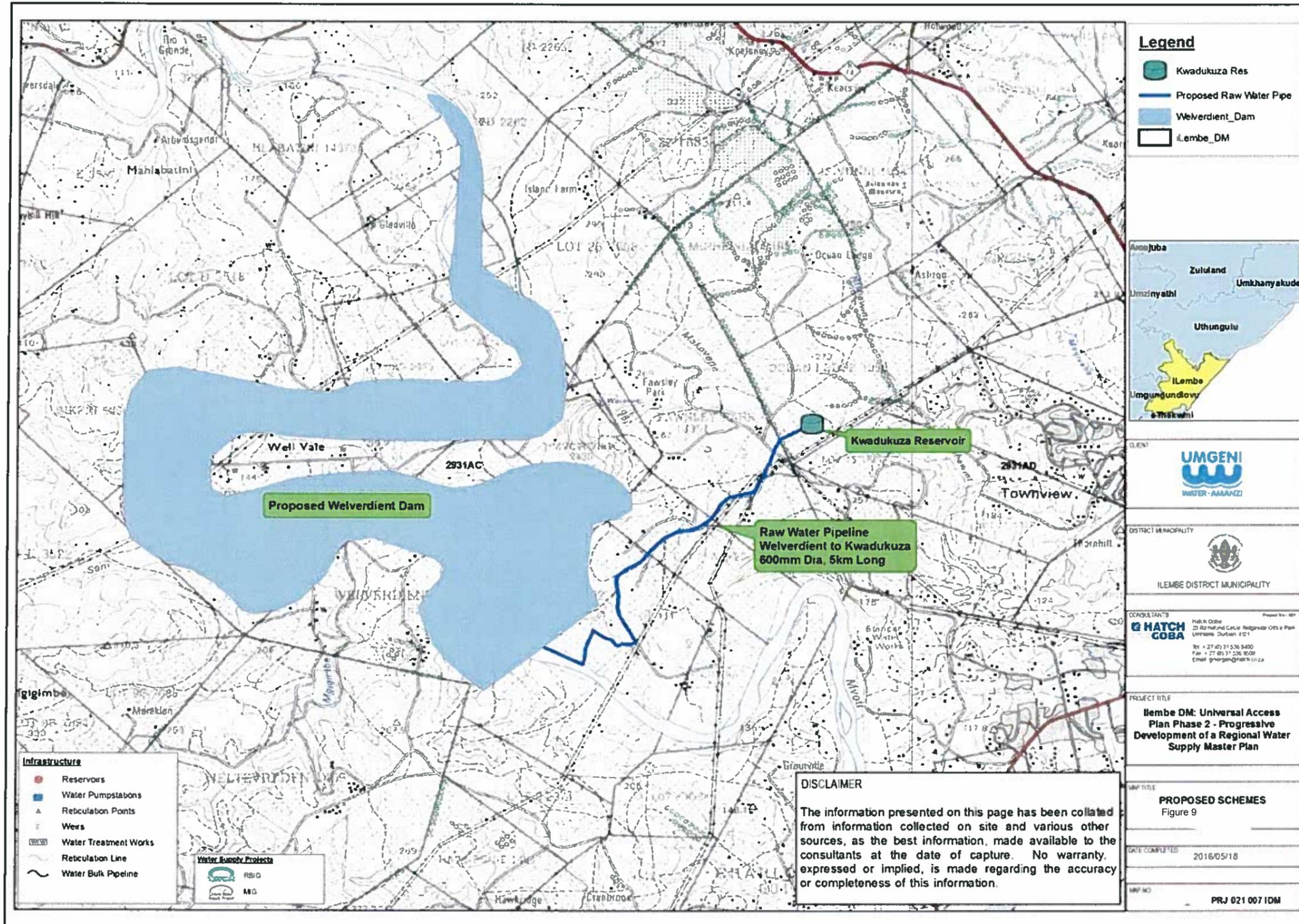
Electricity Capital Costs Excluded

7.3. OPTION 3 : PROPOSED WELVERDIENT DAM TO KWADUKUZA REGIONAL RESERVOIR

The proposed Welverdiend Dam is on the Mvoti River just outside Stanger at co-ordinate position -29.3547S; 31.2119E. This dam could provide raw water to supply Zones 4 to 9 with water. It is understood, after studying Umgeni Water's latest Infrastructure Masterplan, 2015/16 to 2045/46 that the long term intention is to develop a water storage source on the Umvoti River to supply the North Coast System in KwaDukuza LM. This proposed works and command reservoir is situated at co-ordinate position -29.3547S; 31.2119E at an elevation of 265m. It is understood that a 40ML reservoir is planned as a sub system as part of the lower Tugela Water Supply System at KwaDukuza Regional Reservoir.

The 30-year demand for the north coast system has been projected to be 222.3 Ml/day. **Figure 9** shows a possible raw water pipeline route from the proposed Welverdiend Dam to the proposed KwaDukuza Regional Reservoir. A 4km long 1700mm \varnothing raw water pipeline will be required. The longitudinal Section of the system is shown in **Figure 9a**. Capital costs are presented in **Table 14**.

From the proposed KwaDukuza Regional Reservoir, it will be possible to supply water to both the Mvoti Balancing Reservoirs as well as Honolulu Reservoir and Avondale Reservoir via back feed.



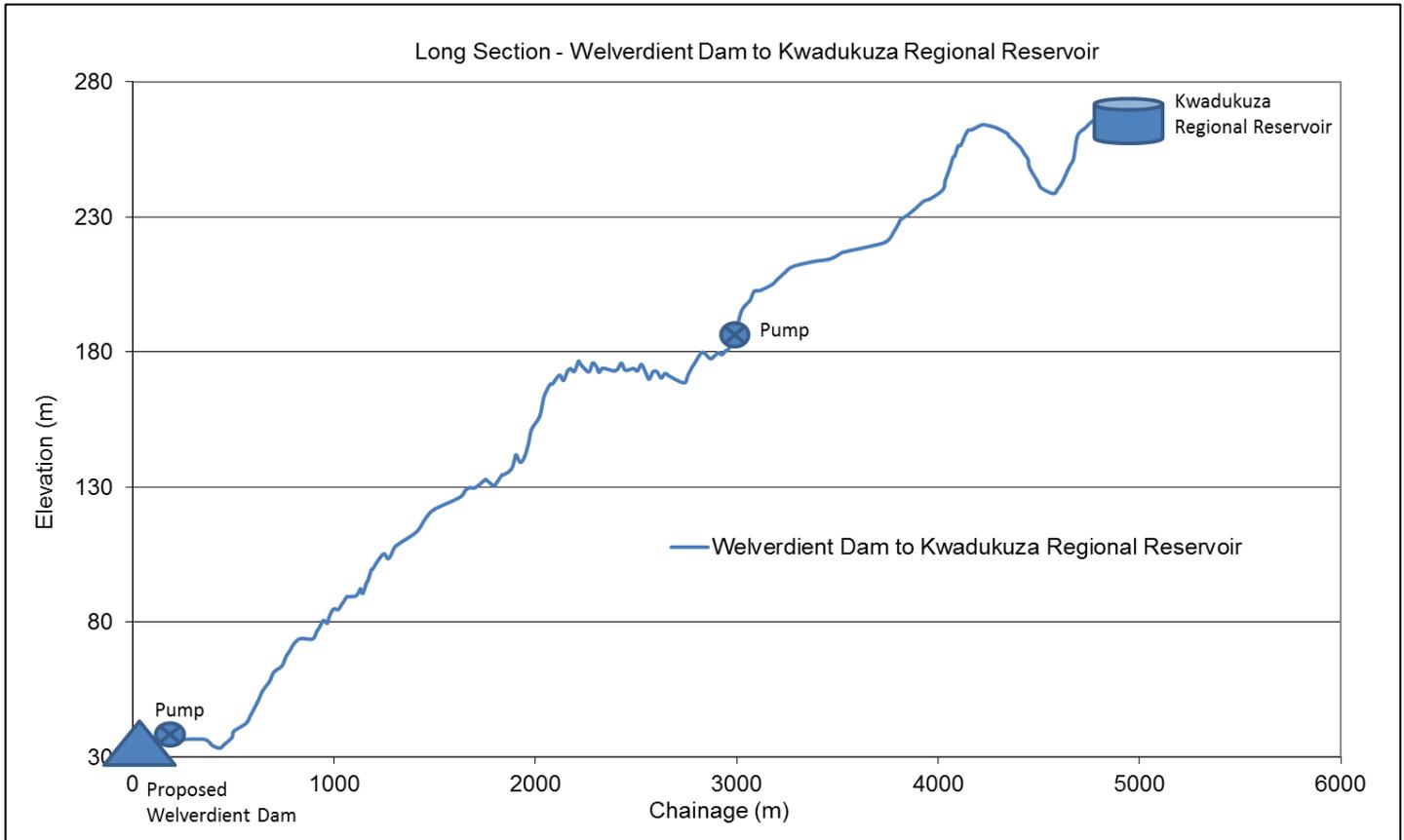


Figure 9a: Long Section of Welverdient to Kwadukuza Regional Reservoir

Table 134: Capital Costs – Welverdient Dam to KwaDukuza Regional Reservoir

Consultants	
Design and Tender Documentation	338 934 035
Geotech Survey	3 000 000
Land Survey	0
Cathodic Protection	5 000 000
Construction Monitoring	0
Construction	
Pipe Supply	56 801 245
Pipeline Construction	101 221 975
Pipe Bridge/Jack	0
Pumpstation	102 910 500
Water Works	0
Reservoir	0
Dam	3 500 000 000
Abstraction	5 000 000
Land Acquisition - 7.5%	282 445 029
Environmental, Community Liaison	10 000 000
Health & Safety, Quality Assurance	37 659 337
Project Office	131 807 680
Contingencies	2 287 389 900
Sub total	6 862 169 701
VAT (14%)	960 703 758
Grand total	7 822 873 459

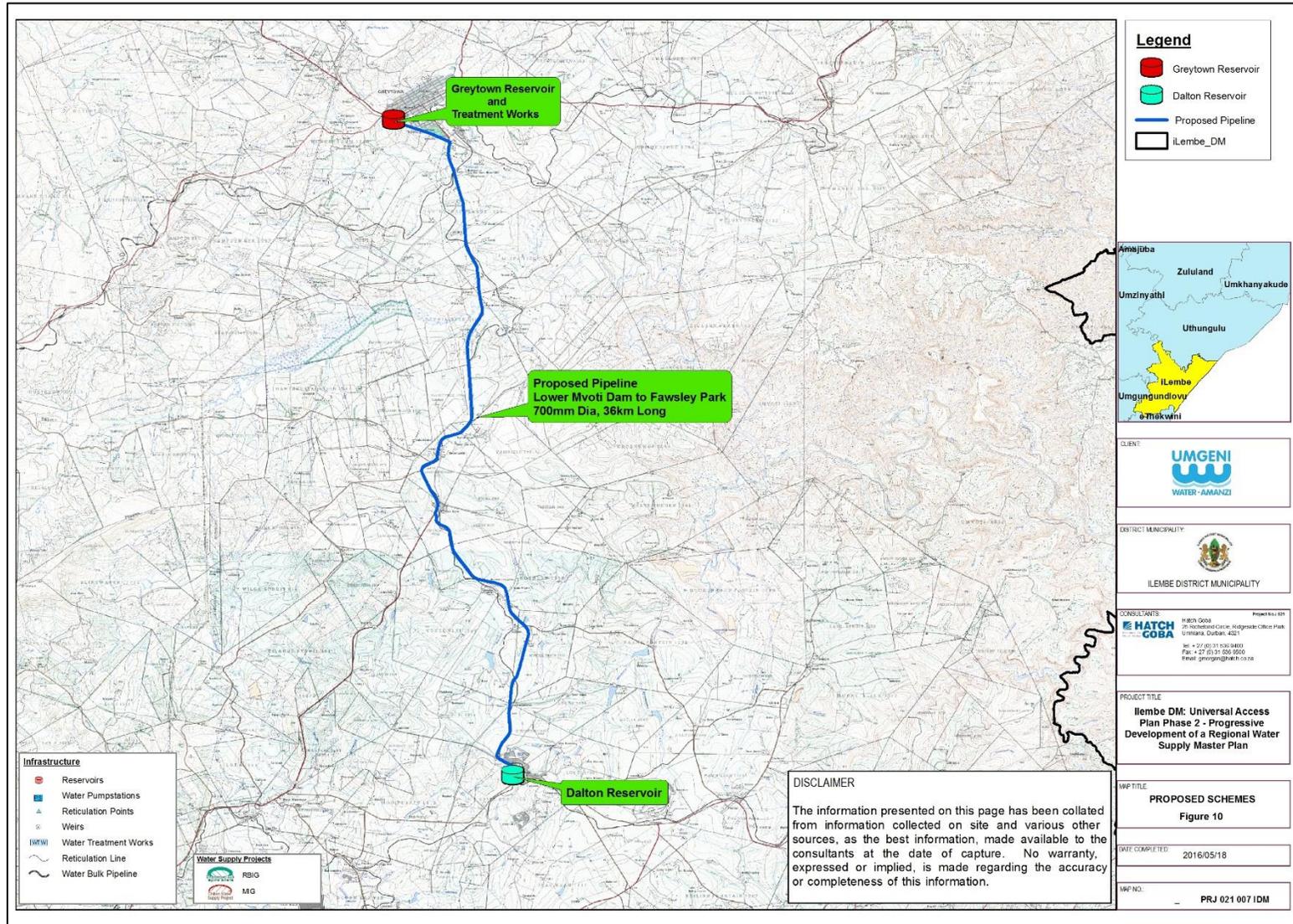
Electricity Capital Costs Excluded

7.4. OPTION 4 : GREYTOWN RESERVOIR TO DALTON RESERVOIR (MVOTIPOORT)

Investigations have been carried out to supply the Areas in northern, central and south eastern Ndwedwe from the uMshwathi Regional Scheme which will terminate at the Nondabula Reservoir in Ozwathini and supply Zones 13 to 15 and sections of Zone 16. An option to augment supply to the uMshwathi Regional Scheme from the proposed Mvotipoort Dam was investigated.

The Dalton reservoir complex is one of the intermediate reservoirs on the uMshwathi System that supplies water to the Nondabula Reservoir. The option of augmenting water to the Dalton Reservoir Complex from Greytown was investigated. This option will allow for the current load on the Mgeni system upstream of Dalton Reservoir to be shed to the Upper Mvoti System

A 12km long 550mm \varnothing raw water pipeline will be required to supply water from the Mvotipoort Dam to the Greytown Water Treatment Works. From this works, a 36km long 700mm \varnothing pipeline along the R33 then along District Road P342 will allow for supply to the Dalton Reservoir under gravity. The pipeline route is shown in **Figure 10** and the longitudinal section is shown in **Figure 10a**. Capital costs are presented in **Table 15**.



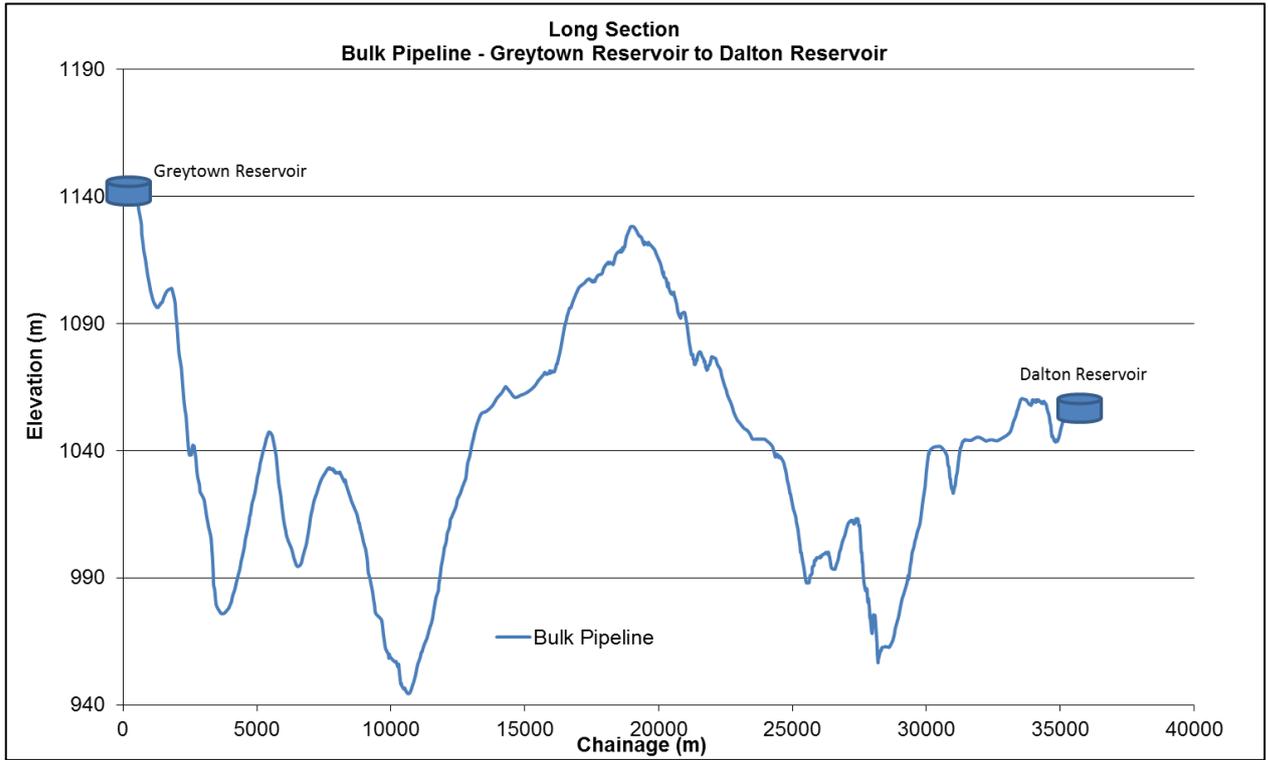


Figure 10a: Long Section of Greytown Reservoir to Dalton Reservoir

Table 145: Capital Costs – Greytown Reservoir to Dalton Reservoir

Consultants	
Design and Tender Documentation	34 437 368
Geotech Survey	3 000 000
Land Survey	288 684
Cathodic Protection	5 000 000
Construction Monitoring	6 735 960
Construction	
Pipe Supply	120 285 000
Pipeline Construction	214 352 417
Pipe Bridge/Jack	48 000 000
Pumpstation	0
Water Works	0
Reservoir	
Dam	0
Abstraction	0
Land Acquisition - 7.5%	28 697 806
Environmental, Community Liaison	5 000 000
Health & Safety, Quality Assurance	3 826 374
Project Office	13 392 310
Contingencies	241 507 959
Sub total	724 523 877
VAT (14%)	101 433 343
Grand total	825 957 220

Electricity Capital Costs Excluded

8. RECOMMENDATIONS

- It is recommended that a detailed feasibility study into the Mvotipoort Dam be undertaken as this dam has the potential to supply both Maphumulo, Ndwedwe and Kwadukuza LM's as well as the uMshwathi LM thereby reducing the load on Mgeni system
- It is also recommended that the investigation of the lower Mvoti system, i.e. Isithundu Dam and Welverdient Dam, be completed in detail as an option to augment current raw water supply to the growing water demands to KwaDukuza LM.
- A reconciliation and optimal configuration of the bulk infrastructure using the Mvotipoort and Welverdient Dams options needs to be undertaken. The scheduling of implementation of the dams and associated bulk distribution infrastructure needs to be determined. This order of implementation should take water demand growth into account. The reconciliation should include the possible future use of the Lower Thukela Bulk Water Scheme to supply northern KwaZulu-Natal. (Refer to Uthungulu UAP Phase 2 Report)

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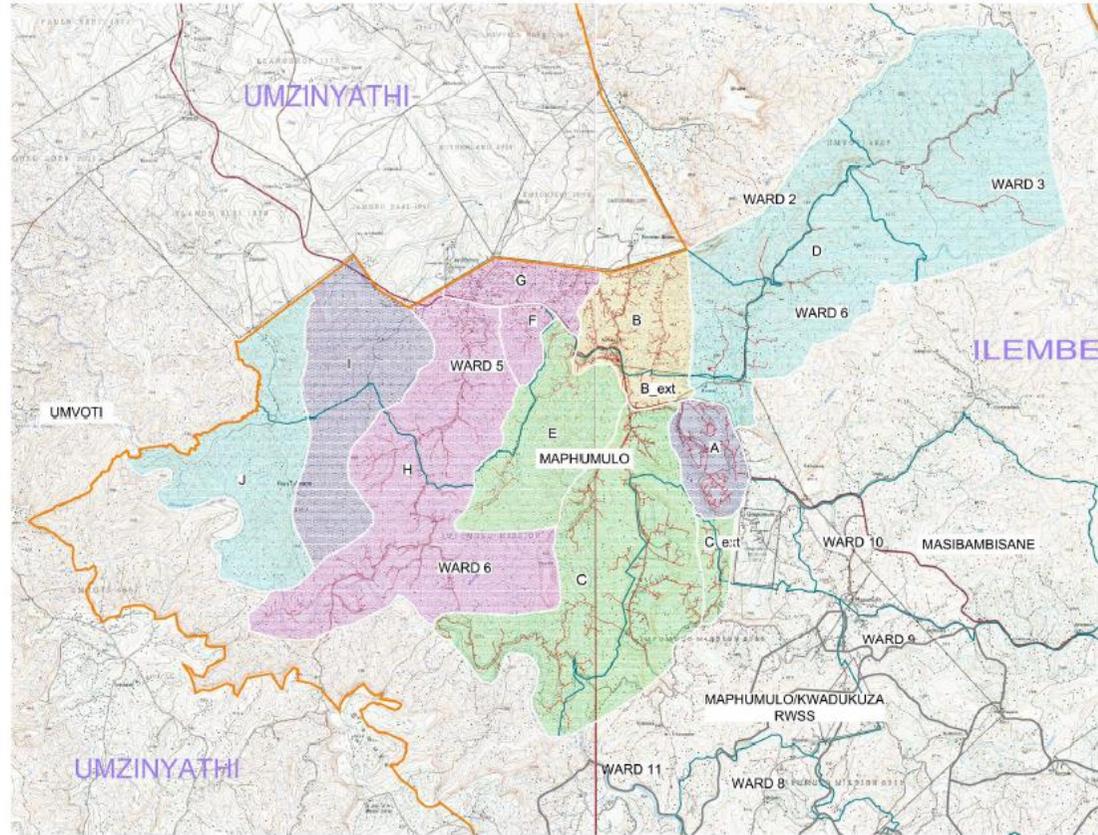
APPENDICES



ANNEXURE A: MAPHUMULO BALCOM KWASIZABANTU SCHEME



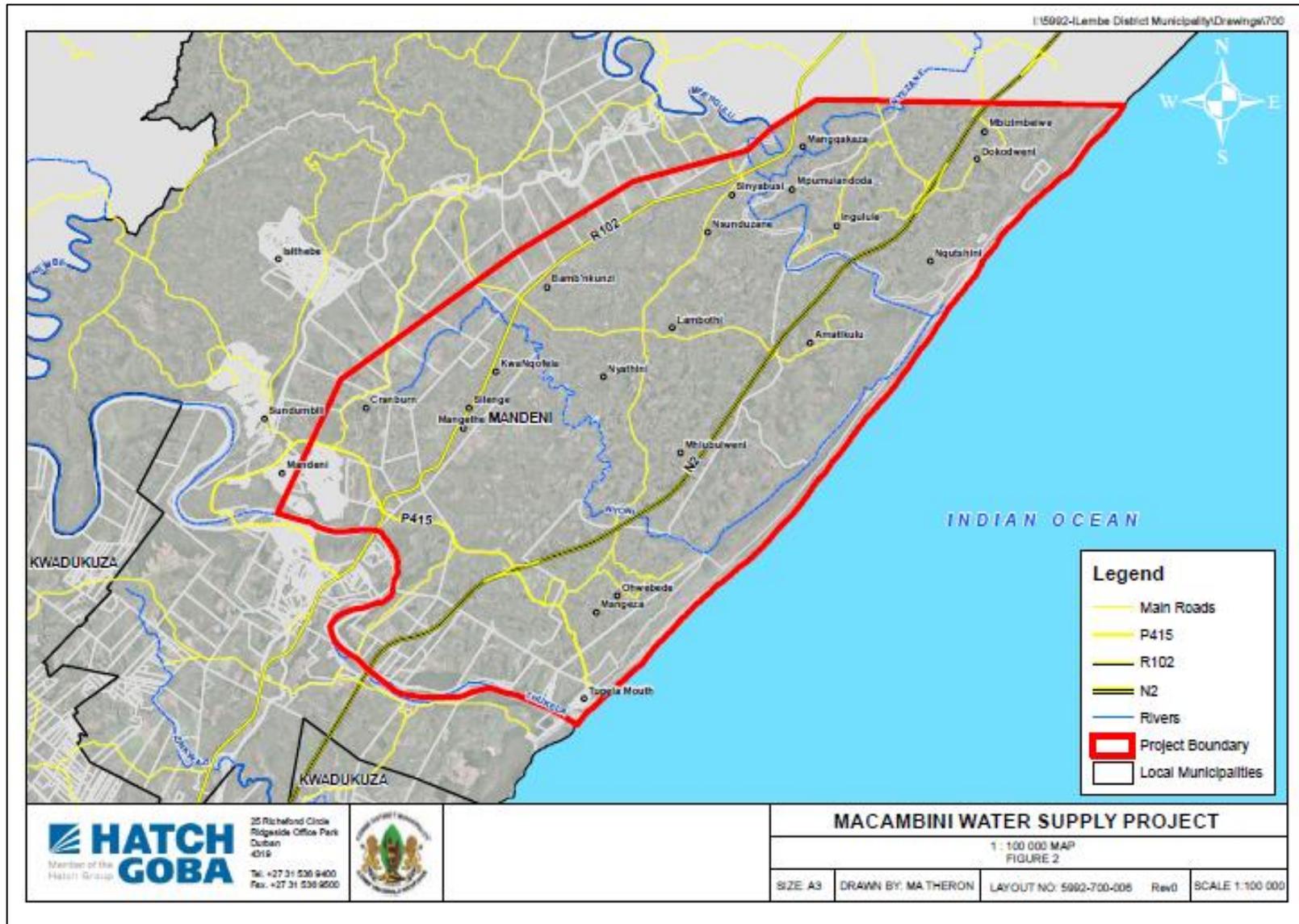
LEGEME	WATER DEMAND	
	3000L + 30% LOSSES (ML)	6000L + 30% LOSSES (ML)
FULLY COMMISSIONED (JUNE 2015)	8.0	12
PRESENTLY UNDER CONSTRUCTION (JUNE 2015)		
TENDER PROCESS COMMENCED	3.2	7.8
2010/16	2.8	9.1
2016/17	4.5	10.8
2017/18	5.4	13.1



ILEMBE DISTRICT MUNICIPALITY		PROJECT: BALCOME / KWASIZABANTU RWSS: MASTER LAYOUT DESCRIPTION: IMPLEMENTATION PLAN	PROJECT NO: 550 CONTRACT NO:	DESIGNED: F. KUPPERS DRAWN: S. MATHI CHECKED: C. MATHELI DATE: JUNE 2016	MSW MBONA SAUNDERS & WIUM (Pty) Ltd CIVIL & STRUCTURAL ENGINEERS ROAD & WATER DESIGN, PROJECT MANAGEMENT & SOCIAL FACILITIES	DRAWING NO: 559/MASTER/01
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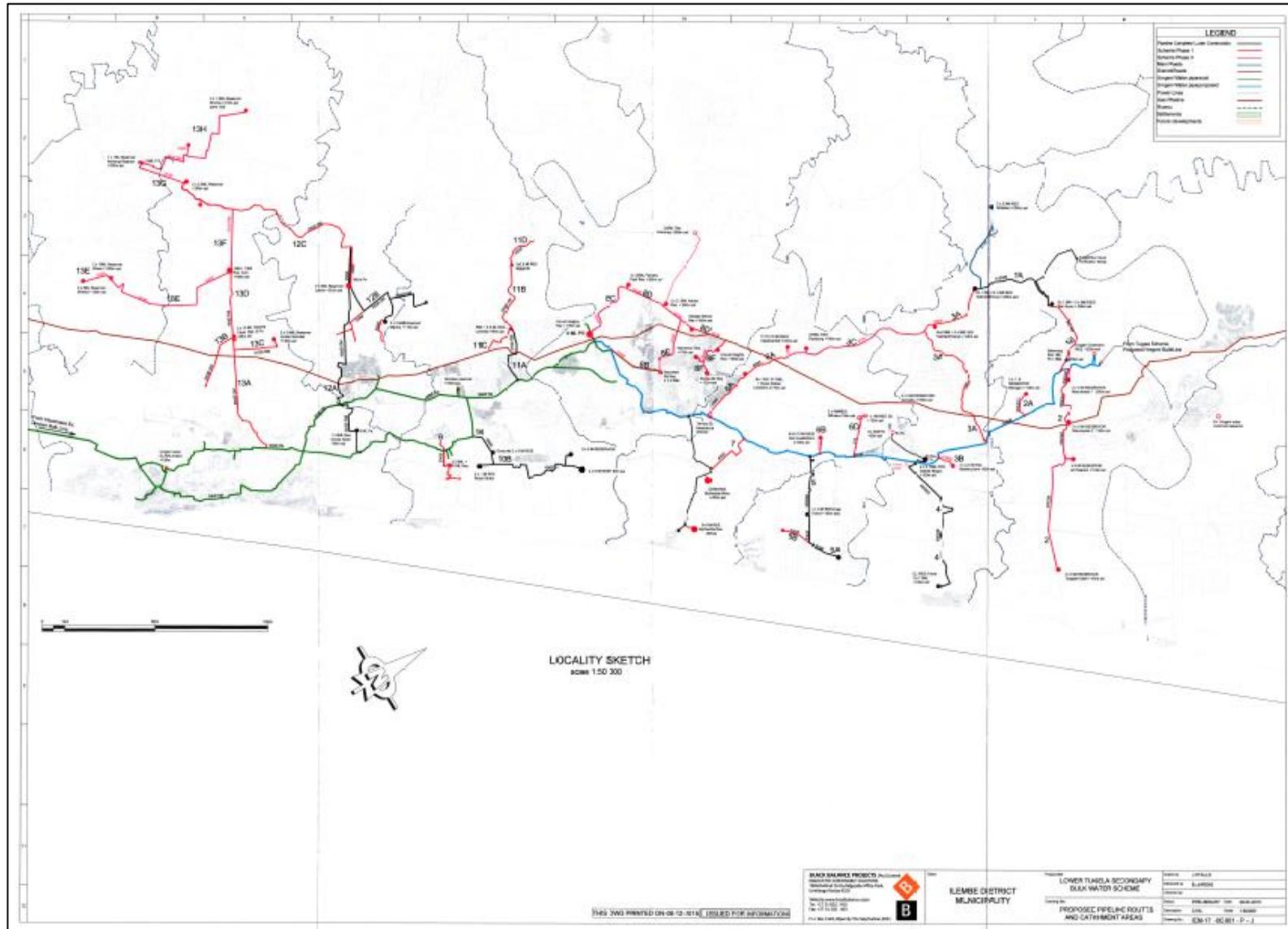


ANNEXURE B: MACAMBINI





APPENDIX C: LAYOUT OF SECONDARY BULK OFF LOWER THUKELA PIPELINE





APPENDIX D: OVERALL LAYOUT OF OPTIONS

